



Design
Compatibility
Guidelines



Davis-Monthan
Air Force Base
Arizona





AIR COMBAT COMMAND
UNITED STATES AIR FORCE

DESIGN COMPATIBILITY GUIDELINES

Davis-Monthan Air Force Base, Arizona

December 2007

**Davis-Monthan Air Force Base
Design Compatibility Guidelines
December 2007 Edition**

Attention

The December 2007 edition of the Design Compatibility Guidelines reflects updates and revisions made to the October 2007 edition. For those familiar with or currently utilizing the October 2007 edition, refer to Appendix A for a summary of the additions, deletions, and revisions incorporated in the December 2007 document.

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SECTION 1.0
Executive Summary

1.1 SCOPE OF THIS DOCUMENT

The following Design Compatibility Guidelines (DCG) outlines a consistent level of quality and style for all facilities at Davis-Monthan AFB. These standards provide a reference for everyone involved in base planning, design, and construction.

Davis-Monthan AFB is located in Pima County, Arizona within the city limits of Tucson in a high altitude, desert environment. Responding to this harsh climate, many buildings on base are influenced by traditional Southwestern desert architecture, using courtyards, thick walls, deeply recessed windows, wide overhangs, trellises, and other shading devices. Existing architectural influences off base are minimal.

The Davis-Monthan style will continue to reflect this Southwest influence: horizontal emphasis in building massing and fenestration, simple, rectangular volumes, low sloped roofs, earth-tone masonry, metal roofing, and use of various traditional and non-traditional shading elements.

All designs must meet but are not limited to the codes referenced in the following sections: CIVIL, ARCHITECTURAL, INTERIORS AND ENGINEERING STANDARDS.

All individuals involved in base planning, design, and construction must use these Design Compatibility Guidelines. The success of any design standard is dependent upon implementation and enforcement. It is the responsibility of each design professional working at Davis-Monthan AFB to adhere to the design framework presented here. Perhaps more importantly, it is the responsibility of the reviewing agencies and the contracting officer, particularly at the base level, to enforce the guidelines. A collective commitment to understand and abide by the guidelines is necessary to achieve the goals desired.

All associate units at Davis-Monthan AFB are required to comply with the architectural, landscape, exterior signs, and engineering sections of this document.

The Chief Engineer or ACC Command Architect must approve any deviations from standards listed

in this document. Waivers to these standards may be requested through the Base Civil Engineer.

The following illustrates procedures for using this document.

1.1.1 Intended Users

Improving the visual environment at Davis-Monthan AFB will require a consistent, determined approach, creative problem solving, and quality design. Two essential ingredients for success are concerned and enlightened clients and sensitive, responsible design professionals. The multiple users of these guidelines will range from independent architects and engineers to Air Force, military, and civilian personnel, including facility managers, responsible for planning, design, and maintenance activities at Davis-Monthan AFB. This document is intended to respond to the diversity of backgrounds and different areas of focus of base personnel and design professionals who will mutually implement the Design Compatibility Guidelines (DCG)

1.1.2 Instructions for Use

There is a critical sequence of tasks, or decisions, to be made when the DCG is being used for developing or evaluating design work. The following summarizes this series of tasks:

TASK ONE—Read and understand all of the background information in the DCG. Establish the location of the project to determine into which character area it should be placed. The determination of an appropriate character area is especially important for building design projects. However, this issue should not be ignored for landscape and site elements design projects.

TASK TWO—Review the assets and liabilities contained in the Character Area section for the chosen character area, and develop a thorough understanding of the positive and negative aspects of past improvements within the character area.

TASK THREE—Develop conceptual design responses which are appropriate for the project, and which will visually enhance the stated objectives of the chosen character area. Check all applicable guidelines throughout the Character Area section

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and review all the applicable Design Guidelines that are required.

TASK FOUR—Review the extent to which the individual project design contributes to accomplishment of the objectives and desired image for both the character area and the base as a whole.

TASK FIVE—Establish whether or not the basic principles, general concepts, and design guidelines have been followed to the maximum extent possible.

TASK SIX—Review the specific design guidelines, which are applicable to the project, and document compliance of the proposed improvements. Projects, which do not comply with the Design Compatibility Guidelines requirements, must be revised to bring them into compliance.

TASK SEVEN—Compare the project to the applicable Concept Landscape Design to determine if the final visual results follow the intent demonstrated.

TASK EIGHT—Rigorous control should be maintained on the project, both during design and during construction. Questions and interpretations, which are delivered during the construction phase of the project, must stay in compliance with the DCG intent.

TASK NINE—Review the Specification Sections (Appendix “H” and “I”).

TASK TEN—Review and familiarize yourself with standard details for Davis-Monthan AFB construction in Appendix “E.”

1.1.3 Contractor’s Responsibility

The Davis-Monthan AFB Design compatibility requirements defined in this document will directly affect the design and/or construction contractor’s overhead for completing the scope of work. Failure on the part of the contractor to adequately review this document and identify/clarify any requirements herein will not constitute justification of contractor claims for additional services and/or fees.

1.2 BASE MISSION AND HISTORY

The base is home for the 355th Fighter Wing providing a training facility for A-10 and OA-10 pilots. The Wing also provides command, control, and communication countermeasures in support of tactical forces in war and other worldwide contingencies. The base is further defined into seven character areas: Flight line, AMARG (Aerospace Maintenance and Regeneration Group), Headquarters, Industrial, Medical, Housing, and Town Center Zones. These guidelines take into account the primary function of each area, and also identify base-wide design standards to help create a consistent image for the base as a whole.

Davis-Monthan AFB was Tucson’s second recorded airfield. Constructed in accordance with U.S. Army guidelines, the Army declared the base suitable for military operations in 1925. In 1927 the Tucson landing field was dedicated by Charles Lindberg in honor of two Tucsonans—Lieutenant Samuel H. Davis and Lieutenant Oscar Monthan—both of whom died in aerial accidents while serving in the U.S. Army. In April of 1941 the 31st Air Base Group became the first unit stationed at the field and on December 3, 1941 the field was officially named Davis-Monthan Field. Davis-Monthan AFB’s two bombardment units shipped out shortly after the Japanese attack on Pearl Harbor thus entering World War II. For the remainder of the war the primary mission of the base was the training of B-24 and B-29 bomber crews. After the war Davis-Monthan AFB served as a separation center, processing soldiers for their return to civilian life. The base also served as a storage base for excess bombers and cargo planes. This mission continues today in the form of the Aerospace Maintenance and Regeneration Group (AMARG) Zone.

The U.S. Air Force took control of the installation in 1948 and officially renamed it Davis-Monthan AFB. During the 1950s the base was primarily home to several B-29 bomber groups. The 1960s brought Titan II missiles and U-2 reconnaissance aircraft, and in 1964 the base began training aircrews for the new F-4 Phantom fighter, the nation’s most advanced fighter of the time.

In 1971, the 355th Tactical Fighter Wing located at Davis-Monthan AFB, began flying A-7 Corsairs and

later A10-A Thunderbolts, while the F-4 Phantoms moved to Luke AFB, Arizona. This marked a shift from a strategic to a more tactical mission. In October 1976, the 355th TFW assumed host unit duties as command of the base switched from Strategic Air Command to Tactical Air Command. In 1981, after about a decade under the 355th TFW, the 836th Air Division assumed host unit responsibility. Their tenure as host unit lasted until 1992 when, due to Air Force downsizing, the 836th was deactivated. In May of 1992 the 355th resumed host duties and was designated the 355th Wing. One month later, command of the based changed to the newly formed Air Combat Command (ACC) as Tactical Air Command was inactivated. On April 26, 2007 the 355th Wing was designated the 355th Fighter Wing.

In addition to the 355th Fighter Wing, Davis-Monthan AFB is home to multiple tenant units including, Twelfth Air Force Headquarters, the 25th Operational Weather Squadron, AMARG, the 55th Electronic Control Group, and 943rd Rescue Group and the 563rd Rescue Group. Other federal agencies with a presence on the base include the Federal Aviation Administration, U.S. Customs Service Air Service, U.S. Corps of Engineers, and a detachment of the Naval Air Systems Command.

1.3 DAVIS-MONTHAN STYLE

The “Davis-Monthan” Response, as endorsed in the following pages, is a clear response to issues of place and function at Davis-Monthan AFB.

Context

The influence of the Sonoran Desert is clearly evident in both climate and architecture at Davis-Monthan AFB. Borrowing from their adobe predecessors, structures adhering to the Davis-Monthan style rely on design to respond to climate. Thick masonry walls provide thermal mass. Broad overhangs and trellis structures provide shade. Deep recesses shade window openings, reducing heat gain. Shaded courtyards and ramadas provide attractive outdoor spaces for people to be sheltered from the sun and wind.

1.4 DESIGN CONCEPTS

Aesthetic responses to the landscape also distinguish the Davis-Monthan style. Earth tone masonry surfaces and sloped roofs blend well with the color and character of the desert and mountains. A horizontal emphasis in building massing, fenestration and site walls reflects and reinforces the broad, horizontal character of the landscape.

Whether due to site and climatic response, or deliberate design reference, buildings in the Davis-Monthan style should and do reflect the spirit of traditional Southwestern desert architecture:

- Simple, rectangular plan and massing
- Earth tone split face or ribbed CMU exterior walls
- Deeply recessed window openings
- Sloped, standing seam metal roofs with broad, shading overhangs
- Horizontal emphasis
- Exterior trellis and ramada structures
- Xeriscape approach to landscaping

Function

Davis-Monthan AFB is an intense working environment. Efficient function, low maintenance, and economy are, appropriately, high priorities in such an environment. This manifests itself in both building massing and material selection. Structures are primarily simple in form and rectangular in plan. Roofs are sloped to drain water efficiently. Split face concrete masonry units (CMU) for exterior walls and standing seam metal roofing are durable and practically maintenance free. While functionally and economically desirable, this approach also responds positively to the aesthetic character of the place.

Considerations of function and place extend to site treatment. The Davis-Monthan style relies on a low maintenance, low water, xeriscape approach to landscaping. While not all plant material is native Sonoran Desert flora, the xeriscape approach visually complements the desert landscape and the architecture without requiring extensive maintenance.

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1.5 DESIGN REQUIREMENTS

1.5.1 Design Compatibility Guidelines Program

Exterior Architectural Compatibility, Interior Design Compatibility and Site Development (Civil) guidelines for the 355th Wing, Davis-Monthan AFB, in this document are an integral part of the overall Air Combat Command (ACC) Facilities Standards program for the installation. These guidelines are based on the directions established in the ACC Commander's Guide to Facilities Standards, ACC Civil Engineer Architectural and Interior Design Standards. Comprehensive Planning, and all UFC's (to include all ACC supplements) briefly summarized in the following paragraphs.

1.5.2 General Plan

The *General Plan* (GP) refers to the cumulative data sources in the form of documents and graphics that provide comprehensive and wide-ranging information used in base planning and decision making processes. The General Plan structure is comprised of the General Plan, Compliant Plans, Elements and Maps. These are related to the quality of life issues discussed in these Design Compatibility Guidelines.

1.5.3 Design Compatibility Guidelines (DCG)

The *Design Compatibility Guidelines* are essentially a second volume of guidance, with the General Plan being the first volume. It concentrates on issues that directly affect the design, quality of life and the physical and visual conditions and experiences found at Davis-Monthan AFB. These include Building Exteriors, Building Interiors, Site Planning, Signage, Lighting and Site Furnishings (Exterior Amenities). The design compatibility effort establishes and enforces aesthetic guidelines and standards for long-term development of each of these throughout the site. Design compatibility is the responsibility of all military, civilian and contractor personnel working at Davis-Monthan AFB. Successful and beneficial plans at other installations can be traced back to the active participation of those working and/or stationed at that installation. These guidelines are not developed to restrict the creativity of the design process, but to ensure the built environment meets the standards set for the 355th Wing and associate units. A

successful Design Compatibility Guidelines document and execution program is dynamic in nature and always changing to meet the challenges of the Air Force mission.

The Davis-Monthan AFB, Design Compatibility Guidelines consists of architectural (exterior) compatibility, civil, mechanical, electrical, landscape and interior design guidelines to be used as a "road map" to achieve the Air Combat Command objectives of "understated excellence".

For the purpose of assigning similar characteristics to individual facilities, "Character Areas" were developed as part of the guidelines. Character Area refers to the exterior features of a particular facility. In an effort to simplify the overall understanding of the plan, the familiar functional area names and/or zones were incorporated as Character Areas. Site development (Civil), Mechanical, and Electrical concepts are similar throughout the installation and apply to all facilities.

1.5.4 Required Design Compatibility Guidelines Approval and Coordination

It should be noted that Air Combat Command (ACC) is the major command organization, with the 355th Wing as the direct caretaker of Davis-Monthan AFB. All requirements established by this chain of command for Design Compatibility Guidelines (DCG) shall be coordinated into all of Davis-Monthan AFB's efforts made by personnel assigned to the installation to modify the built environment. All work shall be coordinated through the office of the Chief Engineer for approval or waiver if justified. The Chief Engineer, as directed by the Wing Commander, shall be the final determination authority over the approval of all waiver requests or conflicts with the established guidelines.

All associate units, formerly known as Tenants, physically located in and/or on Davis-Monthan AFB real property assets, must have a Memorandum of Agreement (MOA) on file with the Chief Engineer that specifically states all "exterior" design compatibility guidelines will be adopted and fully adhered to prior to the approval of any work. Absence of such document does not imply that these design compatibility guidelines are not applicable.

Request for Chief Engineer's waiver shall include description of waiver justification and impact on the project if not approved. Allow 15 working days for response. Any DCG requirement in direct conflict with any applicable code (federal, state, and/or city) shall be brought to the attention of the Chief Engineer for resolution.

1.5.5 Building Code and Code Analysis

As a minimum, each project shall be designed to meet all federal, state, and county code and/or ordinance requirements. Projects not meeting minimum code requirements will be returned to the designer of record for correction at not cost to the government.

Every project drawing set shall include at least one (1) "G" sheet with a code plan and complete code analysis.

1.5.6 Brand Name References

General Provisions include by reference DFARS 211.270-1. Clause 52.236-5, Materials and Workmanship. This clause states reference in the specification to equipment, materials, articles, or patented process by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. Any contractor may, at its option, use any equipment, material, article, or process that, in the judgment of the Contracting Officer, is equal to that named in the guidelines, unless otherwise specifically provided in this document (refer to Appendix D for specific brand name requirements). This statement shall apply to all references made in these Design Compatibility Guidelines to equipment, material, articles, and/or process.

1.6 FORCE PROTECTION DESIGN

An important design influence is the issue of security. As with all military installations, force protection design must address security needs as they relate to the built environment. Several key issues must be addressed:

- Integrate security engineering with other design requirements
- Determine levels of protection required

- Assess what design constraints affect the design solution
- Establish a consistent design procedure and design strategy.

The objective of Force Protection Design or the security engineering process is to define security needs and design protective systems. The planning phase of this process establishes required design criteria. These criteria describe assets within a facility, the threat to the assets, the level to which assets are to be protected, and constraints in the protective system design. Including security requirements with project criteria allows security to be addressed at the start of the project, and to be integrated into the total design. Important aspects of this overall process are discussed in the *UFC 4-010-01, DOD Antiterrorism Standards for Buildings*.

Accommodating the need for security within the greater project design process should be of prime concern and must be integrated into the total project design.

Ideally, incorporating appropriate standoff distances is the most effective and desirable tool in facility site design.

Permanent, passive barriers that visually enhance and complement the design of a facility are preferable to temporary, tacked-on, out of context elements. Integrating landscape planning, site furnishings and site elements such as fences, courtyards, screen walls, ditches, berms, bollards, planters, and retaining walls can be effective protective measures. Some of these site elements can also easily be designed to match the main facility and produce one overall design theme through the consistent use and application of forms, materials and colors.

Vehicle and traffic obstacles such as the Jersey Barriers, concrete curbs, cylinders, tetrahedrons, King Tut Block, heavy equipment tires and 55-gallon drums are visual liabilities and are not allowed under any circumstances.

1.7 SUSTAINABILITY

Sustainability or "Green" Architecture is responsible stewardship of our natural, human and financial

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resources through a practical and balanced approach. Sustainable development requires changes to the facility delivery process to ensure the "best fit" of the built environment to the natural environment. Sustainability integrates environmentally responsible practices into the process of facility delivery from the very beginning.

These sustainable practices are an investment in the future. Through conservation, improved maintainability, recycling, reduction, and reuse of waste, and other actions and innovations, we can meet today's needs without compromising the ability of future generations to meet their own.

The overall goal is not merely to produce environmental demonstration projects, but to become environmentally responsible in the delivery of all Air Force facilities. Sustainability goals include the following:

- To use resources efficiently and to minimize raw material consumption, including energy, water, land, and materials, both during the construction process and throughout the life of the facility
- To maximize resource reuse, while maintaining financial stewardship
- To move away from fossil fuels and towards renewable energy sources
- To create a healthy working environment for all who use the facility
- To build facilities of long-term value
- To protect and, where appropriate, to restore the natural environment

Emphasis on sustainable design has become very important. The Air Force has reevaluated construction practices and created policies such as "Affirmative Procurement" which emphasize sustainability principles and concepts to be incorporated into the design of all projects. Davis-Monthan AFB is committed to the implementation of sustainable and integrated designs responding to the specific climatic conditions of the Sonoran Desert.

Some aspects of sustainable design are not new. Attention has been given in the past to energy conservation and efficiency, water conservation, recycling, reduced use of ozone depleting substances, and avoidance of the use of certain harmful substances such as asbestos, lead based paints, and PCBs. The critical key is an integral design approach, where evaluation of any building element, material, or system, is not viewed solely on the basis of its own isolated merits and cost, but is designed and appraised as an integrated part of the entire facility. Under an integrated design approach, specific materials or systems within the facility may have higher first costs, but these are balanced by lower first costs for other components of the design. The goal is to design a facility for which overall quality is higher, life-cycle costs are lower, and sustainability concepts and principles are incorporated to the greatest extent possible.

All new construction and major renovations must comply with the Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings.

Detailed guidance and technical resources for sustainable design is contained on the Air Force Center for Engineering and the Environment (AFCEE) website.

1.7.1 Recycling and Post-Consumer Sustainable Concepts

Emphasis on sustainable design has resulted in the implementation of policies and construction practices that emphasize sustainability principles and concepts that should be incorporated in the design of all projects. The Air Force is committed to the implementation of sustainable and integrated design that responds to the climatic conditions of the environment. Practicing the sustainable design philosophy involves reducing energy usage by some basic methods:

- Using environmentally responsible materials and recycling demolition waste materials
- Selecting materials and products based on their life-cycle environmental impacts
- Increasing the use of products, such as benches, bollards, playground equipment, athletic suites

and carpeting, composed at least partially of recycled materials.

It is also important to select building materials based on maintainability and operability. Examples include selecting durable finishes that do not require painting, like integral color concrete masonry units; choosing floor coverings which are easily cleaned without harsh chemicals; or specifying long-lasting, low maintenance roofing materials such as metal or concrete tile.

Some of the basic recommendations for promoting sustainable development involve simple steps during construction, such as reducing and recycling construction waste and reviewing material content to limit environmental harm (no CFCs or toxins).

The “Buy Recycled Program” has been implemented across the Air Force and projects must attempt to meet or exceed the EPA Recommended Material Advisory Notice (RMAN) recycled-content recommendations unless the item meets the exemption criteria:

- Is not cost effective
- Does not meet technical performance requirements
- Is not available competitively from two or more sources
- Is not available in a timely manner

The Air Force requires contractors to recycle and/or reuse and salvage as much material as possible in the demolition process. Demolition activities should be planned to allow for selective removal and sorting of materials.

Materials

Society's consumption of virgin and synthetic material resources such as timber, minerals, metals, plastics, glass, and concrete increasingly depletes the basic elements of the ecosystem and produces waste and pollution.

Using material resources much more efficiently to prevent resource depletion, waste, and pollution is a critical component of sustainability. This can be done by recovering the maximum amount of materials from the waste stream and by fostering a

robust economy for secondary (recovered) materials. All goods and services should be designed to require much less virgin material. Develop policies and create strategies that promote and support materials conservation, recovery and efficiency in homes, businesses and institutions.

Environmentally preferable building materials lessen impacts on the natural environment and improve indoor air quality throughout their life cycle. Content of the materials, the environmental impacts relating to the production process, energy required for transportation, impacts relating to ongoing maintenance procedures, life cycle costs, longevity, and ultimate disposal or reuse of the materials are some additional issues to consider. Some examples where the utilization of sustainable materials may be considered include structural fiberboard, laminated paperwork, floor and ceiling tiles, patio blocks, cement/concrete containing granulated blast furnace slag, latex paint, channelizers, cement and concrete containing coal fly ash, parking stops and shower/restroom dividers.

Inherent maintainability, such as materials with integral finish that do not require applied finish after installation, often conserves resources. Thoughtful design can anticipate future reuse or recycling after the material's or product's useful life within the facility. Reduce the amount of waste generated during construction and consider using the Defense Reutilization and Marketing Service for disposal.

Energy

A primary objective in initiating a sustainable design philosophy is to reduce energy usage. Methods for reducing energy usage include the following:

- Increasing energy conservation and efficiency
- Increasing the use of renewable resources
- Improving the efficiency in resource and materials utilization, especially water resources
- Minimizing solar heat gain with passive solar design, radiant barriers, and integrated landscape features
- Maximizing the rate of cooling through the use of energy efficient utility systems and alternative energy

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- Providing natural ventilation through operable windows and convection systems
- Optimizing insulation and facility glazing
- Providing usable spaces for semi-outdoor activities to further reduce indoor energy demands
- Considering thermal mass and the reflective qualities of exterior building colors
- Using environmentally responsible materials and recycling demolition waste materials.

Successful energy-efficient design requires a high degree of coordination and collaboration among architects, engineers, and interior designers.

'Energy Star' products or products in the top 25% of energy efficiency are recommended by the Department of Energy Management Program (FEMP), when it is life cycle cost effective.

1.7.2 Energy Management Design

In the design process, a major consideration must be energy conservation and compliance to realize Air Force energy management strategies. A building's energy requirements should be addressed in the following sequence:

- Minimize impact of the building functional requirements
- Minimize loads (lightings, HVAC, etc.)
- Improve the efficiency of the distribution and conversion systems
- Integrate the building subsystems into an efficient whole
- Minimize impacts of functional requirements by identifying major areas that offer energy efficiency opportunities based on the building's functional use, human occupancy requirements, and site requirements.

All designers, whether in-house or contracted, have an obligation to incorporate energy efficient design into their projects. This is not to limit the creative design process but in fact to encourage solutions that fulfill the user requirements and at the same time acknowledge limited resources. Seek active participation from all members of the design team. This philosophy must be applied consistently

throughout the building envelope design, major building systems design, and the individual product selection process to be effective. Consider building attributes such as building function, form, orientation, window to wall ratio and HVAC system types early in the design process. The Air Force is required under 10 CFR 435/ASHRE 90.1 to meet performance standards for new commercial and multi-family high rise residential buildings. In summary, the standard is mandatory for new federal facilities except residential buildings less than three stories.

Within each of the seven categories there are basic requirements, which must be met. Most basic requirements do not affect the size, shape or physical appearance of the building. These DCG do not intend to discuss in detail all the basic requirements but bring to the designer's attention their existence. It is incumbent upon the designer to obtain a copy of the standards and implement them.

Energy management in industry has forged ahead of what the Air Force generally understands to be available for energy saving products. Many of these products are appropriate for use in Air Force facilities and can save tremendous amounts of energy. Designers should be careful though in their research and application of these products. The Air Force is generally not a good client for experimenting with new products that are not time-tested. Keep in mind that taxpayer's money is what funds these construction projects.

1.8 REGIONAL SETTING

1.8.1 Geographic

Davis-Monthan AFB is located on 10,613-acres in Pima County within the city limits of Tucson, the Pima County seat. The base is easily accessible via Interstate routes 10 and 19. Interstate 10, the major east-west artery serving Tucson, passes just west of Davis-Monthan AFB while Interstate 19 is the major link between Tucson and the Mexican border. A major north-south thoroughfare for the city, Kolb Road cuts through the installation with a single access point to the controlled AMARG Zone at Irvington Road.

1.8.2 Climate

Davis-Monthan AFB’s desert environment, combined with its high altitude (2,550 to 2,900-feet above sea level) creates an ideal environment for flight functions and aircraft storage, as well as for outdoor recreational activities. Mild year-round, the region averages more than 300 days of sunshine and only 12-inches of rainfall annually. The most concentrated rain occurs in the months of July and August in the form of afternoon thunderstorms. The two months average about 15 days of showers. In summer, the average low temperature is 73° F and the average high is 98° F. Winter lows average 41° F with a high of 65° F. The area averages 138 days with temperatures in excess of 90° F and 19 days with temperatures below 32° F.

Prevailing Winds (Typically 6-8 knots)	
0900 - 1100 hours	Southeast
1100 - 1700 hours	Northwest
1700 - 2300 hours	Southeast

Table 1.1A

Maximum sun angles range from approximately 81° F in summer to 33° F in winter. Because of the high summer temperature range, the limited natural shade and the high percentage of sunny days, *solar control is a high priority on any project designed for Davis-Monthan AFB.*

1.8.3 Geological

The Tucson area is situated on a high valley floor in the midst of five mountain ranges - the Santa Catalinas, the Santa Ritas, the Sierritas, the Rincons and the Tucson Mountains. Davis-Monthan AFB is situated in this valley floor near the center of the Tucson Basin. Surface soils on the base consist of silts, clays, sands and gravels. Subsurface soils consist largely of clays, rocks and caliche type soils, typically rock-like in nature. While an ideal surface for outdoor aircraft storage, the caliche is problematic for building construction. Difficulty in excavation and potentially uneven foundation support conditions can result in increased construction costs.

Vegetation native to Davis-Monthan AFB consists of grasses, cactus and scrub indigenous to the Sonoran Desert. Vegetation in developed portions of the base is largely imported non-native flora, artificially irrigated.

While not inhospitable, Davis-Monthan AFB exists in a desert environment. Conditions are harsh in both geologic and climatic terms. Site-specific design is mandatory. It is imperative that design and construction professionals working in this environment recognize and respond to the specific conditions that exist at Davis-Monthan AFB.

Contractors from outside the regional shall familiar themselves with all unique requirements of the Sonoran environment. Site adapted projects from other regions or standard plans from design guides will be modified appropriately or they will be rejected.

1.9 CHARACTER AREAS (ZONING)

Davis-Monthan AFB can be described and categorized by seven distinct character areas. These areas are illustrated on the Zoning in Appendix A and are further described below.

Flight Line Zone

The Flight Line Zone at Davis-Monthan AFB includes areas directly related to the daily operation and functions of the 355th Wing and the 12th Air Force. This area includes, but is not limited to, runways, aircraft hangars, maintenance and storage facilities, and some office functions. This character area is primarily comprised of large scale, utilization buildings which are surrounded by pavement and parking areas. There is typically little attention to landscaping and other site amenities in this area. Noise is a major concern in this area due to its inclusion of the aircraft functions. This area is bounded to the west and south by the main runway and adjacent tarmacs, the north by Sunglow Road, and to the east by Phoenix Avenue.

Aerospace Maintenance and Regeneration Group (AMARG) Zone

The AMARG Zone is unique to Davis Monthan AFB. Occupying over 2,600-acres, AMARG Zone is home to over 5,000 stored aircraft. AMARG

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Zone is a major industrial center providing storage, regeneration, reclamation, and disposal capabilities for a wide range of aircraft and aerospace items. This area occupies the north/central portion of the base.

Headquarters Zone

The Headquarters Zone of Davis-Monthan AFB includes areas that are directly related to the daily operations and functions of the 12th Air Force. It also includes administrative spaces, public service facilities, and commercial buildings to support this function. This area is immediately adjacent to the main gate bounded by Golf Links Road to the north, Sunflow Road to the west, Arizola Street to the south, and family housing to the east.

Industrial Zone

The Industrial Zone sits adjacent to the Flight Line Zone. Buildings are typically pre-engineered structures with metal panel/masonry walls and standing seam metal roofs. Most buildings are one story in nature and house functions supporting the ongoing maintenance of flight operations and aircraft. This area is bounded to the north by Ironwood Street, to the east by Fifth Street, the south by Madera Street, and by First Street to the west.

Medical Zone

The Medical Zone is primarily centered around the clinic and supporting facilities located at the intersection of Picacho and Wilmot Streets. The facilities provide clinical services for those stationed at Davis-Monthan AFB and surrounding areas.

Housing Zone

The Family Housing Zone includes areas designated primarily for single family housing for accompanied personnel. The Family Housing Zone occupies the area bounded by the golf course to the south, Golf Links and Wilmot Roads to the North and East, and Eleventh Street, roughly, to the west.

Town Center Zone

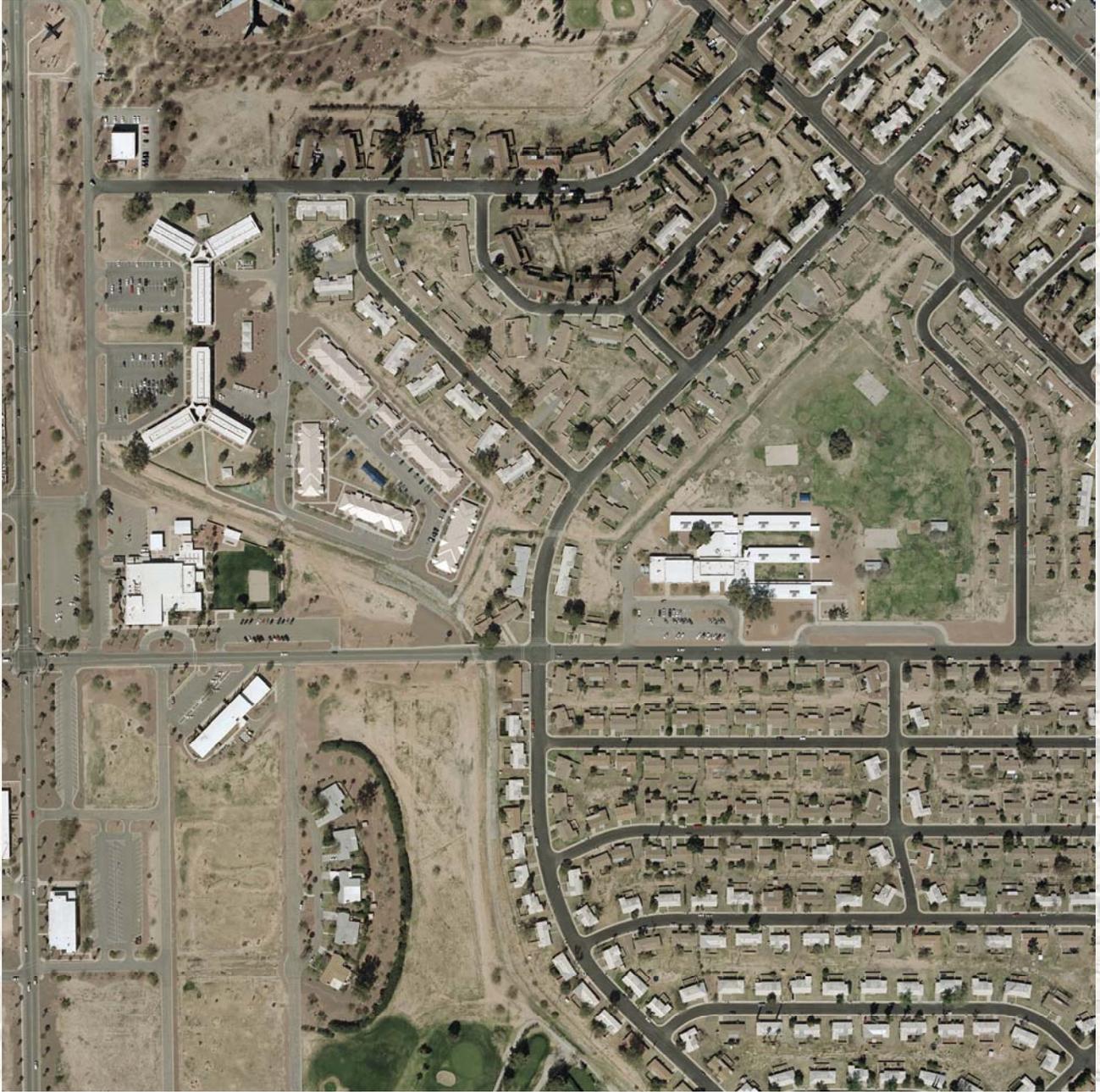
The Town Center Zone includes commercial activities, indoor recreation, club facilities, and community services. Also included in this area are

dormitories and administrative services related to a wide range of base functions. This area is divided into two parcels, one bordered by Arizola to the north, Craycroft to the east, Fifth Street to the west, and Ironwood to the south. The second parcel is bordered by Madera to the north, Craycroft to the east, and Yuma Street borders the western and southern boundaries.

Throughout the base, structures exist that do not fit the zoning categories as described herein.

Administrative support functions serving specific hangar buildings are located in the Town Center Zone. Likewise, dormitories are located in the Town Center Zone rather than in the Family Housing Zone. Complete adherence to the zones is impossible in an environment as functionally complex as Davis-Monthan AFB. Care must be taken in these cases to ensure that *architectural* compatibility is maintained within specific zones despite varying building functions.

Positive base-wide aesthetic trends have emerged in recent construction. Examples are uniform exterior masonry colors, consistent standing seam metal roof and consistent palettes for landscaping. Crossing all character areas, these aesthetic characteristics help create a harmonious, consistent image for the entire base. Continuations of these trends in future development will further reinforce the image of the base as a cohesive whole. Functional requirements will, however, lead to architectural treatments that are zone-specific. Aircraft hangars are required to be large and industrial in character and merit little, if any landscape treatment. In contrast, a child development center should be small in scale and friendly in characters. Only by recognizing the architectural impact that the various functions have on buildings, and continuing to group buildings with similar mission and functional requirements, can functional and aesthetic conflict be minimized and visual cohesiveness maximized.



SECTION 2.0
Planning

2.1 BUILDING SITING

2.1.1 Existing

Building siting at Davis-Monthan AFB is at present, primarily function driven. While compatible groupings of buildings have traditionally been located in proximity to one another (flight line structures, dormitories, etc.), concern with site aesthetics, green space development and pedestrian friendly design has been the exception rather than the rule.

Newer structures on the base exhibit a more campus-like approach to site design. Visual shielding of parking and utilities, enhanced pedestrian environments, and climate- and topography-appropriate design are evident even in the Flight Line and AMARG Zones. The landscaped plaza on the flight line side of the Base Operations Facility represents a good example of aesthetic and pedestrian response in a mission environment.

While the activities in Headquarters and Housing lend themselves more naturally to the “campus” character desired, the same site design guidelines can—and should—be applied to projects in the Flight Line Zone and AMARG Zone. While functional site design factors will be given top priority at Davis-Monthan, pedestrian response and connectivity with neighboring buildings should also be a driving factor on all new projects.

2.1.2 General Considerations

Avoid small sites that cause problems for neighboring buildings and unnecessarily drive up costs.

Site buildings with a common function (such as dormitories) in proximity to each other. In addition to sharing common infrastructure, the massing, scale, materials, and details can be used to link the buildings aesthetically.

Provide enough space around a complex for expansion. Assume 10% for expansion whenever other supporting data is not available.

When existing traffic patterns will be altered by new construction, provide adequate traffic alternatives to coincide with the construction of the project.



2.1A Paved paths, landscaping, and lighting encourage pedestrian circulation between buildings in a functional complex.

Planning SECTION 2.0

Locate buildings in a manner that provides easy, direct pedestrian access among buildings in a complex. Only encourage driving when walking cannot be accommodated.

Do not use sites that force building functions into uneconomical shapes such as curves, diagonals, or long rectangles.

Use sites that allow open landscape space around buildings to separate them from the pavement. Prevent an overcrowded appearance.

Buildings shall be sited to establish a minimum of 5% ground slope away from the building for a minimum of 10-feet. Establish floor elevations at a minimum of 6-inches above any surrounding terrain within 10-feet of the building. Site buildings to capitalize on existing topography when possible.

Use existing or natural grades and contours to develop positive drainage away from buildings, thereby avoiding excessive cut and fill.

In areas where grading or contours are altered, provide adequate erosion control measures consistent with monsoon and flash flood rainfall amounts and rates of the region.

Minimum building setback from streets and roads shall meet AT/FP requirements in accordance with UFC 4-010-01. Building setbacks should vary no more than 10% from the average setback of adjacent buildings. Setback distance in the family housing area should be consistent with individual housing groups. Building setbacks shall include all components of the building including mechanical yards, screen walls, porches, etc.



2.1B Tight site allows no landscape space around building and should be avoided.



2.1C Site buildings to provide landscape space between building and paving to not only meet AT/FP requirements but also enhance the aesthetic quality of the built environment.



SECTION 3.0
Architectural Standards

3.1 ACC ARCHITECTURAL STANDARDS

3.1.1 Policy Statement

The special character of defense installations dictates compatibility over personal style. The limited size and function of Air Combat Command (ACC) bases cannot accept the diverse opinions of the many design professionals without becoming cluttered and unsettled. In this context ‘good design’ is defined as design that contributes to the overall harmony of the base rather than design that attracts individual attention. Good examples of where ACC design goals should lead are college campuses and corporate office parks. Monotony is not the goal; every building does not need to be the same, but some common architectural element or theme should tie all buildings together. Responsible design will achieve this goal.

The designer of record shall prepare all permit paperwork and submit to the appropriate agency or require the permits to be obtained by the contractor as necessary for the type of permit.

3.1.2 Goals

The following goals have guided the above ACC policy and should also guide all levels of design at Davis-Monthan AFB:

- Low Maintenance – Use permanent low maintenance exteriors that are compatible with ACC bases and their natural and man-made environments.
- Environmental – Design facilities in ways to enhance environmental quality and minimize consumption of natural resources.
- Labor – Reduce labor-intensive maintenance procedures.
- Accessibility – The site and interiors of all facilities shall be designed for accessibility in accordance with the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and the Uniform Federal Accessibility Standards (UFAS).



3.1A A masonry base can visually connect building wings of different height or scale.



3.1B Inappropriate building form for new construction. Eliminate old and/or outdated facilities whenever possible.

Architectural Standards SECTION 3.0

An exemption can only be issued by Air Staff for facilities specifically designed for military personnel occupancy and use.

Facilities of this nature will not be afforded any contract services or civil service personnel and should be provided as an absolute final option.

This exemption does not comply with the condition of military personnel with “temporary disabilities” due to physical injuries. Facilities designed under this condition will create a situation of long-term work-arounds during this condition until adequate facility modification can be executed.

- AT/FP Requirements – Renovations exceeding 50% of plant replacement value (PRV) require compliance with UFC-4-010-01 DOD Minimum Antiterrorism Standards for Buildings.

Renovation, sustainment, modernization, and/or maintenance of any existing facility shall not exceed 70% of the plant replacement value without prior Air Staff approval and notification of Congress.

Request for Chief Engineer’s waiver from DCG requirements shall include description of requirement to be waived, justification, and impact on project if not approved (refer to Appendix D for Waiver Request Form). Allow a minimum of 15 working days for response in project schedule.

3.2 HEIGHT/MASSING

3.2.1 General Standards

Building heights at Davis-Monthan AFB will be reviewed on a case-by-case basis. Specific program needs may define or restrict the number of stories or height. In general, except for dormitories, building heights at Davis-Monthan AFB are limited to two stories above grade. Basements should not be used.

Building massing should generally be simple and economical, such as rectangular plans with sloped roofs. Avoid uneconomical shapes such as curves, diagonals, and long rectangles unless specifically justified by site or building function. Use 90° corners unless there is a functional justification or aesthetic response to an existing condition.

Primary building form should emphasize horizontal rather than vertical elements.

Entrances to new and renovated facilities shall be designed to provide a sense of arrival and a clear understanding of the main entrance through measures including, but not limited to, an easily identifiable location, orientation, scale, or the use of unique architectural features.

Do NOT locate equipment room entrances near main entrances to facilities.

Due to the utilitarian nature of buildings within the Flight Line Zone and AMARG Zone, compatibility in building height and scale is often problematic. Structures of conflicting scale should be connected by design elements such as similar masonry base treatment, banding, coloration, etc.



3.2A A distinct horizontal massing emphasis and defined entrance.



3.2B Simple massing, compact plan, and sloped roofs are typical.

3.3 ROOFS

3.3.1 General Standards

New roofs in all character areas at Davis-Monthan AFB should be of gable or hipped design with a slope of 3:12. Lower slopes may be utilized with prior approval of the Chief Engineer. Design roofs to slope to the building's perimeter to assure proper drainage. Do not create interior valleys or depressions that have the potential to pond water.

Davis-Monthan AFB has obtained a blanket waiver from ACC for light-colored roof panels.

Standing seam, factory-finished metal should be used in the Flight Line, AMARG, Headquarters, Industrial, Medical, and Town Center Zones and concrete tiles roofs in the Housing Zone. Medium scale structures such as daycare and schools that may occur in housing areas should incorporate standing seam metal roofs. Roof panels shall be of continuous length. Panels too long to ship shall be formed on site.

Sloped metal roofs shall be light-colored, standing seam color MBCI Signature 300-ALMOND OR BROWNSTONE or as approved by Chief Engineer. Roof systems shall be the product of one manufacturer. Manufacturer's systems shall provide 20-year warranted systems. Provide a minimum 40-mil, self-adhesive, rubberized, fiberglass reinforced, asphaltic membrane over the entire roof substrate.

Approval to use alternative roofing systems must be obtained through the Chief Engineer from the ACC Command Architect.

Roof slope should be accomplished with structural members, not tapered insulation.

Provide rosin paper overlay of roofing felts to avoid adherence to metal roof panels when heated. Adherence will compromise the membrane.

Designers are encouraged to use strategically placed sloped roof elements to punctuate key building points (entrances, for example) and to screen portions of the flat roof where possible.

Skylights and clerestories may be used with prior approval of the Chief Engineer. See ACC



3.3A Trellis element can help identify and shade a building entrance.



3.3B Dormitory with typical sloped, standing seam metal roof, and broad, shading overhang.

Architectural and Interior Design Standards for additional information. Roof overhangs and trellis, canopies, awnings, or other architectural elements should be considered for sun control. Solar gain can be reduced substantially, especially at window locations, by simple shading.

Fascia design becomes especially critical when broad overhangs are used. If pronounced fascias are used on metal roofs, the fascia material should exactly match that of the roof. Seam treatment may vary, however, color and material should match. A metal fascia should never extend above the edge of the sloped roof. In no case should a metal fascia be used on a flat roofed building. Stepped gable ends are an acceptable gable end treatment.

Gutters are recommended, but not mandatory, on all sloped roof buildings. Downspout placement should be carefully considered and well integrated into the overall design. Do not locate downspouts so that rainwater runs over entrance sidewalks. In high profile buildings, conceal the downspouts in columns or pilasters. Interior downspouts, however, should not be used.

All fascia, gutter, and roof trim material shall be made of prefinished metal and be designed to prevent oil-canning deformation due to expansion and contraction.

Redirect all mechanical, electrical and/or communications exterior penetrations to the vertical plane of sidewalls.

Vents, piping, and equipment pre-approved by the Chief Engineer to penetrate the roofing should be treated as a trim material and painted to match the roof. Locate these elements on the rear slope of roofs, out of view if possible. Combine penetrations when possible or create a pattern to reduce visual clutter.

Equipment should, in no case, be located on roofs. Rooftop equipment may be used on Commissary or in Base Exchange flat roofs without a waiver from ACC; however, the facility owners will be required to maintain such equipment without civil engineer assistance.



3.3C "Stepped" gable end.



3.3D Tile roofs in family housing.



3.3E Strategically placed sloped metal roof helps to identify entry.

Architectural Standards SECTION 3.0

Do not mount antennas, satellite dishes, or guide wires on roofs. When required, use ground mounted equipment in visually screened antenna farms.

Composite R-values for all roofs (over-conditioned or unconditioned spaces) shall be R-30 as a minimum.

3.4 EXTERIOR WALLS

3.4.1 General Standards

In all character areas with exception of the housing area, integrally colored split-face, smooth-face, or split-ribbed concrete masonry unit (CMU) should continue to be used as the primary exterior wall finish. All CMU and mortar shall be manufactured with additives to discourage efflorescence and water penetration. The color of CMU walls (smooth, split and ribbed) shall be “Terra Brown #1” manufactured by Young Block Co., or as approved equal. As an alternate Buff #1 may be used if approved by Chief Civil Engineer. It is the intent to utilize a single color CMU unless approved by Base Chief Civil Engineer. Accents will be achieved through different exposed surface finishes.

A single color CMU with one metal color produces the best results. Wall color variations within a single building should be limited to a combination of smooth-face, split-face or split-ribbed block or die-cast concrete.

Accent of the walls should occur through changes in the wall plane and variations in texture with the same masonry color, not through the use of paint or material changes. In addition to adding visual interest to the wall, in appropriate applications masonry articulation can aid in identifying building entry.

Accent materials shall generally be less than 10% of the total wall surface.

If, in large-scale structures such as hangars or warehouses, function and budget dictate the use of pre-engineered metal building system, a masonry “base” should be used. See ACC Architectural and Interior Design Standards for additional information.

Provide flat CMU to attach wall-mounted switches, light fixtures, through-wall vents, etc.

When upgrading existing structures, supplement these guidelines with ACC Architectural and Interior Design Standards.

New construction in the Housing area should use integrally colored EIFS as the primary exterior wall finish.

Main entry doors in all character areas, shall be glazed, **steel frame**, storefront (AT/FP approved) in approved colors and finishes. Exterior doors and frames on houses in Housing area, personnel doors and overhead doors in all character areas shall be pre-finished, insulated steel (metal). Color shall match the adjacent walls or be of a complementary contrasting color.

Extraneous wall attachments such as downspouts, conduit, switches, bells, hollow metal frames, etc. should be de-emphasized by painting. Such elements should be strategically placed across the building and factory finished when possible or painted in a color to match adjacent pre-finished exterior metals or adjacent wall color. Use one trim color to the greatest extent possible.



3.4A Split-face CMU walls with concrete fascia and columns in Town Center Zone



3.4B Typical example of ground face and ribbed CMU combination.

3.5 WINDOWS

3.5.1 General Standards

New windows at Davis-Monthan AFB should have dark bronze tinted, double-glazing set in thermally broken anodized aluminum frames. Triple glazing, for sound control, should be used in windows along the flight line and in Air Installation Compatible Use Zones (AICUZ). Restroom windows should be frosted glass.

Limited glazing in punched masonry openings should be used in character areas with the exception of Housing as required to meet Energy Use Budgets, the International Energy Conservation Code and local amendments. All window installation and glazing shall comply with anti-terrorism/force protection standards for laminated glass and heavy-duty frames as applicable. If appropriate, limited window groups, glazed entry doors with sidelights, and other variations are acceptable. Large curtain wall applications are not unless part of a passive solar application.

Storefront configurations that involve both doors and windows **shall be provided with steel frames**. All steel door and window frames shall be factory finished by either powder coating or electrostatic painting to match the color of anodized aluminum.

Operable windows are prohibited in air-conditioned structures in Flight Line, Headquarters, and AMARG Zones. Operable windows are mandatory in all dormitories, billeting, and military family housing.

When possible, recess windows for solar control. Solar control is mandatory at *all* south and west facing windows. Solar shading film is prohibited for sun control at new installations. If window blinds are used, they should not be of reflective metal.

Skylights and clerestories may be used with prior approval of the Chief Engineer. Clerestory windows should be designed to minimize solar heat gain through orientation or shading.



3.5A Balconies and deep overhangs shade windows of dormitories.



3.5B Recessing windows into masonry openings reduces solar gain.



3.5C Shaded entry glazing.



3.5D Flush, unshaded windows on a south facing wall allow excessive heat gain and should be avoided in application.



3.5E Large curtain wall applications exposed to afternoon sun should be avoided unless part of a passive solar application.

3.6 ADDITIONS, METAL BUILDINGS, TEMPORARY STRUCTURES & STORAGE BUILDINGS

3.6.1 General Standards

Additions

When designing additions, consider two strategies: simply matching the existing building; and designing the addition to conform to base design standards while updating the existing structure.

In general, small additions (less than 25% of the existing floor area) should match the existing construction.

In large additions (exceeding 25% of the existing floor area) both the addition and the original structure should be brought into compliance with these Design Compatibility Guidelines.

For example, a flat roofed building of 10,000 square feet requires an addition of 3,000 square feet. The addition exceeds 25% of the existing floor area of the existing building. The addition should have a sloped roof and the original building should be retrofitted with a sloped roof. If the original building were plain CMU, a new exterior wall finish of split face CMU should be used, either as a complete veneer or at strategic visual points (entries, planters, sign, corner protection, etc.).

Regardless of size, completed additions should be architecturally compatible rather than obvious additions.

Metal Buildings

All metal buildings require ACC/A7D approval regardless of location. Coordinate design efforts with the base project program office.

Metal buildings may be used only for large structures such as hangars or temporary facilities. When large buildings are metal, a masonry base proportionate to the height of the building is required. The base must be an integrally colored, textured masonry base for durability. Temporary buildings must be removed within one year. All temporary buildings and large buildings, except hangars, require a waiver from ACC/A7D.



3.6A Masonry wings lessen the impact of a metal hangar structure.



3.6B Existing metal buildings along the flight line. Provide a masonry base proportionate to the height of the hangar on all new construction.



3.6C Incompatible with adjacent masonry and masonry/metal buildings and should not be replicated.

Specialized facilities such as water towers and fuel tanks may be metal. Temporary wood structures for use as sheds and shelters, such as those manufactured under the trade name of Tuff sheds may not be used on Davis-Monthan AFB.

The use of “Conex” type boxes for storage (either permanent or temporary) is not permitted.

Use factory applied metal finishes with 20-year (or longer) warranties where metal buildings are approved.

Temporary Buildings

In high visibility areas, special consideration must be given to the design of temporary buildings in order to comply with the Design Compatibility Guidelines. Temporary buildings or structures may be reviewing stands or other miscellaneous structures, sheds, canopies, or fences used for protection of the public around and in conjunction with construction work.

Temporary structures shall be completely removed upon expiration of the approved time limit. All base architectural and engineering design standards such as traffic and parking requirements, accessibility standards, and fire requirements shall apply to temporary buildings except as noted below. Exceptions to these standards include:

- Construction Types used for temporary buildings shall be as defined in the latest edition of the International Building Code (IBC).
- Exterior skirts or walls shall be finished with metal paneling consistent with the architectural character, form, and colors of adjacent structures and shall be in compliance with the applicable provisions of these standards.

Submit proposed time limit, floor plans, exterior elevations, exterior color samples, and site plan to Chief Engineer for approval and coordination with ACC. On the site plan show building location, parking, handicapped accessibility, and utility service locations and connections.



3.6D Masonry base softens impact of metal building construction.

Storage Buildings

All proposed storage buildings shall comply with ACC and the Base Architectural Guidelines in this document and must undergo site review by the Chief Engineer before erection on Davis-Monthan AFB.

The Architectural Standards require permanent, low maintenance materials, such as concrete block or precast concrete for the walls of storage buildings. The roof shall either be precast concrete or standing seam metal.

The color of the storage buildings shall be a shade of brown or tan to match the surrounding buildings. In accordance with Wing policy, the Chief Engineer shall be the final approval level in determination of proposed storage buildings that meet or do not meet ACC and base standards.

3.7 Miscellaneous

3.7.1 Asbestos and Lead Based Paint Testing and Abatement

The following standards will be considered normal practice in the testing and abatement of asbestos containing materials (ACM) and lead-based paint (LBP) on Davis-Monthan AFB. These standards are in addition to, not in-lieu-of, industry standards. The goal of these standards is to help alleviate discoveries of unforeseen ACM or LBP after the start of construction and/or demolition.

Flooring

Based on years of building demolition contracts on base, it shall be assumed that there is vinyl composition tile (VCT) or vinyl asbestos tile (VAT) beneath all ceramic tile and/or carpeting. Testing companies must ensure that they have tested all flooring down to bare concrete for the possibility of ACM. In addition, it shall be assumed that all VCT and the mastic adhering it are asbestos-containing and must be tested.

Ceiling Tile

It shall be assumed that all glued on ceilings (ceilings where tiles are glued directly to the deck) utilize asbestos-containing glue, and therefore will be tested for ACM.

Roofing

Based on years of building renovations and the age of the buildings on base, roofing materials and mastic should be considered as ACM unless tested otherwise.

Thermal System Insulation (TSI)

This asbestos containing material is applied to pipes, fittings, boilers, breeching, tanks, ducts, or other interior structural components to prevent heat loss, gain or water condensation. TSI is found in most of the older buildings on base. Any type of renovation or demolition to buildings will include testing of the TSI.

Lead-Based Paint

Renovation/demolition activities that disturb lead-based paint can create lead hazards. Buildings built prior to 1980 may have LBP and shall be tested before renovations or demolitions can occur.

3.7.2 Termite Control

Termiticides shall be applied at the highest EPA-labeled concentration and application rate. Termite control contractors shall use the chemical Termidor in all instances of termite protection. A complete report, including the amount of chemical used, shall be submitted to the Davis-Monthan Pest Management Shop after all chemical treatments.



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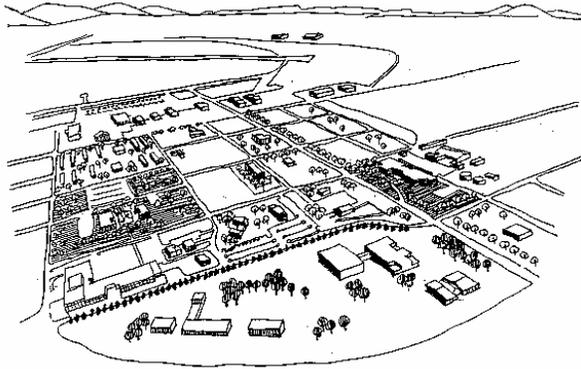
4.1 STREETS/PARKING

4.1.1 General

Site Development is an important resource and visual asset that should be carefully maintained and enhanced for functional as well as aesthetic uses. Used to visually unify an installation through the consistent use of materials, landscaping also improves the physical and psychological well being of the people who work on the site.

Circulation Systems

Circulation systems at Davis-Monthan AFB have been divided into two major types in these Design Compatibility Guidelines; Vehicular and Pedestrian. Bicycle circulation will be addressed as part of the pedestrian circulation.

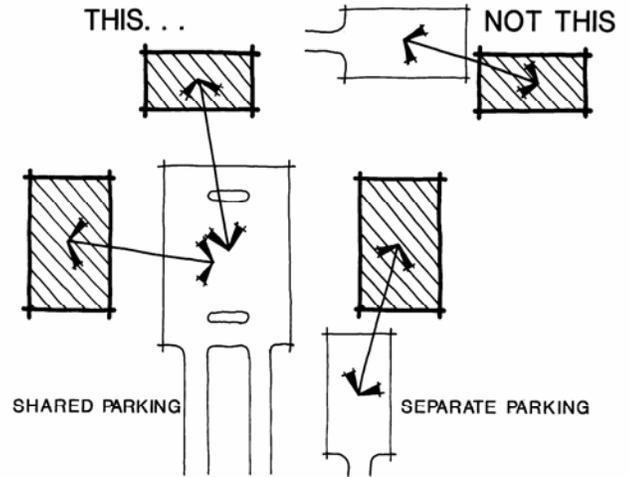


Vehicular Circulation

The vehicular circulation system is one of the most universal elements of the built environment. This is not unique to Davis-Monthan AFB, but is common to both military installations and civilian communities across the United States. With our society's continued heavy demand for individual automobiles, the roadways will continue to be a dominant element in the urban environment. Due to the low-density installation layout and the harsh summer climate, the installation is very dependent upon individual vehicular transportation. As a result, people almost exclusively experience and identify the base from the roadway system, thereby giving it an extremely important role in determining how people perceive the built environment of the installation as a whole.

4.1.2 Parking Lots

The intent of this subsection is to provide guidance on parking lot design. Automobile parking is a dominant visual element in many areas of Davis-Monthan AFB.



Having an adequate number of parking spaces in a convenient location is a functional necessity for the installation's facilities. A quantitative reaction to this need, however, is not enough. Effort must be made to provide adequate parking in a manner that improves, rather than detracts from, the visual environment.

Parking lot designs need coordination with their respective location and service to the street hierarchy. The street hierarchy throughout Davis-Monthan AFB follows the pattern of arterial, collector and local. The hierarchy is based upon the traffic carrying capacity of each type of road, where arterial streets are the largest and local streets are the smallest.

4.1.3 General Design Criteria

General design criteria for parking lot configuration and construction are readily available in AFH 32-1084. Requirements and guidelines in this handbook must be adopted. Additional design criteria relating to antiterrorism and force protection can be found in UFC 4-010-01.

In the design of new parking lots and pavement, all project personnel, including the community planner, should coordinate to determine if any additional upgrades can be accomplished concurrently. This

SECTION 4.0 Civil Engineering Standards

includes valve/waterline replacement, sanitary lines, or similar requirements. This applies only to those utilities falling within the project work area so that they can be connected to future upgrades unrelated to the current project.

When a new paving requirement is requested there should be an allowance for conduit to be installed underground, whether or not it is required at the time. Provide two to four, 4-inch Schedule 40 spare conduits. This will allow for the future placement of electrical wiring, irrigation systems, or other requirements without disrupting the new pavement.

4.1.4 Parking Lot Design Principles

Provide off-street parking. On-street parking is a condition that provides a very unattractive transition between the street and adjacent buildings, reduces the traffic carrying capacity of the roadways, and is a very dangerous traffic safety situation.

Parking lots must be placed on the site in a location that allows for sufficient quantity of spaces and potential future expansion. The quantity of vehicles accommodated should be partly in response to the authorizations permitted for non-organizational vehicle parking spaces, and partly in response to the facility size and intensity of people using the facility.

For planning purposes, use 350 gross square feet per authorized space. This will, in traditional design, include space for access drives, landscaped islands and provide some flexibility for detailed arrangement.

Parking lots should be located to maximize sharing with other related facilities.

Whenever possible, parking lots should be designed as a series of smaller lots rather than as large unbroken areas.

Parking lot layouts that promote cross-traffic between parallel streets should be avoided for safety reasons.

Motorcycle parking should be consolidated and segregated from automobile parking, and must have concrete pavement surfaces to support motorcycle

kickstands. Asphalt will turn soft in the Arizona summer heat.

Parking lots should be paved with asphalt and must have concrete curb and gutter. Dirt and gravel lots are not allowed.

Drainage water from parking lots should be directed to adjacent landscaped areas to maximize rainfall benefits. Detention or retention ponds are required to accommodate runoff from larger paved areas. Detention ponds are the preferred alternative. A principal factor in parking lot grading shall be to provide positive drainage away from buildings and to prevent ponding of water on pavement surfaces.

Parking space requirements guidelines are published in AFH-32-1084. Refer to tables provided for parking requirements based on facility use.

Water retention and percolation rates shall meet all requirements set forth by Pima County and City of Tucson ordinances and codes.

Parking lots should be arranged for safe, efficient, pedestrian travel from vehicles to the buildings. The lot design should emphasize building entries by the alignment of landscape median/pedestrian paths upon each main building entry.

Parking lots must maintain required access for fire apparatus according to NFPA 1, *Fire Prevention Code* and NFPA 241, *Standard for Safeguarding Building Construction and Demolition Operations*.

Parking lots must be located to accommodate parking lot screening and parking lot trees as defined in these Design Compatibility Guidelines.

4.1.5 Parking Space Quantity Guidelines

Chief Engineer determines the number of reserved parking spaces on an as-needed basis. Reserved parking spaces or reserved lots, or portions of lots, location and related needs must be coordinated with the Chief Engineer or assigned project manager. Signage used in conjunction with reserved parking must conform to the guidelines contained in these Design Compatibility Guidelines. See Appendix C for the policy letter that lists the positions that may have reserved parking spaces.

4.1.6 Parking Lot Configuration

General Parking Concepts

Paved areas should clearly communicate, in a visual manner, vehicular functional separations.

Points of ingress and egress, where pavement of the street merges with pavement of adjacent parking, should be adequately defined.

Parking areas shall be designed and located to provide convenience and safety with minimal negative visual impact. These guidelines shall be followed when locating and designing a parking lot intended for use by automobiles and small trucks. When parking lots must accommodate circulation by medium to large sized trucks, including tractor-trailer units, all dimensional criteria must be evaluated and increased accordingly.

Bumper strips should be used for locations where car bumpers would hit adjacent items such as light poles, signs, etc. These items shall be protected within traffic "islands" whenever possible.

Dead-end parking lots shall be avoided for lots exceeding 20 spaces. If additional access (ingress/egress) drives cannot be provided for larger lots, convenient interior circulation should allow for easy maneuvering of vehicles. Typically, two access drives shall be provided for lots exceeding 20 spaces.

The perimeter edges of all parking lots, access drives, and interior "islands" and "peninsulas" shall be physically separated from adjacent surfaces by a continuous concrete curb with integral gutter.

Parking Spaces

Two principal parking arrangements are acceptable. The preferred arrangement is off-street lots containing no more than 50 full-car spaces. Facilities requiring more than 50 spaces shall have a series of lots connected by an external perimeter access drive. All designs shall be in compliance with ACC standards.

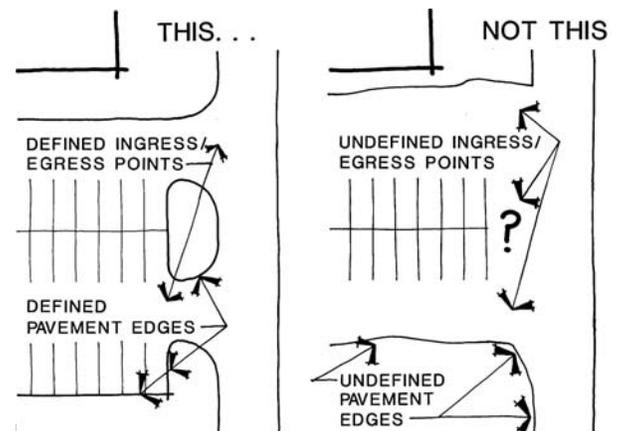
Parking space dimensions shall be per Detail DM-C009, Standard Parking Detail (Refer to Appendix G). Variances to the detail must be approved by the

Chief Engineer. No approvals shall be granted for parking space widths less than 9-feet.

For handicap parking, provide number of spaces as per requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG). Disabled spaces shall be a minimum of 13-feet by 18-feet 6-inches and shall include a ramp access to the adjacent pedestrian circulation system.

For ease of circulation and efficient use of space, 90° spaces and two-way traffic aisles are preferred.

If required by site limitations or high rate of turnover, 60° spaces may be used with one-way traffic aisles. Use only one orientation within a parking lot to avoid potential confusion and conflicts.



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Internal Islands

Provide internal islands within parking lots to help control traffic, and to provide turning radii between parking aisles and intersecting drives at the ends of aisles. Provide additional islands where needed to control traffic and to accommodate landscaping.

All parking lot lighting should be within internal islands. Fixtures outside internal islands conflict with required street and lot sweeping operations.

4.1.7 Street Traffic

Access drives that serve parking lots shall be two-way or one-way if required.

For two-way access drives the minimum width shall be a distance of 26-feet measured from face of curb to face of curb.

In the case of one-way traffic, the access drive width shall be a minimum distance of 15-feet measured from face of curb to face of curb.

Intersections

Properly designed intersections are critical to successful vehicular circulation systems. Poor designs will spoil the best of traffic engineering and streetscape efforts. Offset intersections must be avoided. In cases where offsets are unavoidable, a minimum 125-foot offset shall be considered satisfactory for continued traffic flow.

Intersections involving arterial and collector streets shall be upgraded and visually emphasized to provide ready identification to the motorist, and to provide occasional focal points. This shall be accomplished through the use of streetscape items, including landscaping, street lighting, and street signs, which all help to emphasize these major intersections. For landscaping emphasis, refer to the applicable guidelines in these Design Compatibility Guidelines.

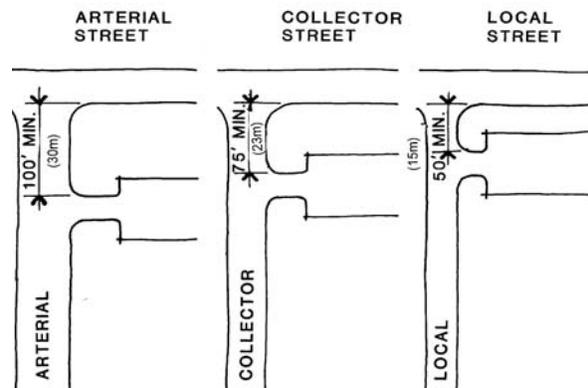


4.1.6 Parking lot islands help control traffic and provide areas for landscaping.

Intersection Setbacks:

Street Type	Minimum Distance
Arterial streets	100'-0"
Collector streets	75'-0"
Local streets.	50'-0"

Table 4.1A



Pavement Marking

All parking spaces and pedestrian crosswalks shall be marked with white stripes of paint. All lane lines shall be 4-inches wide. All street markings shall be in accordance with FHA Manual on Uniform Traffic Control Devices.

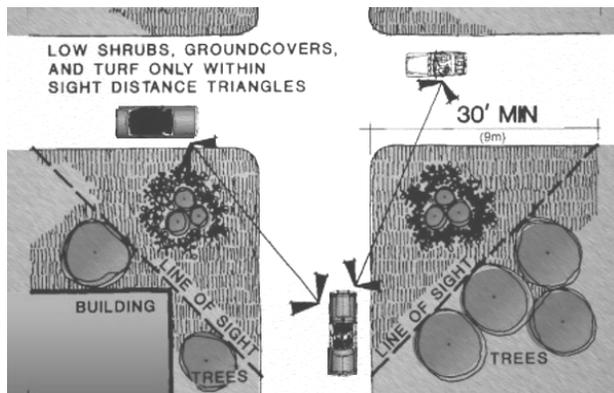
Vinyl striping and/or lettering should not be used.

Lane Design Criteria

Two basic types of lanes i.e., travel and auxiliary, shall be used throughout the street system. Travel lanes shall be used typically to carry "through," continuous traffic, and shall be a standard width as determined by a traffic engineer. Auxiliary lanes include turning, parking, and shoulder lanes. Turning lanes may be used as either left-turn or right-turn lanes at intersections. Shoulders are provided to the "outside" of traffic lanes in built-up areas, and are intended for emergency use only.

Sight Lines (Triangles)

Provide adequate sight lines for an effective sight triangle measured from the face of curb. Site triangle setbacks should be a minimum of fifteen-feet in parking areas, 30-feet at intersections, and 100-feet at major intersections. Plants and any related signage within the sight triangle should not exceed 30-inches growing height within sight triangles. Trees can be allowed in these areas if branches are trimmed to 6-feet to 8-feet from the ground. Signs may not be placed in these triangles.



4.1.8 Pedestrian Circulation

The existing pedestrian circulation system at Davis-Monthan AFB is seasonal. A relatively incomplete system of walkways exists. Over the installation as a whole, pedestrian spaces occur in a random pattern that is not interconnected to provide a comprehensive circulation system.

Intersections where pedestrian routes cross-vehicular circulation paths are critical areas. These crossings should be clearly marked for ready visual identification by both motorists and pedestrians.

Pedestrian systems should be physically separated from vehicular circulation as much as possible. The fewer areas where the two systems cross or are physically adjacent reduces traffic hazards and makes the pedestrian system more efficient, pleasant, and visually attractive.

Materials

All walks shall typically be constructed of concrete with a light broom finish. Provide expansion and construction joints as required. Brick or concrete masonry pavers may be used as an accent material at courtyards and similar public spaces to provide a different texture and accent. Where such pavers are used, the color shall conform to a terra cotta color (Fed. Stand. Color 595B - X0233). Bricks used on walks shall be full pavers set with mortar, and shall typically be 4-inch by 8-inch size.

Layout

The horizontal layout of walks shall generally conform to the geometric configuration precedent set by the formal clustering and arrangement of buildings, streets, parking lots, and other adjacent related site amenities. Occasional meanders and/or jogs may be included to capture views, to add visual interest, or to accommodate difficult site arrangements. Casual curves are encouraged over the course of long monotonous spans. The orthogonal (right angles), angular, or circular geometry may be employed in plan layouts. Walkways must be located a minimum distance of 10-feet from buildings.

Gradients

All walks shall have positive drainage to prevent ponding of water or ice accumulation. Walks with cross slopes ranging from 1% (1/8-inch vertical to 12-inch horizontal) to a maximum of 2% (1/4-inch vertical to 12-inch horizontal) shall typically be used. The minimum permitted cross slope is 0.8%. Walks with a longitudinal (running) slope greater than 5% shall be designed as ramps, per Americans with Disabilities Act Accessibility Guidelines.

Ramps

Generally, ramps shall be incorporated into the pedestrian walk system to accommodate changes in elevation and to provide barrier free access for the

SECTION 4.0 Civil Engineering Standards

Walkway Width Requirements		
Location	Width	Remarks
Walks leading to a secondary entrance of a building	5'-0"	Minimum requirement for two people to walk abreast.
Walks leading to a building main entrance	6'-0"	For larger facilities or buildings with many pedestrian users, the minimum width shall be increased as the traffic volume dictates
Walks included as a part of any streetscape	Varies	As required by the specific streetscape design
Walks at the perimeter of parking lots	5'-0"	Where cars park adjacent and head-in to the walk and separate bumper strips are not used, such perimeter walks shall be increased to a minimum width of eight feet (8') to accommodate overhangs of the parked vehicles
Walks at the interior of parking lots	6'-0"	Utilize "islands" and "peninsulas" to minimize the distances pedestrians must travel across open, paved vehicular spaces and aisles

Table 4.1B

disabled to all buildings and parking lots. Uniform Federal Accessibility Standards (UFAS) and the Americans with Disabilities Act Accessibility Guidelines (ADAAG) must be reviewed for conformance of applicable

requirements requiring disabled access. The more stringent requirement shall govern.

The slope of any ramp shall not exceed 8.33% (1-inch vertical to 12-inch horizontal). Ramps shall be a minimum of 5-feet wide. Ramps shall have landings at the top and bottom, and shall have at least one (1) intermediate landing for every 5-feet of rise.

Top landings and intermediate landings shall have a dimension measured in the direction of ramp run of not less than 5-feet, and landings at the bottom of ramps shall have a minimum dimension in the direction of ramp run of 6-feet. All ramps shall be provided with handrails on each side of the ramp, running the full length of the ramp, if steeper than 1:15 slope. In addition, ramps shall be incorporated into all walks to provide barrier free access for the disabled to all streets, walks, intersections, and crosswalks throughout the installation.

4.1.9 Force Protection in Site Development

Any new site work or repair pavements projects that exceed 50% of the plant replacement value (PRV) must meet all requirements of UFC 4-010-01.

In order to fortify Air Force assets, and in compliance with Department of Defense criteria (UFC 4-010-01), various solutions may be considered. Adapted force protection solutions should provide the desired security; yet offer additional visual interest in its application. As an alternative to metal fences with outriggers and concrete barriers, provide the required security through the use of a more aesthetic approach, utilizing materials which are less visually cluttering and more sensitive to both the natural and visual environment.

The primary barriers used to achieve appropriate and aesthetic force protection are raised earth berms, plant materials in rock mulch beds, local boulders, and occasional man-made bollards. The unofficial term for this application is referred to as the "4-B's", (Boulders, Bollards, Bushes, and Berms). This application has been successfully employed throughout many Air Force installations and is acceptable not only to senior leadership, but also security forces personnel when applied properly.

The goal of this level of protection is to discourage and/or prevent direct access to valuable resources and personnel from dangerous encroachment of vehicles with explosives. By combining raised earth berms and large boulders, vehicles are not only precluded from access, but also distanced at a reasonable level as to not invoke critical damage to facility assets and/or injury to personnel if an explosion were to occur at this deterrence point. Berms should attain a minimal and varying height

and may be offset in order to actually entrap the aggressor. Boulders should be partially buried, approximately 33%. This not only helps them blend in naturally, but also adds stability and horizontal resistance at impact

Boulders should be placed a minimum of 4-feet apart from edge to edge, and should reach a minimum height of 33-inches in combination with the earth berms.

Although plant materials have minimal resistive strength until they have matured, ample use of shrubs and trees tend to deter would-be violators and can screen boulders and bollards placed at strategic locations.

4.1.10 Utilities

Utility structures, distribution (main) lines and service lines are elements that influence the visual environment at Davis-Monthan AFB. Many utility lines have been buried as per previous Design Compatibility recommendations. This design element displays an excellent example of cleaning up the visual environment in an extremely positive way.

Utility Structures

Utilities are by nature a linear site system. Since they service virtually every building within the installation, there is the potential for major positive visual impact.

Ensure screening of utility equipment and structures that allows adequate and proper clearance for safety and maintenance.

The visual impact of these items can be diminished through a combination of careful placement, screen walls, landscaping and painting. Larger structures such as electrical switch-stations, sewage lift stations, fuel storage tanks and mechanical/electrical equipment shall be screened from view, using materials, forms, and colors in the screen walls which match those respective design elements present at adjacent buildings. Smaller items such as incidental above ground piping, shall be painted a complementary color to the exterior masonry selected with a matte (low-lustre) finish, to reduce their visual impact. Since existing facilities have already been sited, they cannot always be hidden;

however, a common color palette will help to reinforce an overall continuity and integrated visual image.

Main Distribution and Service Lines

Overhead telephone and electric lines are generally a prominent visual liability on military installations. Davis-Monthan AFB is reversing this trend. Installing them underground in all construction shall eliminate the visual impact of these items.

4.2 SITE LIGHTING

4.2.1 General

Reference “Site Elements” (Section 4.6.3), Site Lighting.

All exterior lighting shall comply with the City of Tucson Outdoor Lighting Code.

Lighting levels and installations should vary with the volume and type of traffic and the visual character desired.

Coordinate street lighting and sidewalk lighting locations with site amenities (landscaping, benches, signs, etc.).

All site lighting shall be fed from underground.

4.3 SIDEWALKS/CURB AND GUTTERS

4.3.1 General Standards

Within pedestrian use areas, sidewalks shall be installed at all parking lots and along at least one side of each street as a minimum. In housing, sidewalks shall occur on both sides of the street.

Sidewalks shall be a minimum of 5-feet wide. A minimum 5-foot wide landscaping strip should be incorporated between the edge of curb and the edge of sidewalk when used along primary roads. Sidewalks along secondary roads shall include 3-foot wide landscaping strips.

Portland cement concrete (PCC) curb and gutter shall be used on all parking lot paving and all streets except in non-cantonment areas of the base. Curbs shall be a minimum of 6-inches high. Gutters shall be 21-inches wide. Drainage should be along the curb. PCC curb without gutter is acceptable only where drainage does not flow at perimeter. Minimum radii for curb returns at intersection and entrances into parking lots shall be 25-feet. The desired radius for these curb returns is 30-feet. Prior approval from the Chief Engineer is required when radii under 25-feet is not attainable.

All parking lots shall be curbed and shall be designed to drain along perimeter curb and gutter.

No curb painting will be permitted.



4.3A Sidewalk with landscaping bordering parking lot.



4.3B PCC curb with ADA accessible curb cut and ramp.



4.3C PCC parking lot curb with gutter.

4.4 LANDSCAPE PLANNING

4.4.1 Introduction

The approach to landscape design here must be one that is responsive to the native environment and climate. When designing landscaping, all available information about plant materials specific to the region should be studied to determine which varieties are suitable. Landscaping and site design are most important at building entrances and in parking lots because these areas are the most visible and support the majority of the traffic.

Expectations incorporate recreational opportunities as part of the overall quality of life for an Air Force installation. For this reason, a comprehensive pedestrian “path” system should be completed. This path system would offer the much-needed link between the major activity nodes.

It is extremely important that all landscape elements are compatible with the requirements of the harsh desert climate. Conditions like shading and screening are critical and must be designed properly. The Sonoran Desert climate must establish additional constraints overlay added to generally accepted landscape design principles. A practical approach to landscape design needs to facilitate an “oasis” response to the harsh desert environment

Antiterrorism and Force Protection (AT/FP) and Landscape Design

All landscaping design efforts must comply with the most current version of Unified Facilities Criteria (UFC) 4-010-01, DOD Minimum Antiterrorism Standards for Buildings.

Streetscapes

Almost all people who visit, live, or work on Davis-Monthan AFB will experience the base from their vehicles while traveling the street system. Due to the harsh climate and the dispersed development, the most popular mode of transportation is the automobile. This continued reliance upon the automobile brings a heightened visibility to the street system, and all design elements adjacent to these streets.

Streetscapes, when used consistently at all streets throughout the base, can help visually unify the base as a whole. Architectural differences between

buildings and between character areas can be softened by the use of the streetscape landscaping.

The street corridors must be visually cohesive open spaces throughout the base. Similar landscape treatment should be used at the base entrance and all street intersections. Plant material massing, spacing, and height are characteristics that should provide visual clues to motorists about the hierarchy of roadways. The adjacent planting and grading must also work together to create a variety of experiences along the streets. The concept behind the streetscape guidelines is to reflect the level of importance of the street through the level of landscape improvements required.

Courtyards (People Spaces)

The Sonoran Desert region enjoys a relatively mild climate during the winter months. The intent of this section is to establish a requirement for outdoor courtyards (people spaces), to encourage the base populace to enjoy the climate when favorable.

Courtyards Locations

A minimum of one (1) courtyard shall be provided at all administrative and community/commercial facilities. Courtyard outdoor space shall be provided at the rate of 400 square feet for every 5,000 square feet, and fractions thereof, of gross building area contained in the building.

Courtyards should typically be located near building entries, and may be immediately adjacent to the building.

Courtyards must use the same design character, forms, materials, and colors that are used on the buildings to which they are associated or attached.

At the walking surface material, use a material and color which are complementary to the adjacent building’s materials and colors.

Provide a minimum of one shade structure (Ramada) for each courtyard.

Courtyards Locations

Courtyards should be located near the building such that the maximum number of people can use the courtyard. The courtyard must be oriented to capture adjacent and distant views which are pleasing. In addition, each courtyard must be located to take advantage of climatic variations to provide locations which are comfortable for as much of the year as possible and not just during summer months.

Each courtyard should have a minimum of one (1) focal point - a central interest item to make the space inviting to pedestrians and interesting to its users.

Each courtyard must have landscaping provided over an area equal to 20% of the required square feet (square meters) of courtyard space. At a minimum, trees and evergreen shrubs must be used, to provide summer shade/visual screening.

Each courtyard must have one (1) trash receptacle and one (1) bench. Other site furnishings should be incorporated as applicable.

Utilize concrete, brick, tile and similar hard, durable materials at all courtyards. A limited amount of multiple colors and patterns should be used to provide a positive visual accent that is tastefully done.

4.4.2 Plant Listing and Materials

The grounds contractor should be familiar with local landscape materials and plantings that are responsive as well as successful in the dry temperature extremes of this climate.

4.4.3 Paving, Mulches and Other Surface Treatments

Employ decorative rock mulch in areas of low maintenance and visibility. Upon completion of any parking lot and/or facility upgrades, evaluate and establish a defined pedestrian pathway with consistent width, material, and visual interest.

Avoid lining sidewalks with straight lines of above ground boulders or other unnecessary and visually distracting materials.

4.4.4 Installation Entrance Landscaping

Distinguished visitors, guests, and all who work on the installation travel through the entrance gates. These gates and all design elements in the immediate vicinity provide the first impression that most people receive of Davis-Monthan AFB. The first impression is usually a lasting one. People entering the installation should have a very positive first impression.

Upon entering the installation, people need to have a sense of arrival, a feeling that they are approaching and entering an important installation. Part of this arrival process must be supplied by landscape design elements. Through formal, symmetrical plant arrangements, visitors can be made more relaxed and to feel at home and welcome. Landscaping should be located fairly close to main entrance and the street, for maximum visual effect. A combination of acceptable plants provides an interesting seasonal display.

Antiterrorism and Force Protection (AT/FP) plays a primary role in the landscape design of this area.

4.4.5 Parking Lot Landscaping

Parking lot landscaping is required by design compatibility guidelines because it enhances the visual environment, promotes safety, moderates climatic effects, and minimizes noise and glare.

Landscaping is one of the most straightforward and obvious methods of enhancing the appearance of parking lot areas. It should be used to break up wide expanses of parking areas and improve the appearance of adjacent new building construction. It should also be used to separate pedestrian and vehicular traffic, as well as delineating different functional areas of the lot. Landscaping should also be used to enhance the safety of parking lots by guiding the circulation of cars and people and by ensuring that the driver's vision is unobstructed.

4.4.6 Vision Clearance

It is critical that landscaping near parking lots or other maneuvering areas not obstruct the driver's view of traffic and pedestrian ways. To provide for vision clearance triangles, shrub height should be limited to 30-inches. These limitations are

recommended at corners where vehicular or pedestrian traffic intersects with roads or aisles, especially at driveways and street intersections. Site triangle setbacks should be a minimum of fifteen-feet in parking areas, 30-feet at intersections, and 100-feet at major intersections. Trees can be allowed in these areas if branches are trimmed to 6-feet to 8-feet from the ground.

4.4.7 Street Frontage Guidelines

Open parking spaces shall be screened from view from adjacent streets to a minimum height of 3-feet by the use of berms and/or plantings. Structures such as decorative walls or fences may be allowed if one of the following is clearly demonstrated:

1. The structures avoid a blank and monotonous appearance by such means as architectural articulation and the planting of additional landscape materials.
2. The total use of berms and/or plantings is not physically feasible
3. The structures attractively complement the use of berms and/or plantings.

The following are basic guidelines for parking lot screening that can be applied at Davis-Monthan AFB as applicable.

Parking Lot Screening

The entire affected street frontage adjacent to arterial streets must have the required screening. At least 50% of that screening must be made up of plant materials and no more than 50% may be accomplished by the use of berming.

A minimum of 2/3 of the affected street frontage must have the required screening adjacent to collector streets. At least 75% of the screening must be accomplished with plant materials and no more than 25% may be accomplished by the use of berming.

A minimum of 50% of the affected street frontage must have the required screening at local streets. Screening should be provided by using plant materials rather than berms.

4.4.8 Parking Lot Interior Areas

This section focuses on enhancing the general environment of the parking lot itself. Interior landscaping has several purposes. It should be used to break up large expanses of pavement, thereby improving both the appearance and the microclimate of the lot area. It can also have important safety ramifications. Landscaping should be used to delineate pedestrian walkways in order to separate vehicular and pedestrian traffic, and it can guide traffic to reduce the number of minor accidents that are so common to many parking lots. It also serves to denote upcoming aisles to warn against possible cross-traffic. For planting islands that are parallel to spaces, islands should be a minimum of 10-feet wide to allow car doors to open and to provide adequate root growth zone. For planting islands that are perpendicular to spaces, islands should be a minimum of 8-feet wide to allow for sidewalks with overhang of parked cars. Avoid tall shrubs or low branching trees that will restrict visibility.

The main parking lot should have separate pedestrian walkways to allow safe movement within the lots. These walkways should generally be oriented perpendicular to and between parking bays. Adjacent to the walks, trees should be planted to aid in the identification of walkway locations and to provide a more comfortable pedestrian environment (shade and rain protection). Screening of mechanical equipment, trash, and loading areas should be provided. Using solid walls, berms, fences, and landscaping can be used to accomplish this desired effect.

Definition of Lot Area: The determination of gross lot area size to define the recommended extent of landscaping shall include all parking spaces in addition to aisles and maneuvering areas. The criteria are based on gross lot size and the number of parking spaces so that these guidelines will cover lots with large loading areas or special turn around areas that might otherwise be exempt. The following are generally accepted guidelines that can be applied at Davis-Monthan AFB as applicable.

Size	Parking Lot Landscaping Guidelines
Small	Parking lots that are less than 5,250 square feet (15 cars at 350 square feet per car) will not be required to provide any landscaped areas within the lot itself.
Medium	Lot areas that are greater than 5,250 square feet but less than 20,000 square feet (57 cars at 350 square feet per car) must provide at least 5% of the gross lot area in landscaped areas. To meet these "interior" guidelines, landscaped areas must be surrounded on at least three sides by the parking lot area itself.
Large	For parking lots that exceed 20,000 square feet at least 8% of the gross area shall be provided as internal landscaped areas.

Table 4.4A

4.4.9 Parking Lot Trees

One tree of a type suitable for parking lots shall be provided for every 10 open vehicular parking spaces in parking lots with 15 or more spaces. The required trees may be clustered but shall be located to divide and break up expanses of paving and long rows of parking spaces and to create a canopy effect in the parking lot. Interior landscaped areas shall be disbursed to define aisles and limit unbroken rows of parking to a maximum of 100-feet. In order to be considered within the parking lot, the trees must be located in islands that are bounded on at least 3 sides by parking lot paving. Islands shall be of sufficient size and design to accommodate the growth of the trees and to prevent damage to the trees by maneuvering vehicles such as street sweepers and large trucks, but at least a minimum width of 10-feet to allow access of air and moisture to the root system.

Provide parking lot trees in a configuration as to allow for shade. Select tree types that maximize shaded areas during the summer season.

4.4.10 Screen/Accent Landscaping

The landscape guidelines contained in this section address several unrelated but important areas on the installation. These include accent landscaping for signage and screen planting guidelines for trash enclosures and building service areas. Plantings shall be used to screen trash enclosures and building service areas, including services docks adjacent to buildings.

Signage Accent Landscaping

The location of major building signage to receive accent plantings will vary greatly. The intent of this section is to landscape around all freestanding signs for major individual buildings, and at signs for major complexes. New signage shall be in accordance with Section 4.6.1 of the Guidelines.

Screen Planting

Dumpsters and building service docks are pervasive, functionally necessary visual liabilities at Davis-Monthan AFB. To help diminish their negative visual impact screen plantings are required in addition to screen walls. Landscaping is necessary to help diminish the strong horizontal (man-made) lines created by screen barriers. Use plantings adjacent to dumpster enclosures, whenever appropriate, to screen and soften these areas.

4.4.11 Civil Engineering Standards

See Civil Engineering Standards in these DCG for additional landscape design information at it pertains to coordination of landscaping and the "hardscape" elements identified therein. Hardscape consists of the inanimate elements of landscaping (i.e. masonry walls and pavers, trellis, etc.).

Irrigation & Water Usage

As part of General Plan updates and related planning efforts, irrigation zones should be established on base to utilize reclaimed effluent water sources and to support pedestrian greenways and other small oases of green on base. Permit verification is required for the use of reclaimed effluent. In zones with lawns or that are designated for concentrated activity, permanent irrigation systems should be established for plantings in key focus areas and special use zones that require more

than 2-3 years of irrigation. Even when using native and low water plants, infrequent deep watering can help sustain plantings during prolonged periods of drought and high heat.

Temporary irrigation systems should be used to establish native or naturalized landscapes and seeded areas. Drip irrigation utilizing PVC laterals, polyethylene headers and emitter tubes are suitable for temporary systems that are going to be abandoned. While inefficient for large tracts, small areas may be established through hand watering.

Permanent irrigation systems should be schedule 40 PVC, minimum 1/2-inch, and may include pop-up spray heads, bubblers, micro spray heads and drip emitters. If used, single and multiport drip emitters must be incorporated onto PVC laterals and headers, not flexible tubing. Calculate zones, valves and controllers so that all zones may be irrigated completely at night. Calculate mainline, lateral and header flows to support the daily water needs of plants at maturity.

4.4.12 General Standards

Reduce supplemental irrigation requirements by directing runoff from “clean” plaza and courtyard areas, roof drains, and slightly bermed areas where possible, to landscape areas.

All irrigation materials, workmanship, and irrigation controller elements shall be concealed as much as possible and guaranteed for a period of one year from the completion of the entire project. The system must be maintained and adjusted on a regular basis to ensure proper operation and to avoid wasting water.



4.4A Spray type irrigation at recreation area.



4.4B Inert groundcover minimizes irrigation requirements.

4.5 PLANTING/XERISCAPING

4.5.1 Current Conditions

Davis-Monthan AFB has done well in its ability to address with landscaping the geographical, cultural, and climatic conditions of the region. Average summertime temperatures hover around 100° F, therefore it is imperative to use plant species requiring little moisture (whether indigenous or exotic) combined with inert groundcover materials such as gravel mulches and boulders. This practice—known as xeriscaping—significantly reduces the long-term need for irrigation and maintenance.

While variation from this xeriscape approach may be justified in some instances, it is clearly the most logical and aesthetically pleasing approach to landscaping at Davis-Monthan AFB.

General Standards

Use xeriscape principles in all plant material selection and landscape design at Davis-Monthan AFB. Basic xeriscape principals include:

- Group and locate higher water use plants close to human use areas.
- Limit turf areas. Where used, utilize year-round turf mixture.
- Employ water efficient irrigation systems. See Irrigation and Water Usage paragraphs in Section 4.4.11.
- Passively harvest rainwater for beneficial use.
- Improve and protect soil with organic and inert mulches. Gravels in multiple colors and sizes allow a variety of application options. Mulch use shall be limited due to its moisture content and the drying effects of the sun. All inert material shall be treated with an approved pre-emergent herbicide prior to the completion of the project
- Use low water plant material.
- Specify proper maintenance materials.
- See Appendix F for approved plant materials.



4.5A Xeriscaping does not necessarily mean lack of color.

Conditions found at Davis-Monthan AFB limit the use of lush plant material as a viable groundcover. Plant material, if used as a groundcover, should be selected based on limited water and maintenance requirements.

4.5.2 Xeriscaping Principles & Strategies

The practice of xeriscaping builds upon seven basic principles to create resource conscious landscapes that still support a diversity of plants and human activities. Local and state development and water use codes support xeriscape practices and provide guidelines for plant use and water consumption on projects undertaken at Davis Monthan AFB. Relevant portions of codes and related guidelines are included as an appendix to this section. See Appendix F for a complete list of acceptable and approved plantings. Check with the Arizona Department of Water Resources Low Water and Drought Tolerant plant database for revisions prior to finalizing a planting list. The seven basic xeriscape principles are as follows:

1. Planning and Design for Water

Conservation. The foundation of a successful xeriscape is the plan from which it is built. Start with a thorough site analysis, which considers solar exposure, slopes, activity patterns, existing features and vegetation, winds and related site characteristics. Consider different intensities of use and activities and group plants with similar water requirements, with the higher water use plants closer to human use areas, including pedestrian travel routes.

2. Select Low Water-Use Plants. Hundreds of native and adapted plants can be used to create landscapes with diverse color, texture, volume and density of shade. While there are many information sources on the topic, the Arizona Department of Water Resources maintains a regulatory list of low water and drought tolerant plants for each active management area (AMA). Davis-Monthan AFB is within the Tucson AMA. The list includes water consumption data that is useful in developing plant groupings and water use zones on site.

3. Appropriate Turf Areas – Because they are water and maintenance intensive, limit lawns to areas where no other groundcover would be



4.5B Saguaro cactus.

acceptable, such as in a play area, recreation area or a courtyard oasis serving numerous buildings. Use adapted grasses such as hybrid Bermudas in small, simply shaped panels. Avoid the use of desert invasive grasses, including Fountain Grass and Buffalo Grass. Where just a groundcover is needed avoid lawn and introduce other water- efficient ground covers or organic mulches instead.

4. **Efficient Irrigation Practices** – Even drought tolerant and low water use plants need to be irrigated for an establishment period of up to two to three years following installation. Some benefit from deep, widely spaced soakings during the long dry portions of the year. Irrigation systems can be efficiently planned to support key areas through establishment and left in place for infrequent long-term use. For more irrigation guidelines refer to the Irrigation and Water Usage paragraphs in Section 4.4.11.
5. **Soil Improvements** – Building up organic matter in the soil prior to planting can improve the water and nutrient holding capabilities of desert soils. This is especially true with mass plantings of perennials and annuals and non-native plants. Native trees, shrubs, succulents and cacti are more tolerant of native soils, but may be more susceptible to poor drainage. Subsurface hardpan or caliche layers can impede taprooted plants and should be removed, if feasible, prior to planting. On base, especially in the vicinity of Kolb Road, there are sugar soils that may need to be structurally reinforced with geogrids if disturbed or sloped.
6. **Mulch** - The use of organic and inorganic mulches over the root zones of plants can help reduce evaporation and insulate the roots. While organic mulches benefit the soil structure and horticultural characteristics, they break down quickly in the desert and must be replaced regularly. Inorganic mulches such as stone and screened rock help hold the soil and control dust.
7. **Proper Maintenance** – Proper maintenance leads to overall better plant health and development. Over-pruning and shearing is not in character with the form of most desert plants and can increase water use, pest and disease susceptibility. Maintenance contracts for the

base should include detailed maintenance guidelines and require the presence of a certified arborist on site as the project foreman. See Section 4.4.11.



4.5C River rock, screened rock, and low water plant material.



4.5D Properly maintained landscaping helps to enhance the aesthetic quality of a building.

A related principle that supports xeriscape efforts is the incorporation of water harvesting opportunities into grading and planting designs. Water harvesting can be done in many ways, from structural solutions such as oil/water separators and storage cisterns to small-scale landscape swales and basins that channel storm water to plantings. When water harvesting solutions are being integrated, local storm water codes provide standards for functional characteristics such as the maximum length of time that any storm water basin may impound water or the use of passive collection points.

4.5.3 Applying Xeriscaping Principles

Davis-Monthan AFB has incorporated xeriscape principles to varying extents on projects around the base. Recent construction and renovations incorporate a range of drought tolerant plants. A positive example of zoning of plant material is the new dormitory housing, which includes a densely planted pedestrian approach linking the individual entrances. As the plant material matures it will help to shade the areas and define a transitional zone between the public areas on base to a semi-private space for interaction between residents leading into private unit entries.

While this is a good site-specific response, more effort should be made on a base-wide level to establish planting zones that support streetscape identity, reinforce the identity of different use zones, and establish comfortable pedestrian corridors throughout the base. For instance, throughout the base there are zones such as the emerging Town Center where activities and people are concentrated and slightly larger turf areas and more significant tree plantings can be established. This is in contrast to other limited use zones such as the AMARG Zone where turf and lush plantings would not be justified. The Town Center is currently comprised of a number of large buildings with sizable parking areas and is primarily oriented to vehicular use. Pedestrian connections are limited and are not enhanced with shade trees or bosques in gathering areas. Similarly streetscape designs do not consistently convey a hierarchy of use or importance through planting design and densities.

An irrigation framework should be established to support an approach that includes different planting

types and densities within different zones on the base. An allotment of reclaimed effluent water is currently available from the City of Tucson for use on the base, however it is currently being utilized only on the golf course, a limited use facility with continuous grass fairways. A permanent system for distribution of irrigation water can help support a better-developed network of green activity spines and fingers to link key use and residential nodes and enhance the quality of life at Davis-Monthan AFB. Transformation of the turf golf course to a more challenging desert model would allow diversion of reclaimed water elsewhere on base. Local codes provide standards for use of reclaimed water in public and semi-public areas.

Plant Materials

The Arizona Department of Water Resources (ADWR) Low Water and Drought Tolerant plant database can be found online at:

http://www.water.az.gov/adwr/Content/Conservation/LowWaterPlantLists/TucsonAMA/TAMA_Plant_List_webversion_04.pdf.

It should be noted that this regulatory tool is a dynamic list and is updated regularly. In addition to the list of approved plants, the department also maintains lists of plants that have been denied for inclusion on the list, deleted from previous versions of the list, recently added to the list, and plants that are being tested for suitability. Landscape architects and designers working on projects on base should consult the ADWR website for the most recent versions, and should note that not all plant material on the list is commercially available in large numbers. Designers should verify regional availability of plant and seed sources prior to final project design.

Although they are included on the Low Water and Drought Tolerant plant list, Fountain Grass and Buffalo Grass are considered invasive grasses and shall not be used on Davis-Monthan AFB.

In addition to container grown and field dug trees, shrubs, cacti and succulents, many desert groundcovers and plant materials can be effectively grown from seed. Hydroseeding is an effective way to provide a planted groundcover at a reasonable cost over a large area, and can be an alternative to

turf or rock mulches. Seed selection is important to assure the establishment of seeded areas. The City of Tucson zoning code provides a standard for seed mix design and application:

www.tucsonaz.gov/planning

Inorganic Ground Covers

Inorganic groundcovers can be effectively combined with turf areas, seeded areas and plantings to introduce color and texture into the landscape while providing dust and erosion control. Large expanses of inert mulches that do not incorporate plantings can be stark and produce glare and reflected heat and should be avoided. All inorganic mulches should be treated with pre-emergent herbicides. The following inorganic mulches and groundcovers have been approved for use at Davis Monthan AFB:

- **Decorative Rock, ¾-inch.** This fine textured granite mulch is appropriate in highly visible areas such as building entrances, courtyards and areas with a high level of pedestrian traffic. The smaller aggregates are conducive to walking and the incorporation of granite fines and/or mucilard based stabilizing agents provides a denser and more stable surface. Fines and small aggregates are susceptible to washout in areas with significant channel or sheet flow, such as at downspouts or edges of large paved areas. Areas of concentrated flow should be stabilized with larger aggregate rock or other flow dissipaters. Wildcat Red is the primary color used on base, however other complementary colors may be introduced in limited accent areas.
- **Decorative Rock, ¾-inch to 1 ½-inch.** The larger aggregate can be used in large areas, on slopes and where a coarser texture surface is desirable.
- **River Rock, 3-inches to 8-inches.** The rounded surfaces and muted colors of Salt River Run rock evoke images of streams and provide contrast to the finer screened rock surfaces. River rock is an effective stabilizer for low volume swales, downspouts and can be used to break up sheet flow across a site.
- **Granite Boulders, 8 to 27 cubic feet.** Large boulders can be incorporated into planting,

seeding, river rock and screened rock areas to provide bold focal points or dissipate the energy of water flowing through channels. Boulders can also provide informal seating opportunities and can be sandblasted or cut for site signage. For the most naturalistic appearance, boulders should be buried up between 1/3 to ½ of their height.

4.6 SITE ELEMENTS

4.6.1 Exterior Signage

Concise, orderly and visually pleasant signage is a critical design element which creates an ongoing "dialogue" with its users. It directs traffic, identifies facilities, provides warnings, and prohibits access. The signage must respond not only to functional requirements and use signage hierarchy, materials, colors, and concise messages to communicate intent clearly, but must be a unifying element for the installation.

Overall, this is one element in the built environment, which should identify Davis-Monthan AFB as part of a larger whole, the United States Air Force. Common signage systems can visually communicate this continuity more readily than building or landscape design. All signage must be in compliance with UFC 3-120-01 and ACCI 32-1054. This DCG reflects those requirements.

Signage Criteria

Davis-Monthan AFB's signage system must be a unifying visual element, and most importantly, must communicate necessary information effectively. To convey this information clearly and to make a positive contribution to the overall visual image of the base, the signage system must incorporate the following general characteristics:

Non-traffic control and information signs must be the existing brown with white text and symbols. Sign backs, when blank, as well as required posts must be painted.

Install directional signs where needed (key functions) to guide personnel and visitors unfamiliar with the site. Ensure that individual letter-type signs are legible from nearby walkways and/or streets.

As a standard, mount signs on single or double posts set permanently into the ground with concrete bases. Mount building signs on the same side as the doorknob.

Use standard brown background with white lettering for all exterior signage.

Use military symbols and insignia in full color when used on signs.

The entrance sign should be updated periodically as Air Force signage requirements are implemented.

Simplicity

An effective strategy provides only needed information, avoids redundancy and eliminates over-signing with its resulting clutter and visual confusion. Sign messages must be clear, simple and easy for motorists to process quickly.

Consistency

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.

Visibility

Sign location is very important to the success of the system. Signs must be located at significant decision points and oriented to provide clear sight lines for the intended users. Close coordination of locations with respect to landscaping, utilities, adjacent signs and various other streetscape design elements is imperative to insure long-term maximum visibility.

Legibility

Sign typestyle, line spacing, color and size all combine to create the crucial design characteristic of legibility. This aspect of sign design should take into consideration whether motorists, pedestrians, or bicyclists use the sign and the relative travel speed at which each type of user will be going while reading the sign.

Flexibility

At military installations, activities and units are periodically relocated within the installation. The system must allow for changing sign messages without total replacement of entire signs.

Hierarchy

The entire system must communicate by varying sign size, layout, and orientation to the relative

importance of the individual activity which the sign identifies. Likewise, primary roadway identification signage should be part of an integrated signage, lighting, and traffic control system.

Materials

In general, all exterior signage shall consist of white, vinyl lettering on a Federal Standard Color (FSC) X0045 background. The exposed backs of all signs shall be painted to match FSC X0045.

4.6.2 Signage Classifications

Destination Signs

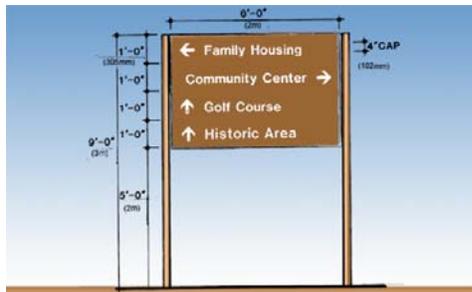
Destination signs direct vehicular and pedestrian traffic within Davis-Monthan AFB. These signs must be located in a logical, continuous progression from the point of entry to the desired activity along the street system.

Color: White letters, arrows, rules, and borders (reflectivity mandatory), Federal Standard Color X0045 background.

Message: Facility Names, in upper and lower case Helvetica Medium (3-inch capital letter height), justified left or right with arrow as shown.

Arrow: 3-inch by 3-inch placed left or right as appropriate.

Ruling Lines and Border: 3/8-inch wide white tape (reflectivity mandatory) at all ruling lines. 3/8-inch wide white tape (reflectivity mandatory) at border.



Regulatory Signs

This category of signage restricts, warns and advises. A systematic approach to sign placement is particularly important in this category to prevent

over-signing and the resulting visual clutter. Regulatory signs have three subcategories: Highway/Traffic, Government Warning, and Parking Regulation. This Design Compatibility Guidelines will not address traffic control signage since this category is not regulated by the installation, but is an extension of the civilian regulatory signage system.

Street Signs

Street signs on Davis-Monthan AFB must meet the requirements of ACC Instruction 32-1054. A 4-inch by 4-inch ACC logo is required on all street signs.

Color: White letters (reflectivity mandatory), Federal Standard Color X0045 background.

Message: Lettering must meet FHA Standard Highway Signs for reflectance and alphabet style and series (Series B or C).

Size of Individual Letters: 4-inch, Series B or C

Dimensions: 6-inches x 30-inches minimum (36-inches maximum)

Border: 1/2-inch wide, white (reflectivity mandatory).

Sign Post: Aluminum, of a thickness to meet bracket manufacturer's requirements.

Logo: 4-inch by 4-inch ACC logo on 4 1/2-inch by 4 1/2-inch reflective background.

Building Address Signs

Since regular and or express mail delivery service is available at Davis-Monthan AFB, every occupied facility is required to have a building address sign containing the address number consistent with US Postal Service protocols.

Building Numbers

Color: Anodized Bronze

Message: Helvetica Medium

Size of Individual Numbers: 10-inches

Facility Lettering - Building Name

Color: Anodized Bronze

Message: Helvetica Medium upper and lower case

Size of Individual Letters: 10-inches

Location: Provide facility lettering at a single location that is visual to vehicles and/or pedestrian destined for the main entrance of the facility. In cases where additional facility lettering is required, the application must obtain approval of the Chief Engineer prior to installation.

Military Emblems

The Air Force has a rich tradition of military heraldry. Military emblems are an important part of personnel identity and the emblems have been carefully designed over the years to express pride and the unique history and/or function of a group. The careful use of organizational emblems in a signage system can add visual interest as well as build pride. The over-use of miscellaneous emblems, however, can lead to clutter and a dilution of its importance. Authorization for use of emblems and appropriate color and shape applications are regulated by UFC 3-120-01. All military emblems must appear in full color. The use of emblems on building exterior walls, doors and/or other permanent structures does not meet Air Combat Command Design Compatibility Guideline standards (as noted in the ACC Instruction to UFC 3-120-01).

International Symbol Signage (Pictographs)

Symbols or pictographs (graphic expressions of actual objects) can be useful where rapid communication is necessary. Each symbol background border must always be square with rounded corners, and the borderline weight must be consistent for all symbols. The symbol types include service, mandatory/prohibitory, sports and recreation symbols.

4.6.3 Site Lighting

The lamp choice for Davis-Monthan AFB is High Pressure Sodium for area, path, street, and parking lot lighting.

Street Lighting

Use high-pressure sodium cobra head fixtures with cutoffs, photocells. Poles shall be tapered aluminum or galvanized steel with arm-mounted fixtures.

Generally, provide street lighting at all intersections and along primary roads for all areas with exception

of housing. In housing, provide street lighting along roadways.

Parking Lot Lighting

Use high-pressure sodium rectilinear heads with cutoffs and photocells and square poles. Luminaires and poles shall be anodized or duranodic bronze aluminum or steel with baked enamel bronze colored finish.

Plaza/Area Lighting

Generally, provide area lighting around all facilities and plazas. For all areas, with the exception of housing, use a combination of bollards, building mounted luminaires, and pole-mounted luminaries. All fixtures shall be high-pressure sodium with cutoffs and photocells. See parking lot lighting for description of poles and rectilinear fixtures. For housing, provide incandescent light fixtures with photocells and motion sensors at each entrance.

Exterior lighting systems are, by their very nature, a linear site design element. They are perceived and used in a linear manner along streets and walkways and in parking lots. Site lighting provides visibility and recognition of facilities at night. While it is not direct communication such as signage, it does have an impact upon the overall communication process. Lighting is thus a critical site design element, which can greatly influence how base users perceive and use the entire installation.

Davis-Monthan AFB is somewhat unique as it pertains to site lighting. Due to high profile observatories in the local vicinity of the installation, all exterior lighting shall comply with the City of Tucson, Outdoor Lighting Code.

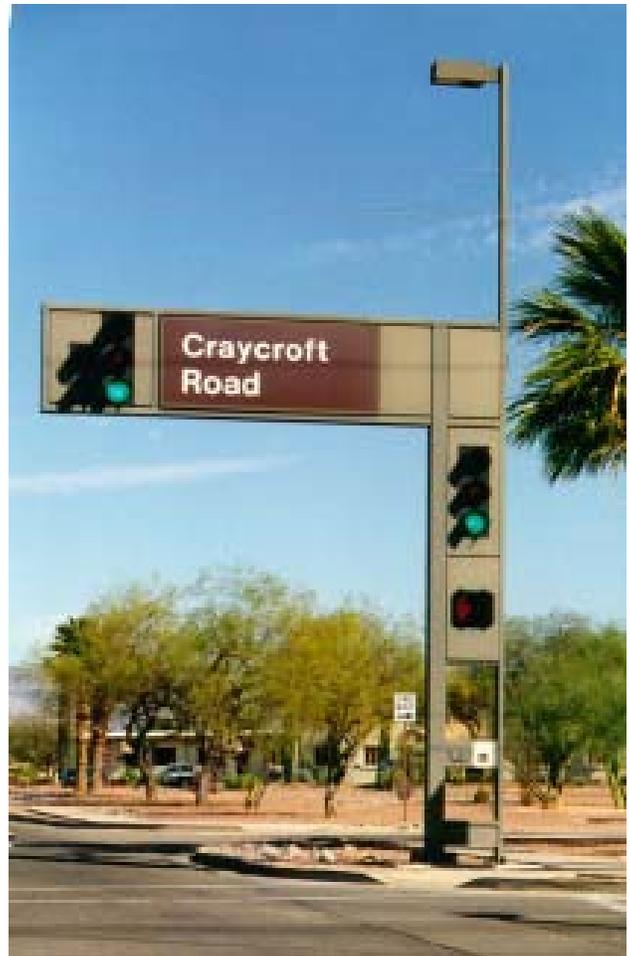
Area and Path Lighting

Lighting for parking lots, exterior spaces, courtyards (people spaces), and pedestrian circulation routes should respond to the architectural character established. Lighting standard heights and spacing will need to vary to adequately serve the needs of these separate activities.

Building wall mounted entry and exterior lighting will need to be handled separately in many instances because numerous buildings have lighting that is integral with the building design. At buildings lacking integral exterior lighting, fixtures should be provided to complement the adjacent pedestrian and parking lot lighting.

Street and Parking Lot Lighting

The use of street lighting should help reinforce recognition of arterial, collector and local streets. Through the use of different fixture heights and spacing of light standards, a separate visual character should be promoted. Arterial roadways should receive the highest lighting levels, while local roadways should receive the lowest. A common palette of colors, materials and forms should be used for all three levels of street lighting to promote a consistent visual image. Parking lot lighting should provide safe access to and from its adjacent facility.



4.6A Integrated street and traffic light unit at the intersection of Craycroft Road and Ironwood Street.



4.6B Cobra head street lighting.

Pole and Base Types

Pole heights and fixture output shall be adjusted as required by the function they serve. Three base types shall be used, all of which are concrete, and shall be installed relative to adjacent finished surfaces. All exposed concrete shall have a natural warm gray color and smooth finish.

Due to extensive winds loads, use a round tapered type pole made of galvanized steel.

Aluminum poles constructed to withstand the wind loads at Davis-Monthan AFB can be implemented as long as they remain economically feasible for specification as a standard.



3.6C Rectilinear parking lot lighting on square pole.



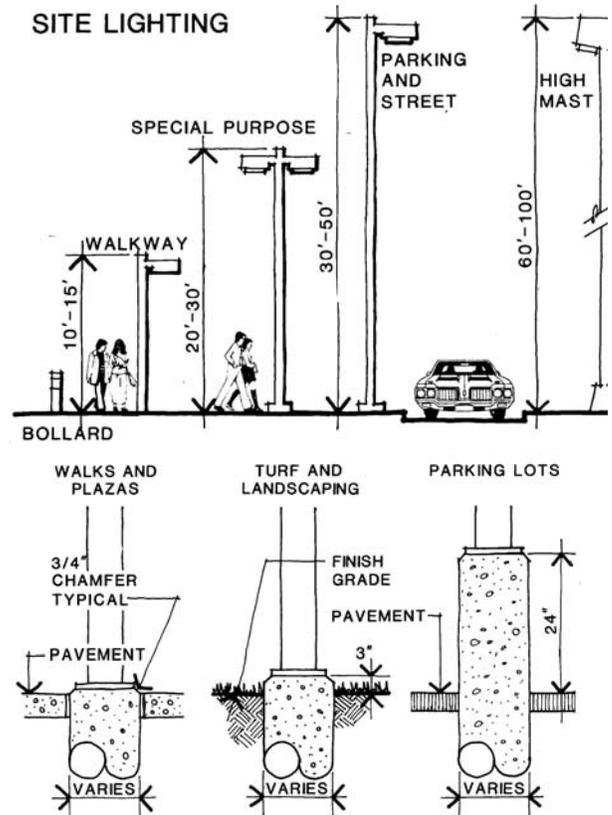
3.6D Typical bollard lighting



3.6E Typical Rectilinear area lighting.

Traffic Lights

Traffic lights at Davis-Monthan AFB are in accordance with City of Tucson standards. Any requirement for additional traffic lights on the installation shall match existing.



4.6.4 Recommended Illuminance Levels

Illuminance levels for exterior applications such as walkways, parking lots and building entrances shall be in accordance with established standards listed in the 9th Edition Handbook of the Illuminating Engineering Society of North America (IESNA).

4.6.5 Site Amenities

Site amenities encompass a wide variety of individual elements. These elements range from being functional on a very literal level (trash receptacles and benches), to being functional on a symbolic level (memorial displays and flagpoles). A coordinated approach and a commitment to continuity will allow site furnishings to contribute in a positive manner to the visual environment, image, and identity of the base

This wide range of exterior amenities can be visually coordinated among themselves through the use of common and repetitive forms, materials, and colors. The repeated use of visually related designs will help provide a common theme.

Trash Receptacles and Ash Urns

Pedestrian oriented trash receptacles and ash urns shall be placed in strategic locations for effective litter control. Where possible, they should be grouped with other site furnishings and placed adjacent to pedestrian paths. Locate all trash receptacles and ash urns on paved surfaces and such that they do not conflict with landscape maintenance or trash removal.

Ash urns specified in this section should be located out of direct wind conditions. In cases where ash urns are exposed to windy conditions, provide the standard, lidded butt-cans. Paint all ash urns to match the color of the adjacent facility.

Bicycle Parking

Bicycle parking facilities shall be placed near activity "nodes" throughout Davis-Monthan AFB. Where possible, they should be grouped with other site furnishings in an area of easy visual supervision and placed outside of, but adjacent to, pedestrian paths. The actual number of spaces at each location shall be based upon anticipated and requested need.

Bicycle parking shall be located such that additional spaces may be provided in the future.

Trash Dumpsters and Dumpster Enclosures

All dumpsters shall be screened from view and/or located behind or beside buildings to make them as inconspicuous as possible and yet accessible by the sanitary truck.

All dumpsters shall be incorporated into enclosures and per the installation's standard construction for dumpster enclosures.

When required or anticipated, standard dumpster enclosure construction shall be expanded to include an additional dumpster position for recyclable materials (usually a "cardboard only" dumpster). The type and number will be determined by the Chief Engineer.

Trash dumpsters and garbage cans must be concealed on at least three sides by the use of walls. Wall materials must match the building materials, forms, and colors used on the adjacent building to which the enclosure is physically and/or functionally attached.

Dumpster enclosures shall incorporate opaque doors into their design, such that enclosure contents are not visible (Reference Appendix "E" Davis-Monthan AFB standard construction for Dumpster Enclosures).

All dumpsters and garbage cans shall be brown (match FSC X0045), to reduce their visual prominence. Stenciled caricatures, messages or similar attachments, are prohibited at all dumpsters and trash receptacles.

At unattached trash enclosures, use materials to match those of the adjacent building that the trash enclosure serves.

Location of dumpster and enclosures shall be in accordance with most current AT/FP requirements.

Bollards

Bollards shall be used throughout the base to control and direct vehicular, pedestrian and bicycle traffic.

The typical purpose of bollards is to control and direct vehicular traffic.

Safety Bollards

This type of bollard shall be used for all areas where a more industrial-use bollard is required. Use typically at locations such as garage door openings, around above-ground utility components, and similar applications. Use receiver/key switch equipped bollards where required. Safety bollards shall have the following design characteristics:

- Non-illuminated bollard.
- Steel well-casing construction, 6-inch diameter and paint to match Federal Standard Color X3522 with white, reflective striping.
- Fill with concrete and provide rounded top for proper water drainage from bollard top.

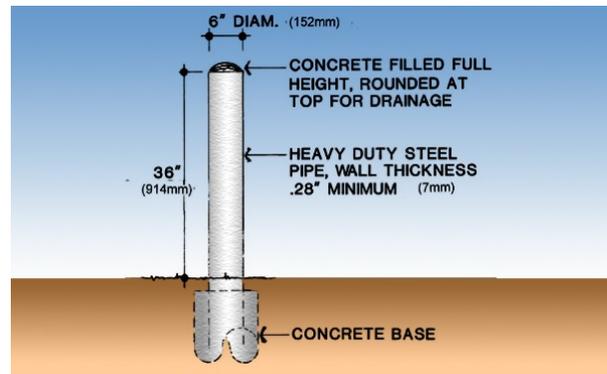
Benches

Benches have application in all areas of Davis-Monthan AFB. As a minimum, benches shall be provided in the locations identified below, and may be provided at additional locations as the need is identified.

Benches shall be set back a minimum distance of 2-feet from adjacent pedestrian paths and 5-feet from stationary objects, to provide leg room and avoid obstruction of pathway traffic. A paved surface shall be provided upon which the bench shall be securely anchored. The paved surface shall extend a minimum distance of 4-feet beyond the ends of the bench for requirements like pedestrian waiting and wheelchair parking.

Picnic Tables and Shelters (Ramadas)

Picnic tables and seating shall be placed in strategic locations around the installation. Where possible, they should be grouped with other site furnishings and placed adjacent major pedestrian activity nodes. Locate all picnic tables and seating on paved surfaces. Picnic shelters (or Ramadas) shall be placed in strategic locations around the installation. Where possible, they should be grouped with other site furnishings and placed adjacent to major pedestrian activity nodes and/or courtyards.



Planters

Planters are not used at Davis-Monthan AFB. Due to the harsh desert climate, maintaining plantings in this type of configuration is not feasible.

Bus Shelters

The use of local (city) transportation services bus shelters at Davis-Monthan AFB is not applicable. Due to Force Protection requirements local city transportation does not enter the installation.

School Bus shelters shall be provided as required for student pickup and delivery to local area schools and youth facilities.

Base shuttle service pick-up points occur at facility entrances.

Fences and Screen Barriers

Fences and/or barriers help meet the military requirements for security and provide a visually controlled design for areas with high visual impact by large numbers of people.

The use of chain-link fencing is prohibited, unless approved by the Chief Engineer.

Screen Barriers

Screen barriers have the highest visual priority. However, its security priority is very low, such that this barrier should be used where security is not an issue. It should be used in areas where visual screening is a prime issue.

Screen barriers shall have the following design characteristics:

Pilasters spaced evenly along the fence length. Pilasters must be 24-inches by 24-inches and height as required. Spacing between pilasters may be a minimum of 8-feet on center up to a maximum of 40-feet on center. Only 1 pilaster-to-pilaster spacing may be used on any single fence. Pilasters may be base standard block construction. Small-screened areas of less than 150 square feet of enclosed space do not require pilasters as part of the screen construction.

Between the pilasters, provide steel privacy paneling, which may include intermediate steel posts spaced evenly between pilasters, a minimum of 2 horizontal rails spaced alternately on each side of the rails, such that the fence looks “finished” from either side. All exposed ends of posts, rails, and panels shall be closed with steel end pieces. Steel privacy paneling color shall match (tan).

Gates with accessories as required, made of stock items to match the fence.

All steel parts exposed to view shall be finished such that bare metal is not exposed at any point. Paint color shall match (tan).

Temporary Construction Fencing

All projects shall include in the contract documents the requirement for site control fencing with tan screening fabric.

Orange or yellow temporary fencing is not authorized for use at Davis-Monthan AFB.

Site Walls

Site walls such as screen walls, fixed planters, retaining walls, and similar site related structures shall be incorporated as integral design elements of the building to which they are physically and/or functionally related. This Design Compatibility Guidelines neither requires nor prohibits use of these site walls. However, wherever such walls are used, their design character, forms, materials, textures, and colors shall match those used elsewhere on adjacent buildings.

4.6.6 Site Amenities - Suggested Procurement

Davis-Monthan AFB is in the process of adopting as part of its architectural design guidelines (Design

Compatibility Guidelines) a “sole source” supplier posture for site furnishings. Brand name procurement will ensure each future furniture order will match Design Compatibility specifications and provide design uniformity throughout the installation, as recommended in the Air Combat Command, Commander’s Guide to Facilities Standards. In researching the various products available, these Design Compatibility Guidelines contacted numerous vendors and “suggested” one that would match the desired style, color, finish and flexibility for Design Compatibility at Davis-Monthan AFB.

In the interest of reducing cost, shipping requirements and delivery time, an alternate local supplier may be chosen prior to full Design Compatibility implementation or reconfiguration. However, every effort should still be made to obtain “sole source” justification from either the suggested or alternate local supplier.

4.6.7 Site Amenities – Suggested Sources

Note: In the interest of reducing cost, shipping requirements and delivery time, an alternate supplier may be chosen. Match style, color, finish and flexibility.

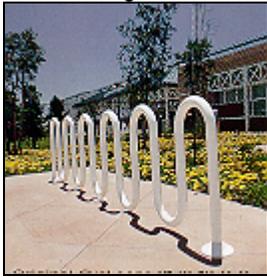
Item	Manufacturer	Item Number	Remarks
<p>Trash Receptacle</p> 	<p>Dura Art Stone 3423 Investment Blvd. #14 Hayward, CA 94545 Phone: 1-800-431-3311 Fax: (510) 265-0299</p>	<p>TR-D2 Round S-TRD2-S18-SK Diameter: 2'-1" Height: 2'-6" Color: Stone Gray Finish: Smooth</p>	<p>Entry/Foyer applications Matches specified urn. Standard lid (LID/ST) Lid Color: Brushed Aluminum</p>
<p>Ash Urns</p> 	<p>Dura Art Stone 3423 Investment Blvd. #14 Hayward, CA 94545 Phone: 1-800-431-3311 Fax: (510) 265-0299</p>	<p>AU-D Round S-AUD-S18-SK Diameter: 1'-2" Height: 1'-10" Color: Stone Gray Finish: Smooth</p>	<p>Entry/Foyer applications Matches specified trash receptacle. Standard lid (LID/ST) Lid Color: Brushed Aluminum</p>
<p>Bollards</p> 	<p>Dura Art Stone 3423 Investment Blvd. #14 Hayward, CA 94545 Phone: 1-800-431-3311 Fax: (510) 265-0299</p>	<p>PB-25 Round S-PB25-48-B-S18-SK Diameter: 1'-0" Height: 4'-0" Color: Stone Gray Finish: Smooth</p>	<p>Color and finish to match trash receptacles and ash urns.</p>
<p>Bike Parking</p> 	<p>Columbia Cascades 1975 S.W. Fifth Avenue Portland, OR 97201-5293 Phone: (503) 223-1157 Fax: (503) 223-4530</p>	<p>Color: Brushed Aluminum Provides parking for 7 bicycles per unit.</p>	<p>Do not paint this Site Amenity</p>

Table 4.6A

Civil Engineering Standards SECTION 4.0

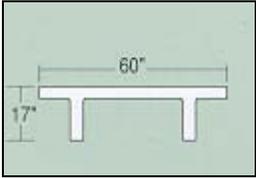
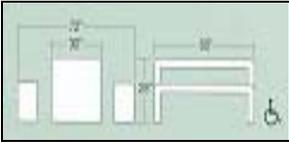
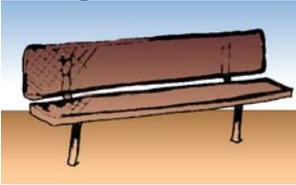
Item	Manufacturer	Item Number	Remarks
<p>Benches</p> 	<p>Dura Art Stone 3423 Investment Blvd. #14 Hayward, CA 94545 Phone: 1-800-431-3311 Fax: (510) 265-0299</p>	<p>Rectangular S-S5B-E-S18-SK Height: 1'-5" Length: 5'-0" Color: Stone Gray Finish: Smooth</p>	<p>Color and finish to match trash receptacles, tables, bollards and ash urns.</p>
<p>Picnic Shelters (Ramada)</p>	<p>W.H. Porter, Inc. (Polygon) 4240 N. 136th Avenue Holland, MI 49424 Phone: 1-800-354-7721 Fax: (616) 399-9123</p>	<p>Square Series Hex 16/Hex 20/Hex 24 Tan or Beige metal roof</p>	
<p>Tables</p> 	<p>Dura Art Stone 3423 Investment Blvd. #14 Hayward, CA 94545 Phone: 1-800-431-3311 Fax: (510) 265-0299</p>	<p>5 PT-70 Rectangular S-5PT70-E-S18-SK</p>	<p>Color and finish to match trash receptacles, ash, urns, seating and bollards</p>
<p>Seating</p> 	<p>Dura Art Stone 3423 Investment Blvd. #14 Hayward, CA 94545 Phone: 1-800-431-3311 Fax: (510) 265-0299</p>	<p>Rectangular S-S5A-E-S18-SK Color: Stone Gray Finish: Smooth</p>	<p>Color and finish to match trash receptacles, tables, bollards and ash urns.</p>
<p>Seating</p> 	<p>Wabash Valley 505 E. Main Street Silver Lake, IN 46982-0005 Phone: (260) 352-2102 Fax: (260) 352-2160 Toll Free: 1-800-253-8619</p>	<p>Model: S710 Color: Brown</p>	<p>Vinyl-coated steel in an open mesh</p> <p>Six-foot long with back, no arms.</p>

Table 4.6B

4.6.8 Civil Standards

See Civil Standards in these DCG for additional site element design information at it pertains to coordination of site elements and the “Civil” requirements identified therein.

4.7 CIVIL UNDERGROUND UTILITIES

4.7.1 General

The soil at Davis-Monthan AFB is underlain with well-drained soils of fine loam and sand. The water table varies from 200-feet to 400-feet below the ground surface.

All underground non-metallic piping shall be provided with bright-colored, continuously printed, plastic ribbon tape manufactured for direct burial service. Tape shall be acid-and alkali-resistant, polyethylene film, and 6-inches wide with minimum thickness of 0.004-inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral, magnetically detectable wire conductors and foil backing, or other means to enable detection by a metal detector when the tape is buried up to three feet deep. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be the industry standard for the specific utility (i.e., blue for water, green for waste, orange for telecommunications, red for electric, and yellow for gas) and bear a continuous printed inscription describing the specific utility.

In addition to the required plastic ribbon tape, provide an insulated, #12 AWG solid copper tracer wire installed along the top of all non-metallic pipe.

Do not locate utility risers within site of the facility main entrance.

Every effort will be made to avoid cutting street pavement for trenching to install new underground utilities. Jacking and boring will be the planned method to cross existing paved streets with new underground utilities. Trenching through existing paved streets will only be allowed if approved by the Chief Engineer on a case-by-case basis and if approved will be constructed per Standard Detail DM-C-008, Utility Patch (Refer to Appendix G). Jacking and boring with required casings will be accomplished per industry standards.

4.7.2 Water Supply (Domestic and Fire Protection)

Water piping shall be designed for a maximum velocity of 5 fps, or manufacturer's recommendation, whichever is less. Trenching,

backfilling, and pipe installation shall be done according to manufacturer's recommendations. Pipe shall have minimum cover of 36-inches.

Provide separate connection to water main for fire protection and domestic water systems.

Irrigation systems shall be fed from domestic mains with appropriate backflow protection.

Service line connections to existing mains shall be pressure or hot-tap, with service valve at or near connection to main.

Provide backflow prevention as required by local AT/FP and/or UFC 4-010-01, with most restrictive requirement governing. Backflow preventers shall be provided with a secure chain and lock on the valve handles to prevent unauthorized tampering. Refer to AFI 32-1066, *Plumbing Systems* and ACC Sustain Advisory 99-001, *Backflow Prevention* for more information.

Use RPBP's in the system according to AWWA Recommended Practice for Backflow Prevention and Cross Connection Control (M 14) and according to the Manual of Cross Connection control Ninth Edition University of Southern California for protection of the Davis-Monthan AFB well water system.

Underground water service piping less than 4-inches in diameter shall be black AWWA C901 polyethylene plastic with ASTM D26571D3261 butt fusion fittings and joints and pre-manufactured anode less service risers. Use 1-inch and 2-inch sizes only.

Underground water mains and service piping 4-inches and greater shall be AWWA C900, Class 150 PVC with AWWA C111, cast iron fittings and ASTM D3139 compression gasket ring joints. Use even sizes only.

Do not route water main or service piping underground beneath the building slab or any concrete slab attached to the building except as shown in Standard Detail (See Appendix E).

Generally, the domestic water service connection shall rise above ground next to the building and

penetrate the exterior wall above grade. Provide a shut off valve and a hose bib in the exterior portion of the riser.

Loop all water piping to eliminate dead ends, improve flow, and reduce losses.

When water lines are demolished, no dead ends greater than four pipe diameters in length shall be left in place.

Meter water service on all new structures and major renovations. Water meters shall have pulse initiators that report to the EMCS. Preferred water meter manufacturers include Neptune, Badger, Sparling and Sensus.

4.7.3 Sanitary Sewer and Storm Drainage

Sewer lines shall be installed according to manufacturer's recommendations with not less than a 2.5 fps hydraulic velocity flow; minimum service connection from building shall be 4-inch.

Sewer manholes shall be precast reinforced concrete manhole sections with two exterior coats of heavy-duty bituminous material. Manholes shall conform to ASTM C478-72. Position manholes at every change in direction 45° and over and at a maximum of 300-feet apart.

Provide a two-way ground cleanout (GCO) on all sewer—soil or waste—lines, which enters a building (refer to standard details).

Waste, Vent, and Drainage Piping shall be one of the following: Acrylonitrile-Butadiene-Styrene (ABS), Polyvinyl Chloride (PVC), Polypropylene (PP), Filament-wound Reinforced Thermosetting Resin (RTRP), or Cast Iron, Service or Extra Heavy. On site retention and percolation shall be designed in accordance with local municipal ordinances.

4.7.4 Natural Gas

Gas lines shall have minimum working pressure of 60 PSIG.

Underground gas piping shall be medium-density, yellow, ASTM 02513 PE 2406 SDR11 pipe category CEC polyethylene plastic with ASTM 03261 butt fusion fittings and joints and pre-manufactured anode less service risers. Use only 1-

inch, 2-inch, 4-inch, 6-inch, and 8-inch underground gas piping sizes.

Underground gas piping shall have a minimum cover of 30-inches.

Service line connections to existing mains shall generally be hot-tapped. Service valve shall be at or near connection to main. Provide brass directional markers at the service valve. Provide locking cover on the valve box.

In addition to the required plastic ribbon tape, an insulated, #12 awg, solid copper tracer wire shall be installed along the top of all new underground gas piping.

Building gas service regulators for reduction from medium pressure (30-35 PSI) service to 5-inch to 8-inch w.g. shall be installed above ground on the exterior of facilities. Gas piping shall enter facility above grade. Provide plug cocks on inlet and outlet of regulator/meter assembly with provisions to remove meters for service with minimum downtime.

Select new service regulators to include the following features: internal high pressure relief, manual reset low pressure cutoff, and orifice size, spring range, and date of manufacture stamped on the outer casing. Provide gas meter directly downstream of regulator. Provide parts listing and service/repair instructions for gas regulator and meter. The gas meter shall have a pulse initiator that reports to the Energy Management Control System. Preferred natural gas meter manufacturers include Sensus and Roots. Rotary/turbine gas meters should be temperature compensated.

Do not route service gas piping underground beneath the building slab.

Valve boxes for all gas lines shall be a minimum of 4-inch diameter. 2-inch diameter boxes shall not be used.

Refer to Section 6.7.4 for information concerning as-built drawing requirements for underground utilities.



SECTION 5.0
Interior Design Standards

5.1 GENERAL

Quality interior design reflects “understated excellence” and assures that facilities are attractive, environmentally safe, operationally efficient, and maintainable. Well-designed facilities satisfy the user’s needs, instill pride in ownership, and promote productivity in the workplace. Design standards are not a fad, but rather a long term attitude necessary to ensure the mission is accomplished regardless of manning and budget reductions.

Both ACC and senior staff have strongly emphasized the necessity to enhance the quality of life at Davis-Monthan AFB. Morale is a crucial factor in the daily work environment. Design compatibility should be the goal as well as the responsibility of everyone at Davis-Monthan AFB. Bright, modern, and attractive facilities for work, living, and relaxation are essential to maintain the morale and efficiency of the installation. The design of all interior renovations and new construction needs to offset the detrimental physiological affects of long work shifts and extended operations.

Interior design compatibility is similar to architectural compatibility in that it involves the relationships of various built elements to each other and to their surrounding context. It does, however, also incorporate a heightened emphasis on comfort and function. Improper lighting levels or uncomfortable seating, for example, have a more immediate and easily defined detrimental effect on performance than does the wrong color of brick. Interiors are also easier and less expensive to change to enhance compatibility, as well as more likely to require intermittent change to accommodate changes in mission.

5.2 INTERIOR DESIGN COMPATIBILITY CONCEPTS

5.2.1 General Objectives

The use and condition of interior space is critical for all buildings. All new repair, renovation, and addition work must meet the standards as outlined below. These standards address all facets of building interiors. A functional, attractive, safe and maintainable work environment will promote productivity and insure the occupant’s sense of well being.

5.2.2 Design Standards

All standards should comply with the most recent version of Air Combat Command’s Commander’s Guide to Facilities Standards and Architectural and Interior Design Standards. All Air Force Architectural and Interior Design Standards and Guidelines and UFAS and/or ADAAG standards will also be followed.

Furniture and finish materials in these guidelines have been selected from United States owned manufacturers. These standards for quality and color should be used as a reference or “or equal” when purchasing items from other countries authorized under specific trade agreements. The Civil Engineer paint shop will keep a supply of the base colors and pigment colors required to mix the paints referenced in these guidelines.

5.2.3 Interior Design Standards Objectives

Continue the development of an overall theme within each building through the use of the DCG standards and consistent finishes, colors, textures, office furniture, and lighting.

5.3 GENERAL FINISHES AND FURNISHING

All finishes, furniture and equipment will be commercial grade with specification information to show that they pass industry testing for grade level and fire safety standards.

The use of “green” and recycled content products is highly encouraged in finishes and furnishings.

5.3.1 Finish Pallets

Finish Pallets for each facility should be established to assure the interior design compatibility of that facility. Consistent function and/or operational themes have been defined and each facility placed in their appropriate category. Refer to the Finish Pallets at the end of the Guideline for details on finishes.

Design Note: The intent of the Finish Pallet color schemes and color boards identified in these Design Compatibility Guidelines is to establish an initial standard to meet quality, life cycle, and aesthetic guidelines. They are in no way intended to stifle the creativity of future qualified designers that continue

the efforts to make Davis-Monthan AFB the leader in fresh and innovative materials as they are applied to the interior environment. However, it is critical to the success of interior design compatibility at Davis-Monthan AFB that any and all modifications to the initial material selections be fully documented and incorporated into the next update of these Design Compatibility Guidelines.

Furnishing

Even though funds are limited and an upgrade to existing furnishings may appear to be an unobtainable luxury, a comprehensive furniture plan should be developed to ensure that small purchases over a long period of time support and comply with the final objectives. Disjointed furniture purchases will present mismatched furnishings and degrade the appearance and professionalism of the space.

Furniture should be appropriate for an office environment and present a professional look; residential or home office furniture will not be accepted on the base.

Furnishings need to provide appropriate support for the task and function being performed in a space.

Provide furniture with ergonomic support for all time intensive tasks

All furniture and equipment must be commercial grade quality and construction. Ask for a commercial use warranty to verify product was manufactured to hold up in a commercial space.

All electrical accessories must be UL listed for use on the base.

Not all furniture that is under GSA contracts will meet AF standards.

Walls

All administrative areas should have a satin or eggshell painted finish over plaster or drywall and semi-gloss paint finish on door and window frames.

Painted concrete masonry units (CMU) are not desired and should be avoided whenever possible unless the space is used for industrial storage or extremely heavy usage such as mechanic shops.

All electrical and data should be behind drywall and plaster. The use of wall mounted conduit and wire-mold should not be accepted unless no other option exists.

Chair rails, corner guards and other wall protection systems should be utilized in areas where chairs and other furniture and equipment will damage the wall. Make sure these fit the aesthetics of the space and are located to produce the best results.

Base Molding

Tile base molding will be used in areas that have ceramic or porcelain tile flooring.

A 4-inch rubber (rubber over vinyl to reduce cracking due to the dry environment) wall base should be used in all areas with floor finishes such as carpet, VCT, concrete, linoleum, and sheet flooring.

Wood base is not used unless in a formal, executive, low traffic area.

Flooring

All carpeting will meet the AF Technical letter for carpeting

Use rubber transition strips from carpet to resilient or non-resilient flooring.

Vinyl, rubber, tile or other easily cleanable floor material should be used under and near areas where there is water (including water fountains).

5.3.2 Entrances

Building entrances provide a transition from the exterior to interior spaces. First impressions are formed here and are difficult to alter once a person enters the main building. Entrances need to be comprised of durable and safe building finishes because of the amount of traffic that passes through them. Consequently, the highest quality materials possible should be used within these spaces.

Provide recessed walk-off mats or stiff bristle-type mat at the point of entry to protect carpet and tile flooring.

Entrance areas can be personalized and creative to reflect the pride of the users in that particular facility and should reflect a professional image to everyone entering the building. However, all renovations must be coordinated through the Chief Engineer's office to ensure they meet the DCG, fire codes and safety regulations.

5.3.3 Corridors

Corridors are the most public portion of building interiors and, as such, convey a strong visual statement. This space, as with the entry space, needs to have durable and maintainable finishes that provoke a clean, well-lighted professional atmosphere.

Electrical panel boxes and other miscellaneous items within the corridors should be painted to match the wall surface – fire and *Life Safety Code* conventions excluded. This practice tends to make unsightly equipment less obvious and should be continued in the future.

Avoid designing corridors that have a long “tunnel like” appearance by considering the following ideas:

- Visually reduce the length of a long corridor by creating perpendicular lines with ceiling grid and light arrangements.
- Create a division of space with wall and floor color changes and patterns.
- When using a border, run it across the corridor at key locations as well as along the wall.
- Keep the base molding color very similar to the floor or wall color to avoid a long stripe effect.
- Add artwork that is big enough to interrupt large wall expanses from enhancing the tunnel effect.
- Add a flooring pattern, lighting to accent artwork, or wall mounted fixtures to make the corridor more interesting.

5.3.4 Stairwells/Landings

Stairwells and landings should emulate the finish materials and attention to detail of the surrounding areas. They should not be treated as a separate

entity. Stairwells can be used as a transition space that ties all floors together for a coordinated overall interior design.

Include finishes that meet the highest fire and safety testing be sure that stairwells used as fire exits meet or exceed requirements for a fire rated exit.

5.3.5 Administrative Areas

Administrative areas should reflect the work performed in these areas and provide finishes and colors that enhance the daily task. Quality work places promote pride and excellent performance in the people occupying these spaces, therefore administrative spaces should be designed to represent an office environment and not appear industrial. Consideration to the space layout, traffic and work flow will help determine the best use of large open spaces. Refer to AFH 32-1084, *Standard Facility Design* for guidance.

Provide ergonomic and adjustable, commercial grade (commercial use warranty) furniture and seating.

Administrative areas will also provide support for daily tasks. If authorized, these spaces may include:

- Centrally located space for shared copy, fax and recycling equipment
- Small conference or group meeting spaces
- Shared file or resource areas
- Easy access to data, phone and power for quick and less expensive reconfigures.
- Shared waiting area/seating.

5.3.6 Conference Rooms

Conference Rooms are in high demand for usage and need to perform under different scenarios. To maximize the flexibility of conference rooms, use adjustable lighting, multipurpose seating, ganging tables, folding and stacking tables and chairs, creative ceiling finishes, acoustical wall treatment, room dividers and multi-media presentation systems.

Conference rooms are also a good area to promote organization branding with quality displays used as art work.

Carefully plan the location of electrical outlets and consider flush mounted floor outlets for audiovisual equipment and computers, to provide flexibility in the setup of the room.

Floor finishes should generally be carpet, unless space is classified as sever usage.

Executive conference rooms can utilize wood furniture, carpet borders, and multiple lighting sources.

5.3.7 Operational Control Centers/Computer Rooms

In Operational Control Centers/Computer Rooms the use of a raised flooring system is appropriate for access to cables and wiring.

Use static dissipate vinyl tile, conductive vinyl tile, or low KV (<2.5) static rated carpet.

Modular furniture systems should be specifically configured for the types and sizes of equipment used.

Provide quality ergonomic seating for personnel that work at a terminal for extended periods of time.

Lighting should have different levels. The use of ambient lighting and adjustable task light is recommended to reduce computer screen glare.

5.3.8 Kitchens/Break Areas/Coffee Bars

These spaces require interior finishes that must be easily cleaned and maintained. These areas should incorporate a counter area and storage for coffee, snacks, utensils, etc. Larger areas may include a designated space and electrical outlet for a refrigerator, coffee pots and microwaves.

Spaces used for eating and drinking should have a tile or VCT floor to make spills easier to clean.

Closed storage should be provided to hide supplies.

Counters shall typically be plastic laminate unless solid surfacing material (e.g. Corian) is justified due to severity of use or the need to blend with or match other premium quality finishes justified for the space.

5.3.9 Restrooms

Although usually the most costly area to renovate and maintain, restrooms need particular attention to demonstrate a clean and uncluttered feel. Often, the best efforts of an interior renovation can focus too much on the more public spaces leaving the restrooms in a “below standard” condition. These areas can undermine the best design compatibility efforts if not properly addressed.

Design restrooms for easy cleaning and maintenance, but not at the expense of quality.

Installation and use of electric hand-dryers or any other similar energy intense specialties is not permitted.

Restroom fixtures should be wall mounted or floor mounted. Wall mounted accessories should include a towel source, toilet paper dispenser, soap dispenser, mirror, clothes hook for shower area and trash receptacle. All plumbing fixtures, electrical and switch plates, and accessories should be brushed-stainless steel.

All sinks must have a counter and mirror that runs the entire length of the counter. Exceptions will be made on a per project basis, with approval of the Chief Engineer.

Toilet and urinal partitions should be a factory baked enamel finish or if cost permits, solid surface material or plastic laminate. Toilet partitions should be floor mounted.

Partitions for industrial areas should be pre-finished metal.

The entire toilet fixture should be one color. Do not use a black seat on a white toilet.

Ceilings in all bathrooms and locker areas should be a hard board, water resistant, painted surface. Use 24-inch by 24-inch suspended ceiling with moisture resistant ceiling tile whenever hardboard application is not practical.

Flooring should be a monolithic tile and walls should be a combination of monolithic and glazed tile. Tile should be used on all walls behind wet areas such as sinks, toilets, urinals and showers.

5.3.10 Locker Rooms

Locker rooms should be well ventilated, designed with materials that are antimicrobial and easily cleaned and should provide the justified number of lockers.

Whenever possible, space between the top of the lockers and ceiling shall be finished and flush with the front of the lockers to avoid dust collecting on top of the locker units.

Lockers should have a vent and incorporate a shelf, clothes hook and accept a lock. Lockers should be a factory baked enamel finish.

5.3.11 Industrial Areas/Storage Rooms

Industrial areas, by definition, function differently than office spaces and must be designed for uses which are tougher on flooring and other finishes. The finishes selected must be more durable than those used elsewhere and must be regularly maintained.

Exposed concrete floors are acceptable for moderate wear areas if properly sealed. Where more severe wear is expected, or where corrosive chemicals or other activities take place which may cause damage to a bare concrete floor, an environmentally safe, epoxy or chemically resistant urethane (CRU) floor covering system shall be used.

5.3.12 Lighting

All areas are to have 24-inch by 48-inch fluorescent light fixtures for overall room lighting (24-inch by 24-inch light fixtures are not approved for use). Discolored diffusers are to be replaced. Replacement lamps shall meet all environmental and sustainable design requirements for Government facilities. Track lighting, can lighting and/or spotlights shall be used in display areas or provide additional lighting for architectural features.

5.3.13 Plants

Plants, whether artificial or live, help improve any environment. Occupants should be conscious of adding plants to their interior spaces to assure that the plant does not take up valuable storage space or damage the surface that it sits on. All plants should present a professional look.

Plants of all types must be clean, well maintained and healthy looking.

Attention also should be paid to the plant containers. They should be selected to coordinate with the overall color scheme of the facility. Basic black plastic and/or metal pots should be used to insure some color coordination as the other interior aspects of the interior areas are upgraded.

Plants that are in public areas or above the “viewing plane” of systems furniture should be in coordinated containers that have been selected to be consistent with the colors of the furniture and interior finishes of the space.

5.3.14 Interior Signage

At the very least, each facility shall establish a signage system for the entire facility. Flexibility for all interior signs is a key factor in order to accommodate mission and/or personnel changes. All signage must conform to UFC-3-120-01, Sign Standards.

The top portion of a sign is used to designate a room number and its corresponding Braille characters. The bottom portion of the sign is used for additional information such as room name, room occupant, position or title, directional information, etc.

Generally, signage must be located on the wall surface adjacent to the door at the height denoted in UFC-3-120-01, Sign Standards.

Develop a long-term program to replace existing non-conforming signage. Start by replacing all painted signs and vinyl letter signs placed directly on the wall surface.

Keep interior signage to a minimum to provide a clutter free environment.

Do not place signs on doors unless it is necessary to provide information concerning the room behind the door, for example a warning sign for a high voltage electrical equipment room. When signs are required to appear on doors, use the minimum size allowable.

Provide personnel recognition boards at visually prominent corridor locations. Provide picture frames (open top) and slip-in nameplates to receive pictures

and names. Nameplates should be chrome or a color to match the overall board color. Titles placed on the board should be raised style brushed chrome. Use non-glare glass at picture frames. Use full color military symbols and insignia.

Paper notices, rosters, and other unframed items of a temporary nature should be neatly arranged on a framed bulletin board. The type, color and style of board should match the signage found throughout the facility. Areas should be designed in all facilities to post special interest items. Taping notices of special events, temporary direction, etc., on walls, windows, and doors is not authorized as it damages the finish, increases maintenance costs, and is unsightly.

5.3.15 Artwork

Artwork for waiting areas, lobbies, corridors, conference rooms, break rooms, billeting rooms and recreational areas should be purchased by the Air Force. Artwork selections for individual offices and dormitory rooms should be left up to the occupant. All artwork should be matted and framed for a professional image. Each facility should establish an artwork theme and use it throughout the public spaces.

Standard Frame: Metal – Black



A good portion of the artwork at Davis-Monthan AFB has been updated and displayed very successfully. To maintain this positive aspect of the interior environment, Davis-Monthan AFB should

continue to implement a photography and/or artwork program among its personnel.

Incorporating local and theme-based images into the installation artwork through photography and art contests will save the limited funding for accessories and establish a consistent look throughout the base. Contests can also help promote a sense of ownership across this duty location.

All paintings, photographs, posters etc. hung on interior building walls or outside of individual workspaces (cubicles or offices) must be matted and framed.

The frames should all match or be metal (preferably) to comply with the facility pallet and these guidelines.

Personal pictures should not be hung on common office area walls. Private offices are the exception.

5.3.16 Windows

Window coverings in the office areas should be a one-inch, horizontal mini blind. Window coverings shall have blackout blinds to accommodate 24-hour and/or contingency operations when required. Curtains should be added as an additional window covering for those areas that require a more finished look. Colors and patterns must coordinate with the interior color scheme.

Windowsills should be plastic laminate or solid surface materials whenever possible. Painted windowsills are an acceptable, but not preferred, finish method.

5.3.17 Doors and Frames

All door hardware throughout a building should match. Nonconforming hardware should be replaced during renovations or as money is available. Hardware includes kick plates and escutcheon.

Standard Door Hardware: Brushed Aluminum finish

Interior metal doors, trim and framing should be painted to match surrounding wall color within a building for consistency and visual softening.

Provide astragal configuration for all double doors.

5.3.18 Wall-Mounted Accessories

A single material and finish standard should be established and incorporated for standing and wall-mounted accessories throughout a common area. Mixing of similar elements with differing finishes can create a cluttered appearance not consistent with facilities excellence guidelines.

All electrical switch plates, electronic devices, and light switches shall be white. The use of ivory colored devices should only be used when matching existing.

Special attention should be taken to conceal all conduit, pipes, electrical wires, communications and computer cables. Where these items cannot be concealed they should be painted to match the surface wall or ceiling color.

5.3.19 Fire Extinguisher Cabinets

Whenever construction and/or renovation occur, all fire extinguisher cabinets, panel boxes and other equipment should be recessed in the wall and have a brushed stainless steel finish. Fire extinguishers should be placed in a metal cabinet that is flush or semi-flush with the wall. Fire extinguishers hanging from a hook on the wall are not acceptable.

Signs for fire extinguishers or fire notices/exits etc. are not required by code to be red. The fire code states that there has to be a sign, but does not specify a color.

The words “fire extinguisher” should be written in black on the cabinet door.

5.3.20 Ceilings

Ceilings need to be kept clean and free of visual clutter. Air diffusers, grills, and light fixtures should be white drop-in units, flush with the ceiling.

Fire detectors and sprinkler nozzles shall be consistent.

Water marked or damaged ceiling tiles should be replaced immediately. Purchase additional ceiling tile stock to have on hand for replacement.

If renovation funds are limited, systematically replace existing flat 24-inch by 48-inch tiles with suspended ceilings tiles. In circulation areas such as corridors, hallways, entrances, etc. use products equal to Armstrong Cirrus Profiles (Classic Step

Scored). All other areas shall be equal to Armstrong CS1 (Cortega).

Interior Design Standards SECTION 5.0

INTERIOR FINISHES COLOR PALLET - DESERT SUNSET (WARM NEUTRALS)					
Symbol	Description	Manufacturer Information	Comments	GSA Contract Number	Manufacturer's Rep.
CPT1	Carpet tile	Collins & Aikman (C&A from Tandus) Style 02415 Mayhem Color 57506 Bedlam	Tile can be turned 90 degrees for more pattern on the floor, or laid in directionally per arrow on tile back.	GS-27F-0032P	Elissa Sweary (480) 704-0520
CPT2	Carpet tile/broadloom	Shaw Carpet Style 59326 Constellation Color 26210 Lunar	This product comes in a 24"x24" modular tile, and 12' broadloom.	GS-27F-0034A	Joe Knapp (602) 821-4636
RB1	Rubber Base	Roppe Wall base #P181 Russet		GS-07F-0429J	
CVT1	Composition Vinyl Tile	Mannington Commercial, Brushworks Brights, #727 Deep Ochre	If used as field color, tile can be turned 90 degrees to create pattern		800-241-2262
CVT2	Composition Vinyl Tile	Mannington Commercial, Brushworks Brights, #716 Sienna	If used as field color, tile can be turned 90 degrees to create pattern		800-241-2262
CT1	Porcelain Floor Tile	Shaw Commercial Hard Surface, Style Mojave II, CT407, Color #00700 Desert	This tile comes in a 12"x12", and 18"x18" tile with trim pieces. For use on floors and walls	GS-07F-0688N	Joe Knapp (602) 821-4636
CT2	Porcelain Floor/Wall Tile	Crossville Tile, Color Blox #A1116 Caboose	This tile comes in 6"x6", 12"x12" and 18"x18" with trim pieces available. For floors & walls		Shannon Vance (480) 752-3366
CT3	Porcelain Floor/Wall Tile	Crossville Tile, Cross-color #C310 Bamboo	This tile comes in 6"x6" or 12"x12" with trim pieces, for floor & walls		Shannon Vance (480) 752-3366
		Crossville Tile, Cross-color mosaics #A310 Bamboo	This tile comes in 3"x3" tiles with trim pieces, for floor & walls		
CT4	Porcelain Floor/Wall Tile	Crossville Tile, Cross-color #B380 Sunflower	This tile comes in 12"x12" with trim pieces, for floor & walls		Shannon Vance (480) 752-3366
		Crossville Tile, Cross-color mosaics #A380 Sunflower	This tile comes in 3"x3" tiles with trim pieces, for floor & walls		
PT1	Wall Paint	Sherwin Williams Color # SW 6385, Dover White	Wall paint to be eggshell or satin finish, door and window trim to be semi-gloss.		Local Tucson Store (520) 323-8080
PT2	Ceiling Paint	Sherwin Williams Color # SW 7005 Pure White	Use as ceiling paint to match ACT tiles & grid		Local Tucson Store (520) 323-8080
PT3	Specialty Wall Paint	Zolatone Polomyx Waterbase Quickship PW-QS024	Use as general wall color		Kathie Winkler (602) 332-1062
PT4	Specialty Wall Paint	Zolatone Waterbase Quickship ZW-QS024	Use as accent wall color		Kathie Winkler (602) 332-1062
PT5	Specialty Wall Paint	Zolatone Luminations ZFX-CD316	Use as specialty accent color (behind lobby reception area)		Kathie Winkler (602) 332-1062
PL1	Plastic Laminate	Wilsonart Laminate #1787-60 Oxide	Horizontal surfaces		Chuck Welsh (602) 763-4461
PL2	Plastic Laminate	Wilsonart Laminate #4638-60 Monterey Sun	Vertical Surfaces		Chuck Welsh (602) 763-4461
SSM1	Solid Surface Material	Formica #802 Treasure Artifacts			Jack Burkett (602) 708-3469
SSM2	Solid Surface Material	Formica # 707 Carrara Stone			Jack Burkett (602) 708-3469
CS1 (Not on Color Board)	Acoustical Ceiling Tile (Suspended)	Armstrong World Industries, Inc. Cortega, White 2195, 24"x24"x 5/8"	Grid: Prelude 15/16" exposed tee white (Use in all non-circulation areas)		R.G. Trimble (Bob), (480) 985-9087
CS2 (Not on Color Board)	Acoustical Ceiling Tile (Suspended)	Armstrong World Industries, Inc. Classic Step Scored, #585, White 24"x 24" x 3/4"	Grid: Superfine 9/16" exposed tee (Use in all circulation areas)		R.G. Trimble (Bob), (480) 985-9087
MP1	Metal Toilet Partitions	Hadrian, 585 Sahara	Color is kept in stock		www.hadrian-inc.com
Not on Color Board	Window Blinds	Levolor Riviera 1" metal stalls Color 116 Polar Bear	Match existing when necessary to ensure windows look the same from exterior or entire building.		

INTERIOR FINISHES COLOR PALLET - STAGE COACH (COOL NEUTRALS)					
Symbol	Description	Manufacturer Information	Comments	GSA Contract Number	Manufacturer's Rep.
CPT1	Carpet Tile	Mohawk Modular Style One First Modular MT086 Color # 8878 Progress	The same pattern comes in a 24"x24" tile,		Bill Casselbury (480) 821-0897 Roger Berg (623) 521-0766
CPT2	Carpet Tile and Broadloom	Shaw Carpet Style 59326 Constellation Color 26110 Moonlight	This product comes in a 24"x24" modular tile, and 12' broadloom.	GS-27F-0034A	Joe Knapp (602) 821-4636
RB1	Rubber Base	Roppe Rubber Base #P147 Light Brown		GS-07F-0429J	
CVT1	Composition Vinyl Tile	Mannington Commercial Colorpoint # 659 Sable	If used as field color, tile can be turned 90 degrees to create pattern		800-241-2262
CVT2	Composition Vinyl Tile	Mannington Commercial Brushworks #717 Venetian Silk	If used as field color, tile can be turned 90 degrees to create pattern		800-241-2262
CT1	Porcelain Floor Tile	Commercial Hard Surface by Shaw, Mojave II CT407, Color #00100 Oasis	This tile comes in a 12"x12", and 18"x18" tile with trim pieces. For use on floors and walls	GS-07F-0688N	Joe Knapp (602) 821-4636
CT2	Porcelain Floor Tile	Crossville Tile, Color Blox #A1108 Sea Otter	This tile comes in 6"x6", 12"x12" and 18"x18" with trim pieces available. For floors & walls		Shannon Vance (480) 752-3366
CT3	Porcelain Floor Tile	Crossville Tile, Color Blox #A1115 Camping Out	This tile comes in 6"x6", 12"x12" and 18"x18" with trim pieces available. For floors & walls		Shannon Vance (480) 752-3366
CT4	Porcelain Floor Tile	Crossville Tile, Color Blox #A1118 Chocolate Candy	This tile comes in 6"x6", 12"x12" and 18"x18" with trim pieces available. For floors & walls		Shannon Vance (480) 752-3366
CT5	Porcelain Wall Tile	Crossville Tile, Milestone Mosaics #AV91 Moonrock	Tiles are 3"x3" and come on a 12"x12" sheet, trim pieces available. Use as wall tile		Shannon Vance (480) 752-3366
CT6	Porcelain Wall Tile	Crossville Tile, Milestone Mosaics #AV94 Cobblestone	Tiles are 3"x3" and come on a 12"x12" sheet, trim pieces available. Use as wall tile		Shannon Vance (480) 752-3366
PT1	Wall Paint	Sherwin Williams Color # SW 6385, Dover White	Wall paint to be eggshell or satin finish, door and window trim to be semi-gloss.		Local Tucson Store (520) 323-8080
PT2	Ceiling Paint	Sherwin Williams Color # SW 7005 Pure White	Use as ceiling paint to match ACT tiles & grid		Local Tucson Store (520) 323-8080
PT3	Specialty Wall Paint	Zolatone Polomyx All Acrylic Waterbase PWQ-Q84	General wall paint		Kathie Winkler (602) 332-1062
PT4	Specialty Wall Paint	Zolatone Polomyx All Acrylic Waterbase PWQ-GR35	Accent wall paint		Kathie Winkler (602) 332-1062
PL1	Plastic Laminate	Wilsonart Laminate # 4637-60 Monterey Haze			Chuck Welsh (602) 763-4461
PL2	Plastic Laminate	Wilsonart Laminate # 4781-60 Sunstone			Chuck Welsh (602) 763-4461
PL3	Plastic Laminate	Wilsonart Laminate # 4796-60 Burnished Chestnut			Chuck Welsh (602) 763-4461
SSM1	Solid Surface Material	Formica #307 Spanish Paprika Mist			Jack Burkett (602) 708-3469
SSM2	Solid Surface Material	Formica # 332 Fawn Matrix			Jack Burkett (602) 708-3469
CS1 (Not on Color Board)	Acoustical Ceiling Tile (Suspended)	Armstrong World Industries, Inc. Cortega, White 2195, 24"x24"x 5/8"	Grid: Prelude 15/16" exposed tee white (Use in all non-circulation areas)		R.G. Trimble (Bob), (480) 985-9087
CS2 (Not on Color Board)	Acoustical Ceiling Tile (Suspended)	Armstrong World Industries, Inc. Classic Step Scored, #585, White 24"x24" x 3/4"	Grid: Superfine 9/16" exposed tee (Use in all circulation areas)		R.G. Trimble (Bob), (480) 985-9087
MP1	Metal Toilet Partitions	Hadrian, 585 Sahara	Color is kept in stock		www.hadrian-inc.com
Not on Color Board	Window Blinds	Levorl Riviera 1" metal stalls Color 116 Polar Bear	Match existing when necessary to ensure windows look the same from exterior or entire building.		

Interior Design Standards SECTION 5.0

INTERIOR FINISHES COLOR PALLET - AVIATOR BLUE (BLUES & REDS)					
Symbol	Description	Manufacturer Information	Comments	GSA Contract Number	Manufacturer's Rep.
CPT1	Carpet Broadloom	Shaw Carpet Style 60562 Unity Color 58425 Twilight Moonshade	The same pattern comes in 12' broadloom only	GS-27F-0034A	Joe Knapp (602) 821-4636
CPT2	Carpet Tile & Broadloom	Shaw Carpet Style 59326 Constellation Color 26710 Shooting Star	The same pattern comes in a 24"x24" tile, and 12' broadloom	GS-27F-0034A	Joe Knapp (602) 821-4636
RB1	Rubber Base Molding	Roppe Rubber Wall Base #P177 Steel Blue		GS-07F-0429J	
CVT1	Composition Vinyl Tile	Mannington Commercial, Colorpoint, Color # 627 Peanut	If used as field color, tile can be turned 90 degrees to create pattern		800-241-2262
CVT2	Composition Vinyl Tile	Mannington Commercial, Solidpoint, Color # 348 Pottery	If used as field color, tile can be turned 90 degrees to create pattern		800-241-2262
CVT3	Composition Vinyl Tile	Mannington Commercial, Solidpoint, Color # 320 Navy	If used as field color, tile can be turned 90 degrees to create pattern		800-241-2262
CT1	Porcelain Floor Tile	Commercial Hard Surface by Shaw, Mojave II CT407, Color #00700 Desert	This tile comes in a 12"x12", and 18"x18" tile with trim pieces. For use on floors and walls	GS-07F-0688N	Joe Knapp (602) 821-4636
CT2	Porcelain Floor/Wall Tile	Crossville Tile, Cross-color #C360 Maple Sugar	This tile comes in 6"x6" or 12"x 12" with trim pieces, for floor & walls		Shannon Vance (480) 752-3366
		Crossville Tile, Cross-color mosaic #A370 Featherstone	This tile comes in 3"x3" tiles with trim pieces, for floor & walls		
CT3	Porcelain Floor/Wall Tile	Crossville Tile, Cross-color LP #LA63 Red Rock	This tile comes in 12"x 12" with trim pieces, for floor & walls		Shannon Vance (480) 752-3366
CT4	Porcelain Floor/Wall Tile	Crossville Tile, Cross-color #B580 Oceana	This tile comes in 6"x6" or 12"x 12" with trim pieces, for floor & walls		Shannon Vance (480) 752-3366
		Crossville Tile, Cross-color mosaic #A580 Oceana	This tile comes in 3"x3" tiles with trim pieces, for floor & walls		
CT5	Glazed Ceramic Wall Tile	Daltile - Semigloss Color # 1469 Galaxy	4 1/4x 4 1/4" or 6"x6" tiles with trim pieces.		Denise Bowser (480) 241-3195
CT6	Glazed Ceramic Wall Tile	Daltile - Semigloss Color # DH57 Grape	4 1/4x 4 1/4", 3"x6", or 6"x6" tiles with trim pieces.		Denise Bowser (480) 241-3195
CT7	Glazed Ceramic Wall Tile	Daltile - Semigloss Color # K174 Mexican Sand	4 1/4x 4 1/4" or 6"x6" tiles with trim pieces.		Denise Bowser (480) 241-3195
PT1	Wall Paint	Sherwin Williams Color # SW 6385, Dover White	Wall paint to be eggshell or satin finish, door and window trim to be semi-gloss.		Local Tucson Store (520) 323-8080
PT2	Ceiling Paint	Sherwin Williams Color # SW 7005 Pure White	Use as ceiling paint to match ACT tiles & grid		Local Tucson Store (520) 323-8080
PT3	Specialty Wall Paint	Zolatone Polomox All Acrylic Waterbase P4M-C1238	Use as general wall color		Kathie Winkler (602) 332-1062
PT4	Specialty Wall Paint	Zolatone Polomox Waterbase P2L-C1223	Use as accent wall color		Kathie Winkler (602) 332-1062
PL1	Plastic Laminate	Wilsonart Laminate # 4637-60 Monterey Haze			Chuck Welsh (602) 763-4461
PL2	Plastic Laminate	Wilsonart Laminate # 4819-60 Lithium EV			Chuck Welsh (602) 763-4461
PL3	Plastic Laminate	Wilsonart Laminate # 4558-60 Artesia			Chuck Welsh (602) 763-4461
SSM1	Solid Surface Material	Formica #801 Copper Artifacts			Jack Burkett (602) 708-3469
SSM2	Solid Surface Material	Formica # 655 Coastal Mosaics			Jack Burkett (602) 708-3469
SSM3	Solid Surface Material	Formica # 331 Nutmeg Classix			Jack Burkett (602) 708-3469
CS1 (Not on Color Board)	Acoustical Ceiling Tile (Suspended)	Armstrong World Industries, Inc. Cortega, White 2195, 24"x24"x 5/8"	Grid: Prelude 15/16" exposed tee white (Use in all non-circulation areas)		R.G. Trimble (Bob) (480) 985-9087
CS2 (Not on Color Board)	Acoustical Ceiling Tile (Suspended)	Armstrong World Industries, Inc. Classic Step Scored, #585, White 24"x24" x 3/4"	Grid: Superfine 9/16" exposed tee (Use in all circulation areas)		R.G. Trimble (Bob) (480) 985-9087
MP1	Metal Toilet Partitions	Hadrian, 609 Colonial Blue			www.hadrian-inc.com
Not on Color Board	Window Blinds	Levolor Riviera 1" metal stalls Color 116 Polar Bear	Match existing when necessary to ensure windows look the same from exterior or entire building.		

SECTION 5.0 Interior Design Standards

INTERIOR FINISHES COLOR PALLET - SAGEBRUSH GREEN (GREEN & WARM NEUTRALS)					
Symbol	Description	Manufacturer Information	Comments	GSA Contract Number	Manufacturer's Rep.
CPT1	Carpet Tile and Broadloom	Lees Carpets Style Invite T (Scenery Collection) Pattern# DL086, Color 321 Aloe	This product comes in a 24"x24" modular tile, and 12' broadloom.		Blake Upton (480) 699-8767
CPT2	Carpet Tile and Broadloom	Lees Carpets Style Venue T (Scenery Collection), Pattern# DI893, Color 311 Pale Green	This product comes in a 24"x24" modular tile, and 12' broadloom.		Blake Upton (480) 699-8767
RB1	Rubber Base	Roppe Rubber wall base #P194 Burnt Umber		GS-07F-0429J	
CVT1	Composition Vinyl Tile	Armstrong Imperial Texture Standard Excelon #51830 Cottage Tan			R.G. Trimble (Bob), (480) 985-9087
CVT2	Composition Vinyl Tile	Armstrong Imperial Texture Standard Excelon #51872 Tea Garden Green			R.G. Trimble (Bob), (480) 985-9087
CT1	Porcelain Tile	Commercial Hard Surface by Shaw, Mojave II CT407, Color #00300 Cactus	This tile comes in a 12"x12", and 18"x18" tile with trim pieces. For use on floors and walls	GS-07F-0688N	Joe Knapp (602) 821-4636
CT2	Porcelain Tile	Crossville Tile, Color Blox #A1114 Tree House	This tile comes in a 6"x6", 12"x12", and 18"x18" tile with trim pieces. For use on floors and walls		Shannon Vance (480) 752-3366
CT3	Porcelain Tile	Crossville Tile, Color Blox #A1112 Mr. Green Jeans	This tile comes in a 6"x6", 12"x12", and 18"x18" tile with trim pieces. For use on floors and walls		Shannon Vance (480) 752-3366
CT4	Porcelain Tile	Crossville Tile, Milestone Mosaics #AV93 Canyon	Tiles are 3"x3" and come on a 12'x12' sheet, trim pieces available. Use as wall tile		Shannon Vance (480) 752-3366
CT5	Porcelain Tile	Crossville Tile, Milestone Mosaics #AV96 Grotto	Tiles are 3"x3" and come on a 12'x12' sheet, trim pieces available. Use as wall tile		Shannon Vance (480) 752-3366
PL1	Plastic Laminate	Wilsonart Laminate # 4673-60 Saffron Tigris			Chuck Welsh (602) 763-4461
PL2	Plastic Laminate	Wilsonart Laminate # 4667-60 Green Tigris			Chuck Welsh (602) 763-4461
PT1	Wall Paint	Sherwin Williams Color # SW 6385, Dover White	Wall paint to be eggshell or satin finish, door and window trim to be semi-gloss.		Local Tucson Store (520) 323-8080
PT2	Ceiling Paint	Sherwin Williams Color # SW 7005 Pure White	Use as ceiling paint to match ACT tiles & grid		Local Tucson Store (520) 323-8080
PT3	Specialty Wall Paint	Zolatone Polomyx Waterbase P2L-C1209	Use as general wall color		Kathie Winkler (602) 332-1062
PT4	Specialty Wall Paint	Zolatone Polomyx All Acrylic Waterbase PWQ-GN88	Use as accent wall color		Kathie Winkler (602) 332-1062
SSM1	Solid Surface Material	Formica #306 Ginger Root Mist			Jack Burkett (602) 708-3469
SSM2	Solid Surface Material	Formica # 309 Pesto Mist			Jack Burkett (602) 708-3469
CS1 (Not on Color Board)	Acoustical Ceiling Tile (Suspended)	Armstrong World Industries, Inc. Cortega, White 2195, 24"x24"x 5/8"	Grid: Prelude 15/16" exposed tee white (Use in all non-circulation areas)		R.G. Trimble (Bob), (480) 985-9087
CS2 (Not on Color Board)	Acoustical Ceiling Tile (Suspended)	Armstrong World Industries, Inc. Classic Step Scored, #585, White 24"x24" x 3/4"	Grid: Superfine 9/16" exposed tee (Use in all circulation areas)		R.G. Trimble (Bob), (480) 985-9087
MP1	Metal Toilet Partitions	Hadrian, 523 Celadon			www.hadrian-inc.com
Not on Color Board	Window Blinds	Levolor Riviera 1" metal stalls Color 116 Polar Bear	Match existing when necessary to ensure windows look the same from exterior or entire building.		



SECTION 6.0
Engineering Standards

6.1 MECHANICAL DESIGN

6.1.1 General Standards

In new buildings or buildings undergoing major renovation, an appropriate, well-lighted mechanical room or rooms will be provided. Where necessary, mechanical rooms shall be provided with double doors to facilitate removal/replacement of equipment and other items too large to be easily moved through single doors.

Chillers and boilers may be installed in exterior walled or screened mechanical yards or enclosures. Maintain compliance with other provisions of these standards.

Mechanical and equipment yards and enclosures must meet all AT/FP requirements, including, but not limited to, location and construction of equipment yards and location of outside air intakes. Verify exact requirements with UFC 4-010-1, *DOD Minimum Antiterrorism Standards for Buildings*.

For maintenance access, an engineered, concrete access drive shall be provided to all mechanical rooms, yards, and enclosures from the nearest street or parking lot. The access drive must be designed to meet all AT/FP requirements.

For facilities undergoing major renovations, especially roofing renovations or repairs, relocate existing roof-mounted mechanical equipment to be ground-mounted to the greatest extent possible.

Clearances surrounding all mechanical equipment will be clearly shown on drawings and will be adequate on all sides to allow for maintenance, repair, and replacement of the equipment. Clearances shall be equal to the manufacturer's standard clearance or 36-inches, whichever is greater. Clearances shall account for and be in addition to clearances required for adjacent equipment and obstructions mounted on enclosure walls.

Provide screening around mechanical equipment in accordance with these and the base standard architectural guidelines. Mechanical screen walls shall include screened, ventilated block. Position the door on the service side of the equipment for ease of maintenance.

Provide a suitably thick concrete floor, separate from equipment pads, on the interior of the entire equipment enclosure. Equipment pads will be appropriately isolated from the adjacent concrete floor.

Provide equipment pads for all equipment. Pads shall be 6-inch thick concrete. Provide equipment pads 8-inches wider than the equipment in all directions. Equipment with compressors shall have an equipment pad 36-inches wider than the equipment on the compressor side. Also provide an 8-foot wide access gate through the enclosure wall on the compressor side.

All mechanical compressors shall be specified to perform in multiple stages of capacity. Non multi-stage compressors are not permitted over 19 tons.

As applicable, provide Low Ambient Kits on systems that are designed to be "cooling" operational year-round or have critical cooling requirements (i.e. Server Rooms, Simulators, etc.)

Do not locate outside equipment, louvers, or any mechanical fenestration, near or within visual the distance of the main entry of buildings without appropriate screening. Verify all questionable issues with the Chief Engineer prior to finalizing the design documents.



6.1A Provide screening around mechanical equipment.



6.1B CMU screen walls hide equipment.



6.1C Provide 120 and 220-volt convenience outlets at mechanical enclosures.

For chillers, provide concrete pads 36-inches wider than the equipment on all sides.

If equipment other than that specified on the drawings is proposed, require in the specifications that the Contractor provide a revised layout for approval, which maintains the clearances specified above.

Provide hose-bibs for use by maintenance personnel in all mechanical rooms, yards, and enclosures.

Provide one each 120-volt (20 amp, 1 phase) and 208-volt (30 amp, 1 phase) waterproof, labeled convenience outlet for use by maintenance personnel in all mechanical rooms, yards, and enclosures. In addition, provide switchable lighting for use by maintenance personnel inside all mechanical rooms, yards, and enclosures.

Maintenance access shall be given high-priority consideration in system and equipment selection and layout. Install air-handling units in equipment rooms where possible. If air-handling units are installed high overhead or above suspended ceilings, provide a working level platform with suitable clear working space and access ladders or stairs.

Ensure clearances are provided for filter servicing, fan shaft and coil removal, tube pulling and cleaning, and similar work. Locate terminal devices over common use areas where possible to reduce interference with building occupants – especially unit commanders – during maintenance activities.

Do not use roof-mounted equipment.

Do not penetrate roof with outside air requirements. Redirect to vertical wall surfaces and provide metal grilles.

All projects shall include meters to measure consumption of water, natural gas, and electricity per UFC 3-400-01 *Energy Conservation*. If there is conflict with any additional guidance, the most stringent guidance shall govern. All meters shall have pulse initiators readable through EMCS. If there is no EMCS system, provide meters with pulse initiators for future.

Provide ION 7350 or ION 7550 power meters consistent with base requirements/standards.

New or replacement refrigeration equipment shall use HCFC-22 or other suitable, non-CFC refrigerant, rather than chlorofluorocarbon refrigerants.

Compliance with the latest edition UFC 3-400-01 *Design: Energy Conservation*, UFC 3-400-2 *Engineering Weather Data*, the *International Energy Conservation Code* (IECC), and the Tucson amendments to that code shall be required. Equipment standards can be met by compliance with the Environmental Protection Agency's (EPA) Energy Star program. Provide the calculations of the thermal transmission values as part of the Design Analysis.

CO₂ monitors shall be installed where applicable in new construction and major renovations.

6.1.2 Design Analysis

Minimum requirements are as follows:

- List of applicable codes governing design and used for guidance.
- Detailed cooling and heating load calculations using commercially available computerized software. Include actual personnel loads, actual lighting loads – not watts per square foot (SF) – and actual equipment loads where known. Submit a complete report with interpretive sheets as necessary.
- Proportioning of airflow based on area is not acceptable.
- Selection of air handlers shall include a calculation of system static pressure losses.
- Sizing of equipment based on the size of existing equipment is not acceptable.
- Detailed equipment selection for each item.
- Cut sheets clearly depicting the essential elements of information for each item selected, legibly marked to show the item intended for use.
- Selection of pumps shall include a calculation of system head. Pumps shall be sized and specified to be non-overloading under all conditions.

• Design Parameters:

Design Conditions shall be per Engineering Weather Data AFH (1) 32-1163 as follows:

Latitude	32° 17'N
Longitude	110° 8'W
Elevation	2654 feet
Cooling Degree Days	2769
Summer design	101°F Dry bulb
	72°F Wet bulb Outside
	75°F Dry bulb 50% RH Inside
Mean Daily Range	26 F
Heating Degree Days	1,574
Winter Design	@97.5% Column
	33°F Outside
	70DB 50% RH Inside

6.1.3 Standard Details

The base standard design details are attached in Appendix "E" and shall be incorporated into the design wherever they are applicable.

Submit the analyses required by UFC 3-400-01 *Design: Energy Conservation* for new and renovated facilities.

6.1.4 Mechanical Specifications

Use CSI format specifications edited to specific project requirements.

Air devices shall be specified as follows:

Ceiling Diffusers

Perforated face with fully-adjustable pattern and removable face; fabricated of steel with baked enamel finish; round neck adapter, if required; provided with opposed blade damper; Krueger series 6000 or approved equal.

Ceiling Return and Exhaust Grilles

Extruded aluminum frame containing a fixed core of ½-inch by ½-inch by ½-inch fabricated aluminum squares; baked enamel finish; provided with opposed blade damper only for ducted return or exhaust systems with multiple grilles; Krueger series EGC-5 or approved equal. Grilles in T-bar type ceilings shall be 24-inch by 24-inch. Exposed ductwork behind return air grilles shall be painted flat black color.

Supply Grilles

Vertical front with horizontal rear deflection blades, spaced on ¾-inch centers, individually adjustable front and rear, 1¼ -inch margin frame with countersunk screw mounting; fabricated of aluminum extrusions with factory clear lacquer finish; provided with opposed blade damper; Krueger series AL5880V or approved equal.

Return and Exhaust Grilles

Vertical front deflection blades, spaced on ¾-inch centers, individually adjustable, 1¼ -inch margin frame with countersunk screw mounting; fabricated of aluminum extrusions with factory clear lacquer finish; provided with opposed blade damper; Krueger series AL580V or approved equal. Exposed ductwork behind return air grilles shall be painted flat black color.

Temperature Controls and Energy Management

Existing central Energy Management and Control System (EMCS) is Staefa Direct Digital Controls (DDC). All new HVAC systems in excess of 15-tons shall be provided with Staefa DDC controls.

Temperature controls will be used to the fullest extent consistent with economy of operation. They will be adequately protected against unauthorized adjustments or tampering (locking covers).

All DDC components shall be provided in a control panel remotely installed from the equipment being controlled. No relays shall be allowed on the equipment. Only control wiring shall be installed on the equipment requiring DDC management.

Where packaged units are provided, provide electronic programmable thermostats with seven-day time clocks for each unit. Ensure supply fans run continuously.

Use dry-bulb temperature controls for economizer cycle operation in lieu of enthalpy control.

Miscellaneous

New pneumatic control systems shall not be used.

Circulating pumps for closed hot water and chilled-water systems shall have mechanical seals. Provide two sets of spare seals for each pump supplied.

Air filters (rough-in and pre-filters) shall be permanent-frame, renewable media, panel type. Air filters shall be placed either at the air handler or in the mechanical room. They shall not be placed in ductwork within interior hallways and rooms. Filter return grilles are allowed for Housing area and other housing occupancies such as dorms and Visiting Airman's Quarters (VAQ's).

Use high efficiency motors for all applications 2 horsepower (HP) or greater.

All mechanical piping shall be designed with the use of unions, flanges, or other means of disconnection to allow for maintenance, repair, and replacement activities of pumps, valves, and other equipment.

All underground non-metallic piping shall be provided with bright-colored, continuously printed plastic ribbon tape not less than 6-inches wide by 4-mil thick. Tape shall include a magnetically detectable conductor and be manufactured for direct burial service.

Do not use direct drive fans unless belt drive is not available due to small size. If direct drive fans must be used, provide variable-speed controls except in small bathrooms/restrooms with a single water closet.

Avoid plastic and/or non-corrosive resistant parts for all mechanical equipment/connections in rooms where corrosive chemicals are stored.

Connect each facility's mechanical system to the Davis-Monthan AFB central plant. Projects not connecting to this plant shall obtain a waiver from the Chief Engineer prior to the installation of a separate system.

6.2 HEATING, VENTILATION AND AIR CONDITIONING

6.2.1 General Standards

General Requirements and Energy Conservation

HVAC systems should be selected as indicated in the Facility HVAC Matrix (see Appendix B). The total building load should be used to select equipment from the matrix.

A small central heating or cooling plant should be studied for every project.

Provide central building heating and air conditioning systems wherever possible.

Generally, multiple systems are not recommended due to high initial and maintenance costs. However, for total facility air conditioning requirements less than 15-tons, a maximum of three smaller (5-tons or less) split systems for zoning may be considered.

Heat pumps shall have a Heating Season Performance Factor (HSPF) of at least 7. Ensure that the unit will operate down to 25° F.

Seasonal Energy Efficiency Rating (SEER) for air conditioners shall be at least 14. Units larger than 5-tons shall have an EER rating of at least 9.

Minimum Coefficient of Performance (COP) for heat pumps shall be at least 2.5.

Provide plate and frame heat exchangers, with appropriate controls for remote (EMCS) start-stop in facilities with year-round air conditioning requirements and systems with water-cooled condensers.

Circulating pumps shall operate at 1750 RPM or less. Motors shall be non-overloading.

Generally, provide blow-through air handling units.

Insulate all fluid conveying piping. Insulate all duct work carrying conditioned air through unconditioned spaces, *except* return ductwork in return plenum space. Use duct liner only for sound attenuation.



6.2A An uncluttered roof is the desired goal for every roof.



6.2B Avoid rooftop equipment and vents, which visually clutter a roof and are subject to leaks.

Recover heat from exhaust air if cost efficient. Heat exchangers shall be plate and frame type.

Variable Air Volume (VAV) systems are preferred. In order to provide a constant amount of outside air on a VAV air-handling unit, provide an outside air damper separate from the economizer damper. Control this outside air damper with a velocity sensor.

Fan coil and constant volume air handlers shall be equipped with both heating and chilled water coils and a 4-pipe system. Both heating and cooling coils should have supply and return shut isolation valves and connections for flushing and draining of the coils.

Humidifiers shall be of the infrared type. Canister-type humidifiers shall not be used.

Install test ports and thermometers at inlets and outlets to all pieces of equipment (pumps, boilers, chillers, towers, etc.) in heating, cooling, and chilled water systems.

Use freeze-stats in lieu of glycol to start circulating pumps for chilled and heating water freeze protection.

Use ducted supply and plenum return air systems for air conditioning utilizing central-station-type air handling units with economizer air cycles. Use ducted returns only where not able to use plenums. Normally return fans are not required; verify that return fans are actually required before including them in the design.

Fire dampers shall be specified with blades out of air stream.

Duct cleaning shall be performed on air handling systems and ductwork when project activities affect any portion of the renovation. Duct cleaning done outside of a construction or renovation project is the responsibility of the building occupants.

Roofs should not be “cluttered” with mechanical appurtenances. Locate mechanical equipment in equipment rooms or on the ground on equipment pads. When units are set outdoors, do not run ductwork up building walls or across roofs.

Ductwork should extend from the unit directly through the wall. Provide hoods over the flex connection between the unit and the ductwork.

Paint the hoods and all exterior ductwork to match the building finish.

Exhaust outlets and outside air inlets should be located in vertical surfaces rather than through roofs. Air intakes to HVAC systems shall be in compliance with UFC 4-010-1, *DOD Minimum Antiterrorism Standards for Buildings*, Appendix B. If only a single-story building, then the element must be integrated into the roof system so the inlets are vertical.

All outside air louvers shall be placed strategically out of view, or organized aesthetically, grouping elements of equal size and spacing.

Variable speed drives shall be used for VAV systems in lieu of inlet vanes or bypass dampers.

Heating

Boilers shall be gas fired where possible, with electronic flame safeguard protection and appropriate flame response time.

Provide boiler water testing sample points on all hot water systems. Provide chemical feeding systems on all hot water heating systems.

Provide automatic pilot-less ignition systems on all gas-fired equipment. Install gas pressure gauges with valves on all gas trains.

Heated water piping three inches and greater shall be schedule 40 steel with welded joints.

All heating water systems shall be four pipe systems.

Utilize Griswold type flow control valves for all heating coils using three-way valves.

Cooling

Evaporative coolers shall be installed at the 2-foot to 3-foot level, not on the roof. They shall be Cell deck type. Provide dump cycle pump system.

Portable chillers shall be installed with supply and return chilled water piping, connectors, and isolation valves. Install all electrical disconnects.

Air-cooled condensers shall be selected based on 105° F ambient.

Solar heat gain calculations shall be prepared for all building construction.

Minimum outdoor air requirements for ventilation shall be as indicated in ASHRAE Standard 62. These requirements shall be met through building pressurization and introduction of outside air at the air handler. Infiltration is not an acceptable method of providing outside air.

Chilled water piping three inches and greater shall be schedule 40 steel with welded joints.

Utilize “Griswold” type flow control valves for all chilled water coils using three-way valves.

Splitters in ductwork are not allowed. Use round (or low aspect ratio) duct over square.

Round, flexible duct should be the same size as the diffuser to which it is connected. In other words, an 8-inch by 8-inch diffuser should be supplied with an 8-inch diameter flexible duct. Maximum length of the flexible duct shall be 6-feet.

6.3 PLUMBING DESIGN

6.3.1 Underground Plumbing

Provide separate connections to water main for fire protection and domestic water systems. Meter all utilities on new facilities and those undergoing major renovation.

A reduced pressure backflow preventer (RPBP) is required in the water supply main as the water is supplied from Davis-Monthan AFB owned wells. This does not, however, preclude using RPBPs in the system according to AWWA Recommended Practice for Backflow Prevention and Cross Connection Control (M14) for protection of the Davis-Monthan AFB well water system. Backflow preventers shall be provided with a secure chain and lock on the valve handles to prevent unauthorized tampering. Refer to AFI 32-1066, *Plumbing Systems* and ACC Sustain Advisory 99-001, *Backflow Prevention* for more information.

Do not route water service piping underground beneath the building slab or any concrete slab attached to the building.

Use only type K or L copper piping for piping inside facility. Non-domestic water supply piping may be Chlorinated Polyvinyl Chloride (CPVC) or Polyvinyl Chloride (PVC).

All underground non-metallic piping shall be provided with bright-colored, continuously printed, plastic ribbon tape manufactured for direct burial service. Tape shall be acid- and alkali-resistant, polyethylene film, 6-inches wide with minimum thickness of 0.004-inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral, magnetically detectable wire conductors and foil backing, or other means to enable detection by a metal detector when the tape is buried up to 3-feet deep.

In addition to the required plastic ribbon tape, provide an insulated, #12 AWG solid copper tracer wire installed along the top of all non-metallic pipe.

The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be in the

industry standard for the specific utility (i.e., blue for water, green for waste, orange for telecommunications, red for electric, and yellow for gas) and bear a continuous printed inscription describing the specific utility.

Shutdown of any utility will require a minimum of 14 calendar days. If a road closure is involved, 21 calendar days will be required.

In addition to the required plastic ribbon tape, an insulated #12 AWG, solid tracer wire shall be installed along the top of all new underground gas piping.

6.3.2 Aboveground Plumbing

In buildings normally occupied by more than 10 persons, provide separate toilet rooms for each sex. Where possible, position male and female toilet rooms together and use a common wall for plumbing chase.

In buildings occupied by 1 to 10 employees, a single toilet to serve both sexes may be provided.

Furnish minimum plumbing fixtures as indicated in the International Plumbing Code (IPC).

Approved piping materials are as follows:

- Use only Type K or L copper piping for the domestic water piping inside facilities. No domestic water supply piping may be Chlorinated Polyvinyl Chloride (CPVC) or Polyvinyl Chloride (PVC).
- Compressed Air Supply Piping shall be copper with copper cast fittings.
- Waste and Vent Piping shall be PVC/CPVC or no hub cast iron.
- Drainage Piping shall be PVC/CPVC or cast iron.
- Aboveground Gas Piping shall be Schedule 40 black steel.

All valves in copper piping must be threaded.

Provide floor drains in every area that has a water

closet. Provide a hose bib to prime trap. Do not use trap primers.

Do not route piping under concrete building slab, except for sewer piping for fixtures within facility.

Generally, combine vents from different stacks throughout the facility, and provide only a single vent-thru-roof for entire facility.

6.3.3 Plumbing Fixtures

Energy conservation washerless fixtures shall be all metal construction, no chrome-plated plastic. All techniques shall be considered for both new facilities and facilities undergoing major renovations, including but not limited to: one gallon per minute (GPM) flow restrictors for faucets, 2.5 GPM low-flow shower heads, single control mixing type faucets, low volume flush water closets, 1.6 gallons or less, self-closing faucet valves, and battery-powered electronic controls and sensors. However, air-energized flush systems for water closets and urinals shall not be used.

Showers shall have valves with a pressure balance feature.

Utilize freezeless wall hydrant. Provide interior wall access (self-draining) with hose attached.

Wall mounted drinking fountains are preferred.

All applications of plumbing fixtures shall be considered for handicapped usage as directed by ADAAG and UFAS.

Do not utilize low volume or water conservation type water closets for AMARC projects.

Water heaters greater than 10 gallons shall use natural gas as a fuel. Where possible, locate water heaters near point of use to eliminate the need for a circulating system.

Suggested fixture types are listed below:

1. Water Closets – Manual operated, except at hospital and food eating establishments where hands-free is required for sanitation purposes. Flushometer valve as specified below, siphon jet,

elongated bowl, top supply spud, floor or wall mounted. Seat: plastic, elongated, open front.

2. Water Closets (handicapped) - Top rim of bowl shall be 18-inches above the floor. All other characteristics shall be the same as # 1 above.
3. Water Closet (residential) - Flush tank, siphon jet, elongated bowl, flush tank, floor mounted. Seat: Plastic, elongated, open front with seat cover.
4. Lavatories - Enameled cast iron or vitreous china. Faucet: As required below.
5. Handicap Sinks - Vitreous china, 20-inches by 27-inches deep.
6. Urinal - Wall hung. Blowout or Siphon-jet, low profile with splashguards. Flushometer as specified below. Equal to American Standard "Trimbrook." Waterless urinals are not acceptable.
7. Kitchen Sinks - Single for break rooms and double bowl for residential, self-rimming, with holes for faucet and spout, stainless steel. Faucet: As required below.
8. Service Sinks - Enameled cast iron. Trap standard, wall mounted or floor mounted. Faucet: As required below.
9. Water Coolers - Self-contained. Exposed surfaces shall be stainless steel. Shall be energy efficient and CFC free. Wall mounted, semi-recessed is preferred. .
10. Showers - Cultured marble stall and base. Valves: As required below.
11. Bathtubs - Straight front recessed. Enameled cast iron or acrylic with cultured marble to ceiling height wall.

Flushometer shall be specified as Sloan Royal water-saving Flushometer, or approved equal. Consider using electronic units.

FIXTURE FAUCET

Fixture faucets shall be specified as Delta models as follows. Consider Delta electronic faucets for non-residential applications.

Model 300WF for kitchen applications.

Model 1101WF or 570WF for lounge sink applications.

Model 2121- VB for janitor sink applications.

Model 520WF (Model 515WFHDF for handicap) or lavatory applications.

Model 1323 for shower applications.

Model 1343 for bathtub applications or approved equal.

The approved equal shall use the same repair kits as the Delta faucets.

Facility water meters shall meet the following standards:

- Electronic Propeller Meter
- Battery powered electronic rate/totalizer
- Nema-4X enclosure
- Available sizes 2-inch to 72-inch
- LCD display with 5-digit minimum
- 4-20 mA output
- Scaled pulse output
- Accuracy +/-2% minimum actual flow
- Recommended Vendor: Sparling model: FT 193-111-2
- Require CEC approval for any substitutions

6.4 ELECTRICAL DESIGN

6.4.1 Design Analysis

Minimum requirements are as follows:

Short-circuit and fault calculations study.

Voltage (V) drop analysis study.

Load calculations for new and existing.

Coordination study: a minimum of two, coordinated ground fault levels is required for 480V system, with electric service of 1000 AMP (A) and more.

Foot-candle analysis. The goal is to achieve an illumination efficiency of 1.5 watts per square foot or less.

6.4.2 Drawings

Minimum requirements are as follows:

Electrical site plan, accurately scaled, showing the following:

All exterior electric from the pole to the pad-mounted transformer to the electric service.

All communication, voice, data, etc. lines.

Wire and conduit sizes.

Reflected ceiling plan.

Lighting plan.

Power plan, panel schedule showing minimum 30% spare space.

Communication (voice, data) plan with riser diagram.

Fire alarm plan with fire alarm riser diagram.

Details, showing grounding, trenching and backfilling, pad mounted transformers, existing poles, modified poles including grounding, and other details as required by the project. See standard details.

Electrical power riser diagram, including wire and conduit sizes.

One line diagram showing new and existing, the coordination, and at least three fault points.

Load calculations and tabulations.

6.4.3 Standard Details

The base standard design details (Appendix “E”) shall be incorporated into the design wherever they are applicable.

6.4.4 General Standards

For new electric service, 480/277V or 208/120V, 3-phase (Ø) service is preferred.

Electrical service and transformer and equipment shall not be located near the front entrance to the facility. The electrical equipment shall be placed inside an enclosure that maintains compliance with this standard.

Base primary voltage line is 13.8KV, 3- Ø delta.

All new electric service shall be in the electrical room.

All new electrical distribution shall be underground. When new facilities are constructed, include relocation of site electrical to underground.

All service entrances shall be underground, from the high voltage poles (either poles or underground), and shall be stepped down by using pad-mounted transformers.

All new facility projects shall include RF-readable, LCD-style, KWH meters for measuring energy consumption and shall be capable of connection to the EMCS system (see mechanical section).

New meters shall be the standard manufacturer of ION, model number 7350 (typically for smaller buildings) or 7550 (typically for larger buildings). Meters may be placed on the interior or exterior of the building.

All major renovation projects shall retrofit existing meters with an RF-readable with new meters. Meter

testing and approval required prior to building/facility final acceptance. Provide pulse initiators with output to EMCS for all electric meters.

All exposed exterior electronic boxes, panels, etc. shall be painted to match walls.

Provide standardized prewiring, receptacle, conduit, and ductwork for telephones, office automation equipment, and Energy Management Control System.

Wire size: The minimum wire size shall be No. 12 AWG copper in 1/2-inch diameter conduit per circuit.

Switchboard shall be full copper bus with a KWH meter. Panel boards shall be copper bus sized with 30% more for future expansion.

Wall switches: Quiet, slow make, slow break design, toggle handle with totally enclosed case, rated for 20 AMP and voltage as required.

Duplex receptacles: Full gang size, polarized, duplex, parallel blade u-grounding slot, hospital grade, rated 20 AMP, 125 volts, designed for split feed service. Install Arc-Fault Circuit Interrupter Protection on all receptacle outlets in housing/dorm dwelling unit bedrooms.

Interior conduit: EMT or as required for explosion-proof construction. Conduit filling shall be per NEC (National Electrical Safety Code). When using NEC-approved wiring, conduit is not required in base housing.

High voltage cable (primary) must be EPR with 133% insulation.

Sizing of Neutral: Account for adjustable speed drives, automatic data processing, and other electronic loads.

Surge Suppression: Provide surge suppression to protect against harmonic distortion and transients in critical or mission essential areas. Provide dedicated circuits for computers.

Parking Stations are required whenever load break elbows are specified for switchgear or manholes.

Insulated bushings parking stands are required for the primary side of dead-front pad mount transformers in addition to the switchgears, and in manholes where load break elbows are specified.

Motors: All motors of 5HP or larger shall have single phasing protection of the type that trips when the phase angle between the three phases is not 120° F or on an under voltage condition. All motors of 50HP or larger shall utilize soft start type.

Site Lighting: See Site Lighting in the Civil Standards (Site Development) section for lighting fixture standards.

Grounding: Provide separate grounding conductors and rods for surge (lightning) arrestors and service neutrals. Provide insulated grounding conductors to all grounding type outlets. Metallic conduit shall not constitute a safety ground. Include the following in specifications:

“Use three-point ground test and instrumentation. Perform test in presence of government inspector. Submit results and indicate type of test performed.”

Transformers: Provide service transformers with delta primary and wye secondary connections for three phase services. Provide low %z transformers where short circuit currents permit.

Screen all exterior transformers, pad mounted switches and cabinets. The primary side of transformers shall be 13.8 KV delta and secondary as required.

Transformers shall be liquid-filled, copper-wound, PCB-free, pad-mounted, dead front, loop feed with lightning protection, Bay-O-Net with ELSP current-limiting back-up fusing, group internal high voltage switch, and 2-2½ % taps above and below rated voltage. Use three two-position (On-Off) switches. Use Feed-thru bushing inserts to mount elbow arresters.

Services: Service conductors and equipment for control and protection of services shall be installed per the NEC. Install main service equipment for the facility inside the electrical room.

Panel boards: Provide printed panel schedules. Provide manual bypass for all auto transfer generator panels. Provide bolt-on circuit breakers only.

Pad Mounted Switchgears shall be dead-front style with elbow connectors and circuit configurations for switching and protection as required.

Emergency lighting in shops and offices shall be ceiling mounted, no wall packs or bug eyes.

6.4.5 Underground Electrical

Underground electrical distribution shall be PVC duct encased in concrete 36-inches below grade with warning tape 12-inches below finished grade. For secondary distributions, use rigid PVC, 24-inches below grade. Provide one (1) spare conduit. Use “stirrup” connectors to connect service feeders to overhead conductors.

Design Conditions: The design of underground distribution systems shall be based on the calculated demand with sufficient electrical capacity for expansion if allowed.

Materials: The materials as indicated above shall be rigid, heavy-duty plastic conduit encased in concrete. Allowable plastic conduits include PVC, fiberglass, or similar nonmetallic electrical duct.

Wiring: For underground or damp locations, use XHHW insulation rated for 600V and 75 insulation rated for 600V and 75° F.

All underground cable terminations to equipment shall be loadbreak/non-loadbreak elbows with grounding kits.

Underground secondary distribution shall have junction boxes with load breaks, not manholes.

Primary Manholes, at a minimum, shall:

- Utilize a four-point junction.
- Contain a spare junction for a future circuit, with proper safety caps.

Conduits: All new utility lines shall be run in underground conduit. Provide spare conduits from transformer to building.

Electrical Identification: Provide underground marker tapes for all underground conductors. If underground conductors are not in metallic conduit, provide marker tape with foiled backing to facilitate detection.

6.4.6 Aboveground Electrical

Overhead Transmission and Distribution Lines: Overhead transmission and distribution lines currently exist in some areas of the base. Future or new overhead electrical distribution shall be prohibited.

Transformers shall be liquid-filled, copper-wound, PCB-free, pad-mounted, dead front, loop feed with lightning protection, Bay-O-Net with ELSP current-limiting back-up fusing, group internal high voltage switch, and 2-2½ % taps above and below rated voltage. Use three two-position (On-Off) switches. Use Feed-thru bushing inserts to mount elbow arresters.

If used, the poles for this system of distribution shall be sized to handle the application and shall be concrete or wood pressure treated with creosote. Concrete poles shall be reinforced or prestressed either cast or spun.

Cross arms for wood poles shall be solid wood, distribution type and shall be sized for the intended load.

Generally, under built services are prohibited. Where existing under built services exist, such as low voltage distribution or communications distribution running on the same pole system, install per NEC.

Vertical phases for directional changes of the aerial distribution shall be per NEC.

Lightning protection for aerial distribution shall be through the use of combination static and neutral wire.

Only a single vertical riser shall be allowed on each pole.

Panelboards: Provide typewritten panel schedules. Provide manual bypass for all auto transfer generators panels. Provide bolt-in circuit breakers only.

Pad Mounted Switchgears shall be dead-front style with elbow connectors and circuit configurations for switching and protection as required.

Services: Service conductors and equipment for control and protection of services shall be installed per the NEC. Install main service equipment for the facility inside the mechanical/electrical room.

6.4.7 Interior Power

Wiring: For indoor locations, use THHN insulation rated for 600V and 75° F.

Transformers: Minimum requirements for dry-type transformers include “K” rating applicable for non-linear loads, copper windings, minimum temperature rise (80, 115, or 150 degrees C), and Nema TP-1 energy efficient, Energy Star rating.

Wiring Devices: Provide new devices and plates whenever an area is renovated. All devices shall be recessed except in equipment and utility rooms. Provide devices rated at 20A or greater. All wiring shall be copper. No aluminum allowed.

Automatic Controllers: Provide battery backup for lawn sprinkler system controllers and automatic setback thermostats.

Over current Protective Devices: The minimum sized over current device for branch circuits is 20 amps. Ensure proper coordination and withstand ratings for all over current protection devices. Demonstrate coordination with first upstream existing protective device. Replace old circuit breakers with new when remodeling facilities. If replacement breakers are unavailable, consider replacement of entire panel board. Main fusing is acceptable for limiting short circuit currents; however, place a box with one full set of spare fuses adjacent to main panel. Use bolt-on circuit breakers.

Electrical Identification: Provide plastic panel board and disconnect labels. Labels shall be laminated (black with white core), engraved with ¼-inch high letters. Attach to front exterior of enclosures. Labels shall match plan designations. Provide nonferrous phase and circuit identification labels in all enclosures for feeder circuit conductors.

Power Factor Correction: Add power factor (p.f.) capacitors to induction motors (10 HP or larger) to correct p.f. to 0.90 (+.05, -.00). Switch p.f. capacitors in with the motor. Size capacitor IAW IEEE 141, NEMA MG2 and motor to manufacturer recommendations.

Power Service: Power requirements for buildings shall be 208/120V or 480/277V.

Electrical Related Work: Balance loads on phases within 10% at all panel boards. Conduit fault calculations to ensure proper withstand ratings for all protective devices. Ensure coordination for all protection devices, conductors, enclosures, and equipment.

Raceways: Conduit run in concrete shall be PVC unless steel conduit is needed for a specific reason,



6.4A Paint all panels.



6.4B Conceal all conduit and cabling.

i.e. to limit fault currents. Underground primary voltage feeders shall be in concrete encased conduit.

All penetrations of fire resistance rated walls shall be fire stopped IAW NEC Article 300-21.

Highlight compliance with NEC Articles 300-5(g) and 300-7(1) regarding moisture seals.

Conductors: Aluminum conductors may not be used. The smallest branch circuit conductors acceptable are No. 6 AWG and larger shall have heat resistant insulation.

All conduit and cabling shall be concealed (phone, electrical, computer, etc.), except in equipment and utility rooms.

Meters: Meters shall be generally located in rear of building or near service entrance and shall be on all new and remodeled buildings.

All new buildings are not required to have lightning protection designed into the project. Buildings containing high-value, lightning-sensitive assets or explosive materials/munitions shall have lightning protection designed into the project. Coordinate the requirement to install a lightning protection system through the base Project Manager. For facilities requiring lightning protection, be sure to use adhesive-mounted air terminals and to provide vibroground test point(s).

Electrical panels shall be painted to match or coordinate with interior color scheme or specified with appropriate factory finish.

All switches, plates, outlets, covers, and all other associated electrical components shall be white. Use ivory only in situations where “match existing” is applicable.

6.4.8 Lighting

Provide wire guards for all open fluorescent lamps. Utilize energy-saver, 32-watt T-8 fluorescent, low mercury “green” lamps, and electronic ballasts in administrative and similar areas. Use metal halide in hangar/bay areas, even in areas of non-critical color rendition. Daylighting (Natural Lighting Co., Inc., or equal) shall be used in all hangars/bays/warehouses, and similar areas. Use automatic light controller in the design.

Provide seismic protection for all fixtures, especially ceiling grid-mounted fluorescent fixtures.

Provide Certified Ballast Manufacturer (CBM) listed ballasts. All ballasts shall be electronic and shall have 0.90 power factor or greater and with a total harmonic distribution of <10%.

Do not use incandescent lighting. Where spot dimming is required, use special dimming ballasts with compact fluorescents or multiple switching of circuits with compact fluorescents.

Outdoor/Exterior Lights: All outdoor/exterior lighting shall comply with the City of Tucson Outdoor Lighting Code. Exterior building lights shall be fluorescent fixtures. All other exterior lights shall be high-pressure sodium, with ballast, high power factor, low temperature type, reliable starting (-5° F), and efficacy of 105 to 120 lumens per watt. If EMCS is not available, motion detectors and photocells shall be used in lieu of switches where lights are for convenience rather than security.

Interior Lights: Utilize energy saver 32-watt T-8 fluorescent low mercury “green” lamps and electronic ballasts as the principal system within a facility. To achieve the interior lighting plan standard, consider the following:



6.4C LED-style exit light.

Provide 2-foot by 4-foot fixtures only. 2-foot by 2-foot fixtures are not acceptable as substitutes to meet lighting requirements.

Provide occupancy sensors, with manual control capability, for areas where occupancy is irregular or intermittent, as in conference rooms, copier rooms, storage rooms, etc.

Consider specular reflectors for retrofit applications.

Use LED-style exit lights, with nickel-cadmium-type emergency batteries. When renovating facilities with existing radio luminescent exit signs, retrofit lamps with Merlin (Lithonia Lighting) LED light tubes or equal.

All emergency exit lighting shall be on dedicated circuits for facility connection or future connection to the EMCS system. Emergency exit lighting in offices and shops shall be ceiling mounted; no wall packs or bug eyes. If EMCS connection is required for emergency exit lighting, override switches shall be placed in areas around the facility, including individual offices, in locations acceptable to and approved during the design process.

Hangar Lights (and areas of non-critical color rendition): Metal Halide, efficacy of 105 to 120 lumens per watt including ballast losses.

Building security lighting shall be on a photocell/timer circuit.

6.5 FIRE PROTECTION

6.5.1 General Standards

Water Distribution

Any additions to the base water system must be kept in a grid system so that no fire hydrants are located on a dead-end line.

Fire hydrants shall be the standard manufactured by Clow, Model F2545 and painted to indicate high and low pressures per NFPA 101.

Underground fire protection piping shall comply with "Underground Utilities" in Civil Standards (Site Development).

Water supply: Utilize UFC 3-600-01, Design: *Fire Protection Engineering for Facilities* to determine minimum fire flow water demands and durations for new or upgraded facilities, and (or) the necessity for fire hydrant(s) at or near new or upgraded facilities.

Connection to main: Provide separate connection to water main for fire protection and domestic water systems.

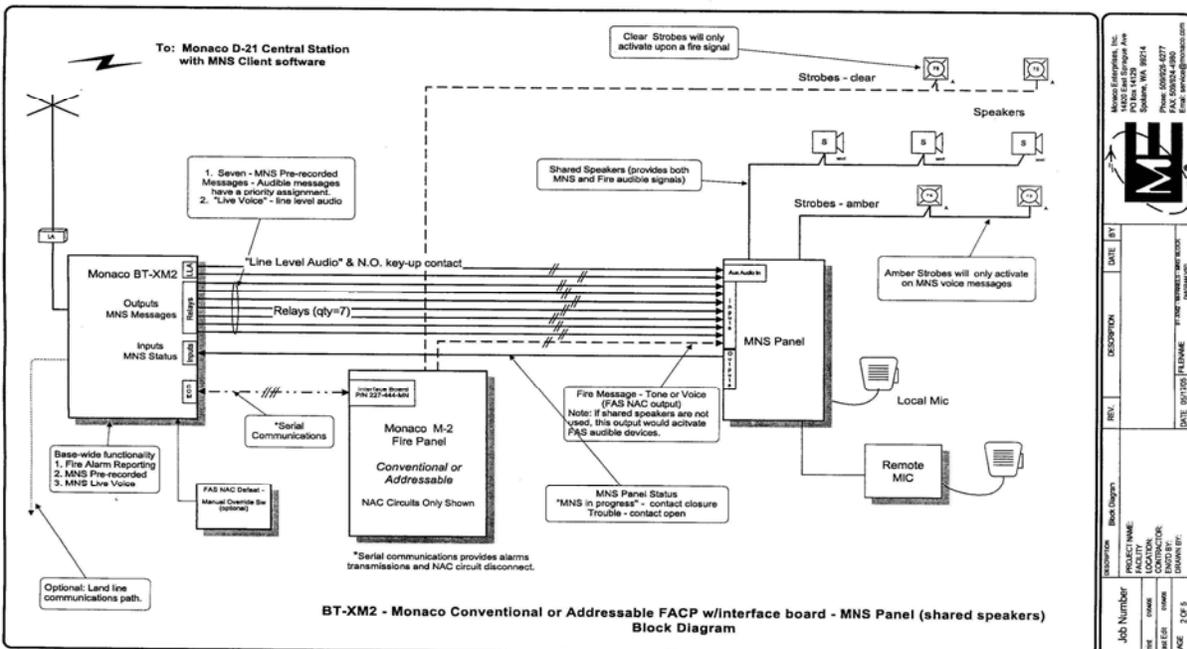
Fire Alarm Systems

All parts of the building exterior must be within 350-feet of a hydrant with consideration given to accessibility and obstructions. Hydrants must be located with consideration given to emergency vehicle access.

All buildings shall be equipped with a fire monitoring system. All cabling shall be in conduit, whether exposed or concealed.

All fire alarm systems must be Class "A," Style D. Fire alarm panels and transmitters must be accessible to the fire department, such as in a mechanical or electrical room, or outside the building. Fire alarm panels shall have at least two spare zones. Circuit breakers for fire alarm panels, exit lights, and emergency lights must have a locking device so occupants cannot tamper with them. Fire alarm panel and transmitter batteries must be gel cell type. Alarms shall be a combination alarm horn/strobe alerting devices.

Mass notification system shall be in compliance with UFC 4-010-01. Speakers that are part of a mass notification system or public address system shall not be used in classified secure room environments.



Note: An override module must be included in the panel in order to meet UFC guidelines.

Manual pull stations shall be the toggle switch type.

Transponders shall be receiver/transmitter radio units operating on 138.925 megahertz designed for compatibility with Monaco radio multiplex system. Transponders shall have four input zones including fire alarm panel alarm, trouble, transponder power failure, and a spare. An exterior, wall-mounted antenna shall be installed for each transponder and shall be one-half dipole with 2.25 dB gain, manufactured by Monaco, Inc. Fire alarm panels shall be the standard manufacturer of Monaco.

Fire Detection Systems

Heat detectors are required in all areas unless the building is protected by a sprinkler system. Temperature classification of heat detectors shall be determined in accordance with NFPA Standard 72, Chapter 5. Generally, use 135° F, fixed temperature heat detectors in all areas below ceilings; and 194° F, fixed temperature heat detectors above ceilings.

Exception: Smoke detectors are required in electrical equipment rooms and sleeping rooms, even when the building is protected by a sprinkler system. Smoke detectors are also required in other special occupancies as required by NFPA.

Fire Suppression Systems

Design Conditions: All fire protection design shall be per NFPA 13, NPA 13R, *Life Safety Code*, and UFC 3-600-01. Design of the fire protection system shall typically be of the performance-type and shall normally be the responsibility of the A-E. **The A-E is required to perform the requisite flow tests for incorporation into the design.**

Distribution: Aboveground piping systems shall be Schedule 40-steel with threaded, welded, or victaulic connections. No thin wall (Schedule 10) or plastic piping shall be allowed as part of the fire suppression system after it enters the facility.

Dormitories shall have dual detection systems, heat/smoke in sleeping room with a local alert. Sprinkler heads in finished ceilings shall be semi-recessed, chrome plated or flush painted white.

Specifications for fire suppression systems shall include a statement requiring the design of the sprinkler system under the direct supervision of a Professional Fire Protection Engineer licensed in the State of Arizona. Shop drawings for fire suppression systems shall be required and shall bear the seal of that Engineer.

Specifications shall include the provision for the Contractor to flow test the existing hydrants adjacent to the site, which were used in the design, to confirm the design parameters, prior to providing submittals of the fire suppression water distribution system. The Contractor shall be required to notify the Contracting officer of any discrepancies both in the submittal and prior to construction. The Contractor shall also be required in the specifications to conduct flow tests of all newly installed fire hydrants and the existing adjacent upstream and downstream fire hydrants after completion of construction and prior to final acceptance. All flow tests shall be conducted in the presence of the Contracting Officer or his authorized representative, and a representative of the Fire Department. Water runoff shall be controlled in a manner satisfactory to the Contracting Officer.

Tamper Switches: All OS&Y for fire sprinkler, deluge, and HIXF systems must have tamper switches connected into fire alarm system on its own zone.

Fire Protection Riser: Comply with standard detail. Provide double check valve backflow prevention. Backflow preventers shall be provided with a secure chain and lock on the valve handles to prevent unauthorized tampering. (Refer to AFI 32-1066, *Plumbing Systems* and ACC Sustain Advisory 99-001, *Backflow Prevention* for more information.)

Post indicator valves: Do not use post indicator valves. NFPA allows the Authority Having Jurisdiction (in this case, Davis-Monthan AFB) to permit a non-indicating valve, such as an underground gate valve with approved roadway box complete with T-wrench. This is the case at Davis – Monthan AFB.



6.5A Recessed heads only. Surface mounted sprinkler head should not be used.



6.5B Do not use plastic pipe as any part of the fire protection system.

HiX Foam: The contractor must provide HiX foam for projects using HiX systems. When these systems are used in the building, a reduced pressure backflow preventer rather than a double check valve is required in the fire system riser. Backflow preventers shall be provided with a secure chain and lock on the valve handles to prevent unauthorized tampering. (Refer to AFI 32-1066, *Plumbing*

Systems and ACC Sustain Advisory 99-001, *Backflow Prevention* for more information.) HiX foam systems require positive action pull stations, preferably those that feature key reset. The use of micro-switch pull stations with HiX foam systems is prohibited.

Electronic Equipment Installations, including major automatic data processing (ADP) areas, command centers, command and control systems, and other mission-critical systems shall be located in buildings protected by wet-pipe automatic sprinklers. Provide complete coverage throughout the building including the electronic equipment areas. Provide pre-action type system at electronic equipment areas. Further, electronic equipment shall be protected by disconnecting the power upon activation of the fire protection system.

Fire Department Connections (FDC) shall be on the street side of buildings and shall be located and arranged so that hose lines can be readily and conveniently attached to the inlets without interference from any nearby objects, including buildings, fences, posts, or other fire department connections. At least one fire hydrant will be located within 150-feet of the FDC.

Fire Department vehicles must have unimpeded access to the building for emergency response. Access from the road to the building must be paved and terminate no farther than 33-feet from the building.

Such access may require fire apparatus to drive over a curb, open a gate, or remove a bollard, provided no more than one person is required to open the gate or remove the bollard. Any locking device controlling vehicle access must be under the control of the Fire Department or 24-hour security person located at specific facility.

6.6 MISCELLANEOUS**6.6.1 Utility Shutdowns**

Shutdown of any utility will require a minimum of 14 calendar days. If a road closure is involved, 21 calendar days will be required. It takes 21 calendar days to get a digging permit cleared. (Reference Appendix—General Requirements Specifications section.)

6.6.2 Security Systems**General Standards**

In order to maintain coordinated system growth, security panels shall be compatible with the Base system.

Install a ¾-inch conduit from the security panel to the building's main telephone backboard (home run panel). Install a 24 AWG four wire Cat 5 telephone cable in this conduit.

Security panels shall have a minimum of 16 programmable zones. Door contacts will be grouped together with the maximum office door contacts per zone. Do not install recessed balanced magnetic switch. Motion detectors will be grouped together with a maximum of five door contacts per zone. Under the floor or above the ceiling motion detectors or other sensors will be zoned separately. Duress alarm sensors and duct detectors will also be zoned separately. Duress switches shall have reset capabilities. Sensors on each zone are to be wired in series.

All Intrusion Detection Systems (IDS) are to transmit fully compatible data back to base 'Vindicator' system.

Install a separate power supply in a junction box adjacent to the security panel to power all motion detectors or other non-passive field security sensors. Install conduit between the power supply junction box and the security panel. Provide 155V AC to security panel. Inside the security panel, install duplex outlet for step-down transformer.

The keypad shall be mounted on the outside of the primary entrance into the classified area. If the keypad is mounted on a wall exposed to the elements, a NEMA enclosure with hinged cover

shall be installed to protect the card reader. The enclosure will be of sufficient size to allow the user to swipe the card through the reader.

All SCIF construction and supporting security systems shall meet certification requirements defined by Director of Central Intelligence Directive (DCID) 6/9 Annex A, SCIF Fixed Facility Accreditation Checklist.

The Civil Engineering EMCS Shop will perform all software programming necessary for the central computer to communicate with security panels.

6.6.3 Telecommunications**General Standards**

This section describes telephone, rewiring, computer support, and other communication requirements, which must be addressed in the project design. These criteria are as follows:

New construction and remodeling projects should make provisions for conduit, outlets, lockable enclosures, power and building entrance. Locate telecommunication rooms close by electrical equipment rooms.

All new communication, telephone, and cable must be underground.

Telephone systems – Provide 120V duplex receptacle adjacent to board with a #6 AWG bare copper wire from backboard to grounding bar in panel board. Provide conduit to exterior for telephone service drop – prefer below ground access.

Pay Phones – Ensure that electrical power is provided next to all pay phones.

Wiring (General) – Provide prewired outlets with covers for phones and computer. All cable and phone lines shall be prewired back to a central electrical space in the building.

All new buildings shall be pre-wired for telecommunication in conduit, which include fire alarm, telephone and EMCS Systems.

Provide one 4-inch (one-way) and one 4-inch (four way) underground conduit to closest manhole with available telecom utilities for cable TV, government telephone, non-government telephone, and abase networking.

LAN System: Category 5, 10 Base T cable. Use dual wall plates, one (1) phone and one (1) LAN.

Provide two (2) data jacks and one (1) communication jack at every designated workstation (desk) location.

Refer to Appendix “F” for additional information regarding telecommunication systems.

6.6.4 Communications Equipment Room

General Standards

Communications Equipment Room (CER): A CER is required for a facility that has significant communications/computer system requirements and is greater than 10,000 square feet. Unoccupied facilities and small facilities such as guardhouses, utility control buildings, storage bunkers, etc., will normally not require a CER. CER requirements are as follows:

Minimum CER size shall be 8-feet by 15-feet.

Room should be located on the first floor and must have an exterior door entrance.

Room must not be co-located with electrical or mechanical equipment.

Room must be environmentally controlled.

Room shall have ¾-inch plywood backboards on all walls, beginning one foot above finished floor and continuing to no less than seven feet above finished floor. The boards shall be painted with two coats of white, flame retardant paint.

Provide dedicated electrical circuits to support communications/computer system equipment.

As a minimum, provide two, 20-AMP dedicated branch circuits. In addition, the room should also have receptacles on all walls in accordance with the NEC.

As a minimum, provide a single point ground for all communications/electronics equipment for the building within the CER. Provide a ground riser with a No. 1 or larger wire directly connected to the provided ground plate with no taps. The resistance of the ground wire must be five ohms or less, measured from the main ground point. Grounding must meet NEC requirements.

Building Entrance Terminals (BETS): Provide gas protector modules in the CER to protect the inside plant wiring and equipment from power surges. Where the length of the outside plant cable from the point it enters the building to the BETS is greater than 50-feet, install the outside plant cable in metal conduit. Terminate twisted pair outside cable plant on BETS at the point where it enters the building. Provide cross-connects from the BETS to the first set of 110-type blocks.

Telecommunications Closet (TC): A TC is required for each floor with 10,000 square feet of usable footage in a facility. A TC services as the interface from the CER to the individual voice/data outlets in the facility and as a location for enterprise hubs for data LAN equipment. The CER may also function as a TC for the area in the facility where it is located. TC requirements are as follows:

Minimum TC size shall be 6-feet by 8-feet.

Room should be centrally located to the area it serves. The installed length of all horizontal distribution cables run from the TC to the outlets must be less than 295-feet to support LAN data requirements.

Room must be environmentally controlled.

Room shall have ¾-inch plywood backboards on all walls, beginning one foot above finished floor and continuing to no less than seven feet above finished floor. The boards shall be painted with two coats of white, flame retardant paint.

As a minimum, provide two, 20-AMP dedicated branch circuits. In addition, the room should also have receptacles on all walls in accordance with the NEC.

As a minimum, provide a No. 6 ground wire connected with a direct home run to the ground plate in the CER. The resistance of the ground wire must be ten ohms or less, measured at the grounding point. Grounding must meet NEC requirements.

Telephone board (used for unoccupied/smaller facilities which do not require a CER/TC): 4-feet by 8-feet by $\frac{3}{4}$ -inch plywood, with #6 ground. Provide receptacle on or near telephone board.

Telephone/Data Primary: Underground from the main telephone demarcation point to the telephone terminal board. As a minimum, specify two, 4-inch PVC conduits with $\frac{1}{4}$ -inch, nylon pull wire and 90° long sweep. One of these two conduits shall have three, 1 $\frac{1}{4}$ -inch interduct. Interduct shall be orange in color to designate fiber optic cable run.

Telephone/Data Secondary: From the CER, TC, or telephone board to the telephone/data outlet. Cable between outlet and patch panel shall be continuous (no splices). The riser conduit design should include spare capacity for a second riser cable of equal size. All voice and data wiring should be at least 12-inches from parallel power runs and 2-inch from diagonal power runs.

Telephone wiring: All voice wiring shall meet minimum EIA/TIA (Electronics Industries Association/Telecommunications Industry Association) 568A Category 5 requirements. The voice riser cables from the CER to each TC should be sized at a minimum of 30% of the total pair distribution planned for the TC, rounded up to the next 100-pair count. Specify 8 pairs (24-gauge) telephone cable in 1-inch conduit.

Data wiring: Copper data wiring shall meet the minimum EIA/TIA Category 5 requirements. Wiring shall be less than 295-feet and terminated in the TC/CER on a RJ45/110 modular patch panel mounted on a hinged wall bracket. All fiber cabling shall meet the minimum ANSI/EIA/TIA-492AAAA requirements. The minimum fiber optic riser cable from the CER to each TC is 6 strands.

Telephone/Data Outlets: Outlets for voice and data shall be dual, RJ-45 with the telephone outlet on top, and the LAN outlet on the bottom. The LAN outlet shall be identified with green marking. RJ-45

outlets shall be no closer than 18-inches to electrical receptacles.

Telecommunications and coax systems shall have surge suppression as appropriate to the degree of mission essentiality.

6.6.5 Corrosion Control

General Standards

When metal is in contact with water, either above or below ground, sacrificial anodes and impressed current systems shall be used. Provide test stations. All rectifiers shall be standardized.

6.7 SUBMITTALS AND DELIVERABLES

The Davis-Monthan AFB Design Compatibility Guideline requirements, as defined, may directly affect the Contractor’s overhead for completing the scope of work. Failure on the part of the Contractor to adequately review this section, and all other sections, and identify/clarify any requirements herein will not constitute justification of Contractor claims for additional design and/or construction costs.

Submittal and deliverable requirements defined in this section shall apply to all programming, concept, design, bidding, construction, and as-built documents. Submittals not meeting these criteria shall be returned for correction at no additional cost to the Government.

6.7.1 Drawing Production and Drafting Standards

Standard Drawing Sheets

Standard “D” size sheets (24-inch by 36-inch) are the installation standard. For projects involving large-scale facilities, larger sheets may be used based on prior approval from the Chief Engineer. Base Map, Title Sheet, and Standard Davis-Monthan standard border sheets are available electronically from the Project Manager.

Drawing Scale

The minimum scale for all floor plans shall be 1/8-inch = 1-foot 0-inches. For projects requiring larger than the standard “D” size sheets to meet minimums, provide “keyed” floor plans on multiple sheets. Provide ¼-inch enlarged plans as required to properly convey the scope of the project designed. The Davis-Monthan “FBNV” project number shall be included on each sheet of the drawing set.

Discipline Designators (DD)	
DD	Description
G	General (Title Sheets/Abbreviations/Code Analysis/Phasing/Bidding/Program)
B	Geotechnical (Soils Reports/Analysis)
V	Surveying and Mapping (GIS)
H	Environmental Engineering (Hazardous Materials/Abatement/Remediation)

C	Civil Engineering
L	Landscape (Plantings/Irrigation Systems)
S	Structural Engineering
A	Architectural
I	Interior Design (Finishes/Furnishings)
Q	Equipment and/or Allied Support
F	Fire Protection Engineering
P	Plumbing (Mechanical Engineering)
M	HVAC (Mechanical Engineering)
E	Electrical Engineering
T	Telecommunications (LAN/Data/Telephone/Satellite/Wireless)
R	Readiness (Contingency Operations)
X	Antiterrorism and Force Protection
Y	Airfield Operations
Z	Contractor Submittals and/or Shop Drawings

Table 6.7A

Building Codes and Code Analysis

As a minimum, each project shall be designed and/or constructed in compliance with all Federal, State, County, and City codes and ordinances. In addition to the Design Analysis requirements, include at every submittal stage a detailed “G” sheet with a code plan and complete code analysis. Drawing sets submitted without a required code plan and code analysis shall be returned for correction at no additional cost to the Government.

Images and Photos

The use of digital photos included as part of the drawing set is encouraged when applicable to document existing conditions and/or construction methods. Insure that all photos or images remain legible after half-size reductions are made.

Line Work in Drawings

All drawings shall be created using varying lines weights, styles, and screen values consistent with standard architectural drafting practices. Drawings produced without proper line work delineation shall be returned for correction at no additional cost to the Government.

Lettering (Text)

All lettering shall be sized so that finished drawings, prior to half-scale reduction, incorporate text sizes of 1/2-inch for major titles, 1/4-inch for titles, 1/8-inch for notes, and 3/32-inch for dimensions. Larger text sizes may be used as part of the Title Sheets only. Text fonts shall be as determined in the CADD standards identified in this section.

6.7.2 Computer Aided Design and Drafting (CADD) Standards

CADD Software Format

Drawings submitted as part of a design or final record drawings shall be in Autodesk, AutoCAD format only. Other formats will be not accepted. Files converted from other platforms shall be edited to match plotted drawings in scale, size, line weight, and attribute definition prior to electronic submittal.

Project File Naming: Drawings shall be stored under file names consisting of the FBNV Project number, followed by the Discipline of Work designator, and then the Project Sheet Number.

Project File Name: 060114A01.DWG	
060114	FBNV Project Number
A	Discipline Designator (Architecture)
01	Project Sheet Number
. DWG	Required AutoCAD file extension

Table 6.7B

Standard Detail File Naming

Detail drawings shall be stored under file names consisting of the CSI number followed by the detail number in the series.

Standard Detail File Name: 02950-008.DWG	
02950	CSI Number related to the intent of the detail
-008	The detail number in that series
. DWG	Required AutoCAD file extension

Table 6.7C

Drawing Format

Create drawings in such a fashion that the majority of information is located in “model space” with the creation of the plotted drawing sheet in

“paperspace”. Digital Drawings shall be produced at full size (1-inch = 1-inch) and scaled to the appropriate size when plotted. Unscaled drawing sheets (details, schedules, diagrams, etc.) should be drawing to be plotted at 1=1 (AutoCAD paperspace).

Layers and/or Layering

All drawings shall be produced using the latest version of the AIA Layer Standards (short format). Expansion of the published layers for “military” or “Government” specific information may be used as approved by the Government’s Project Manager. Any deviations from the AIA standards shall be fully documented in the Design Analysis submittal and included digitally on the disk(s) containing the drawing files.

Line Weights

All drawings shall be created using varying lines weights consistent with standard architectural drafting practices. Drawings files produced without line weight delineation shall be returned for correction. All line weights shall be assigned to the associated layer the drawing element is located. Maximize “screened” lines to show backgrounds and existing objects. Drawings files with line weights assigned to specific pen numbers or plot tables shall be returned for correction at no additional cost to the Government. Line weights assigned to individual drawing elements can be applied as required. However, limited use of this procedure should be followed to avoid submittal rejection.

Line Types

All drawings shall be created using varying lines types consistent with standard architectural drafting practices. Drawings files produced without line type delineation shall be returned for correction at no additional cost to the Government. All line types shall be assigned to the associated layer the drawing element is located. Drawings files without appropriate line types shall be returned for correction. Line types assigned to individual drawing elements can be applied as required. However, limited use of this procedure should be followed to avoid submittal rejection.

Fonts and Text Sizes

Text Description	Size	Approved Fonts
Presentation and Preliminary Design Concepts		
Lettering (Major Titles)	1/2"	Arial, Architext, Romans, or Helvetica Medium
Lettering (Titles)	1/4"	
Lettering (Notes)	1/8"	
Dimensioning	3/32"	
Title Sheets and Sheet Borders		
Lettering (Major Titles)	1/2"	Arial, Architext, Romans, or Helvetica Medium
Lettering (Titles)	1/4"	
Lettering (Notes)	1/8"	
Construction Documents (Drawings)		
Lettering (Major Titles)	1/2"	Arial, Architext, Romans, or Helvetica Medium
Lettering (Titles)	1/4"	
Lettering (Notes)	1/8"	
Dimensioning	3/32"	
Notes: 1. All sheets of the drawing set shall have a single and consistent usage of the available fonts throughout. Drawing sets with multiple font schemes shall be returned for correction. 2. Projects contracted through the Army Corps of Engineer may follow the font scheme of the managing District office.		

Table 6.7D

External References (XREF) Files and Images

External reference files and images submitted as part of design submittals shall be supplied in a directory mapped so that when drawing files are opened, all associated reference files and images will be properly loaded. Final As-Built submittals shall “bind” all external references and images into a single drawing file. Submittals not meeting these criteria shall be returned for correction at no additional cost to the Government.

Supplemental Files

All electronic files use to create the drawing set to include external references, images, digital photos, overlays, blocks, symbols, details, menus, fonts, and routines not included in the basic AutoDesk AutoCAD package shall be include as part of all digital submittals. Submittals not meeting these criteria shall be returned for correction at no additional cost to the Government.

6.7.3 Contract Specifications

Format

As part of the contract documents, provide specifications in accordance with AIA MasterSpec or Corps of Engineer SpecsIntact formats.

Required Sections

Determination of each specification section required to adequately communicate the project design scope shall be determined by the Contractor (Designer of Record) and approved by the Chief Engineer during the submittal review process.

The Contractor shall edit and incorporate the following specification sections as part of all contract document submittals: (Reference DCG appendix for complete versions of required sections to incorporate)

- Section 01010 - Summary of Work
- Section 01101 - Design Compatibility Guidelines

Submittals not including these sections shall be returned for correction at no additional cost to the Government.

Paper Copies

All printed specifications shall adhere to the following sheet color and binding scheme during reproduction of submittals:

Specification Division	Paper Color	Binding Color	Comments
Division 1	Green	Comb: Black 3-Ring: White, with side pockets and clear cover, back, and spline inserts	Final specifications submittal shall include one (1) of the required copies to be punched and bound in a 3-ring binder
Division 2 through 14	White		
Division 15 (Mechanical)	Blue		
Division 16 (Electrical)	Yellow		
Division 17 (Tele/Data)	Tan		

Table 6.7E

6.7.4 Geographical Information Systems (GIS)

Geodetic Control Surveys

The contractor shall provide horizontal and vertical control surveys for the precise location of primary survey points for planning, engineering, construction, real estate projects, GIS applications, or facility management.

The contractor shall use conventional and other methods, such as a planetable, total station, or Global Positioning Systems (GPS) for field data collection at an accuracy level in accordance with *Geospatial Positioning Accuracy Standards, Part 2: Standards for Geodetic Networks*, published by the Federal Geographic Data Committee (FGDC), dated July 1998.

All geodetic data shall be collected using the coordinate and projection system of the installation imagery, GCS North American 1983, North American Datum (NAD) 1983 State Plane Arizona Central FIPS 0202 Feet, except where modified by the government. The contractor shall use survey grade GPS, at an accuracy level of +/- 2cm.

Global Positioning System (GPS) data collection activities will be based on a post-processed environment using an accurately sighted base station. Base station files for post processing acquired locally (off-site CORS Continuous Operating Reference Station) will be verified for accuracy.

Any new on-site base station to be initiated for collection activities will be a survey grade base station providing output files compatible with both survey & resource grade rover units (specifically Trimble 5700 and 4700/TRS). NOTE: the contractor shall provide a quality control (QC) report that must state whether all inconsistencies in the data generated were corrected, or it must detail the remaining errors by case.

All Survey data collected shall be provided to the Government in a digital format with an attached Survey Report identifying survey method, equipment list, calibration documentation, survey layout, description of control points, control diagrams, and field survey data.

A Survey Control Database (consisting of a survey marker database and a survey traverse database) will be produced for all survey control points established under this contract, and delivered in ESRI ArcGIS 8.x geodatabase format.

Feature Attributes

The contractor shall identify the horizontal and vertical order, classification, ID number, elevation, coordinate location, and any other necessary attributes (specified by the Government) for all surveyed features.

Entity naming conventions, attribute fields, and domain names will be collected in the format defined by the CADD/GIS Technology Center's Spatial Data Standards (SDS) release 2.2 (or the most current version available), except where modified by the government. This standards document can be found at:

<http://tsc.wes.army.mil/products/tssds-tsfmts/tssds/projects/sds/>.

Metadata

The contractor shall complete all metadata elements marked mandatory and mandatory-if-applicable as defined by the FGDC Content Standards for Digital Geospatial Metadata for each feature layer collected. This standards document can be found at:

<http://www.fgdc.gov/metadata/contstan.html> .

Metadata should be submitted in ESRI ArcGIS 8.x format and stored as an XML document with the corresponding feature layer.

Topographic and Infrastructure Surveys

The contractor shall provide surveys to consist of, but are not limited to, field data acquisition of detailed topographic, planimetric and infrastructure feature data for use in engineering site planning, cost estimating, design, as-builts, and construction layouts.

The contractor shall use conventional surveying and other methods, such as a total station or Global Positioning Systems (GPS) for field data collection at an accuracy level in accordance with "Geospatial Positioning Accuracy Standards, Part 4:

Architecture, Engineering, Construction, and Facilities Management,” published by the Federal Geographic Data Committee (FGDC), dated February 2002. This standards document can be found at:

http://www.fgdc.gov/standards/status/sub1_5.html .

All geospatial data shall overlay on the installation’s most current orthorectified imagery provided by the government. The collected data will incorporate the coordinate and projection system of the imagery, GCS North American 1983, North American Datum (NAD) 1983 State Plane Arizona Central FIPS 0202 Feet, and have an external spatial reference (.prj) file attached that specifies the parameters of the coordinate system.

The contractor shall provide survey grade GPS data at an accuracy level of +/- 2cm. where appropriate (as determined by the Government) and all other collection at a resource grade accuracy level of +/- < .5m.

The contractor shall provide a quality control (QC) report that must state whether all inconsistencies in the data generated were corrected, or it must detail the remaining errors by case.

Data on the location of utility lines shall be captured at a minimum every 50-feet and each turn or bend in a utility line must also be captured. Locate all utility lines with GPS coordinates. Locate all mains and valves with intermediate point between.

The contractor shall prepare and submit a GIS geodatabase that links the respective spatial and tabular databases through ESRI ArcGIS 8.x. The contractor shall utilize a topology build and clean routine and assure the following:

- No erroneous overshoots, undershoots, dangles or intersections in the line work
- Lines should all be continuous, i.e. do not create dashed lines with many small line segments
- Point features should be digitized as points, not graticules, symbols or icons
- No sliver polygons

- All polygons completely close and have a single unique centroid
- Digital representation of the common boundaries for all graphic features must be coincident, regardless of feature layer

Feature Attributes

The contractor shall identify the classification, type, location, ID number, and any other necessary attributes (specified by the Government) for all surveyed, mapped, designed, or proposed features.

Entity naming conventions, attribute fields, and domain names will be collected in the format defined by the CADD/GIS Technology Center’s Spatial Data Standards (SDS) release 2.2 (or the most current version available), except where modified by the government. This standards document can be found at:

<http://tsc.wes.army.mil/products/tssds-tsfsms/tssds/projects/sds/>.

Metadata

The contractor shall complete all metadata elements marked mandatory and mandatory-if-applicable as defined by the FGDC Content Standards for Digital Geospatial Metadata for each feature layer collected. This standards document can be found at:

<http://www.fgdc.gov/metadata/constan.html>.

Metadata must include an NSSDA accuracy statement at the 95% confidence interval & corresponding calculation worksheets as outlined in “Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy,” published by the Federal Geographic Data Committee (FGDC), dated July 1998. This standards documentation can be found at:

http://www.fgdc.gov/standards/status/sub1_3.html

Metadata should be submitted in ESRI ArcGIS 8.x format and stored as an XML document with the corresponding feature layer.

Delivery Media

CD-ROM is the preferred format due to its extended shelf life. Digital media must have an external label

listing format and version of the operating system on which the media was created (e.g. Windows 2000), utility (command) used for writing the files to the media, a short description of contents, a sequence number if there are multiple volumes, and the date of CD creation.

A transmittal sheet must accompany the media containing the information included on the external labels, total number of volumes being delivered, and a list of file names and file descriptions on each volume. The transmittal sheet must also include instructions for reading, restoring, or transferring the files from the media, and certification that all delivery media is free of known computer viruses - including the name(s) of the virus scanning software, date the virus scan was performed, virus definition pattern date of service and version.

Government Furnished Materials

The Government will provide the contractor with data and information concerning all necessary and pertinent functions and principal features of the identified project. These items will include:

- The installation's latest georeferenced digital planimetric data and/or base map in ESRI Arc/Info 8.x format, or best format available, with associated data files.
- The installation's most current orthorectified imagery and its geospatial parameters (coordinate system, datum, projection, distance units).
- Any pertinent and necessary prototype or seed files.
- Frequency settings for the Real-Time Kinematic (RTK) GPS Base Station and the preferred GPS receiver specifications.

Any other data or schematics deemed necessary for project completion, pending approval from the Government.

Government Review

The Government shall review the submitted data and documentation upon completion of all stated work. Missing or incomplete items will be documented and forwarded to the contractor for

completion. Upon receipt of a complete submittal, the Government will conduct a quality review and notify the contractor within 21 days of acceptance (along with any stipulations this includes) or rejection of the deliverables described herein. Failure to adhere to any of the stated delivery specifications could result in rejection of deliverables and nonpayment. Contractors should, at a minimum, submit data and documentation samples at 25% and 75% project completion to avoid the rejection of final deliverables.

Any questions regarding data collection efforts, deliverable formats or specifications should be addressed to the Geo Integration Office, contact information:

355 CES / CEOEG
5220 E. Madera St
Bldg 5313
Davis-Monthan AFB , AZ
(520) 228-7325

6.7.5 Submittal and Deliverable Minimum Requirements

Media

All electronic submittals shall only be submitted on CD-ROM disk(s).

Electronic Data Submittal Formats

All digital information shall be delivered in the formats listed below. Submittals not meeting the following criteria shall be returned for correction at no additional cost to the Government.

Drawings

The latest version of AutoDesk, AutoCAD. In addition to all DWG files, the contractor shall include a set of full size, plot (Adobe Distiller) files for each drawing in Adobe Acrobat (PDF) format.

Specifications

Microsoft Word. In addition to all DOC files, the contractor shall include a copy of each specification section in Adobe Acrobat (PDF) format.

Cost Estimates: Microsoft Excel. In addition to all XLS files, the contractor shall include a copy of the project estimate in Adobe Acrobat (PDF) format.

Engineering Standards SECTION 6.0

Procurement Documents

Microsoft Office compatible. In addition to all Office files, the contractor shall include a copy of each file in Adobe Acrobat (PDF) format.

Reproducible

Final submittals must include one complete set of high quality, 3-mil, reproducible Mylar drawings. Sepia mylars (copies) will not be accepted.

Hard Copy (Paper) Drawings

All required hard copy (printed) drawing submittals shall adhere to the following sheet color and binding scheme during reproduction of submittals:

Drawing Types	Paper Color	Binding Color	Comments
Preliminary Submittals (Design)	White	Standard Staples as required with folded paper binding cover	Provide number of copies as required in addition to set of mylar reproducibles.
Final Submittals (Contract Drawings)	White		
Addendum Drawings (Bidding and RFI's)	Blue		
Contract Modifications (Construction)	Yellow		
As-Builts (Final Submittal)	White		

Table 6.7F



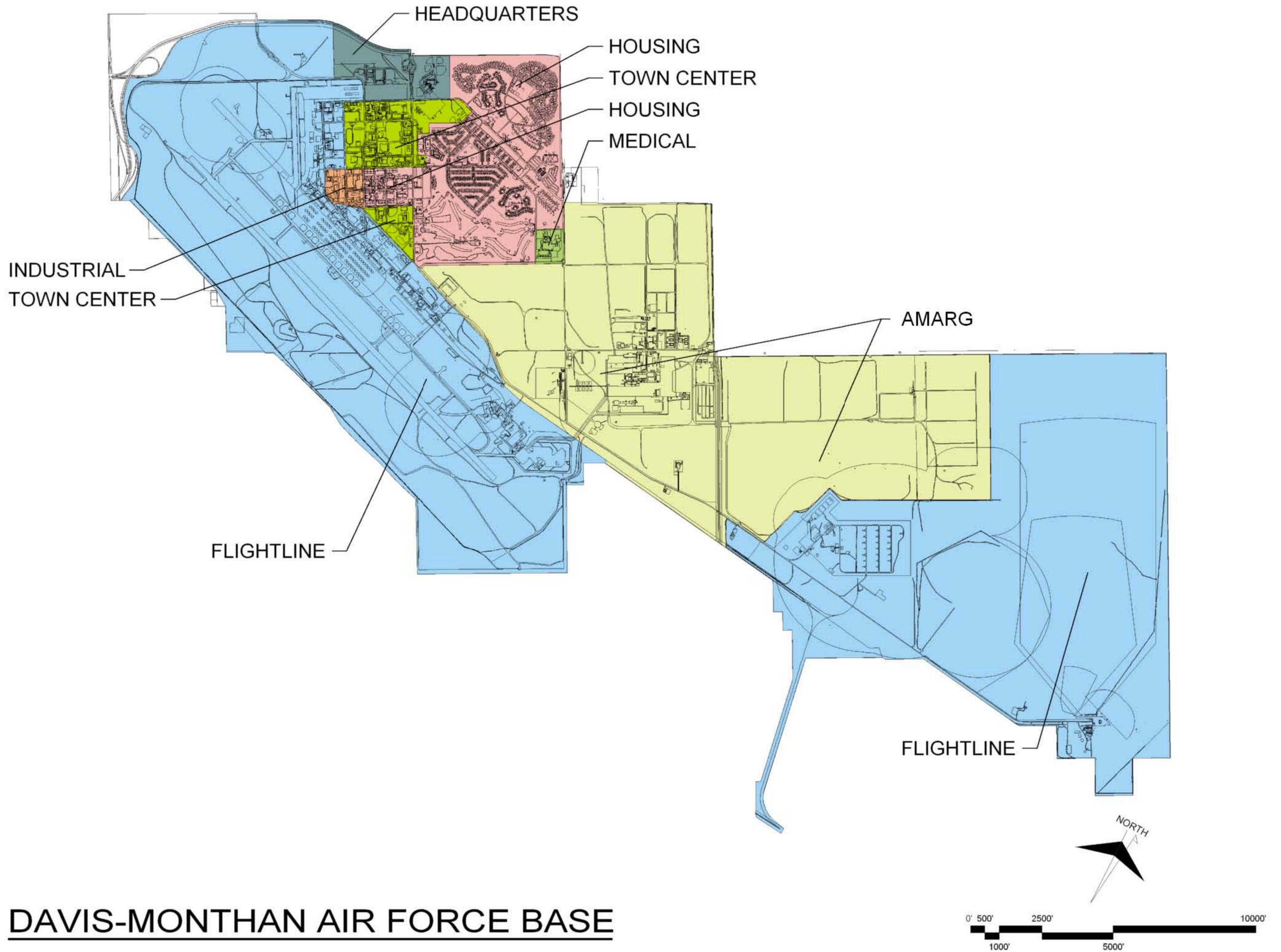
APPENDICES

Appendix A:
What's New:
Design Compatibility Guidelines Updates
This Edition

**What's New:
Design Compatibility Guidelines Updates This Edition**

Section	Heading	Subsection	Subsection Heading	Status	Comment
1.0	Executive Summary			N/A	None
3.0	Architectural Standards	3.4.1	General Standards	Revised	Paragraph 9 – Added requirements for "steel" doors and frames - anodized aluminum no longer permitted.
3.0	Architectural Standards	3.5.1	General Standards	Revised	Paragraph 9 – Storefront configurations that involve both doors and windows shall be provided with steels frames . All steel door and window frames shall be factory finished by either powder coating or electrostatic painting to match the color of anodized aluminum
4.0	Civil Engineering Standards			N/A	None
5.0	Interior Design Standards	5.3.9	Finish Pallets	New	New Paragraph 3 - Installation and use of electric hand-dryers or any other similar energy intense specialties is not permitted.
6.0	Engineering Standards	6.1.1	General Standards (Mechanical Design)	New	New Paragraph 10 – All mechanical compressors shall be specified to perform in multiple stages of capacity. Non multi-stage compressors are not permitted over 19 tons.
6.0	Engineering Standards	6.1.1	General Standards (Mechanical Design)	New	New Paragraph 11 – As applicable, provide Low Ambient Kits on systems that are designed to be "cooling" operational year-round or have critical cooling requirements (i.e. Server Rooms, Simulators, etc.)
Appendix	A: What's New: DCG Updates	-	-	Revised	Entire Section
Appendix	C: HVAC Matrix			Revised	Added note for Multi-Stage Compressor Requirement

Appendix B:
Base Map/Character Areas





**APPENDIX B
PRIMARY AND SECONDARY
STREETS**

Primary Streets: 
 Secondary Streets: 

Appendix C:

HVAC Matrix

Appendix D:
Policy Letters



**DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA**

18 Mar 02

**MEMORANDUM FOR 355 CES/CC
3791 S 3rd Street
Davis-Monthan AFB AZ 85707-3844**

**FROM: HQ ACC/CEC
129 Andrews Street, Suite 102
Langley AFB VA 23665-2777**

SUBJECT: Blanket Waiver Request to ACC Standards for Standing Seam Metal Roof Color at Davis-Monthan AFB (Your Memo, 20 Dec 01 and Our Memo 18 Jan 02)

- 1. We received the proposed samples for roof and wall colors requested in our 18 Jan 02 memo. The use of the light colored almond or putty colored roof for the Davis-Monthan AFB Architectural Standards is approved.**
- 2. We agree that your concept to use light colored roofs is more consistent with the desert heat. The light colored roofs will help lower cooling loads and reduce the fading effect found with darker roofs. Your photographs demonstrate that there is a significant enough difference in the wall and roof colors to maintain differentiation on the façade. Further the use of balconies, entry trellises, and other architectural features will create shadow effects adding to that differentiation.**
- 3. We appreciate your interest in your base's architectural compatibility program. Our POC for this matter is Ms Paula Loomis, 764-0798 or paula.loomis@langley.af.mil.**

**PATRICK A. BURNS
Brigadier General, USAF
The Civil Engineer**



DEPARTMENT OF THE AIR FORCE
355TH FIGHTER WING (ACC)
DAVIS-MONTHAN AIR FORCE BASE, ARIZONA

JUN 1

MEMORANDUM FOR 12 AF/CC, GROUP COMMANDERS AND ALL TENANT UNITS

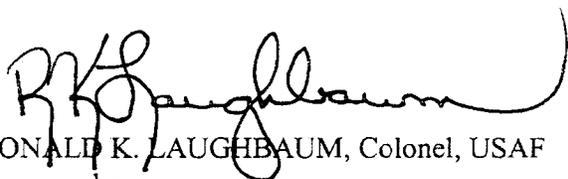
FROM: 355 FW/CC

SUBJECT: 355th Fighter Wing Policy Letter - Reserved Parking
(S/S 355 WG/CC Memo, 12 Jan 06)

1. The approval authority for all reserved parking spaces is the 355th Civil Engineer Squadron Commander. Existing signs that do not meet the requirements of this policy will be removed. ~~The list of positions that may have reserved parking signs are as follows:~~

Twelfth Air Force Commander
Twelfth Air Force Vice Commander
355th Fighter Wing Commander
355th Fighter Wing Vice Commander
Twelfth Air Force and 355th Fighter Wing Command Chiefs
Group Commanders and Deputies
Aircraft Maintenance and Regeneration Group Commander
Squadron Commander and Deputies
Section Commanders
Unit First Sergeants
General Officers
Colonels
Chief Master Sergeants
Government Owned Vehicles
Civil Engineer Maintenance Vehicles (around mechanical rooms only)
Wing Quarterly Award Winners
Handicapped
Visitors
Customers

2. The wing POC is the base traffic engineer who works in Maintenance Engineering, 355 CES/CEOE. Please coordinate any exceptions to policy through this office. The contact number is DSN 228-4181.


RONALD K. LAUGHBAUM, Colonel, USAF
Commander

GLOBAL POWER FOR AMERICA



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON DC

APR 27 2006

MEMORANDUM FOR ALMAJCOM/A7/C

FROM: AF/A7C
1260 Air Force Pentagon
Washington, DC 20330-1260

SUBJECT: Department of Defense (DoD) Facility Metering Installation Initiative

Attached is DoD's Installation Energy Management Instruction (DoDI 4170.11), updated 22 Nov 05, which reflects Public Law 109-58, Energy Policy Act of 2005, dated 8 Aug 05, and implements DoD Directive 4140.25, dated 12 Apr 04. A key initiative of this DoDI is the application of meters and/or sub meters for all facilities where appropriate and cost effective by 1 Oct 12. As a result of this DoDI:

a. Installation Civil Engineers will identify and meter existing facilities for electricity, natural gas and water based on cost effectiveness. Cost effectiveness is met where the cost of the meter, installation and ongoing maintenance, and data collection and management do not exceed 20% of the yearly utility cost. Existing facilities 35,000 square feet and larger will be metered for electricity consumption; 50,000 square feet and larger will be metered for natural gas consumption.

b. Steam will be metered at steam plants.

c. All new facility and utilities system renovation projects exceeding \$200K will have meters installed for electricity, natural gas and water. Meters will have interval and remote reading capability.

d. Advanced meters shall be installed on at least 15% of the required facilities annually.

On a case-by-case basis installations may install simpler, locally read meters if it is determined that advanced meters are not practical. Installations will document findings that support a determination of exemption for facilities that fall into the categories above and forward to MAJCOM level for approval. The MAJCOM will forward all approved exemptions to HQ AFCESA/CESM to be used as part of the annual energy report to Congress on progress of meeting the metering goal.

It is DoD policy that utility infrastructure be secure, safe, reliable and efficient. We have an opportunity through metering, and the collection and analysis of the metering data to reap the benefits of energy and cost savings. We appreciate your continued support and efforts as we move forward towards meeting OSD's energy goals for our installations. Technical issues regarding this policy can be directed to Mr. Gerald Doddington, HQ AFCESA/CESM, at DSN 523-6222, COMM (850) 283-6222. Our POC is Captain Christopher Buzo, HQ USAF/A7CCD, at (703)-601-0196.

Kathleen I. Ferguson
KATHLEEN I. FERGUSON, P.E.
The Deputy Civil Engineer
DCS/Logistics, Installations & Mission Support

Attachment:
DoDI 4170.11, 22 Nov 05



DEPARTMENT OF THE AIR FORCE

355TH CIVIL ENGINEER SQUADRON (ACC)
DAVIS-MONTHAN AIR FORCE BASE, ARIZONA

11 Sep 2007

MEMORANDUM FOR 355 CONS/MSCA

FROM: 355 CES/CEC

SUBJECT: Brand Name Justification

1. The following brand name justification documentation is submitted for your review and approval in accordance with the procedures outlined in FAR 6.302-1(c).

2. Description of Supplies/Services to be acquired: Purchase of Vindicator Security Systems, Monaco Fire Alarm and Mass Notification Systems, Staefa Control Systems, Best Door Hardware and Ion Meters.

3. Justification for Brand Names: Civil Engineering has a base standard for these systems. At present 100% of security alarms are Vindicator, 100% of fire alarms are Monaco, 98% of Energy Management Control Systems (EMCS)/HVAC controls are Staefa, and the Ion meters interface with the EMCS. The maintenance and repair training for these systems is very brand name specific so it is necessary to keep the systems the same kind for training purposes. With multiple brand names, the end user would need to be trained how to use all the different systems. CE spare parts inventory will remain manageable with all systems of the same brand name. Also, for every brand name specified, a different software system is required, resulting in extra costs for the purchase of each system. Having the same name brand on the above systems would be the most cost effective.

4. Actions taken to Preclude Future Brand Name Acquisitions for Same Supply/Services: None, all system replacements on DM by CE will be these brand names.

5. Technical/Requirements Advisor Certification: This justification is certified as accurate and complete to the best of the Technical/Requirements Advisor's knowledge and belief. The above proposed brand names are the only systems that will satisfy the bases requirements.

A handwritten signature in black ink, appearing to read "JAMES B. BARKER". The signature is stylized with a large loop and a horizontal line extending to the left.

JAMES B. BARKER, P.E., YF-02
Chief, Engineering Flight

Request for Waiver from Davis-Monthan Design Compatibility Guidelines (DCG) Requirements				
Name, Organization of Requester		Phone Number	Date of Request	
DCG Requirement Requiring Waiver				
Reason for Waiver				
Justification (include drawings or photographs if relevant)				
Impact if Not Provided				
For Government Use Only				
Approval Granted		Yes	No	
Comments From Approving Official				
Name, Title of Approving Official				
Signature of Approving Official		Date		



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, DC

DEC 17 2007

MEMORANDUM FOR ALMAJCOM/A7, AFCEE, AFCESA

FROM: HQ USAF/A7C

SUBJECT: Roles and Responsibilities at Final Inspection and Acceptance of Facilities

Ref:

- (a) UFC 1-300-08 Transfer and Acceptance of Military Real Property, June 2004
- (b) DUSD I&E Real Property Acceptance Requirements (RPAR), Aug 2006
- (c) DUSD I&E Real Property Construction in Progress Requirements (RPCIPR), Oct 2006
- (d) PL 101-576, Chief Financial Officers (CFO) Act of 1990

1. We need your assistance in requiring installations to collect and document all real property (RP) data associated with the receipt of newly constructed or improved facilities. Getting accurate facility data on the "books", e.g. loaded in the Automated Civil Engineer System RP module, supports: modeling of sustainment needs; data accountability responsibilities; and provides an effective audit trail.

2. The Department of Defense issued new policy and guidance (ref above), mandated by legislation, identifying the roles and responsibilities for all members involved in accepting and capitalizing new and improved real property assets. This memo emphasizes the importance of the criteria and the need to fully comply with the requirements. The basics of these practices include the following:

- Pre-final DD Form 1354, *Transfer and Acceptance of Military Real Property*, is required from the construction agent, i.e. US Army Corps of Engineers (USACE), Naval Facilities Engineering Command (NAVFAC), or the construction contractor at least 30 days before final inspection of any facility construction project that meets or exceeds the \$20,000 capitalization threshold.
- The construction agent (CA) project manager, in coordination with the Civil Engineering Squadron (CES) construction project manager (PM), shall invite all appropriate facility stakeholders such as: facility user, operators and maintainers, real property accountable officer (RPAO), security, fire protection, safety, environmental and communications, to participate in the pre-final and final inspections..
- The CES-assigned PM will provide an accurate and complete *Pre-final* DD Form 1354 to the installation RPAO within three (3) days of accepting any portion of the facility. The RPAO will obtain necessary coordination and relevant data input from functions with a vested interest in the facility's profile to include construction and financial status, historic and environmental status, and associated demolition/disposal activities.

- The RPAO will capitalize the asset within ten (10) work days of receipt of the *Pre-final* DD Form 1354 and update the estimate with final amounts not more than ten (10) working days after receipt of the *Final* DD Form 1354 provided at financial close-out.
- The target financial close-out period is four (4) months after physical completion of the facility or infrastructure. The period begins when the *Final* DD Form 1354 transfers the completed project to the Air Force and the facility's using organization.
- The RPO shall closely coordinate actions at the Placed in Service Date with the BCE Resources Flight Chief who in turn works closely with the Installation FM to ensure the construction-in-progress (CIP) account is updated and accurately reflects the cost of the asset accepted on the *Final* DD Form 1354.

3. Accurate records are required to support civil engineering real property accountability, facility sustainment, restoration, modernization, and demolition requirements, and serve as the basis for resource advocacy from the Air Force Corporate Structure and OSD. I need your personal attention at facility acceptance to ensure we fully adhere to these guidelines and continue to effectively manage our real property assets.

If you need any additional information, please have your staff contact Mr. Charles Lee at Charles.Lee@pentagon.af.mil, DSN: 332-5540 or Comm. (703) 602-5540 or Mr. David Barrineau, DSN: 604-3975 or Coml: (703) 604-3975 or David.Barrineau@pentagon.af.mil.



PAUL A. PARKER
The Deputy Civil Engineer
DCS/Logistics, Installations & Mission Support

cc:
Mr. Tollefson, OSD Comptroller
Ms. Erickson, AFAA

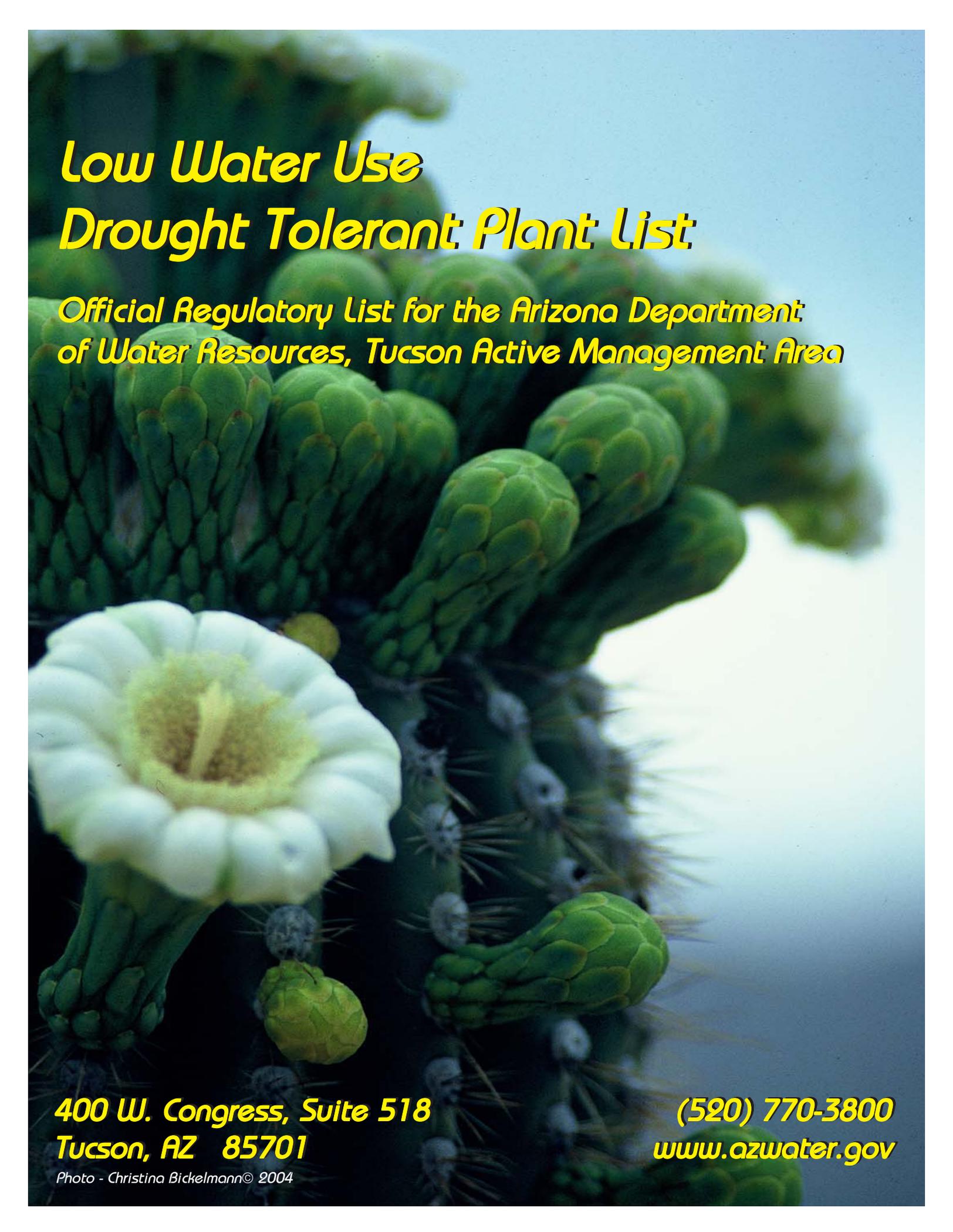
Appendix E:
Product Alternatives

Product Alternates

All product alternates must be approved by the Chief Engineer prior to use in any construction project. For door hardware alternates refer to Appendix J: Specification and Performance Guideline – Door Hardware.

- **Roofing Metal Alternates**
AARA Architectural Metals, Shur-Lock, Color: Sandstone
- **Exterior Wall Alternates**
Young Block Co., Color: Buff #1
- **Energy Meter Alternates**
Siemens Model 9350
Siemens Model 9310
- **Paint Alternatives**
Sherwin Williams, Color: India Tan, B42WJ951 (Satellite antenna)
Sherwin Williams, Color: Cowboy Brown, B40WJ858 (Satellite support structure)

Appendix F:
Landscape Plant List



Low Water Use Drought Tolerant Plant List

***Official Regulatory List for the Arizona Department
of Water Resources, Tucson Active Management Area***

***400 W. Congress, Suite 518
Tucson, AZ 85701***

***(520) 770-3800
www.azwater.gov***

Photo - Christina Bickelmann© 2004



ROP YOUR WATER USE!

Tucson is Educating Consumers to Drop their Water Use . . .

The Tucson office of the Arizona Department of Water Resources (ADWR) has developed a new pilot program, **Drop Your Water Use**, to educate retail nursery customers on how to plan and maintain a healthy and water efficient landscape.

The program is a voluntary collaboration between ADWR and local nurseries that uses a simple water drop system to identify plants with similar water requirements. Plants are labeled one through three, distinguished with corresponding water drops and numbers.

All of the labeled plants are Xeriscape plants currently on the Tucson AMA -Low Water Use/Drought Tolerant plant list. The one through three numbering system correlates with the plant list.



A “number one” indicates very low water use mostly native Sonoran and Chihuahuan desert plants,



Two is low water use,



Three is moderate water use.

By choosing plants with the same number a gardener can more successfully group plants by water needs.

Although the plants are all low-water-using, the frequency that they need to be irrigated varies from approximately once a week to once a month after the plants are established (in about 2-3 years). ADWR hopes that consumers will use separate valves on their irrigation system to water each zone and irrigate trees separately, enabling them to manage their irrigation water use more efficiently.

To date, fourteen Tucson retail nurseries and all six Tucson area Home Depot's have signed up for the program. ADWR is working with other nurseries to encourage them to participate. Wholesale nurseries in Phoenix and Tucson are also participating in the program by adding water drop symbols to the labels on plants to be sold in Tucson.

Retail nurseries that participate receive free posters, water drop stickers for their signage and handouts for their customers explaining the program and watering guidelines. In addition all participating nurseries will be listed on the ADWR website and will be promoted in press releases and at community events.

Anyone interested in more information or Tucson nurseries that would like to sign up for the program should contact Christina Bickelmann, Water Conservation Specialist for the Tucson ADWR office @ (520) 770-3816 or email: cbickelmann@azwater.gov

LOW WATER USE/DROUGHT TOLERANT PLANT LIST

OFFICIAL REGULATORY LIST FOR:

Arizona Department of Water Resources - Tucson Active Management Area Pima County, City of Tucson, Town of Oro Valley, Town of Marana

The plants on this list can be grown in the Tucson area with very low to moderate supplemental irrigation once they are established. Supplemental irrigation should be of sufficient quantity to saturate the plant's root zone. All plants listed can grow with less water than traditional high water use landscape plants and do not require more than the ADWR regulations for low water use plants, a maximum of 18 inches of supplemental irrigation on an annual basis, not including rainfall. In addition to water requirements, other factors (e.g. highly invasive) may be considered to determine acceptability of individual plants for addition to the list. The list provides a wide array of plants to accomplish a variety of low water use landscape designs.

Applications for additions, deletions or exceptions to the list may be submitted to the Department of Water Resources, Tucson Active Management Area Office for consideration. Phone: (520) 770-3800. The list and application forms may be downloaded from the ADWR website at www.water.az.gov

Key to symbols:

* Irrigation:

1 – Very low, irrigate every 3-4 weeks during the growing season after establishment in 2-3 years

2 – Low, irrigate every two to three weeks during the growing season after establishment in 2-3 years

3 – Moderate, irrigate weekly during the growing season after establishment in 2-3 years

* *Average annual rainfall for Tucson is 11-12"; in low rainfall years the plants on the list may need additional irrigation to maintain good appearance and plant health.*

Growing Season:

Wi winter – apply water September through March; less frequently in off season

Su summer – apply water March through September; less frequently in off season

Plant Type:

A accent plant

C cactus

Gc groundcover

Gr ornamental grass

An annual

S shrub

Sc succulent

T tree

V vine

P perennial

Seasonal Color:

cl showy flowers, fall color, berries

Allergenicity:

a strongly allergenic

b moderately allergenic

c weakly allergenic

Hardiness:

(sh) semi-hardy -- some dieback in a hard frost

(t) tender – severely damaged or killed in a hard frost

Allergenicity of the plants was classified with the help and advice of Michael J. Schumacher, M.D., Professor, Dept. of Pediatrics and Head, Allergy-Immunology Section, Univ. of Arizona Health Sciences Center and Mark R. Sneller, Ph.D., Office of Pollen and Mold Control, Pima County Health Dept.

Native Plants:

CD Chihuahuan Desert- includes north central and NW Mexico, SW Texas, southern New Mexico and extreme SE Arizona

SD Sonoran Desert – includes arid and semi-arid areas of NW Mexico, SE California and most of Arizona south of the Mogollon Rim

Note: Chihuahuan and Sonoran Desert Regions annotated by Matt Johnson, Native Plant Society.

Special Considerations:

Toxic: may be harmful if eaten. Call Arizona Poison Control Center at 626-6016

Invasive: may spread and intrude into natural and cultivated areas

Spreads in cultivated areas: may spread by seed or sucker in urban or cultivated areas

Low Water Use Drought Tolerant Plant List - Tucson Active Management Area

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
2	<i>Abutilon palmeri</i>	Indian Mallow	Su	S					Yes	sh	SD
2	<i>Acacia aneura</i>	Mulga	Su	T	c					sh	Austr.
2	<i>Acacia angustissima</i>	White Ball Acacia	Su	S	c					sh	SD
3	<i>Acacia berlandieri</i>	Guajillo	Su	T,S	c				Yes		CD
1	<i>Acacia constricta</i>	Whitethorn, Mescat Acacia	Su	T,S	c			Yes	Yes		SD,CD
1	<i>Acacia crasspedocarpa</i>	Waxleaf Acacia	Su	T,S	c				Yes		Austr.
2	<i>Acacia cultiformis</i>	Knife-Leaf Acacia	Su	T,S	c					sh	Austr.
3	<i>Acacia farnesiana (small)</i>	Southwestern Sweet Acacia	Su	T,S	c			Yes	Yes		SD,CD
1	<i>Acacia greggii</i>	Catclaw Acacia	Su	T,S	c			Yes	Yes		SD,CD
2	<i>Acacia notabilis</i>	Notable Acacia	Su	S	c						Austr.
2	<i>Acacia redolens</i>	Prostrate Acacia	Su	S,Gc	c						Austr.
2	<i>Acacia rigidula</i>	Black Brush Acacia	Su	T,S	c						CD
2	<i>Acacia salicina</i>	Willow Acacia	Su	T	c					sh	Austr.
2	<i>Acacia saligna</i>	Weeping Wattle	Su	T	c					sh	Austr.
3	<i>Acacia schaffneri</i>	Twisted Acacia	Su	T	c						CD
2	<i>Acacia stenophylla</i>	Pencilleaf Acacia	Su	T	c						Austr.
2	<i>Acacia willardiana</i>	Palo Blanco	Su	T	c					sh	SD
3	<i>Achnatherum hymenoides (Oryzopsis hymenoides)</i>	Indian Ricegrass	Su	Gr	a						SD,CD
1	<i>Agave americana & varieties</i>	Century Plant	Su	A,Sc							CD
2	<i>Agave angustifolia v. marginata</i>		Su	A,Sc						sh	Mex.

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
2	Agave bovicornuta	Cow's Horn Agave	Su	A,Sc						sh	Mex.
2	Agave bracteosa	Spider Agave	Su	A,Sc							CD
2	Agave celsii	Apple Green Agave	Su	A,Sc							E. Mex.
2	Agave chrysantha	Golden Flower Agave	Su	A,Sc						sh	AZ
2	Agave colorata	Mescal Ceniza, Blue Century Plant	Su	A,Sc							SD
2	Agave desmetiana & varieties	Smooth Agave	Su	A,Sc						t	Mex.
2	Agave filifera	Agave	Su	A,Sc							CD
2	Agave geminiflora	Twin-flowered Agave	Su	A,Sc						sh	Mex.
2	Agave havardiana	Havard Agave	Su	A,Sc							CD
2	Agave huachuensis	Huachuca Agave	Su	A,Sc				Yes			SD
2	Agave lophantha (univittata)	Holly Agave	Su	A,Sc							CD
2	Agave macrocarantha	Black Spine Agave	Su	A,Sc						sh	Mex.
2	Agave montana	Mountain Agave	Su	A,Sc							Mex.
2	Agave multiflora	Chahuiqui	Su	A,Sc						sh	CD
2	Agave murpheyi	Murphy Agave	Su	A,Sc							SD
2	Agave ocahui	Ocahui Agave	Su	A,Sc							SD
2	Agave ovatifolia	Whales Tongue	Su	A,Sc						sh	Mex.
2	Agave palmeri	Palmer Agave	Su	A,Sc							SD
2	Agave parrasana	Parras Agave	Su	A,Sc							Mex.
2	Agave parryi & varieties	Agave	Su	A, Sc				Yes			CD
2	Agave parviflora	Small Flowered Agave	Su	A,Sc							SD

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
2	Agave potatorum		Su	A,Sc						t	Oaxaca Mex.
2	Agave salmiana ssp Ferox		Su	A,Sc						sh	Central Mex.
2	Agave scabra	Rough-leaved Agave	Su	A,Sc							CD
2	Agave schidigera	Agave	Su	A,Sc							Durango Mex.
2	Agave shawii		Su	A,Sc						sh	Baja Cal. Mex.
2	Agave striata		Su	A,Sc							Mojave D
2	Agave utahensis		Su	A,Sc							Mojave D
2	Agave victoriae-reginae & varieties	Queen Victoria Agave	Su	A,Sc							Mex.
2	Agave vilmoriniana	Octopus Agave	Su	A,Sc						sh	SD
2	Agave weberi	Weber Agave	Su	A,Sc							Mex.
1	Aloe barbadensis	Aloe vera	Wl	Sc					Yes	sh	Africa
2	Aloe ferox	Cape Aloe	Su	Sc					Yes	sh	Africa
1	Aloe saponaria	Soap Aloe	Wl	Sc					Yes	sh	Africa
2	Aloe variegata	Partridge Breast Aloe	Su	Sc					Yes		Africa
2	Aloe x	Blue Elf	Wl	A,Sc					Yes	sh	garden variety
2	Aloysia gratissimma	Fragrant Bush, Bee Brush	Su	S				Yes	Yes		SD,CD
2	Aloysia wrightii	Wright's Bee Bush	Su	S							SD,CD
1	Ambrosia deltoidea (Franseria)	Triangle-leaf Bursage	Wl	S	a						SD
1	Ambrosia dumosa (Franseria)	White Bursage	Wl	S	a						SD
3	Amsonia grandiflora	Large-Flowered Blue Star	Su	S,P					Yes		SD
2	Anisacanthus quadrifidus & varieties	Flame Anisacanthus	Su	S					Yes		CD

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
2	<i>Antiscanthus thurberi</i>	Desert Honeyuckle	Su	S					Yes		SD
2	<i>Antigonon leptopus</i>	Queen's Wreath	Su	V					Yes	t	SD
2	<i>Aristida purpurea</i>	Purple Three-awn	Su	Gr				Yes	Yes		SD,CD
2	<i>Artemisia ludoviciana</i>	Prairie Sagebrush	Su	S,Gc	a						SD
3	<i>Asclepias linaria</i>	Pineleaf Milkweed	Su	S		Yes					SD,CD
1	<i>Asclepias subulata</i>	Desert Milkweed	Su	P		Yes			Yes	sh	SD
1	<i>Aster bigelovii</i>	Aster	Su	An					Yes	t	SD
1	<i>Aster tanacetifolius</i>	Aster	Su	An					Yes	t	SD,CD
1	<i>Atriplex canescens</i>	Four-Wing Saltbush	Su	S	a						SD,CD
2	<i>Atriplex lentiformis</i>	Quail Bush	Su	S	a						SD
2	<i>Atriplex lentiformis breweri</i>	Brewer Saltbush	Su	S	a						SD
1	<i>Atriplex nummularia</i>	Old Man Saltbush	Su	S	a						Austr.
1	<i>Atriplex polycarpa</i>	Desert Saltbush	Su	S	a						SD
2	<i>Atriplex semibaccata</i>	Australian Saltbush	Su	S	a						Austr.
2	<i>Baccharis hybrid 'starr'</i>	Thompson Broom	Su	Gc	c						garden cultivar
2	<i>Baccharis sarothroides</i> and hybrids (male varieties only)	Desert Broom	Su	S	a						SD
1	<i>Bahia absinthifolia</i>	Desert Daisy	Wi	P					Yes		SD
1	<i>Baileya multiradiata</i>	Desert Marigold	Wi	P		Yes			Yes		SD,CD
3	<i>Bauhinia lunaroides</i>	Chihuahuan Orchid Shrub	Su	S					Yes		CD
2	<i>Bebbia juncea</i>	Sweet Bush	Su	S,P				Yes	Yes		SD,CD
3	<i>Berberis harrisoniana</i>	Barberry	Su	S					Yes		SD

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
2	<i>Berberis trifoliata</i>	Agritos	Su	S					Yes		SD
3	<i>Berlandiera lyrata</i>	Chocolate Flower	Su	P				Yes	Yes		SE, AZ
2	<i>Bothriochloa barbimodis</i>	Cane Beardgrass	Su	Gr	c				Yes		SD, CD
2	<i>Bougainvillea</i> spp.	Bougainvillea	Su	S, V					Yes	t	Brazil
2	<i>Bouteloua</i> spp.	Grama Grass	Su	Gr	a						SD, CD
2	<i>Brachycthon populneus</i>	Bottle Tree	Su	T							Austr.
3	<i>Brahea (Erythra) armata</i>	Mexican Blue Palm	Su	T	c						SD
3	<i>Buchloe dactyloides</i>	Buffalo Grass	Su	Gr	a						CD
1	<i>Buddleia marrubifolia</i>	Wooly Butterfly Bush	Su	S					Yes		CD
3	<i>Bulbine frutescens</i> and cultivars	Shrubby Bulbine	Wi	Sc					Yes	sh	S. Africa
2	<i>Caesalpinia (Poinciana) gilliesii</i>	Yellow Bird of Paradise	Su	S		Yes	Yes	Yes	Yes		S. Amer.
2	<i>Caesalpinia (Poinciana) mexicana</i>	Mexican Bird of Paradise (yellow)	Su	S		Yes		Yes	Yes		CD
3	<i>Caesalpinia cacalaco</i>	Cascalote	Su	S		Yes			Yes	sh or t?	Mex.
3	<i>Caesalpinia pulcherrima</i>	Red Bird of Paradise	Su	S		Yes			Yes	sh	Caribb.
2	<i>Callaenum iliacina (Mascagnia)</i>	Lavender Orchid Vine	Su	V					Yes		CD
2	<i>Callaenum macroptera (Mascagnia)</i>	Yellow Orchid Vine	Su	V					Yes	sh	SD, CD
2	<i>Calliandra californica</i>	Baja Fairy Duster	Su	S					Yes	sh	SD
1	<i>Calliandra eriophylla</i>	Fairy Duster, False Mesquite	Su	S					Yes		SD
2	<i>Calliandra peninsularis</i>	Red Calliandra, Baja Fairy Duster	Su	S					Yes	sh	SD
3	<i>Callistemon citrinus</i>	Lemon Bottlebrush	Su	T, S	c				Yes	sh	Austr.
3	<i>Calyptophus hartwegii</i> & varieties	<i>Calyptophus</i>	Su, Wi	Gc				Yes	Yes		CD

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
3	Campsis radicans	Common Trumpet Creeper	Su	V					Yes	sh	SE U.S.
1	Carnegeia gigantea	Saguaro	Su	C					Yes		SD
3	Carpobrotus edulis	Ice Plant	WI	Gc,Sc					Yes	t	Africa
2	Cassia artemisioides	Wormwood Senna, Feathery Cassia	WI	S					Yes	sh	Austr.
2	Cassia nemophila (eremophila)	Green Cassia	WI	S				Yes	Yes		Austr.
2	Cassia phyllodinea	Silvery Cassia	WI	S					Yes		Austr.
2	Casuarina cunninghamiana	Australian Pine	Su	T	b						Austr.
2	Casuarina stricta	Coast Beefwood	Su	T	b						Austr.
2	Cathostecum erectum	False Grama	Su	Gr	c						SD
1	Celtis pallida	Spiny or Desert Hackberry	Su	S	a						SD,CD
3	Celtis reticulata	Netleaf or Western Hackberry	Su	T	a						SD,CD
3	Centaurea cineraria	Dusty Miller	WI	P					Yes		Medit.
2	Cephalophyllum aestonii 'Red Spike'	Red Spike Ice Plant	WI	Gc,Sc					Yes		S. Africa
3	Ceratonia siliqua	Carob, St. John's Bread Tree	Su	T						sh	Medit.
3	Cercis canadensis mexicana	Mexican Redbud	Su	T,S					Yes		CD
1	Cereus hildmannianus (C. peruvianus)	Peruvian Cereus	Su	C					Yes	sh	S. Amer.
3	Chamaerops humilis	Mediterranean Fan Palm	Su	T	c						Spain
3	Chilopsis linearis and cultivars	Desert Willow	Su	T,S				Yes	Yes		SD,CD
2	Chrysactinia mexicana	Damianita Daisy	Su	S					Yes		SW U.S.
2	Cissus trifoliata (C. incisa)	Desert Grape Ivy	Su	V			Yes	Yes			SD,CD
2	Condalia globosa	Bitter Condalia	Su	T,S					Yes		SD

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
1	<i>Condalia warnockii</i> v. <i>kearneyana</i>	Condalia	Su	S							SD,CD
2	<i>Convolvulus oneorum</i>	Bush Morning Glory	Wi	S,Gc		Yes			Yes		S. Eur.
3	<i>Convolvulus mauritanicus</i>	Ground Morning Glory	Wi	Gc					Yes	sh	Africa
2	<i>Cordia boissieri</i>	Anacahuita, Texas Olive	Su	T,S					Yes	sh	CD
2	<i>Cordia parvifolia</i>	Littleleaf Cordia	Su	S					Yes		SD,CD
3	<i>Cupressus arizonica</i> & varieties	Rough-barked Arizona Cypress	Su	T	a						SD,CD
3	<i>Cupressus glabra</i>	Smooth Bark Cypress	Su	T	a						SD
3	<i>Dalbergia sissoo</i>	Rosewood	Su	T						sh	India
2	<i>Dalea bicolor</i> & varieties	Dalea Bicolor	Su						Yes		CD
3	<i>Dalea capitata</i>	Yellow Dalea	Su	Gc					Yes		Mex.
3	<i>Dalea frutescens</i>	Black Dalea	Su	S					Yes		CD
2	<i>Dalea greggii</i>	Trailing Indigo Bush	Su	Gc					Yes		CD
2	<i>Dalea pulchra</i>	Indigo Bush	Su	S					Yes		SD
3	<i>Dalea versicolor</i> var. <i>sessilis</i>	Indigo Bush, Dalea	Su	S					Yes		SD
2	<i>Dasyliiron acrotiche</i>	Green Desert Spoon	Su	A							CD
2	<i>Dasyliiron leiophyllum</i>	Green Desert Spoon	Su	A							CD
2	<i>Dasyliiron quadrangulatum</i> (<i>D. longissimum</i>)	Toothless Desert Spoon	Su	A							CD
2	<i>Dasyliiron texanum</i>	Green Desert Spoon	Su	A							CD
2	<i>Dasyliiron wheeleri</i>	Sotol, Desert Spoon	Su	A							SD,CD
2	<i>Datura wrightii</i>	Sacred Datura	Su	Gc		Yes			Yes	sh	SD
2	<i>Didiplera resupinata</i>	Native Didiplera	Su	P				Yes	Yes		SD,CD

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
2	<i>Digitaria californica</i>	Arizona Cottontop	Su	Gr	a						SD,CD
3	<i>Dimorphotheca sinuata</i>	African Daisy, Cape Marigold	WI	An					Yes		S. Africa
2	<i>Dodonaea viscosa</i> & varieties	Hopbush	Su	S						sh	SD,CD
2	<i>Dyssodia acerosa</i>	Dogweed	Su	Gc					Yes		SD,CD
2	<i>Ebenopsis ebano</i> (<i>Pithecellobium flexicaule</i>)	Texas Ebony	Su	T					Yes	sh	CD
1	<i>Echinocactus grusonii</i>	Golden Barrel	Su	C					Yes		SD
1	<i>Echinocereus</i> spp.	Hedgehog, Rainbow Cactus	Su	C					Yes		CD,SD
1	<i>Echinopsis</i> spp. & varieties	Easter Lily, Sea Urchin Cactus	Su	C					Yes		S. Amer.
1	<i>Encelia californica</i>	California Brittlebush (green)	WI	S	c				Yes	sh	SD
1	<i>Encelia farinosa</i>	Brittlebush	WI	S	c				Yes	sh	SD
1	<i>Ephedra nevadensis</i>	Ephedra	Su	S		Yes					SD
3	<i>Eragrostis intermedia</i>	Plains Lovegrass	Su	Gr	a						SD,CD
1	<i>Eremophila decipiens</i>	Emu Bush	Su	S					Yes		Austr.
2	<i>Eremophila hybrid</i>	Summertime Blue	Su, WI	S					Yes	sh	Austr.
2	<i>Eremophila laanii</i> 'pink beauty'	Emu Bush	Su, WI	S					Yes	sh	Austr.
2	<i>Eremophila maculata</i> 'valentine'	Valentine Emu Bush		S					Yes		Austr.
2	<i>Ericameria laricifolia</i> and cultivars	Turpentine Bush	Su						Yes		SD
2	<i>Erigeron divergens</i>	Native Fleabane	WI	Gc,An,P			Yes	Yes	Yes		SW U.S.
2	<i>Eriogonum fasciculatum</i> v. <i>poliofolium</i>	Flattop Buckwheat	WI	S					Yes		S. CA, AZ, UT
2	<i>Eriogonum wrightii</i>	Wright Buckwheat	WI	S					Yes		SD
1	<i>Eriogonum pulchellus</i>	Fluffgrass	Su	Gr	a						SD,CD

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
3	Eschscholtzia californica	California Poppy	Wi	An					Yes		SD
3	Eschscholtzia mexicana	Mexican Gold Poppy	Wi	An					Yes		SD
3	Eucalyptus camaldulensis	Red River Gum	Su	T	c					sh	Austr.
2	Eucalyptus campaspe	Silver Gimlet	Su	T	c					sh	Austr.
2	Eucalyptus formanii	Eucalyptus	Su	T	c						Austr.
2	Eucalyptus leucoxydon (rosea)	White Iron Bark	Su	T	c				Yes		Austr.
2	Eucalyptus microtheca	Tiny Capsule Eucalyptus, Coolibah	Su	T	c						Austr.
2	Eucalyptus papuana	Ghost Gum	Su	T	c					sh	Austr.
2	Eucalyptus polyanthemus	Silver Dollar Gum	Su	T	c						Austr.
2	Eucalyptus rudis	Desert Gum	Su	T	c						Austr.
2	Eucalyptus sargentii	Salt River Mallet	Su	T	c					sh	Austr.
2	Eucalyptus spathulata	Swamp Mallee	Su	T	c						Aust.
1	Euphorbia antisyphilitica	Wax Plant, Candelilla	Su	S							CD
2	Euphorbia myrsinites	Euphorbia	Wi	Gc							S. Europe, Cnt. Asia
2	Euphorbia rigida (biglandulosa)	Gopher Plant	Wi	A,Sc		Yes		Yes	Yes		Africa
2	Eysenhardtia orthocarpa	Kidneywood	Su	T							CD
3	Eysenhardtia texana	Texas Kidneywood	Su	T					Yes		CD
3	Feijoa sellowiana	Pineapple Guava	Su	T,S					Yes		S. Amer.
1	Ferocactus spp.	Barrel Cactus	Su	C					Yes		SD,CD
1	Fouquieria columnaris	Boojum	Wi	T,A						sh	Baja
1	Fouquieria macdougalii	Mexican Tree Ocotillo	Su	S,A					Yes	t	SD

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
1	Fouquieria splendens	Ocotillo	Su	A					Yes		SD, CD
3	Fraxinus greggii	Littleleaf Ash	Su	T, S	a						CD
2	Gaillardia aestivalis spp. winkleri	Winkler Gaillardia	Wi	P					Yes	sh	TX
2	Gaillardia pinnatifida	Blanketflower	Wi	P					Yes		SW U.S.
3	Gaillardia pulchella	Fire Wheel, Blanket Flower	Wi	An					Yes		CD
3	Gazania rigens & varieties	Gazania	Wi	Gc					Yes		Africa
3	Geijera parviflora	Australian Willow	Su	T							Austr.
1	Geoffreya (Gourleia) decorticans	Chilean Palo Verde	Su	T					Yes		S. Amer.
1	Glandularia goodingii (Verbena)	Gooding Verbena	Wi	P					Yes		SD
3	Glandularia pulchella (V. tenuisecta) (V. tenera)	Moss Verbena, Fineleaf Verbena	Su, Wi	P			Yes	Yes	Yes		S. Amer.
2	Gossypium harknessii	Gossypium	Su	S					Yes	t	SD
3	Guaiacum coulteri	Guayacan	Su	T, S					Yes	sh	SD
1	Gutierrezia sarothrae	Snakeweed	Su	S, P				Yes	Yes		W. U.S., CAN, Mex.
3	Hamelia patens	Texas Firecracker Bush	Su	S					Yes	sh	FL, Caribn.
2	Havardia mexicana (Pithecellobium mexicanum)	Mexican Ebony	Su	T							SD
2	Havardia pallens (Pithecellobium pallens)	Tenaza	Su	T	c					sh	CD
2	Hesperaloe campanulata	Bell Flowering Hesperaloe	Su	A					Yes		NM
2	Hesperaloe funifera	Giant Hesperaloe	Su	A							CD
2	Hesperaloe nocturna	Night Flowering Hesperaloe	Su	A					Yes		SD
2	Hesperaloe parviflora & varieties	Red Yucca, Yellow Yucca	Su	A					Yes		CD
3	Heteropogon contortus	Tanglehead	Su	Gr	c			Yes			SD

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2	Hibiscus coulteri	Yellow Hibiscus, Coulter's Hibiscus	Su	S					Yes		SD,CD
2	Hilaria berlandieri	Curly mesquite	Su	Gr	b						SD,CD
2	Hilaria mutica	Tobosa grass	Su	Gr	b						SD,CD
2	Hilaria rigida	Big galleta grass	Su	Gr	b						SD,CD
1	Hypis emoryi	Desert Lavendar	Su	S						sh	SD
1	Jatropha cardiophylla	Limberbush	Su	S							SD
1	Jatropha dioica	Jatropha	Su	S					Yes	t	CD
3	Juniperus chinensis and cultivars	Juniper	Su	T	b						Asia
3	Juniperus depeana	Alligator Bark Juniper	Su	T	a						SD,CD
3	Juniperus sabina	Sabine Juniper	Su	S	b						AZ
2	Justicia californica and cultivars (Beloperone)	Chuparosa	Su	S					Yes	sh	SD
2	Justicia candidans	Red Jacobinia	Su	S					Yes	sh	SD
3	Justicia fulvicoma	Mexican Plume	Su	S					Yes	t	Mex.
3	Justicia spicigera	Firecracker Bush	Su	S					Yes	sh	SD
3	Lantana camara and cultivars	Bush Lantana	Su	S			Yes		Yes	t	U.S.
3	Lantana montevidensis	Trailing Lantana	Su	Gc					Yes	t	S. Amer.
1	Larrea tridentata (divaricata)	Creosote Bush, Greasewood	Su	S					Yes		SD,CD
3	Leptochloa dubia	Green Sprangle-Top	Su	Gr	a						CD
2	Leucaena retusa	Golden Leadball	Su	T					Yes	sh	CD
2	Leucophyllum spp. & varieties	Texas Ranger	Su	S					Yes		CD
3	Linum grandiflorum 'Rubrum'	Scarlet Flax	Wi	An					Yes		N. Africa

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3	<i>Linum lewisii</i>	Blue Flax	Wi	An					Yes		SD, CD
1	<i>Lophocereus schottii</i>	Senita	Su	A						sh	SD
1	<i>Lophocereus schottii</i> , ssp. <i>Monstrosus</i>	Totem Pole Cactus	Su	A, C							
2	<i>Lotus rigidus</i>	Desert Deerweed	Wi	Gc, P					Yes		SD
1	<i>Lupinus arizonicus</i>	Lupine	Wi	An					Yes		SD
1	<i>Lupinus sparsiflorus</i>	Desert Lupine	Wi	An					Yes		SD
1	<i>Lupinus succulentus</i>	Arroyo Lupine	Wi	An					Yes		SD
2	<i>Lycium andersonii</i>	Desert Wolfberry	Su	S					Yes		SD
1	<i>Lycium exsertum</i>	Thornbush	Su	S							SD
1	<i>Lycium fremontii</i>	Wolfberry	Su	S							SD
2	<i>Lycium pallidum</i>	Desert Thorn	Su	S					Yes		SD, Mojave D
3	<i>Lysiloma thornberi</i>	Feather Bush	Su	T, S				Yes	Yes	sh	SD
2	<i>Macfadyena unguis-cati</i>	Cat's Claw Vine	Su	V				Yes	Yes		U.S.
1	<i>Maireana sedifolia</i>	Pearl Bluebush		S						sh	Austr.
2	<i>Malephora crocea</i>	Crocoem, Ice Plant	Su	Gc, Sc					Yes		S. Africa
3	<i>Malephora lutea</i>	Rocky Point Ice Plant	Su	Gc, P					Yes	sh	S. Africa
1	<i>Mammillaria</i> spp.	Pincushion, Fishhook Cactus	Su	C					Yes		CD
2	<i>Maytenus phyllanthoides</i>	Mangle Dulce	Su	S							SD, CD
2	<i>Melampodium leucanthum</i>	Blackfoot Daisy	Su	Gc				Yes	Yes		SD, CD
2	<i>Merremia aurea</i>	Yellow Merremia	Su	V					Yes	t	SD
2	<i>Mimosa dysocarpa</i>	Velvetpod	Su	S	c				Yes		SD

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
3	Mirabilis multiflora	Colorado Four O'clock	Su	Gc,P,V					Yes		U.S.
3	Muhlenbergia capillaris	Regal Mist	Su	Gr					Yes		U.S.
3	Muhlenbergia dumosa	Bush Muhlenbergia, Bamboo Muhly	Su	Gr	a						SD
2	Muhlenbergia emersleyi	Bullgrass	Su	Gr	a						SD
3	Muhlenbergia lindheimeri	Autumn Glow	Su	Gr					Yes		TX
1	Muhlenbergia porteri	Bush muhly	Su	Gr	a				Yes		SD,CD
2	Muhlenbergia rigens	Deer grass	Su	Gr	a						SD
3	Muhlenbergia rigida	Muhlenbergia	Su	Gr	a				Yes		SD
3	Myoporum parvifolium	Myoporum	Su	Gc							Austr.
3	Myrtus communis & varieties	True Myrtle, Roman Myrtle	Su	S							Medit.
3	Nandina domestica & varieties	Heavenly Bamboo	Su	S					Yes		Asia
2	Nassella tenuissima	Mexican Feather Grass	Su	Gr	b						CD
2	Nerium oleander & varieties	Oleander	Su	S		Yes			Yes		Asia
1	Nolina beltingii	Belting's Nolina	Wi	A							Baja
1	Nolina bigelovii	Beargrass	Su	A							SD
1	Nolina lindheimeriana	Lindheimer's Nolina	Su	A							TX
1	Nolina matapensis	Tree Beargrass	Su	A							SD
1	Nolina microcarpa	Beargrass	Su	A							SD
1	Nolina nelsoni	Blue Nolina	Su	A							Mex.
1	Nolina parryi	Parry's Beargrass	Su	A							SD
1	Nolina texana	Bear Grass	Su	A							TX, NM

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
2	Oenothera berlandieri	Mexican Evening Primrose	Su, Wf	Gc, P				Yes	Yes	sh	CD, TX, Mex.
2	Oenothera caespitosa	White Evening Primrose	Su, Wf	Gc, P					Yes		W. U.S.
2	Oenothera stubbei	Chihuahuan Primrose	Su, Wf	Gc, P					Yes	sh	SD, NE Mex.
2	Olea europaea 'Swan Hill', 'Wilsoni'	Fruitless non-pollinating Olive	Su	T							Medit.
1	Olneya tesota	Desert Ironwood, Tesota	Su	T					Yes	sh	SD, CD
1	Opuntia basilaris	Beavertail Cactus	Su	C					Yes		
1	Opuntia bigelovii	Teddy Bear Cholla	Su	C					Yes		
1	Opuntia engelmannii	Engelmann's Prickly Pear	Su	C					Yes		SW, U.S., Mex.
1	Opuntia ficus-indica	Indian Fig	Su	C					Yes	sh	Mex.
1	Opuntia microdasys	Rabbit Ears Prickly Pear	Su	C					Yes		
1	Opuntia santa rita tubac	Purple Pancake	Su	C					Yes		AZ cultivar
1	Opuntia turpinii	Pinecone Cactus	Su	C					Yes		W. Argentina
1	Opuntia versicolor	Staghorn Cactus	Su	C					Yes		
1	Opuntia violacea macrocentra	Long Spine Prickly Pear	Su	C					Yes		
1	Opuntia violacea 'Santa Rita'	Santa Rita Prickly Pear	Su	C					Yes		
3	Osteospermum fruticosum	Trailing African Daisy	Wf	Gc	c				Yes	sh	Africa
2	Pappophorum mucronulatum	Pappusgrass	Su	Gr	a						SD
2	Parkinsonia praecox (Cercidium)	Palo Brea	Su	T	b				Yes	sh	SD
2	Parkinsonia florida (Cercidium floridum)	Blue Palo Verde	Su	T	b			Yes	Yes		SD
2	Parkinsonia hybrid "Desert Museum" (Cercidium)	Desert Museum Palo Verde	Su	T	b				Yes		SD, CD
1	Parkinsonia microphylla (Cercidium microphyllum)	Littleleaf or Foothill Palo Verde	Su	T	b				Yes		SD

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
1	Parkinsonia x sonorae (Cercidium)	Sonoran Palo Verde	Su	T	b				Yes		SD
3	Passiflora foetida	Passion Flower	Su	V				Yes	Yes	sh	SD
1	Pedilanthus macrocarpus	Slipper Flower	Su	A,Sc		Yes			Yes		SD
2	Pennisetum setaceum `Cupreum`	Purple Fountain Grass	Su	Gr	b						Africa
2	Penstemon ambiguus	Pink Plains Penstemon	Su	P					Yes		W. U.S.
3	Penstemon amphorellae		Su	P					Yes		Central Mex.
3	Penstemon baccharifolius	Cutleaf Penstemon	Su	P					Yes		CD
3	Penstemon barbatus	Beardlongue Penstemon	Wl	P					Yes		SD, CD
3	Penstemon cardinalis	Cardinal Penstemon	Wl	P					Yes		TX
3	Penstemon cobaea	Foxglove	Wl	P					Yes		TX?
3	Penstemon eatoni	Eaton's Penstemon	Wl	P					Yes		SD
3	Penstemon fendleri	Fendler Penstemon	Wl	P					Yes		OK, AZ, NM
3	Penstemon grandiflorus	Large Fendler Penstemon	Wl	P					Yes		TX
3	Penstemon palmeri	Palmer Penstemon	Wl	P					Yes		SW U.S.
3	Penstemon parryi	Parry Penstemon	Wl	P				Yes	Yes		SD
3	Penstemon pinifolius	Pineleaf Penstemon	Su	P					Yes		No. AZ, UT
3	Penstemon pseudospectabilis	Mohave Beardlongue	Wl	P					Yes		SD
3	Penstemon spectabilis		Wl	P					Yes		CA, N. Baja Mex.
3	Penstemon strictus	Rocky Mountain Penstemon	Su	P					Yes		W. U.S.
3	Penstemon superbus	Superb Penstemon	Wl	P					Yes		CD
3	Penstemon triflorus	Hill Country Penstemon	Wl	P					Yes		TX

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3	<i>Penstemon wrightii</i>	Texas Rose, Wright Penstemon	Wi	P					Yes		TX
1	<i>Pentzia incana</i>	Karoo Bush	Su	Gc			Yes	Yes	Yes		S. Africa
2	<i>Phacelia campanularia</i>	Desert Canterbury Bells	Wi	An					Yes		SD
2	<i>Phacelia tanacetifolia</i>	Tansy Phacelia	Wi	An					Yes		SD
2	<i>Phoenix canariensis</i>	Canary Island Date Palm	Su	T	c						Canary Islands
2	<i>Phoenix dactylifera</i>	Date Palm	Su	T	c						Asia
3	<i>Phyla nodiflora</i>	Lippia	Su	Gc					Yes		Trop. S. America
2	<i>Pinus edulis</i>	Pinon Nut Pine	Su	T	c						NM
2	<i>Pinus eldarica</i>	Afghan Pine	Su	T	c						Asia
2	<i>Pinus halepensis</i>	Aleppo Pine	Su	T	c						Medit.
2	<i>Pinus monophylla</i>	Singleleaf Pinon Pine	Su	T	c						Mojave D
2	<i>Pinus pinea</i>	Italian Stone Pine	Su	T	c						Medit.
3	<i>Pinus roxburghii</i>	Chir Pine	Su	T	c						Asia
2	<i>Pistacia atlantica</i>	Mt. Atlas Pistache	Su	T	c						Medit.
3	<i>Pistacia atlantica x integerrima</i>	Pistache hybrid tereb. x integerrima	Su	T	c				Yes	t	Medit. x Asia
3	<i>Pistacia chinensis</i>	Chinese Pistache	Su	T	c				Yes		Asia
2	<i>Pistacia vera</i>	Pistachio	Su	T	c					t	Asia
2	<i>Pittosporum phillipraeoides</i>	Willow Pittosporum	Su	T							Austr.
3	<i>Pittosporum tobira</i> & cultivars	Mock Orange	Su	S							Asia
1	<i>Plantago spp.</i>	Indian Wheat	Wi	An							SD,CD
3	<i>Polionintha maderensis</i>	Lavendar Spice	Su	S					Yes		CD

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3	Portulacaria afra	Elephant Food	Su, Wf	Sc						t	S. Africa
2	Prosopis hybrid	South American Mesquite	Su	T	b						S. Amer.
2	Prosopis glandulosa & varieties	Texas Honey Mesquite	Su	T	b						CD
2	Prosopis pubescens	Screwbean Mesquite	Su	T	b						SD,CD
2	Prosopis velutina (juliflora)	Velvet Mesquite	Su	T	b						SD
1	Psilostrophe cooperi	Paper Flower	Wf	P					Yes		SD,CD
1	Psilostrophe tagetina	Paper Flower	Wf	P					Yes		SD,CD
3	Punica granatum & varieties	Pomegranate	Su	T,S					Yes		India
3	Pyracantha & varieties	Pyracantha (red berried types)	Su	S					Yes		Asia
3	Quercus arizonica	Arizona White Oak	Su	T	b						SD,CD
3	Quercus buckleyi (Q. texana)	Texas Red Oak	Su	T	b				Yes		W. TX
3	Quercus emoryi	Emory Oak	Su	T	b						SD,CD
3	Quercus fusiformis	Escarpment Live Oak	Su	T	b						W. TX
3	Quercus gambelii	Gambel Oak	Su	T,S	b				Yes		SW U.S.
3	Quercus illex	Holly Oak	Su	T	b						Medit.
3	Quercus muhlenbergia	Chinquapin Oak	Su	T	b				Yes		W. TX
3	Quercus polymorpha	Monterey Oak	Su	T	b						W. TX
3	Quercus suber	Cork Oak	Su	T	b						Medit.
2	Quercus turbinella	Shrub Live Oak	Su	S	b						W. U.S.
3	Quercus virginiana	Live Oak	Su	T	b						SE U.S.
2	Rhus microphylla	Littleleaf Sumac	Su	S	c	Yes			Yes		CD

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
2	Rhus ovata	Sugar Bush, Sugar Sumac	Wi	S	c	Yes					SD
2	Rhus trilobata & varieties	Three Leaf Sumac	Su	S	c				Yes		Can., U.S., Mex.
2	Rhus virens	Evergreen Sumac	Su	S	c	Yes			Yes		CD
3	Rosa banksiae	Lady Banks Rose, Tombstone Rose	Su	S, Gc, V					Yes		AZ
2	Rosmarinus officinalis	Bush Rosemary	Su	S					Yes		Medit.
3	Ruellia brittoniana & varieties	Mexican Barrio Ruellia	Su	Gc					Yes	sh	Mex.
2	Ruellia californica	Sonoran Desert Ruellia	Su	S					Yes	t	SD
2	Ruellia peninsularis	Baja Ruellia	Su	S					Yes	t	SD
2	Ruschia uncinatus	Ruschia	Su	Gc, Sc							S. Africa
2	Salvia chamaedryoides	Blue Chihuahuan Sage	Su	S					Yes		CD
2	Salvia clevelandii	Cleveland Sage	Wi	S					Yes		S. CA, Baja
3	Salvia columbariae	Chia	Wi	An					Yes		SD
2	Salvia dorri v. dorrii	Sage	Wi	S					Yes		SD
3	Salvia farinacea	Mealy Cup Sage, Texas Violet	Su	S					Yes		CD
3	Salvia greggii	Red Chihuahuan Sage, Autumn Sage	Su	S					Yes		CD
2	Salvia hybrid (S. dorri x S. clevelandii x S. mojaveensis)	Trident	Wi	S					Yes		SD hybrid
3	Salvia leucantha	Purple Mexican Bush Sage	Su	S					Yes	sh	Mex.
2	Salvia mohavensis	Mohave Sage	Wi	S					Yes		SD
3	Sambucus nigra spp. Cerulea (S. mexicana)	Mexican Elderberry	Wi	T					Yes		SD, CD
2	Santolina chamaecyparissus	Lavendar Cotton	Wi	S, Gc					Yes		Medit.
3	Santolina virens	Green Santolina	Wi	S, Gc					Yes		Medit.

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
3	Sapindus saponaria saponaria	Soapberry	Su	T		Yes				sh	SD,CD
2	Sapindus saponaria drummondii	Soapberry	Su	T		Yes					SD,CD
3	Schinus molle	California Pepper Tree	Su	T	b						S. Amer.
2	Senecio cineraria	Dusty Miller, Silver Plant	Wl	P		Yes			Yes		Medit.
1	Senna covesii (Cassia)	Desert Senna	Su	P					Yes		SD
2	Senna lindheimeriana (Cassia)	Senna	Wl	S					Yes	sh	CD
2	Senna wislizenii (Cassia)	Cassia, Shrubby Senna	Su	S					Yes		SD,CD
2	Sesuvium verrucosum	Sea Purslane, Ice Plant	Su	Gc					Yes	t	Africa
1	Simmondsia chinensis & varieties	Jojoba, Goat Nut	Wl	S	a						SD
2	Sophora secundiflora & varieties	Texas Mountain Laurel	Su	T,S		Yes			Yes		CD
2	Sphaeralcea ambigua & varieties	Globe Mallow	Wl	P					Yes		SD
1	Sporobolus airoides	Alkali Sacaton	Su	Gr	a						SD,CD
1	Sporobolus contractus	Spike Dropseed	Su	Gr	a						SD,CD
3	Sporobolus cryptandrus	Sand Dropseed	Su	Gr	a						SD,CD
2	Sporobolus flexuosus	Mesa Dropseed	Su	Gr	a						SD,CD
3	Sporobolus wrightii	Sacaton	Su	Gr	a						SD,CD
1	Stenocereus thurberi (Lemaitreocereus)	Organ Pipe Cactus	Su	C					Yes	t	SD
3	Tagetes lemmoni	Mountain Marigold	Su	P					Yes		SD
2	Tecoma stans v. angustata	AZ Yellow Bells	Su	S					Yes	sh	SD,CD
3	Tecomaria capensis	Cape Honey-suckle	Su	S,V					Yes	sh	Africa
2	Tetranuris acaulis (Hymenoxys)	Angelita Daisy	Su	P					Yes		SW U.S.

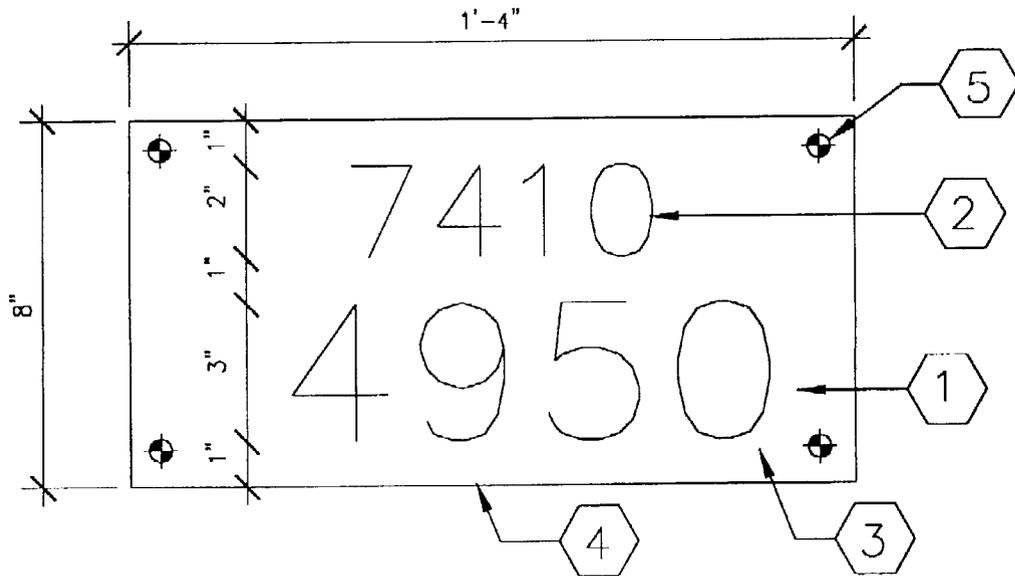
Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
2	<i>Teucrium chamaedrys</i> (prostratum)	Prostrate Germander	Su	Gc		Yes			Yes		Medit.
2	<i>Teucrium fruticans</i>	Bush Germander	Su	S							Medit.
2	<i>Thymophylla pentachaeta</i> (Dyssodia)	Golden Dyssodia	Su	Gc					Yes		SD,CD
2	<i>Trichloris crinita</i>	Two-feather Trichloris	Su	Gr	a						SD,CD
2	<i>Trichocereus</i> & varieties	Trichocereus Cactus	Su	C					Yes		S. Amer., Argentina
2	<i>Tridens nuticus</i>	Slim Tridens	Su	Gr	b						SD,CD
2	<i>Trixis californica</i>	Trixis	Su	S					Yes	sh	CA to TX
3	<i>Ungnadia speciosa</i>	Mexican Buckeye	Su	T					Yes		CD
2	<i>Vauquelinia californica</i> & varieties	Arizona Rosewood	Su	T,S					Yes		SD
2	<i>Vauquelinia corymbosa</i> & varieties	Mexican Rosewood	Su	S					Yes		TX, Mex.
3	<i>Verbena peruviana</i>	Peruvian Verbena	Su	P					Yes		S. Amer.
3	<i>Verbena rigida</i>	Sandpaper Verbena	Su	Gc,P				Yes	Yes		S. Amer.
3	<i>Verbena tenuisecta</i> 'edith'	Moss Verbena	Su, Wl	Gc, P				Yes	Yes		S. Amer.
2	<i>Verbesina encelioides</i>	Crown Beard	Wl	An			Yes	Yes	Yes		SD,CD
2	<i>Viguiera parishi</i> (V deltoidea)	Golden Eye	Wl	P					Yes		SD
3	<i>Viguiera stenoloba</i>	Asteraceae	Su	S					Yes	sh	TX, NM, No. Mex.
2	<i>Vitex agnus-castus</i>	Chaste Tree, Monk's Pepper	Su	T,S					Yes		Medit.
2	<i>Washingtonia filifera</i>	California Fan Palm	Su	T	c		Yes	Yes			SD
2	<i>Washingtonia robusta</i>	Mexican Fan Palm	Su	T	c		Yes	Yes		sh	SD
3	<i>Wedelia texana</i> and cultivars (Zexmenia hispida)	Rough Zexmenia, Devil's River	Su	S			Yes	Yes	Yes	sh	SW U.S., TX
3	<i>Xylosma congestum</i>	Xylosma	Su	T,S							China

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
2	<i>Yucca aloifolia</i>	Spanish Bayonet Yucca	Su	A					Yes		SD
1	<i>Yucca baccata</i>	Banana Yucca	Su	A					Yes		SD, CD
2	<i>Yucca baileyi</i>		Su	A					Yes		CO, UT
1	<i>Yucca brevifolia</i>	Joshua Tree	Wi	A					Yes		CD
2	<i>Yucca constricta</i>	Buckley Yucca	Su	A					Yes		TX
2	<i>Yucca elata</i>	Soapfree Yucca	Su	A					Yes		SD, CD
2	<i>Yucca faxoniana</i> (Y carnerosana)	Giant Dagger Yucca	Su	A					Yes		CD
2	<i>Yucca filifera</i> (australis)	St. Peter's Palm	Su	A					Yes		Mex.
2	<i>Yucca glauca</i>	Small Soapweed Yucca	Su	A					Yes		U.S.
2	<i>Yucca harriniae</i>	Harriman's Yucca	Su	A					Yes		SW U.S.
2	<i>Yucca pallida</i>	Paleleaf Yucca	Su	A					Yes		TX
2	<i>Yucca rigida</i>	Blue Dagger Yucca	Su	A					Yes		CD
2	<i>Yucca rostrata</i>	Beaked Yucca	Su	A					Yes		CD
2	<i>Yucca schidigera</i>	Mojave Yucca	Su	A					Yes		W. U.S., Mex.
2	<i>Yucca schottii</i>	Mountain Yucca	Su	A					Yes		SD
2	<i>Yucca thompsoniana</i>	Thompson Yucca	Su	A					Yes		SW TX
2	<i>Yucca torreyi</i>	Torrey's Yucca	Su	A					Yes		TX, NM, No. Mex.
1	<i>Yucca treculeana</i>	Spanish Dagger, Palma Pita	Su	A					Yes		CD, W. TX
1	<i>Yucca whipplei</i>	Our Lord's Candle	Su	A					Yes		SD
3	<i>Zauschneria californica</i> & varieties	Hummingbird Trumpet	Su	Gc					Yes		SD
3	<i>Zephyranthes</i> spp. & varieties	Rain Lily	Su	Gc, P					Yes		S. Africa

Water Use	Botanical Name	Common Name	Growing Season	Plant Type	Allergenic	Toxic	Invasive	Spreads in Cultivated Areas	Seasonal Color	Hardiness	Origin
1	Zinnia acerosa	Desert Zinnia	Su	P					Yes		SD,CD
2	Zinnia grandiflora	Rocky Mountain Zinnia	Su	P					Yes		SE, AZ
2	Zizyphus jujuba	Chinese Date, Common Jujube	Su	T				Yes			Asia

Appendix G:

Davis-Monthan AFB Standard Details for Construction



KEYNOTES

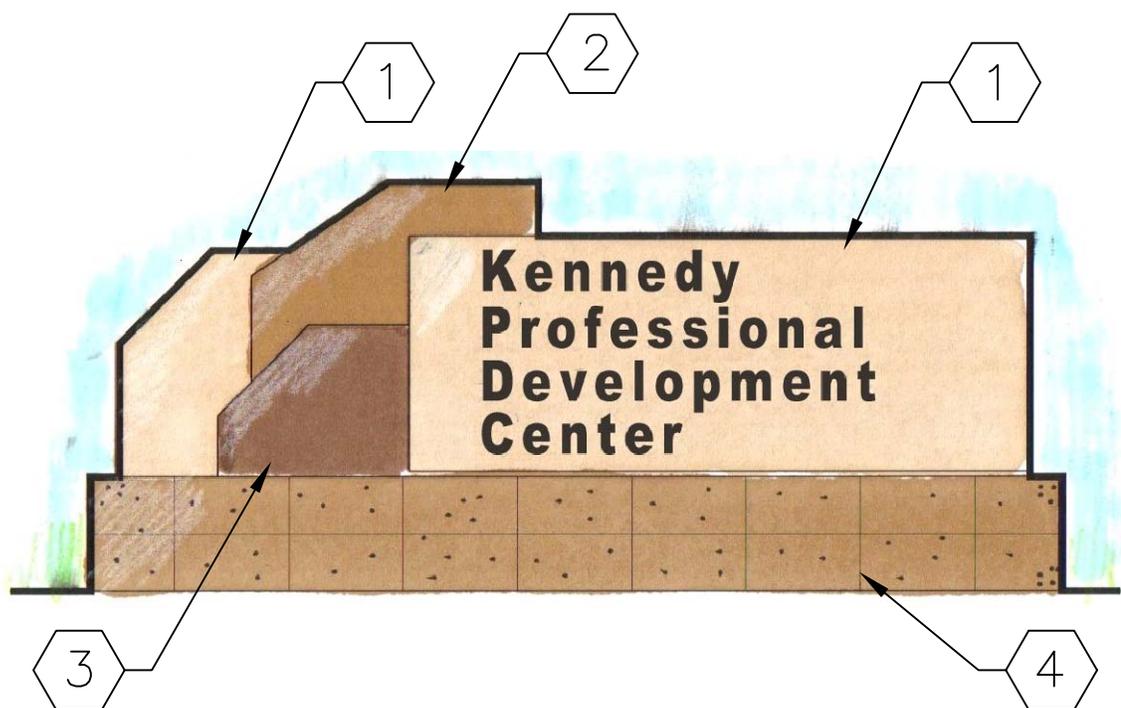
1. 3" REFLECTIVE WHITE VINYL LETTERS
(BUILDING ADDRESS, EXAMPLE ONLY)
2. 2" REFLECTIVE WHITE VINYL LETTERS
(BUILDING NUMBER, EXAMPLE ONLY)
3. BACKGROUND SCOTCH LITE "BROWN"
4. 18 GA. SHT. METAL PANEL
5. SIGNAGE ATTACHMENT LOCATION

COORDINATE BUILDING ADDRESS AND NUMBER, AND MOUNTING LOCATIONS WITH CONTRACTING OFFICER PRIOR TO FABRICATION.
(2 REQ'D PER FACILITY)

BUILDING ADDRESS SIGN

NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	BUILDING ADDRESS SIGN	CHECKED BY	MO INGALLS	DETAIL NO
		SCALE	NONE	DM-A
		DATE	25 FEB 99	001



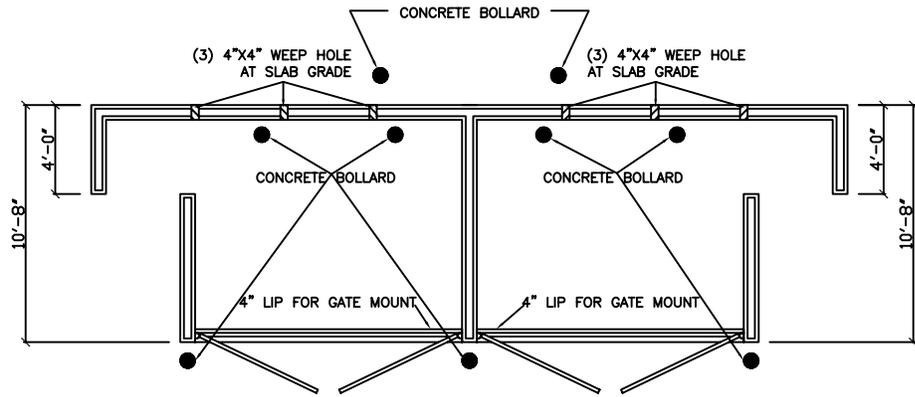
KEYNOTES

1. CHOCOLATE MOUSSE 380, SP6-0706
2. HONEY TWIST 383, SP6-0694
3. SPECTRUM BROWN 142, SPB-0536
4. TIERRA BROWN #1 SPLIT FACE BLOCK

FACILITY SIGN DRYVIT COLORS

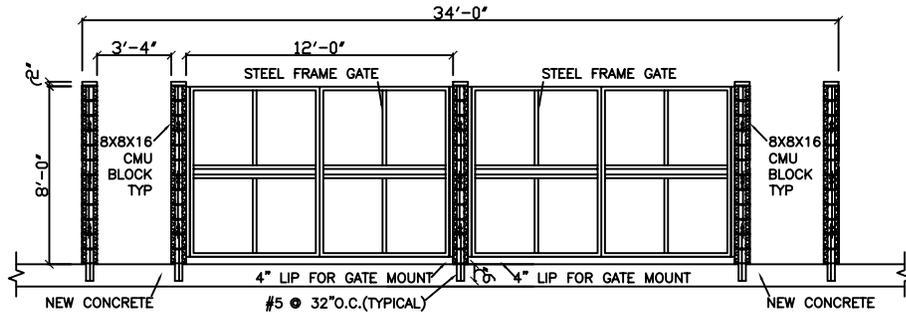
NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	FACILITY SIGN DRYVIT COLORS	CHECKED BY	J. SORENSEN	DETAIL NO DM-A 002
		SCALE	NONE	
		DATE	18 SEP 07	



(A) DUMPSTER ENCLOSURE PLAN

N.T.S.



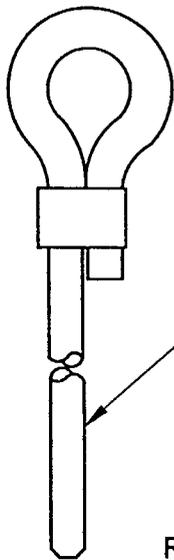
(B) DUMPSTER ENCLOSURE SECTION DETAIL

N.T.S.

DUMPSTER ENCLOSURE

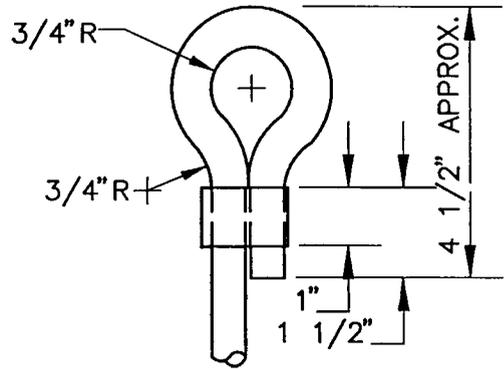
NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	DUMPSTER ENCLOSURE	CHECKED BY J. SORENSEN	DETAIL NO DM-A 003
		SCALE NONE	
		DATE 26 SEP 07	



3/4" x 10'-0"
(COPPERWELD OR EQUAL)

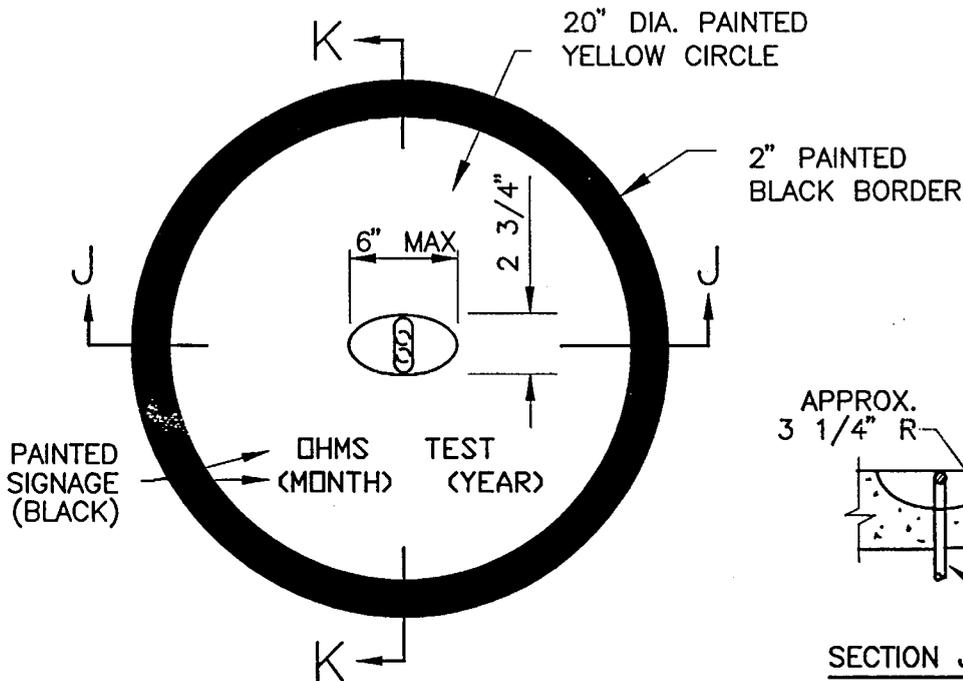
ROD DETAIL



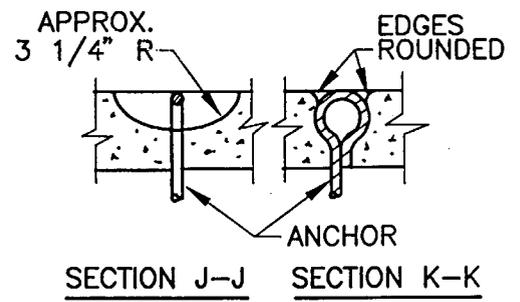
COPPER SLEEVE
COMPRESSED ON ROD



DETAIL OF EYE AND SLEEVE
ASSEMBLY



PLAN VIEW

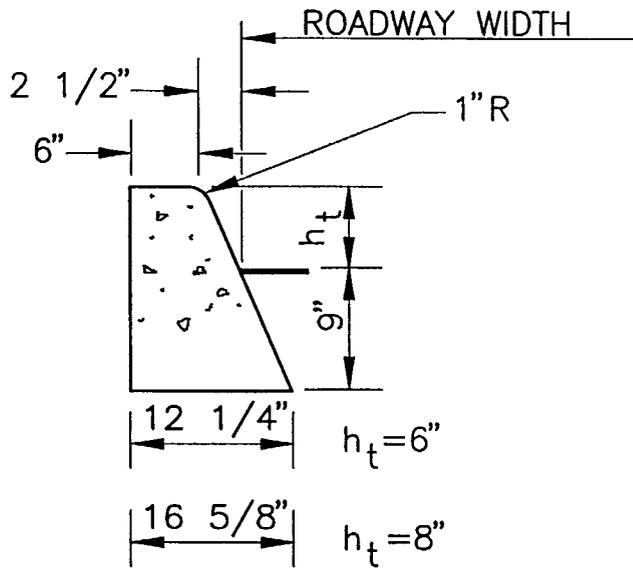


DETAIL OF PAVEMENT

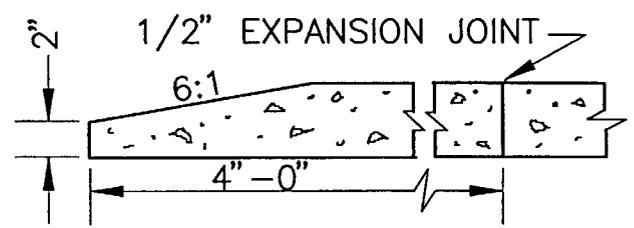
GROUNDING ROD DETAILS

NTS

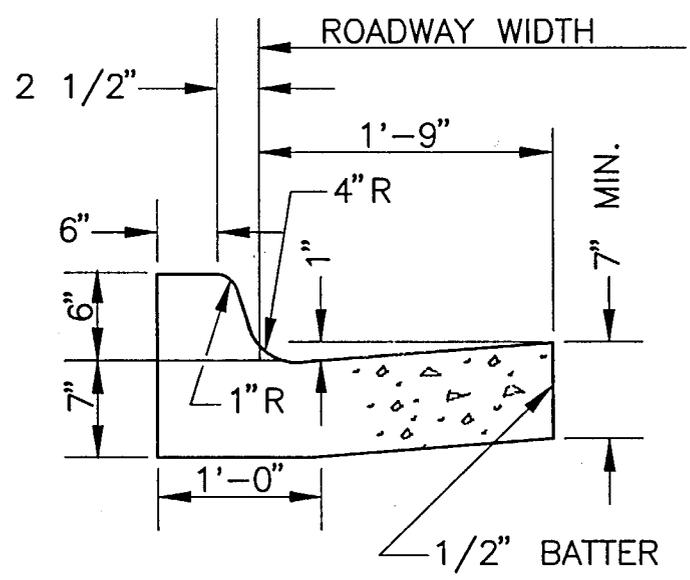
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	GROUNDING ROD DETAILS	CHECKED BY J. BARKER	DETAIL NO
DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE		SCALE NONE	DM-C 002
		DATE 15 JUN 95	



SINGLE CURB



CURB TERMINAL SECTION

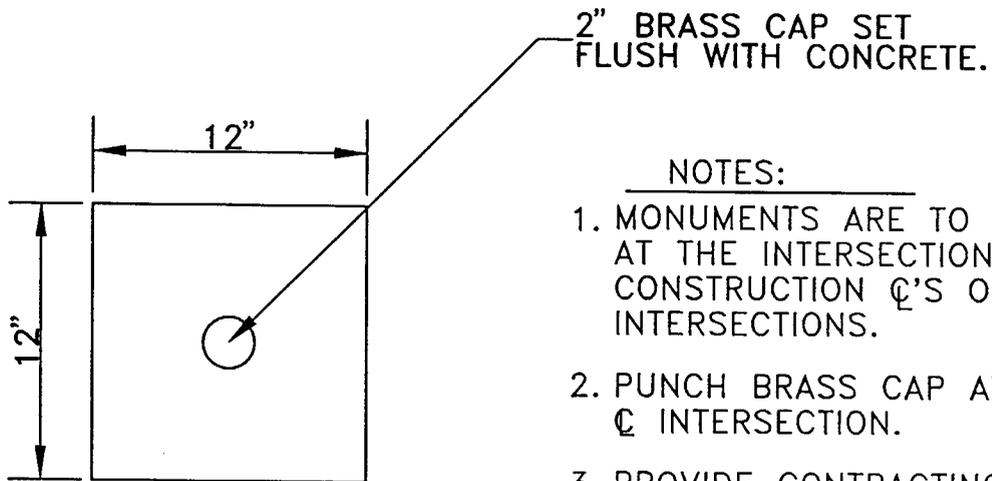


CURB & GUTTER

CURBING DETAILS

NTS

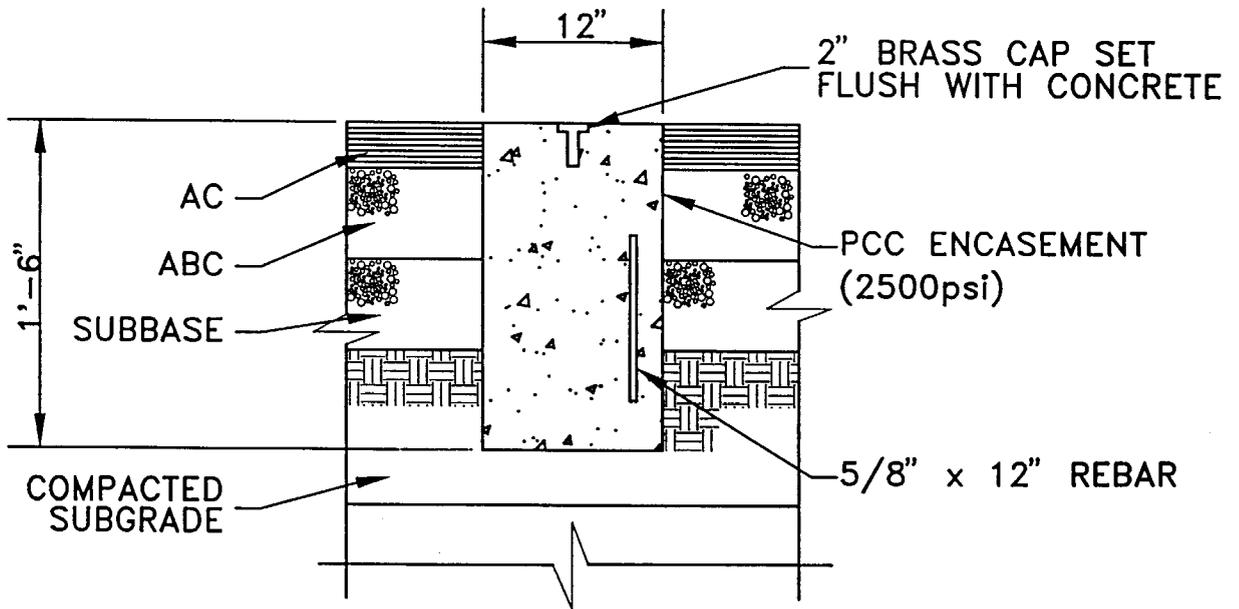
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	CURBING DETAILS	CHECKED BY	J. BARKER	DETAIL NO
		SCALE	NONE	DM-C
		DATE	15 JUN 95	003



TOP VIEW

NOTES:

1. MONUMENTS ARE TO BE PLACED AT THE INTERSECTION OF CONSTRUCTION \odot 'S OF ALL NEW INTERSECTIONS.
2. PUNCH BRASS CAP AT EXACT \odot INTERSECTION.
3. PROVIDE CONTRACTING OFFICER WITH LIST OF ALL BRASS CAP ELEVATIONS.

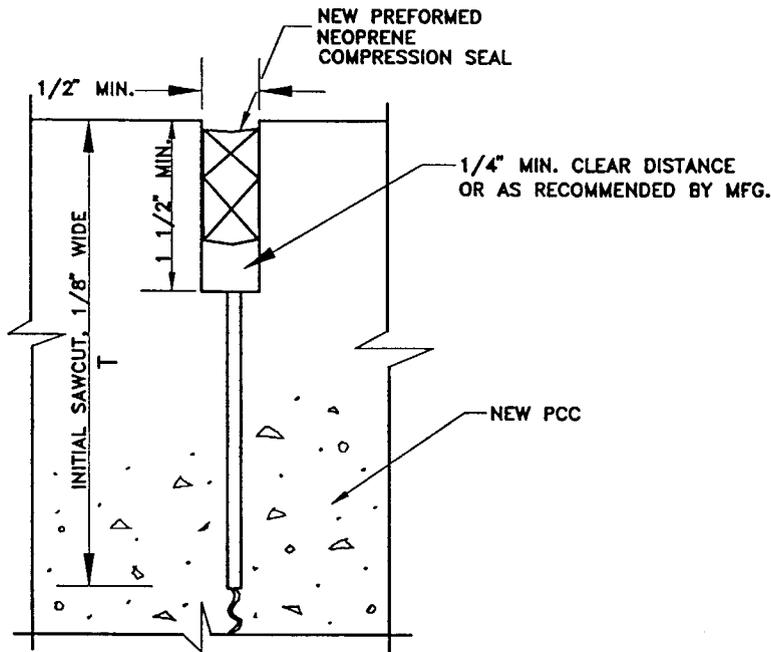


PROFILE

SURVEY MONUMENT DETAIL

NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	SURVEY MONUMENT DETAIL	CHECKED BY	J. BARKER	DETAIL NO
		SCALE	NONE	DM-C
		DATE	15 JUN 95	004



NOTES:

1. DEPTH & WIDTH AS RECOMMENDED BY MANUFACTURER PER TYPE OF SEAL BEING USED.
2. TOP OF PREFORMED SEAL WILL BE $3/16" + 1/16"$ BELOW PAVEMENT SURFACE.
3. COMPRESSION SEAL MUST BE IN COMPRESSION AT ALL TIMES.
4. WIDTH SHALL NOT BE LESS THAN $1/2" + 1/8", -0"$.
5. DIMENSIONS ARE FOR RECEIVING SLOT, NOT THE SEAL.
6. REFER TO TAC DE-103-85, DESIGN OF RIGID AFLD PAVEMENTS, ATTACH. #1 FOR PREFORMED COMPRESSION SEAL.

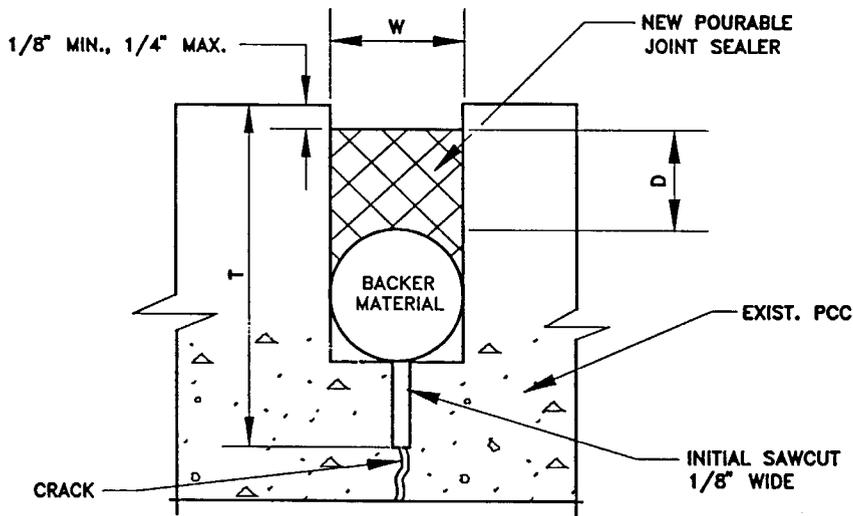
TABLE 1

JOINT SPACING FT.	WIDTH, IN.	
	MIN.	MAX.
< 25	1/2	5/8
25 - 50	3/4	7/8
> 50	1/0	1-1/8

SAWED CONTRACTION JOINT WITH PREFORMED SEALS

NOTES:

1. NONABSORBENT BACKER MATERIAL REQUIRED TO PREVENT SEALANT FROM FLOWING INTO SAWCUT; TO SEPARATE NONCOMPACTABLE MATERIALS AND PREVENT JOINT SEALANTS FROM BONDING TO BOTTOM OF RESERVOIR.



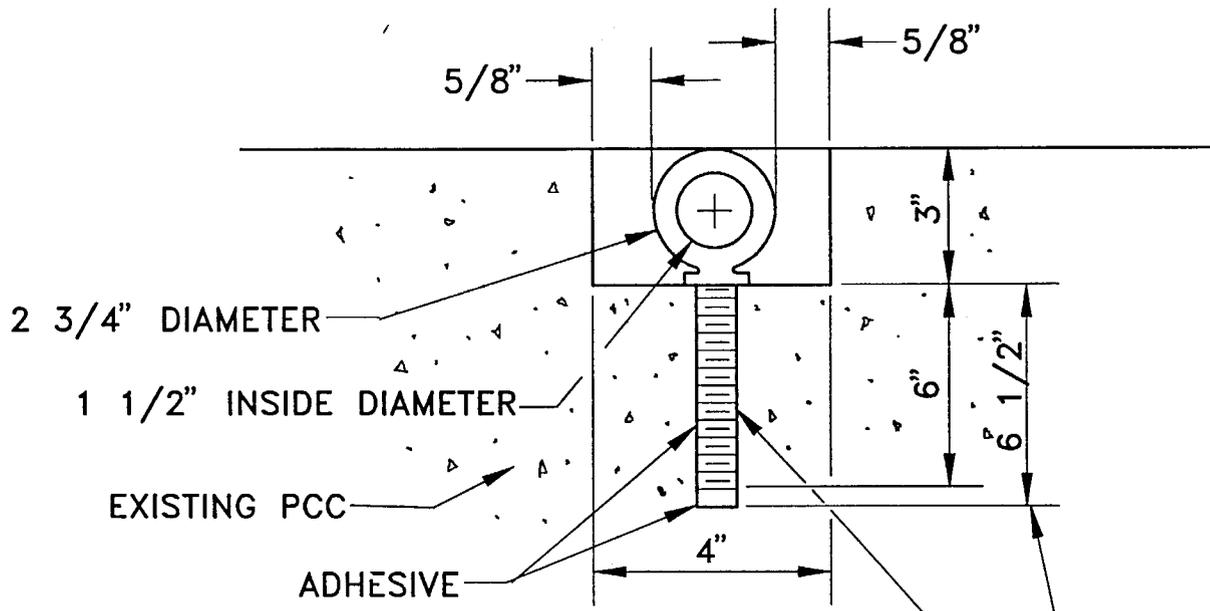
- W = WIDTH OF SEALANT RESERVOIR (SEE TABLE 1)
 D = DEPTH OF SEALANT (1.0 TO 1.5 x W)
 T = DEPTH OF INITIAL SAWCUT:
- a. 1/4 SLAB THICKNESS FOR PAVEMENT LESS THAN 12 INCHES
 - b. 3 INCHES FOR PAVEMENTS 12-18 INCHES
 - c. 1/6 SLAB THICKNESS FOR PAVEMENTS MORE THAN 18 INCHES.

POURABLE JOINT SEALANT RESERVOIR

CONTRACTION JOINT DETAILS

NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	CONTRACTION JOINT DETAIL	CHECKED BY	J. BARKER	DETAIL NO DM-C 005
		SCALE	NONE	
		DATE	15 JUN 95	



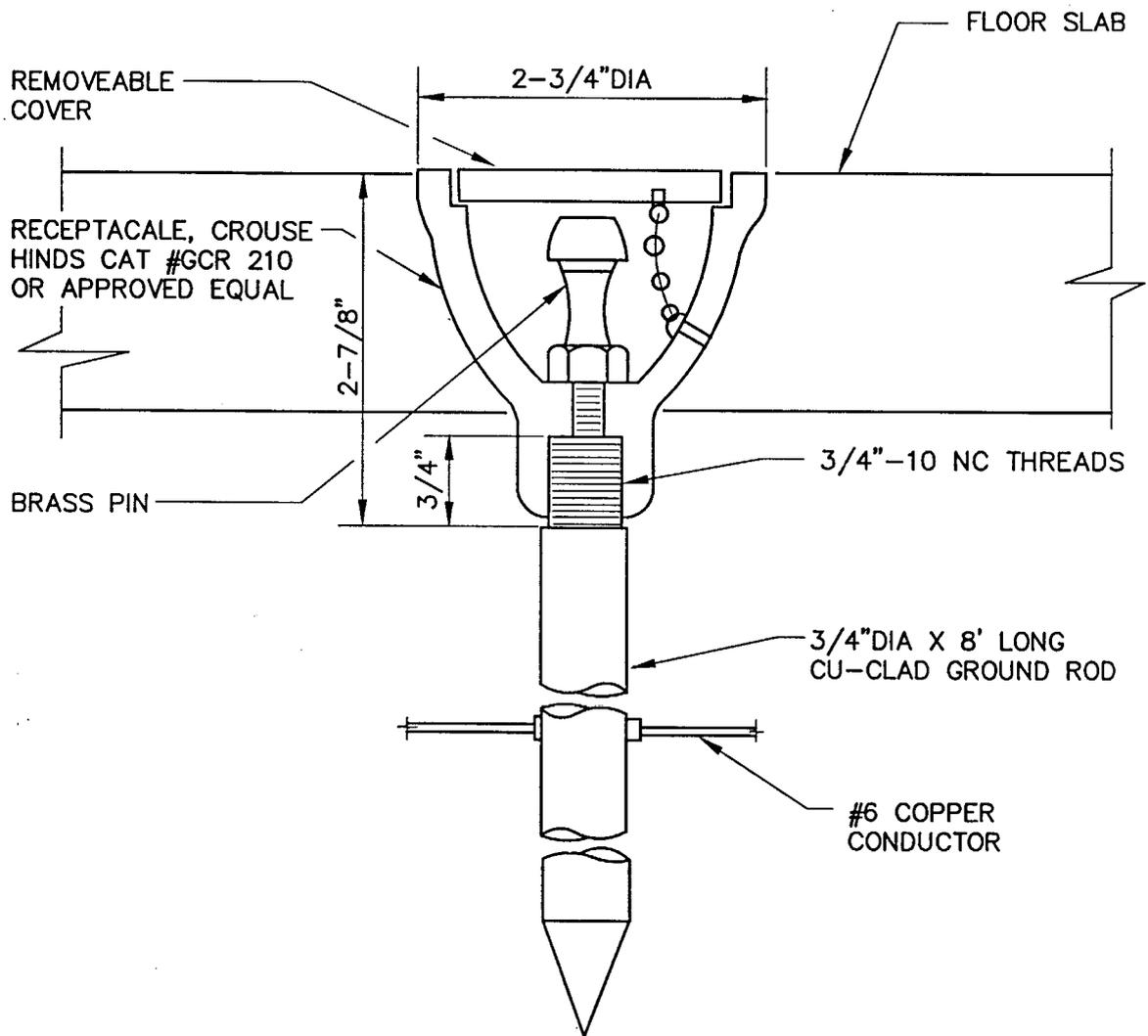
3/4" DIA. DROP FORGED GALVANIZED EYE BOLT WITH SHOULDER. SAFE LOAD OF 5200 LBS. TOP OF EYE BOLT SHALL BE BETWEEN FLUSH AND MINUS 1/8" WITH PCC SURFACE.

OR PER MANUFACTURERS RECOMMENDATIONS IF DIFFERENT

AIRCRAFT TIE DOWN DETAIL

NTS

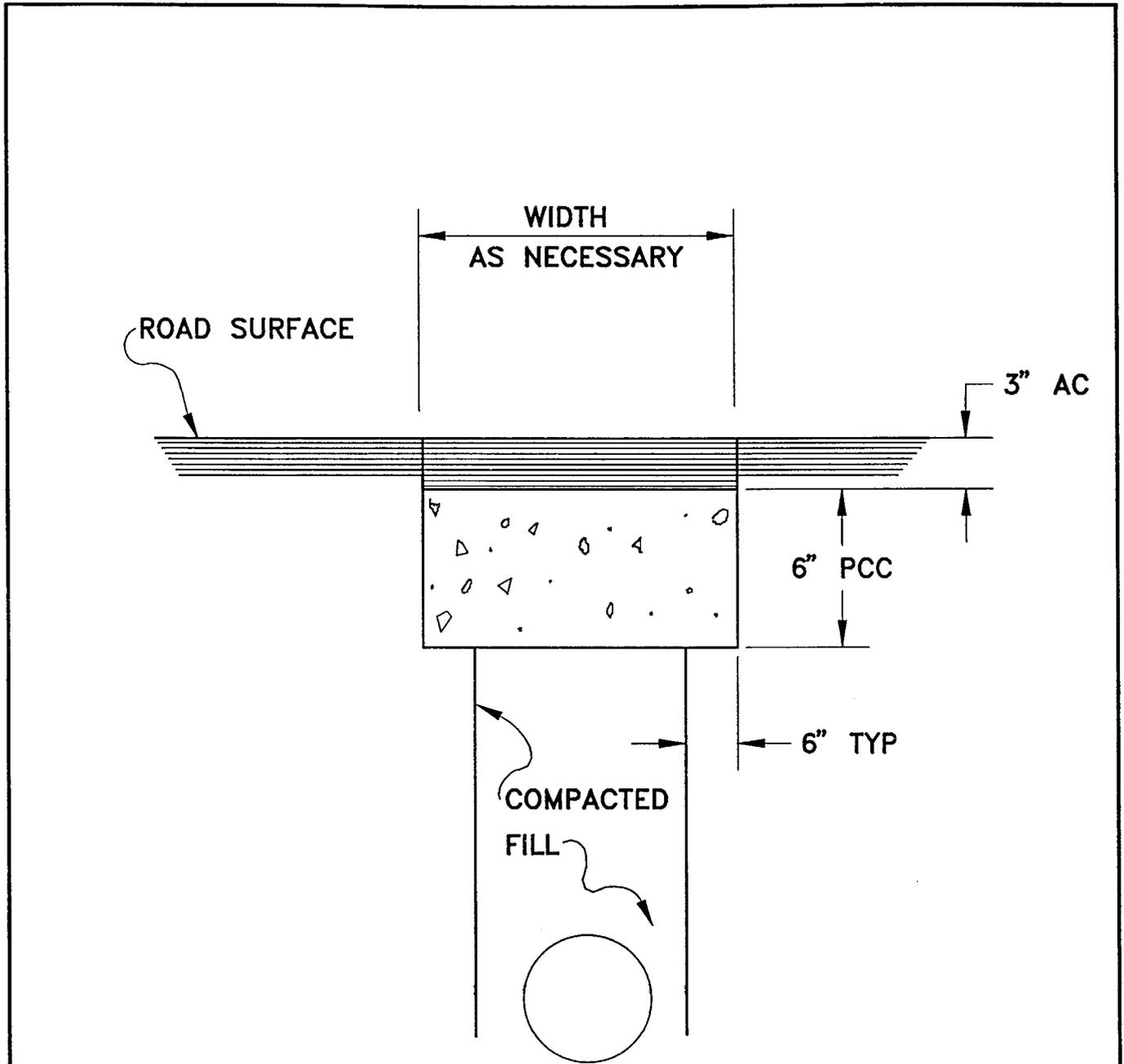
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	AIRCRAFT TIE DOWN DETAIL	CHECKED BY	J. BARKER	DETAIL NO
		SCALE	NONE	DM-C
		DATE	15 JUN 95	006



STATIC GROUNDING RECEPTACLE FOR INDOOR FLOORS

NTS

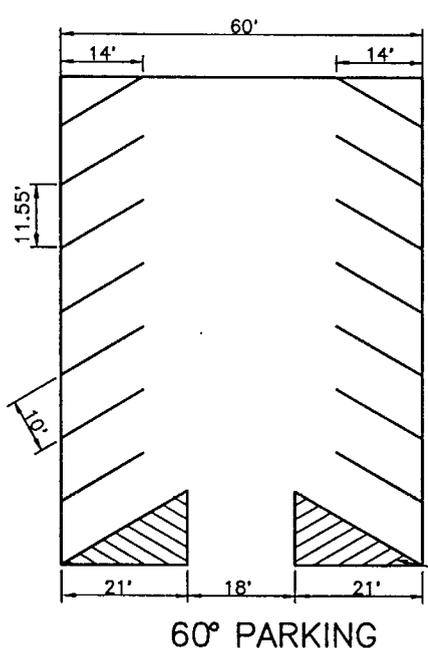
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	STATIC GROUNDING RECEPTACLE FOR INDOOR FLOORS	CHECKED BY J. BARKER SCALE NONE DATE 15 JUN 95	DETAIL NO DM-C 007
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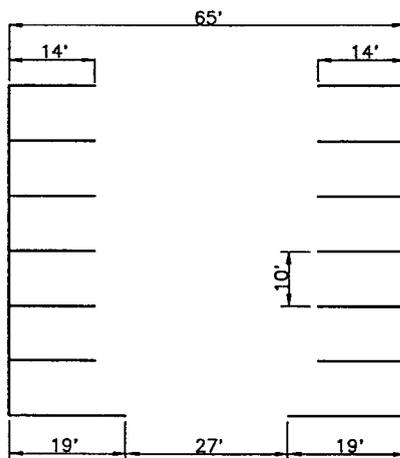
UTILITY PATCH

NTS

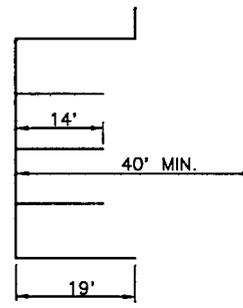
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	UTILITY PATCH	CHECKED BY J. BARKER	DETAIL NO DM-C
		SCALE NONE	008
		DATE 15 JUN 95	



60° PARKING



90° PARKING



90° PARKING

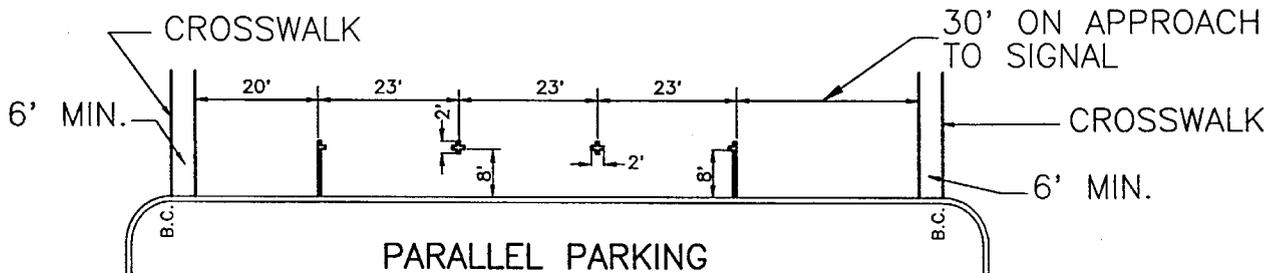
HATCHED LINES PER UNIFORM TRAFFIC CODE

HANDICAP PARKING DIMENSIONS

ONE VAN.....20' DEEP x 16' WIDE
 TWO VANS....20' DEEP x 24' WIDE
 ONE CAR.....20' DEEP x 13' WIDE
 TWO CARS....20' DEEP x 21' WIDE
 (REF. UNIFORM FEDERAL ACCESSIBILTIIY STANDARDS)

NOTES:

1. HANDICAP SIGN TO BE USED WHERE APPROPRIATE.
2. ALL PAVEMENT MARKINGS TO BE WHITE IN COLOR.
3. ALL STRIPES WILL BE 4" WIDE.



PARALLEL PARKING

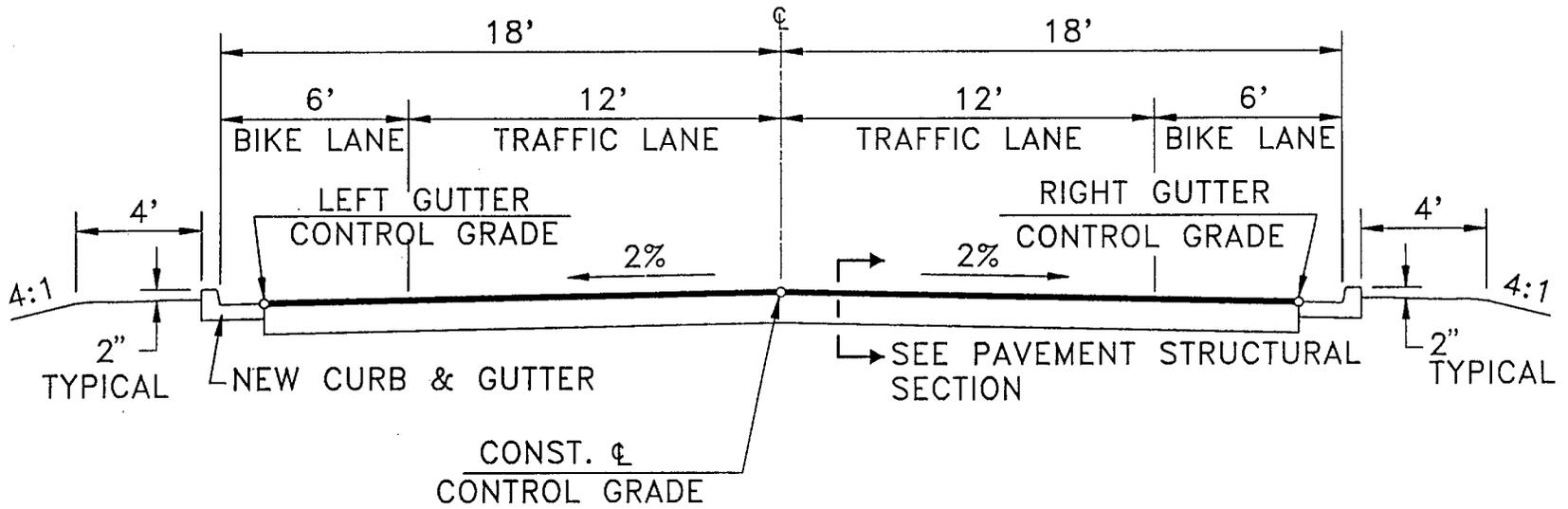
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	STANDARD PARKING DETAIL	CHECKED BY	J. BARKER	DETAIL NO DM-C 009
		SCALE	NONE	
DATE	15 JUN 95			

DEPARTMENT OF THE AIR FORCE
 AIR COMBAT COMMAND
 DAVIS-MONTHAN AFB, AZ
 CIVIL ENGINEER OFFICE

TYPICAL ROADWAY SECTION

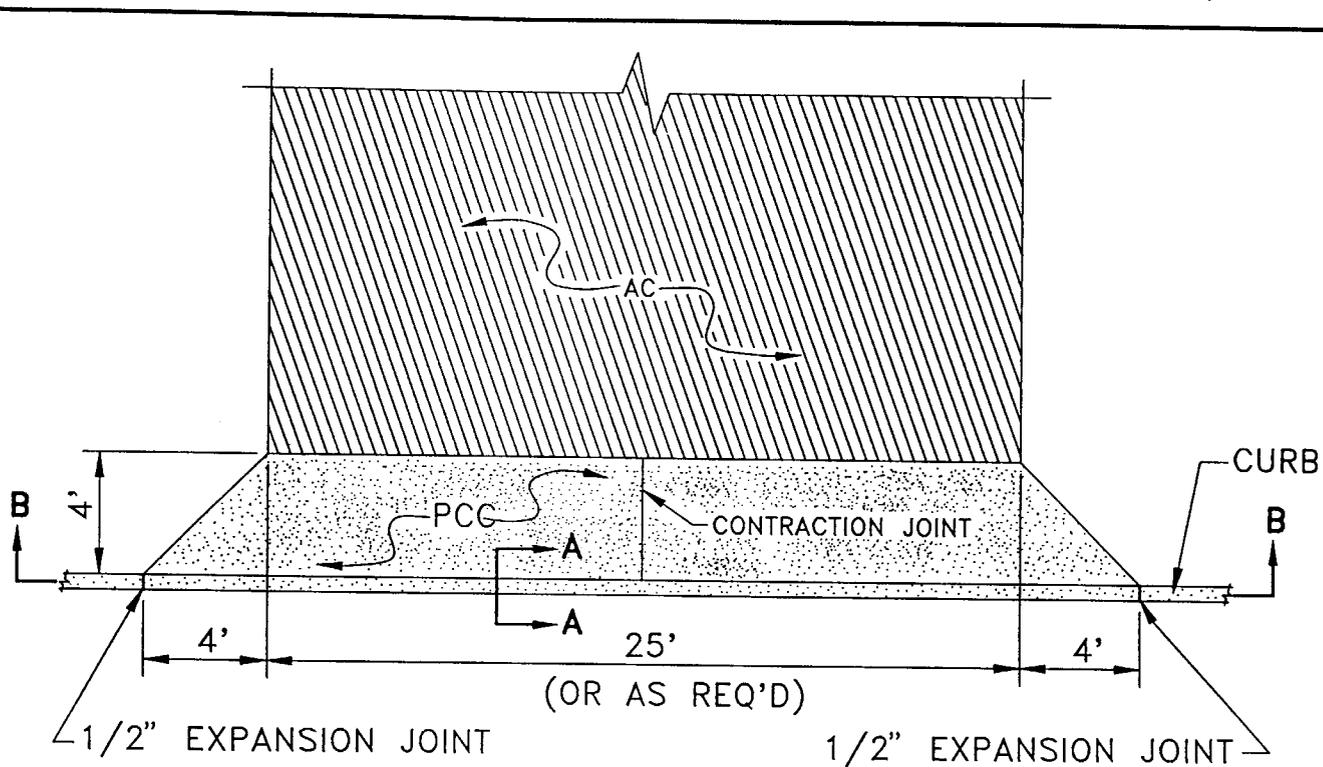
CHECKED BY J. BARKER
 SCALE NONE
 DATE 15 JUN 95

DETAIL NO
 DM-C
 010

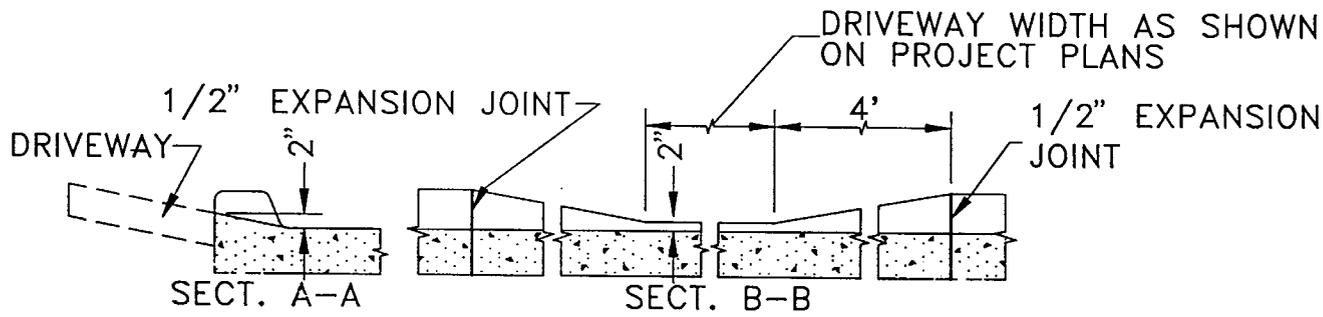


TYPICAL ROADWAY SECTION

SCALE: 1" = 5'



DRIVEWAY
N.T.S.

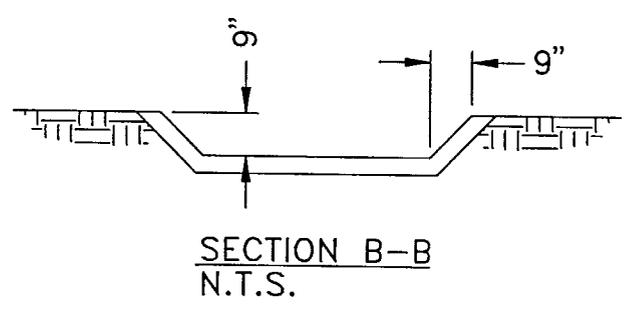
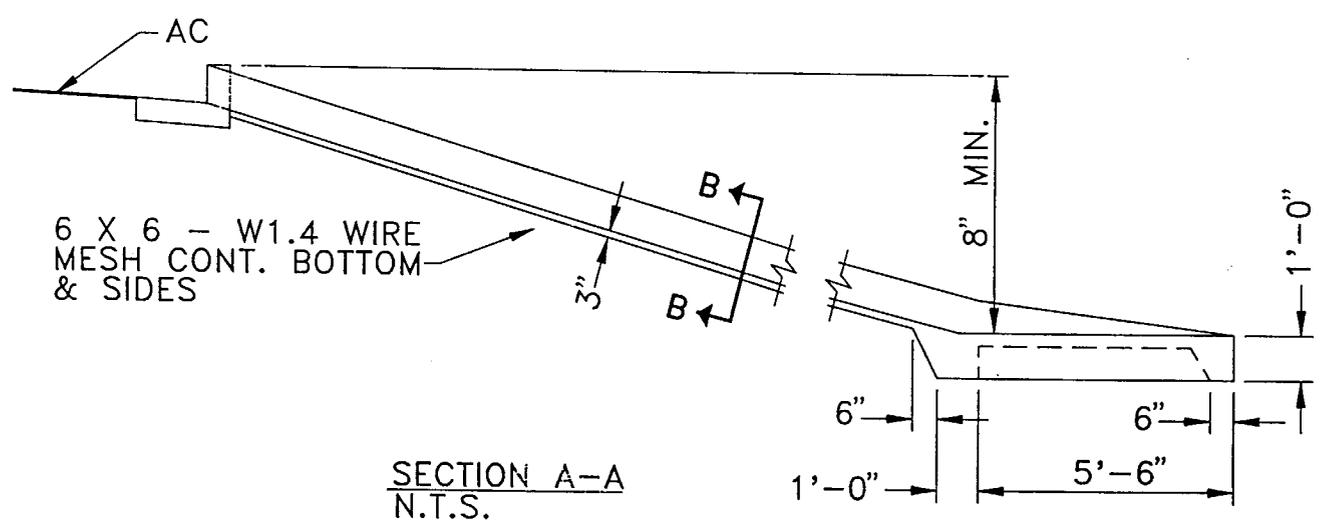
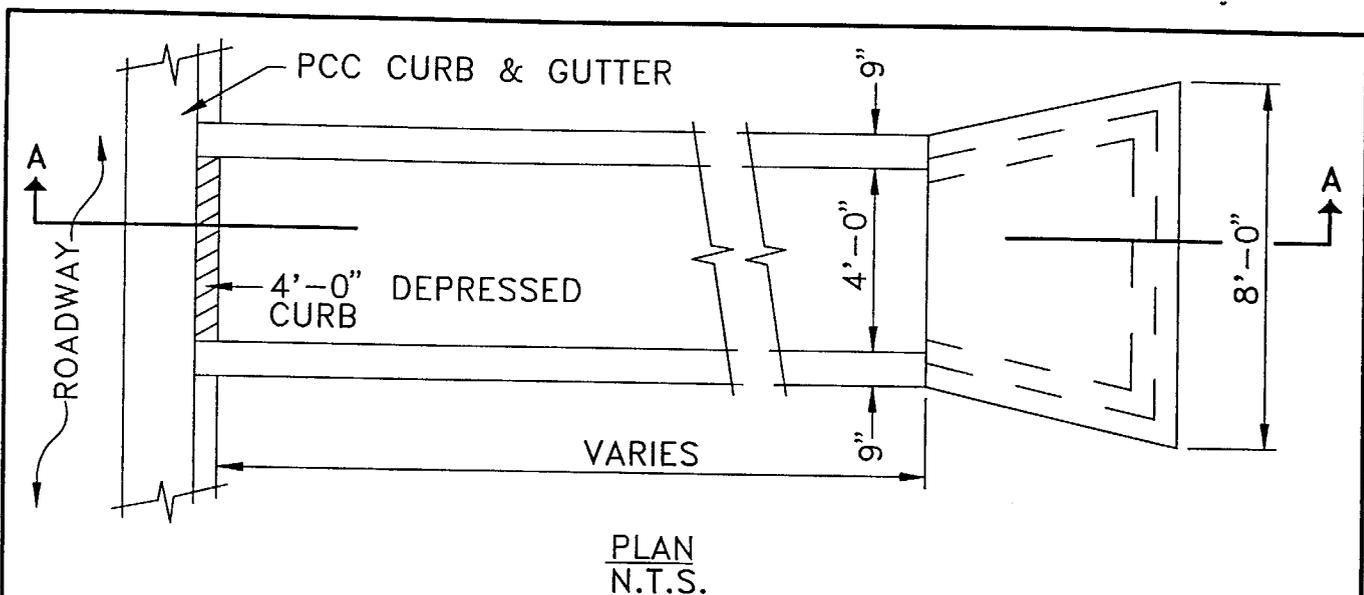


DEPRESSED CURB AT DRIVEWAY ENTRANCE
N.T.S.

NOTE:
CONCRETE SHALL BE FINISHED BY MEANS OF FLOAT, THEN THEN TROWELLED, AND THEN BROOMED WITH A FINE BRUSH IN TRANSVERSE DIRECTION.

DRIVEWAY ENTRANCE

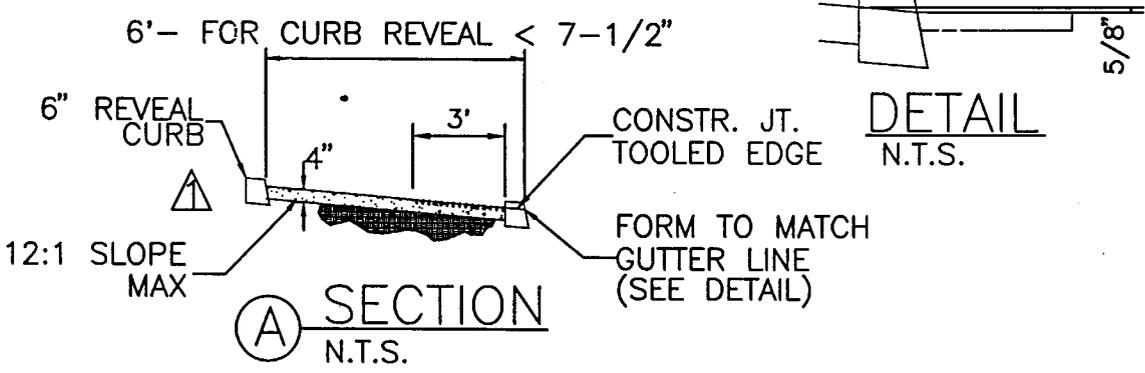
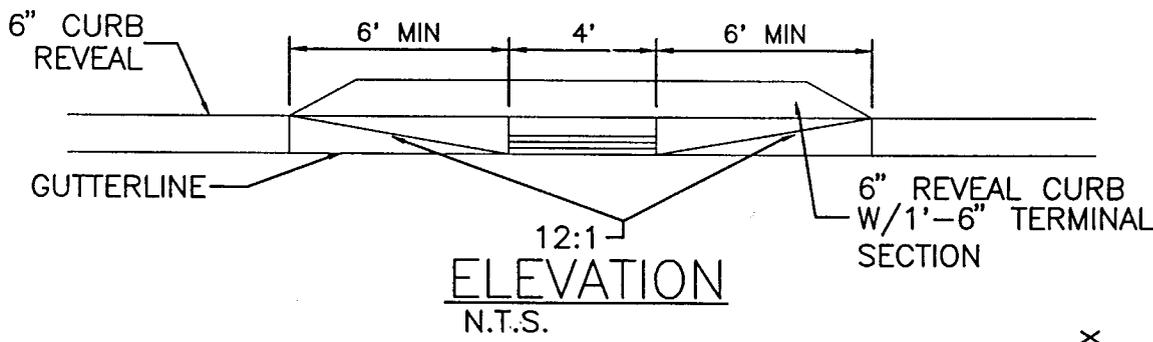
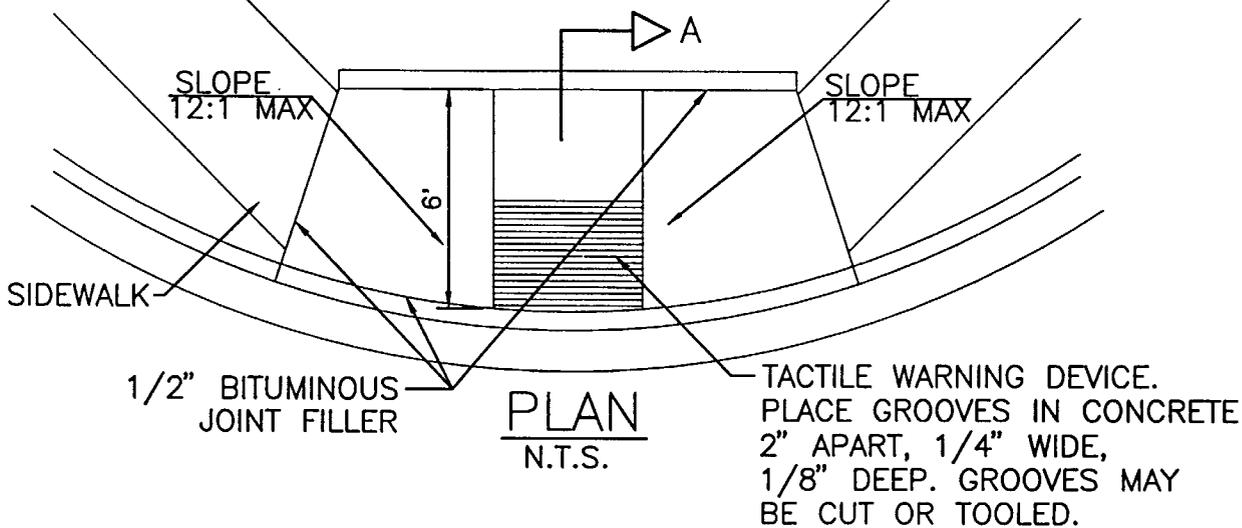
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	DRIVEWAY ENTRANCE DETAIL	CHECKED BY	J. BARKER	DETAIL NO DM-C 016
		SCALE	NONE	
		DATE	15 JUN 95	



SPILLWAY

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	SPILLWAY DETAIL	CHECKED BY	J. BARKER	DETAIL NO DM-C 024
		SCALE	NONE	
		DATE	15 JUN 95	

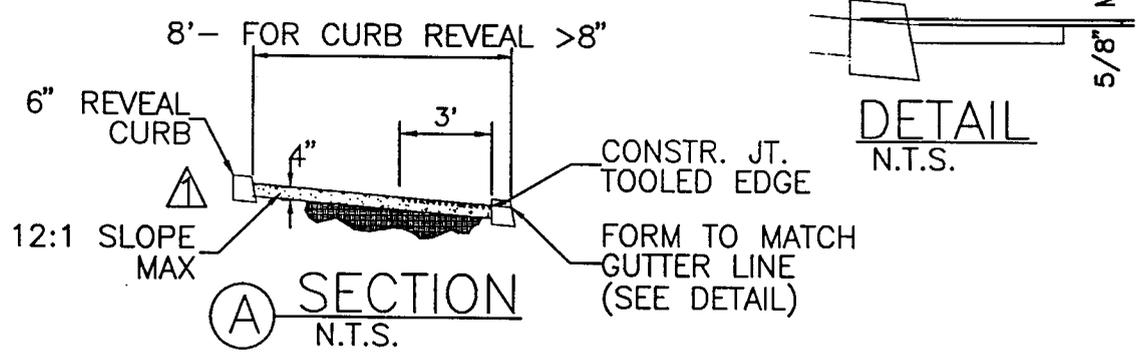
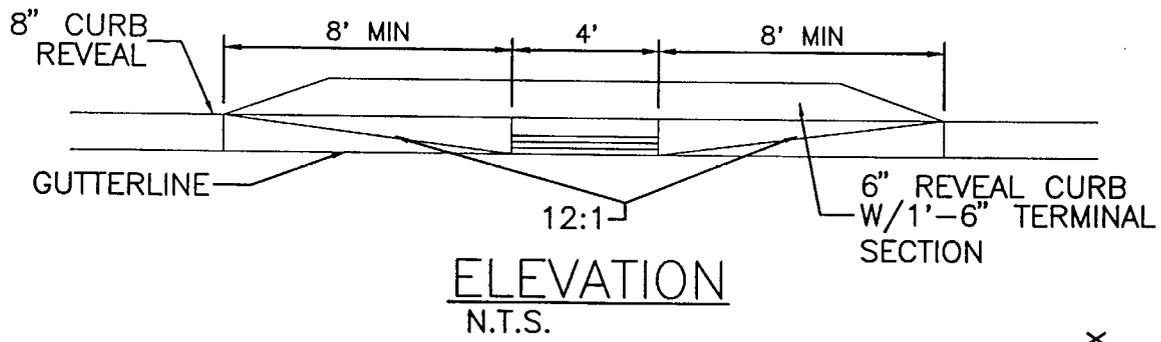
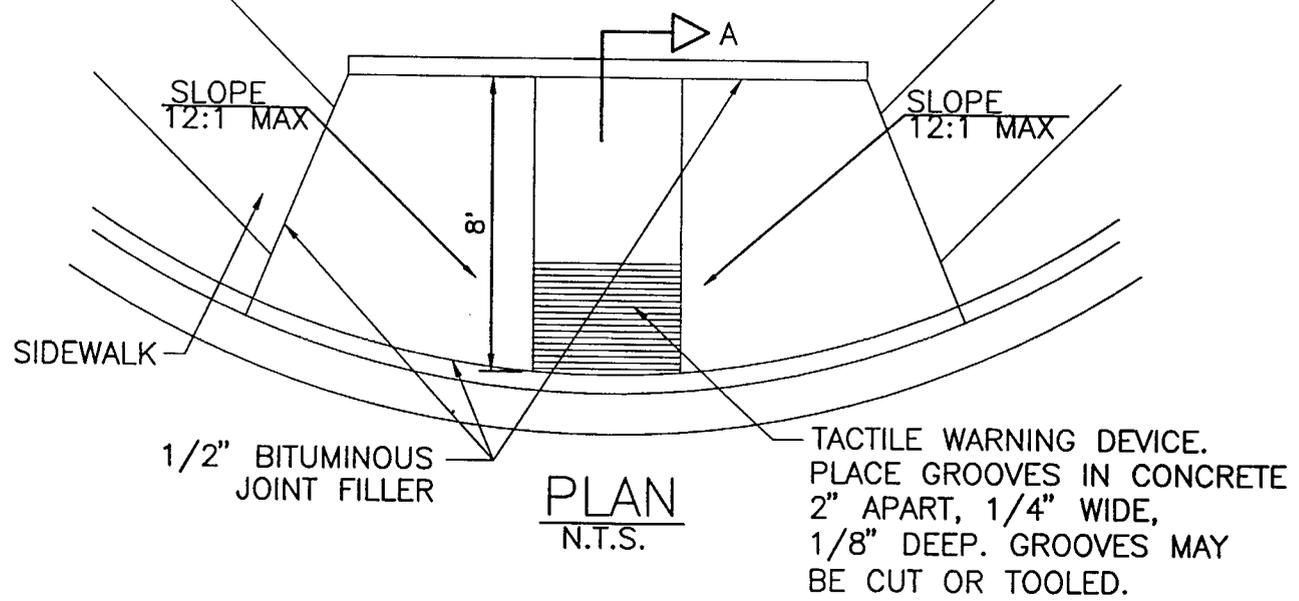
NOTE: IF SITE CONDITIONS
 DICTATE DEVIATIONS FROM STD.
 DETAIL, COORDINATE W/ AGENCY



⚠ 6" REVEAL CURB REQUIRED ONLY WHEN NOTED ON THE PLANS TO RESTRICT VEHICULAR TRAFFIC. VERIFY NEED; DELETE IF NOT APPLICABLE

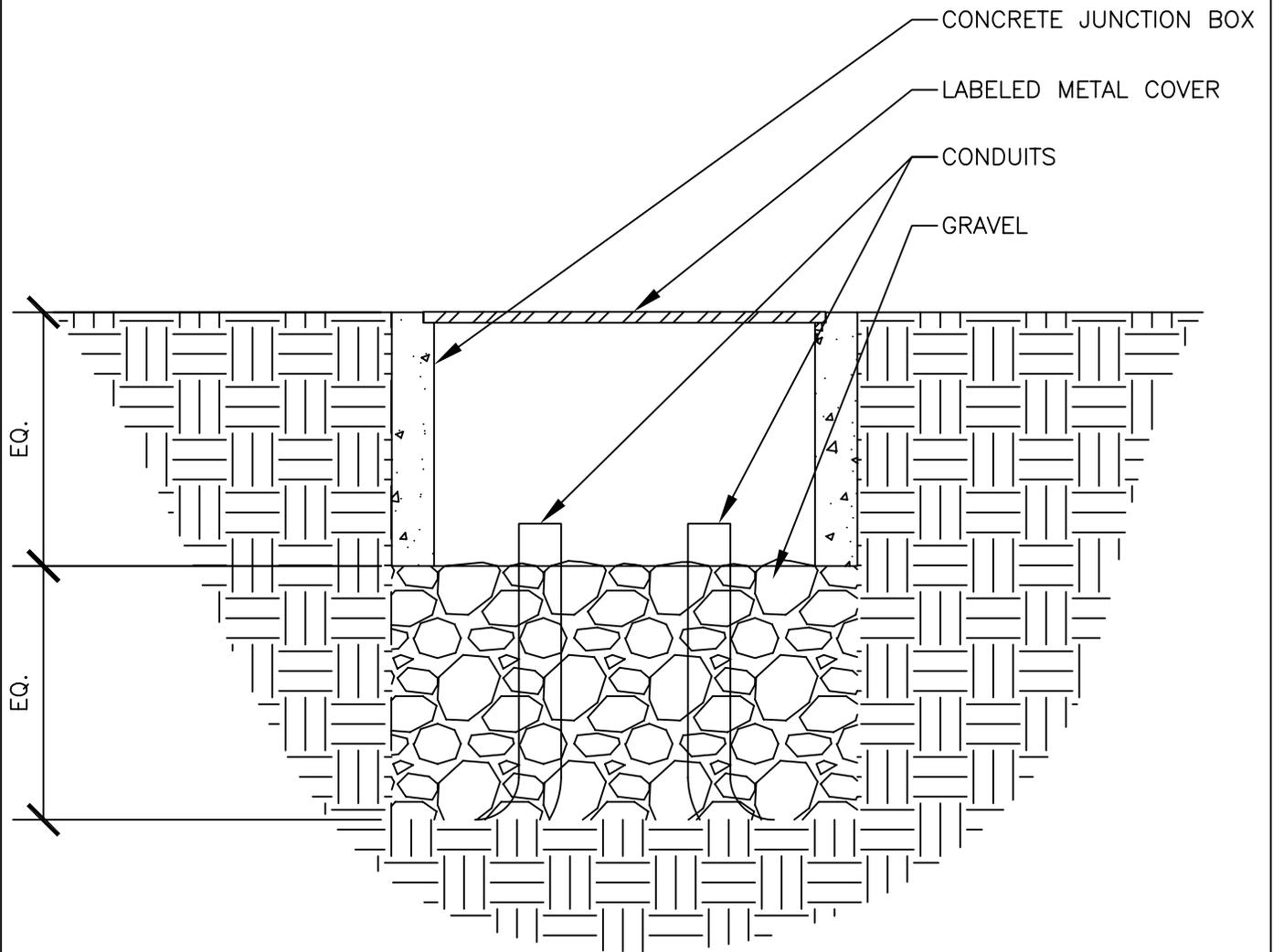
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	6' REVEAL CURB DETAIL	CHECKED BY	J. BARKER	DETAIL NO
		SCALE	NONE	DM-C
		DATE	15 JUN 95	25A

NOTE: IF SITE CONDITIONS
 DICTATE DEVIATIONS FROM STD.
 DETAIL, COORDINATE W/ AGENCY



▲ 6" REVEAL CURB REQUIRED ONLY WHEN NOTED ON THE PLANS TO RESTRICT VEHICULAR TRAFFIC. VERIFY NEED; DELETE IF NOT APPLICABLE

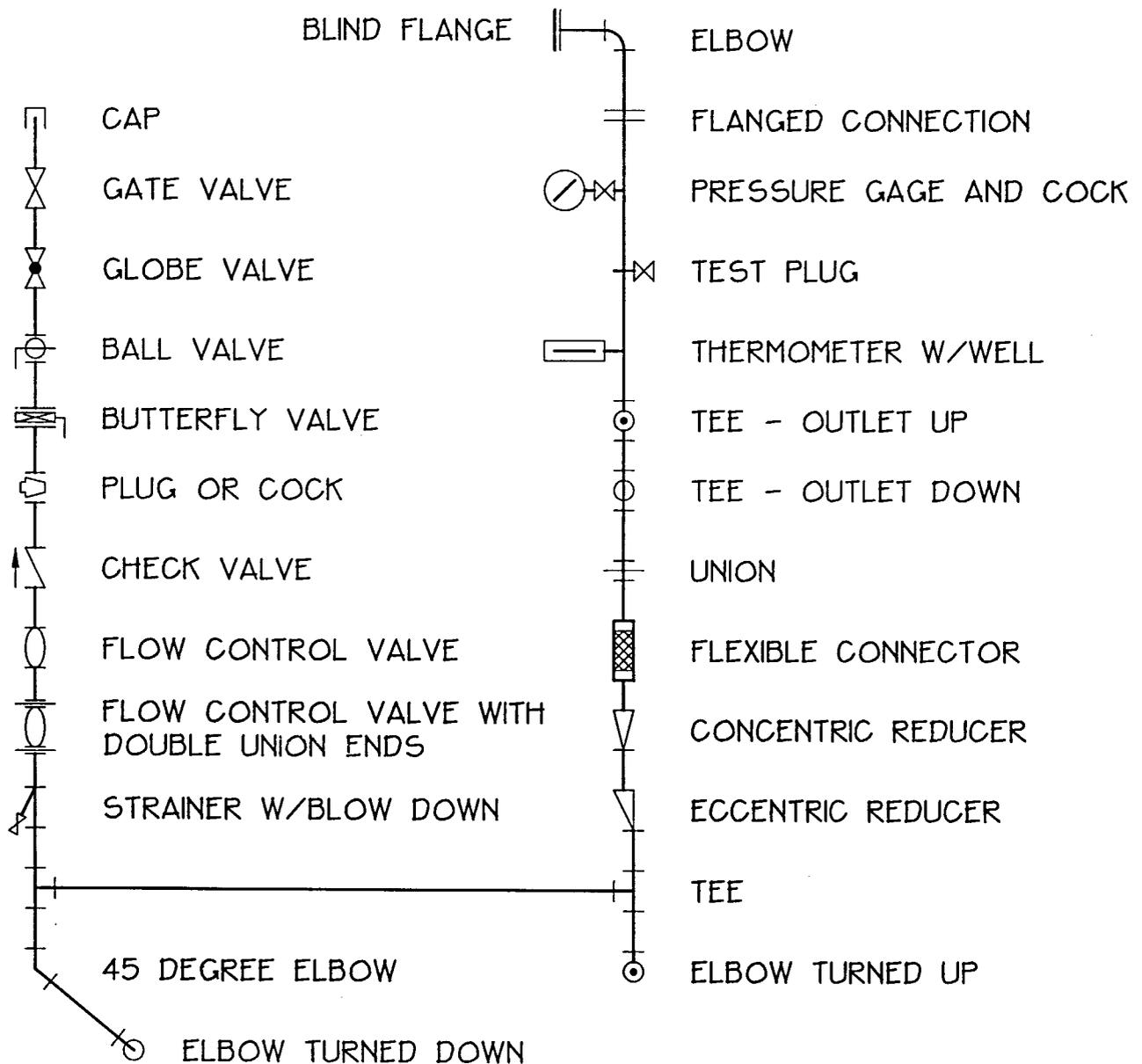
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	8' REVEAL CURB DETAIL	CHECKED BY J. BARKER SCALE NONE DATE 15 JUN 95	DETAIL NO DM-C 25B
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HAND HOLE CONCRETE JUNCTION BOX DETAIL
 N.T.S.

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	HAND HOLD CONCRETE JUNCTION BOX DETAIL	CHECKED BY J. SORENSEN	DETAIL NO DM-C 26
		SCALE NONE	
		DATE 25 SEP 07	

HYDRONIC SYMBOLS



DEPARTMENT OF THE AIR FORCE
AIR COMBAT COMMAND

DAVIS-MONTHAN AFB, AZ
CIVIL ENGINEER OFFICE

HYDRONIC STANDARD
SYMBOLS

CHECKED BY J. BARKER

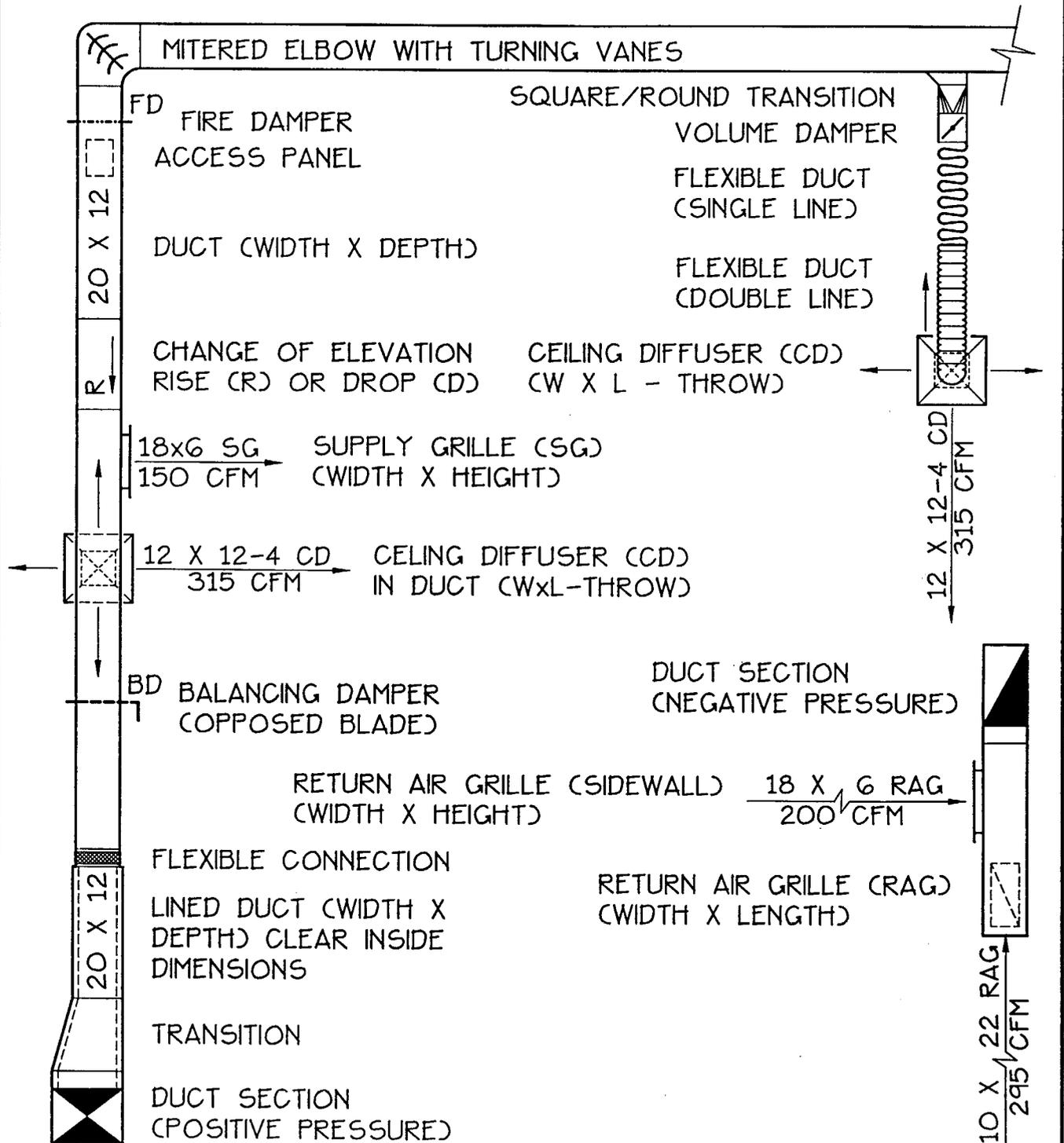
SCALE NONE

DATE 18 MAR 91

DETAIL NO

DM-M
-001

DUCTWORK SYMBOLS



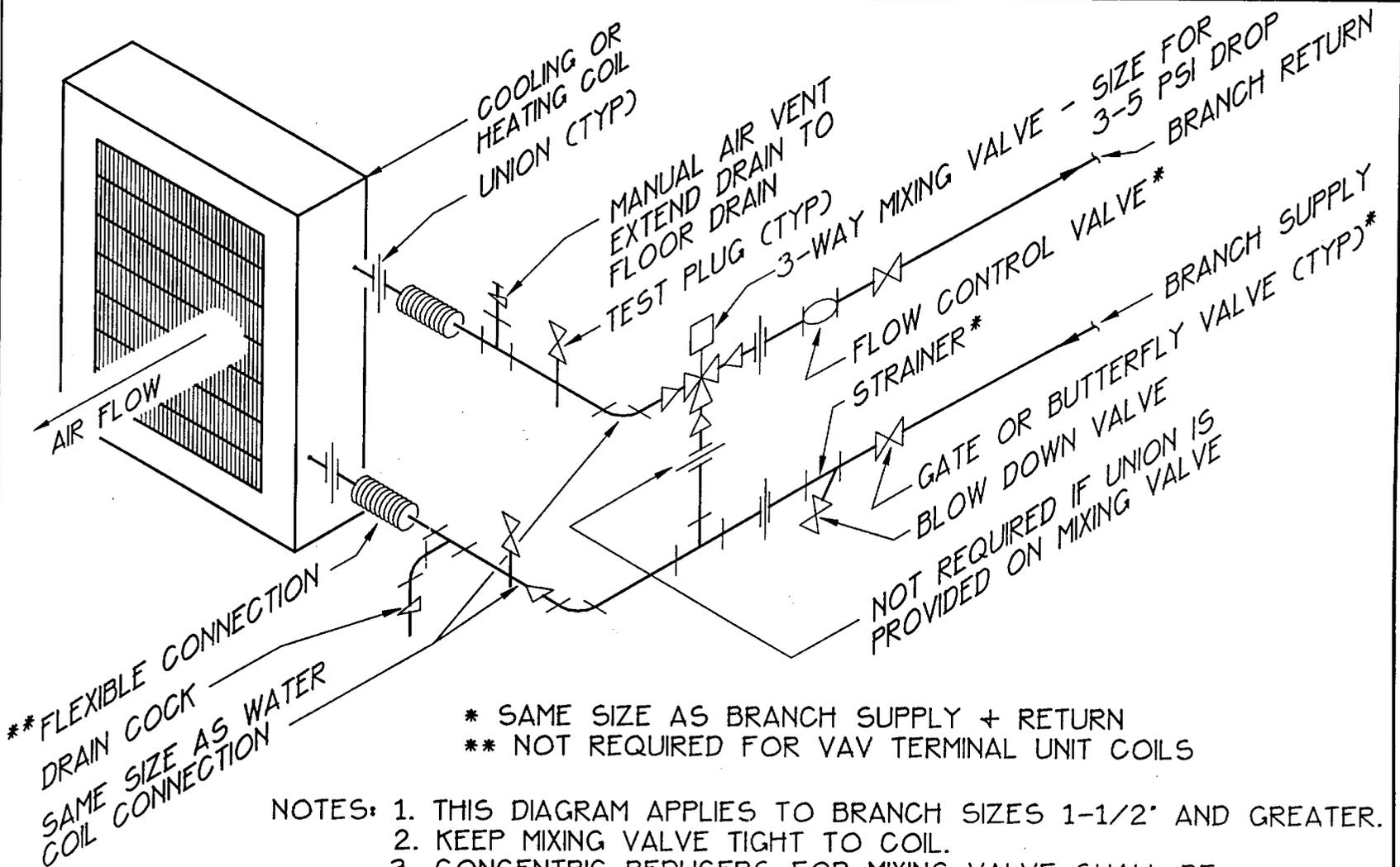
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	DUCTWORK STANDARD SYMBOLS	CHECKED BY J. BARKER SCALE NONE DATE 18 MAR 91	DETAIL NO DM-M -002
--	---	---	--

DEPARTMENT OF THE AIR FORCE
 AIR COMBAT COMMAND
 DAVIS-MONTHAN AFB, AZ
 CIVIL ENGINEER OFFICE

TYPICAL WATER COIL
 PIPING DIAGRAM

CHECKED BY J. BARKER
 SCALE NONE
 DATE R1 15 APR 92

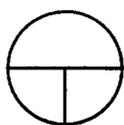
DETAIL NO
 DM-M
 003



** FLEXIBLE CONNECTION
 DRAIN COCK
 SAME SIZE AS WATER
 COIL CONNECTION

* SAME SIZE AS BRANCH SUPPLY + RETURN
 ** NOT REQUIRED FOR VAV TERMINAL UNIT COILS

- NOTES:
1. THIS DIAGRAM APPLIES TO BRANCH SIZES 1-1/2' AND GREATER.
 2. KEEP MIXING VALVE TIGHT TO COIL.
 3. CONCENTRIC REDUCERS FOR MIXING VALVE SHALL BE LOCATED WITHIN SIX INCHES OF THE VALVE.
 4. ALL VALVES AND STRAINER SHALL HAVE THREADED CONNECTIONS.



TYPICAL WATER COIL PIPING DIAGRAM

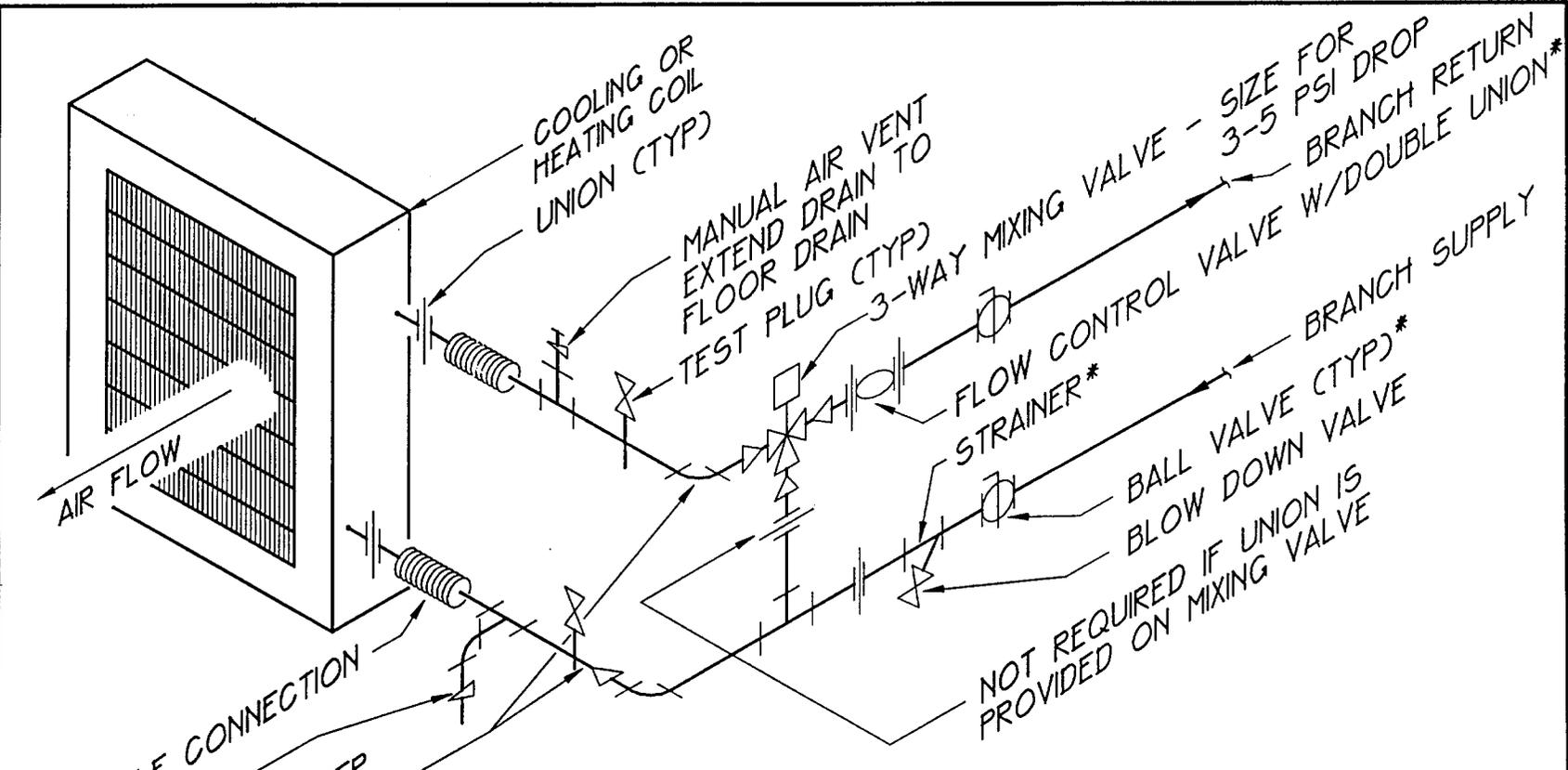
NOT TO SCALE

DEPARTMENT OF THE AIR FORCE
 AIR COMBAT COMMAND
 DAVIS-MONTHAN AFB, AZ
 CIVIL ENGINEER OFFICE

TYPICAL WATER COIL
 PIPING DIAGRAM

CHECKED BY J. BARKER
 SCALE NONE
 DATE R1 15 APR 92

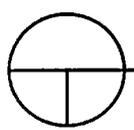
DETAIL NO
 DM-M
 004



** FLEXIBLE CONNECTION
 DRAIN COCK
 SAME SIZE AS WATER
 COIL CONNECTION

* SAME SIZE AS BRANCH SUPPLY + RETURN
 ** NOT REQUIRED FOR VAV TERMINAL UNIT COILS

- NOTES:
1. THIS DIAGRAM APPLIES TO BRANCH SIZES 1-1/4" AND SMALLER.
 2. KEEP MIXING VALVE TIGHT TO COIL.
 3. CONCENTRIC REDUCERS FOR MIXING VALVE SHALL BE LOCATED WITHIN SIX INCHES OF THE VALVE.
 4. ALL VALVES AND STRAINER SHALL HAVE THREADED CONNECTIONS.



TYPICAL WATER COIL PIPING DIAGRAM

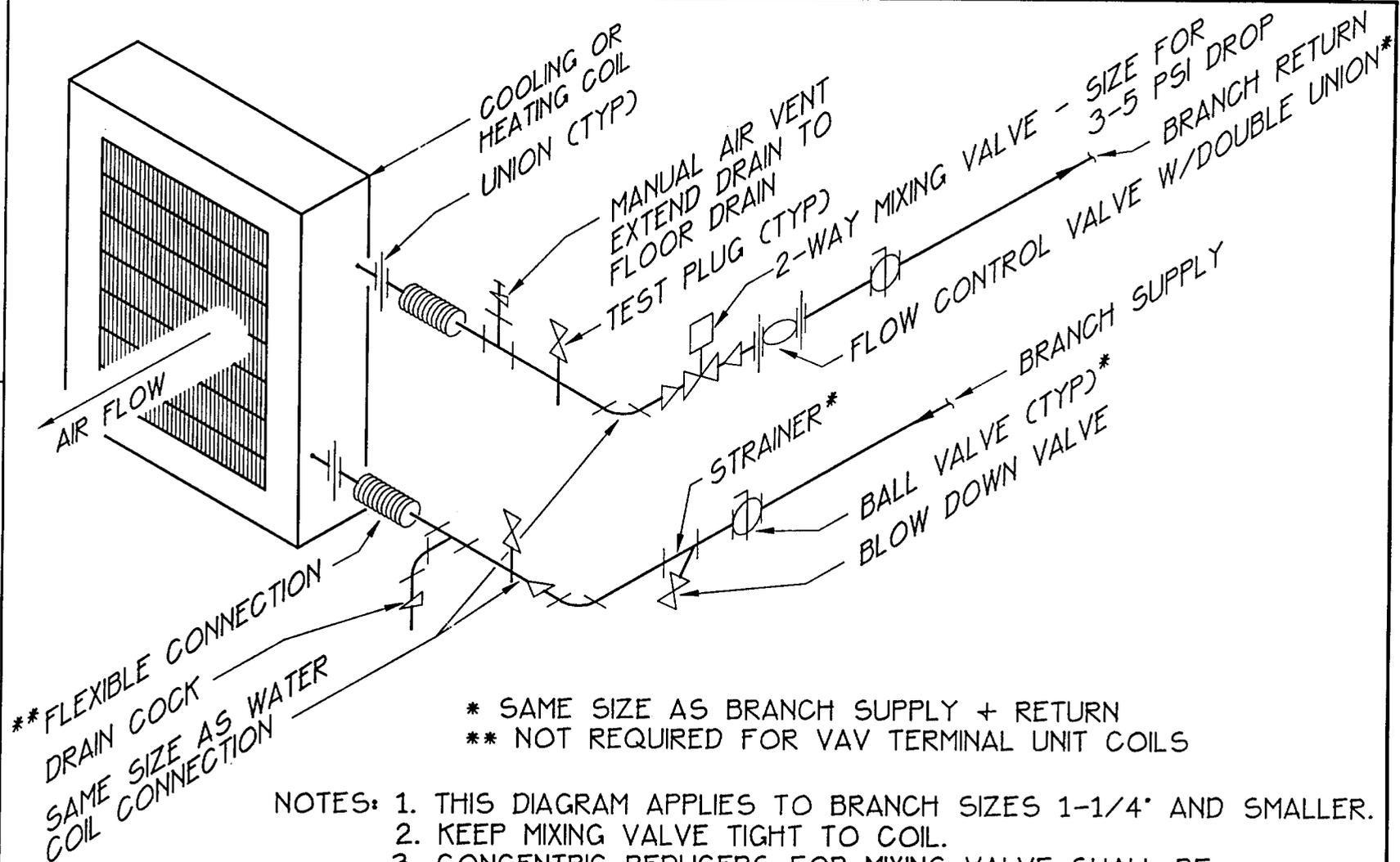
NOT TO SCALE

DEPARTMENT OF THE AIR FORCE
 AIR COMBAT COMMAND
 DAVIS-MONTHAN AFB, AZ
 CIVIL ENGINEER OFFICE

TYPICAL WATER COIL
 PIPING DIAGRAM

CHECKED BY J. BARKER
 SCALE NONE
 DATE R1 15 APR 92

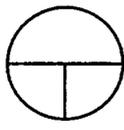
DETAIL NO
 DM-M
 005



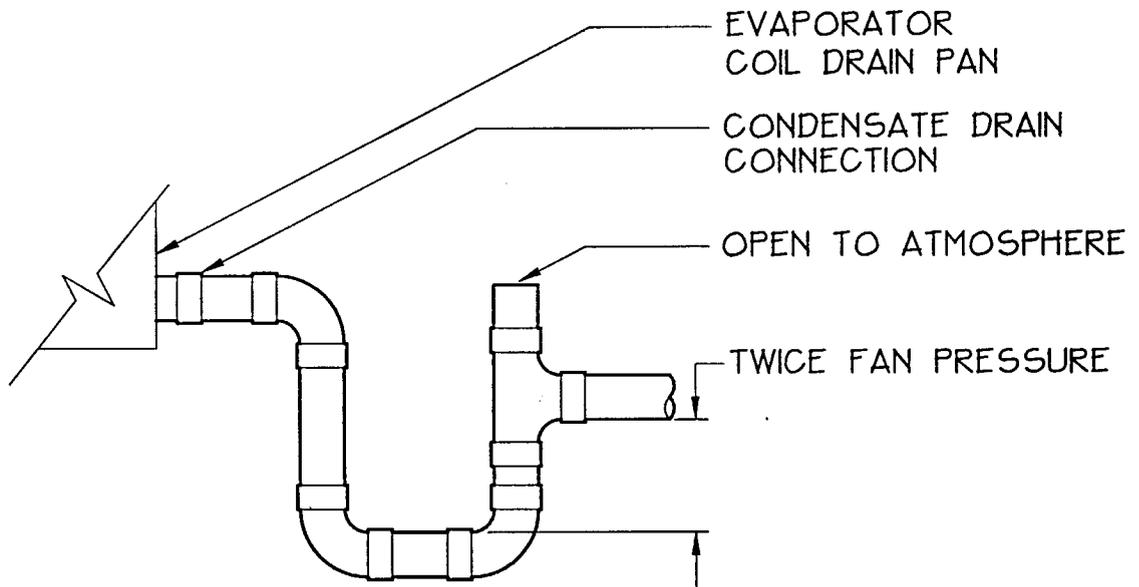
** FLEXIBLE CONNECTION
 DRAIN COCK
 SAME SIZE AS WATER
 COIL CONNECTION

* SAME SIZE AS BRANCH SUPPLY + RETURN
 ** NOT REQUIRED FOR VAV TERMINAL UNIT COILS

- NOTES:
1. THIS DIAGRAM APPLIES TO BRANCH SIZES 1-1/4" AND SMALLER.
 2. KEEP MIXING VALVE TIGHT TO COIL.
 3. CONCENTRIC REDUCERS FOR MIXING VALVE SHALL BE LOCATED WITHIN SIX INCHES OF THE VALVE.
 4. ALL VALVES AND STRAINER SHALL HAVE THREADED CONNECTIONS.

 TYPICAL WATER COIL PIPING DIAGRAM
 NOT TO SCALE

CONDENSATE DRAIN DETAIL

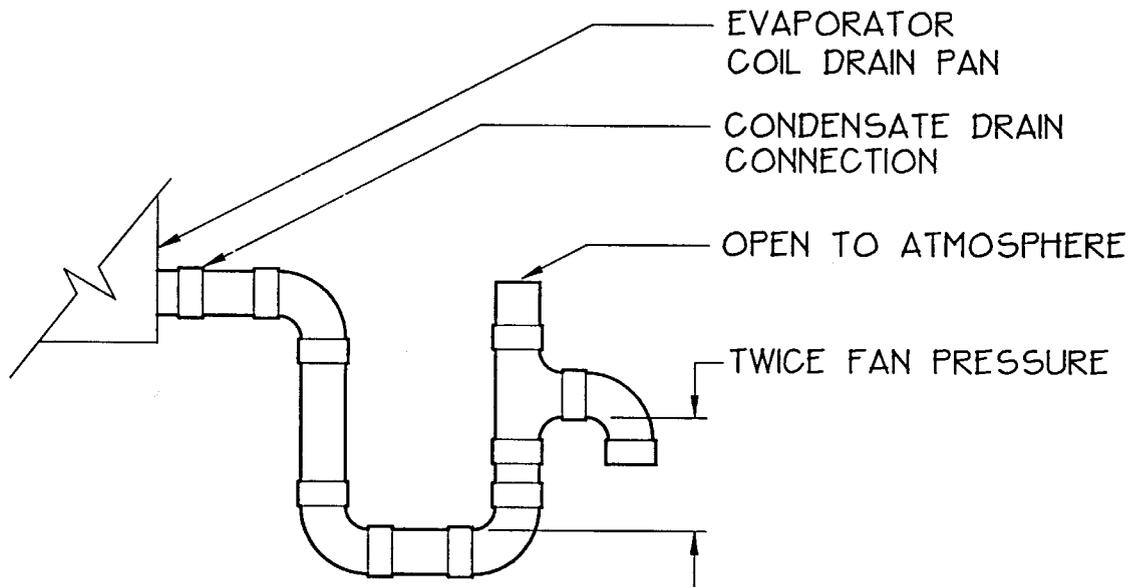


NOTE: MINIMUM SIZE OF CONDENSATE DRAIN SHALL BE SIZE OF CONDENSATE DRAIN CONNECTION.

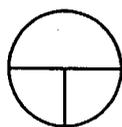
CONDENSATE DRAIN DETAIL
NOT TO SCALE

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	CONDENSATE DRAIN DETAIL	CHECKED BY J. BARKER	DETAIL NO DM-M 006
		SCALE NONE	
		DATE 25 MAR 91	

CONDENSATE DRAIN DETAIL



NOTE: MINIMUM SIZE OF CONDENSATE DRAIN SHALL BE SIZE OF CONDENSATE DRAIN CONNECTION.



CONDENSATE DRAIN DETAIL

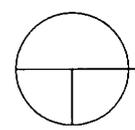
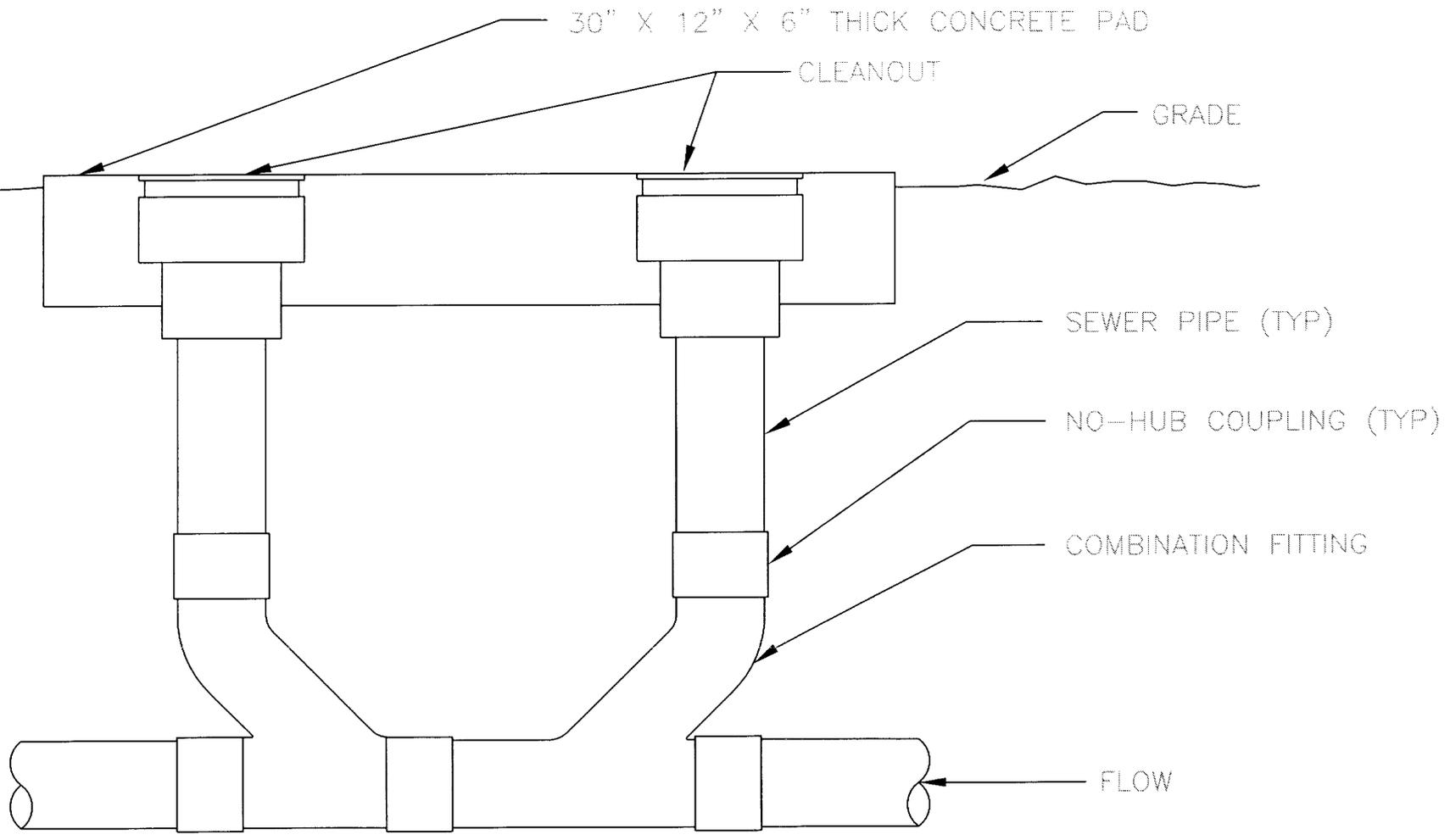
NOT TO SCALE

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	CONDENSATE DRAIN DETAIL	CHECKED BY	J. BARKER	DETAIL NO DM-M 007
		SCALE	NONE	
		DATE	25 MAR 91	

DEPARTMENT OF THE AIR FORCE
AIR COMBAT COMMAND
DAVIS-MONTHAN AFB, AZ
CIVIL ENGINEER OFFICE

TYPICAL TWO-WAY
CLEANOUT DETAIL

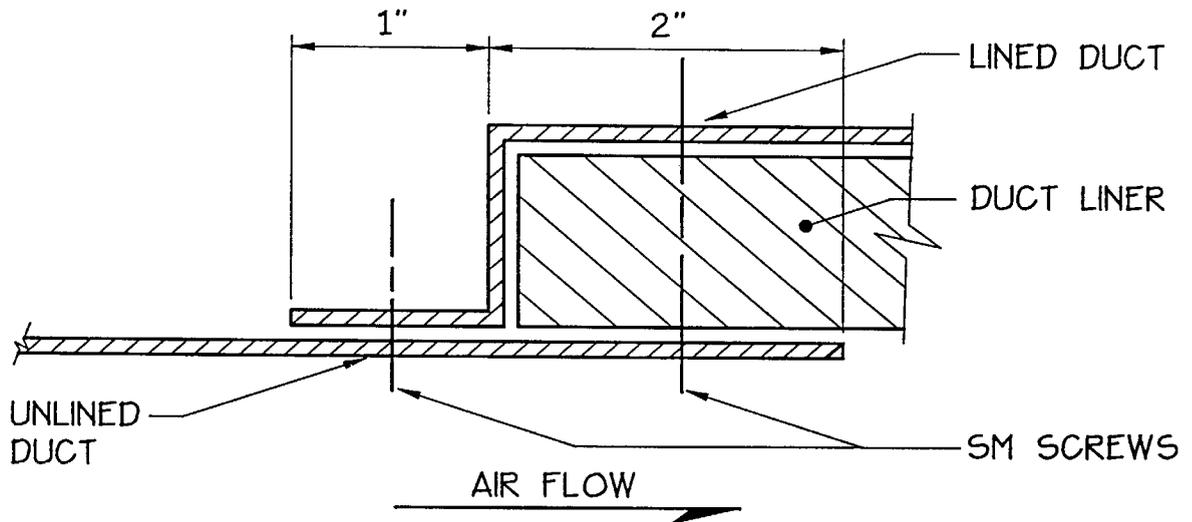
CHECKED BY J. BARKER
SCALE NOT TO SCALE
DATE 16 APR 01
DETAIL NO DM-M 010



TYPICAL TWO-WAY CLEANOUT DETAIL

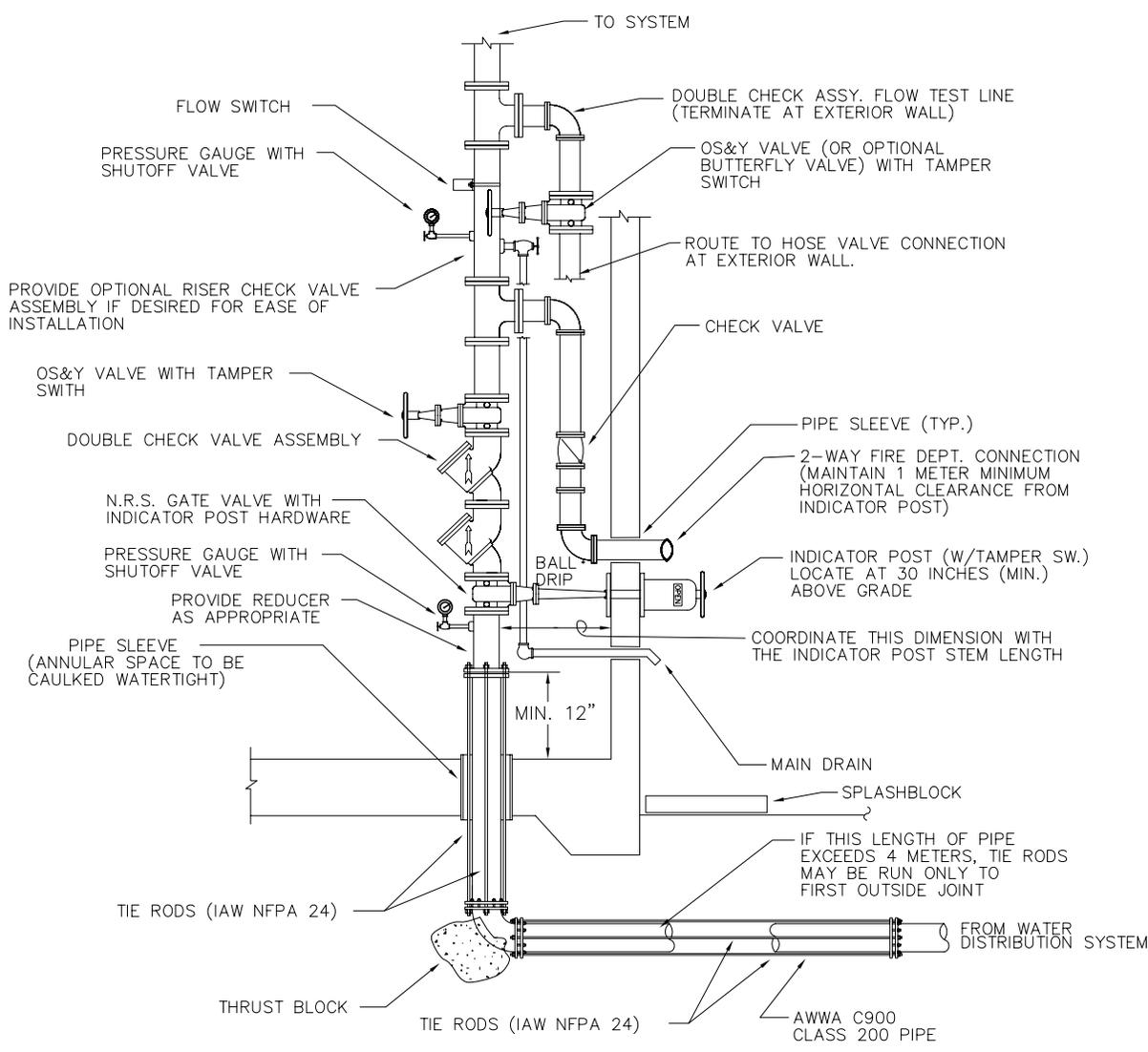
NOT TO SCALE

INTERNAL DUCT LINER DETAIL



INTERNAL DUCT LINER DETAIL
NOT TO SCALE

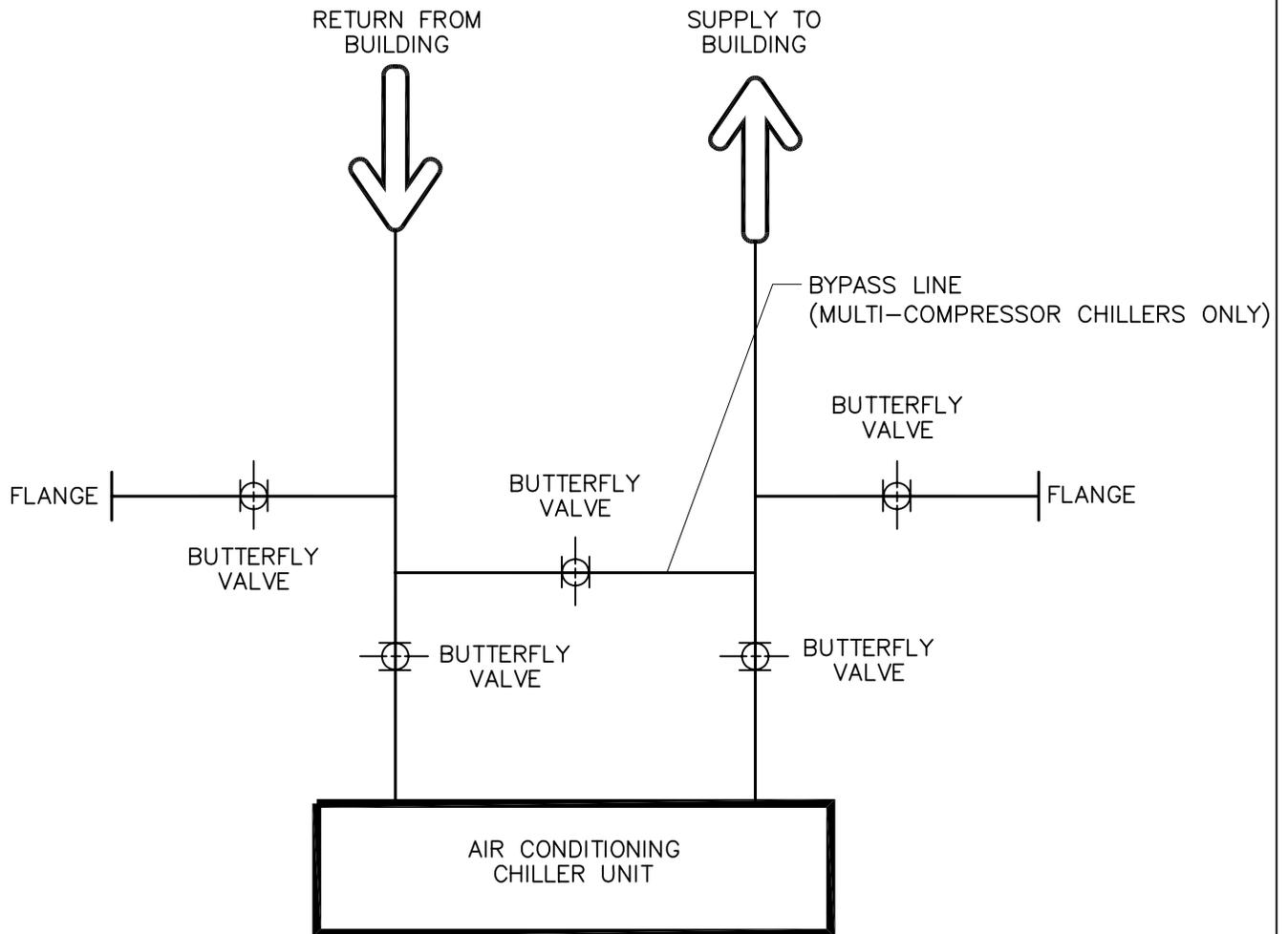
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	INTERNAL DUCT LINER DETAIL	CHECKED BY	J. BARKER	DETAIL NO DM-M 008
		SCALE	NONE	
		DATE	25 MAR 91	



FIRE SUPPRESSION SYSTEM RISER

NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	FIRE SUPPRESTION SYSTEM RISER	CHECKED BY J. SORENSEN	DETAIL NO DM-M 011
		SCALE NONE	
		DATE 17 SEP 07	



CHILLER MAINTENANCE BY-PASS

NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	CHILLER MAINTENANCE BY-PASS	CHECKED BY J. SORENSEN	DETAIL NO DM-M 012
		SCALE NONE	
		DATE 17 SEP 07	

STANDARD HYDRONIC PIPE SIZES

MINIMUM GPM	MAXIMUM GPM	PIPE SIZE
0	1	1/2"
1	2-1/2	3/4"
2-1/2	5	1"
5	8	1-1/4"
8	15	1-1/2"
15	25	2"
25	45	2-1/2"
45	80	3"
80	150	4"
150	300	6"
300	550	8"
550	800	10"
800	1,000	12"

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	STANDARD HYDRONIC PIPE SIZES	CHECKED BY J. BARKER SCALE NONE DATE 20 MAR 91	DETAIL NO DM-5 001
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STANDARD FLEXIBLE DUCT SIZES

DUCT SIZE	CFM RANGE
* 3"	UP TO 15 CFM
* 4"	20 - 30 CFM
* 5"	35 - 50 CFM
6"	55 - 85 CFM
* 7"	90 - 120 CFM
8"	125 - 180 CFM
* 9"	185 - 220 CFM
10"	215 - 315 CFM
12"	320 - 425 CFM
14"	430 - 545 CFM
16"	550 - 730 CFM
18"	735 - 900 CFM

* OPTIONAL USE

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	STANDARD FLEXIBLE DUCT SIZES	CHECKED BY	J. BARKER	DETAIL NO DM-5 002
DAVIS-MONTHAN AFB, AZ		SCALE	NONE	
CIVIL ENGINEER OFFICE		DATE	20 MAR 91	

STANDARD RETURN AIR GRILLE SIZES

USE	GRILLE SIZE	CFM RANGE
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T-BAR	10 X 22	UP TO 600
CEILING	22 X 22	605 - 1250

HARD CEILINGS	6 X 6	UP TO 95
	8 X 8	100 - 170
	10 X 10	175 - 270
	12 X 12	275 - 395
	12 X 24	400 - 600
	24 X 24	605 - 1400

SIDEWALL	SIZE INDIVIDUALLY
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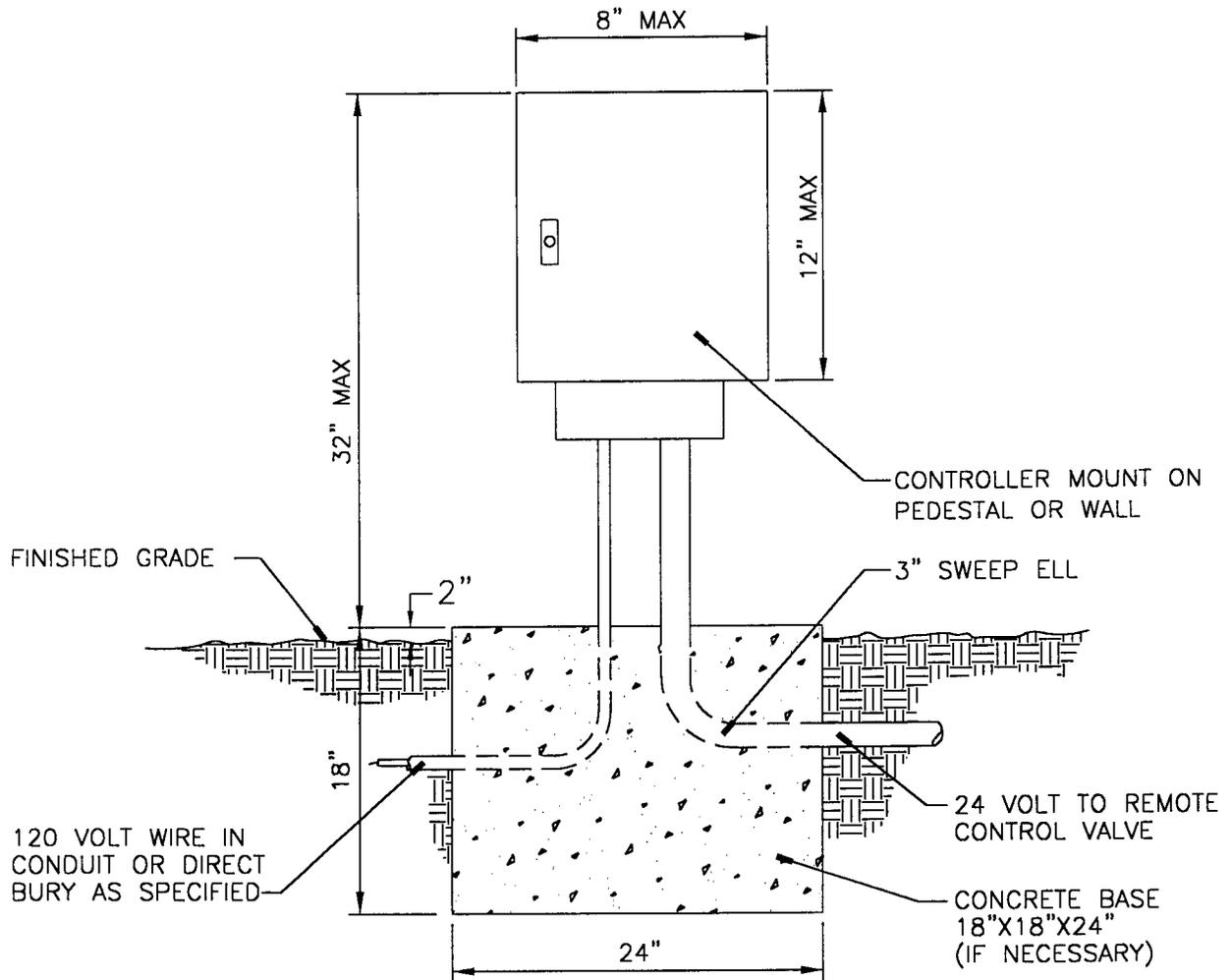
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	STANDARD RETURN AIR GRILLE SIZES	CHECKED BY	J. BARKER	DETAIL NO
DAVIS-MONTHAN AFB, AZ		SCALE	NONE	DM-5
CIVIL ENGINEER OFFICE		DATE	20 MAR 91	003

KRUEGER CEILING DIFFUSER SIZES

MODEL 1240P - 4 WAY - NC 30

DIFFUSER SIZE	MAX CFM	THROW FT	FLEX HOSE SIZE
6 X 6	85	5'	6"
8 X 8	180	6'	8"
10 X 10	315	10'	10"
12 X 12	425	11'	12"
14 X 14	545	13'	14"
16 X 16	730	14'	16"
18 X 18	900	15'	18"

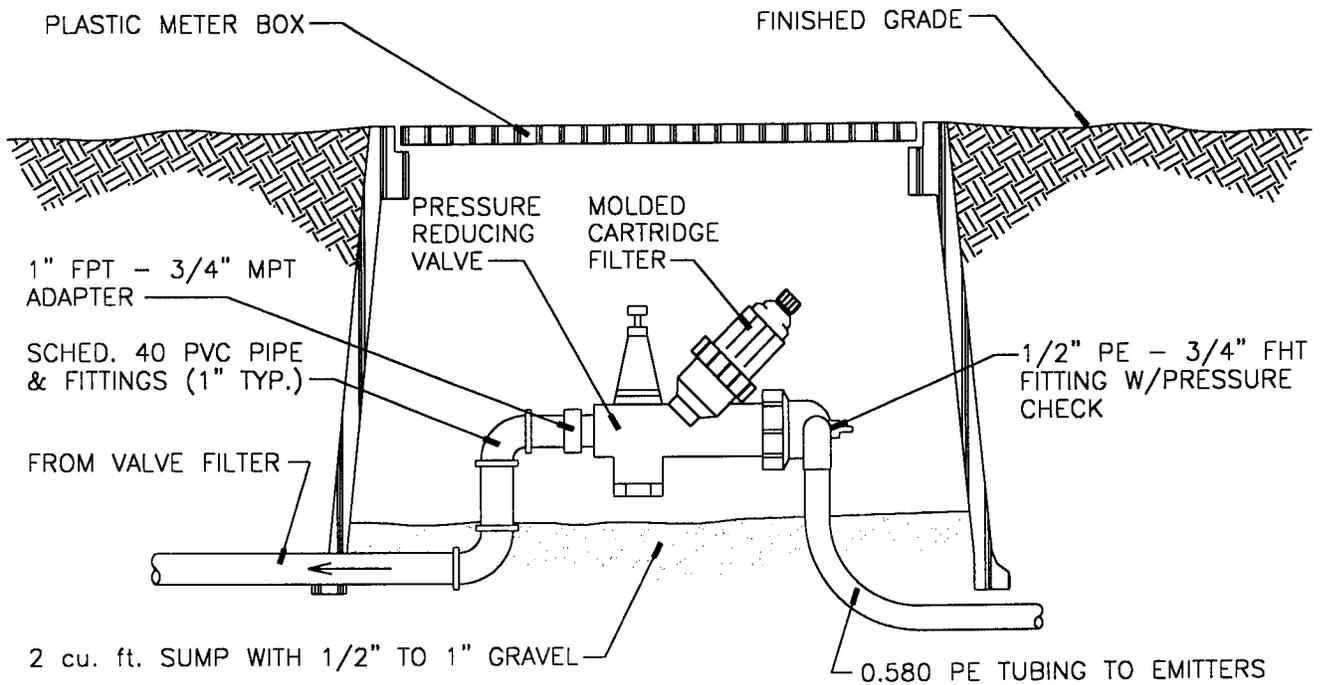
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	KRUEGER CEILING DIFFUSER SIZES	CHECKED BY J. BARKER SCALE NONE DATE 19 JUN 91	DETAIL NO DM-5 005
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AUTOMATIC CONTROLLER

NTS

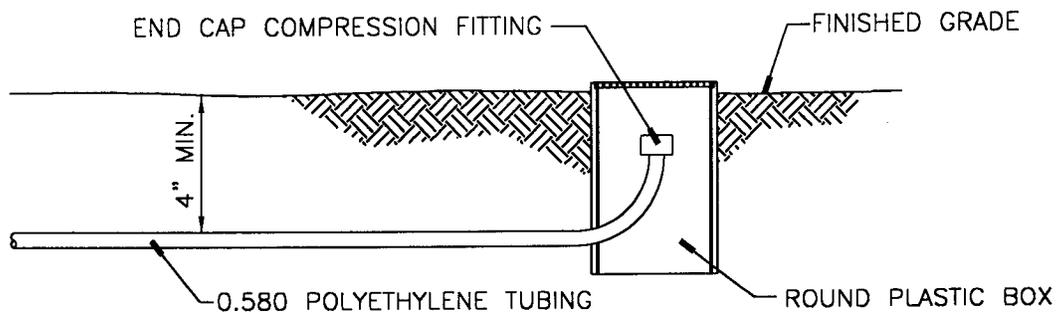
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	<h2 style="margin: 0;">AUTOMATIC CONTROLLER</h2>	CHECKED BY D. SPEIR SCALE AS SHOWN DATE 11 JAN 96	DETAIL NO DM-L 001
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RISER ASSEMBLY

NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	RISER ASSEMBLY	CHECKED BY D. SPEIR	DETAIL NO DM-L 002
		SCALE AS SHOWN	
		DATE 11 JAN 96	

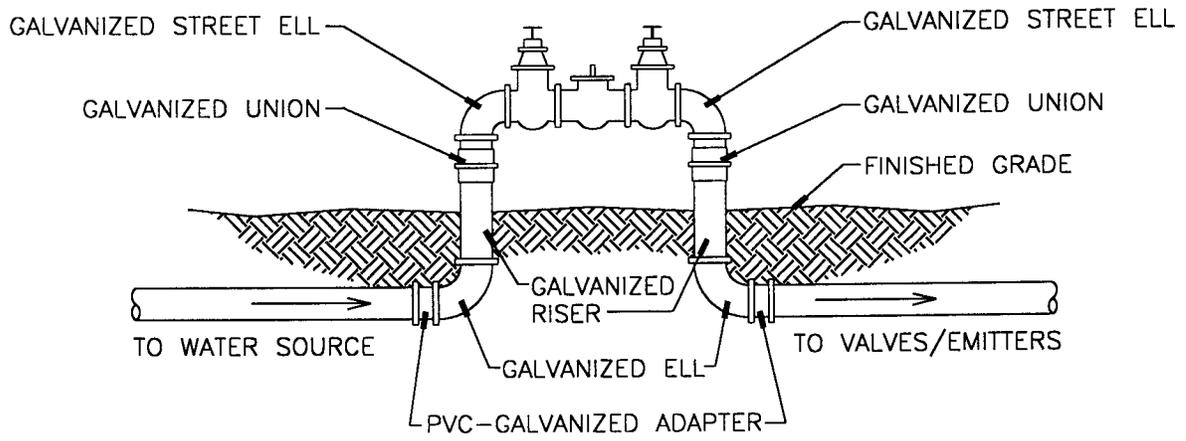


NOTE: THIS DETAIL SHALL BE USED AT THE
END OF ALL POLYETHYLENE LATERAL LINES.

EMITTER LINE FLUSH VALVE

NTS

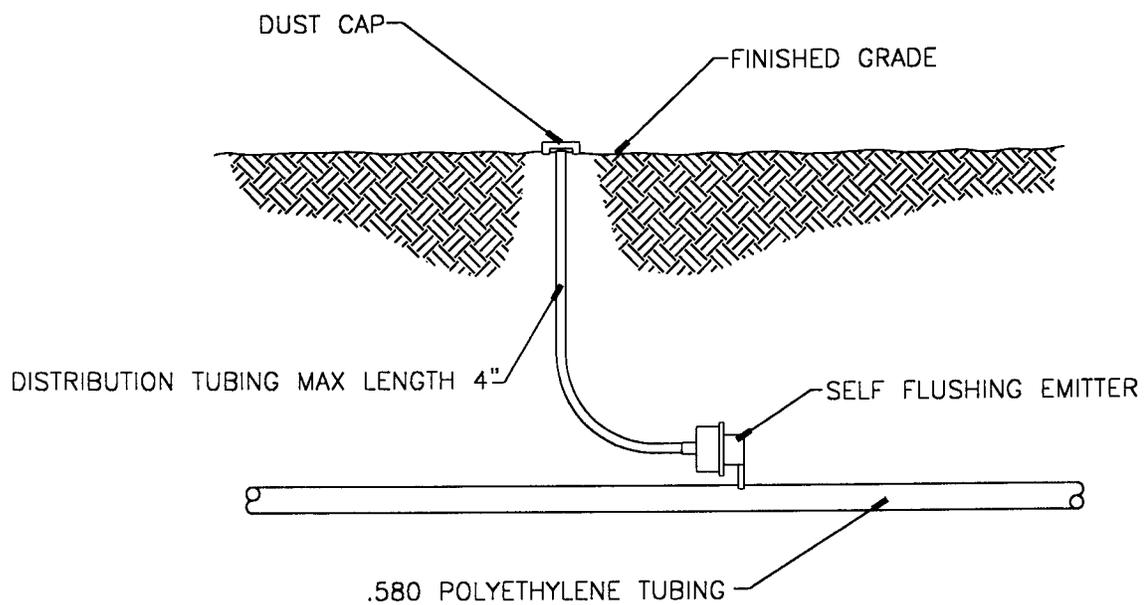
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	EMITTER LINE FLUSH VALVE	CHECKED BY	D. SPEIR	DETAIL NO DM-L 003
		SCALE	AS SHOWN	
		DATE	11 JAN 96	



BACKFLOW PREVENTER

NTS

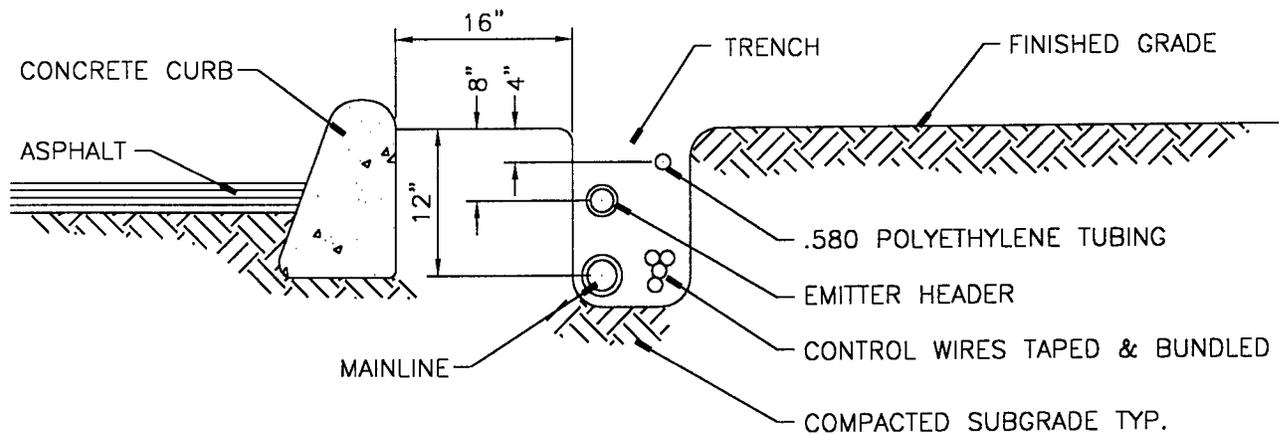
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	<h2 style="margin: 0;">BACKFLOW PREVENTER</h2>	CHECKED BY D. SPEIR SCALE AS SHOWN DATE 1 JAN 96	DETAIL NO DM-L 004
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EMITTER

NTS

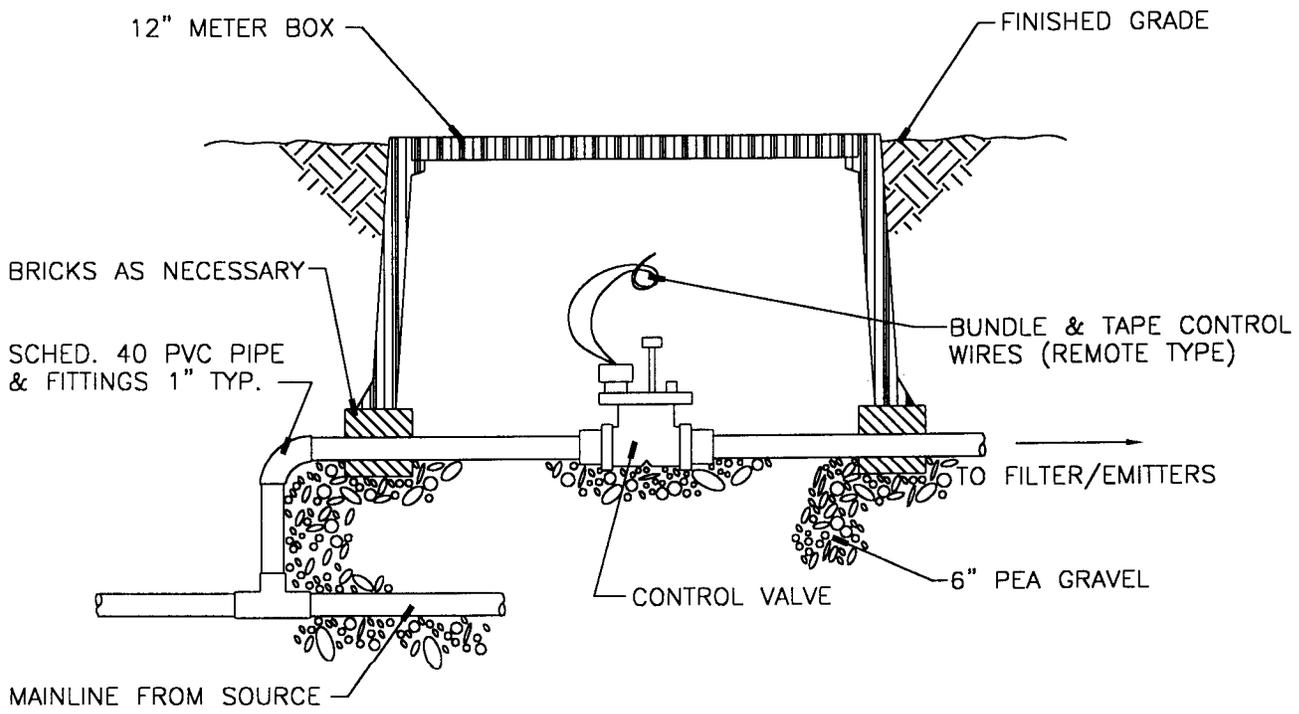
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	EMITTER	CHECKED BY D. SPEIR	DETAIL NO DM-L 005
DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE		SCALE AS SHOWN	
		DATE 11 JAN 96	



TYPICAL TRENCHING STANDARDS

NTS

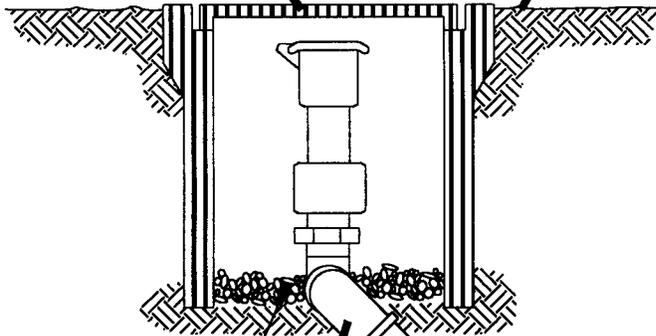
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	TYPICAL TRENCHING STANDARDS	CHECKED BY	D. SPEIR	DETAIL NO DM-L 006
		SCALE	AS SHOWN	
		DATE	9 JAN 96	



CONTROL VALVE
NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	CONTROL VALVE	CHECKED BY D. SPEIR SCALE AS SHOWN DATE 9 JAN 96	DETAIL NO DM-L 007
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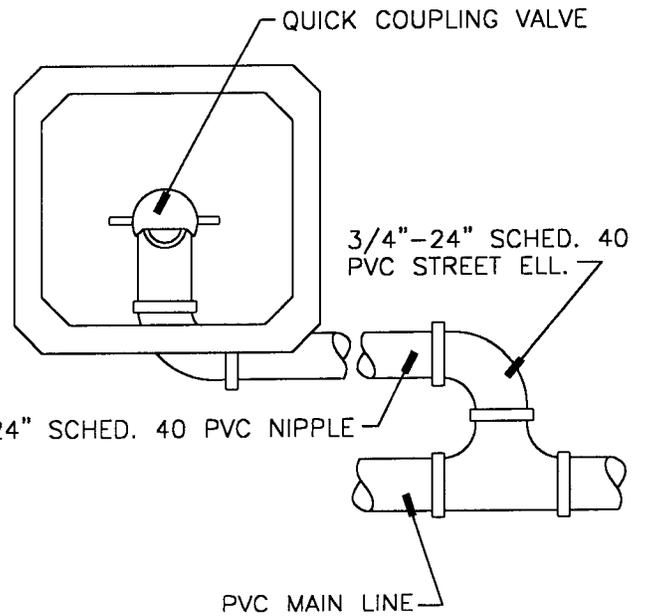
PLASTIC VALVE BOX WITH LOCKING LID — FINISHED GRADE



1 CUBIC FOOT
1/2"–1" GRAVEL

3/4"–24" SCHED. 40
PVC. STREET ELL.

SECTION



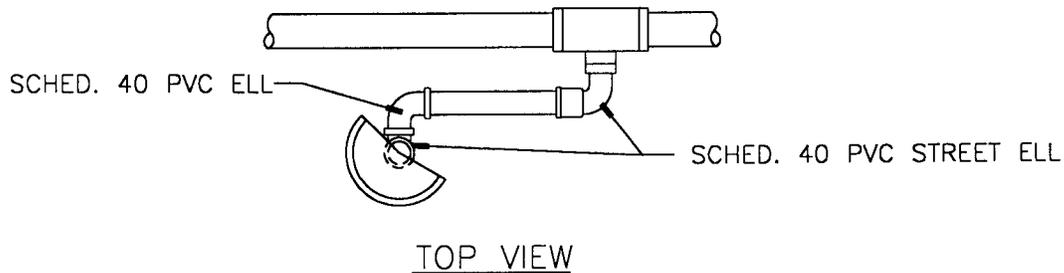
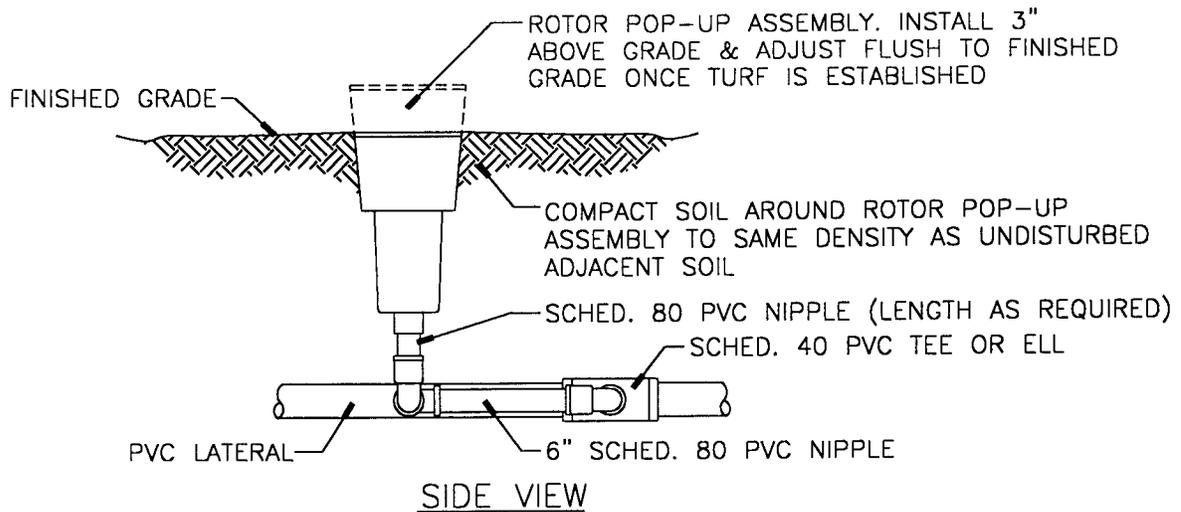
PVC MAIN LINE

PLAN

QUICK COUPLING VALVE

NTS

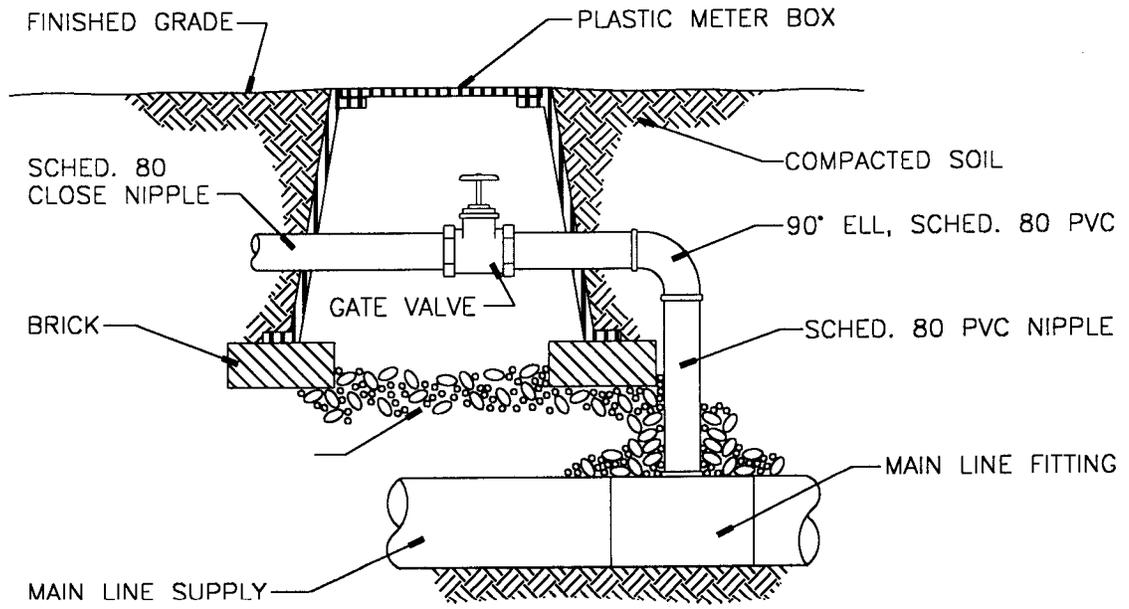
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	QUICK COUPLING VALVE	CHECKED BY D. SPEIR	DETAIL NO
DAVIS–MONTHAN AFB, AZ CIVIL ENGINEER OFFICE		SCALE AS SHOWN	DM–L 008
		DATE 9 JAN 96	



SWING JOINT POP-UP ROTOR ASSEMBLY

NTS

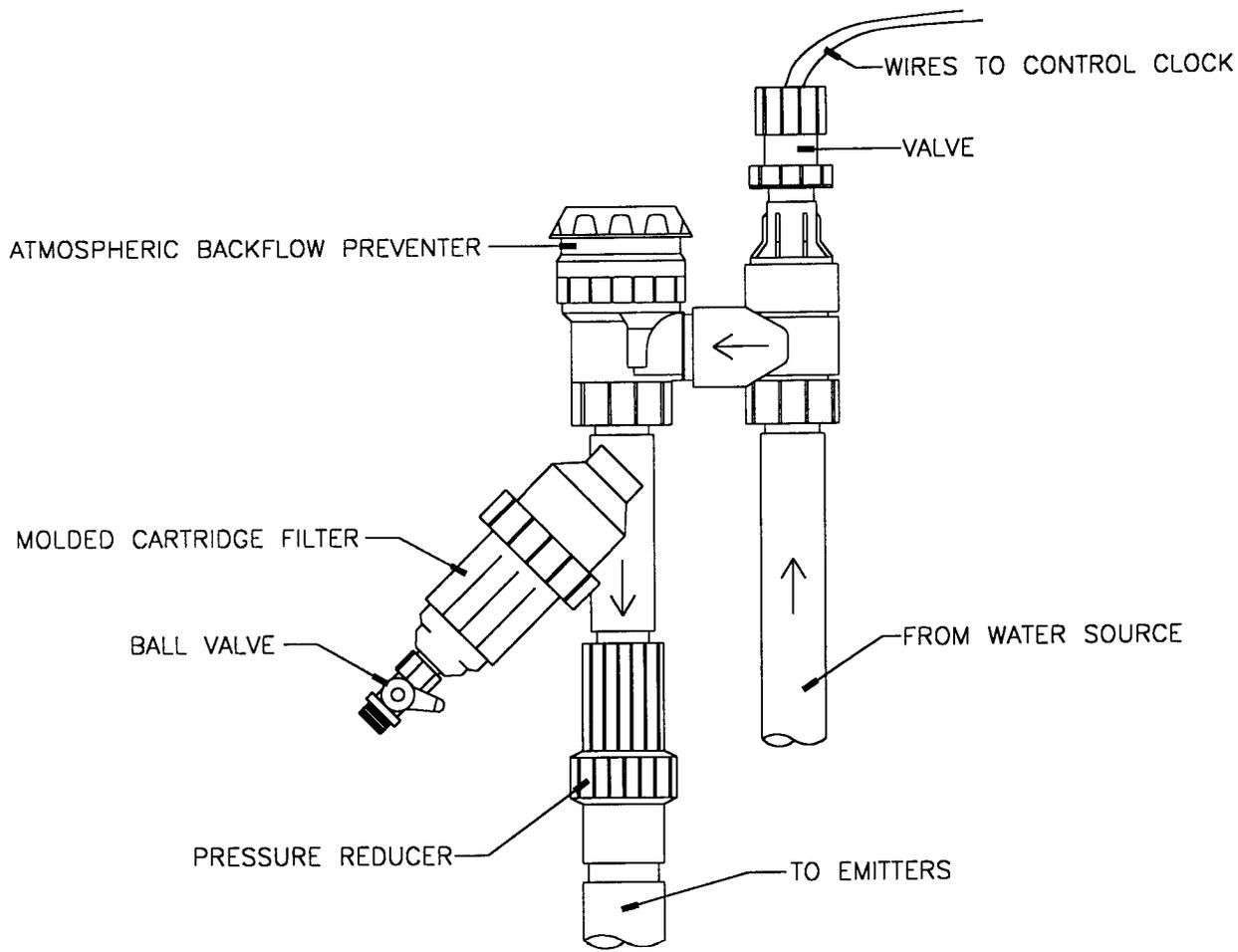
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	SWING JOINT POP-UP ROTOR ASSEMBLY	CHECKED BY	D. SPEIR	DETAIL NO DM-L 009
		SCALE	AS SHOWN	
DATE	9 JAN 96			



GATE VALVE

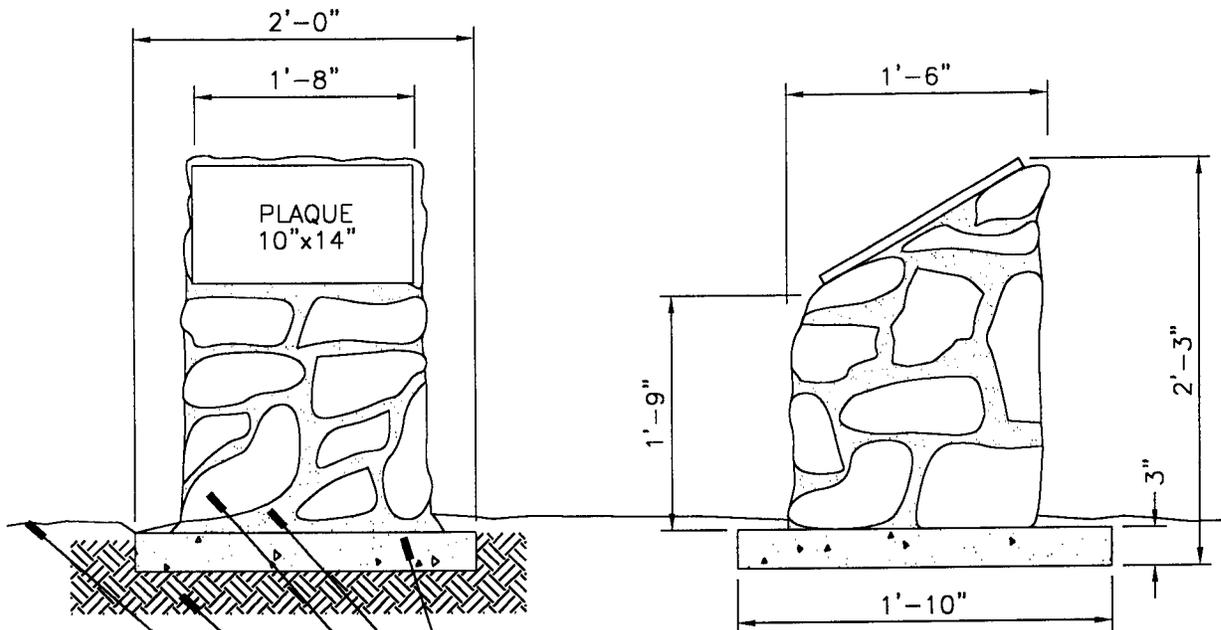
NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	<h2 style="margin: 0;">GATE VALVE</h2>	CHECKED BY D. SPEIR SCALE AS SHOWN DATE 9 JAN 96	DETAIL NO <h2 style="margin: 0;">DM-L 010</h2>
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DRIP-SYSTEM ASSEMBLY
 NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	DRIP-SYSTEM ASSEMBLY	CHECKED BY D. SPEIR	DETAIL NO
DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE		SCALE AS SHOWN	DM-L 011
		DATE 11 JAN 96	

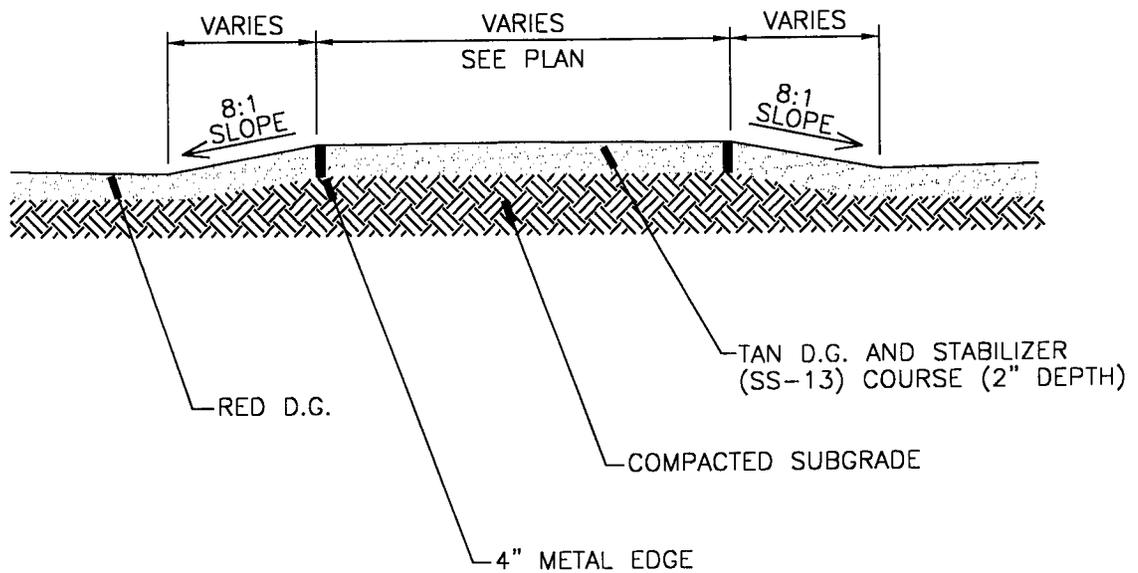


- 3" CONCRETE FOOTER
- MORTAR, JOINTS NOT TO EXCEED 3/4"
- "APACHE RED" +6" NATURAL STONE
SUBMIT SAMPLE FOR APPROVAL
- COMPACTED SUBGRADE
- FINISHED GRADE

PLAQUE ROCKWORK

NTS

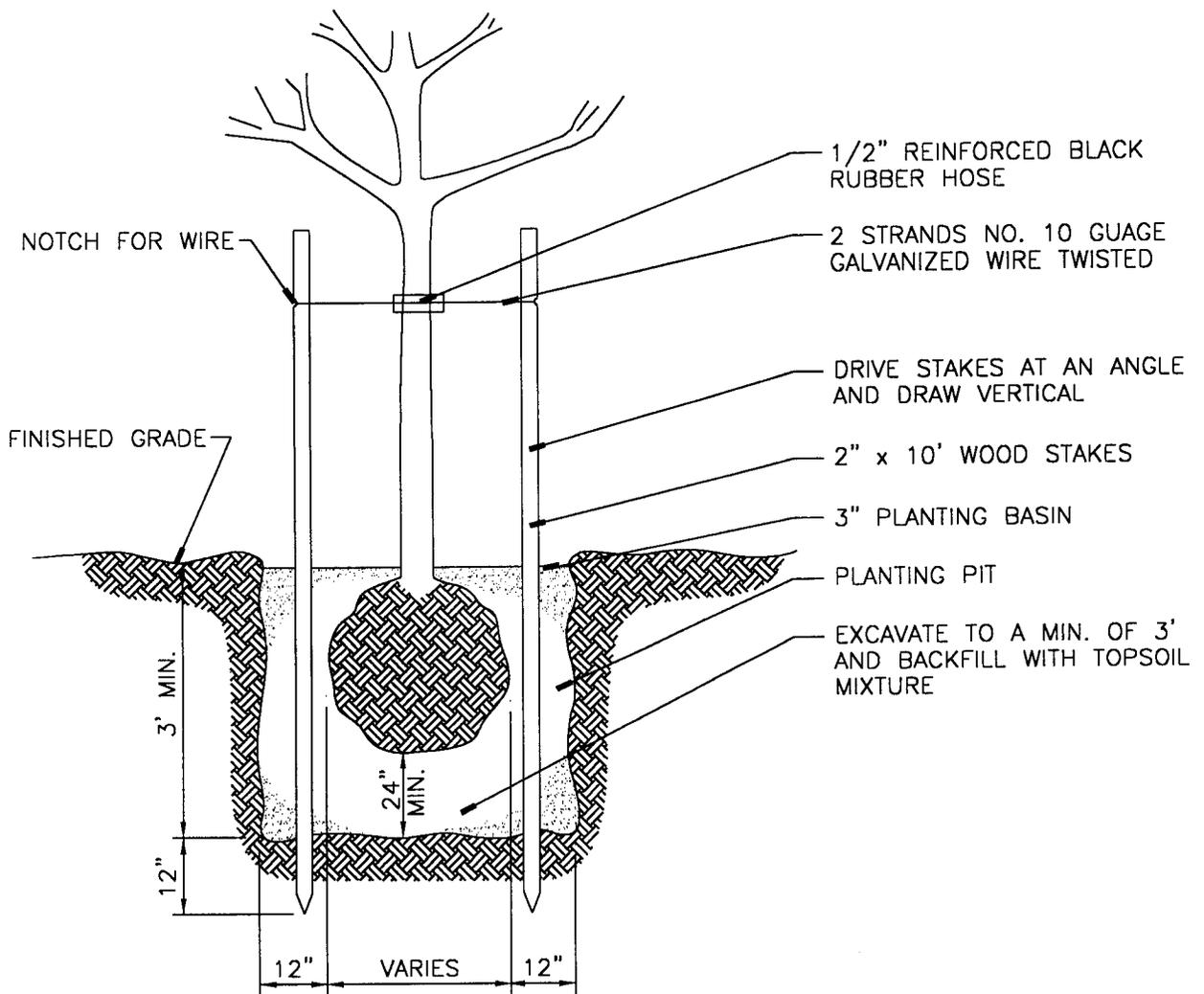
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CML ENGINEER OFFICE	PLAQUE ROCKWORK	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="font-size: small;">CHECKED BY</td> <td>D. SPEIR</td> <td rowspan="3" style="text-align: center; vertical-align: middle;"> DETAIL NO DM-L 012 </td> </tr> <tr> <td style="font-size: small;">SCALE</td> <td>AS SHOWN</td> </tr> <tr> <td style="font-size: small;">DATE</td> <td>11 JAN 96</td> </tr> </table>	CHECKED BY	D. SPEIR	DETAIL NO DM-L 012	SCALE	AS SHOWN	DATE	11 JAN 96
CHECKED BY	D. SPEIR	DETAIL NO DM-L 012							
SCALE	AS SHOWN								
DATE	11 JAN 96								



DECOMPOSED GRANITE WALKWAY

NTS

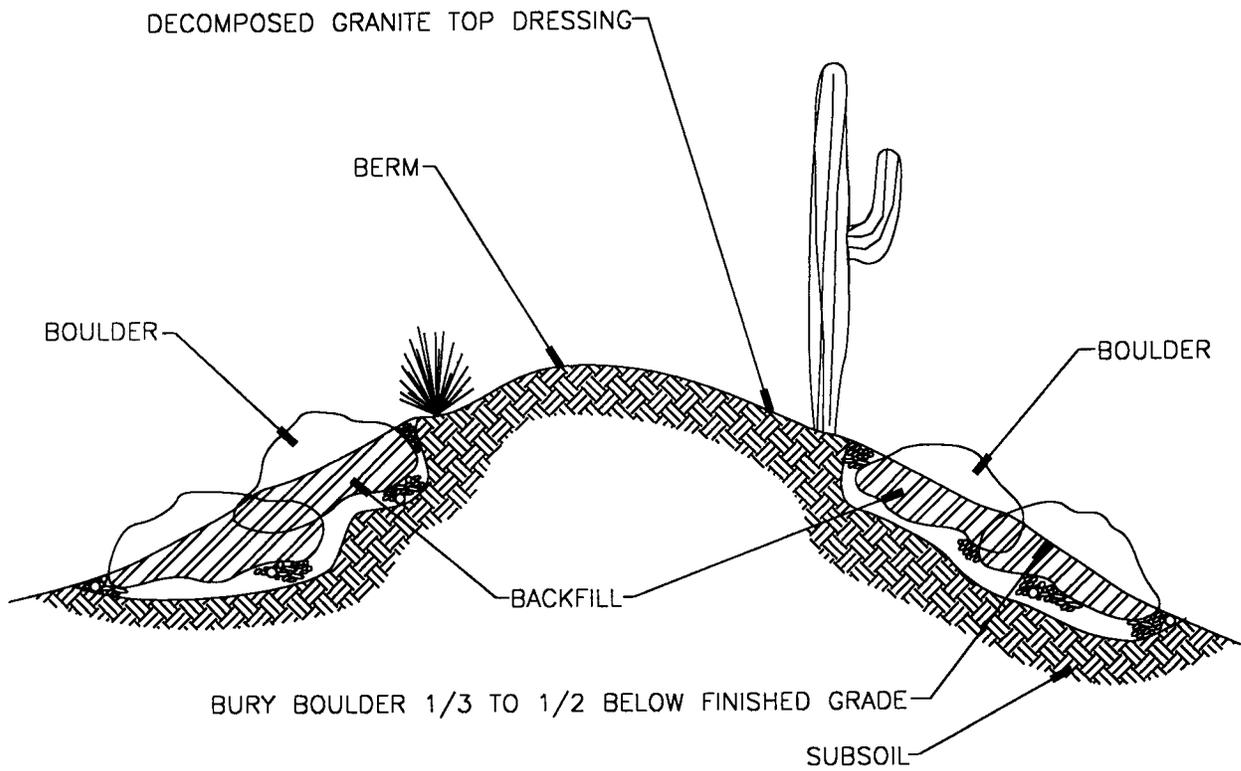
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	DECOMPOSED GRANITE WALKWAY	CHECKED BY D. SPEIR	DETAIL NO
DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE		SCALE AS SHOWN	DM-L 013
		DATE 11 JAN 96	



STAKING AND PLANTING TREES

NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	STAKING AND PLANTING TREES	CHECKED BY D. SPEIR	DETAIL NO
DAVIS-MONTHAN AFB, AZ CML ENGINEER OFFICE		SCALE AS SHOWN	DM-L 014
		DATE 11 JAN 96	



BOULDER
NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CML ENGINEER OFFICE	BOULDER	CHECKED BY D. SPEIR SCALE AS SHOWN DATE 11 JAN 96	DETAIL NO DM-L 015
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SET TO CONFORM
TO SLOPE GRADE

3" PLANTING BASIN, FILLED
WITH FIR BARK MULCH

TOPSOIL MIXTURE

LOOSEN SUBSOIL

FORM A SOIL BASIN AROUND
EDGE OF PLANT POCKET ON
LOW SIDE SLIGHTLY HIGHER
THAN NURSERY GRADE OF
PLANT

12" MIN VARIES 12" MIN

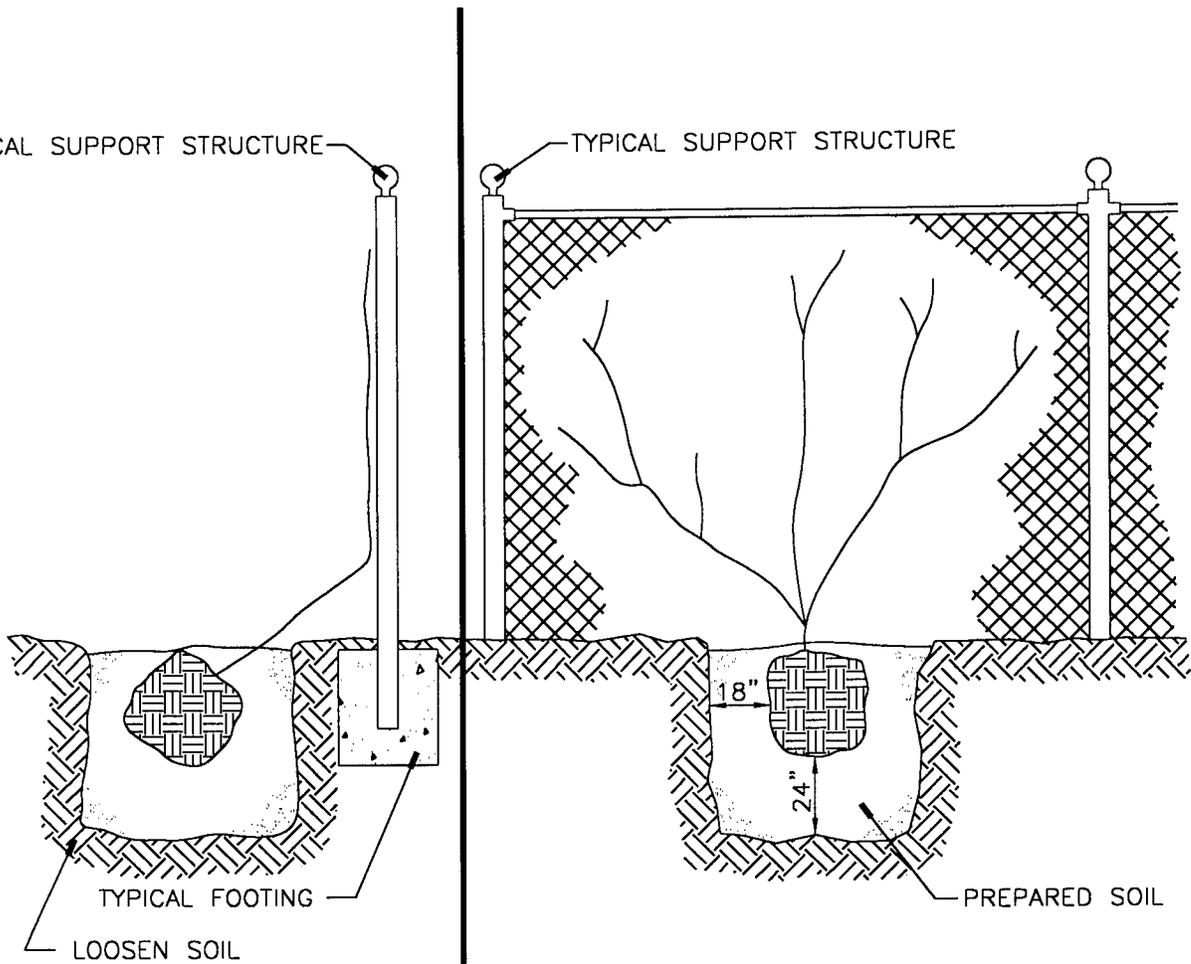
SLOPED PLANTING

NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	SLOPED PLANTING	CHECKED BY D. SPEIR	DETAIL NO DM-L 016
		SCALE AS SHOWN	
		DATE 11 JAN 96	

TYPICAL SUPPORT STRUCTURE

TYPICAL SUPPORT STRUCTURE



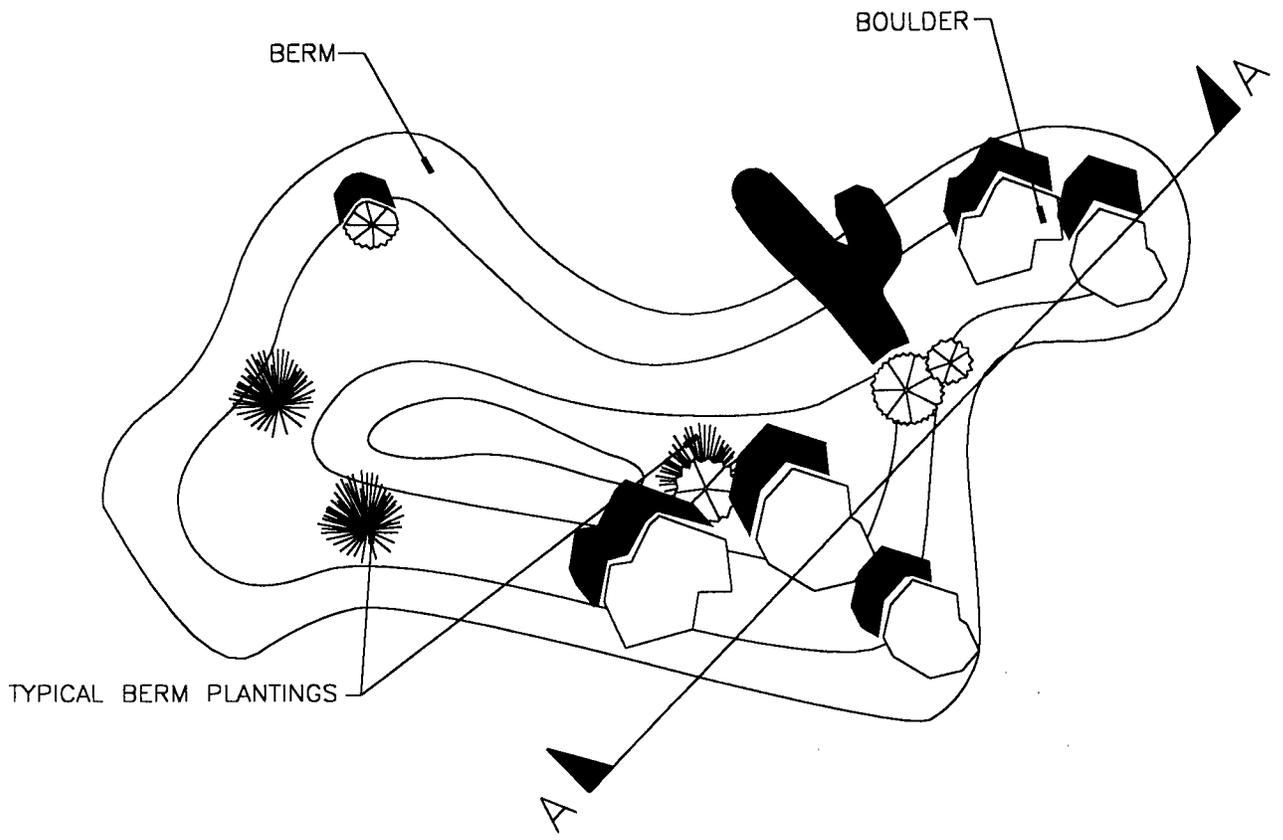
SECTION

SECTION

VINE PLANTING

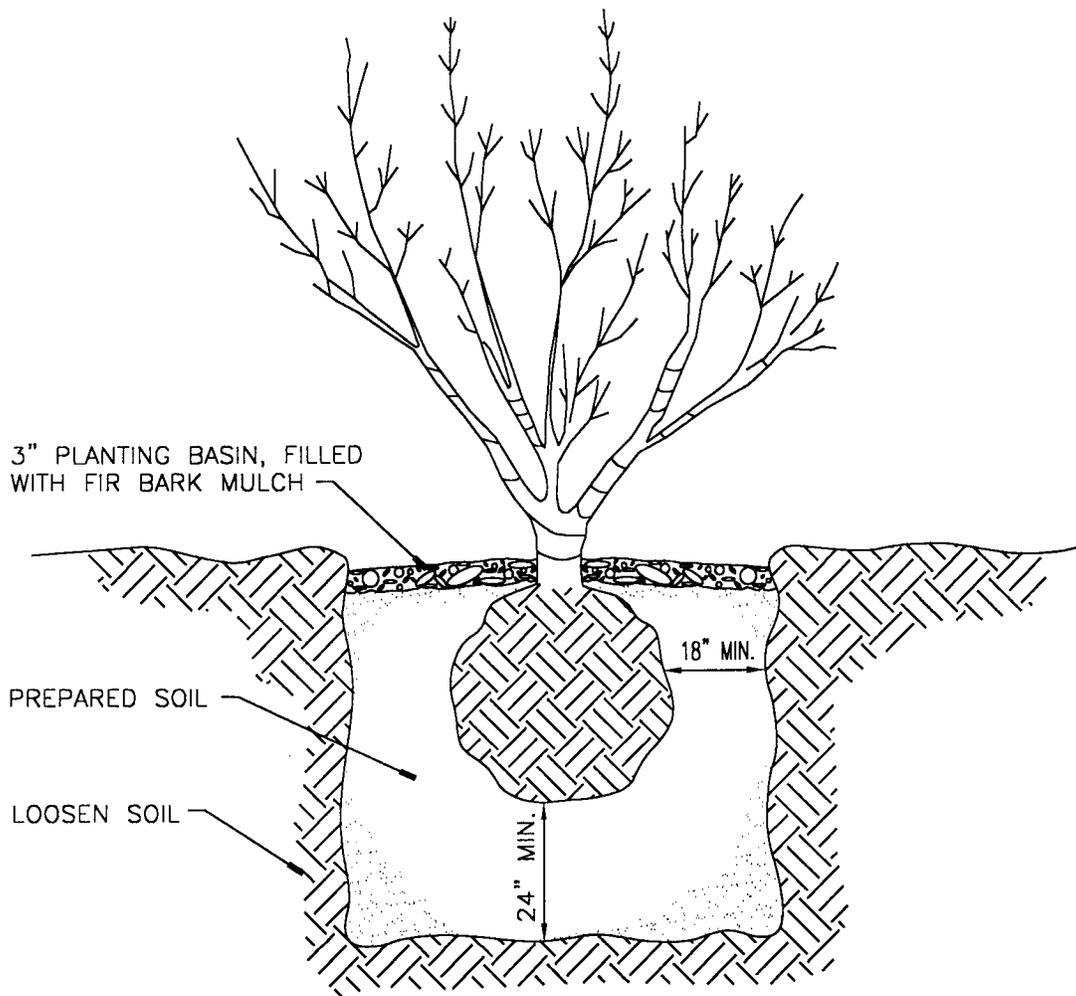
NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	VINE PLANTING	CHECKED BY D. SPEIR SCALE AS SHOWN DATE 11 JAN 96	DETAIL NO DM-L 017
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BERM
NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	BERM	CHECKED BY D. SPEIR	DETAIL NO DM-L 018
DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE		SCALE AS SHOWN	
		DATE 11 JAN 96	

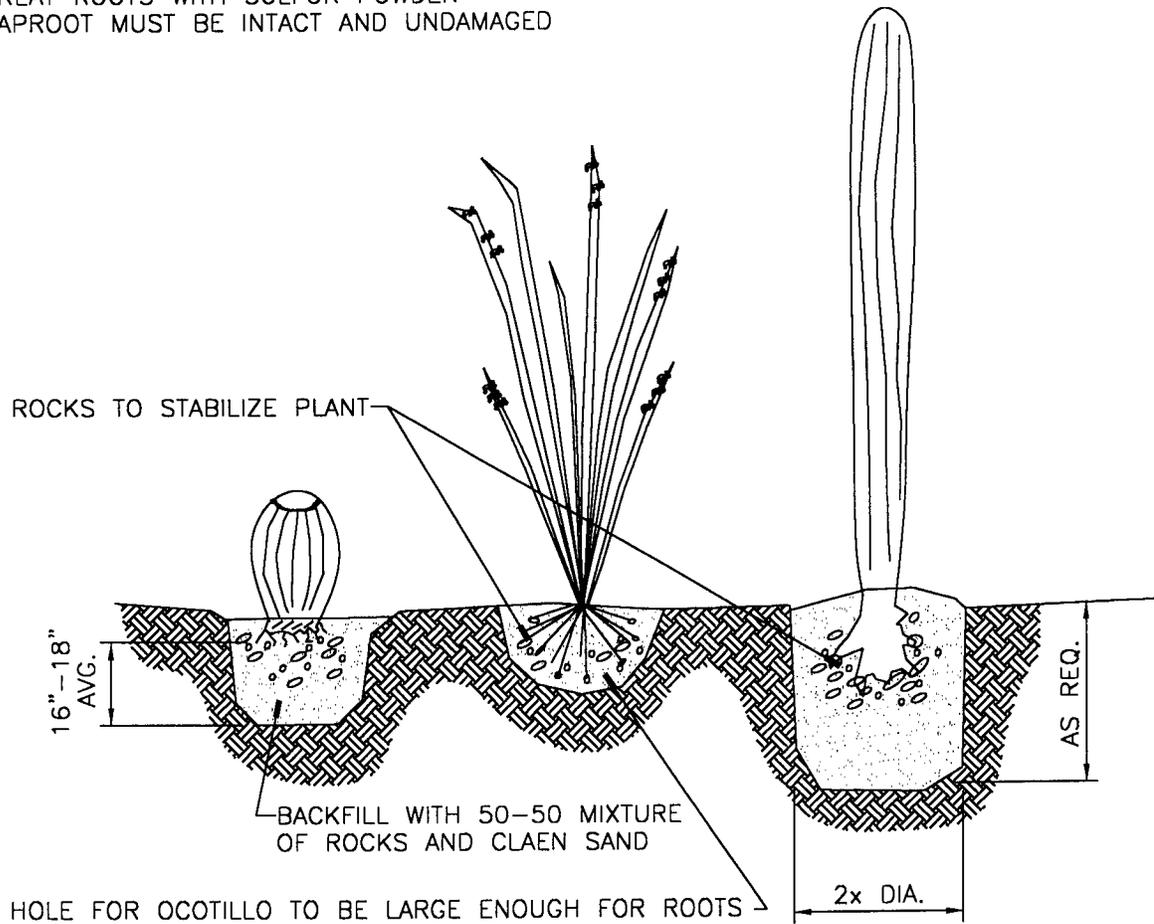


NON-NATIVE SHRUB PLANTING

NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	NON-NATIVE SHRUB PLANTING	CHECKED BY D. SPEIR SCALE AS SHOWN DATE 11 JAN 96	DETAIL NO DM-L 019
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- PLACE PLANT IN ORIGINAL ORIENTATION
- TREAT ROOTS WITH SULFUR POWDER
- TAPROOT MUST BE INTACT AND UNDAMAGED



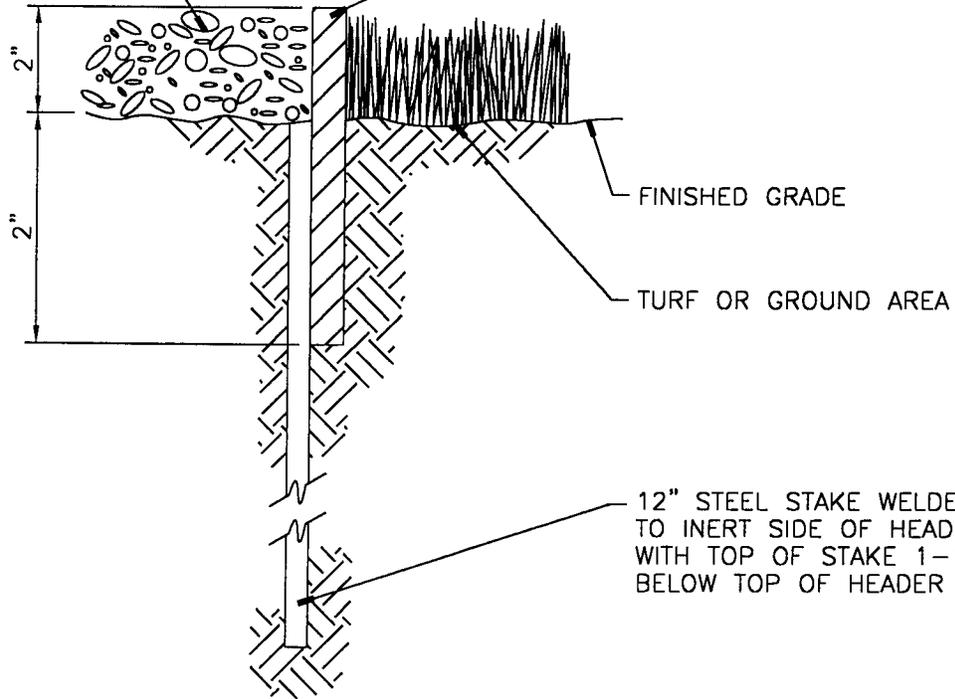
CACTUS PLANTING

NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	CACTUS PLANTING	CHECKED BY D. SPEIR	DETAIL NO
DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE		SCALE AS SHOWN	DM-L
		DATE 11 JAN 96	020

INERT MATERIAL AREA

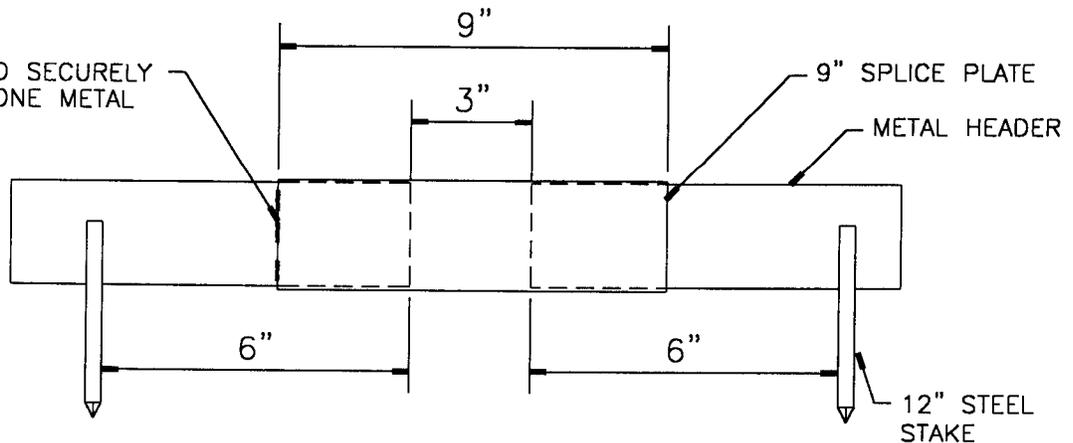
4" x 1/8" METAL HEADER
WITH STAKES WELDED A 6'-0"
O.C. AND AS NECESSARY.



METAL EDGE

NTS

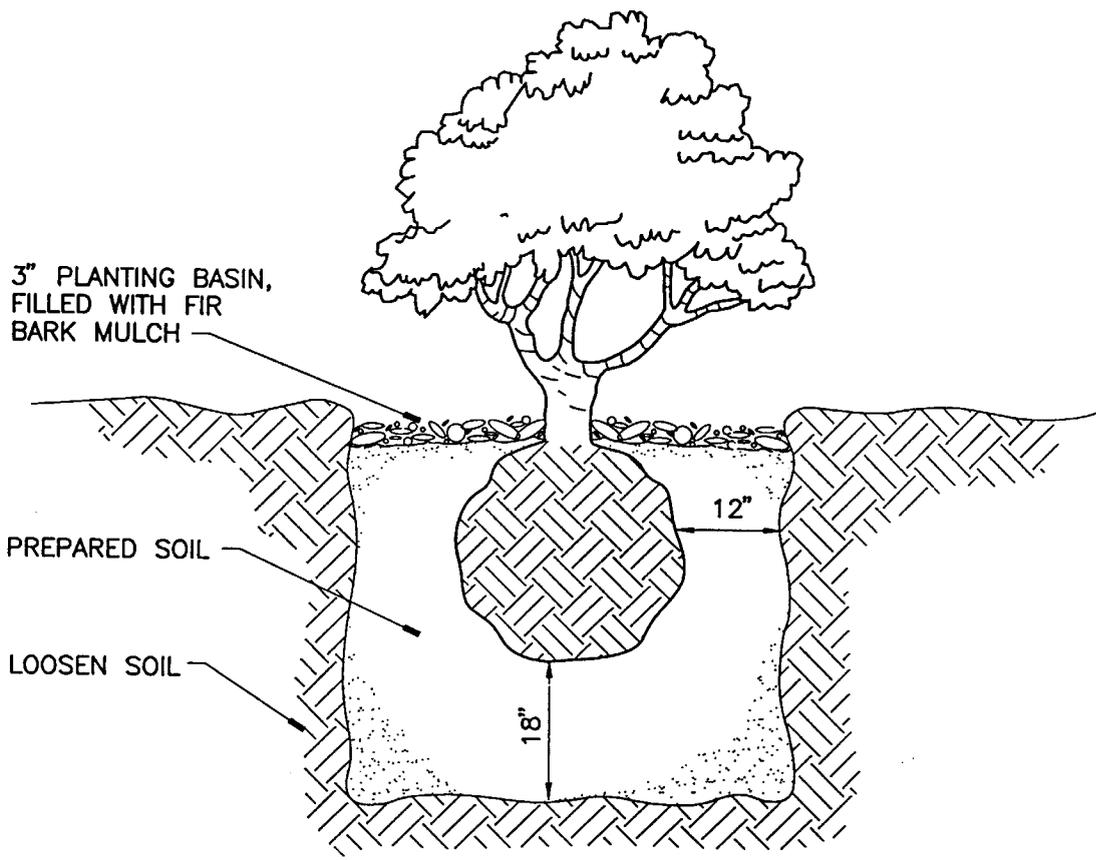
SPOT WELD SECURELY
TO ONLY ONE METAL
HEADER



METAL EDGE CONNECTION

NTS

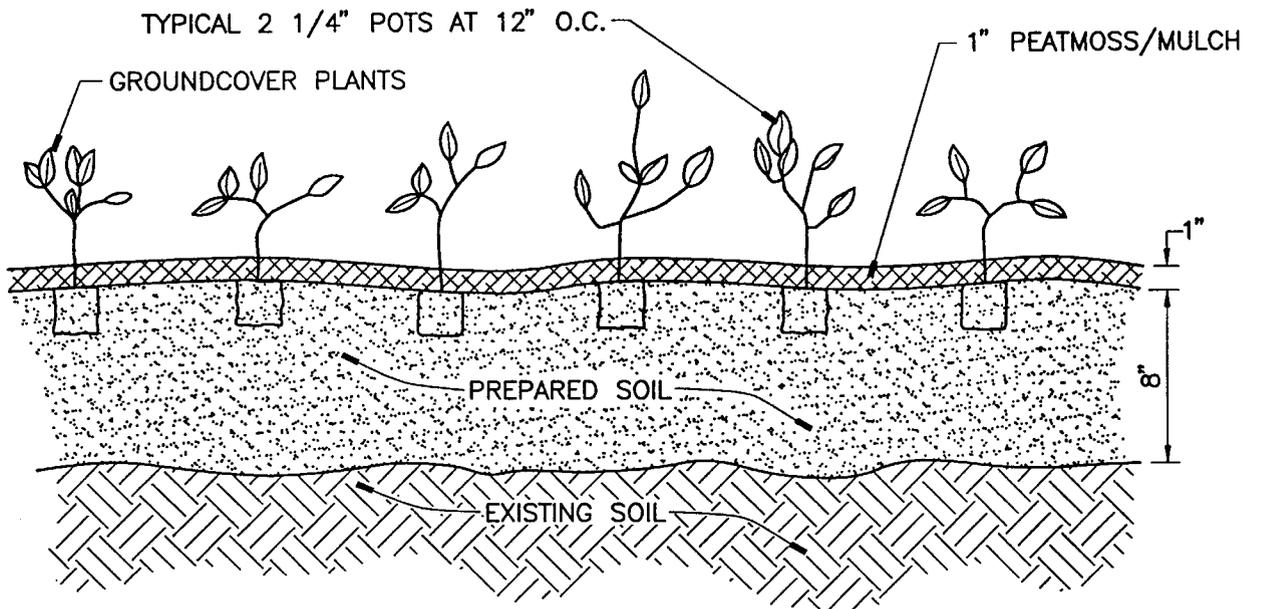
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	METAL EDGE	CHECKED BY D. SPEIR	DETAIL NO
DAVIS-MONTHAN AFB, AZ		SCALE AS SHOWN	DM-L 021
CIVIL ENGINEER OFFICE		DATE 11 JAN 96	



NATIVE SHRUB PLANTING

NTS

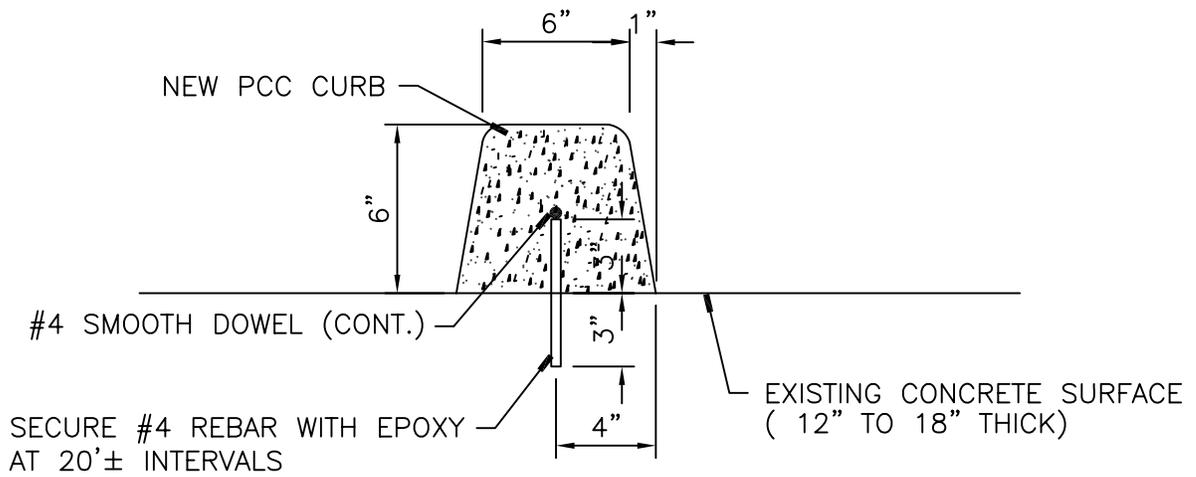
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	NATIVE SHRUB PLANTING	CHECKED BY D. SPEIR	DETAIL NO
DAVIS-MONTHAN AFB, AZ		SCALE AS SHOWN	DM-L
CIVIL ENGINEER OFFICE		DATE 11 JAN 96	022



GROUND COVER PLANTING

NTS

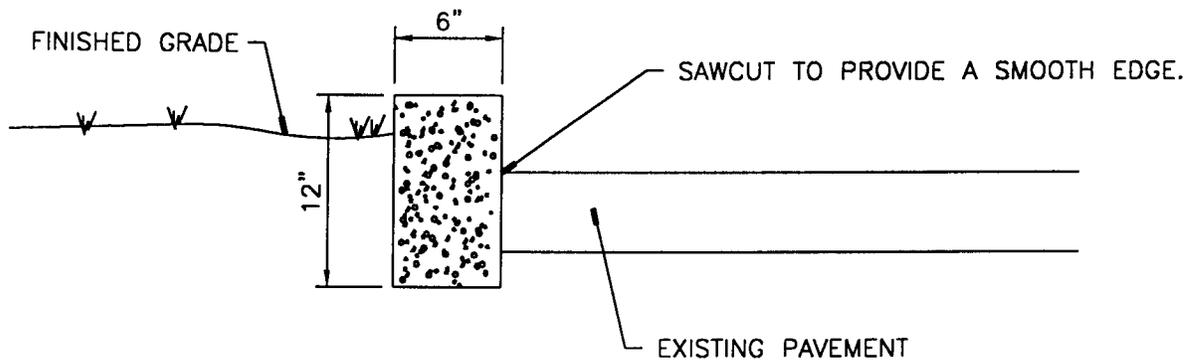
DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE	GROUND COVER PLANTING	CHECKED BY	D. SPEIR	DETAIL NO
		SCALE	AS SHOWN	DM-L
		DATE	11 JAN 96	023



TYPICAL EXTRUDED CURB

NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	TYPICAL EXTRUDED CURB	CHECKED BY D. SPEIR	DETAIL NO
DAVIS-MONTHAN AFB, AZ CIVIL ENGINEER OFFICE		SCALE AS SHOWN	DM-L
		DATE 11 MARCH 96	024



TYPICAL CONCRETE HEADER

NTS

DEPARTMENT OF THE AIR FORCE AIR COMBAT COMMAND	TYPICAL CONCRETE HEADER	CHECKED BY D. SPEIR	DETAIL NO
DAVIS-MONTHAN AFB, AZ CML ENGINEER OFFICE		SCALE AS SHOWN	DM-L
		DATE 11 MARCH 96	025

CONSTRUCTION COST ESTIMATE BREAKDOWN

CONTRACTOR				ADDRESS						
ONLY 3 BLANKS GET FILLED IN ON TOP BLOCK--TOP BLOCK SAME FOR EACH PAGE										
CONTRACT FOR(WORK TO BE PERFORMED)				(PUT PROJECT NAME HERE)				PROPOSED TOTAL CONTRACT PRICE		
PURCHASE REQUEST NUMBER				PROJECT NUMBER			WORK LOCATION			
				(PUT PROJECT NUMBER HERE)			DAVIS-MONTHAN AFB, AZ 85707			
LINE NO.	ITEM	UNIT OF MEASURE	QUANTITY	MATERIAL COST		LABOR COST			DIRECT COSTS	LINE TOTAL
				UNIT	TOTAL	MANHOURS	RATE	TOTAL		

SUMMARY ←

FIRST SHEET OF ESTIMATE SHOULD BE SUMMARY SHEET WITH OH&P AND SIGNATURE

1	SUBTOTAL CIVIL WORK				17,988			17,124	820	35,932
2	SUBTOTAL ARCHITECTURAL				58,741			60,147	8,710	127,598
3	SUBTOTAL MECHANICAL				12,587			15,478	2,479	30,544
4	SUBTOTAL ELECTRICAL				19,547			16,587	2,540	38,674

LINE TOTALS		108,863		109,336	14,549	232,748
OVERHEAD (15%)						34,912
SUBTOTAL						267,660
PROFIT (10%)						26,766
SUBTOTAL						294,426
TAX (5% of 65%)						9,569
BID BOND(1.4%)						4,122
TOTAL PROJECT PRICE						\$308,117

THESE CAN VARY BASED UPON PROJECT & BIDDING CLIMATE -- COORDINATE WITH PROJECT MANAGER

LEAVE THESE COLUMNS BLANK ON SUMMARY SHEET

DO NOT FORGET TAX -- CALCULATED ON SUBTOTAL

BID BOND FOR PROJECTS > 25K - % VARIES -- CALCULATED ON SUBTOTAL

ALL \$ ON THE SUMMARY SHEET SHOULD BE ROUNDED TO THE NEAREST \$

DATE SHOULD BE CURRENT, <90 DAYS OLD AT TIME OF AWARD; COORDINATE WITH PROJECT MANAGER

DATE: 14-Feb-95 FIRM NAME: 355 CES/CEEE

TITLE: PROJECT ENGINEER BY:

BOTTOM OF EVERY PAGE OF ESTIMATE

PROJECT MANAGER
ORIGINAL SIGNATURE OF CEEE PM (NOT A-E) TO CONS/ COC, COORD WITH PROJECT MGR

NUMBER PAGES

Appendix H:
**Design Criteria for Pre-Wiring and other
Telecommunications Systems**

355 Communications Squadron Design Criteria For Pre-Wiring and Other Telecommunications Systems

1. Purpose:

This guide will be used by all Air Force Agencies at Davis-Monthan AFB to plan, design, review and evaluate telecommunications cabling and distribution systems for pre-wiring new and remodeled facilities and for rewiring existing facilities at the time of remodeling or requested upgrades. Per AF Engineering Technical Letter (ETL) 87-9, pre-wiring shall be included in all facility construction, addition and alternation projects accomplished with 3300 Series funding and all Military Construction Projects (MCP).

2. General Scope:

- a. The facility design will provide concealment of the wiring/cabling systems, adequate space for installation and maintenance of C-CS equipment and wiring, proper separation if specialized systems and cable, flexibility of office layout in administrative areas and standardization and commonality of common user requirements. The base CSO will be the approving authority in ensuring that the most efficient cable/wiring distribution system is selected, consistent with facility size and function, current and projected C-CS requirements and the need for flexibility to accommodate future additions or changes.
- b. The installation shall be consistent with all known base installation criteria and shall support the current base blueprint document prepared by the 38 EIW, Tinker AFB, OK as approved by HQ ACC/SCX and 355 Communications Squadron.

3. Personnel Certification Requirements:

- a. Contract personnel involved in the design , planning and construction of these systems shall have expertise in the design, engineering and installation of telecommunications, cabling and distribution systems. Whenever determined necessary by the CSO, contract personnel shall provide adequate proof of their individual skills, upon request, in writing, to be reviewed and recorded by the CSO. National certifications or collegiate credentials may be required to ensure the training adequacy of personnel performing the work.
- b. AF engineers, designers, operators and maintainers shall be involved in all phases of the project including preliminary planning and technical requirement definition phases.

4. Local Minimum Standards:

To minimize the long-term cost of the infrastructure, local standards are established as follows and may only be changed when approved in writing by the CSO. These

standards are intended to promote common skills among maintenance personnel and to minimize the necessity for excessive on hand spare parts and varying equipment.

1. For Base Fiber Optic Back-Bone Connections:
ATM Technology Connections - 36 Strand SM Fiber 8.3/125 micron
2. For Base Fiber Optic Satellite Connections:
Switched Ethernet Connections - 12 Strand SM Fiber 8.3/125 micron
3. Minimum of 25 pair copper cable for new installations.
4. All cables used for telecommunications outlets shall be four pair, 24 AWG, solid copper conductor, Category 6, UL tested and certified.
5. Whenever exposed in air circulation areas, only plenum cable may be used.
6. Each cable shall be dedicated to one device or outlet only
7. All telecommunications jacks shall provide dual RJ45 type jacks utilizing TIA 568A wiring configuration. (Reference figures 1 and 2)
8. Information outlet spacing in office areas shall be based upon one jack for each 12LF of perimeter wall space or one for each 50 square foot of floor space whichever provides a higher outlet density. All other locations will be provided with outlet density as determined by the CSO.
9. Administrative telephone wiring will be based on the single-line instrument concept with individual cable running from the wall outlet to the Communications Equipment Room (CER) or Telecommunications Closet (TC) via the cross connect cabinet, if required.
10. All wall mounted wall phone jacks shall be 630B type receptacles.
11. All outside metallic Twisted Pair (TP) Cable will be filled core type, and meet Rural Utility Service (RUS)PE-39 or PE-89 specifications.
12. Comprehensive Requirements: Comprehensive requirements include those requirements that apply to all telecommunications systems.

a. Building Communications Distribution System - Entrance Conduit, Duct Banks and Manhole (MH) System

1. All primary backbone conduits shall be installed in locations as determined by the 355CS CSO, and shall provide adequate size and quantity to meet current requirements, plus 100% growth for future use, to preclude digging at a later date to meet emerging requirements.
2. Whenever new construction or remodeling takes place, the design, installation and all related cost necessary to extend the conduit and manhole system to the new location shall be included in the project cost. Multiple service entrance locations will be required for all facilities housing command and control systems to provide redundant, survivable service.
3. A manhole with a minimum of two four inch conduit/duct bank lateral system with tracer and pull rope will be used for required cables plus 100% spare ducts (not less than 2 spares) for expansion and maintenance on all primary duct banks.
4. Manholes shall be installed for all connections to the existing cable plant as required to maintain a maximum manhole spacing of 475 feet. Additional

manholes may be required to provide adequate control of connection and distribution of cable plant. See attached detail sheet (Figure 4) for specific manhole construction criteria.

5. All manhole designed and constructed to meet the requirement of T.O. 31-W-3-10-22, and provide a clear floor space of 8' x 10' measured inside the manhole. An alternate size of 6' x 8' may be approved only when no primary backbone cable passes through the manhole (lateral or dead end service only). All manholes shall provide a clear height of not less than 7'-0". Mandatory appurtenances include grounding bus bar and rod and related conductors and wiring, a ladder or steps, cable rack supports, a 50 cubic foot sump (French drain), pull in irons, frame and manhole cover cast with the word "Communications" exposed to the surface. Conduits shall enter the MH's 4 to 5 feet from floor on the end and be perpendicular to the wall in approximate location as shown on attached sketch (figure 4).
6. IAW T.O. 31-W-3-10-12, power and communications cables will be separated by 12 inches (30.48cm) of well tamped, fine earth protection. The cable at the top of the crossing, whether power or communications cable, will receive the same additional protection (see item 8 below). Gas and water mains will be separated and protected by 3" of concrete or 12" of fine earth. In addition, if the cable crosses over the main, extend additional cable protection 3 feet from each side of the crossing. Where highway, railroad and runway crossings occur, cable at crossing must be placed in underground metallic conduit. PVC conduit may be direct buried. If steel pipe conduit is used, boring procedures will be followed that ensures protection of existing resources. Where PVC conduit are installed, a metallic tracer wire will be installed within the conduit or 6" above the duct bank to assist in future location efforts, with bonding to occur inside each manhole and at CER grounding frame.
7. Stub up 2 each 4" lateral conduits 6" above finished floor in the corner of the CER, adjacent to the telephone back board, continuous from the nearest manhole. Provide one lateral (entrance) conduit with four each 1.25 inch interduct from CER to the inter-connect manhole location within the existing backbone conduit system for fiber optic cable connection and for future requirements.
8. Provide 36" minimum cover for all conduit duct banks and 36" minimum cover for laterals measured to top of conduit. 355CS Telephone O&M contractor will provide termination in the manhole and perform any necessary cross-connection in the CER.
9. When determined necessary to simplify installations, conduit will be curved to provide gentle sweeps, with a minimum radius of 25 feet, for a total bending radius not to exceed 180 degrees between manholes.
10. All conduits shall be sloped toward each opposing manhole at a slope of 3" per 100' of run to promote drainage of any accumulated liquids.
11. Handholes, when specified, will be nominally 4' x 4' x 4' inner dimensions and is provided with a grounding rod, cable rack supports sump drain and pulling irons.

b. Telephone Entrance Cable

The contractor will provide base cable, gel filled, IAW Rural Electrical Association (REA) standard from main communications panel to the nearest manhole with sufficient vacant pairs to provide each facility with required circuits plus 100% spare pairs, as determined by the CSO.

c. Communications Equipment Rooms (CER)

1. A CER will be provided for C-CS switching and transmission equipment, private branch exchanges (PBXs, gateways, power supplies, etc.) main distribution frame(s), Local Area Networks (LAN) equipment racks, fiber optic cable termination and patch panels and other equipment needed for termination of the building's interior wiring systems and to interface the local service equipment with the exterior base cable system. Adequate installation and maintenance space (See figure 5), environmental control and power, typical to an office environment, shall be included to support this equipment and any necessary cable entry requirements. No other building support equipment, including mechanical equipment, plumbing equipment and electrical panels, will be placed in the CER. Maintenance space and access space will not be utilized for any other purpose and will be free and clear of all obstructions to a height of 8'-0" to allow for adequate cooling and servicing of equipment. Storage is prohibited in the CER and Telecommunications Closet (TC). Special attention will be given to the space allocation required for placement of classified systems IAW AFSSI 7010 and AFSSM 7011 to ensure security countermeasures are met.
2. TC's will be provided with space required for CER rooms (See figure 5) and will be located that the distance, measured along the routing path of the cable, will not exceed 300', including vertical distance to wall telecommunications outlets, to maintain the integrity of the digital data signal as stipulated by Category 6 wiring requirements. Where multiple TC rooms are required, attention must be given to their strategic placement to support interconnection via two 4" conduits between each room as well as to the primary CER in which the cable head/fiber connections are to be located. Where it is necessary to interconnect more than one remote TC to the primary CER, Multimode fiber optical cable will be used. A 1.25" innerduct will be provided inside the 4" conduit or conduit raceway, with pull chord, as a dedicated, direct path between each TC and the primary CER. For telephone interconnection, provide not less than 300 pair copper 24AWG wire cable between the TC and the CER.
3. Circuit connectivity from the telecommunications outlet jacks to the TC closet or the CER will be provided through 3/4" (min) conduit stubbed to 12" above the finished ceiling, using the most direct route available, complete with pull chords. A 12" wide by 4" deep above the ceiling cable trough/raceway may be used to connect rooms provided plenum type cable is used or provided. Where cable trays are provided, conduits will be extended to the cable tray and be terminated. The trough/raceway will run above the ceiling, on the top

of proper support structures, using the most direct route between TC and the CER. Conduit fill will not exceed the 40% rule as stipulated in the National Electrical Code (NFPA 70).

4. 630B type wall jacks will be provided for wall mounted telephones in the CER, electrical/mechanical rooms and communications closets mounted 60" above the finished floor.
5. Secure interior and exterior access to CER workspace should be provided to allow 24-hour access.
6. Environmentally controlled temperatures will be provided in the CER and TC areas, equal throughout the building with a constant temperature of not less than 40 degrees (F) or greater than 85 degrees (F).
7. LAN wiring will be terminated in a standard 19" rack mounted Category 6 patch panel located in the primary communications room (CER) situated in a central location within the building (See figure 6), unless the cable distance exceeds 300'. In such cases, the LAN cable will be terminated in a TC patch panel and provisions will be made to interconnect each TC to the primary via two 4" conduits or innerduct.
8. Fourplex 110 VAC power outlets on a separate 20 AMP circuit with isolated ground will be provided on each wall for use in powering telecommunications devices only. An additional duplex convenience outlet will be located away from the telecommunications outlets to provide power to operate service and maintenance equipment. Switched lighting will be provided in all CER areas, adequate to promote work with small fiber items and miniature lettering devices.
9. Ground facility for cable sheaths, protectors and other equipment in accordance with T.O. 31-W-3-10-22. No 6 ground wire or larger must be used and the grounding point should be 10 ohms or less. A ground bus bar should be 6" (H) X 24" (L).
10. 355CS telephone O&M contractor will be terminating entrance cable inside the CER to Building Entrance Terminals (BET).
11. All BETs will be provided with 3-element plug in gas tube protective modules and will provide equal protection to REA-PE-80 specifications.
12. BETs used for the termination of outside Twisted Pair (TP) cables, 300 pair or less in size, will have a built in splice chamber with 710 type splice modules. Equipment side of BET will use AT&T 110 type connection to station.

d. Wiring and Termination

1. Administrative telephone and data lines will be terminated on CAT 6 type 110 blocks with CAPs provided. Blocks will be mounted on the fire retardant coated, 3/4 inch 4' x 8' ACX plywood backboard mounted with smooth side out in the TC and CER. Termination will be numbered according to room and jack number. Pairing and color-coding will be accordance with EIA 568A standards (See figures 1 & 2).

PIN NO.	COLOR	PIN NO.	COLOR
1	White/Green	5	White/Blue
2	Green	6	Orange

3	White/Orange	7	White/Brown
4	Blue	8	Brown

Distribution frame and interior conduits shall be of sufficient size to allow for 100% growth and not exceed the 40% fill rule stipulated in the National Electrical Code (NFPA 70).

3. Wiring:

- a. The contractor will perform all interior pre-wiring to include the CER, TC, with termination to CER.
- b. Wiring administrative telephones and office automation equipment will be unshielded twisted pair (UTP), Category 6 cable, 24 AWG, will be Integrated Services Digital Network (ISDN) compatible and be installed by a Category 6 certified installation team. All installations require compliance with the Institute of Electrical and Electronic Engineers (IEEE) standards 802.3 for baseband systems.
- c. 355CS Telephone O&M contractor will cross connect the interior blocks and splice the cable in the manholes when required.

4. Modular/Movable Equipment and Construction Items: Areas with equipment or construction items which can be easily moved, such as pre-wired work stations, system furniture and modular walls/offices, will be pre-wired by the contractor and will provide sufficient flexibility and connectivity to enable rearrangement without modifications to the permanent TC or CER wiring system in the facility. Adequate quantities or suitable connectors and extension cables will be provided; permanent splices/connections will not be made.

5. Wiring Identification Standard: To clearly identify cables and their usage, each cable will be marked with an adhesive type strip marker at both ends, as noted in figure 6, which clearly identify their room and outlet number. Each outlet cover plate will also carry the outlet designation, as shall the termination jack on the patch panel or termination block. A permanent type label affixed to the cable or outlet jack cover to preclude damage due to age or other mechanical means will identify all cable and termination. Hand written or manual embossing labels is NOT permitted. Automated embossed labels are preferred, such as Brothers P-Touch systems utilizing 1/4" labels with 1/8" lettering.

e. Cross Connect Closets

1. Cross-connect closets will be provided as required to serve approximately every 10,000 square feet of usable floor space. The closets will serve as a secondary interconnection point between the telephone modular jack outlets and the main communications frame in the CER. Wall and floor space will be provided for installation and maintenance of C-CS equipment such as frames or backboards. Such equipment will be concealed and secured as required for primary CERs and will not be installed in common use areas and must be fully accessible and maintainable as outlined for CERs.
2. All cables in the TC, cross connect closet and room and jack number to indicate its associated jack number and location will tag CER. (See figure 5). Cross-connect

closets will not be used for LAN wiring. All LAN runs must be continuous from wall outlets to TC or CER.

f. Telecommunications Outlets

1. In general office areas, a dual modular Telecommunications outlet plate, with two each RJ45 type inserts, one for voice and one for LAN, will be provided approximately every 12' around the room perimeter or one for each 50 square feet of net floor area, whichever provides greater density. All wall outlets components will be certified, as Category 6 and jacks will be RJ45 type wall jacks with a removable outer bezel that is labeled individually to identify the outlet usage. (ie – V1, V2, D1, D2) (See figure 1) Where modular furniture is to be installed, modular dual outlet jacks will be installed in each workstation.
2. Telecommunication outlets will be mounted at 18" above the floor, to the centerline of the cover plate, unless noted otherwise.

g. Periodic, Final Inspections, Testing and Documentation

1. All telecommunication cables will be certified and tested in accordance with EIA/TIA standards with written results to be provided to the 355CS/SCX. Where deficiencies of any type are discovered upon testing, the installation contractor will make all necessary repairs, including replacement if necessary, at no cost to the government.
2. Revised drawings which reflect the actual "as built" conditions will be maintained throughout the construction phases and will be submitted to the 355CS/SCX with the cable certification records upon completion of the work, but prior to final acceptance of the work, to allow representatives of the 355CS to perform a final review of drawings and inspect installations.
3. Communications-Computer System Installation Records: Design drawings and schedules which will form the basis of "as built" cable records, will be provided to the 355CS/SCX upon final project acceptance. The drawings will show cross-connect and termination points for each cable pair, locations and identification number for each modular outlet and the location and value of each line amplifier and multi-port device throughout the cable system. Approximate cable routing will also be shown. Five copies of these drawings will be updated to final "as built" conditions by the construction contractor and turned over to the 355CS, along with one digital as built drawing prepared in the most current version of AutoCAD, prior to the time of facility turn-over.
4. During construction, in-progress inspections by 355CS personnel are required. For example, trenches will not be covered without an in-progress inspection to verify conduit size and quantity, cable type, earth cover compliance with installation requirements and accuracy of "red line" base cable drawings. The installation activity/contractor is solely responsible for requesting in progress inspections before backfill, installation of sheet-rock, during cable certification, etc.
5. All installed cable (fiber and copper) will be tested in the presence of 355CS personnel and baseline test records provided to the CSO in printed and digital

format. All Category 6 cable will be tested and certified to 155 Mbps (100 MHz) to ensure it is usable at higher data transmission speeds. UL testing standard for new cable, including fiber optic testing of single-mode cable will be followed. (UL standards for Category 6 cable are attached)

6. All contractor cable installations will be inspected and all defects discovered will be repaired at no cost to the government.

h. Tempest/EMP and Classified Cabling Consideration: Classified requirements may vary and will be taken on a case by case basis. If any unit identifies classified message traffic or telephone requirements, coordinate all requirements with the 355CS/SCBS (228-3023) to ensure proper compliance measures are attained. Note: Red/Classified cable drop must be placed in rigid conduit and the conduit must be exposed.

i. Related Documents

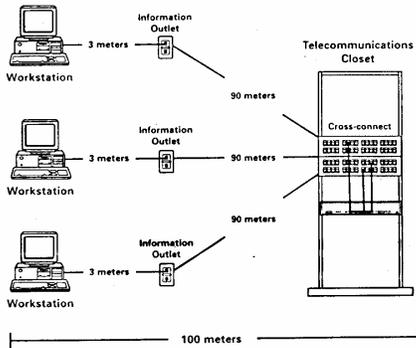
The following documents are recognized within this document or are hereby recognized as a standard of good practice to be followed during the performance of the work.

National Fire Protection Association
Underwriter's Laboratories
Rural Utility Service

EIA/TIA Standards
AF Documents

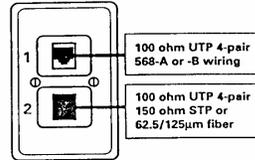
NFPA 70 National Electrical Code
UL Standards for CAT 6 UTP Wire
PE-39 Specifications for Filled Telephone
PE-80 Specifications for Gas Tube
PE-89 Specifications for Filled Telephone
Cable with Expanded Insulation
EIA/TIA 568 Commercial Building Wire
ETL 02-12 Pre-wiring
TO 31-W-3-10-22 Telecom Engineering
TO 31-W-3-10-12 Outside Plant Cable
AFSSI 7010 Emission Security Assessment
AFSSM 7011 Emission Security Counter-Measures

Maximum Distances for Horizontal Cabling



In addition to the 90 meters of horizontal cable, a total of 10 meters is allowed for work area and telecommunications closet patch and jumper cables.

Telecommunications Outlet



Two ports minimum

- 1) 100 ohm, 4-pair UTP
- 2) 100 ohm, 4-pair UTP 150 ohm, 2-pair STP or 62.5/125 µm fiber

Eight-Position Modular Jack Pair Assignments

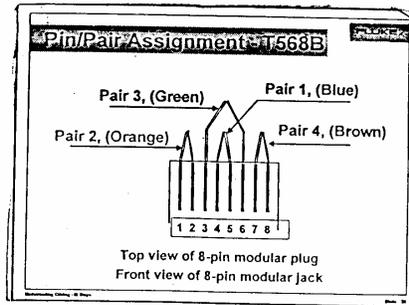
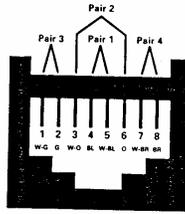


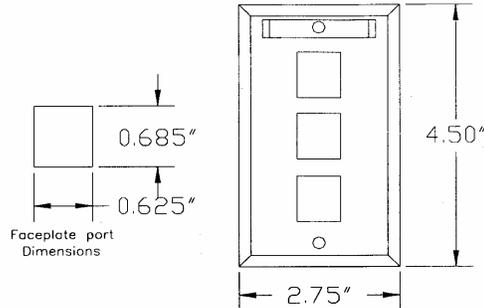
FIGURE 1

Not To Scale

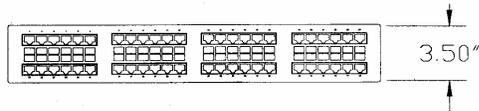


EIA/TIA-568A

With clear plastic label window



Standard Three Gang Wall Plate
(Single and Dual Outlet Plate Similar)
INFORMATION OUTLET WALL PLATE DETAIL

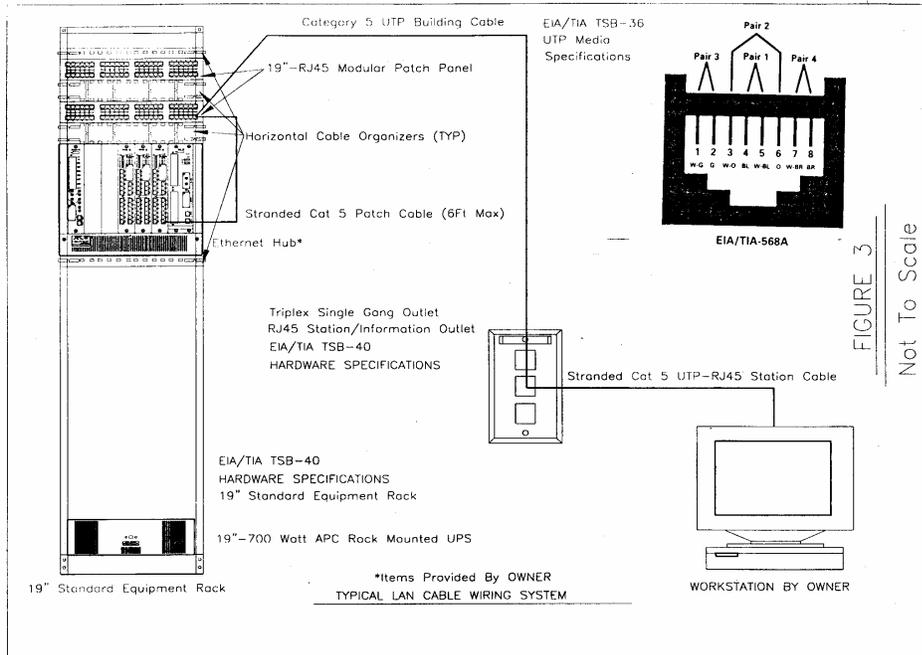


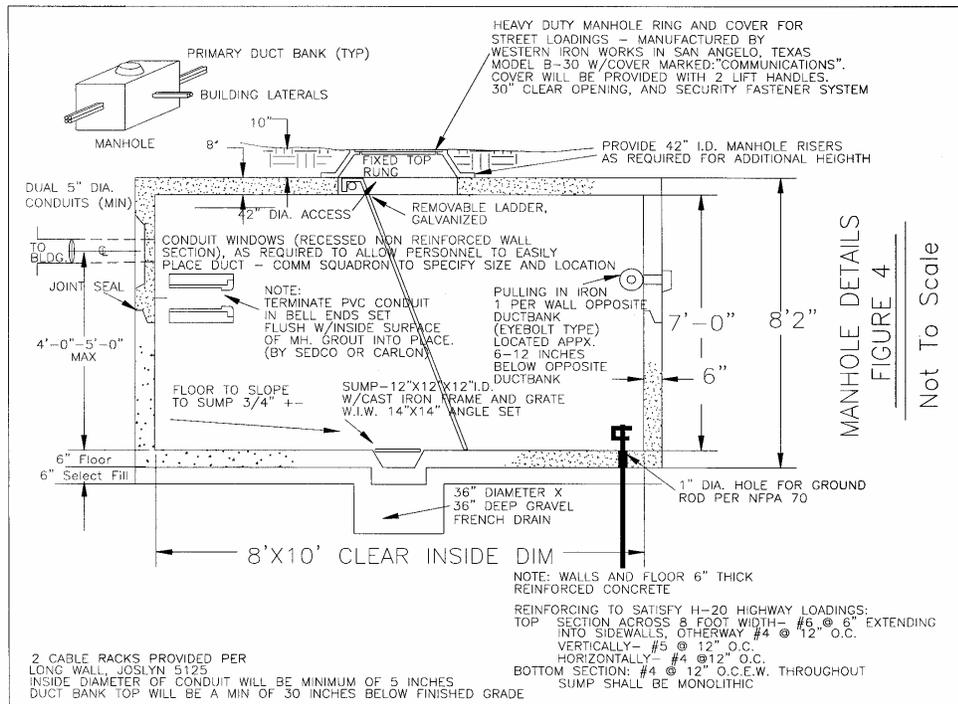
All Category 5 Patch Panels shall have 110 Interface On Back Side
Panel width shall be as require to fit Standard 19" Equipment racks

48 PORT PATCH PANEL DETAIL

FIGURE 2

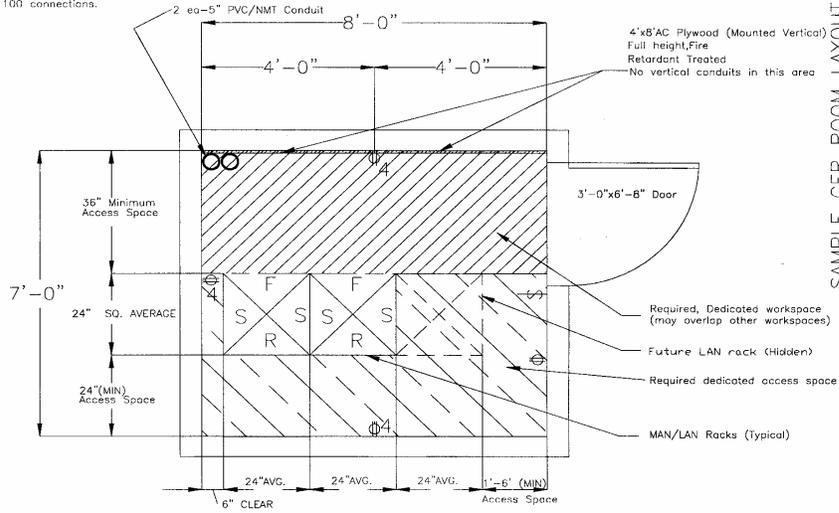
Not To Scale





COMMUNICATIONS EQUIPMENT ROOM CRITERIA (CER)

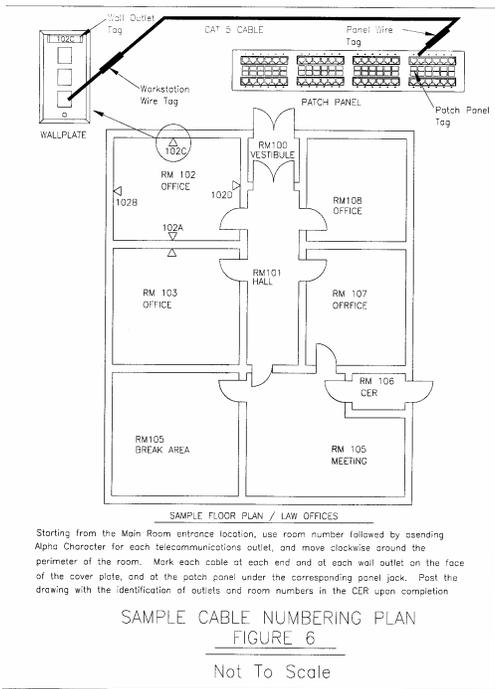
1. Provide a duplex service outlet on the unused wall.
2. Provide fourplex outlets with isolated (Computer) ground on all walls adjacent to installed equipment.
3. Room shall be provided with environmentally controlled temperatures and lighting as required for office space.
4. Room access shall be lockable with access limited to the building custodian and comm personnel.
5. Wiring shall be installed to EIA 568 standards. All installations shall comply with EIA/TIA 568,569,570.
6. Grounding and bonding shall comply with EIA 607/NFPA 70 tested to 10 Ohms.
7. Documentation of installations shall comply with EIA 606.
8. Provide 1EA-4x8x3/4" ACX Plywood sheeting, fire retardant treated, long dimension vertical, attached to the wall for each 100 connections.
9. Provide one EIA/TIA standard 19" LAN/MAN Rack with 12/24 threaded fasteners set at 5/8,5/8,1/2 pitch, floor mounted directly adjacent to existing rack locations for each 75 nodes.
10. Extend 2 Ea-5" Diameter PVC/NMT entrance conduits 6" above the finished floor in the corner adjacent to the plywood panels, and extend each conduit to the nearest communications manhole system. Install new manholes at 475' maximum spacing to connect to the existing communications systems.
11. Floor shall be hard surfaced and be moisture resistant.
12. Brace all racks from the top to the nearest wall.



SAMPLE CER ROOM LAYOUT

FIGURE 5

Not To Scale



CATEGORY III

Category III data cable with one or more conductor pairs complies with the requirements of EIA/TIA 568, Commercial Building Telecommunications Category Standard. These requirements apply to both shielded and unshielded cable constructions.

(CATEGORY III PERFORMANCE SPECIFICATIONS)

SHIELDED OR UNSHIELDED				
		24 AWG	22 AWG	
D-C Resistance (ohms/100 meters at 20 C), max. For a single copper conductor regardless of whether it is solid or stranded and is or is not metal-coated. See UL 444 for multiplying factors for adjusting values of resistance read at temperatures other than 20 C.		9.38	5.91	
D-C Resistance Unbalance (percent), max.		5	5	
Pair-to-Ground Capacitance Unbalance (pF/100 meters), max.		330	330	
Impedance (ohms)	772 kHz 1.0 - 16.0 MHz	102 + 15% (87-117) 100 + 15% (85-115)		
UL will apply the values in parentheses as the upper and lower limits.				
Structural Return Loss (dB)	1.0 - 10.0 MHz 16.0	12 10*		
The Structural Return Loss is to be greater than or equal to the values listed in this table. The asterisk (*) value is for information only. Above 10 MHz, the Structural Return Loss is to be determined using the formula $SRLf > SRL10.0 - 10 \log_{10} (F/10.0)$				
Attenuation (dB/100 meters at 20 C), max. The attenuation values for frequencies of 512 kHz and below are provided for information only. These values are intended for engineering purposes and not for conformance testing.	256 kHz	Solid Conductors 1.3	Stranded Conductors 1.6	Solid Conductors 1.3
	512	1.8	2.2	1.8
	772	2.2	2.6	2.2
	1.0 MHz	2.6	3.1	2.6
	4.0	5.6	6.7	5.6
	8.0	8.5	10.2	8.5
	10.0	9.8	11.8	9.8
	16.0	13.1	15.7	13.1
Worst-Pair	772 kHz	43*		
Near-End	1.0	41*		
Crosstalk (dB), min. (a)	4.0	32*		
	8.0	27*		
	10.0	26*		
	16.0	23*		
The asterisk (*) values are for information only. The minimum NEXT coupling loss for any pair combination at room temperature is to be greater than the value determined using formula				
$NEXT (FMHz) > NEXT (0.722) - 15 \log_{10} (FMHz/0.772)$				
for all frequencies in the range of 0.772 MHz-16 MHz for a minimum length of 100 meters.				
For cable consisting of two or more jacketed members that are cabled together and then covered by an overall jacket, Crosstalk between these members shall be $[6 + 10 \log_{10}(n)]$ dB better than the specified Crosstalk of each member at all of the specified frequencies. In this instance, "n" refers to the number of members within the overall jacketed cable.				
(a) For cable employing 5 or more pairs, calculation is also to be of the Power-Sum Near-End Crosstalk (P.S.NEXT) for uncorrelated disturbing pairs using the individual pair-to-pair Crosstalk measurements at the stated discrete frequencies and limits, in accordance with ASTM D 4566-90.				

TABLE 16740-A

CATEGORY V

Category V cable with one or more conductor pairs complies with the requirements of EIA/TIA 568, Commercial Building Telecommunications Category Standard. These requirements apply to both shielded and unshielded cable constructions

(CATEGORY V PERFORMANCE SPECIFICATIONS)

SHIELDED OR UNSHIELDED																																																											
		24 AWG	22 AWG																																																								
D-C Resistance (ohms/100 meters at 20 C), max. for a single copper conductor regardless of whether it is solid or stranded and is or is not metal-coated. See UL 444 for multiplying factors for adjusting values of resistance read at temperatures other than 20 C.		9.38	5.91																																																								
D-C Resistance Unbalance (percent), max.		5	5																																																								
Pair-to-Ground Capacitance Unbalance (pF/100 meters), max.		330	330																																																								
Impedance (ohms)	772 kHz 1.0 - 100.0 MHz UL will apply the values in parentheses as the upper and lower limits.	102 + 15% (87-117) 100 + 15% (85-115)																																																									
Structural Return Loss (dB)	1.0 - 20.0 MHz 25.0 31.25 62.5 100.0 The Structural Return Loss is to be greater than or equal to the values listed in this table. The asterisked (*) value is for information only. Above 10 MHz, the Structural Return Loss is to be determined using the formula $SRL > SRL_{10.0} - 10 \log_{10} (F/10.0)$	23 22* 21* 18* 16*																																																									
Attenuation (dB/100 meters at 20 C), max.	256 kHz 512 772 1.0 MHz 4.0 8.0 10.0 16.0 20.0 25.0 31.25 62.5 100.0 The attenuation values for frequencies of 512 kHz and below are provided for information only. These values are intended for engineering purposes and not for conformance testing.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Solid Conductors</th> <th style="text-align: center;">Stranded Conductors</th> <th style="text-align: center;">Solid Conductors</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">1.1</td><td style="text-align: center;">1.3</td><td style="text-align: center;">1.1</td></tr> <tr><td style="text-align: center;">1.5</td><td style="text-align: center;">1.8</td><td style="text-align: center;">1.5</td></tr> <tr><td style="text-align: center;">1.8</td><td style="text-align: center;">2.2</td><td style="text-align: center;">1.8</td></tr> <tr><td style="text-align: center;">2.1</td><td style="text-align: center;">2.5</td><td style="text-align: center;">2.1</td></tr> <tr><td style="text-align: center;">4.3</td><td style="text-align: center;">5.2</td><td style="text-align: center;">4.3</td></tr> <tr><td style="text-align: center;">5.9</td><td style="text-align: center;">7.1</td><td style="text-align: center;">5.9</td></tr> <tr><td style="text-align: center;">6.6</td><td style="text-align: center;">7.9</td><td style="text-align: center;">6.6</td></tr> <tr><td style="text-align: center;">8.2</td><td style="text-align: center;">9.8</td><td style="text-align: center;">8.2</td></tr> <tr><td style="text-align: center;">9.2</td><td style="text-align: center;">11.0</td><td style="text-align: center;">9.2</td></tr> <tr><td style="text-align: center;">10.5</td><td style="text-align: center;">12.6</td><td style="text-align: center;">10.5</td></tr> <tr><td style="text-align: center;">11.8</td><td style="text-align: center;">14.2</td><td style="text-align: center;">11.8</td></tr> <tr><td style="text-align: center;">17.1</td><td style="text-align: center;">20.5</td><td style="text-align: center;">17.1</td></tr> <tr><td style="text-align: center;">22.0</td><td style="text-align: center;">26.4</td><td style="text-align: center;">22.0</td></tr> </tbody> </table>	Solid Conductors	Stranded Conductors	Solid Conductors	1.1	1.3	1.1	1.5	1.8	1.5	1.8	2.2	1.8	2.1	2.5	2.1	4.3	5.2	4.3	5.9	7.1	5.9	6.6	7.9	6.6	8.2	9.8	8.2	9.2	11.0	9.2	10.5	12.6	10.5	11.8	14.2	11.8	17.1	20.5	17.1	22.0	26.4	22.0	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Solid Conductors</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">1.1</td></tr> <tr><td style="text-align: center;">1.5</td></tr> <tr><td style="text-align: center;">1.8</td></tr> <tr><td style="text-align: center;">2.1</td></tr> <tr><td style="text-align: center;">4.3</td></tr> <tr><td style="text-align: center;">5.9</td></tr> <tr><td style="text-align: center;">6.6</td></tr> <tr><td style="text-align: center;">8.2</td></tr> <tr><td style="text-align: center;">9.2</td></tr> <tr><td style="text-align: center;">10.5</td></tr> <tr><td style="text-align: center;">11.8</td></tr> <tr><td style="text-align: center;">17.1</td></tr> <tr><td style="text-align: center;">22.0</td></tr> </tbody> </table>	Solid Conductors	1.1	1.5	1.8	2.1	4.3	5.9	6.6	8.2	9.2	10.5	11.8	17.1	22.0
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Appendix I:

**Sample Specification
01010 Summary of Work**

SECTION 01010
SUMMARY OF WORK

PART 1: SUMMARY OF WORK

1.01 WORK INCLUDED IN THIS CONTRACT: The following descriptions are for general reference only, and shall not be construed as a complete list of all operations to be performed.

A.

(Develop a Detail Description of the Scope of Work Here)

1.02 SALVAGE AND DISPOSAL: All salvageable and nonsalvageable material obtained by removal of existing material shall be considered as having been included as a factor in the Contractor's bid price.

A. Salvageable material obtained from existing construction may be reused only if so stated elsewhere in the Contract Documents, and then only when the material is approved for reuse by the Contracting Officer.

B. Salvageable material shall remain the property of the Government only when specifically called out in the Contract Documents.

C. Salvageable material not reused or otherwise designated to remain the property of the Government shall become the property of the Contractor and shall be removed and disposed of off base in accordance with the environmental controls specified in this Section.

D. Nonsalvageable material: Remove all nonsalvageable material from the project site and dispose of it off base, in accordance with the environmental controls specified in this Section.

1.03 UTILITY OUTAGES:

A. Accomplish all work required in connection with utility outages on weekends or off-duty hours, or as directed by the Contracting Officer. The Contractor shall be responsible for all work associated with the utility outages.

B. Notify the Contracting Officer in writing 14 days prior to the desired date for the utility outage.

1.04 SUBMITTAL PROCEDURES:

A. SCHEDULE OF MATERIAL SUBMITTALS (AF FORM 66): At the end of this section is a set of AF Forms 66 listing the items of equipment and materials for which submittals are required by the specifications. This list may not be all-inclusive and additional submittals may be required. The Contractor shall complete the column for "Required Submission Date" and submit to the Contracting Officer for approval within 10 calendar days after Notice to Proceed. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract.

B. TRANSMITTAL FORM (AF FORM 3000):

1. The AF Form 3000 shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out the heading blanks and

identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the information submitted for each item(s).

2. The Contractor shall forward all material submittals required by the technical specifications using the AF Form 3000 as stated in paragraph B(1) above. The Contractor provides the submittals in the number of copies as specified on the AF Form 66 and one original of the completed AF Form 3000 to the Contracting Officer no later than the required submission date specified on the AF Form 66 or 10 calendar days from the Notice to Proceed, whichever is later.

3. Identify each submittal by project, Contractor, drawing or detail number, and specification section number, as appropriate. Mark submittals to show the specific item(s) that will be furnished. Include intended use of the submittal and any other pertinent information necessary for a complete evaluation. If the Contractor provides a submittal which show variations from the contract documents, the Contractor shall completely describe such variations in writing clearly and separately from any other portion of the submittal. Highlighting or marking in any manner the proposed variations is not sufficient to comply with this requirement. This requirement applies irrespective of the provisions of any specification which follow this section and which may be particular to specific item(s).

C. Submit to the Contracting Officer complete information applicable to the item(s) of equipment and materials called for by the Contract Documents, for approval, prior to installing the relevant item(s) of equipment and material. If unapproved item(s) of equipment or material are installed, the Contracting Officer, at his sole discretion and option, may reject the installed equipment and material. If rejected, the Contracting Officer may then pursue, again in his sole discretion and option, remedies including but not limited to the removal and reinstallation of approved item(s) of equipment or material at the Contractor's expense, extended warranties, and other remedies as may be deemed appropriate and applicable to that portion of the construction.

D. Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled.

E. Adequate time (a minimum of 14 calendar days) shall be allowed and shown on the register for distribution, review and approval by both or either the Project Inspector and Contracting Officer.

F. The Contractor, as part of the bid price, shall have a Government-approved, independent, commercial testing laboratory perform all sampling and testing as called for in these specifications. Test reports shall be properly sealed by a professional engineer.

1.05 QUALITY CONTROL:

A. Provide quality control over the entire project including but not limited to the items of equipment and materials intended for installation, necessary coordination and services to facilitate the performance of the work, site conditions, and the workmanship of the Contractor personnel and any subcontractors.

B. The Contractor shall become familiar with all the details of the work depicted in the Contract Documents and shall verify all field conditions related to the construction prior to commencement of the work. If conditions are discovered by the Contractor prior to commencement of the work which conflict with the Contract Documents, and which will substantially affect the construction as designed and depicted in the Contract Documents, identify and explain the condition(s) in writing to the Contracting Officer within 48 hours of discovery of the condition(s); and request clarification from the Contracting Officer before commencing work.

C. If site conditions are discovered by the Contractor during the construction which conflict with the Contract Documents, and which affect either a portion of the current construction, or which will substantially affect the construction as designed and depicted in the Contract Documents, identify and explain the condition(s) in writing to the Contracting Officer within 48 hours of discovery of the

condition(s); and request clarification from the Contracting Officer before proceeding. All such requests for information shall completely address aspects of the condition, including but not limited to, engineering judgments and engineered solutions, possible costs or deductions, and time extensions.

D. If site conditions or defects are discovered during the construction, by the Contracting Officer or the Contracting Officer's designated representative, which are the result of the Contractor's inadequate quality control or substandard workmanship, whether by the Contractor or a subcontractor, which conflict with the Contract Documents, and which affect either a portion of the current construction, or which will substantially affect the construction as designed and depicted in the Contract Documents, the Contracting Officer may direct the Contractor to identify and explain the condition(s) or defect(s) in writing to the Contracting Officer within 48 hours of discovery of the condition(s). In all such instances, the Contractor shall present no less than three viable options to correct the condition or defect, completely addressing aspects of the condition, including but not limited to, engineering judgments and engineered solutions, possible costs or deductions, and time extensions. The Contracting Officer will then review and approve an option for use by the Contractor. The Contractor shall not proceed with the work until receiving the written permission from the Contracting Officer.

E. The Contractor shall comply fully with manufacturer's instructions, including each step in sequence. If such instructions conflict with the Contract Documents, identify and explain the conflict in writing to the Contracting Officer within 48 hours of discovery of the conflict; and request clarification from the Contracting Officer before proceeding.

F. Testing: The Contractor shall provide samples and test results as required by the Contract Documents. Test reports shall be properly sealed by an independent professional engineer.

G. Cleanup: The Contractor shall keep the work area and surrounding surfaces clean and orderly. Remove any contractor-caused residue, dirt, or markings immediately upon completion of the work involved. Clean site daily.

H. Exterior surfaces including but not limited to Portland cement concrete, asphalt pavements, and gravel and interior surfaces including but not limited to carpet, tile, ceiling tiles, and gypsum board damaged by construction work or the Contractor's operations, shall be replaced with materials consistent in quality and workmanship to match existing.

I. It is the Contractor's responsibility to maintain any and all quality control records and have them available to the Government at all times.

J. Record drawings shall be kept at the job site at all times, and shall be made available upon request by either or both the Project Inspector or the Contracting Officer. The record drawings shall be marked up on a daily basis to show actual "as-built" construction and conditions.

1.06 EXPERIENCE REQUIREMENT:

A. The Contractor must have in the past been engaged in Department of Defense (Military) Construction work of this type for a minimum of five (5) year(s). Contractors proposing to submit a bid on this project must be prepared to (low bidder only) submit notarized affidavits from Government agencies attesting to satisfactory performance of work of at least five (5) projects of this nature during the previous five (5) year period and to the qualifications both in terms of expertise and having proper and adequate equipment to accomplish the work. The affidavits of the successful low bidder will be reviewed for approval or disapproval. The notarized affidavits will be submitted within three (3) days after requested. If the successful low bidder for this project has previously submitted the required certification to the Contracting Officer under a previous contract requiring the same certification, re-submission is not required.

PART 2: CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

2.01 TRAFFIC REGULATION:

A. Barriers: Contractor shall furnish all signs, barricades, and flagmen required to control traffic in the construction area.

1. All signs and barricades shall be in accordance with ANSI D6.1, Manual of Uniform Traffic Control Devices.

2. Minimize interference with the flow of traffic. At no time may access to any facility be prevented.

B. Haul routes: As designated on the drawings.

1. Immediately clean up any material spilled along the haul route. This shall include clean up of mud tracked on the road by contractor equipment.

2. For any spill of hazardous material on base, immediately notify the base fire department at 911. The Contractor is responsible for all costs incurred by the Government in responding to or cleaning up any such spill.

C. Access: Contractor shall maintain access to the base work site at all times. The Contractor is to perform his work with a minimum of interference to the flow of traffic.

2.02 SAFETY:

A. Comply with the Corps of Engineers Manual on General Safety Requirements, EM 385-1-1; Occupational Safety and Health Act (OSHA), Public Law 91-596; and AFI 91-301, Air Force Occupational Safety, Fire Prevention, and Health (AFOSH) Program.

B. Use of flammable adhesives or other similar flammable materials will be in strict accordance with manufacturer's instructions and the Contractor shall take all necessary safety and fire prevention steps to supervise and assure safe execution of work on the contract. This paragraph is applicable to adhesive materials or any other material involving flammable characteristics.

2.03 BLASTING: No blasting will be permitted.

2.04 GRADE CONTROL: Grade site to drain to protect site from puddling or running water, or accumulation of standing water in excavations. The Contractor shall provide all surveying required to establish and maintain line and grade stakes necessary to complete the construction.

2.05 ENVIRONMENTAL CONTROL:

A. Obtain permits from the Pima County Department of Environmental Quality, Air Quality Division, for installation of new equipment or use of contractor equipment which generate air pollution, for earth-moving activities related to new construction, and for asbestos removal or demolition. See Attachment 1 for the current, applicable Activity Permit Fees Schedule. These permits shall be included as a submittal on the AF Form 66, Schedule of Material Submittals. Submit copies of permits to the Contracting Officer prior to beginning construction. All permit costs shall be considered as having been included as a factor in the Contractor's bid price.

B. For projects involving asbestos abatement, complete standard "Notification of Demolition or Renovation" forms and submit to PCDEQ and other required agencies. These forms shall be included as a submittal on the AF Form 66, Schedule of Material Submittals. Submit copies of forms to the Contracting Officer prior to beginning construction.

C. Treat areas subject to dust-producing activities with liquid palliatives which will not harm regrowth of vegetation, or other such method of dust control which complies with PCAQCD regulations.

D. No open burning of trash, brush, or refuse will be permitted.

E. The Contractor shall segregate hazardous or regulated materials, and non-hazardous or non-regulated materials during demolition; and handle, transport, store, and dispose of these hazardous and non-hazardous materials in accordance with applicable federal, state, and local laws, ordinances, or other rulings having the effect of law, including but not limited to the items listed below. In addition, the Contractor shall obtain proper disposal manifests for both hazardous and regulated materials, and for non-hazardous or non-regulated materials, and submit these manifests to the Contracting Officer. These manifests shall be included as a submittal on the AF Form 66, Schedule of Material Submittals. Submit original manifest—with original signature of the Contractor's superintendent or authorized representative attesting to the validity of the manifest—to the Contracting Officer within 3 working days of disposal. All handling, transporting, and disposal costs shall be considered as having been included as a factor in the Contractor's bid price. Any questions regarding proper handling or disposal of hazardous or non-hazardous materials may be directed through the Contracting Officer to the Environmental Quality Flight at 228-4829.

1. Resource Conservation and Recovery Act (42 USC 6901)
2. Clean Water Act (33 USC 1251)
3. Clean Air Act (42 USC 7401-7642)
4. Toxic Substances Control Act (15 USC 260)
5. National Environmental Policy Act (42 USC 4321-4347)
6. Hazard Communication (OSHA Std 29 CFR 1910.1200)

F. Asbestos Abatement: [NOT USED] .

G. Provide the Contracting Officer with a chemical inventory and an estimated quantity to be used, prior to bringing hazardous materials on the base. A copy of same shall be provided to and maintained by Bioenvironmental Engineering. An additional copy of the chemical inventory and appropriate MSDS's shall be provided to 355 CES/CEVC. These requirements shall be included as a submittal on the AF Form 66, Schedule of Material Submittals.

H. All radioactive material or equipment using radioactive material must be approved for use prior to bringing it on the base. The written request for approval, along with a copy of the permit for the source and a brief description of the intended activities, shall be submitted to the base Bio-Environmental Engineering Flight through the Contracting Officer 30 calendar days prior to the Contractor's use. No work involving radioactive materials may proceed until receipt of the approved request. This requirement shall be included as a submittal on the AF Form 66, Schedule of Material Submittals.

I. Any items containing radioactive material, especially radioluminescent exit signs, discovered while performing maintenance, repair, alteration or renovation activities, shall be turned in by the Contractor through the Contracting Officer to 355 CES/CEO for proper disposal.

J. The Contractor will be held responsible for complying with all federal, state, and local environmental regulations included as part of the processes in performing the work included in this project.

K. Lead in liquid paints or coatings shall be restricted to no more than 0.06 per cent lead by weight of the non-volatile solids for use in or on all base facilities [Part 35 of 24 CFR].

2.06 SECURITY:

A. For entry to the base, submit an entry authorization request letter for each individual requiring access to the project, at least 10 calendar days prior to beginning work. A copy of the format of this letter may be obtained from the Contracting officer on or before the pre-performance conference. Valid identification with a photograph together with the base pass will be required for all individuals when entering the base.

B. All passes issued must be returned to the Contracting Officer upon termination of the employee or completion of the project, whichever is sooner.

2.07 PROJECT IDENTIFICATION SIGN:

A. Install a project identification sign adjacent to the main entrance to the site, within 10 days after the Notice to Proceed.

B. Sign shall measure 4' high by 8' wide, and be securely erected with the bottom edge 6' above the ground.

C. Content:

1. Project title
2. "General Contractor: [Name]"
3. "Architect/Engineer: [Name]"
4. "Construction Managed by 355 CES"

D. Color and style: Paint all surfaces and supporting structures brown, matching Federal Standard 595a color #20100. Use white, helvetica medium lettering, 3" high for the project title, 2" high elsewhere.

2.08 PROJECT PROGRESS PHOTOGRAPHS: Submit to the Contracting Officer construction project progress photographs taken on or about the first of every month, showing the general conditions of the work as viewed from the north, south, east, west, and/or building interior. Photographs (one roll of 35 mm color prints, minimum of twenty 3-inch x 5-inch standard prints) shall accompany each application for payment. Each print shall be identified by the date of exposure, the project number and title, and description of content.

2.09 FENCED STORAGE YARD: The Contractor shall install and maintain a temporary, fenced storage yard in a location close to the project site, in a location designated by the Contracting Officer. The temporary fencing shall be of sufficient strength and height to minimize and restrict entry by unauthorized personnel. The temporary fencing shall be provided with visual screening for the full height and length, using tan-colored screening or a similar color selected and approved by the Contracting Officer. The temporary fencing and screening shall remain in place and be maintained for the life of this contract.

2.10 MATERIAL HANDLING AND STORAGE:

A. Handle, store, and protect all products in accordance with manufacturer's instructions.

B. At the end of each work day, park and store all equipment and materials in the location designated by the Contracting Officer.

PART 3: PROJECT CLOSE-OUT

3.01 PRE-INSPECTION FINAL CLEANING:

- A. Clean all surfaces exposed to view.
- B. Polish transparent and glossy surfaces.
- C. Clean equipment and fixtures.
- D. Clean debris from roofs, gutters, drainage systems, and site.
- E. Remove temporary labels.

F. Properly dispose of all hazardous and non-hazardous materials off base in accordance with the environmental controls specified in this Section.

3.02 RECORD DISKS, DOCUMENTS AND DRAWINGS. Prior to the Contracting Officer's final acceptance of and final payment for the completed project, submit for approval the record as-built drawings, disks, documents, and shop drawings as required in the following paragraphs, no later than 30 days after the Final Inspection. These requirements shall be included as submittals on the AF Form 66, Schedule of Material Submittals.

A. Record As-built Drawings. Standard drafting practices shall be used to represent changes and shall include supplemental notes, legends, details and dimensions as required to show actual "as-built" construction. Submit to the Contracting Officer one complete set of high-quality, 3-mil, reproducible mylar drawings, clearly and legibly marked "AS-BUILT DRAWINGS" in large print at the bottom right corner of each drawing sheet above the title block. Printing on mylars shall be reverse side, mirror image. Sepia mylars (copies) will not be accepted.

B. Record Disks. The Contractor shall, using AutoDesk AutoCAD as per the latest version directed by the Contracting Officer, transfer the "as-built" conditions to the project disks provided by the Contracting Officer, and submit the revised disks to the Contracting Officer.

C. Record Documents. Fourteen (14) calendar days prior to the final inspection, using clear and legible copies of Attachments 2 and 3 to this specification section, complete the following record documents and submit to the Contracting Officer.

- 1. Construction Data Sheet.
- 2. Warranty/Guarantee Items.

D. Record Shop Drawings. [NOT USED / Record shop drawings shall be signed by the Contractor. Mark shop drawings to show the specific items that were furnished and to show actual as-built conditions; and submit to the Contracting Officer.]

E. Operation and Maintenance Manuals: Submit operation and maintenance manuals for each major building system or item of equipment as per the contract specifications, including but not limited to all mechanical and electrical systems and equipment:

- 1. Reference information to be included, as applicable:
 - a. Table of contents.
 - b. Directory listing names, addresses, and telephone numbers of the architect/engineer, Contractor, subcontractors, and suppliers.
 - c. Significant design criteria.
 - d. Shop drawings and product data.

- e. Air and water balance reports.
 - f. Certificates.
 - g. Copies of warranties.
2. Operation and maintenance information to be included, as applicable:
- a. List of equipment.
 - b. Parts list for each component.
 - c. Operating instructions.
 - d. Maintenance and troubleshooting instructions.
 - e. Repair and assembly/disassembly instructions.
 - f. Calibration requirements.

3.03 FIELD INSTRUCTIONS:

A. Prior to final inspection, provide competent instruction—using the manuals described above—to the Government in the operation and maintenance of the building systems and equipment, including but not limited to all mechanical and electrical systems and equipment.

END OF SECTION

**Table 17.12.540
ACTIVITY PERMIT FEES SCHEDULE (effective July 1, 2003)**

S.S.	ACTIVITY	RATE COMPONENTS	EXEMPTIONS
A	Landstripping and/or Earthmoving	1-2 Acres \$100.00 >2-10 Acres \$500.00 >10-40 Acres \$1,500.00 >40+ Acres....\$3,000.00	< 1 Acre
B	Trenching	300-500 Ft. \$75.00 501-1500 Ft. \$200.00 1501-5000 Ft. \$400.00 5001+ Ft. \$800.00	< 300 Ft., Trenching for Landscaping
C	Road Construction	50-1000 Ft. \$50.00 1001-3000 Ft. \$250.00 3001-6000 Ft. \$500.00 6001+ Ft. \$1000.00	< 50 Ft.
D	Activity Permit for NESHAP Facilities	\$420.00	See Exemption Note
E	Blasting (NOT ALLOWED AT DMAFB)	\$18.00 plus \$3.53 per day of blasting	None
<p>Exemption Note: < 260 linear feet on pipes; < 160 square feet on other facility components; < 35 cubic feet off facility components</p> <p>----- † Sub-schedule for identification only. (Ord. 2002-108 §2, 2002; Ord. 1995-87 §26, 1995; Ord. 1994-83 §44, 1994; Ord. 1993-128 §3 (part), 1993; Ord. 1990-113 §16, 1990; Ord. 1989-165 §17 (part), 1989; Ord. 1987-175 §18, 1987)</p>			

Note: Contractor shall verify current rates and apply fees calculations accordingly.

CONSTRUCTION DATA SHEET

FBNV: _____ TITLE: _____

STRUCTURES

TYPE OF CONSTRUCTION: _____

MATERIAL a. Foundation: _____ b. Floor: _____

c. Wall: _____ d. Roof: _____

DIMENSIONS: a. Main Building: _____ b. Offsets: _____

UTILITY CONNECTION SIZE:

a. Water: _____ b. Sewer: _____ c. Gas: _____ d. Electric: _____

BUILDING EQUIPMENT:

1. AIR CONDITION/HEATING:

a. Type, size, and number of units: _____

b. Space affected: _____

c. Cost: \$ _____

2. FIRE SYSTEMS:

<u>TYPE SYSTEM</u>	<u>NUMBER OF UNITS EACH</u>	<u>AMOUNT SF COVERED</u>	<u>COST</u>
990222 Manual Fire Alarm Sys	_____ ea		\$ _____
880221 Auto Fire Detect Sys	_____ ea	_____ sf	\$ _____
880211 Closed Head Sprnk Sys	_____ ea	_____ sf	\$ _____
880212 Deluge System	_____ ea	_____ sf	\$ _____
880231 CO ² System	_____ ea		\$ _____
880235 Dry chemical System	_____ ea		\$ _____
880233 (Other) Standpipe Sys	_____ ea		\$ _____
880217 AFFF Foam System	_____ ea	_____ sf	\$ _____
880235 Wet Chemical Sys	_____ ea		\$ _____
880234 HALON System	_____ ea		\$ _____
880222 Local Smoke Detect Sys	_____ ea		\$ _____

3. EMERGENCY LIGHTS (Number of sets): _____

4. GENERATORS: (a) Serial No# _____ (b) KW: _____ (c) Cost \$ _____

Attachment 2 (1 of 3)

PAVEMENTS

	<u>Type Construction</u>	<u>Square Yards</u>	<u>Cost</u>
Parking Lot:	_____	_____ sy	\$ _____
Driveway:	_____	_____ sy	\$ _____
Road:	_____	_____ sy	\$ _____
Airfield:	_____	_____ sy	\$ _____
Open Storage:	_____	_____ sy	\$ _____
Equipment Pads:	_____	_____ sy	\$ _____
Sidewalk:	_____	_____ sy	\$ _____

UTILITIES

1. ELECTRICITY:	<u>Linear Feet</u>	<u># Poles</u>	<u># Manholes</u>	<u>Cost</u>
a. Primary (OH) :	_____ lf	_____	_____	\$ _____
b. Primary (UG):	_____ lf	_____	_____	\$ _____
c. Secondary (OH):	_____ lf	_____	_____	\$ _____
d. Secondary (UG):	_____ lf	_____	_____	\$ _____
e. Transformers:	_____ KVA			\$ _____
2. SEWER LINES:	_____ lf	\$ _____		
3. WATER LINES:	_____ lf	\$ _____		
4. OIL/WATER SEPARATOR:	Capacity: _____			
5. GAS LINES:	_____ lf	\$ _____		
a. Regulator:	_____ ea	_____	_____	\$ _____
b. Meter:	_____ ea	_____	_____	\$ _____

Attachment 2 (2 of 3)

FENCING

Linear Feet _____ Type: _____ Cost: \$ _____

EXTERIOR LIGHTING

	<u>#LIGHTS</u>	<u>TYPE</u>	<u>COST</u>
1. STREET:	_____	_____	\$ _____
2. FLOOR:	_____	_____	\$ _____
3. SECURITY:	_____	_____	\$ _____

MISCELLANEOUS

1. STORM DRAINAGE: Linear Feet: _____ Type: _____ Cost \$ _____

2. CURBS & GUTTERS: Linear Feet: _____ Cost \$ _____

3. SEPTIC TANKS: Size: _____ Cost \$ _____

Primary power (600 volts or more) and secondary power (under 600 volts) included the linear feet between all poles, plus service drops for the overhead system and the linear feet between all duct manholes in the underground system.

EXAMPLE: Two primary systems, or feeders, and one secondary line between two poles 100 feet apart would equal 200 feet of primary and 100 feet of secondary overhead distribution.

CONTRACTOR
Signature

INSPECTOR
Signature

DATE

Attachment 2 (3 of 3)

WARRANTY / GUARANTEE ITEMS

Project No. - FBNV _____

Contract No. - F02601- _____ **Delivery Order No.** _____

Project Title: _____

CONTRACTOR'S Name/Address/Phone #:

(Name)}

(Address) (City) (State) (Zipcode)

(Phone) (E-mail/Website)

CONSTRUCTION TYPE: New Installation Renovation

Item Installed: _____ Date Installed: _____

Location of Installed Item: _____

Warranty / Guarantee Date: _____

DESCRIPTION OF ITEM:

ITEM _____ TYPE _____ MODEL _____

SERIAL NO. _____ STYLE _____ HORSEPOWER _____

VOLTAGE _____ CYCLES _____ FRAME _____

SIZE _____ QTY _____ OTHER _____

MANUFACTURER'S EXTENDED WARRANTY INFORMATION:

(Name}

(Address) (City) (State)} (Zipcode)

(Phone) (E-mail/Website)

ITEM COST: \$ _____

Appendix J:
Specification Section
01101 Design Compatibility Guidelines

SECTION 01101
DESIGN COMPATIBILITY GUIDELINES

NOTE: The Davis-Monthan Air Force Base Design Compatibility Guideline requirements defined in the following section may directly affect the Contractor's overhead for completing the scope of work. Failure on the part of the Contractor to adequately review this section and identify/clarify any requirements herein will not constitute justification of Contractor claims for additional construction costs.

PART 1 GENERAL

1.01 DESIGN COMPATIBILITY GUIDELINES

A. The contractor shall not provide any labor, materials, methods of construction, furnishings, equipment that is not in full compliance with the current Davis-Monthan Air Force Base Design Compatibility Guidelines.

1. In situations where requirements in the current Davis-Monthan Air Force Base Design Compatibility Guidelines may conflict with other contract documents, regulatory agencies, codes and/or life safety requirements, the Contractor shall submit a request for clarification prior to ordering and/or installing any materials or equipment in question. No further work and/or ordering of materials directly affected by this request for clarification in this area shall be performed until the request has been fully resolved.

B. The Contracting Officer, or Government's designated representative, shall make final determination as to whether or not the Contractor's work meets the specific requirements or intent of the Davis-Monthan Design Compatibility Guidelines. All other interpretations shall be secondary to that of the Contracting Officer.

1.02 DESIGN COMPATIBILITY GUIDELINES DEFINITIONS

A. DCG: Design Compatibility Guidelines

B. Character Area: A grouping of facilities that establishes a subset of exterior guidelines

1.03 DESIGN COMPATIBILITY GUIDELINES CONSULTATION

A. Working hours for Design Compatibility Guidelines consultation with the Government will normally be Monday through Friday, between the hours of 8:00 am and 3:00 pm. Availability on Saturdays, Sundays, and Federal holidays will not be provided unless otherwise scheduled and approved by the Contracting Officer. In the event the Contractor requires weekend consultation, the Contractor shall coordinate weekend activities, for final approval, with the Contracting Officer no later than the Wednesday prior to the work weekend.

1.04 BRAND NAME REFERENCES

A. General Provisions include by reference DFARS 211.270-1. Clause 52.236-5, Material and Workmanship. This clause states "reference in the specification to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a

Standard of quality and shall not be construed as limiting competition. The contractor may, at its option, use any equipment, material, article, or process that, in the judgment of the Contracting Officer, is equal to that named in the specification, unless otherwise specifically provided in this

contract." This statement shall apply to all references made in the current Davis-Monthan Air Force Base Design Compatibility Guidelines and these specifications to equipment, material, articles, or process.

1.05 SUBMITTALS

A. An additional copy of each submittal will be required on all Design Compatibility Guidelines materials (exterior and interior) used under each proposal. The submittal should be delivered to the Government's Design Compatibility Guidelines coordinator for record keeping purposes only. Approval of the submittal will remain the responsibility of the Contracting Officer.

1.06 SUBSTITUTIONS

A. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by the current Davis-Monthan Air Force Base Design Compatibility Guidelines proposed by the Contractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions:

1. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified as substitutions.

2. Revisions to Contract Documents requested by the Government.

3. Specified options of products and construction methods included in Contract Documents.

4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities, including but not limited to the current Davis-Monthan Design Compatibility Guidelines.

1.07 FURNITURE AND FURNISHINGS REUSE

A. Unless otherwise specified or noted in the contract drawings, all materials generated as the result of required reconfiguration and/or demolition work shall become the property of the Contractor for disposal.

1. All furniture and furnishing items identified as Design Compatibility Guidelines reuse will remain the property of the Government.

B. Consistent with current Government programs, the Contractor is strongly encouraged, but not required, to reduce landfill and/or incinerator waste by recycling.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

Appendix K:
Specification and Performance Guideline
Door Hardware

DAVIS MONTHAN AIR FORCE BASE

DOOR HARDWARE SPECIFICATION AND PERFORMANCE GUIDELINE SECTION 08710 EDIT DATE: JANUARY 28, 2002

The purpose of this booklet is to support the building standards for door hardware. The Base maintains the following hardware and is currently stocking replacement parts. The products listed in this booklet are to be used without substitution on new construction and modernization projects unless products are listed in this package as an alternate.

It is the intent of this booklet to provide guidelines for the architect's specification section 08710, for product groups and the hardware schedule. It remains the architect's responsibility to coordinate these products to meet the applicable building codes, life safety codes and ADA requirements.

Section 08710 door hardware preamble must specify the following:

Door and frame prep

Before hardware installation, verify that all doors and frames are properly prepared to receive the specified hardware. Hollow metal frames shall be prepared for ANSI strike plates per A115.1-2 (4-7/8" high); hinge preps will be mortised and reinforced with a minimum of 16-gauge material for either mortised or cylindrical locks as specified. It is preferred that all hollow metal doors receiving door closers have 12-gauge reinforcement. If this is not possible, the use of sex bolts is mandatory. Wood doors shall be factory prepared to receive the scheduled hardware.

Hardware installation

The manufacturer's representative shall make themselves available for inspection and/or approval of the installation of their products upon request of the owner's representative. Hardware installed incorrectly must be reported to the contractor prior to the contractor's final punch list.

Specification Service

Lise C. Allard, AHC CSI (602) 684-7558
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DAVIS MONTHAN AIR FORCE BASE

DOOR HARDWARE SPECIFICATION AND PERFORMANCE GUIDELINE SECTION 08710 EDIT DATE: JANUARY 28, 2002

Description	Manufacturer	Model/Series	Finish
-------------	--------------	--------------	--------

Hanging Devices

Hinges

Preferred:	Hager	BB1129 x NRP (Heavy Use Ext. Doors)	630
		BB1168 x NRP (Heavy Use Int. Doors)	652
		BB1279 x NRP (Interior Doors)	652
Alternate:	Stanley	FBB199 x NRP (Heavy Use Ext. Doors)	630
		FBB168 x NRP (Heavy Use Int. Doors)	652
		FBB179 x NRP (Interior Doors)	652
Alternate:	McKinney	T4A3386 x NRP (Heavy Use Ext. Doors)	630
		T4A3786 x NRP (Heavy Use Int. Doors)	652
		TA2714 x NRP (Interior Doors)	652

Continuous Hinges

Preferred:	Roton	780-224 HD Full Mortise	628
		780 057 HD	628

Securing Devices

Mortise Lock Sets

Mortise type locks and latches shall be heavy-duty with one-piece solid ¾ inch throw latchbolt made of self-lubricating stainless steel. Functions and design as indicated below. Deadbolt functions shall be 1 inch projection made of hardened stainless steel. Both deadbolt and latchbolt are to extend into the case a minimum of 3/8 inch when fully extended. Furnish locksets and latchsets with sufficient curved strike lip to protect door trim. Provide locksets with 7-pin (7th pin enhances the system by 16,383 additional codes per master) interchangeable core cylinders. All mortise cylinders shall have a concealed internal set screw for securing the cylinder to the lockset. The internal set screw will be accessible only by removing the core from the cylinder body. All mortise locksets and latchsets to have self-aligning, thru-bolted trim. Auxiliary deadlatch to be made of one piece stainless steel, permanently lubricated. Level handles must be of forged or cast brass, bronze or stainless steel construction and conform to ANSI A117.1. Levers which contain a hollow cavity are not acceptable. Spindle to be such that if forced it will twist first, then break, thus preventing forced entry. Levers to be operated with a roller bearing

DAVIS MONTHAN AIR FORCE BASE

DOOR HARDWARE
SPECIFICATION AND PERFORMANCE GUIDELINE
SECTION 08710
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spindle hub mechanism, and have separate spring load. The mortise case cover shall be stipled, keeping the cover flat and self-lubricated and held shut with five screws.

<u>Description</u>	<u>Manufacturer</u>	<u>Model/Series</u>	<u>Finish</u>
Preferred:	Best	35H Series 15J lever and trim	626
Alternate:	Must be presented 10 days prior to bid date and conform to above performance guideline.		

Cylindrical Lock Sets

Cylindrical lever type locksets must be extra heavy duty type with 2-3/4 inch backset, or greater as specified, with a 9/16 inch throw latchbolt. Provide locksets with 7-pin interchangeable core. Locksets and latchsets must conform to ANSI A156.2, Series 4000, Grade 1, and be UL listed. Locksets and cores to be of the same manufacturer to maintain complete lockset warranty. Locksets and latchsets with levers must fit modified ANSI A115.2 door preparation. Locksets to have anti-rotational studs that are thru-bolted. Keyed lever shall not have exposed "keeper" hole. Each lever to have independent spring mechanism designed to control the lever only. Outside lever sleeve to be seamless, of one piece construction, made of a hardened steel alloy. Keyed lever to be removable only after core is removed by authorized control key, to allow access to knob "keeper." Hub, side plate, anti-rotational studs to be a one-piece casting with a shrouded locking lug. Locksets outside locked lever must withstand 1400 inch pounds of torque. In excess of that, a replaceable part will shear, not allowing entry by lever. Permanent core face must be the same finish as the lockset finish. Outside levers shall have Lost Motion that when locked the lever will move without moving the latchbolt. The above replaceable part will still be in effect. Classrooms shall have an intruder function in which the outside lever can be locked or unlocked from the outside, the outside lever can be locked or unlocked from the inside without opening the door, the inside lever is always operable.

Perferred:	Best	93K Series 15D Lever and Trim	626
Alternate:	Must be presented 10 days to bid date and conform to above performance specification.		
Cylinders	Best	1E74 Mortise Cylinder 1E72 Rim Cylinder	626 626

DAVIS MONTHAN AIR FORCE BASE

DOOR HARDWARE
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<u>Description</u>	<u>Manufacturer</u>	<u>Model/Series</u>	<u>Finish</u>
--------------------	---------------------	---------------------	---------------

Key System

Key System	Best	Removable/Interchangeable Core 7-pin System	626
------------	------	--	-----

All locks to be supplied with temporary brass construction cores

Keys	1 each Grand Master keys 4 each Master keys 3 each Change keys each keyed core 9 each Construction master keys 1 each Control keys
------	--

Exit Devices

Non handed, Stainless Steel, field sizeable
Must have deadbolt deadlocking, have a ¾” throw latchbolt, have roller strikes
Must be versatile – manufacturer’s interlocking case must be compatible with different locking cases
On electrified exit device – must be by same manufacturer
3 year warranty

Preferred:	Von Duprin	98 Series on non-fire rated doors	630
		98-F Series on fire rating doors	630
		22 Series	630
	Trim	992L	630
Alternate	Precision (Reliant)	1100 Series on non-Fire Rated Doors	630
		FL-1100 Series on Fire Rating Doors	630
	Trim	39LA	630

Closing Device

Door Closers

Cast aluminum body, full rack and pinion hydraulic action, low friction bearings
All weather fluid and must meet positive pressure
Must meet ADA – must have adjustable size as required per door
Operating back-check, latch speed, delayed action where required

DAVIS MONTHAN AIR FORCE BASE

DOOR HARDWARE SPECIFICATION AND PERFORMANCE GUIDELINE SECTION 08710 EDIT DATE: JANUARY 28, 2002

Extra Duty Arm and forged steel main arm
One piece forged steel piston, high strength cast iron cylinder
10 year warranty

Description	Manufacturer	Model/Series	Finish
Preferred:	LCN	4040 Series	689
		1461 Series	689
Alternate:	Ryobi	D-4550 Series	689

Stops and Holders

Door Holder

Preferred:	ABH	1000 Series (36"+) Overhead Concealed	630
		4000 Series (36"+) Overhead Concealed	626
		4400 Series (36"+) Overhead Surface	626
Alternate:	Glynn Johnson	100 Series (36"+) Overhead Concealed	630
		410 Series (36"+) Overhead Concealed	626
		450 Series (36"+) Overhead Surface	626

Door Stops

Preferred:	Trimco	1211/1210AR Floor Stop	626
		1270 Wall Stop	626
		1201 Floor Stop	626
		1209 Floor Stop	Black
Alternate:	Glynn Johnson	FB13/14R Floor Stop	626
		60W Wall Stop	626
		FB36	626
		FB18S	Black

Accessories

Kick Plate	Trimco	KO050 10" x 2" LDW x .050" Thick x B3E	630
		(Single Door)	
		KO050 10" x 1" LDW x .050" Thick x B3E	630
		(Pair Doors)	

DAVIS MONTHAN AIR FORCE BASE

DOOR HARDWARE SPECIFICATION AND PERFORMANCE GUIDELINE SECTION 08710 EDIT DATE: JANUARY 28, 2002

<u>Description</u>	<u>Manufacturer</u>	<u>Model/Series</u>	<u>Finish</u>
Push/Pull Plate	Trimco	1001/1017-3B 4x16 1096TL	630 630
Alternate	Rockwood	Kick, push/pull plates – match Trimco products	
Threshold	Pemko	271A (1/2" x 5" Saddle Threshold) ▪ Architect to coordinate with project conditions	628
Alternate	National Guard	425 (1/2" x 5" Saddle Threshold) ▪ Architect to coordinate with project conditions	628
Smoke Seal	Pemko	S88 x HS2000 (1/2 x 3/16 x Pressure Sensitive mounting)	Charcoal
Weather Seal	Pemko	29310CS (at head and jambs) 315CN (at sill on door – surface mount)	628 628
Alternate	National Guard	170SA (at head and jambs) 200NA (at sill on door – surface mount)	628 628
Door Silencer	Trimco	1229A (Metal Frame)	Gray
Alternate	Glynn Johnson	GJ64 (Metal Frame)	Gray
Astragal	Pemko	357SB x HSS2000 (wood doors) (Where required by code) ▪ Astragal by door manufacturer at HM door	628
Alternate	National Guard	139A x 9800C (wood doors) (Where required by code) ▪ Astragal by door manufacturer at HM door	

Appendix L:
Installation Energy Management



Department of Defense INSTRUCTION

NUMBER 4170.11
November 22, 2005

USD(AT&L)

SUBJECT: Installation Energy Management

- References:
- (a) DoD Instruction 4170.11, same subject as above, October 13, 2004 (hereby canceled)
 - (b) Public Law 109-58, Energy Policy Act of 2005, August 8, 2005
 - (c) DoD Directive 4140.25, "DoD Management Policy for Energy Commodities and Related Services," April 12, 2004
 - (d) Executive Order 13123, "Greening the Government through Efficient Energy Management," June 3, 1999
 - (e) through (t), see Enclosure 1

1. PURPOSE

This Instruction:

- 1.1. Reissues reference (a) according to the guidance in reference (b).
- 1.2. Implements reference (c) to provide guidance, assign responsibilities, and prescribe procedures for DoD installation energy management.

2. APPLICABILITY AND SCOPE

This Instruction:

- 2.1. Applies to the Office of the Secretary of Defense (OSD), the Military Departments, the Chairman of the Joint Chiefs of Staff, the Combatant Commands, the Defense Agencies, the DoD Field Activities, and all other organizational entities in the Department of Defense (hereafter referred to collectively as the "DoD Components"). The term "Military Services," as used herein, refers to the Army, the Navy, the Air Force, and the Marine Corps.
- 2.2. Pertains to all phases of administration, planning, programming, budgeting, operations, maintenance, training, and materiel acquisition activities that affect the supply, reliability and consumption of facilities energy.

3. POLICY

It is DoD policy, according to reference (c), that:

3.1. The DoD utility infrastructure is secure, safe, reliable and efficient.

3.2. Utility commodities are procured effectively and efficiently.

3.3. The DoD Components shall maximize energy and water conservation efforts.

3.4. The Department of Defense invests in cost-effective renewable energy sources, energy efficient facility designs, and regionally consolidates Defense requirements to aggregate bargaining power to get better energy deals.

4. RESPONSIBILITIES

4.1. The Principal Deputy Under Secretary of Defense for Acquisition, Technology and Logistics shall:

4.1.1. Ensure that the Department meets the goals of the Energy Policy Act of 2005 (reference (b)) and Executive Order (E.O.) 13123 (reference (d)).

4.1.2. Represent the Department on the Interagency Energy Policy Committee.

4.2. The Deputy Under Secretary of Defense for Installations and Environment (DUSD(I&E)) shall:

4.2.1. Implement policies and provide guidance to the DoD Components for managing facility energy resources in the Department of Defense and serve as the primary adviser for facility energy policy matters according to reference (a).

4.2.2. Provide for energy conservation and resource management, including the following:

4.2.2.1. Goals. Establish Departmental energy conservation program goals and develop procedures to measure energy conservation accomplishments by the DoD Components.

4.2.2.2. Annual Guidance. Provide annual programming guidance and oversight for the achievement of DoD energy goals and objectives.

4.2.2.3. Investment. Establish criteria, program and budget for, and monitor the execution of the Military Construction (MILCON)- Energy Conservation Investment Program (ECIP).

4.2.2.4. Reporting. Develop policy guidance, consistent with current legislation and executive orders, to report energy use and results of energy conservation accomplishments against Federal energy conservation and management goals.

4.3. The Director of Installations, Requirements and Management (DUSD(I&E)IRM) shall:

4.3.1. Represent the Department on the Interagency Energy Management Task Force (IEMTF) which is the technical support to the Interagency Energy Policy Committee for meeting the goals of references (c) and (d).

4.4. The Heads of the DoD Components shall:

4.4.1. General

4.4.1.1. Implementation. Implement defense installation energy policies in section 3., above, according to the procedures described in section 5., below.

4.4.1.2. Representation. Designate and assign qualified individuals to represent the DoD Component in national, international, Government, or industry organizations deliberating installation energy policy matters.

4.4.1.3. Resources. Provide management and resources for the execution of installation energy policies and procedures outlined herein.

4.4.2. Energy Conservation and Resource Management

4.4.2.1. Program. Establish and execute an energy program management structure to provide for the following:

4.4.2.1.1. Funding. Program and budget funds sufficient to meet energy conservation goals.

4.4.2.1.2. Measure Progress. Implement DoD-established policies and procedures to measure progress in meeting energy conservation goals.

4.4.2.1.3. Reporting. Report energy use and progress in meeting energy conservation goals and program costs. Report ECIP program execution.

4.4.2.1.4. Efficiency. Develop programs that shall result in facilities that are designed, constructed, operated, and maintained to achieve optimum performance and maximize energy efficiency according to sustainable design principles.

4.4.2.1.5. Staffing. Ensure facilities are provided with trained energy program managers and operators and maintenance personnel for heating, power generating, water, ventilating, and air-conditioning plants and systems. Conduct training programs, as required, to ensure energy efficient operation of facilities.

4.4.2.1.6. Leased Facilities. Ensure facility leases for Government-owned, contractor-operated facilities contain the requirement to implement sound energy conservation procedures; allow contract modification to accommodate energy efficiency improvements; and measure and report energy use and the resulting savings.

4.4.2.2. Energy Awareness. Develop internal energy awareness programs to provide the following:

4.4.2.2.1. Publicity. Publicize energy conservation goals.

4.4.2.1.2. Shared Information. Disseminate information on energy matters and energy conservation techniques.

4.4.2.1.3. Command Attention. Emphasize energy conservation at all command levels and relate energy conservation to operational readiness.

4.4.2.1.4. Incentives. Promote energy efficiency awards and recognition.

4.5. The Director, Defense Logistics Agency (DLA), shall provide the following:

4.5.1. Management. Perform energy management responsibilities assigned according to reference (c).

4.5.2. Reporting. Utilize the DoD energy database assigned under DoD Directive 5126.46 (reference (e)), in addition to other required information provided by the DoD Components, to compile Component data and prepare the Department of Defense's annual energy management report described in subparagraph 5.1.1.

4.5.3. Energy Markets. Monitor the utility markets to determine existing or potential adverse conditions.

5. PROCEDURES

5.1. Reporting. The following reporting mechanisms shall be used to track energy conservation measures, investments, and performance against established goals.

5.1.1. Annual Energy Management Report and Implementation Plan. The Department of Energy (DoE) Federal Energy Management Program, working with Office of Management and Budget, consolidated the separate energy management data and reports required by the National Energy Conservation Policy Act (reference (f)) as amended by the Energy Policy Act of 1992 (reference (g)) and references (c) and (b). The National Defense Authorization Act for FY 2002

(reference (h)) requires the Department of Defense to also submit reports required by reference (b) to the congressional defense committees. The Annual Energy Management Report is the primary vehicle in which the Department tracks and measures its performance and energy efficiency improvement. The format for the report is prescribed annually by DoE and contains a narrative section, tables, a data report spreadsheet (quantitative data on consumption and costs), implementation plan and a scorecard.

5.1.2. Defense Utility Energy Reporting System (DUERS). DUERS is the Department of Defense's energy data collection and reporting system that generates reports which are provided to the different levels (Major commands, regions, and installations) within their organization on a recurring frequency to evaluate performance and trends against established goals.

5.1.3. ECIP. ECIP is an OSD-centrally managed, project-oriented, Defense-wide MILCON account which is programmed annually and represents the only direct DoD investment in conservation. The program requires congressional notification prior to project execution and periodic update of execution status. Components with active projects are required to submit monthly status updates to DUSD(I&E).

5.2. Implementation Strategies. It is the Department of Defense's philosophy to give the DoD Components the flexibility of managing their own energy programs to meet goals. The primary objectives are to improve energy efficiency and eliminate energy waste while maintaining reliable utility service.

5.2.1. Awareness campaign. Energy awareness programs publicize energy conservation goals, disseminate information on energy matters and energy conservation techniques, and emphasize energy conservation at all command levels and relate energy conservation to operational readiness.

5.2.1.1. Training and Education. Awareness and training programs are important to the Department of Defense for achieving and sustaining energy-efficient operations at the installation level. DoD personnel shall be trained through either commercially available or in-house-generated technical courses, seminars, conferences, software, videos, and certifications. The DoD Components shall increase awareness and publicize program goals, tools, and progress at different organizational levels through web sites, conferences, e-mails, displays, reports, newsletters, handbooks, and guidance.

5.2.1.2. Recognition. Energy conservation awards shall be presented to individuals, organizations, and installations in recognition of their energy-savings and water conservation efforts. In addition to recognition, these awards provide motivation for continued energy-reduction achievements. The DoD Components shall establish and/or maintain their individual awards programs, and incorporate on-the-spot awards and incentive awards to recognize exceptional performance and participation in the energy management program. Components are encouraged to participate in the DoE's Federal Energy and Water Management Awards Program. This program recognizes organizations, small groups, and individuals for outstanding achievements in several energy-related categories within the Federal sector. Categories include energy management, renewable energy, water conservation, Energy Saving Performance

Contracts (ESPC), and beneficial landscaping. Each DoD Component may also recognize one outstanding individual for overall contribution to the program. In addition to DoE and Service energy award programs, the White House recognizes Leadership in Federal Energy Management with Presidential Awards.

5.2.1.3. Showcase Facilities. Showcase facilities demonstrate promising best commercial practices and the use of innovative techniques to improve energy and water efficiency. The Department of Defense shall emphasize the benefit of these facilities, with a target of each Service developing at least one showcase facility for the federally sponsored program (www.eere.energy.gov/femp/prodtech/fed_showcase.html) per year.

5.2.2. Energy and Water Efficiency Investment.

5.2.2.1. Capital Investment.

5.2.2.1.1. Project Development.

5.2.2.1.1.1. Life-Cycle Cost Analysis. DoD facilities shall continue to utilize life-cycle cost analysis in making decisions about their investment in products, services, construction, and other projects to lower the Federal Government's costs and to reduce energy and water consumption. All projects with 10 year or less simple payback that fit within financial constraints shall be implemented. The DoD Components shall consider the life-cycle-costs of combining projects, and encourage aggregating of energy efficiency projects with renewable energy projects, where active solar technologies are appropriate. The use of passive solar design shall be required when cost-effective over the life of the project. Sustainable development projects shall continue to use life-cycle costing methodology and should follow the Whole Building Design Guide (reference (i)).

5.2.2.1.1.2. Facility Energy Audits. Energy audits evaluate current energy usage and assist installations in determining the best locations to incorporate energy savings measures. Reference (b) requires Federal Agencies to audit approximately 10 percent of their facilities each year. Since auditing 10 percent of DoD facilities each year may be cost prohibitive, the DoD Components are encouraged to use either appropriated funding or alternative financing through Utility Energy Savings Contracts (UESC) and ESPC projects to conduct their energy audits. In addition to facility audits, software such as Renewable and Energy Efficiency Planning and the Federal Energy Decision Screening system may be utilized to assist this process by determining the investment required to meet energy reduction goals.

5.2.2.1.1.3. Sustainable Building Design. Sustainability initiatives require an integrated design approach to the life-cycle of buildings and infrastructure. The concepts of sustainable development as applied to DoD installations shall continue to be incorporated into the master planning process of each of the Services. MILCON and facility repair and/or sustainment projects shall include an energy analysis to show compliance with 10 CFR 434 (reference (j)), relevant E.O.s, and other Federal energy conservation requirements. All new facility construction and major renovations shall use current American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) standards according to Unified Facilities Criteria (UFC 3-400-01), Design: Energy Conservation, (reference (k)) for design

criteria and follow life-cycle cost analysis for sustainable development principles. Renewable energy systems may be considered when cost effective through a life cycle cost analysis. The DoD Components shall strive to obtain U.S. Green Building Council's Leadership in Energy and Environmental Design level of performance or equivalent. The DoD Components shall document sustainable development costs on DD Form 1391, "Military Construction Project Data," and are encouraged to approach land use planning and urban design in a holistic manner and integrate it with energy planning. Additional information on "sustainable design" is found in reference (i). This intuitive, internet-based tool (located at www.wbdg.org) serves as a portal to the design principles and other resources needed to construct cost-effective, sustainable buildings.

5.2.2.1.2. Project Execution. The DoD Components are encouraged to include cogeneration systems, fuel switching, lighting efficiency upgrades, waste heat usage, and thermal storage units in new construction and/or retrofit projects when cost-effective. The DoD Components are encouraged to incorporate energy saving technologies such as efficient thermal storage systems, chillers, boilers, lights, motors, Energy Management Control Systems (EMCS), ground source heat pumps, and water reducing devices.

5.2.2.1.2.1. Operation and Maintenance (O&M). The DoD Components shall insure that the energy efficiency measures are incorporated into repair and minor construction projects using available O&M funding. The DoD Components shall also ensure that sufficient O&M funding is available to support other projects using alternative financing vehicles such as UESC and ESPC contracts.

5.2.2.1.2.2. MILCON. Congress appropriates funding for the ECIP to execute projects that save energy or reduce energy costs. Funds shall be allocated on a fair share basis based on the DoD Component's previous year reported facility energy use and factoring in the obligation rate for the last 5 years. This approach allows the DoD Components to manage the program with a degree of funding certainty and encourages timely execution. The DoD Components shall strive to obligate 100 percent of the ECIP funds provided by the end of third quarter in which the funds were issued. At the end of the third quarter, any unobligated funding at that point may, at the discretion of the Office of the DUSD(I&E)(IRM), be withdrawn and redistributed to another DoD Component poised to obligate against a valid design-complete project, with priority given to renewable energy projects. MILCON funding should only be applied to projects that directly produce energy savings and/or cost reduction, however the Office of the DUSD(I&E)(IRM) shall have the discretion to directly apply funding for other uses such as studies and assessments if deemed appropriate. Realized saving should not only be auditable, but initial submission on DD Form 1391 of proposed projects shall identify the method to be used for savings verification. Project lists shall include project title, installation, Savings to Investment Ratio (SIR), and payback, as well as the estimated project cost and annual energy savings in British Thermal Units and dollars. At the discretion of the DoD Component, up to 10 percent of its annual ECIP target budget may be programmed against renewable energy applications that do not necessarily meet the SIR and payback criteria in order to expand use of renewable energy applications and to meet the goals of references (c) and (b). Detailed ECIP program guidance can be found in the Office of the Assistant Secretary of Defense for Logistics Memorandum (reference (l)).

5.2.2.1.2.3. Alternate Financing Mechanisms. Partnerships with the private sector through alternative financing (UESC and ESPC) are a crucial tool for financing energy efficiency measures and allow installations to improve their infrastructure. These contracts shall include infrastructure upgrades (e.g. new cogeneration, renewable systems and ancillary structures) and new equipment (e.g. HVAC, lighting, motors, fixtures and controls) to help the installations reduce energy and water consumption. Increasingly, projects with higher SIR should be first pursued using UESC and ESPC before consideration for ECIP, since these projects shall typically be more attractive to the commercial sector. Any funds paid by the Component in the agreement pursuant to such a financed energy project shall be from funds made available through the same project's recurring or nonrecurring energy or water related cost savings. Payments may be made only when the project is determined to be life cycle cost effective and when actual savings generated from the financed project, exceed the payment amount in the same year. Non-recurring savings are defined as ancillary savings such as utility rebates and avoided costs from repairs, replacements, retrofits, or capital improvements that have been budgeted for but are no longer required because of the financed energy project. Recurring savings are defined as reductions in energy, water, or wastewater consumption; maintenance; or operations costs because of the financed energy project. The basis for all cost savings used to pay for these projects must be fully documented in the contract file. Components shall track all estimated and actual costs, estimated and verified savings, interest rates, measurement and verification (M&V) information, and mark-ups, as well as any changes to project scope that may affect costs and savings. Components shall make this information available on a central web-based application. Each Component entering into a financed project agreement shall ensure that a qualified project facilitator is designated and assigned, that aggregate annual costs do not exceed the savings, and that contracts are only awarded and administered by teams with appropriately documented experience and training. Activities not possessing the prerequisite expertise may use the contracting centers of the Air Force, Navy, Army, and Defense Energy Support Center according to Inter Service Support Agreements (ISSA) or Memorandums of Understanding (MOU). Contracting agencies should ensure that multi-year indefinite delivery/indefinite quantity contracts are re-competed at regular intervals. Each Component contracting center that awards or administers ESPC contracts or task orders shall conduct internal audits at intervals no greater than every 5 years to ensure project performance and guaranteed savings. Components may issue more detailed implementing guidance.

5.2.2.2. EnergyStar[®] and Other Energy-Efficient Products. The DoD Components shall select energy efficient standby power devices, EnergyStar[®], Federal Energy Management Program (FEMP)-designated energy efficient products, and other energy-efficient products when acquiring energy-consuming products when life-cycle cost-effective. Guidance generated by the DoE, the General Services Administration (GSA), and the DLA are continuously being incorporated into the sustainable design and development of new and renovated facilities. Information technology hardware, computers and copying equipment shall be acquired under the Energy Star Program using GSA Schedules, Government-wide contracts, or Service Contracts. Computer equipment should be turned off at night or when not in use. The DLA distribution centers shall serve as the focal point of the Department of Defense's program to procure energy and water efficient products. DLA and GSA product catalogs shall be widely used, as well as the Construction Criteria Base (available on CD-ROM and the Internet). Procuring agents, including users of government credit cards, shall procure EnergyStar[®] products and other products in the top 25 percent of energy efficiency.

5.2.2.3. EnergyStar® Buildings. The DoD Components shall encourage participation in this program, developed by the U.S. Environmental Protection Agency, which promotes energy efficiency in buildings and requires measured building data and a comparison with archetypes in various regions of the country. EnergyStar® Building criteria are based on a five-stage implementation strategy consisting of lighting upgrades, building tune-up, load reductions, fan system upgrades, and heating and cooling system upgrades.

5.2.3. Energy Security/Flexibility. The DoD Components shall take necessary steps to ensure the security of energy and water resources.

5.2.3.1. Vulnerability Assessments. Installations shall perform periodic evaluation of the vulnerability of basic mission requirements to energy disruptions and assess the risk of such disruptions, implement remedial actions to remove unacceptable energy security risks and investigate off-base utility distribution and energy supply systems.

5.2.3.2. Critical Asset Assurance Program. Subject to findings of vulnerability assessments, critical nodes of assessed systems with unacceptable risk implications to mission achievement shall be nominated for inclusion in the Critical Asset Assurance Program under DoD Directive 5160.54 (reference (m)).

5.2.3.3. Renewable Energy. The Department of Defense is committed to creating opportunities to install renewable energy technologies and purchase electricity generated from renewable sources when life cycle cost-effective to enhance energy flexibility. Passive solar designs, such as building orientation and window placement and sizing, shall be implemented in a variety of building types and new facility construction.

5.2.3.3.1. Purchases. The Military Services shall purchase renewable energy generated from solar, wind, geothermal, and biomass sources when cost-effective and any premium is considered fair and reasonable. The DoD Components are encouraged to aggregate regionally when considering renewable energy purchases to leverage the Departments buying power and produce economy of scale savings.

5.2.3.3.2. Generation. Exploration in efficiency opportunities in renewable energy technologies such as wind, biomass, geothermal, ground source heat pumps and photovoltaics shall be pursued when life cycle cost effective. Self-generated power may be coupled with ground-source heat pumps, solar water heating systems and photovoltaic arrays to generate electricity at isolated locations, such as range targets, airfield landing strip lighting and remote water pumping stations.

5.2.3.4. Distributed Energy Generation. Distributed Energy Resources shall be used for on-site generation using micro-turbines, fuel cells, combined heat and power, and renewable technologies when determined to be life cycle cost effective or to provide flexibility and security to mitigate unacceptable risk. In most cases, larger scale, off-grid, electrical generation systems should be privately owned and operated. Off-grid generation, owned and operated by the DoD Components may make sense for mission criticality and remote sites when it is life-cycle cost-effective. In these cases, innovative energy generation technologies such as

solar lighting, large photovoltaic arrays, wind turbine generators, micro-turbines and fuel cell demonstration projects shall be utilized.

5.2.3.5. Procurement Strategy. Reference (b) requires Agencies to take advantage of competitive opportunities in the electricity and natural gas markets to reduce costs and enhance services. The DoD Components are encouraged to partner with Defense Energy Support Center (DESC) to identify and develop risk mitigation strategies appropriate for the risk preference profile of the end-user and are encouraged to aggregate demand across facilities or agencies to maximize the economic advantage.

5.2.3.5.1. Electricity. The DoD Components are encouraged to partner with DESC and aggregate regional electricity requirements (including renewable energy) to competitively procure electricity, and ancillary and incidental services needed to meet the identified requirements. Award determinations shall be based on best value compared to the applicable utility tariff available under a Utility Services Contract.

5.2.3.5.2. Direct Supply Natural Gas (DSNG) Program (DSNGP). The Department of Defense's policy is to competitively acquire DSNG under the DSNGP, managed by DESC, when cost effective and the DSNG has the same degree of supply reliability as other practical alternative energy sources. The DESC and the DoD Components may mutually agree to exclude an installation from a DSNG contract when:

5.2.3.5.2.1. An award is uneconomical.

5.2.3.5.2.2. The local distribution company (LDC) does not provide transportation from the citygate to the end use customer.

5.2.3.5.2.3. If ongoing or pending legal or regulatory action adversely impacts participation in the program.

5.2.3.5.2.4. It is impacted by base realignment and closure actions.

5.2.3.5.2.5. Existing contractual arrangements with the LDC or with existing multi-year DSNG suppliers offer better prices or have termination liabilities exceeding DESC direct supply contract cost benefits, or

5.2.3.5.2.6. Loss of utility-sponsored demand side management program benefits is greater than the potential savings available through the DESC DSNG program. The DoD Components shall enter into and maintain all necessary LDC transportation agreements to support delivery to the burnertip and for ensuring that sufficient funding is available for payment. The DoD Components shall consult with DESC to ensure that the DSNG and LDC contracts are synchronized.

5.2.4. Conservation Measures.

5.2.4.1. EMCS. The DoD Components are encouraged to apply EMCS or other energy management technology on all new and existing system expansion applications subject to funding availability and cost effectiveness. The DoD Components shall ensure that installed systems are provided with the necessary O&M support to maintain efficiency and resultant savings. EMCS implementation using shared energy savings contracts, which provide continuous O&M through the contract term, is an option to assure adequate O&M support.

5.2.4.2. Metering. Application of meters and/or sub meters is required for all appropriate facilities. Appropriate facilities are defined as those for which the Component has determined metering would be cost effective and practical as a management enhancement tool to identify energy cost savings attributed to conservation projects, energy systems maintenance activities, energy load management, command leadership or other specific, discrete measures implemented during the year. Usage shall be determined through engineering estimates only when metering proves to be cost prohibitive and shall be reported through DUERs. By 2012, electricity, natural gas, and water shall be metered on appropriate facilities; steam will be metered at steam plants. Annually, installations should strive to install meters in at least 15 percent of facilities that are in noncompliance with this policy. Components should document their findings that support a determination that a given facility is not an appropriate facility to meter, and accordingly, exempt from this guidance. Each Component should establish policy and specific criteria for installations to establish a metering program. Each policy should address the process to be used for the Service's approval of exemptions. Final approval should reside at the Component Headquarters level. The DoD Energy Manager's Handbook, reference (n) is available to assist in the determination of cost effectiveness and practicality. For existing facilities, cost effectiveness can generally be achieved where the cost of the meter, installation, and ongoing maintenance, data collection, and data management does not exceed 20% of the yearly cost of the utility being metered. Digital meters with interval and remote reading capabilities are required when utility costs exceed the DoD Energy Manager's Handbook guidelines. Meters with interval and remote reading capabilities are required on all new construction and utilities system renovation projects exceeding \$200K. On a case by case basis, Components may install simpler, locally read meters if it is determined that advanced meters are not practical. Safety switches will be required on all new electrical metering systems in order to facilitate meter replacement and maintenance. Metering data will be incorporated into existing energy tracking systems and made available to facility and installation energy managers. While meters themselves do not constitute a direct energy conservation measure, it is expected that the management of data collected through metering will lead to energy and cost savings. Meter data should be collected, assimilated, interpreted, and made available to facility and energy program managers. This information should serve as the foundation to establishing facility energy efficiency relative to other facilities in the building inventory. It should also serve to identify and confirm opportunities for energy reduction or increased energy efficiency through improved operational procedures, best practices, or energy conservation and retrofit projects.

5.2.4.3. Water Conservation/Best Management Practices (BMP). Reference (b) requires water efficiency improvement goals for Federal Agencies, suggesting specific strategies that include development of a water management plan and adoption of at least four of the Federal Energy Management Program Water Efficiency Improvement BMP. The BMPs range from

system-related (boiler and/or steam, cooling tower, faucets and showerheads, etc.) to public information and education programs. Installations shall incorporate water management plans in their existing O&M plans and shall focus on dissemination of information to all levels to educate personnel on water conservation practices. Audits shall be conducted to identify the best opportunities and where economical, installations shall initiate water conservation projects using O&M, ECIP, UESC or ESPC. The DoD Components shall continue to concentrate on water conservation methods such as public awareness programs, early leak detection and repair, and installation of low-flow water-efficient fixtures in housing and administration buildings consisting of electronic flush sensors, electronic sensor control valves for hand wash lavatories, and waterless urinals.

5.2.4.4. Electrical Load Reduction Measures. Because of the Presidential Memorandum (reference (o)), DoD installations' emergency load reduction plans were updated. The DoD Components shall continue to identify load-shedding techniques to cut electricity consumption in buildings and facilities during power emergencies. Examples of these techniques include EMCS, sub-metering, cogeneration, thermal storage systems, duty cycling of air conditioning in military family housing by EMCS, alternative energy sources for air-conditioning, and turning off unneeded lights with motion sensors and separate lighting circuits. In addition, the Department continues to focus its energy conservation program on measures that reduce electric consumption.

5.2.5. Modernize Infrastructure.

5.2.5.1. Establish and Maintain C-2 level for Utility Systems that are not Privatized. Under current Defense Planning Guidance, the DoD Components are directed to achieve a 67-year recapitalization and sustainment rate in which the readiness of existing facilities is restored to a C-2 status, on average, by the end of FY 2008. The Military Services shall program sufficient funds to accomplish this goal.

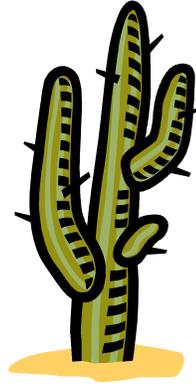
5.2.5.2. Utilities Privatization. Historically, military installations have been unable to maintain reliable utility systems due to inadequate funding and competing installation management priorities. Utilities privatization is the preferred method for modernizing and recapitalizing DoD utility systems. By allowing military installations to focus on core defense missions and functions instead of the responsibilities of utility ownership, this program shall transform how installations obtain utility services. Activities will benefit from innovative industry practices, the reliability of systems kept at current industry standards and private sector financing and efficiencies. Following the Deputy Secretary of Defense guidance issued on October 9, 2002 (reference (p)), and supplemental guidance issued by the Under Secretary for Acquisition, Technology and Logistics (reference (q)), the DoD Components shall complete privatization decisions on all electric, water, wastewater and natural gas systems. Except where the Secretary of the Military Department has certified that the systems are exempt due to security reasons or privatization is uneconomical, the Military Services shall privatize those types of utility systems at every Active and Reserve Component installation, within the United States and overseas, that is not designated for closure under a base closure law. Since upgrades are normally completed within 5 years after a privatization award is made, most privatized systems should reach a readiness level of at least C-2 prior to 2010. Services must program sufficient funds to support privatization contracts.

5.3. General Guidance. The Department of Defense occupies over 620,000 buildings and structures worth \$600 billion comprising more than 400 installations on 25 million acres in the United States and spends over \$2.5 billion per year on facility energy consumption. The Department of Defense is the largest single energy consumer in the Nation representing 78 percent of the Federal sector, and a significant (and sometimes the largest) local energy user in many metropolitan areas. Conserving energy and investing in energy reduction measures makes good business sense and allows limited resources to be applied to readiness and modernization. The Department shall make great strides in energy efficiency and consumption reduction in order to meet the Departmental vision of providing reliable and cost effective utility services to the warfighter. Dramatic fluctuations in the cost of energy significantly impact already constrained operating budgets, providing even greater incentives to conserve and seek ways to lower energy consumption.

5.3.1. Governing Statutes and Executive Orders. It is DoD policy to satisfy all goals and policies established by references (c), (d), and (g), and 42 U.S.C. 8251 ((reference (r))). References (c) and (d) require a reduction in emissions and improvement in energy management, and task the Department of Defense to provide leadership to prom

Appendix M:
Civilian Contractor Environmental Guide

355 Environmental Dept
5285 E. Madera
Davis-Monthan AFB, Tucson AZ
85707
Phone 520-228- 5372
Fax 520-228-6307



...Protection of human health and the environment...

This Environmental Guide is provided to assist civilian contractors in meeting federal, state, and local environmental regulations while working on Davis-Monthan Air Force Base

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1. **Obligations:** As a contractor, you are obligated to comply with federal, state, and local environmental regulations. Some of the environmental issues to be considered while completing your job at Davis-Monthan AFB include:
 - Hazardous Material usage and management;
 - Recovered Materials usage;
 - Protection of native plants and birds
 - Dust control (caused by activities such as land stripping, trenching, sandblasting, etc.);
 - Painting or cleaning operations;
 - Stormwater Discharges;
 - C&D waste recycling / disposal; and
 - Waste management.

As the prime contractor, you are also responsible for ensuring any subcontractors also adhere to environmental regulations.

2. **Responsibilities:** Contractors, subcontractors and concessionaires are responsible for environmental protection while in the process of executing contracts on Davis-Monthan Air Force Base involving:

- New Construction
- Renovations and major repairs on existing structures or systems
- Demolition/removal of old structures or systems
- Performance of contract maintenance or services

Environmental regulations will be will be complied with by all contractors, subcontractors, and concessionaires.

- Pre-work conference: The prime contractor will brief employees and/or subcontractors on environmental regulations and policies as applicable to the project.
- Project sites are subject to inspection by the Environmental Flight to ensure compliance with environmental regulations and practices.
- Contractors **must report spills to the Base Fire Department (dial 911)** when:
 - The spill involves an area greater than two feet; or
 - The spill is greater than one gallon; or
 - The spill is an unknown substances; or
 - The spill is on soil or cracked pavement; or
 - The spill may create a threat of fire or explosion; or
 - The spill may be a risk to personnel.

The Base Fire Department will report these spills to the Environmental Quality Flight.

- Contractors **must report small spills** (spill less than two feet in area) to the DM Environmental Quality Flight for directions regarding disposal of spill residues (228-5849 or 228-5372).
- Contractors must report all accidents involving **Air Force** people, property, or equipment damage, and any contractor personnel injured in the performance of the Air Force contract to the Contracting Office.
- Contractors shall take immediate corrective action to comply with environmental regulations if informed of a violation by the Contracting Office.
- If necessary, appropriate actions will be initiated through Contract Management to correct substandard environmental practices or conditions.

3. Summary of Common Environmental Requirements and Contractor Responsibilities: The following, organized by the step in the construction project, is a list of common¹ Contractor responsibilities:

Project Step	Requirement	When required?	What is required?	Required Submission
At Contract Award	Recovered Materials Certification <u>prior</u> to Construction	When the contractor is installing items that must contain recycled material. (for instance carpet, floor tile, restroom dividers, park benches, etc.)	By signing the contract, the contractor certifies that “Recovered Materials” to be used in the project will be at least the amount required by the contract specifications (FAR 52.223-4). Refer to www.epa.gov/cpg for further information.	De facto submission by the signing of the contract.
Before Construction	Protection of Native Plants	Always when land will be disturbed (even if the area is less than one acre)	It is unlawful for any person to destroy, dig up, mutilate, collect, cut, harvest, or take any living native protected plant species without <u>first obtaining required permits, tags, seals, or receipts from the Arizona Department of Agriculture</u> (ADA: Arizona State Statute, Chapter 7 – Arizona Native Plants). Native protected plant species include, <u>but are not limited to</u> : saguaro cactus, barrel cactus, pima pineapple cactus, prickly-pear cactus and many species of agave, cholla, hedgehog, ocotillo, senita and yucca, as well as ironwood, palo verde and mesquite trees. At least 30 days prior to the start of construction, contact the ADA – Tucson Office (520-628-6317) to apply for a permit/submit Notice of Intent (NOI). ADA fees apply. Obtain approved permit, tags, seals, receipts from the AZDA <u>prior to the removal of native plants.</u>	Submit copy of ADA permit to the Contracting Office. Prior to removal of the native plant for transplanting – the native plant tag and seal must be firmly affixed to each plant. After transplanting, the tag and seal should be removed from the plant and kept as proof that the plant was legally obtained.

¹ This table is not all inclusive of all environmental requirements that could be encountered during a construction project (for instance the removal of underground storage tanks). If further guidance is needed on a specific construction project, please contact the 355th Environmental Department at 228-5372.

Project Step	Requirement	When required?	What is required?	Required Submission
Before Construction (continued)	Protection of Native Birds	Always when land will be disturbed (even if the area is less than one acre)	<p>It is unlawful to kill, possess, or trade migratory birds, their parts, nests, or eggs (Migratory Bird Act Treaty). Several bird species that are of concern at DMAFB include: Burrowing Owls, Swainson’s Hawks, Cooper’s Hawks, and Great Horned Owls.</p> <p>The contractor shall contact the Environmental Flight (228-3215) if any birds are noted to be burrowing/nesting/living within or immediately adjacent to the planned construction area.</p> <p>If the area is marked with a “Caution - Burrowing Owls” sign, the contractor shall abide by the warnings on the sign and shall contact the Environmental Flight (228-3215) to report that construction is planned in the area.</p>	N/A
	Preservation of Cultural Resources	Required when a building or structure is over 45 years of age <u>or</u> was built or used during the Cold War Also required when archaeological sites or historic trails are encountered	<p>The Arizona State Historic Preservation Office (SHPO) is <u>required to review federal projects</u> that may affect historic or archaeological properties (National Historic Preservation Act; Arizona Historic Preservation Act).</p> <p>Contact the Environmental Flight (228-3215) to determine if the building/structure/archaeological site is already classified as an historic site.</p> <p>The Environmental Flight may contact the Arizona SHPO for assistance.</p>	N/A
	Hazardous Material Review	Always	<p><u>At least 3 weeks prior to the start of construction</u>, submit anticipated hazardous material usage (e.g., paint, adhesives, sealants, paint remover, refrigerants, pesticides, acids, compressed gases, etc.), a Material Safety Data Sheets (MSDS) for each hazardous material, and a contractor AF-EMIS worksheet for each hazardous material to be used during the project.</p> <p>Refer to Appendix A for guidance on the submission anticipated usage, MSDSs and contractor AF-EMIS worksheets.</p>	Submit material usage, MSDS(s), and contractor AF-EMIS worksheet(s) to the Contracting Office.



Project Step	Requirement	When required?	What is required?	Required Submission
<p>Before Construction (continued)</p>	<p>Asbestos Determination</p>	<p>Prior to renovation or demolition activities</p>	<p><u>If a project has already been designed</u> (i.e., it is not a design/build and it is not a SABER project), then DM will inform the contractor of the asbestos determination.</p> <p><u>If a project is a SABER project or a design/build project</u>, then the contractor is responsible for the asbestos determination as follows:</p> <ul style="list-style-type: none"> •The contractor must test for asbestos <u>prior</u> to renovation or demolition activities using an EPA accredited Asbestos Building Inspector. •If asbestos is present, the Contractor must: <ul style="list-style-type: none"> - Submit an PDEQ Asbestos NESHAP Notification/ Permit Activity Application for Renovation / Demolition Activities at <u>least 10 days prior to the start of work</u> (permit application fee at least \$420) - Ensure asbestos workers are properly trained - Ensure asbestos inspector is certified <p>For questions contact PDEQ at 520-740-3360.</p>	<p>Submit a copy of the Asbestos Survey Report to the Contracting Office.</p> <p>If asbestos is present, submit a copy of the Asbestos Removal / Demolition Activity Permit obtained from PDEQ to the Contracting Office.</p>
	<p>Lead-Based Paint (LBP) Determination</p>	<p>Testing for LBP is necessary prior to renovation, repair, demolition, sanding, sandblasting, or maintenance activities that will involve or disturb painted surfaces.</p>	<p><u>If a project has already been designed</u> (i.e., it is not a design/build and it is not a SABER project), then DM will inform the contractor of the lead-based paint determination.</p> <p><u>If a project is a SABER project or a design/build project</u>, then the contractor is responsible for the lead-based paint determination as follows:</p> <ul style="list-style-type: none"> •LBP data may be available for review for some buildings. Contact the Bioenvironmental Engineering Office or the CE LBP Program Officer to determine if LBP data already exists for the specific building or work area. •If data does not exist or is inadequate, testing for LBP is required. •If it is determined that LBP is present above the action level and will be disturbed, the contractor will ensure activities are performed in conformance with regulations governing lead paint in the construction industry (OSHA 29 CFR 1926.62) to ensure occupant, worker, and environmental protection. Necessary abatement and protection procedures shall be incorporated into work plans and contract documents. •Bioenvironmental Engineering and the CE LBP Program Officer review contractor submittals and work plans, including training certifications, for project activities that disturb LBP. <p>THE USE OF PAINT WITH A LEAD CONTENT OF 0.06% OR GREATER IS PROHIBITED.</p>	<p>Submit a copy of the LBP Survey Report to the Contracting Office.</p> <p>If LBP is present, submit a copy of the LBP Removal/Demolition Activity to the Contracting Officer.</p>



Project Step	Requirement	When required?	What is required?	Required Submission
Before Construction (continued)	Base Civil Engineering Work Clearance Request	Prior to any excavation work, trenching, digging, or boring	<p>Complete Blocks 1, 3, 5, 6, and 7 of the Base Civil Engineering Work Clearance Request – AF Form 103 (refer to http://www.e-publishing.af.mil/search.asp?keyword=AF103 and then select the AF103 IMT form).</p> <p>As specified in Block 1, Form 103 <u>must be accompanied by a drawing/sketch</u> showing the street, cross street, building(s) if applicable, and the area(s) to be excavated, trenched, dug, or bored.</p> <p>It is the responsibility of the contractor to contact Arizona Blue Stake for the marking of telephone, gas, and electric lines at 1-800-782-5348. For additional information refer to www.azbluestake.com.</p>	<p>Submit two sets of the request (each set to contain AF Form 103 and the location drawing) to Civil Engineering Operations (228-3171) for processing/approval.</p> <p>Work <u>shall not begin</u> without an <u>approved</u> AF Form 103.</p>
	Construction and Demolition (C&D) Debris Diversion Plan	Always	<p><u>At least 3 weeks prior to the start of construction</u>, submit the C&D Debris Diversion Plan – this plan describes how the contractor will recycle (or dispose) of scrap metal, concrete, wood, green waste, garbage, etc.</p> <p>Note: DMAFB encourages recycling.</p> <p>Refer to Appendix B for guidance.</p>	Submit the C&D Debris Diversion Plan to the Contracting Office.
	Air Quality Activity Permit for dust control	Landstripping and/or earthmoving (greater than 1 acre); trenching (greater than 300 feet); road construction (greater than 50 feet); abrasive blasting, crushing/screening, etc.	<p>Submit an Air Quality Activity Application to PDEQ Obtain Air Quality Activity Permit from PDEQ.</p> <p>Refer to Pima County Code, Title 17 - Air Quality Control, Table 17.12.540 for permit fees</p> <p>Refer to PDEQ Technical Procedure, TECH-211 - Determining Applicability for Air Quality Permits for guidance</p>	Submit a copy of the permit obtained from PDEQ to Contracting Office.
	Minimize organic solvent emissions from outdoor spray paint operations	Always (unless architectural coating or spot painting exemption)	Conduct operation in an enclosed area equipped with controls to contain no less than 96% of the overspray.	If an architectural or spot painting exemption has been obtained from PDEQ, submit a copy of the exemption to the Contracting Office.



Project Step	Requirement	When required?	What is required?	Required Submission
Before Construction (continued)	Storm Water Pollution Prevention Plan (SWPP Plan) and AZPDES General Permit for Discharges from Construction Activities	When 1 acre or more of soil disturbance	<p>The AZPDES General Permit for Discharges from Construction Activities requires the preparation of a SWPP Plan and the submittal of a Notice of Intent (NOI) with ADEQ <u>at least two days prior to the start of construction activities.</u></p> <p>For additional information refer to the ADEQ Water Quality Division webpage at http://www.azdeq.gov/enviro/water/index.html.</p>	Submit NOI and SWPP Plan to ADEQ Submit copy of the SWPP Plan and the NOI to the Contracting Office.
	<p>Permission to Use <u>Equipment Containing Radioactive Material</u></p> <p>And/or</p> <p>Permission to Use <u>Radiation Producing Equipment</u></p>	<p>Always required if the equipment contains radioactive material (such as nuclear density gauges) , <u>and/or</u></p> <p>Always required if the radiation producing equipment meets any of the following criteria:</p> <ol style="list-style-type: none"> a. Equipment generating radiofrequency in excess of 7 Watts and/or 1000 MHz; or b. Lasers that are class 3b or 4; or c. Ionizing radiation such as x-ray equipment for imaging; or d. Ultraviolet radiation for industrial use such as welding processes. 	<p>Submit a letter to the 355th Bioenvironmental Engineering Flight detailing the work to be done, the equipment to be used, the timeframe for the work, and POCs (including telephone numbers). <u>A copy of the Radioactive Material License (with NRC Form 241 if it is a state license) and the contract must be attached to the letter.</u></p> <p>The Bioenvironmental Engineering Flight will provide an approval letter regarding the use of radioactive material on DMAFB. <u>The radioactive material or radiation producing equipment may not be brought on-base until the contractor receives an approval letter from Bioenvironmental Engineering.</u> Surveys may be performed to ensure that general public exposure is within limits.</p>	Submit request for the use of radioactive material and/or radiation producing equipment to Bioenvironmental Engineering.



Project Step	Requirement	When required?	What is required?	Required Submission
Before Construction (continued)	Notice of Intent to Drill (NOI)	When drilling, deepening, modifying, capping, or abandoning a monitoring well, drinking water well, piezometer, or environmental well.	<p>Submit a NOI to Arizona Department of Water Resources (ADWR). Obtain from ADWR the drilling card authorizing the drilling. The drilling card must be kept in the possession of the driller at the well site during drilling. Drilling may not begin until the drilling card has been received. If the driller changes, the new driller cannot begin drilling until he receives a new drilling card from ADWR.</p> <p>For additional information refer to the ADWR website at http://www.water.az.gov/dwr/ or the webpage - Online Filing Center for Notices of Intent to Drill Wells at www.water.az.gov/webnoi/WebNoiDII.dll/EXEC/0/15jt00q13kdnv1gw5se80v2x9q4.</p>	Submit a copy of the NOI and the drill card to the Contracting Office.
During Construction	Proper management of hazardous materials	Always	Follow the "Civilian Contractor Safety / Fire Guide" and common industry good housekeeping practices.	N/A
	Reporting of hazardous material usage	Monthly for contracts greater than 60 days	Refer to Appendix A for guidance.	Submit usage information to the Contracting Office.
	Asbestos Removal	If asbestos was determined to be present (renovation or demolition activities)	<p>The Contractor must:</p> <ul style="list-style-type: none"> - Follow the requirements of the Asbestos Removal / Demolition Activity Permit - Ensure that asbestos waste is properly managed - Obtain certification of asbestos removal/inspection 	Submit disposal tickets and certification of asbestos removal/inspection records to Contracting Office.
	Proper management of waste and recyclables (hazardous waste, garbage, scrap metal, etc.)	Always	<p>Refer to Appendix C for guidance regarding Hazardous Waste, PCB waste, and Universal Waste.</p> <p>For C&D waste follow the previously submitted C&D Debris Diversion Plan (refer to Appendix B).</p>	N/A



Project Step	Requirement	When required?	What is required?	Required Submission
During Construction (continued)	Reporting of recycling and disposal of construction and demolition debris	Monthly for contracts greater than 60 days	Refer to Appendix B for guidance.	Submit monthly recycling and disposal numbers to the Contracting Office.
	Dust control (Air Quality Activity Permit)	Landstripping and/or earthmoving (greater than 1 acre); trenching (greater than 300 feet); road construction (greater than 50 feet); abrasive blasting, crushing/screening, etc.	Follow Air Quality Activity Permit (permit required prior to beginning construction activities).	N/A
	Storm Water Pollution Prevention	1 acre or more of soil disturbance	Follow SWPP Plan and permit (permit required prior to beginning construction activities).	N/A
	Proper Management of Investigation-Derived Waste (IDW)	Waste generated during <u>environmental investigation field work</u> is termed IDW. IDW must be properly managed.	IDW, such as soil cuttings from borehole drilling and other solid waste generated during <u>environmental investigation activities</u> , must be properly managed <u>at the moment of generation</u> . Management of IDW must be addressed in the environmental investigation field work plan. Refer to Appendix D for guidance on the proper management of IDW.	Submit the work plan to the Contracting Office.



Project Step	Requirement	When required?	What is required?	Required Submission
After Construction (Prior to Project Close-Out)	Industrial Ventilation and Confined Space	Always required for industrial ventilation systems	<p>Contractor must ensure that the Contracting Office notifies Bioenvironmental Engineering prior to any industrial ventilation systems (systems which control a hazard) being evaluated for acceptance.</p> <p>Bioenvironmental Engineering needs to observe or perform all tests for any new or renovated systems prior to initial start-up to determine if the system will control the hazard. Bioenvironmental Engineering needs to be present for the tests of fan speed and rotation, and fan motor load, and needs to be present for or conduct tests for air flow in all hoods or branches.</p>	Notify the Contracting Office to schedule close-out survey with Bioenvironmental Engineering.
	Recovered Materials Certification Upon Completion of Work	When the total contract cost is greater than \$100,000	Certification statement by the contractor did use Recovered Materials as required by the contract specifications (FAR 52.223-9).	Submit signed Certification Statement to the Contracting Office.
	Storm Water Pollution Prevention Plan (SWPP Plan)	1 acre or more of soil disturbance	After completion of construction project, contractor must submit a Notice of Termination (NOT) to ADEQ.	Submit NOT to ADEQ Submit copy to the Contracting Office.
	Reporting of hazardous material usage	For contracts less than 60 days, report total hazardous material used during the project For contracts greater than 60 days, report the final months' hazardous material usage	Refer to Appendix A for guidance.	Submit usage information to the Contracting Office.



4. **Phone Numbers**

Fire Reporting	911
Security Police	228-6432or 911
Ambulance	911
Wing Safety Office	228-5558 / 228-4895
Service Contracting Flight	
Construction Contracting Flight	
Environmental Flight	228-5372 (Chief) 228-3793 (Supervisor – Compliance) - 228-4840 (Hazardous Waste) - 228-5849 (Spills, Storage Tanks) - 228-4774 (Water, Wastewater, Stormwater) - 228-4829 (Air) 228-4829 (Supervisor – Analysis) - 228-3215 (Natural/Cultural Resources) - 228-6318 (P2, HAZMAT, Green Purchasing) - 228-5897 (ESOH CAMP, EMS) 228-5595 (Supervisor – Installation Restoration)
Bioenvironmental Engineering Flight	228-5369



APPENDIX A
GUIDANCE FOR SUBMISSION OF MATERIAL SAFETY DATA SHEETS
FOR HAZARDOUS MATERIAL (HAZMAT) AND REPORTING OF HAZMAT USAGE

Hazardous Materials: A hazardous material is commonly known as a HAZMAT. OSHA defines a hazardous material as any substance to which exposure “results or may result in adverse affects on the health and safety of employees” or “any chemical which is a physical hazardous or health hazard.” There is no ‘one simple list’ of hazardous materials.

Listed below are the general categories of hazardous materials that require the submission of Material Safety Data Sheets (MSDS) hazardous material usage reporting to the Contracting Office:

- Compressed gases (all types)
- Adhesives
- Sealants
- Paints (including aerosols)
- Lubricants / oils / fuels
- Welding materials
- Solvents
- Chemicals used in testing or as additives
- Any fluids (except water) added to machinery / government-owned or leased equipment
- Pesticides/insecticides/rodenticides

- 1) At least three weeks prior to the start of construction, contractors must provide:
 - a. An MSDS for each hazardous material to be used during the contract period.
 - b. A complete “DMAFB AF-EMIS Contractor Worksheet” included as the first page of the stack of MSDSs (refer to Attachment A-1).
- 2) After receipt / review of the “DMAFB AF-EMIS Contractor Worksheet”, and the associated MSDSs, DMAFB will return to the contractor the “Contractor Hazardous Material Review” sheet (refer to Attachment A-2 for an example).
 - a. Depending upon the item(s) marked on the “Contractor Hazardous Material Review” sheet, the Contractor may (or may not) have additional submittal requirements.
 - b. If the Contractor does have additional hazardous material submittal requirements, the submittal(s) must be accomplished before the hazardous material is brought on base.
 - c. The contractor must receive the “Contractor Hazardous Material Review” sheet from DMAFB before hazardous material is brought on base.
- 3) For those hazardous materials that will be tracked (as identified on the “Contractor Hazardous Materials Review” sheet), the following requirements apply:
 - a. For contracts less than 60 days, the Contractor will submit the “Contractor Hazardous Material and Usage Data” (refer to Attachment A-3) to the Contracting Office prior to the start of the contracted work, and again at the completion of the contract.
 - b. For contracts greater than 60 days, the Contractor will submit the “Contractor Hazardous Material and Usage Data” (refer to Attachment A-3) to the Contracting Office prior to the start of the contracted work, once each month of the contract, and at the completion of the contract.
- 4) If the contractor needs to bring hazardous material onto the installation that was not included in the original submittal [refer to step 1) above], the contractor must submit the information required in step 1) (above) to the Contracting Office to begin the review process identified in step 2).

ATTACHMENT A-1 (continued)
DMAFB AF-EMIS CONTRACTOR WORKSHEET INSTRUCTION GUIDE

1. This information is required in order to help the DMAFB track all hazardous materials used on-base. A worksheet must be filled out for each product containing a hazardous material. All blocks must be filled in.
 - a. Prime Contractor Name: Fill in the name of the Prime Contractor performing the work.
 - b. Subcontractor Name: Fill in the name of the Subcontractor. If not applicable – use N/A.
 - c. Contract Number: Fill in contract number.
 - d. Project Number: Fill in the project number. If not applicable – use N/A.
 - e. Project Title: Fill in the title of the project. This is never N/A.
 - f. Estimated Start Date: Fill in the date the project is projected to start.
 - g. Estimated Completion Date: Fill in the date the project is projected to end.

2. Material Information: *IMPORTANT: The information recorded in this section must match-up to the submitted MSDSs.* Refer to Appendix A for examples of common HAZMATs.
 - a. Hazardous Material Name: Fill in the name of the material to be used. Be as descriptive as possible (e.g., Hi-Gloss Latex Paint #555).
 - b. Manufacturer: Fill in the manufacturer's name.
 - c. Part Number: Fill in the manufacturer's part number or item number.
 - d. Container Type/Size: Fill in the container type (e.g., bag, bottle, can, drum, pail, etc.) and the container size (e.g., pound, pint, gallon, etc.).
 - e. Estimated Quantity to be used: Fill in the amount to be used throughout the duration of the project. For instance, if the project will last three months (project timeframe is recorded in Block 1) and you expect to use 100 gallons each month, then record 300 gallons.

3. Project Location and Process Information: Information about how the products will be used, what the products will be used on, where the project is located, and where the materials will be stored when not in use.
 - a. Location of Project: Identify in the physical location of where the product will be used. Example: Building number, intersection street names, etc.
 - b. Project will be Performed at: Circle all boxes that apply which pertain to where and on what the process that use the hazardous material will occur.
 - c. Describe the process or process that will be performed during the duration of the work.
 - d. Is the area occupied by USAF military or civilians: Circle the appropriate response. For instance, if painting will be done in an occupied building – then the correct response is YES.
 - e. Location of Stored Materials: Identify the physical location of where the material will be stored when not in use.

4. Additional Information:
 - a. Will the project or processes used in the project create any hazardous waste, universal waste, or PCB waste? Refer to Appendix C for examples of hazardous waste, universal waste, and PCB waste. If any waste will be generated, it must be properly managed from the moment it is generated.
 - b. Site Diagram Available: Is a site diagram available to identify where the product(s) will be used and stored at the jobsite?
 - c. Spills: Does the Contractor have a listing of base procedures for reporting a spill?

5. Signatures: This submittal cannot be processed without both a Contractor Signature(s) and a Contracting Office Signature. This block must be completed and signed by both parties.

6. For specific projects, each month a Contractor Hazardous Material Usage Data Sheet must be completed by the contractor and submitted to the Contracting Office for any project over sixty days. Projects less than sixty days are required to turn in a usage data sheet after completion of project. The Contracting Office will forward this information to the Project Inspector or QAE, who will in turn forward the information to the Contractor HAZMAT Review Subcommittee.

ATTACHMENT A-2
DMAFB CONTRACTOR HAZARDOUS MATERIAL REVIEW

TO: 355 CONS/MSCA

FROM: 355CES/CEVA (Contractor HAZMAT Review Subcommittee)

RE: CONTRACT NUMBER: _____ PROJECT NUMBER: _____

DATE: _____

The Contractor HAZMAT Review Subcommittee has received / reviewed the attached AF-EMIS Contractor Worksheets and associated Material Safety Data Sheets. Documents and the attached packet may require additional action. Please see below comments.

Comment 1 Tagged MSDS(s) need replacing because it is illegible or outdated.

Comment 2 No action required, these items do not require tracking in the EMIS database.

_____ Worksheets are incomplete, additional information required. See comments below.

_____ AF-EMIS Contractor Worksheets must be filled out for each attached MSDS. Return worksheet and MSDS to the Contracting Office for input into the EMIS database to create a hazardous material tracking account.

_____ The MSDSs that were submitted have been reviewed and information entered into the hazardous materials tracking data base. The attached hazardous materials list will be the items that the Hazardous Material Office will track on a monthly basis using the Contractor Hazardous Material Usage Data worksheet. If any additional or different types of hazardous materials will be used on this or any future project, MSDSs must be submitted for review.

_____ No action needed, documents are complete and will be entered into the hazardous materials tracking database.

Comment 3 Other Comments.

Comment 1A:	RAWL anchors are listed in the 3- ring binder index, but the MSDS for RAWL anchors is missing. If the product is still used, include the MSDS.
Comment 1B:	The OXYSEAL MSDS is dated 1993. This MSDS is probably outdated.
Comment 1C:	The Purple Rages MSDS was prepared in 1990. The MSDS is outdated. Is this product still used, and if so, what is this product used for?
Comment 2:	Aside from those MSDSs identified in Comment 1, no action is required for the other listed products/MSDSs.
Comment 3	

APPENDIX B CONSTRUCTION AND DEMOLITION (C&D) DEBRIS

DMAFB is required to report the quantity of waste landfilled and the quantity of waste recycled on a quarterly basis. Because Construction and Demolition (C&D) debris can be a large portion of the waste generated in any quarter, **DMAFB encourages the recycling of C&D debris.**

Types of C&D debris include, but are not limited to:

- Aluminum cans (e.g., soda cans)
- Asphalt
- Bricks
- Cardboard
- Concrete
- Drywall
- Electrical wiring and components
- Green waste (palm fronds, scrub brush, land clearing debris, etc.)
- Landscaping stone
- Plaster
- Plumbing fixtures and piping
- Roof coverings (e.g., shingles or tiles)
- Metal scraps (from stud trim, ductwork, rebar, piping, roofing, banding, etc.)
- Wood (scrap wood)

At least 3 weeks prior to the start of construction, submit the C&D Debris Diversion Plan to the Contracting Office. This plan describes how the contractor will recycle (or dispose) of C&D debris (refer to Attachment B-1 for an example C&D Debris Diversion Plan).

For contracts less than 60 days, the Contractor will submit the “Summary of C&D Debris Recycling and Landfilling” (refer to Attachment B-2) to the Contracting Office prior to the start of the contracted work, and again at the completion of the contract.

For contracts greater than 60 days, the Contractor will submit the “Summary of C&D Debris Recycling and Landfilling” (refer to Attachment B-2) to the Contracting Office prior to the start of the contracted work, each month of the contract, and at the completion of the contract.

It is acceptable to combine the table included in the C&D Debris Diversion Plan and the monthly reporting requirements into one, comprehensive table (as shown in Attachment B-2).

**ATTACHMENT B-1
EXAMPLE SUBMITTAL
C&D DEBRIS DIVERSION PLAN**

Project Number and Title: FBVN06-A601, Demolish Dormitory

Project Waste Management Coordinator(s): Ms. Jane Doe, Mr. John Smith

Waste Management Project Guidelines

1. This project shall generate the least amount of waste possible by planning and ordering carefully, following proper storage and handling procedures to reduce damaged, expired, and broken materials, and reusing materials wherever possible. Waste materials generated shall be salvaged for donation or resale, or separated for recycling to the extent that is economically feasible.
2. The Waste Management Chart (below) identifies the waste materials expected to be generated on this project, the disposal method for each material, and any handling requirements.
3. Waste diversion activities will be discussed at each safety meeting. Each contractor and subcontractor will receive this WMP and be provided a tour of the job site and shown the containers to be used for recycling or disposal. Each subcontractor will be expected to make sure all work crews comply with the WMP. All containers will be clearly labeled and lists of accepted/unaccepted materials will be posted throughout the site.

Material	Anticipated Quantity for the project	Recycling or Disposal Method	Handling Procedure (Good Housekeeping)
Wood cabinets	20 ea.	Donated to 'Help for the Homeless'	Ensure cabinets are not damaged at job site while awaiting transport to donation store.
Green waste (brush)	2 tons	John and Jack's Crushing Company (to be mulched for reused/resale)	Avoid contamination of green waste with other construction debris
Scrap metal (steel window frames, copper pipe, etc.)	0.5 tons	Western Iron and Metal	Deposit all metals in roll-off labeled "Scrap metal"
Concrete	10 tons	Roadbase Material Recycling (to be crushed for reuse/resale)	To be collected in piles then trucked to the recycling facility
Clean asphalt	0.5 tons	Dee's Inert Landfill	To be trucked to the landfill on the day that it is removed
Aluminum soda cans	10 lbs	Pima County Transfer Station	Avoid contamination of cans with garbage
Remaining wastes (e.g., garbage and material that cannot be recycled)	8 tons	COT Los Reales Landfill	Keep job site free of windblown debris. Remove garbage daily.

**ATTACHMENT C-2
EXAMPLE SUBMITTAL
SUMMARY OF C & D DEBRIS RECYCLING AND LANDFILLING**

Project Number and Title: FBVN06-A601, Demolish Dormitory

Project Waste Management Coordinator(s): Ms. Jane Doe, Mr. John Smith

Material	Anticipated Quantity for the project	Recycling or Disposal Method	Handling Procedure (Good Housekeeping)	For the month of JUNE , 2006		Project totals to date	
				Recycled	Landfilled	Recycled	Landfilled
Wood cabinets	20 ea.	Donated to 'Help for the Homeless'	Ensure cabinets are not damaged at job site while awaiting transport to donation store.	20 ea	0	20 ea	0
Green waste (brush)	2 tons	John and Jack's Crushing Company (to be mulched for reused/resale)	Avoid contamination of green waste with other construction debris	1.5 ton	0	2	0
Scrap metal (steel window frames, copper pipe, etc.)	0.5 tons	Western Iron and Metal	Deposit all metals in roll-off labeled "Scrap metal"	0.5 ton	0	0.5	0
Concrete	10 tons	Roadbase Material Recycling (to be crushed for reuse/resale)	To be collected in piles then trucked to the recycling facility	0	0	2 tons	0
Clean asphalt	0.5 tons	Dee's Inert Landfill	To be trucked to the landfill on the day that it is removed	0	0	0	0
Aluminum soda cans	10 lbs	Pima County Transfer Station	Avoid contamination of cans with garbage	2 lb	0	4 lb	0
Remaining wastes (e.g., garbage and material that cannot be recycled)	8 tons	COT Los Reales Landfill	Keep job site free of windblown debris. Remove garbage daily.	0	1 ton	0	3 ton

APPENDIX C HAZARDOUS, PCB, AND UNIVERSAL WASTE: PROPER MANAGEMENT AND DISPOSAL

Hazardous Waste, PCB, and Universal Waste: The Contractor is required to manage and dispose of hazardous waste, PCB waste, and universal waste in accordance with local, state, and federal laws. It is the Contractor’s responsibility to determine whether any of these wastes will be generated by a particular project and to properly manage such wastes.

Listed below are examples of wastes which can be hazardous waste (this list is not all inclusive):

- Acids or caustics
- Adhesives, calks, roofing cements
- Empty aerosol cans
- Items that contain lead (such as lead flashing, lead solder, lead-based paint chips)
- Items that contain mercury (such as mercury switches, mercury thermostats, fluorescent bulbs)
- Paints, varnishes, and sealers
- Pesticides, insecticides, and rodenticides
- Waste solvents, thinners, cleaners, and fuels
- Sandpaper, sand blasting residue
- Rags, gloves, coveralls, masking paper contaminated with hazardous materials.

The following table presents a list of questions that the Contractor may use to help identify whether their work will be generating a hazardous, PCB, or universal waste (these questions are not all inclusive).

What processes will be performed during the project?	Potential Regulated Waste
Will any paint be chipped, sanded, abraded, or chemically removed?	<ul style="list-style-type: none"> • Many paints and primers contain lead, cadmium, or chromium, and these paint residues and sandpaper may be RCRA toxic for heavy metals.
Will any flammable paints, varnishes, cements, adhesives, or other coatings be used?	<ul style="list-style-type: none"> • Many flammable coatings & adhesives contain methyl ethyl ketone (synonyms are MEK & 2-butanone) and brushes, rags, etc. contaminated with these may be RCRA toxic for MEK. • Additionally, if these are to be disposed in liquid form they may be RCRA ignitable.
Will any chemicals be used to clean or strip surfaces?	<ul style="list-style-type: none"> • Many solvents (e.g., chlorinated solvents, benzene, toluene, MEK, xylene, etc.) are hazardous and the stripping residues along with rags and applicators may be RCRA listed spent solvent wastes. • Corrosive strippers (acids, alkalis, etc.) may be RCRA corrosive if disposed in liquid form. • Depending on what is being removed, the residues may also contain RCRA toxic heavy metals.
Will any aerosol cans be used?	<ul style="list-style-type: none"> • Empty aerosol cans are regulated as RCRA reactive. • Non-empty aerosol cans that are disposed may also be RCRA ignitable.
Will any fluorescent lamps be removed?	<ul style="list-style-type: none"> • Fluorescent lamps contain mercury and are regulated as Universal Waste (unless low mercury “green” lamps).
Will any electronic equipment be removed (equipment containing circuit boards, switches, thermostats, transformers, soldered parts, CRTs, etc.)?	<ul style="list-style-type: none"> • Some types of equipment may contain heavy metals and be RCRA toxic for mercury, lead, or silver. • Transformers and lamp ballasts may contain Polychlorinated Biphenyls (PCBs). • Some types of equipment may contain batteries that have RCRA toxic metals or are RCRA corrosive or are regulated as Universal Waste.
Will all unused hazardous materials be removed by the contractor at job completion?	<ul style="list-style-type: none"> • Full or partially full containers that are to be disposed may be RCRA wastes. RCRA wastes must be removed by a licensed hazardous waste transporter and accompanied by a hazardous waste manifest.

APPENDIX D

INVESTIGATION-DERIVED WASTE (IDW): PROPER MANAGEMENT AND DISPOSAL

Investigation-derived waste (IDW) is often generated during environmental investigation field work. IDW can include (but is not limited to) drill cuttings, excess soil sampling material, and concrete fragments or building materials encountered during investigation activities. IDW also includes personal protective equipment (PPE), and sampling equipment decontamination wash waters and rinse waters.

IDW – Proper Management

IDW must be properly managed from the moment of generation. IDW may be accumulated/collected in roll-off bins or drums (as appropriate). Bins must be covered to prevent stormwater intrusion and to prevent IDW from becoming windblown. Alternatively, it is permissible to lay down plastic sheeting (with bermed sides) on which the IDW can be placed. Again, the bermed area must be covered to prevent stormwater intrusion and to the IDW from becoming windblown.

IDW decontamination wash waters and rinse waters are to be contained and allowed to evaporate from the containment.

IDW PPE must be containerized (for example “bagged”) for proper disposal.

IDW – Proper Sampling

IDW must be properly sampled to determine the appropriate method of disposal. Waste soil is usually tested for potential listed and characteristic hazardous waste properties. Composite samples of IDW (for instance petroleum contaminated soil or drill cuttings) are often acceptable.

There is no need to sample IDW wash waters and rinse waters as these are containerized and allowed to evaporate.

Unless PPE is extremely contaminated, there is no need to sample IDW PPE.

IDW – Proper Disposal

The appropriate avenue for disposal of IDW (for instance soil, drill cuttings, or concrete fragments) is determined based upon the sample analytical results. Non-hazardous IDW is suitable for disposal at a municipal or solid waste landfill (such as the Southwest Regional Landfill in Buckeye Arizona or Los Reales in Tucson). IDW PPE is normally disposed of as solid waste.

Hazardous IDW must be disposed at a RCRA permitted facility. Hazardous IDW must be manifested off-site. It may be possible to arrange for the Environmental Flight to sign the IDW hazardous waste manifest.

Appendix N

Code Research Supplement

CODE RESEARCH SUPPLEMENT

A quick guide to useful information from the following publications:

UFC 1-200-01 General Building Requirements

International Building Code (IBC)

Uniform Federal Accessibility Standards (UFAS)

Americans with Disabilities Act Accessibility Guidelines (ADAAG)

NFPA 101 Life Safety Code

Note: The following supplement has been compiled as a guide to assist 355 CES Project Managers, A-E firms and Contractors in understanding the above listed codes and their general requirements. It is not intended to be all-inclusive and may not represent the extent of code analysis required for a particular project. Refer to the complete publications for more detailed information and additional requirements.

General Information

- Codes are legally and ethically considered the minimum standard.
- Codes are revised every three years.
- All codes have the common goals of health, safety and welfare of the public.
- Design and construction professionals are held to a high standard.

Definitions/Background Information

- Model codes: developed by non-government, private code groups; have no force of law onto themselves, must be adopted by a government agency
- Authority Having Jurisdiction (AHJ): dictates which model code meets the legal standard
- 1996 – UFC Title 15, Section 272 directed all federal agencies to “use technical standards that are developed by voluntary consensus bodies” (in other words, use model codes).
- It is the intent of the services to seek to adopt a single model building code when available and build criteria from that code.
- Department of Defense (DoD) Unified Facilities Criteria (UFC) documents are affected by model codes. Specific DoD code guidance can be found in UFC 1-200-01 *General Building Requirements*.

UFC 1-200-01 *General Building Requirements*

Purpose and Scope:

To “provide guidance for the use of model building codes for design and construction of Department of Defense (DoD) facilities.”

Goal:

In line with that of Public Law 104-113, National Technology Transfer and Advancement Act of 1995 – “...to reduce reliance on Federal standards by using industry standards when there is the potential to simplify contracting, increase timeliness and cost effectiveness, and promote the safety and welfare of users.”

Key Points:

- Latest version, 20 June 2005, states that the 2003 *International Building Code* (IBC) should be used in the design and construction of all DoD property and facilities, with some modifications for unique military requirements.
- Chapter 2 lists chapter by chapter which parts of the IBC should be used, and if a chapter is not used, it specifies which guidance should be used instead.

Summary of Chapter 2 DoD Usage of the *International Building Code*

Chapter 1 Administration—Use as is, with the following exceptions:

- Delete paragraphs 101.4.1, 101.4.5 and 101.4.6
- Delete sections 103, 104, 105, 107, 108, 110, 112, 113, 114 and 115

Chapter 2 Definitions—Use as is (definitions not intended to replace terms used in military documents)

Chapter 3 Use and Occupancy Classification—Use in conjunction with UFC 3-600-01; UFC takes precedence if there are any conflicts

Chapter 4 Special Detailed Requirements Based on Use and Occupancy—Use as is, with the following exception:

- Delete section 412; refer to DoD and Air Force service standards for aircraft-related occupancies

Chapter 5 General Building Heights and Areas—Use as is, with the following exceptions:

- Refer to UFC 3-600-01 for limitations on the use of Table 503
- Area limitations in Table 503 may be increased by 300% for Air Force facilities when an approved automatic sprinkler system is installed, regardless of building height

Chapter 6 Types of Construction—Use as is

Chapter 7 Fire-Resistance Rated Construction—Use as is

Chapter 8 Interior Finishes—Use in conjunction with UFC 3-600-01; UFC takes precedence if there are any conflicts

Chapter 9 Fire Protection Systems—Use UFC 3-600-01 in lieu of this chapter

Chapter 10 Means of Egress—Use UFC 3-600-01 in lieu of this chapter

Chapter 11 Accessibility—Use Uniform Federal Accessibility Standards (UFAS) and Americans with Disabilities Act Accessibility Guidelines (ADAAG) in lieu of this chapter

Chapter 12 Interior Environment—Use as is with the following exceptions:

- Delete paragraph 1204.1 and replace with “Refer to applicable Unified Facility Criteria and individual military service standards for temperature control criteria.”
- Delete paragraphs 1207.2 and 1207.3 and replace with “1208.3 Room area. Refer to applicable Unified Facility Criteria and individual military service standards for air-borne and structure-borne sound transmission criteria.”
- Delete paragraph 1208.3 and replace with “Refer to applicable Unified Facility Criteria and individual military service standards for minimum sizes for rooms.”
- Delete paragraph 1208.4 and replace with “1208.4 Efficiency dwelling units. Refer to applicable Unified Facility Criteria and individual military service standards for dwelling unit criteria.”

Chapter 13 Energy Efficiency—Use in conjunction with UFC 3-400-01

Chapter 14 Exterior Walls—Use as is

Chapter 15 Roof Assemblies and Rooftop Structures—Use in conjunction with the NRCA Roofing and Waterproofing Manual

Chapter 16 Structural Design—Use as is, with the following exceptions:

- Refer to UFC 3-310-01 for:
 - importance factors for snow load, wind load and seismic load
 - minimum uniformly distributed live loads and minimum concentrated live loads
 - ground snow loads for determining the design snow loads for roofs

- basic wind speeds for determining the design wind loads for buildings/structures
- maximum considered earthquake ground motion
- Seismic design in new buildings must be in accordance with Ch. 16 as modified by UFC 3-310-04

Chapter 17 Structural Tests and Inspections—Use as is, with the following exceptions:

- Add the following sentence to the end of paragraph 1704.1: “The Government may require the Contractor to provide special inspections as part of his work.”

Chapter 18 Soils and Foundations—Use in conjunction with UFC 3-220-01

Chapter 19 Concrete—Use as is

Chapter 20 Aluminum—Use as is

Chapter 21 Masonry—Use as is

Chapter 22 Steel—Use as is

Chapter 23 Wood—Use as is

Chapter 24 Glass and Glazing—Use in conjunction with UFC 4-010-01

Chapter 25 Gypsum Board and Plaster—Use as is

Chapter 26 Plastic—Use as is

Chapter 27 Electrical—Use NFPA 70 in lieu of this chapter

Chapter 28 Mechanical Systems—Use in conjunction with UFC 3-410-01FA

-Use NFPA 54 in lieu of International Mechanical Code

-Use NFPA 58 in lieu of International Fuel Gas Code

Chapter 29 Plumbing Systems—Use in conjunction with UFC 3-420-01

Chapter 30 Elevator and Conveying Systems—Delete chapter, refer to applicable individual military standards for criteria

Chapter 31 Special Construction—Use as is

Chapter 32 Encroachment into the Public Right-of-Way—Use as is

Chapter 33 Safeguards During Construction—Delete chapter

Chapter 34 Existing Structures—Use in conjunction with UFC 3-600-01, with the following exceptions:

- Existing buildings inside the US, its territories and possessions must comply with ICSSC RP6 / NISTIR 6762 in addition to Chapter 34
- Refer to applicable Unified Facility Criteria and individual military service standards for specific seismic requirements for existing buildings outside the US
- Seismic evaluation of existing buildings must be in accordance with ASCE 31-03

- Rehabilitation of existing buildings for seismic loads must be in accordance with FEMA 356 Chapter 35 Referenced Standards—Use in conjunction with Appendix A of this UFC [Appendix A basically lists all the additional publications referenced above]

International Building Code (IBC)

Purpose and Scope:

“to establish the minimum requirements to safeguard the public health, safety, and general welfare through structural strength, means of egress facilities, stability, sanitation, adequate light and ventilation, energy conservation, and safety to life and property from fire and other hazards attributed to the built environment and to provide safety to fire fighters and emergency responders during emergency operations.”

Key Points:

- Chapter 3 Use and Occupancy Classification

Assembly	Mercantile
Business	Residential
Factory and Industrial	Storage
High Hazard	Utility
Institutional	

- Chapter 4 Special Detailed Requirements based on Use and Occupancy

Covered mall buildings	Stages and Platforms
Atriums	Aircraft Related Occupancies
Motor Vehicle Related Occupancies	Combustible Storage
Motion Picture Projection Room	Hazardous Materials

- Chapter 6 Types of Construction
 - Type I and Type II: building elements are of non-combustible materials
 - Type III: exterior walls are of non-combustible materials and interior building elements are of any material permitted by the code
 - Type IV: Heavy Timber; exterior walls are of non-combustible materials and interior elements are of any material permitted by the code
 - Type V: structural elements, exterior walls and interior walls are of any materials permitted by code
- Chapter 7 Fire-Resistance-Rated Construction
- Chapters 13 – 31 Specific chapters on building systems and materials

Overview of IBC Use and Occupancy Classifications

Assembly (*Section 303*): Groups A-1, A-2, A-3, A-4, A-5
Business (*Section 304*): Group B
Educational (*Section 305*): Group E
Factory and Industrial (*Section 306*): Groups F-1 and F-2
High Hazard (*Section 307*): Groups H-1, H-2, H-3, H-4, H-5
Institutional (*Section 308*): Groups I-1, I-2, I-3, I-4

Mercantile (Section 309): Group M

Residential (Section 310): Groups R-1, R-2, R-3, R-4

Storage (Section 311): Groups S-1 and S-2

Utility and Miscellaneous (Section 312): Group U

Assembly Group A: "...includes, among others, the use of a building or structure, or a portion thereof, for the gathering purposes such as civic, social or religious functions; recreation, food or drink consumption; or awaiting transportation."

Exceptions:

- building used for assembly, but with an occupant load of less than 50 should be classified as Group B occupancy
- room/space used for assembly, but with an occupant load of less than 50 and is accessory to another assembly should be classified as Group B or as a part of the main occupancy
- room/space used for assembly that has an area less than 750 sf and is accessory to another assembly should be classified as Group B or as a part of the main occupancy

Examples (not inclusive):

- A-1—production and viewing of performing arts and motion pictures (usually with fixed seating)—theaters, concert halls
- A-2—food and/or drink consumption—banquet halls, restaurants, night clubs
- A-3—worship, recreation, amusement and uses not classified anywhere else in Group A—churches, museums, bowling alleys, community halls, courtrooms, gymnasiums (no spectator seating), indoor swimming pools (no spectator seating), libraries
- A-4—viewing of outdoor sporting events with spectator seating—arenas, outdoor swimming pools, tennis courts
- A-5—participation in or viewing outdoor activities—bleachers, stadiums, amusement park structures

Business Group B: "...includes, among others, the use of a building or structure, or a portion thereof, for office, professional or service-type transactions, including storage of records and accounts."

Examples (not inclusive): air traffic control towers, animal hospitals, banks, barber and beauty shops, civic administration, educational occupancies for students above 12th grade, electronic data processing, laboratories, post offices, professional services, training and skill development not within a school or academic program

Educational Group E: "...includes, among others, the use of a building or structure, or a portion thereof, by six or more persons at any one time for educational purposes through the 12th grade."

When referring to day care, "the use of a building or structure, or portion thereof, for educational, supervision or personal care services for more than five children older than 2 ½ years of age, shall be classified as a Group E occupancy."

Factory Industrial Group F: "...includes, among others, the use of a building or structure, or portion thereof, for assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair or processing operations that are not classified as Group H hazardous or Group S storage."

Examples (not inclusive):

- F-1 (moderate hazard occupancy)—aircraft, automobiles, boats, clothing, electronics, engines (including rebuilding), paper mills/products, plastic products, refuse incineration, woodworking, metals, machinery
- F-2 (low hazard occupancy, no significant fire hazard)—brick and masonry, ceramics, glass, gypsum, metal products (fabrication and assembly)

High-Hazard Group H: “...includes, among others, the use of a building or structure, or a portion thereof, that involves the manufacturing, processing, generation or storage of materials that constitute a physical or health hazard in quantities in excess of those allowed in control areas constructed and located as required in Section 414 [section 414 refers to Hazardous Materials].”

There is a list of 15 exceptions; please check Section 307.1 for more details.

Examples (not inclusive):

- H-1 (building contains materials that may detonate)—explosives, organic peroxides, oxidizers, unstable/reactive materials, detonable pyrophoric materials
- H-2 (building contains materials that accelerate burning)—combustible dusts, cryogenic fluids (flammable), flammable gases, organic peroxides, oxidizers, pyrophoric materials (non-detonable), unstable/reactive materials (non-detonable), water-reactive materials
- H-3 (building contains materials that support combustion or pose a physical hazard)—flammable or combustible liquids, combustible fibers, fireworks, cryogenic fluids, flammable solids, oxidizers, oxidizing gases, unstable/reactive materials, water-reactive materials
- H-4 (building contains materials that are health hazards)—corrosives, highly toxic materials, toxic materials
- H-5—semiconductor fabrication facilities and research and development areas where hazardous production materials are used

If quantities of materials do not exceed a number that is specified by tables in Section 307, building *may be* able to be classified differently.

Institutional Group I: “...includes, among others, the use of a building, structure, or a portion thereof, in which people are cared for or live in a supervised environment, having physical limitations because of health or age are harbored for medical treatment or other care or treatment, or in which people are detained for penal or correctional purposes or in which the liberty of the occupants is restricted.”

Examples (not inclusive):

- I-1 (more than 16 persons, 24 hour basis, supervised residential environment with personal care services)—assisted living facilities, halfway houses, group homes, alcohol and drug centers, convalescent facilities
- I-2 (medical/surgical/psychiatric/nursing/custodial care for more than 5 persons who are not capable of self-preservation, 24 hour basis)—hospitals, nursing homes, mental hospitals, detoxification facilities; a child care center than provides care on a 24 hour basis for more than 5 children under 2 ½ years of age
- I-3 (more than 5 persons under restraint or security)—prisons, jails, reformatories, detention centers, correctional centers, prerelease centers; there are 5 occupancy conditions (based on amount of free movement) to further classify I-3 buildings, refer to Section 308.4 for further explanation
- I-4 Adult care: personal care and supervision for more than 5 unrelated adults for less than 24 hours; exception: if occupants can respond to an emergency situation without physical assistance, then may be classified at A-3

- Child care: personal care and supervision for more than 5 children under 2 ½ years of age for less than 24 hours; exception: if more than 5 but less than 100 children under 2 ½ years are in rooms located on the level of exit discharge and each room has an exit door directly to exterior, may be classified as Group E

Mercantile Group M: "...includes, among others, buildings and structures or a portion thereof, for the display and sale of merchandise, and involves stocks of goods, wares or merchandise incidental to such purposes and accessible to the public."

Examples (not inclusive): department store, drug stores, markets, motor fuel-dispensing facilities, retail/wholesale stores, sales rooms

Residential Group R: "...includes, among others, the use of a building or structure or a portion thereof, for sleeping purposes when not classified as an Institution Group I or when not regulated by the International Residential Code in accordance with Section 101.2."

Examples (not inclusive):

- R-1 (sleeping units where occupants are primarily transient in nature)—boarding houses, hotels, motels
- R-2 (sleeping units or more than two dwelling units where the occupants are primarily permanent)—apartment buildings, boarding housings (non-transient), convents, dormitories, hotels (non-transient), monasteries, motels (non-transient)
- R-3 (permanent occupants, but not classified as R-1, R-2, R-4 or I)—buildings that do not contain more than two dwelling units, adult or child care facilities that accommodate 5 or less people for less than 24 hours, congregate living facilities with 16 or less people
- R-4 (assisted living facilities for more than 5 but less than 16 occupants)

Note: single family houses are regulated by the International Residential Code

Storage Group S: "...including, among others, the use of a building or structure or a portion thereof, for storage that is not classified as a hazardous occupancy."

Examples (not inclusive):

- S-1 (moderate hazard)—aircraft repair hangar, aerosols, bags (cloth, burlap, paper), books and paper, boots and shoes, cardboard boxes, clothing, furniture, lumber, upholstery and mattresses
- S-2 (low hazard)—aircraft hangar, asbestos, cement in bags, dry cell batteries, electrical coils and motors, food products, glass, gypsum board, metal cabinets, metal desks with plastic tops/trim, other metals, parking garages, stoves, washers and dryers

Utility and Miscellaneous Group U: "Buildings and structures of an accessory character and miscellaneous structures not classified in any specific occupancy shall be constructed, equipped and maintained to conform to the requirements of this code commensurate with the fire and life hazard incidental to their occupancy."

Examples (not inclusive): agricultural buildings, barns, carports, fences more than 6' high, greenhouses, private garages, retaining walls, sheds, tanks, towers

Accessibility

Key Points:

- Law states that “no person shall be discriminated against on the basis of disability in the full and equal enjoyment of goods, services, facilities, privileges, advantages, or accommodations of an place...”
- Americans with Disabilities Act (ADA) of 1990 does not apply to most of the federal government, *however*, the Secretary of Defense voluntarily adopted Americans with Disabilities Act Accessibility Guidelines (ADAAG) in 1993.
- Per UFC 3-600-01 Fire Protection Engineering for Facilities, “Buildings required to be accessible must meet the provisions of Federal Standard FED-STD-795, Uniform Federal Accessibility Standards (UFAS)...and the Americans with Disabilities Act Accessibility Guidelines (ADAAG)...”
- If visitors, contractors, or civil service personnel use or access a facility or space it must comply with UFAS and ADAAG. *No waivers, no exceptions.*
- Per UFAS, the following facilities do not need to be designed as accessible, but accessibility is recommended since the intended use of the facility may change with time: unaccompanied personnel housing, closed messes, vehicle and aircraft maintenance facilities where all work is performed by able-bodied military personnel, all facilities intended for use or occupancy by able-bodied military only (including Reserve and National Guard facilities). The exclusion does not apply to portions of a building which may be open to the public or which may be used by the public during the conduct of normal business hours or which may be used by physically handicapped employees or persons seeking employment.
- Per Davis-Monthan AFB Design Compatibility Guidelines, “The site and interiors of all facilities shall be designed for accessibility in accordance with the ADA accessibility guidelines and the Uniform Federal Accessibility Guidelines (UFAS). An exemption can only be issued by Air Staff for facilities specifically designed for military personnel occupancy and use. This exemption does not comply with the condition of military personnel with ‘temporary disabilities’ due to physical injuries.”

Areas to Consider for Accessibility

Parking
Curbs/Ramps
Entrances
Doors
Accessible Route
Stairs
Elevators
Restrooms
Drinking Fountains
Signage

NFPA 101 *Life Safety Code*

Purpose and Scope:

“...to provide minimum requirements, with due regard to function, for the design, operation and maintenance of buildings and structures for safety to life from fire. Its provisions will also aid life safety in similar emergencies.”

Key Points:

- UFC 3-600-01 *Fire Protection Engineering for Facilities* states that existing facilities must meet the requirements of NFPA 101 *Life Safety Code* for existing occupancies. It also states that building construction related to egress and safety to life must comply with NFPA 101. For conflicts between the IBC and NFPA 101 related to fire resistance rating and for the fire resistance ratings of non-bearing partitions, comply with NFPA 101.
- The *Life Safety Code* is not a building code—it does not address construction requirements. It does provide standing for legal strength and enforcement.
- *Life Safety Code* Objectives:
 - Occupant Protection: for the time needed to evacuate, relocate, or defend in place
 - Structural Integrity: shall be maintained for the time needed to evacuate, relocate, or defend in place
 - Systems Effectiveness: in mitigating the hazard; shall be reliable, maintained at the proper level and remain operational
- Code Organization
 - Core Chapters: Chapters 1 through 11
 - Mandatory Requirements – “Shall be” or “Shall have”
 - Optional Provisions – “Where permitted by”
 - How to do it – “Where required by”
 - Limited Provisions – “Unless prohibited by”
 - Occupancy Chapters: Chapters 12 through 42
 - Even chapter number – New
 - Odd chapter number – Existing
 - Occupancy chapter organization follows a consistent format throughout.
 - Rehabilitation: Chapter 43
 - Repair
 - Renovation
 - Modification
 - Reconstruction
 - Change of use or occupancy
 - Addition
 - Annexes
- *Life Safety Code* occupancies are not the same as the *International Building Code* occupancies. *Life Safety Code* occupancy classifications:

Assembly	Residential Board and Care
Educational	Mercantile
Day Care	Business
Health Care	Industrial
Ambulatory Health Care	Storage
Detention and Correctional	Multiple Occupancies
Residential	

- Design for the nature of the occupancy. **Changes in occupancy can result in a code violation.**
- Significant *Life Safety Code* issues:
 - Hazard of Contents
 - Means of Egress
 - Features of Fire Protection
- *Life Safety Code* Search:
 - Classify occupancy and determine application (new construction or existing)
 - Determine hazard of contents
 - Determine occupant load and egress capacity of all components, note most restrictive component
 - Determine number and arrangement of egress
 - Determine maximum distances for common path of travel, travel distance and dead-end corridors
 - Identify special construction requirements, including fire-resistance ratings and sprinkler needs
- Life Safety Plan should show:
 - Location of exits
 - Travel distance from remote location(s) to exits (include direction)
 - Common path of travel with direction and distance
 - Fire-rated walls
 - Location of fire extinguishers

Overview of *Life Safety Code* Occupancies

Ambulatory Health Care: building or portion thereof used to provide services or treatment simultaneously to four or more patients that provides, on an outpatient basis, one or more of the following: (1) treatment that renders patients incapable of taking action in an emergency without the assistance of others, (2) anesthesia that renders patients incapable of taking action in an emergency without the assistance of others, (3) emergency or urgent care for patients who, due to the nature of their injury or illness, are incapable of taking action in an emergency without the assistance of others

Assembly: (1) used for a gathering of 50 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation, or similar uses; (2) or used as a special amusement building, regardless of occupant load

Business: used for the transaction of business other than mercantile

Day Care: four or more clients receive care, maintenance and supervision, by other than their relatives or legal guardians, for less than 24 hours per day

Detention and Correctional: used to house one or more persons under varied degrees of restraint or security where such occupants are mostly incapable of self-preservation because of security measures not under the occupants' control

Educational: used for educational purposes through the twelfth grade by six or more persons for 4 or more hours per day or more than 12 hours per week [for educational functions above grade 12, use business occupancy]

Health Care: used for purposes of medical or other treatment or care of four or more persons where such occupants are mostly incapable of self-preservation due to age, physical or mental disability, or because of security measures not in their control

Industrial: used for product manufacturing or processing, assembling, mixing, packaging, finishing, decoration or repair operations

- General Industrial: ordinary or low hazard industrial operations; building is of conventional design suitable for various types of industrial processes
- High Hazard Industrial: high hazard materials, processes or contents
- Special-Purpose Industrial: ordinary and low hazard industrial operations; building designed for or suitable only for particular types of operations; relatively low density of employee population, with much of the area occupied by machinery or equipment

Mercantile: used for the display and sale of merchandise

Multiple: building or structure in which two or more occupancy classes exist

- **Mixed Occupancies:** multiple occupancy where the occupancies are intermingled; shared egress—carry strictest requirements throughout
- **Separated Occupancies:** multiple occupancy where occupancies are separated by fire resistant construction

Residential Board and Care: building or portion thereof used for lodging and boarding of four or more residents, not related by blood or marriage to the owners or operators, for the purpose of providing personal care services

Residential: provides sleeping accommodation for purposes other than health care or detention and correctional

Storage: used primarily for the storage or sheltering of goods, merchandise, products, vehicles or animals

Incidental Occupancy: may be considered part of predominant occupancy

Hazard of Contents

“...the relative danger of the start and spread of fire, the danger of smoke or gases generated, and the danger of explosion or other occurrence potentially endangering the lives and safety of the occupants of the building or structure.”

- Should be classified by registered design professional or owner and submitted to the AHJ (usually the BCE) for review and approval
- If different degrees of hazards of contents exist in the same building, “the most hazardous shall govern the classification”

Classifications:

- Low hazard contents: low combustibility, no self-propagating fire can occur
- Ordinary hazard contents: likely to burn with moderate rapidity or give off a considerable amount of smoke

- High hazard contents: likely to burn with extreme rapidity or likely to explode

Means of Egress (Chapter 7)

“A continuous and unobstructed way of travel from any point in a building or structure to a public way consisting of three separate and distinct parts: the exit access, the exit, and the exit discharge.”

- Exit access: “that portion of a means of egress that leads to an exit”
- Exit: that portion of a means of egress that is separated from all other spaces of a building or structure by construction or equipment as required to provide a protected way of travel to the exit discharge
- Exit discharge: that portion of a means of egress between the termination of an exit and a public way
- Accessible means of egress: “a means of egress that provides an accessible route to an area of refuge, a horizontal exit or a public way.”
- Area of refuge: “an area that is either a story in a building where the building is protected throughout by an approved, supervised automatic sprinkler system and has not less than two accessible rooms or spaces separated from each other by smoke-resistant partitions; or a space located in a path of travel leading to a public way that is protected from the effects of fire, either by means of separation from other spaces in the same building or by virtue of location, thereby permitting a delay in egress travel from any level.”
- Public way: “a street, alley or other similar parcel of land essentially open to the outside air deeded, dedicated or otherwise permanently appropriated to the public for public use and having a clear width and height of not less than 10’”

Means of egress components

Doors:

- Clear widths: minimum = 32’ (in a pair, at least one will be 32’); maximum = 48” (no single doorway over 48’)
- Door must swing in direction of exit travel when serving a room/area with an occupant load of 50 or more
- During its swing, door should not obstruct more than one half of the required width of an aisle, corridor, passageway or landing; when fully open, door should not project more than 7” into the required width [of the same]
- Opening force: 15 lbf to unlatch, 30 lbf to start swing, 15 lbf to open to minimum required width

Stairs:

- Dimensions (new stairs):
- Minimum width = 44” or 36” for occupant load less than 50
- Minimum riser height = 4”
- Maximum riser height = 7”
- Minimum tread depth = 11”
- Minimum headroom = 6’-8”
- Maximum height between landings = 12’
- Landings: shall continue with no decrease in width along the direction of egress travel; dimension should not be less than the width of the stair [minimum 44”]
- No variations exceeding 3/16” in adjacent risers or treads

- No variations exceeding 3/8" in entire flight
- Handrails should be between 34" and 38" above the surface of the tread (measured vertically); should be located minimum 1 1/2" from wall to which it is fastened; should have a circular cross section between 1 1/4" and 2"

Smokeproof enclosures:

- "a continuous fire-resistive enclosure protecting a stairway from smoke and fire generated in the building served"
- Can be accomplished by natural ventilation, mechanical ventilation, pressurizing (be careful of door release minimum force needs)
- Requires 2 hour rating
- Must discharge into a public way or direct access to a public way

Horizontal exits:

- "a way of passage from one building to an area of refuge in another building on approximately the same level, or a way of passage through or around a fire barrier to an area of refuge on approximately the same level in the same building that affords safety from fire and smoke originating from the area of incidence and areas communicating therewith"
- "can be substituted for other exits where the total egress capacity of the other exits is not less than half that required for the entire building or connected buildings, and provided that none of the other exits is a horizontal exit" [cannot be given credit for providing more than 1/2 the required exits of exit capacity of the building]
- Space large enough to accommodate the occupants of both the fire area and the area of refuge (minimum: 3 sf floor space per person)

Ramps:

- Dimensions (new ramps):
- Minimum width = 44"
- Maximum slope = 1 in 12
- Maximum cross slope = 1 in 48
- Maximum rise for a single ramp run = 30"
- Dimensions (existing ramps—class A):
- Minimum width = 44"
- Maximum slope = 1 in 10
- Maximum height between landings = 12'
- Dimensions (existing ramps—class B):
- Minimum width = 30"
- Maximum slope = 1 in 8
- Maximum height between landings = 12'
- Landings: required at top, bottom and at doors opening onto ramp; slope not steeper than 1 in 48; width not less than width of the ramp; no less than 60" long in direction of travel (except at approved existing ramps)
- Handrails required along both sides of a ramp with a rise greater than 6"

Egress Capacity

Occupant load: number of people that can occupy a space based on total floor area and an occupant load factor (based on occupancy)

- Steps to Calculating Egress Capacity

1. Determine occupant load
2. Determine clear width of components
3. Determine capacity of components
4. Determine most restrictive component
5. Determine if egress capacity is sufficient

Number/Arrangement of Means of Egress

Minimum number of exits: most occupancies require a minimum of 2 separate egress exits; fewer than 2 only allowed where permitted by occupancy chapter

- 3 egress exits required for occupant loads greater than 500, but less than 1000
- 4 egress exits for occupant loads greater than 1000

Arrangement: at least 2 means of egress for every occupant by separate paths of travel, as remote from each other as possible

Separation distance:

- ½ diagonal rule: where 2 exits are required they shall be placed at a distance no less than ½ the length of the maximum overall diagonal dimension of the building/area being served, measured in a straight line between the nearest edge of the exit doors or exit access doors
- increased to 1/3 diagonal for sprinkled facilities

Impediments to egress: exit access cannot be provided by travel through kitchens, storerooms, restrooms, workrooms, closets or any space subject to locking; exit access and doors shall be clearly recognizable—no hangings, draperies or mirrors

Travel distance to exits: distance along natural path of travel to closest exit; measured on the floor/walking surface along the centerline of the natural path of travel starting from the most remote point that can be occupied, curving around corners/obstructions with a 1' clearance and ending at the center of the doorway or point where exit begins

- Specific requirements for each occupancy, refer to occupancy section or Table A.7.6

Common path of egress travel: portion of the exit access that must be traveled before two separate and distinct paths of travel to two exits are available

- Specific requirements for each occupancy, refer to occupancy section or Table A.7.6

Dead end corridors: specific requirements for each occupancy, refer to occupancy section or Table A.7.6

Discharge from exits: discharge must terminate directly at a public way or equivalent

- 50% (max) of exits may discharge through areas on the level of exit discharge if:
 1. discharge is a free and unobstructed, readily visible and identifiable way to the exterior
 2. level of discharge is protected by sprinklers
 3. level of discharge is separated from other areas by having a fire rated construction not less than that required for the exit enclosure

Features of Fire Protection (Chapter 8)

Fire Resistance-Rated Assemblies

- Should meet requirements of NFPA 251 Standard Methods of Tests of Fire Endurance of Building Construction and Materials [see also IBC for Fire Resistance-Rated Assemblies]
- Fire barriers used to provide enclosure, subdivision, or protection under the Life Safety Code should be rated as 2-hour, 1-hour or ½-hour

Openings in Fire Rated Assemblies

Every opening in a fire barrier must be protected to limit the spread of smoke from one side of barrier to another:

- 2-hour fire barrier = 1 ½ hour fire rated opening
- 1-hour fire barrier = 1-hour fire rating for vertical openings and/or exit enclosures, ¾-hour rating for all other openings
- ½-hour fire barrier = 20 minute fire rated opening

Vertical openings

Every floor that separates stories in a building shall be fire rated (constructed as a smoke barrier)

Openings in floors (stairways, elevator shafts, etc.) shall be enclosed with fire rated walls:

- 4 or more stories = 2-hour rated
- 3 or less stories = 1-hour rated
- Existing enclosures in existing buildings = ½-hour rated

Smoke barriers

- Subdivide building spaces to prevent the movement of smoke
- Should be continuous from outside wall to outside wall, floor to floor, smoke barrier to smoke barrier, or a combination
- Doors in smoke barriers:
 1. No undercuts, louvers or grills
 2. No less than 20-min rated
 3. Self-closing or automatic closing

Sprinklers

- Covered briefly in Chapter 9
- Refer to NFPA 13 Standard for the Installation of Sprinkler Systems for detailed information

Chapter 43 Rehabilitation Work Categories

Repair: “The patching, restoration, or painting of materials, elements, equipment, or fixtures for the purpose of maintaining such materials, elements, equipment, or fixtures in good or sound condition.”

Renovation: “The replacement in kind or strengthening of load-bearing elements; or the refinishing, replacement, bracing, strengthening, or upgrading of existing materials, elements, equipment, or fixtures, without involving the reconfiguration of spaces.”

Modification: “The reconfiguration of any space; the addition, relocation, or elimination of and door or window; the addition, or elimination of load-bearing elements; the reconfiguration or extension of any system; or the installation of any additional equipment.”

Reconstruction: “The reconfiguration of a space that affects an exit or a corridor shared by more than a single tenant; or the reconfiguration of a space such that the rehabilitation work area is not permitted to be occupied because existing means of egress and fire protection systems, or their equivalent, are not in place or continuously maintained.”

Change of Use: “A change in the purpose or level of activity within a structure that involves a change in application of the requirements of the *Code*.”

Change of Occupancy Classification: “The change in the occupancy classification of a structure or portion of a structure.”

Addition: “An increase in the building area, aggregate floor area, height, or number of stories of a structure.”

Appendix O

Reference Sources/UFCs

References

This section contains a list of recommended references. Contractors shall refer to, but not limit their references to, the latest edition of the listed publications.

- A Manual of Recommended Practice, latest edition, American Conference of Governmental industrial Hygienists
- ADAAG, Americans with Disabilities Act Architectural Guidelines
- AFH 32-1084 Facility Requirements Handbook
- AFI 31-101, Volume I, Air Force Physical Security Program
- AFI 31-209 Air Force Resource Protection Program (Chapters, 3, 4, 5)
- AFI 31-209 USAF Resources Protection Program
- AFI 31-210 Air Force Antiterrorism Program
- AFI 32-1010, Land Use Planning, 1 November 1998
- AFI 32-7062, Air Force Comprehensive Planning, 1 October 1997
- AFMAN 32-1071, Vol. 1 force protection requirements for glazing
- AFOSH 9166, General Industrial Operations
- AFPM 32-1097, Sign Standards Pamphlet, 1 November 1997
- Air Force Regulation 91-38
- Americans with Disabilities Act (ADA)
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- ANSI/TIA/EIA-568-B and All Addenda, Commercial Building Telecommunications Cabling Standard, 2001 (includes System Testing Requirements)
- ANSI/TIA/EIA-569-A, Commercial Building Standard for Telecommunications Pathways and Spaces
- ANSI/TIA/EIA-598-A, Optical Fiber Cable Color Coding
- ANSI/TIA/EIA-606, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
- ANSI/TIA/EIA-607, Commercial Building Grounding and Bonding Requirements for Telecommunications
- ASTM—American Society for Testing and Materials—E648—Naval Publications and Forms Center, 5801 Tabor Ave, Philadelphia, PA 19120
- Department of Energy Standards Part 435, Energy Conservation Voluntary Performance Standards for New Buildings
- Development and Maintenance of Traffic Control Device Inventories for DOD Installations
- DoE 435 (Energy conservation performance standard)
- Emerald Book for Equipment Grounding, NFPA-70/NEC, National Electric Code
- Engineering Technical Letter (ETL) 93-1, Construction Signs, 11 March 93
- ETL 93-1, Construction Signs, 11 March 1993
- ETL 94-3, Air Force Carpet Standards
- ETL's 86-8, 86-9, 90-6, 90-9, 91-1, 91-4, 91-5, 93-4, 96-1, 99-12, 00-7, and 01-2
- Factory Mutual Global (FM) (<http://www.fmglobal.com>)
- HQ AFCEE Carpet Selection Handbook
- International Conference of Building Officials
- International Conference of Building Officials, publishers of the Uniform Building Code (UBC), (<http://www.icbo.org>)
- International Organization for Standardization (ISO)
- Manual on Uniform Traffic Control Devices (MUTCD by Federal Highway Administration)
- MIL-HDBK-1008B Fire Protection for Facilities, Engineering, Design, and Construction
- Military Traffic Management Command, Traffic Engineering 7 Highway Safety Bulletin, Traffic Engineering for Better Gates; August 2001

- National Fire Protection Association (NFPA) (<http://www.nfpa.org>)
- NFPA 101 The Life Safety Code
- NFPA 13 Sprinkler Systems
- NFPA 1500 Standard for Fire Department Occupational Safety and Health Program
- NFPA 17A Standard for Wet Chemical Extinguishing Systems
- NFPA 403 Standard for Aircraft Rescue and Fire Fighting Services at Airports
- NFPA 409 Aircraft Hangars
- NFPA 410 Aircraft Maintenance
- NFPA 70 National Electrical Code
- NFPA 72 Standard for Fire Protection Signaling Systems
- NFPA 72E Automatic Fire Detectors
- NFPA 80 Fire Doors and Windows
- NFPA 96 Standard for Installation of Equipment for the Removal of Smoke and Grease Laden Vapors
- National Institute of Building Sciences (NIBS), producers of the “Construction Criteria Base” (CCB). (<http://www.nibs.org>): (<http://www.ccb.org/html/home.html>)
- National Standard Plumbing Code, latest edition
- Occupational Safety & Health Administration (OSHA) (<http://www.osha.gov/comp-links.html>)
- Plant Installation Safety Guide, NESC (ANSI/IEEEC-2), National Electric Safety Code
- Society of Fire Protection Engineers, Inc. (SFPE) (<http://www.sfpe.org>)
- The general Plan Guide and Template, HQ Air Force Center for Environmental Excellence (AFCEE)
- UFAS, Uniform Federal Accessibility Standards
- UFC (Unified Facilities criteria) 4-010-01, DoD Minimum Antiterrorism Standards for Buildings, latest edition
- UFC 3-120-01 Air Force Sign Standard, 6 February 2003
- UFC 4-010-02, DoD Minimum Antiterrorism Standoff Distances for Buildings, 08 October 2003
- Underwriters Laboratories, Inc. (UL) (<http://www.ul.com/welcome.html>)

Appendix P

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