Robins Air Force Base
Base Facility Standards

78ABW **WR/ALC** **78CEG**

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September 2011

The requirements of this document are mandatory as stated herein for all facilities work at Robins AFB

Robins Air Force Base
Base Facility Standards

Title: General Requirements

Date: 27 September 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 1B – GENERAL REQUIREMENTS

NOTE: THESE BASE FACILITY STANDARDS ARE APPLICABLE ONLY TO THE EXTENT THEY APPLY TO REQUIREMENTS IN THE SOLICITATION/CONTRACT.

KEY REFERENCE DOCUMENTS TO BE USED WITH THE ROBINS BASE FACILITY STANDARDS

RAFB Procedural Guide for Designers, Including Architectural-Engineer (AE) and Contractor Firms

RAFB Architect-Engineer (A-E) Services: Open-End Statement of Work
(or)
RAFB Architect-Engineer (A-E) Services: Discrete Contract Statement of Work

1.0 Introduction

1.1 General Standards

1.1.1 **The RAFB Procedural Guide for Designers**, referenced above, provides detailed instructions on administrative rules, and on preparation of specifications, drawings, design analyses, cost estimates and other components of design packages prepared for construction contracting actions. Several of these key issues bear bringing forward in this introductory part of the Base Facility Standards…

1.1.2 **Drawings –** In recent years the RAFB standard has been to use MicroStation CADD format V8 version or Auto-CAD 2007 version, closely conforming to the Tri-Services Standards requirements as well as mandatory Base supplements. The specific format must be IGDS. ***With the publication of this edition of the BFS that is now changed to Auto-CAD 2010 version***. This will adjust in the future as the RAFB use-version changes, and all designers will be notified officially via BFS changes when that happens.

1.1.3 **Specifications –** In recent years the RAFB standard has been to use locally BCE developed Division 1 sections and Technical sections. ***With the publication of this edition of the BFS that is now changed to Unified Facilities Guide Specifications (UFGS)*** for all Technical Sections. Continue to use RAFB BCE developed Division 1 sections. The RAFB BCE is currently editing the basic UFGS Division 1 specifications to adapt them to RAFB specific requirements. Upon completion of that effort, these will be mass-issued to all designers for use in design packages. All designers will be notified officially via BFS changes when that happens.

1.2 Special Initiatives

1.2.1 ***General:***
a. The Air Force and DOD often discover special situations that result in new requirements that must be incorporated into the latest facility design and

construction documents. These are referenced by this section to be sure these areas are properly addressed.

b. Priorities:

1 - Force Protection/Antiterrorism criteria overrule all other standards.

2 - Sustainable Design comes next, but not in violation of the Base Architectural Compatibility Standards. Normally incorporate this concept in all cases where there is negligible cost difference from past practice. Discuss high cost cases with the Base Project Manager.

3 - Follow the Base Facility Standards for all other items.

1.2.2 ***Force Protection/Antiterrorism*** – A new module ***BFS Part 7E*** is "<u>under development</u>", and will cover the RAFB specific requirements for this facet of designs. It will be mass-published with a BFS official change when ready.
1.2.3 ***Sustainable Design*** – See new module ***BFS Part 7C*** published with this edition of the BFS. Also see other cross-referenced BFS Part within that module.

1.2.4 ***Metric Dimensions*** – Robins AFB does not use metric dimensions in preparation of design drawings. Use metric dimensions only when specifically mandated by other Air Force or DOD directives, and only after clearing it with the 778CES Technical Support Office.

1.2.5 ***Corrosion Control*** – See new module ***BFS Part 7B*** published with this edition of the BFS. Also see other cross-referenced BFS Part within that module.

1.2.6 ***Airfield Temporary Construction Waivers*** (TCW) on Robins AFB Airfield – All construction projects to be located on the RAFB Airfield (Industrial Area or Active Airfield Area) must be presented by the Base Design Project Manager to the Base Community Planning Office for review and determination on the need for an Airfield Temporary Construction Waiver [see attached map defining boundary of airfield area]. This procedure must start not later than the 65% Design Stage of each project that will be located on the RAFB Airfield. Specific instructions are contained in *UFC 3-260-01 Airfield and Heliport Planning & Design (current version published 17 Nov 08) and AFMCI 32-1056 Airfield Obstruction Management Program (current version published 17 Feb 09), and Draft RAFB Instruction/Supplement to AFPD 32-10, Installation & Facilities (see attached airfield boundary delineation map)*. It mandates the use of RAFB 78CEG/CEAOC developed preliminary information TCW Form, then if deemed necessary, the AFMC Form 300 for each of these projects to provide data on the project including scope description, location map, and other pertinent data to be used in the decision process. This form is also used to process the required requests through the proper channels for approval prior to construction start. Notice to Proceed will not be issued until TCW, if needed, is approved.

2.0 General Applications

2.1 Scope

The Robins Air Force Base Facility Standards are to provide the minimum requirements of engineering, quality and aesthetics expected for facility design at Robins Air Force Base. These standards reflect and incorporate the policies and direction of the Air Force, industry codes and standards, and compliance with these standards is mandatory unless a deviation is properly approved.

2.2 Applicability

These standards apply to all new facilities at Robins AFB. They apply to new additions and to all major repairs, renovations and upgrades. They apply where possible to all repairs, renovations and upgrades. Deviations from the standards are permitted on repair projects were it is required to match existing conditions and systems. Deviations from the standards may be permitted on new work but the request must be made in writing and submitted to the Civil Engineer Technical Support office for review in accordance with the procedures below. Failure to obtain written approval prior to implementation shall be considered an error and it shall be corrected or made compliant with these standards at no cost to the Government.

2.3 Requests for Deviations

Requests for deviations from the standards are to be submitted in writing to the Civil Engineer Technical Support office. The request shall include a statement describing which standard item the request concerns, what the deviation is, the reason why the deviation is needed and the name and contact information of the person who can respond to questions. The Supervisor of the Technical Support Office shall make the determination to approve or disapprove. The Technical Support Supervisor shall provide a written response for all requests and detail the reason for all disapprovals. The Supervisor of the Technical Support office may elevate the request for deviation to the Base Civil Engineer if the deviation has a significant impact to base appearance or operations. Also the originator of a disapproved request may request that the issue be elevated to the Base Civil Engineer for review. An approved Request for Deviation shall not be considered as a change to the standard and shall be applicable only for the project, facility and circumstances of the specific request.

2.4 Revisions

2.4.1 The CE Technical Support Office will periodically review and revise this Standard but no revision will be made and published without the approval of the Technical Support Office Supervisor. The document date will be changed to reflect the date of the change and the most recent version will be the one with the most current date. Individual parts may be released separately and may have different release dates. This is to permit portions to be updated and corrected without having to release the entire Standard. When an individual BFS Part is revised and issued, the Base Facility Standards (BFS) Index will also be revised and issued with the revised BFS Part.

2.4.2 Anyone may submit a proposal for a change to the standards. A proposal for a change shall be sent to the Technical Support Office. The Request will be logged in and forwarded to the appropriate BFS Part Team Lead for review. If the proposed revision is acceptable, then the revision will be presented to the Technical Support Office Supervisor for approval. If the revision is approved, then the revision will be incorporated in the correct section of the standard and that section will be signed and dated. This section will then replace the previous section in computer files where the master Base Facility Standards are stored, and the Revised Section/Part will be issued electronically to all In-House and Contract Designers (AEs, etc). If the proposed revision is not approved then the request will be returned to the originator with the reason for the disapproval.

2.4.3 If the Technical Support Office Supervisor determines that the proposed revision is significant, then he may route it to other Base Agencies/Affected Offices for comment prior to providing the final approval or disapproval.

2.4.4 The Technical Support Office Supervisor may determine that the proposed revision has a significant impact to Base appearance or Base operations. In these cases he may deem that higher level approval must be obtained prior to issuing the revision.

2.5 Authority Having Jurisdiction

The Base Civil Engineer is the Authority Having Jurisdiction. The Construction Managers and Project Managers are the first level of enforcement of the Base Facility Standards. Appeals or questions must be brought to the attention of the Technical Support Supervisor prior to elevating any issue concerning these standards to the Base Civil Engineer.

Other Parts/Modules in Separate Documents**: See* ***INDEX of BFS Parts published with this edition of the Base Facility Standards.

Revision History of this BFS (At end of this module)

<<<End of Part 1B – General Requirements>>>

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Revision History (Since 2005):

26 Jan 2005 Major update to Comm requirements. 78 CS pulled out sections from Elec area, created separate Comm area, and updated the details.

27 Jan 2005 Added info on new IntelliNet transceivers for fire alarm.

22 Feb 2005 Added note about MILCON projects running cable and conduit for Comm to base cable plant.

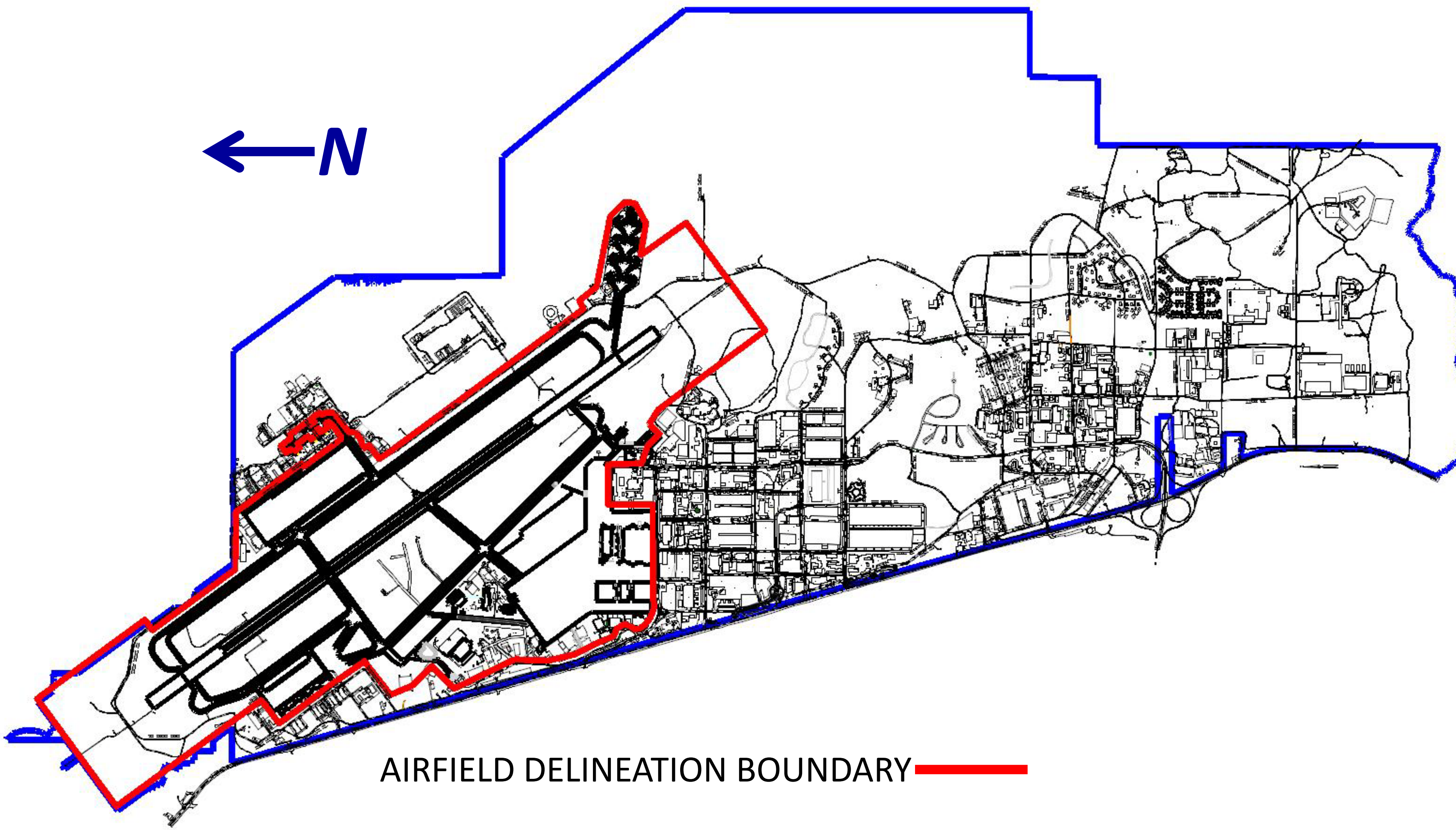
24 Aug 2005 Divided into 7 different documents as Parts 1-7, with 2 appendices. In the future, each Part will have its own revision record. This became Part 1.

27 June 2006 Change from “dgn” to “dgn or dwg”

19 Dec 2007 Revised location of Base Contracting Office

2008-2011 Miscellaneous Revisions in several BFS Parts.

15 Sep 2011 Total overhaul of BFS including developing subsets/modules from previous large BFS Parts. New Special Category modules/parts developed and published for the first time. Added Criteria Reference Documents section to the first segment of each BFS Part. Developed and published new INDEX in new format to cover all published and under-development future modules/parts. Major update to the Base Architectural Compatibility Plan and separated it into its own stand-alone document. Inserted in the Introductory Section of the Part 1B General Requirements module several key major parallel documents to be used in conjunction with the Base Facility Standards. Also included in this section primary General Standards and Special Initiatives instructions.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AIRFIELD DELINEATION BOUNDARY

Robins Air Force Base
Base Facility Standards

Title: Environmental

Date: 8 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS
PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 2 - ENVIRONMENTAL

Air Force and Department of Defense Environmental Legal Requirements		
Air Quality		
Requirement Type	**Citation**	**Requirement Description**
State of GA		Georgia Rules for Air Quality Control, Chapter 391-3-1
GA Permit		Robins AFB Title V Air Operating Permit 9711-153-0033-V-02-0 and Amendment 9711-153-0033-V-02-2
AFI	AFI 32-1068	Heating Systems and Unfired Pressure Vessels
AFI	AFI 32-7040	Air Quality Compliance
AFI	AFI 48-145	Occupational and Environmental Health Program
AFPD	AFPD 32-70	Environmental Quality
DoD	DODI 3020.37	Continuation of Essential DoD Contractor Services
DoD	DODI 4715.6	Environmental Compliance
DoD	DODI 4715.9	Environmental Planning and Analysis
DoD	DOD 4160.21-M	DRMO Defense Material Disposition Manual
Executive Order	Executive Order 12088	Federal Compliance with Pollution Control Standards
Executive Order	Executive Order 12902	Energy Efficiency & Water Conservation at Federal Facilities
Executive Order	Executive Order 13123	Greening the Government Through Efficient Energy Management
Executive Order	Executive Order 13423	Strengthening Federal Environmental, Energy, and Transportation Management
Executive Order	Executive Order 13514	Federal Leadership in Environmental, Energy, and Economic Performance
Water Quality		
Requirement Type	**Citation**	**Requirement Description**
AFI	AFI 32-1066	Plumbing Systems
AFI	AFI 32-1067	Water Systems
AFI	AFI 32-7041	Water Quality Compliance
AFI	AFI 48-145	Occupational and Environmental Health Program
AFPD	AFPD 32-70	Environmental Quality
DoD	DODI 3020.37	Continuation of Essential DoD Contractor Services
DoD	DODI 4715.6	Environmental Compliance
DoD	DODI 4715.9	Environmental Planning and Analysis
DoD	DOD 4160.21-M	DRMO Defense Material Disposition Manual
Executive Order	Executive Order 11514	Protection and Enhancement of Environmental Quality

Executive Order	Executive Order 12088	Federal Compliance with Pollution Control Standards
Executive Order	Executive Order 12777	Implementation of Federal Water Pollution Control Act & Oil
Executive Order	Executive Order 12902	Energy Efficiency & Water Conservation at Federal Facilities
Executive Order	Executive Order 13123	Greening the Government Through Efficient Energy Management
Executive Order	Executive Order 13514	Federal Leadership in Environmental, Energy, and Economic Performance

Restoration

Requirement Type	Citation	Requirement Description
GA Permit		Hazardous Waste Facility Permit No. HW-064(S)
Robins AFB Plan		Excavation Plan for the Base Industrial Area (2001)
AFI	AFI 32-7020	The Environmental Restoration Program
AF FAR Supplement	AFFARS 5305.303	Announcement of Contract Awards
DFARS	DFARS 205.303	Defense Federal Acquisition Regulation Supplement
DERP	DERP	Defense Environmental Restoration Program
Executive Order	Executive Order 12580	Superfund Implementation

Hazardous Materials Program

Requirement Type	Citation	Requirement Description
Robins AFB Plan		Robins AFB Hazardous Material Management Plan (2011)
AFI	AFI 32-7086	Hazardous Material Management
AFI	AFI 48-145	Occupational and Environmental Health Program
AFMAN	AFMAN 23-227	Storage and Handling of Liquefied and Gaseous Compressed
AFMAN	AFMAN 32-4004	Emergency Response Operations
AFMAN	AFMAN 32-4013	Hazardous Material Emergency Planning and Response Guide
AFPD	AFPD 32-70	Environmental Quality
DoD	DODI 3020.37	Continuation of Essential DoD Contractor Services
DoD	DoD 4145.19-R-1	Storage and Materials Handling
DoD	DODI 4715.6	Environmental Compliance

DoD	DODI 4715.9	Environmental Planning and Analysis
DoD	DODI 6050.5	DOD Hazard Communication Program
DoD	DOD 4160.21-M	DRMO Defense Material Disposition Manual
DoD	DOD 4160.21-M-1	Defense Demilitarization Manual, Oct 91
Executive Order	Executive Order 12088	Federal Compliance with Pollution Control Standards
Executive Order	Executive Order 13423	Strengthening Federal Environmental, Energy, and Transportation Management
Executive Order	Executive Order 13514	Federal Leadership in Environmental, Energy, and Economic Performance
Hazardous Waste Program		
Requirement Type	**Citation**	**Requirement Description**
Robins AFB Plan		Robins AFB Hazardous Waste Management Plan (2004)
AFI	AFI 32-7042	Waste Management
AFI	AFI 32-3001	Explosive Ordinance Disposal Program
AFI	AFI 136-8	Interservice Responsibilities for Explosive Ordnance Disposal.
AFI	AFI 48-119	Medical Service Environmental Quality Program
AFI	AFPD 32-70	Environmental Quality
AFPAM	AFPAM 32-7043	Hazardous Waste Management Guide
DoD	DODI 3020.37	Continuation of Essential DoD Contractor Services
DoD	DODI 4715.6	Environmental Compliance
DoD	DODI 4715.9	Environmental Planning and Analysis
DoD	DODM 4160.21	DRMO Defense Material Disposition Manual
DoD	DODM 4160.21-M-1	Defense Demilitarization Manual, Oct 91
Executive Order	Executive Order 12088	Federal Compliance with Pollution Control Standards
Executive Order	Executive Order 12580	Superfund Implementation
Executive Order	Executive Order 13148	Greening the Government through Leadership in Environmental Management
Executive Order	Executive Order 13423	Strengthening Federal Environmental, Energy, and Transportation Management
Executive Order	Executive Order 13514	Federal Leadership in Environmental, Energy, and Economic Performance

Solid Waste and Recycling Programs		
Requirement Type	**Citation**	**Requirement Description**
State of GA		Georgia Rules for Solid Waste Management, Chapter 391-3-4
Robins AFB Plan		Robins AFB Integrated Solid Waste Management Plan (2010)
Robins AFB Plan		Robins AFB Resource, Recovery and Recycling Plan for Recoverable and Unusable Liquid Petroleum Products
AFI	AFI 32-3001	Explosive Ordinance Disposal Program
AFI	AFI 32-7080	Pollution Prevention
AFI	AFI 48-104	Quarantine Regulations of the Armed Forces
AFI	AFI 23-502	Recoverable and Unusable Liquid Petroleum Products
AFI	AFI 41-201	Managing Clinical Engineering Programs
AFR	AFR 136-8	Interservice Responsibilities for Explosive Ordnance Disposal
AFI	AFI 32-7042	Waste Management
AFI	AFI 48-145	Occupational and Environmental Health Program
AF Policy		HQ USAF/A7C Memorandum, Air Force Solid Waste Diversion and Qualified Recycling Program (QRP) Policy.
AFPD	AFPD 32-70	Environmental Quality
DoD	DODI 3020.37	Continuation of Essential DoD Contractor Services
DoD	DODI 4715.6	Environmental Compliance
DoD	DODI 4715.9	Environmental Planning and Analysis
DoD	DOD 4160.21-M	DRMO Defense Material Disposition Manual
DoD	DODI 7301	Disposition of Proceeds from DoD Sales of Surplus Personal Property
DoD	DODI 4715.4	Pollution Prevention
DoD Policy		Department of Defense Strategic Sustainability Performance Plan FY 2010 (Public Version, 26 Aug 2010)
Executive Order	Executive Order 11514	Protection and Enhancement of Environmental Quality
Executive Order	Executive Order 12088	Federal Compliance with Pollution Control Standards
Executive Order	Executive Order 13423	Strengthening Federal Environmental, Energy, and Transportation Management
Executive Order	Executive Order 13514	Federal Leadership in Environmental, Energy, and Economic Performance

Toxics -- Asbestos Management		
Requirement Type	**Citation**	**Requirement Description**
State of GA		Georgia Rules for Asbestos Removal and Encapsulation, Chapter 391-3-14
State of GA		Georgia Rules for Solid Waste Management, Asbestos Containing Waste,
Robins AFB Plan		Robins AFB Asbestos Management Plan (2005)
Robins AFB Plan		Robins AFB Asbestos Operating Plan (2008)
AFI	AFI 32-7066	Environmental Baseline Surveys in Real Estate Transactions
AFI	AFI 32-7040	Air Quality Compliance
AFI	AFI 32-1052	Facility Asbestos Management
AFI	AFI 91-302	Air Force Occupational Health and Environmental Safety, Fire Protection and Health (AFOSH)
AFI	AFI 48-101	Aerospace Medicine Operations
AFI	AFI 48-145	Occupational and Environmental Health Program
AFI	AFI 32-9004	Disposal of Real Property
AFH	AFH 32-9007	Managing Air Force Real Property
AFOSH Std.	AFOSH Std. 48-137	Respiratory Protection Program
AFOSH Std.	AFOSH Std. 48-119	Medical Service Environmental Quality Program
AFOSH Std.	AFOSH Std. 161-21	Hazardous Communication
AFPD	AFPD 32-70	Environmental Quality
DoD	DODI 3020.37	Continuation of Essential DoD Contractor Services
DoD	DODI 4715.6	Environmental Compliance
DoD	DODI 4715.9	Environmental Planning and Analysis
DoD	DOD 4160.21-M	DRMO Defense Material Disposition Manual

Toxics -- Lead Based Paint		
Requirement Type	**Citation**	**Requirement Description**
State of GA		Georgia Rules for Lead Based Paint Abatement, Certification, and Accreditation,
AFI	AFI 32-7040	Air Quality Compliance
AFI	AFI 32-9004	Disposal of Real Property
AFI	AFI 48-101	Aerospace Medicine Operations

AFI	AFI 91-302	Air Force Occupational Health and Environmental Safety, Fire Protection and Health (AFOSH)
AFI	AFI 48-145	Occupational and Environmental Health Program
AFM	AFM 85-3	Paints and Protective Coatings
AF Policy	USAF/CC, 24 May 1993	Air Force Policy and Guidance on Lead Based Paint in Facilities
AFPD	AFPD 32-70	Environmental Quality
DoD	DODI 3020.37	Continuation of Essential DoD Contractor Services
DoD	DODI 4715.6	Environmental Compliance
DoD	DODI 4715.9	Environmental Planning and Analysis
DoD	DOD 4160.21-M	DRMO Defense Material Disposition Manual
Executive Order	Executive Order 11514	Protection and Enhancement of Environmental Quality
Executive Order	Executive Order 12088	Federal Compliance with Pollution Control Standards
Executive Order	Executive Order 13423	Strengthening Federal Environmental, Energy, and Transportation Management
Natural Resources		
Requirement Type	**Citation**	**Requirement Description**
Robins AFB Plan		Robins AFB Integrated Natural Resources Management Plan (2007)
Robins AFB Instruction	RAFBI 32-7064	Integrated Natural Resources Management
AFI	AFI 32-7064	Integrated Natural Resources Management
AFI	AFI 32-7061	Environmental Impact Analysis Process
AFI	AFI 32-7063	Air Installation Compatible Use Zone Program
AFI	AFI 32-7066	Environmental Baseline Surveys for Real Estate Transactions
AFI	AFI 48-145	Occupational and Environmental Health Program
AFPAM	AFPAM 32-1010	Land Use Planning
AFPAM	AFPAM 91-212	Bird Aircraft Strike Hazard (BASH) Management Techniques
AFPD	AFPD 32-70	Environmental Quality
DoD	DODI 3020.37	Continuation of Essential DoD Contractor Services
DoD	DODI 4715.3	Environmental Conservation Program
DoD	DODI 4715.6	Environmental Compliance
DoD	DODI 4715.9	Environmental Planning and Analysis
DoD	DODM4160.21	DRMO Defense Material Disposition Manual

Executive Order	Executive Order 11514	Protection and Enhancement of Environmental Quality
Executive Order	Executive Order 11988	Flood Plain Management
Executive Order	Executive Order 11990	Protection of Wetlands
Executive Order	Executive Order 13112	Invasive Species
Executive Order	Executive Order 12088	Federal Compliance with Pollution Control Standards
Executive Order	Executive Order 13423	Strengthening Federal Environmental, Energy, and Transportation Management
Cultural Resources		
Requirement Type	**Citation**	**Requirement Description**
Robins AFB Plan		Robins AFB Integrated Cultural Resources Management Plan (2005)
Agreement		Comprehensive Programmatic Agreement (2007)
AFI	AFI 32-7065	Cultural Resources Management Plan
AFI	AFI 48-145	Occupational and Environmental Health Program
AFPD	AFPD 32-70	Environmental Quality
DoD	DODI 3020.37	Continuation of Essential DoD Contractor Services
DoD	DODI 4715.3	Environmental Conservation Program
DoD	DODI 4715.6	Environmental Compliance
DoD	DODI 4715.9	Environmental Planning and Analysis
DoD	DOD 4160.21-M	DRMO Defense Material Disposition Manual
DoD	MIL-HDBK-1028/8A	Design of Pest Management Facilities
Executive Order	Executive Order 11593	Protection and Enhancement of the Cultural Env.
Executive Order	Executive Order 12088	Federal Compliance with Pollution Control Standards
Executive Order	Executive Order 13007	Indian Sacred Sites
Pollution Prevention (P2)		
Requirement Type	**Citation**	**Requirement Description**
Robins AFB Plan		Robins AFB Green Procurement Program (GPP) Plan (2011)
AF Policy		AF Policy on ODCs

AF Policy		HQ USAF/A7C Memorandum, Air Force Solid Waste Diversion and Qualified Recycling Program (QRP) Policy).
AF Policy		USAF Memorandum, Policy to Establish the Air Force GPP, 29 September 2006).
AF Policy		USAF Memorandum, Green Procurement Program (GPP) Training Update, 5 October 2006
AF Policy		USAF Memorandum, Air Force Green Procurement Program, 02 Jun 2011
AFI	AFI 32-7080	Pollution Prevention Program
AFI	AFI 32-7086	Hazardous Materials Management
AFI	AFI 13-212	Range Planning and Operations
AFI	AFI 21-101	Maintenance, Aerospace Equipment Maintenance Management
AFI	AFI 32-7001	Environmental Budgeting
AFI	AFI 32-7002	Environmental Information Management System
AFI	AFI 90-801	Environmental, Safety, and Occupational Health Councils
AFI	AFI 32-7047	Environmental Compliance Tracking and Reporting
DoD	DODI 4715.4	Pollution Prevention
DoD	DoD 4160.21-M	Defense Materiel Disposition Manual
DoD	DFARS 252.223-7001	Defense FAR Supplement
DoD Policy		Updated DoD GPP Strategy, 02 Dec 2008
DoD Policy		Department of Defense Strategic Sustainability Performance Plan FY 2010 (Public Version, 26 Aug 2010)
FAR Interim Rule		Federal Acquisition Regulation; Sustainable Acquisition; Department of Defense, General Services Administration, and National Aeronautics and Space Administration; Interim Rule; 31 May 2011(Federal Register Doc No 2011-12851)
DoE	EPAct, Title I, Subtitle A	Energy Policy Act of 2005, Energy Efficiency, Federal Programs
Executive Order	Executive Order 13221	Energy Efficiency Standby Power Devices
Executive Order	Executive Order 11514	Protection and Enhancement of Environmental Quality
Executive Order	Executive Order 12856	Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements
Executive Order	Executive Order 12902	Energy Efficiency & Water Conservation at Federal Facilities

Executive Order	Executive Order 13123	Greening the Government Through Efficient Energy Management
Executive Order	Executive Order 13423	Strengthening Federal Environmental, Energy, and Transportation Management
Executive Order	Executive Order 13514	Federal Leadership in Environmental, Energy, and Economic Performance
National Environmental Policy Act (NEPA)		
AFI	AFI 32-7061	Environmental Impact Analysis Process
AFI	AFI 32-7066	Environmental Baseline Surveys for Real Estate

1.   GENERAL SCOPE: This is one part of the Robins Air Force Base (AFB) Facility Standards. Any exceptions granted to these requirements shall be noted clearly in the project design analysis by using a Deviation Request. This section supplements the requirements and local criteria contained in the base's master Civil Engineering Specifications (CE Specs), 01560 Environmental Requirements.

(Note: Environmental Management is the owner of all environmental issues detailed below; contact Environmental Management for concern or questions: (478) 926-9645.)

2.   CONTRACTOR RESPONSIBILITY: Comply with all applicable federal, state, any laws and regulations from other states where disposal might occur, permit requirements and local laws and regulations concerning environmental compliance and pollution prevention. Ensure all products produced or generated under contract shall meet all stated performance objectives and shall not violate in any manner the Environmental Requirements of any applicable local, state, or federal entity including the Department of Defense (DoD).

(Note: Not all of these status statements must be used, but only those that apply to the subject project.)

[Note: All references to AE in this document apply to contracted AE designers, Corps of Engineers designers, In-house CE designers, and any other facility project designers that handle Robins Air Force Base projects for Main Base Units, ANG, Marine Corps, or any other Hosted Units on RAFB.]

3.   LOCAL CONDITIONS AND SPECIFICATIONS: Base CE Specs, 01560 Environmental Requirements is kept updated on the latest environmental issues at Robins AFB. Refer to it for disposal of fluorescent light tubes and ballasts, local disposal of solid, hazardous, and toxic waste, local landfill procedures, permits required, etc.

4.   AIR QUALITY (Georgia Rules for Air Quality Control, Chapter 391-3-1; Robins AFB Title V Air Operating Permit 9711-153-0033-V-02-0 and Amendment 9711-153-0033-V-02-2): For purposes of Title V air permitting under the 1990 Clean Air Act Amendments and subsequent implementing regulations, Robins AFB is considered to be a major source of air emissions for one or more regulated air pollutants as defined in Title 40 Code of Federal Regulations 70.2. The Architect-Engineer (A-E) firm shall review the project to see if the air quality will be affected and to determine if any of the following apply:

a. According to Georgia Environmental Protection Division (GA EPD) Rules for Air Quality Control, Chapter 391-3-1-.03, any person prior to beginning the construction or modification of any facility which may result in air pollution shall obtain a permit for the construction or modification of such facility. The contractor shall submit the required data to Environmental Management in order to complete the permit application form as early in the planning process as possible. Since an approved permit to construct is mandatory prior to start of construction, the contractor shall not install the equipment until the permit has been approved and government approval of the contractor's submittal has been obtained. Contractor shall anticipate nine months to one year from air source data submittal for this to occur.

b. Certification that generators meet federal standards must be submitted and approved prior to order and delivery of the unit. Some generators require permitting as indicated in (a) above.

c. New sources require utilization of Maximum Achievable Control Technology to reduce emissions of hazardous air pollutants.

d. For work involving refrigerants, submit the following documentation to Environmental Management:

   i. The name, address, telephone number, and technician certification of each person who will service, repair, maintain, and/or dispose of any equipment containing and/or using a refrigerant (Class I Ozone Depleting Substance (ODS), Class II ODS, or non-ozone depleting substance).

   ii. A list of appliances located on base that have a capacity of 50 pounds or more of a Class I or Class II refrigerant, to include type, location, manufacturer, serial number, amount of full charge and date full charge was determined.

   iii. Records, work logs, service tickets, invoices, and supporting documentation for maintenance, service, repair, and/or disposal of base appliances containing 50 pounds or more of a Class I or Class II refrigerant.

   iv. Invoices, purchase or rental documents, and a copy of the equipment certification sent to Environmental Protection Agency for any equipment used to recover or recycle refrigerants on base.

   v. Receipts, invoices, purchase orders, or bills of lading for any purchases or acquisitions of refrigerant used for any service on base.

e. Open burning operations are prohibited on base and shall not be used.

f. Where construction/demolition operations create dust, perform dust control as the work proceeds and whenever a dust nuisance or hazard occurs.

5. WATER SUPPLY: The project shall be reviewed to determine if any backflow prevention device or flow meter will be installed, or modification to the Robins AFB public water system (PWS) will occur as a result of construction activity. Each of these activities requires adherence to base-specific or Georgia-specific requirements and regulations.

a. Backflow Prevention, See *Base Facilities Standard Part 3C, Water Supply.*

b. Flow Meters, See *Base Facilities Standard Part 3C, Water Supply.*

c. Modification to Public Water System, See Base Facilities Standard Part 3C, Water Supply. A Georgia Professional Engineer is required to certify all plan sheets related to modification of the Robins AFB PWS. Approval of all designs to modify the PWS is required by GA EPD prior to construction. Project designer shall ensure appropriate time for regulatory review/comment period in design schedule.

6. WASTEWATER: The project shall be reviewed to determine if any connection to the Robins AFB Sanitary or Industrial Wastewater Collection System will be performed. See *BFS Part 3D, Wastewater*.

7. STORMWATER: The project shall be reviewed to determine applicability of each stormwater requirement. See *Base Facility Standard Part 3G, Stormwater.*

8. INSTALLATION RESTORATION PROGRAM (Hazardous Waste Facility Permit No. HW-064(S), Excavation Plan for the Base Industrial Area): Any activities that may impact a restoration site, remedial systems, groundwater monitoring wells or environmental piping must be coordinated with Environmental Management. Excavation on an Installation Restoration Program (IRP) site requires a Hazardous Waste Operations and Emergency Response (HAZWOPER) certified crew unless otherwise determined by Environmental Management.

a. Sampling plan representative of the construction site must be provided to and approved by Environmental Management. Sampling results must be provided to Environmental Management for waste determination.

   i. Environmental Management must also concur with the contractor's plan for disposal at an approved, permitted facility. Disposal method must be coordinated through Environmental Management prior to removal from Robins AFB.

   ii. Excavated soil identified as contaminated must be stored in a covered, water proof container until hauled to the approved disposal facility. Excavations on restoration sites must be backfilled from a clean soil source.

   iii. Contaminated water from the site must be contained and properly treated prior to release in accordance with base requirements.

b. Excavation in the Base Industrial Area must be performed in accordance with the "Excavation Plan for the Base Industrial Area".

c. Groundwater monitoring wells, aboveground remedial equipment, underground vaults and piping must not be disturbed without prior approval through Environmental Management. If wells or other environmental assets within construction zones are damaged, the contractor is responsible for all required repairs or replacements. In the event that assets are damaged, the contractor must notify Environmental Management immediately.

d. Work performed on an IRP site will have an assigned Environmental Management inspector that checks progress and verifies work is performed properly and to the expected standards.

9. POLLUTION PREVENTION (P2): The project must be reviewed to determine if any pollution prevention initiatives need to be addressed. All activities must actively pursue the pollution prevention hierarchy of source reduction, re-use, recycle, and as a last resort, disposal. Such pollution prevention initiatives include:

a. Use of EPA 17 Top Priority Chemicals:

   i. Robins has a goal of reducing the chemicals listed in the EPA 17 Top Priority list. Contractor must notify Robins Hazardous Materials Program Manager if these chemicals are going to be brought onto base premises. See *Base Facility Standards, Environmental section 10. Hazardous Materials.*

ii. All projects will incorporate Green Procurement and Sustainable Acquisition policy. *See Base Facility Standards Part 7CC, Green Programs.*

iii. All design projects will incorporate the U.S. Council of Green Building Council (USGBC) policy which sets the benchmark standards for green design. All design projects must be able to achieve a Leadership in Energy and Environmental Design (LEED) rating of silver. *See Base Facility Standards Part 7C, Sustainable Design.*

10. HAZARDOUS MATERIALS (Robins AFB Hazardous Material Management Plan): The project shall be reviewed to see if hazardous materials (HAZMAT) will be used and/or stored.

a. HAZMAT includes all items (including medical supply items, but excluding drugs in their finished form and pharmaceuticals in individually- issued items) covered under the Emergency Planning and Community Right-to-Know Act (or other host nation, federal, state, or local) tracking requirement, the Occupational Safety and Health Administration (OSHA) Hazardous Communication (HAZCOM) Standard, all Class I and Class II ODS, lead acid batteries and aerosol products. It does not include munitions or hazardous waste.

b. **Prohibition on Requirements for a Contractor to use a Class I ODS.** Unless the requiring activity has obtained prior Senior Acquisition Official approval, you may not:

i. Provide any service or product with any specification, standard, drawing, or other document that requires the use of a Class I ODS in the test, operation, or maintenance of any system, subsystem, item, component, or process; or

ii. Provide any specification, standard, drawing, or other document that establishes a test, operation, or maintenance requirement that can only be met by use of a Class I ODS.

c. **Class II ODS Limitations.** Do not develop or modify any existing weapon or facility system scheduled to remain in the Air Force (AF) inventory beyond 01 January 2020 in any manner that requires or adds requirements for Class II ODS in their operations or maintenance. For additional restrictions on ODS usage on Robins AFB, please see *Base Facility Standards 5B, Heating, Ventilation, and Air Conditioning*.

d. The storage and usage of all HAZMAT must be tracked in the AF Standardized Tracking System, which is currently the Hazardous Material Management System (HMMS). If the contractor does not have access to a government-furnished computer and cannot access HMMS, the contractor must coordinate with the Environmental Management HAZMAT Cell.

e. Contractors must submit a “Hazardous Material Purchase Request for Contractors” form to Environmental Management HAZMAT Cell prior to transporting any HAZMAT onto Robins AFB. This form must be completed for all hazardous materials – initial and recurring – purchased by contractors for use on Robins AFB and approval must be granted prior to transportation onto Robins AFB.

f. Contractors must submit for every HAZMAT (or potential HAZMAT) that will be used or stored on Robins AFB to the Environmental Management HAZMAT Cell an AF Form 3952 with the most current manufacturer's material safety data sheet(s) (MSDS) attached. This must be submitted prior to transportation onto Robins AFB and the HAZMAT may not be used on Robins AFB until the AF Form 3952 has been approved.

11. HAZARDOUS WASTE (Robins AFB Hazardous Waste Management Plan): The project shall be reviewed to determine if any amount of hazardous waste will be generated.

a. Contractors must comply with all applicable hazardous waste compliance requirements (federal, state, and local). The Robins AFB Hazardous Waste Management Plan is the controlling document for hazardous waste management on Robins AFB.

b. Contractors must identify any contamination already present if any type of excavation is required. If unable to identify before excavating, contractor must coordinate container placement and waste sampling needs with Environmental Management before project start.

c. Contractors must identify all types and amounts of hazardous waste expected to be generated from the project.

d. Contractors must provide hazardous waste accumulation and storage needs (satellite or 90-day) to Environmental Management prior to project start. Contractor must coordinate project activities with the Unit Environmental Coordinator (UEC) of the organization with ownership over the affected area prior to requesting services from Environmental Management.

e. Contractors must request the correct types and number of containers required for hazardous waste collection. Container labels will be issued by Environmental Management and tracked in the HMMS. All container labels must be accounted for at the end of the project. Contractors are responsible for transporting all accumulation containers and unused HMMS labels or containers from the project location to the Hazardous Waste Processing Facility for disposal.

f. Contractors must meet all hazardous waste management personnel training requirements prior to project start.

g. Contractors must identify the method of payment for hazardous waste disposal. If waste disposal cost is identified as a contractor responsibility in the contract the contractor must have a valid Department of Defense Activity Address Code (DODAAC) with a valid/ active type of address code for billing (TAC 3) prior to project start. DODAACs can be obtained at: *https://dodaac.wpafb.af.mil/*. The status of a DODAAC can be checked at: *https://www.transactionservices.dla.mil/DAASINQ/warning.asp*.

   (NOTE: The process to obtain a DODAAC can take several weeks or months.)

h. All hazardous waste determinations will be made by Environmental Management.

i. All hazardous waste must be disposed of through the Defense Logistics Agency Disposition Services via Environmental Management. Contractors are not authorized to sign hazardous waste manifests or transport hazardous waste from Robins AFB.

12. SOLID WASTE (Robins AFB Integrated Solid Waste Management Plan): The project shall be reviewed to see if and how solid waste disposal will be affected by the construction of this project. The following items are used to show the status of solid waste.

a. Applicable solid waste handling and disposal system criteria (federal, state, and local).

b. Waste volume generated: include type and characteristics of material to be disposed, while maximizing recycling /reuse of waste material. All recyclable scrap metals, including wiring, shall remain the property of the government and be recycled through the Robins AFB Qualified Recycling Program (QRP).

   i. Diversion (from landfilling) goal is 60% by weight for C&D debris.

   ii. Diversion goal is 50% for non-C&D solid waste.

c. Method of collection, transportation, and disposal. If by landfill: leachate contamination or pollution of groundwater.

d. Possibilities for recycling or use of contaminated fuel.

e. Type of waste involved (inert, construction & demolition (C&D) debris, municipal solid waste (MSW), industrial, profiled special waste, asbestos, universal waste).

f. Permit requirements for solid waste handling and disposal. Project notification to the State of Georgia must be made 10 working days prior to beginning work for all projects that include removal of any load bearing walls, even if asbestos is not present.

13. TOXICS (Robins AFB Integrated Solid Waste Management Plan): The project shall be reviewed to determine if any amount of toxics will be generated.

a. Asbestos Containing Materials (Robins AFB Asbestos Management Plan, Robins AFB Asbestos Operating Plan):

   i. Do not use products containing asbestos.

   ii. Prior to renovation/demolition, an asbestos inspection by a certified asbestos inspector is required. Certain materials must be presumed to contain asbestos in buildings constructed prior to 1981.

   iii. If asbestos is in the area of construction, describe where it is located. There should not be any work done in the area involving asbestos, unless specified.

   iv. If new material is discovered during construction that is suspected to be asbestos, stop all work in that area until directed to proceed.

   v. All asbestos abatement work shall only be performed in the areas shown by the required specifications and shall be in accordance with CE Specs 01568 Asbestos Abatement or 01567 Asbestos Abatement Non-Friable Asbestos Roofing and Transite Wall Panels.

   vi. Asbestos waste shall be handled and disposed in accordance with federal, state, and local requirements.

   vii. Copies of project and completion notifications and payments to the state, manifests, and landfill receipts are required by Environmental Management.

b. Lead Based Paint (LBP) (Robins AFB Lead Based Paint Management Plan):

i. Precautions should be taken to protect employees from exposure to lead dust hazards during C&D projects.

ii. If the project designer has not analyzed suspect painted materials for the presence of lead, all painted surfaces, including painted surfaces covered by other materials such as wall paper, should be assumed to contain varying levels of lead.

iii. If the presence of lead is confirmed, the contractor shall take precautions to protect his workers and government employees from exposure to lead dust hazards during construction/demolition in accordance with OSHA standards.

iv. All LBP abatement work shall only be performed in the areas shown by the required specifications and shall be in accordance with CE Specs 01569 and/or 02065 Lead Based Paint In-Place Management and Abatement for Robins AFB.

v. All work in residential and child occupied facilities constructed before 1978 shall be in compliance with EPA Lead: Renovation, Repair, and Painting Program rules.

vi. HUD Guidelines shall apply to priority facilities as designated by the government.

vii. The disposal of all debris containing lead paint must be treated for collection and disposal purposes as a hazardous waste until a determination is made otherwise based on test results.

c. Polychlorinated Biphenyls (PCBs) (Robins AFB Hazardous Waste Management Plan): Do not use equipment or components containing PCBs. This includes ballasts and capacitors for fluorescent and high-intensity discharge (HID) lighting.

i. Fluorescent lighting ballasts and HID lighting capacitors must be managed and disposed of as toxic waste unless the label states they do not contain PCBs. Ballasts and capacitors with no markings are assumed to contain PCB. Ballasts and capacitors marked as non-PCB or PCB free are handled as standard solid waste.

14. NATURAL RESOURCES (Robins AFB Integrated Natural Resources Management Plan, Robins Air Force Base Instruction (RAFBI) 32-7064). The project shall be reviewed to determine if natural resources will be affected. The conservation of natural resources on Robins AFB includes the protection and management of the following resources:

a. Forest resources: Trees shall not be removed without advance approval from the Environmental Management, and measures shall be implemented to protect trees on construction sites per RAFBI 32-7064.

b. Floodplain: Construction within the 100-year floodplain shall be avoided whenever possible per Executive Order 11988, Floodplain Management.

c. Fish and wildlife management: Most species of wildlife are protected by state or federal law, as are some of the water resources inhabited by fish on Robins AFB. Contact Environmental Management if the project may impact these species or their habitats.

d. Wetlands: Wetlands are protected per Section 404 of the Clean Water Act, and Executive Order 11990, Protection of Wetlands. Contact the Environmental Management if the project will require filling, dredging, or other impacts to wetlands, creeks, or streams. Mitigation measures may be required.

e. Threatened and endangered species (Endangered Species Act): American alligators and the Ocmulgee skullcap can be found on Robins AFB, and other listed species have occurred on base. Do not harm or harass federal or state listed species, and do not damage their habitats.

f. Landscaping and invasive species: Landscaping plans for all construction projects must be reviewed and approved in advance by the Environmental Management per RAFBI 32-7064. Executive Order 13112, Invasive Species, prohibits the introduction of invasive species on federal lands. Guidance for proper landscaping, as well as lists of plants to use and not to use, can be found in the Best Practices for Landscaping at Robins AFB.

15. CULTURAL RESOURCES (Robins AFB Integrated Cultural Resources Management Plan): The project shall be reviewed by the A-E firm prior to construction to determine if cultural resources will be impacted. Cultural resources include but are not limited to archaeological sites and artifacts, as well as historic structures, cemeteries, and buildings.

a. Should it be determined that a cultural resource would be impacted during the course of the contractor's work, then coordination with Environmental Management is required and the base archaeologist may be required to be on site during ground disturbing activities.

b. In the event of an inadvertent discovery of cultural resources, the contractor must contact Environmental Management to determine if any historic structures or archaeological sites are in the area of potential effect (APE) of the project. If Environmental Management determines that there are cultural resources in the APE then the contractor must not continue work on the project until the criteria below are met:

   i. Environmental Management determines that the work required by the project is allowed via the Comprehensive Programmatic Agreement (PA) that Robins AFB has with the Georgia State Historic Preservation Office (GA SHPO). If the work of the project is approved by Environmental Management via the Comprehensive PA, then the contractor must follow the guidelines set forth in the PA.

   ii. Environmental Management consults and coordinates with the state regulators to determine how to minimize, mitigate, or avoid adverse effects to the cultural resources. If the GA SHPO provides guidelines then they must be adhered to by the contractor.

   iii. In the event of an inadvertent discovery that involves human remains, consultation with local officials, the GA SHPO, and 12 federally-recognized Indian tribes is necessary.

16. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA): In accordance with 32 Code of Federal **Regulation 989, the A-E firm shall review the AF Form 332 (Base Civil Engineer Work Request), AF** Form 813 (Request for Environmental Impact Analysis), or Environmental Assessment associated with the project. The A-E firm shall use these documents to identify special environmental provision that have been outlined by Environmental Management and incorporate these provisions into the scope, design, and implementation of the project.

<<<<< **END OF BFS PART 2** >>>>>

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Approval: ______***Original Signed By***______
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Revision History

24 Aug 2005	Separated from combined BFS into its own document
19 Jul 2011	Updated per Environmental Management, 78 CEG/CEAN
08 Aug 2011	Updated per Environmental Management, 78 CEG/CEAN

Environmental Requirements Checklist

PART 1 - GENERAL

1.01 GENERAL:

A. General Scope: This Section provides the requirements necessary to ensure that all construction projects are in environmental compliance. Environmental Management, 78 CEG/CEAN, is the organization responsible for management of base environmental concerns. Contact program managers in 78 CEG/CEAN at (478) 327-8104. Major environmental program areas which may be affected include solid and hazardous wastes, toxics, water quality, air quality, natural resources, storage tanks, cultural resources, pollution prevention, hazardous materials and waste, and petroleum, oil, and lubricants.

B. Contractor Responsibility: Comply with all applicable Federal, State of Georgia, any laws and regulations from other states where disposal might occur, and local laws and regulations concerning environmental compliance and pollution prevention. Ensure all products produced or generated under contract shall meet all stated performance objectives and shall not violate in any manner the Environmental Requirements of any applicable local, state, or federal entity including the Department of Defense (DoD).

1. Environmental Management Systems (EMS) Awareness Training: All contractor personnel working on Robins Air Force Base (AFB) who perform activities on the installation are required to complete Air Force-provided initial EMS Awareness Training. It is the responsibility of the Prime Contractor to ensure that all sub-contractors, vendors, and employees complete this training prior to beginning work on Robins AFB. Failure to provide documentation of EMS Training may result in termination of the contract.

   EMS training is provided by Environmental Management, 78 CEG/CEAN, at (478) 327-8104. Contractors have three options to satisfy the mandatory EMS Awareness Training requirement. Contractors that do not have a Computer Access Card (CAC) must exercise Option 2.

   - Option 1 (Preferred Option): An online version of Robins EMS Awareness Training is available at the following website: https://geobase.robins.af.mil/emstraining/EMSTrainingOptions.aspx. This option is only available to contractors who have a CAC and takes approximately 10 minutes to complete.

   - Option 2: Contractor requests a copy of the Robins EMS Awareness Training Power Point Presentation from Environmental Management. The request should be sent to the Environment Management Workflow Box at the following email address, 78ceg.cev.FrontOfc@robins.af.mil. Once the presentation is received, the contractor is responsible for ensuring that all his/her employees view the training.

2. Green Procurement Program (GPP): GPP is a mandatory federal acquisition program that focuses on the purchase and use of environmentally preferable and biobased products and services. Biobased products are composed in whole or in part of biological products and are safer for the environment. GPP requirements apply to all acquisitions including services and new requirements. Federal Acquisition Requirement 23.404(b) applies and states that GPP requires 100% of Environmental Protection Agency (EPA) designated product purchases included in the Comprehensive Procurement Guidelines list containing recovered materials, unless the item cannot be acquired competitively within a reasonable timeframe, meet appropriate performance standards, or at a reasonable price.

C. Base Environmental personnel (78 CEG/CEAN) will conduct no-notice inspections to ensure compliance with all Environmental Requirements. Written documentation of any findings from such an inspection will be forwarded to the CO by the inspector. The CO will follow-up with the Contractor on all findings of non-compliance reported by the inspector. A finding of non-compliance with any of the Environmental Requirements may result in the issuance of a work stoppage by the CO until documentation of compliance is submitted and accepted by both, 78 CEG/CEAN and the CO.

1.02 SUBMITTALS:

A. General: Provide the following submittals in accordance with instructions found in Section 01300, Submittals and Contractor Furnished Items. The contractor may submit manufacturer's data in lieu of the required certificate of compliance if he/she desires. The Government requires manufacturer's data if an "X" appears under the "Mfg. Data Required" column.

B. Material Submittals: Not required under this section.

C. Other Submittals: Provide the following submittals as required by the contract or as directed by the CO.
*** IMPORTANT >> Designer, edit list below to project requirements***

Inspector Para #	Description	Date Required	Check Mark
3.01 B.	Solid Waste Handling Permit or Permit by Rule Letter	Within 3 days of receipt	_________
3.01 C.3.	Landfill License	Prior to dumping	_________
3.01 C.3.a)	Special Waste Acceptance Application	5 days prior to dumping	_________
3.01 C.3.a)	Waste Shipment Tracking	Monthly by the 5th	_________
3.01 C.4.	Commencement Notice	Prior to dumping	_________
3.01 D.	Waste Management Report	Monthly by the 5th and Prior to final payment	_________
3.01 F.1.	Solid Waste Disposal Plan	10 days prior pre-con. conf.	_________
3.01 F.1.f)	Landfill Receipts	Monthly by the 5th	_________
3.01 F.1.g)	Disposal Certification Letter	Prior to final payment	_________
3.01 F.2.	Recycling Letter	Prior to final payment	_________
3.01 F.3.	GA EPD Demolition Notice	15 days prior to starting work	_________
3.02 B.2.c)	DRMO Receipts	Within 7 days	_________
3.02 B.2.d)	DRMO Bill	Within 7 days	_________
3.02 G.1.	Hazard Communication Program	14 days after Notice to Proceed	_________
3.02 G.2.	Hazardous Waste/Hazardous Material List	Prior to starting work	_________
3.02 G.3.	Asbestos Removal Info	As required	_________
3.02 G.4.	Lead Compliance/Training/Sampling	Prior to starting work	_________
3.02 G.5.a)	Refrigerant Technician Certification	Prior to starting work	_________
3.02 G.5.b)	Refrigerant Appliance List	Within 7 days	_________
3.02 G.5.c)	Refrigerant Maintenance Repair Log	Within 7 days	_________
3.02 G.5.d)	Refrigerant Equipment Certification	Within 7 days	_________
3.02 G.5.e)	Refrigerant Purchase Documentation	Within 7 days	_________
3.03 E.1	Air Permit Data	14 days after Notice to Proceed	_________
3.05 D.1.	Pesticide List	At end of project	_________
3.05 D.2.	Pest Control License	Prior to pest control	_________
3.07	UST Removal	14 days after Notice to Proceed	_________

Inspector Para #	Description	Date Required	Check Mark
3.11 A.1.	Notify CEAN of Digging	Beginning of project	_________
3.11 A.1.	Notify CEAN of Digging	1 week before digging	_________
3.11 A.1.	Notify CEAN of Digging	2 hrs before restart dig	_________
3.11 B	Notify of Find	upon discovery	_________
3.12 G.1	Tree Tags	3 days after removal	_________
3.12 G.4	Landscaping Plan	Prior to beginning work	_________
3.12 I.1.a)	Erosion, Sedimentation, and Pollution Control Plan	60 percent design package	_________
3.12 I.1.b)	Notice of Intent – NPDES Permit	14 days before site work	_________
3.12 I.1.b)	Permits/Fees Copies – NPDES Permit	14 days prior to site work	_________
3.12 I.1.c)	Notice of Termination – NPDES Permit	After final stabilization at site	_________
3.12 I.2	Post Construction Stormwater Management Plan and Calculations	60 percent design package	_________
3.13 E.1	Backflow Device Location	Prior to installation	_________
3.13 E. 2	BPD Test Report	After BPD installation	_________

PART 2 - PRODUCTS - OMITTED

PART 3 - EXECUTION

3.01 DISPOSAL OF WASTE/EXCESS MATERIAL:

A. General: The Contractor shall take a proactive, responsible role in the management of non-hazardous solid waste and require all subcontractors, vendors, and suppliers to participate in the effort. Non-hazardous Solid Waste, as defined in Code of Federal Regulations (CFR) 261.2, dispositioned for disposal shall be removed from the base in accordance with all Federal, State of Georgia, and local codes and requirements. Every effort shall be made to segregate individual waste streams and divert waste from any landfill by reusing or recycling materials. Direct all non-hazardous solid waste inquiries to 78 CEG/CEANQ Solid Waste Program Manager.

B. Solid Waste Handling: All persons engaged in solid waste handling, including solid waste collection and transportation, or operations of solid waste handling facilities or disposal sites shall have a solid waste handling permit or permit by rule letter. The provisions of Georgia Environmental Protection Department (GA EPD) regulations concerning proper handling of solid waste and applicable prohibitions shall govern. All materials must be properly removed by the end of the project. Equipment/material to be removed from the project but not turned in to the Government is the property of the contractor. Revenues or other savings obtained for salvage or recycling may accrue to the Contractor according to the Statement of Work.

C. Solid Waste Disposal: Use one or more of the following methods to divert/dispose of non-hazardous solid waste. All materials to be disposed of in other than a sanitary landfill must be kept segregated at the project site from those materials, which are allowed only in a sanitary landfill.

1. Reuse (diversion): First consideration of waste shall be given to salvage for reuse to be used in the original form. Sale or donation of waste suitable for reuse shall be considered. Salvaged materials, other than those specified in other sections to be salvaged and reinstalled, shall not be used in this project unless approved by the CO. Materials defined as "recovered materials" are excluded from regulation as solid wastes.

2. Recycling (diversion): Recycling of materials is strongly encouraged. Waste materials not suitable for reuse but have value as being recyclable, shall be recycled whenever economically feasible. Materials destined for recycling must meet the definition of non-hazardous wastes under federal/state solid waste regulations. Materials defined as "recovered materials" are excluded from regulation as solid wastes. Recyclable metal materials shall remain the property of the

government and be included in the Robins AFB Qualified Recycling Program (QRP). Contact 78 CEG/CEAN QRP Manager for collection of scrap wire and metal.

3. Sanitary Landfill (disposal): All solid waste may be disposed of in a sanitary landfill properly licensed by the State of Georgia. Provide proof that any Georgia municipal solid waste disposal facility receiving Robins AFB waste is operated by someone who has obtained the certification required by the Georgia Solid Waste Management Act, O.C.G.A. 12-8-24.1. If a landfill other than Houston County Landfill is used, provide a copy of the landfill license.

   a) All non-hazardous wastes disposed of in the Houston County Landfill may require a Waste Shipment Tracking Document signed by the Contractor's hauler certifying that no hazardous waste was introduced into the waste while in his custody. The contractor must provide a Waste Shipment Tracking Document with each disposal load when required by Houston County. If required, the contractor may need to collect a representative sample of building demolition material to be tested. The results of the test are to be provided on the Special Waste Acceptance Application (SWAA) form and submitted to 78 CEG/CEAN for approval for acceptance by the Houston County Landfill Engineer and the issuance of a Special Waste Profile Number, which must be used on the Waste Shipment Tracking Document. Attached at the end of this document are copies of both, the Waste Shipment Tracking Document and SWAA. Allow a minimum of three working days for 78 CEG/CEAN to process the SWAA form to obtain the profile number.

      Note to Designer: Common concerns for demolition waste include lead based paint and asbestos. If the presence of lead based paint, asbestos, or other hazardous materials are suspected, permission for landfill disposal is required via the SWAA process. DURING THE DESIGN, an analysis of the suspected material shall be performed by a certified lab approved by the State. If the Toxic Characteristic Leaching Procedure (TLCP) results for lead are greater than 5 mg/L, the waste shall be disposed of as hazardous waste in a Subtitle C permitted facility--not a Subtitle D permitted facility such as the Houston County Landfill. If the lab analysis for asbestos is positive, the waste must be dispositioned through the SWAA process. The completed form (top & middle portion) along with a copy of the lab analysis should be forwarded to 78 CEG/CEANQ Solid Waste Program Manager for approval. Houston County currently does not require a SWAA if there is no presence of lead based paint, asbestos, or other non-hazardous Special Waste or hazardous materials suspected. In the future, if the landfill authority does require a SWAA, the contractor shall obtain composite samples of the materials likely to be disposed of during the demolition of the project. Submit the samples to the appropriate certified laboratory for testing and complete the SWAA. Attach a copy of the signed lab analysis and submit the SWAA to 78 CEG/CEAN for signature. 78 CEG/CEAN will fax the completed form to the County's landfill consultant for disposal approval and issuance of Special Waste Profile Number. Once it is approved, attach a copy to the specifications during advertisement. 78 CEG/CEAN will also complete the top part of the Waste Shipment Tracking Document with the Profile Number issued at the same time. Include this form in the contract documents as well. 78 CEG/CEAN will be the signing authority as the generator on the SWAA form.

4. Inert Waste Landfill (disposal): Materials not likely to cause production of leachate of environmental concern may be disposed of in an inert waste landfill. Only earth and earth-like products, concrete, cured asphalt concrete, rock, bricks, yard trimmings, and land clearing debris such as stumps, limbs, and leaves are acceptable for disposal in an inert waste landfill. Provide a copy of the written notice of commencement of operation by the landfill as given to the GA EPD and provide a copy of the landfill license or permit by rule letter issued by the GA EPD. Include the weights of material disposed of in this type of landfill in the monthly waste management report.

5. Construction/Demolition Disposal Site (disposal): Only wood, metal, wallboard, paper, cardboard, as well as materials that can go in an inert waste landfill may be disposed of in this facility. Provide a copy of the landfill license if other than Houston County Landfill.

6. Solid Waste Disposal Outside of Georgia: No solid waste can be disposed of outside the state of Georgia without prior written approval of the CO. If the contractor desires this, he shall provide sufficient information as determined by the contracting officer to allow verification of compliance with the law.

D. Reporting of Disposal and Recycling: Robins AFB is required to report to Air Force Headquarters the amount (weight) of solid waste and construction and demolition (C&D) debris which is dispositioned for reuse, recycle, or disposal. Weights shall be cumulative from the start of each month and shall reflect the total amount of material disposed or recycled during the month. Attach copies of any completed Waste Shipment Tracking Documents and Georgia Asbestos Waste Shipment

Records with landfill tickets for these materials. A copy of the report shall be turned in to the contract administrator by the 5th of the following month and prior to final payment and immediately forwarded to:

78 CEG/CEANQ
Attn: Solid Waste Program Manager
775 Macon Street, Building 1555
Robins AFB GA 31098-2201

Each month, the Contractor shall record the amounts of reused, recycled, and disposed materials on the Waste Management Report. The report should reflect the method of disposal for the material generated from the project. Weights of material disposed of in a sanitary or C&D landfill shall be based on the weight tickets. Material disposed of in other types of landfills, which do not have weight scales, may be estimated. The weight of materials reused and or recycled may be estimated. Use a good faith effort to obtain the most accurate estimate possible.

E. Building Demolition: The Contractor must provide 10 working day notification to GA EPD prior to the start of demolition activity in accordance with Georgia Solid Waste Regulations. This may also apply to the modification of a building, and is considered demolition when the removal of a load-bearing wall occurs. To start the process, coordinate with 78 CEG/CEANQ Toxics Program Manager for guidance and assistance.

F. Submittals, Notifications, and Approvals: The following submittals, notifications, and approvals are required to maintain compliance:

1. Solid Waste Disposal Plan: In accordance with Civil Engineering Specification (CE Spec) 01572 and CE Spec 01560, the Contractor shall provide a solid waste disposal plan stating how all materials leaving Robins AFB shall be disposed of and recycled no later than15 days after notice to proceed and not less than 10 days before the preconstruction meeting prior to starting work.

   a) The plan shall address the disposal of all solid waste and shall include a notarized letter from the contractor stating how all materials leaving Robins AFB shall be disposed of. The letter shall certify that the Contractor shall dispose of all materials in compliance with all Federal, State of Georgia, and local laws. A senior official of the company shall sign this letter. The plan shall address the disposal of each item addressed in Sections 3.01 and 3.02 as applicable. The plan shall designate an employee who shall be responsible for verifying that all materials removed from Robins AFB are disposed of in accordance with the above referenced laws. Non-hazardous solid waste shall be broken down into individual types, i.e., asphalt, concrete, wood, brick, etc. to facilitate recycling of recovered materials.

   b) Provide five copies of the Disposal Plan to the CO to forward to 78 CEG/CEAN prior for review and approval 10 days prior to the Pre-construction Conference or 15 calendar days prior to the start of disposal operations if no pre-construction conference is held.

   c) Identify each landfill and recycler to be used. A copy of all landfill permits shall be provided unless the Houston County landfill is used.

   d) Provide a copy of a Solid Waste Handling Permit or permit-by-rule letter, issued by GA EPD, which allows the Contractor to handle solid wastes, including solid waste collection and transportation. A copy of the EPD permit-by-rule letter is required for the inert waste landfill being used.

   e) Establish and maintain a Daily Waste Disposal and Recycling Log. Each load of materials that leaves Robins AFB shall be accounted for in the log. The log shall list the load number, bill of sale number/date or other record for recycling, as well as the name of the contract employee who verified that the material was disposed of properly, along with details as to how verification was accomplished.

   f) Keep evidence of proper disposal and recycling of construction debris per CE Spec 01572 as well as provide this evidence to the CO. Examples of evidence include dump tickets from a licensed sanitary landfill, copies of current landfill permits from the State of Georgia (unless Houston County landfill is used), manifest, bill of sale, or other record for recycling. The evidence shall be obtained the workday after the load is carried off and provided by the 5th of each monthly Waste Management Report.

   g) After contract work is completed and prior to final payment, the Contractor shall submit a notarized letter of certification signed by a senior official of the company certifying that all materials disposed, recycled, and removed from Robins AFB have been dispositioned in compliance with Federal, State of Georgia, and local laws, and 78 CEG/CEAN has received all monthly waste tracking reports. Attach a copy or duplicate of the Waste Shipment Tracking Document for each load transported for disposal and recycling.

2. Recycling: Provide a letter indicating what materials shall be treated as recovered materials under GA EPD regulations and show how the criteria for recovered materials are met. Please note that for C&D Waste, per CE Spec 01572, a minimum of 75 percent by weight of total project solid waste shall be diverted from the landfill.

3. Building Demolition: Submit copies of GA EPD demolition notification to CO and 78 CEG/CEAN Toxics Program Manager 15 days prior to starting work and prior to submittal to the GA EPD for review, and submit final copies with copy of any payment made to GA EPD.

3.02 SPECIAL WASTES OR HAZARDOUS MATERIALS:

A. General: The Contractor must comply with all applicable federal, state, and local requirements concerning use of hazardous materials and hazardous waste. If there should be a conflict between environmental regulation/ordinances/statues and the contract's specifications, the contractor shall, in writing, contact the CO for a written determination. Disposal of all non-hazardous Special Wastes, such as asbestos, requires submittal of a SWAA to obtain a Profile Number for use on the Waste Shipment Tracking Document as described in 3.01 C.3. a).

B. Hazardous Waste: Hazardous Waste is defined as waste meeting the requirements of 40 CFR 261.3. 78 CEG/CEANQ Hazardous Waste Program Manager makes all hazardous waste determinations for waste generated on Robins AFB. The Contractor must provide all data necessary to determine the regulatory status of waste to 78 CEG/CEANC. The Contractor must ensure personnel have completed hazardous waste training. All hazardous wastes generated on Robins AFB must be disposed of through 78 CEG/CEANC at building 359. Direct all inquiries to the 78 CEG/CEANQ Hazardous Waste Program Manager.

1. Paints, sealants, solvents, rags, or any other hazardous material(s) destined for disposal must be managed as a hazardous waste unless they have been determined not to be via Material Safety Data Sheet (MSDS) or laboratory sampling. 78 CEG/CEAN is the only organization authorized to make a hazardous waste determination.

2. Light fixture components: High-intensity discharge (HID) and fluorescent lamps and tubes containing mercury must be recycled as universal waste.

3. Batteries used in emergency and exit lights that contain lead must be recycled and managed as universal waste.

4. Disposal Procedures for Hazardous and Universal Waste :

a) Gather the lamps/tubes and batteries into containers suitable for shipping per Department of Transportation (DOT) guidelines. The lamps/tubes can be placed in the original boxes the new tubes came in or in boxes designed to prevent breakage.

b) Take care not to break any lamps/tubes. If any are broken, they must be treated as spilled hazardous waste.

c) Obtain labels and containers from building 359. Place the provided labels on the boxes, properly filled out and deliver to building 359. Payment for disposal will be made through your Department of Defense Activity Address Code (DODAAC) account.

d) The Defense Reutilization and Marketing Offices (DRMO) contractor will dispose of the items, normally by recycling the lamps, tubes, and batteries.

C. Asbestos Containing Materials:

1. Do not use any products containing asbestos.

2. All asbestos abatement work shall only be performed in the areas shown by the required specifications and shall be in accordance with CE Spec 01568.

3. Prior to the start of any demolition, renovation, or digging, determine if asbestos is in the area of construction. If there is

no known asbestos in the project area, proceed as normal. If the contractor discovers any material he/she suspects to be asbestos, bring it to the CO's attention immediately. Stop all work in that area until directed to proceed.

a) Known Asbestos: If asbestos is in the area of construction, describe where it is located. There should not be any work done in the area involving asbestos if it was not written in the contract. If any asbestos is accidentally damaged, notify Base Asbestos Operations Officer, 78 CES/CEOS at (478) 327-4534, Bioenvironmental Engineering, 78 AMDS/SGPB, at (478) 327-7555, and 78 CEG/CEANQ Toxics Program Manager immediately. After they inspect the damage, the contractor shall repair it and remove debris in accordance with the following regulations, at no additional cost to the Government:

- 29 CFR 1910.1001 (1985)
- 40 CFR 61.20 Subpart B (1985)
- 40 CFR 61.145 (1985)
- AFOSH Standard 161-4 (20 Jun 77)
- Georgia Air Quality Rules, Section 391-3-1-02(9)(b)1 (1986)

Policy: Samples will be taken by the designer during design and routed through 78 CES/CEOS for testing by a certified lab approved by the State to determine the presence of asbestos and results copied to 78 CEG/CEAN. Items that must be sampled include floor tile <u>and</u> mastic, pipe insulation and insulation mastic. Other potential asbestos items include some sprayed on coatings, roofing insulation, and siding.

D. Lead Paint:

1. General: The contractor shall take precautions to protect his workers and government employees from exposure to lead dust hazards during C&D projects in accordance with 29 CFR 1926.62, Occupational, Safety, and Health Administration (OSHA) Lead in Construction Standard, and Specification 01569. All painted surfaces including painted surfaces covered by other materials such as wall paper may contain varying levels of lead. All lead based paint abatement work shall only be performed in the areas shown by the required specifications and shall be in accordance with CE Spec 01569.

2. Major Abatement Requirements, Housing, Childcare**Designer-not for our normal Operation and Maintenance (O&M) projects**: All painted surfaces including painted surfaces covered by other materials such as wall paper may contain varying levels of lead. The disposal of all debris containing lead paint shall be handled as a hazardous waste until a determination has been made otherwise based on test results.

Policy: Composite samples will be taken by the designer during design and routed through 78 CES/CEOS for TCLP testing by a certified laboratory approved by the State to determine the presence and level of lead in the debris and results copied to 78 CEG/CEAN. Follow guidelines on sampling to ensure the samples are representative of the weight of debris anticipated.

3. Maintenance, Repair, and Minor Construction Projects: All painted surfaces including painted surfaces covered by other materials such as wall paper in this project contain varying levels of lead. The disposal of all debris containing lead paint is to be treated for collection and disposal purposes as hazardous waste until a determination has been made otherwise based on test results. For hazardous waste, the contractor shall provide DOT approved drums and collect the waste in the drums. The drums shall be sealed, properly labeled, and turned in to the government for disposal.

E. Polychlorinated Biphenyls (PCB): Do not use equipment or components containing PCB's. This includes ballasts and capacitors for fluorescent and HID lighting.

1. Disposal Procedures for Fluorescent lighting ballasts and HID lighting capacitors containing PCB's:

a) Fluorescent lighting ballasts and HID lighting capacitors must be managed and disposed of as toxic waste unless the label states they do not contain PCB's. Ballasts and capacitors with no markings are assumed to contain PCB. Ballasts and capacitors marked as non-PCB are handled as standard solid waste.

b) Gather HID capacitors and fluorescent ballasts into separate containers during construction and place them into labeled, suitably sized DOT-approved containers per 49 CFR 173.202. (Typical sizes are 1, 5, 10, 30, and 55 gallons) Labels and containers may be obtained from building 359, 78 CEG/CEANC.

c) If any are broken, they must be treated as spilled hazardous material. Contact 78 CEG/CEANC at (478) 926-1176 for disposal instructions.

d) Dispose of sealed non-leaking capacitors through DRMO. Do not keep any of the full or partially full containers at the construction site for more than 30 days. Provide DD Form 1348 obtained from building 359 prior to contacting DRMO for disposal.

e) DRMO will dispose of PCB containing materials by incineration. DRMO will mail a signed copy of the manifest to 78 CEG/CEAN after transportation to the disposal site. A certificate of destruction should be received in the next month.

F. Ozone Depleting Substances (ODS) and Controlled Substances Restriction:

1. Unless the requiring activity has obtained prior Senior Acquisition Official (SAO) approval, contractors may not:

a) Provide any service or product with any specification, standard, drawing, or other document that requires the use of a Class I ODS in the test, operation, or maintenance of any system, subsystem, item, component, or process; or

b) Provide any specification, standard, drawing, or other document that establishes a test, operation, or maintenance requirement that can only be met by use of a Class I ODS.

[Air Force Federal Acquisition Regulation Supplement (AFFARS) Part 5352.223-9000, Elimination of Use of Class I Ozone Depleting Substances (ODS)]

2. For the purposes of Air Force policy, the following products are Class I ODS:

a) Halons: 1011, 1202, 1211, 1301, and 2402;

b) Chlorofluorocarbons (CFCs): CFC-11, CFC-12, CFC-13, CFC-111, CFC-112, CFC-113, CFC-114, CFC-115, CFC-211, CFC-212, CFC-213, CFC-214, CFC-215, CFC-216, and CFC-217, and the blends R-500, R-501, R-502, and R-502; and

c) Carbon Tetrachloride, Methyl Chloroform, and Methyl Bromide

NOTE: Materials that use one or more of these Class I ODSs as minor constituents do not meet the Air Force definition of a Class I ODS. [AFFARS Part 5352.223-9000, Elimination of Use of Class I ODS]

3. Class II ODS usage requires prior approval through the Air Force (AF) Form 3952 Authorization Process. [Air Force Instruction (AFI) 32-7086, Hazardous Materials Management]

4. Do not develop or modify any existing weapon or facility system scheduled to remain in the AF inventory beyond 01 January 2020 in any manner that requires or adds requirements for Class II ODS in their operations or maintenance. For exceptions to this Class II ODS policy, the requiring activity must receive SAO approval, using the same process as Class I ODS Contract approvals, or, for installation Real Property air conditioning and refrigeration equipment, the requiring activity must obtain approval authority from the Base Civil Engineer (BCE). [AFI 32-7086, Hazardous Materials Management]

5. For the purposes of Air Force policy, the following products are Class II ODS:

Hydrochlorofluorocarbons (HCFCs): HCFC-21, HCFC-22, HCFC-31, HCFC-121, HCFC-122, HCFC-123, HCFC-124, HCFC-131, HCFC-132, HCFC-133, HCFC-141b, HCFC-142b, HCFC-151, HCFC-221, HCFC-222, HCFC-223, HCFC-224, HCFC-225ca, HCFC-225cb, HCFC-226, HCFC-231, HCFC-232, HCFC-233, HCFC-234, HCFC-235, HCFC-241, HCFC-242, HCFC-243, HCFC-244, HCFC-251, HCFC-252, HCFC-253, HCFC-261, HCFC-262, HCFC-271 [AFI 32-7086, Hazardous Materials Management, Table 4.2]

6. The Contractor shall label products which contain or are manufactured with ozone depleting substances in the manner and to the extent required by 42 United States Code (U.S.C.) 7671j(b), (c), and (d) and 40 CFR Part 82, Subpart E, as follows:

Warning

Contains (or manufactured with, if applicable) *_______, a substance(s) which harm(s) public health and environment by destroying ozone in the upper atmosphere.

* The Contractor shall insert the name of the substance(s). [FAR Part 52.223-11, ODS]

7. The Contractor shall comply with the applicable requirements of Sections 608 and 609 of the Clean Air Act (42 U.S.C. 7671g and 7671h) as each or both apply to this contract. [FAR Part 52.223-12, Refrigeration Equipment and Air Conditioners]

G. Hazardous Materials (HAZMAT):

1. HAZMAT Definition: The term HAZMAT includes all items (including medical supply items, but excluding drugs in their finished form and pharmaceuticals in individually-issued items) covered under Emergency Planning and Community Right-to-Know Act (or other federal, state, or local) tracking requirement, the OSHA Hazard Communication (HAZCOM) Standard, and all Class I and Class II ODS. It does not include munitions or hazardous waste.

2. HAZMAT Exemptions: The OSHA HAZCOM Standard [29 CFR 1910.1200(b)(6)(ix)] excludes “Any consumer product or hazardous substance, as those terms are defined in the Consumer Product Safety Act (15 U.S.C. 2051 et seq.) and Federal Hazardous Substances Act (15 U.S.C. 1261 et seq.) respectively, where the employer can show that it is used in the workplace for the purpose intended by the chemical manufacturer or importer of the product, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended.” OSHA further states in a 14 April 2005 interpretation letter that office cleaning products utilized with the same frequency and duration as that of a normal consumer would fall under the HAZCOM Standard exemption for consumer products in 29 CFR 1910.1200(b)(6)(ix). Based on the OSHA HAZCOM Standard exemption, consumer products that are used at Robins AFB in such a way that the duration and frequency of use are the same as that of a consumer are not required to be included in the employer’s HAZCOM program. If unsure if the item meets the exemption, contact the HAZMAT Cell (78 CEG/CEANQ).

3. Lead Acid Batteries: OSHA determined that lead acid batteries are hazardous chemicals because of their potential chemical exposure risks and physical hazards. As a result, lead acid batteries are classified as HAZMAT and do not fall under the article exemption because they have the potential to leak, spill or break during normal conditions of use.

4. Aerosol Products: All aerosol products are classified as HAZMAT.

5. The storage and usage of all HAZMAT must be tracked in the Air Force Standardized Tracking System, which is currently the Hazardous Material Management System (HMMS). If the contractor does not have access to a government-furnished computer and cannot access HMMS, the contractor must report data on the HAZMAT stored and used during the performance of the contract at a minimum of weekly to the HAZMAT Cell and in the format specified. The Contractor should coordinate the submittal of HAZMAT data with the HAZMAT Cell prior to the beginning of work.

6. Each HAZMAT container must have a HMMS bar code tracking label affixed, with the exception of kits. The tracking label must be for the same manufacturer, same product and same size item. Substitutions are not allowed. (Note: Items with Hazard Code of B, C and M are considered HAZMAT and must have an HMMS bar code tracking label affixed.) HAZMAT that has been broken down into smaller “child” containers from the original “parent” container must have a packaging label affixed in addition to the HMMS bar code tracking label. If the contractor does not have access to a government-furnished computer and cannot access HMMS, the contractor must coordinate with the HAZMAT Cell the printing of HMMS labels for all HAZMAT items.

7. All HAZMAT with a Hazard Code of C or M must be licensed to the user prior to use. The material is licensed by stock number for specific zones for the using organization or contractor. Licenses are good for 24 months. At the end of the 24 months, the user must re-new the license. Hazard Code C and M items cannot be issued in HMMS to an employee without an active, valid license. The contractor must submit an AF Form 3952 for the license to use the HAZMAT.

8. Contractors must submit a "Hazardous Material Purchase Request for Contractors" form prior to transporting any hazardous material onto Robins AFB. This form must be completed for all hazardous materials purchased by contractors for use on Robins AFB and approval must be granted prior to transportation onto Robins AFB. The purpose of this form is to ensure compliance with AFI 32-7086 and OSHA HAZCOM, ensuring that hazardous materials are approved for use prior to transportation onto Robins AFB and a current MSDS is available in HMMS. Once approval is given, the contractor is permitted to transport hazardous materials onto Robins AFB. The contractor must track the hazardous materials in HMMS and must send the HMMS serial numbers to the HAZMAT Cell to close the request.

9. Contractors must maintain compliance with the Robins AFB Hazardous Material Management Plan and AFI 32-7086. A copy of the plan can be obtained by contacting the Hazardous Material Cell (HAZMAT Cell).

10. Contractors should contact the HAZMAT Cell (78ceg.cev.hazmat@robins.af.mil) with specific HAZMAT questions.

H. Submittals, Notifications, and Approvals: The following submittals, notifications, and approvals are required to maintain compliance:

1. Hazard Communication (HAZCOM) Program: The Contractor must submit a written HAZCOM program to the CO when hazardous materials or chemicals are to be used or demolished. This HAZCOM plan must include the following information:

    a) List of each work activity/process required to use/demolish hazardous materials/chemicals.

    b) List of hazardous materials/chemicals used.

    c) MSDS for each hazardous material/chemical used. The MSDS must be the most current MSDS available from the manufacturer. MSDSs from third party MSDS sites are not allowed.

    d) Hazardous Material Listing and AF Form 3952 for each Hazardous Material: Provide the CO with MSDS and the list of hazardous materials/chemicals prior to starting work. Each MSDS must be accompanied with a completed AF Form 3952, detailing the intended use of the hazardous material. The same procedure should be followed for additional hazardous material brought on base during the performance of the contract. The CO will forward the list of hazardous materials, AF Form 3952s and MSDSs to the HAZMAT Cell, 78 CEG/CEANQ, for review and approval. Hazardous materials are not permitted for transportation onto Robins AFB or use on Robins AFB until approval is given by 78 CEG/CEANQ. A completed, signed, approved AF Form 3952 is required for every hazardous material used on Robins AFB.

    e) Written procedures for handling of any hazardous waste generated.

2. Asbestos Work/Removal: The Contractor shall provide 15 working day notification to the CO and 78 CEG/CEANQ Toxics Program Manager and 10 working day notification to GA EPD prior to the start of any work involving asbestos. Copies of all notifications, GA EPD approval, and landfill disposal receipts and waste shipment tracking forms must be provided to the CO and 78 CEG/CEANQ Toxics Program Manager.

3. Lead Based Paint: For maintenance, repair, and minor construction projects. Provide a written compliance program as required by OSHA Standard 29 CFR 1926.62 to the CO and the 78 CEG/CEANQ Toxics Program Manager. Provide certification that contractor personnel involved in removal and handling of lead based paint has received training in accordance with OSHA Lead Standards. Provide results of air sample testing to demonstrate worker safety. For abatement projects only, provide submittals as specified in Section 01569 of the specifications.

4. ODS and Controlled Substances Restriction:

    a) The Contractor shall provide the name, address, telephone number, and technician certification of each person who will service, repair, maintain and/or dispose of any equipment containing and/or using a refrigerant (Class I ODS, Class II ODS, or non-ozone depleting substance) to 78 CEG/CEAN.

    b) The Contractor shall provide a list of appliances located on base that have a capacity of 50 pounds or more of a Class I or Class II refrigerant to 78 CEG/CEAN. Include the following information for each appliance:

        (1) The type of appliance, i.e., commercial refrigeration appliance, industrial process refrigeration appliance,

comfort cooling appliance, or other type of refrigeration appliance;

(2) The location of each appliance;

(3) The manufacturer, serial number, or other method of identification;

(4) The amount of the full charge of refrigerant, the type of refrigerant used, and the date full charge was determined.

c) For maintenance, service, repair, and/or disposal of base appliances containing 50 pounds or more of a Class I or Class II refrigerant, provide records, work logs, service tickets, invoices, and supporting documentation to 78 CEG/CEAN. The documentation required should contain the following:

(1) The date and type of service performed, i.e., repair, maintenance and/or disposal;

(2) The date any leak was discovered;

(3) A complete, detailed description of any service performed;

(4) The amount of refrigerant added at the completion of each service performed;

(5) Dates and results of the initial and follow-up verification tests; and

(6) The name of the technician who performed the work.

d) For any equipment used to recover or recycle refrigerants on base, provide the following information to 78 CEG/CEAN:

(1) A copy of any invoice or other record documenting the purchase or rental of such equipment, including the type of equipment, the manufacturer's name, the equipment model number, year manufactured, and any associated serial number; and

(2) A copy of the equipment certification sent to EPA.

e) For any purchases or acquisitions of refrigerant used for any service on base, provide copies of records, including, but not limited to, receipts, invoices, purchase orders, or bills of lading to 78 CEG/CEAN. The information should include the name, address and telephone number of each person, agent, or business entity from whom the facility purchased refrigerant.

5. DODAAC Account: After the Preconstruction Conference, the Contractor must have a valid DODAAC or work with the COR to obtain a DODAAC account number to pay DRMO for disposals.

a) After contract award, work with the 78 CEG/CEANC Point of Contact (POC) to discuss how to obtain containers and container labels. The Contracting Official Technical Representative must apply or update a DODAAC through the AF DODAAC manager at https://dodaac.wpafb.af.mil/.

b) Wait until the DODAAC account number is validated to begin generating regulated waste items to avoid long-term storage issues.

3.03 AIR QUALITY:

A. The contractor will perform value engineering for each project requiring specification or installation of equipment for control of regulated air pollutants. These analyses will ensure that the proposed control technology meets air quality compliance requirements. New sources require utilization of Maximum Achievable Control Technology to reduce emissions of hazardous air pollutants.

B. Open Burning: Open burning operations are prohibited on base and shall not be used. Open burning is any outdoor fire which emits products of combustion directly into the open air without passing through a stack, chimney, or duct.

C. Ozone depleting substances are restricted from use. Comply with paragraph 3.02.F. above.

D. Projects which will put generators into operation will require certification from the manufacturer of the unit that all Federal Standards for the performance of Stationary Compression Ignition Internal Combustion Engines are met. This certification must be submitted and approved by the CO prior to ordering and delivery of the unit.

E. Submittals, Notifications, and Approvals: The following submittals, notifications, and approvals are required to maintain compliance:

1. Air Permit – Emission Sources: According to GA EPD Rules for Air Quality Control, Chapter 391-3-1-.03, any person prior to beginning the construction or modification of any facility which may result in air pollution shall obtain a permit for the construction or modification of such facility. The contractor shall submit the required data to complete the permit application form as early in the planning process as possible. Since an approved permit to construct is mandatory prior to start of construction, the contractor shall not install the equipment until the permit has been approved and Government approval of the contractor's submittal has been obtained. Contractor shall anticipate nine months to one year from air source data submittal for this to occur. Direct all inquiries to the 78 CEG/CEANQ Air Program Manager.

3.04 DUST CONTROL:

A. General: The Contractor must maintain all excavations, embankments, stockpiles, haul roads, permanent access roads, plant sites, waste areas, borrow areas, and all other work within or without the project boundaries free from dust which could cause a hazard or nuisance to others. Dust is considered minute solid particles caused to be suspended by natural forces or by mechanical processes such as, but not limited to, crushing, grinding, milling, drilling, demolishing, shoveling, conveying, covering, bagging, mixing, and sweeping.

B. Dust Control Measures: Perform dust control as the work proceeds and whenever a dust nuisance or hazard occurs. Approved temporary methods of stabilization consisting of sprinkling, chemical treatment, light bituminous treatment, or similar methods are permitted to control dust. To be approved, sprinkling must be repeated at such intervals as to keep all parts of the disturbed area damp at all times. If sprinkling is used, keep sufficient equipment on the job site at all times.

3.05 PESTICIDES (INSECTICIDES, FUNGICIDES, HERBICIDES, ETC.):

A. The Contractor shall use only EPA approved pesticides, insecticides, fungicides, herbicides, etc., and report pounds of active ingredient used for each pesticide to the 78 CEG/CEANR Natural Resources Program Manager at the end of the project. The Contractor shall abide by the principles of Integrated Pest Management, implementing physical methods to control pests as the primary strategy. Chemical methods of control should only be used as a last resort, and the chemicals used should be the most environmentally benign available. The contractor shall contact 78 CEG/CEANR before using pesticides, herbicides, etc., in order to ensure that the chemical they plan to use is on the list of products that have been approved for use on Robins AFB.

B. The Contractor must possess a pest control operator’s license and a list of all chemicals to be used. Use only a pest control operator licensed in the State of Georgia to apply these chemicals.

C. The Contractor must ensure proper delivery, storage, handling, and disposal of all chemicals.

D. Submittals, Notifications, and Approvals: The following submittals, notifications, and approvals are required to maintain compliance:

1. The Contractor must submit a list of all pesticides to be used and amount (pounds) of active ingredients used to 78 CEG/CEANR so that coordination of all pesticide usage can be coordinated with Base Entomology Shop, 78 CES/CEOSV.

2. Proof of License: The contractor must submit a copy of the pest control operator’s license to the CO and 78 CEG/CEANR.

3.06 RADIOACTIVE MATERIALS:

A. Radioactive materials are not permitted on base without the prior approval of the CO in coordination with 78 AMDS/SGPB. Common items to be aware of include equipment for roof moisture testing, soil moisture/compaction testing, and radiographic testing of welds.

B. Dispose of radioactive waste in accordance with Technical Order 00-110N-2, Radioactive Waste Disposal.

3.07 UNDERGROUND STORAGE TANKS (UST): The Contractor shall provide information to the CO so that 78 CEG/CEAN can submit notification to the GA EPD about the project. Allow at least 45 days after the Notice to Proceed before starting the removal process for tanks. The removal process must be completed within 90 days to comply with GA EPD regulations. Direct all inquiries to the 78 CEG/CEANQ Tanks Program Manager.

3.08 THREATENED AND ENDANGERED SPECIES OF PLANTS AND WILDLIFE: Two state-protected species of plants occur on Robins AFB, as well as eight other species considered to be rare. The Contractor shall not clear vegetation on project sites without prior approval from 78 CEG/CEANR. Rare wildlife species such as Bald Eagles and Wood Storks are occasionally seen on base. The Contractor shall not harm wildlife of any kind. Most wildlife species found on base are protected by law, including birds, bats, land turtles, non-venomous snakes, and game species such as deer. If the Contractor encounters problems with wildlife, notify the CO. The CO shall contact the 78 CEG/CEANR Natural Resources Program Manager to determine the best solution for each problem. The CO will ensure that the Contractor's actions do not injure rare species and/or their habitats.

3.09 WETLANDS: Wetlands delineation has been completed on base and wetland boundaries are currently identified with markers. However, markers can, in some instances, be missing or not readily visible, and wetlands often do not contain water throughout the year, so they may not be apparent. When in doubt, verify that the site in question is or is not a wetland by contacting 78 CEG/CEANR. These areas shall not be filled, dredged, or disturbed in any way. Comply with water and land protection sections outlined in this Specification to prevent construction site sediments and runoff from entering wetlands.

3.10 GREEN PROCUREMENT PROGRAM (GPP): The Contractor must follow the guidelines provided in 01540 Green Procurement Specification to comply with GPP requirements. Direct all inquiries to the 78 CEG/CEANQ Green Procurement Program Manager.

3.11 PRESERVING HISTORICAL AND ARCHAEOLOGICAL RESOURCES:

A. General: When a building or archaeological site determined eligible for the National Register of Historic Places is within a project area, the Contractor shall take adequate measures to prevent adverse impact to the cultural resource. This may include the development of a mitigation plan, consultation with the Georgia State Historic Preservation Office, the Advisory Council on Historic Preservation, and 12 culturally affiliated Native American tribes.

1. The Contractor shall provide 78 CEG/CEAN with all the project information to prevent adverse impacts to the building or archaeological site. The Contractor shall contact Cultural Resources Program Manager at the beginning of the project, one week before excavation starts and at least two hours before excavation resumes during the construction period.

2. When cultural resources are inadvertently discovered during construction, project personnel are directed to avoid the site of discovery and immediately contact the Cultural Resources Program Manager. All work in the area of discovery must stop until it can be investigated. 78 CEG/CEAN will send a qualified representative to the site and the resource will need to be recorded and evaluated and the effects mitigated as necessary.

B. Archaeological Finds: All archaeological finds are the property of Robins AFB. Do not remove or disturb finds without the CO's written authorization. Archaeological Finds are artifacts, ecofacts, or modifications to the landscape that are associated with past human activity and are a minimum of 50 years old.

3.12 PROTECTION OF LAND RESOURCES:

A. General: The Contractor shall not take any action that will adversely affect the existing Water Quality Standards classification of any streams, rivers, lakes, wetlands, or reservoirs within or adjacent to the project site or which would otherwise contribute to the pollution of these water resources. No fuel, oils, bituminous, calcium chloride, acids, construction waste, or otherwise harmful materials shall be permitted to enter these water resources. Land resources shall be preserved in their present condition or restored to a condition that appears natural and does not detract from the appearance of the surrounding area. If restoration is to be accomplished, the Contractor shall submit an appropriate restoration plan and receive base approval from 78 CEG/CEAN on the proposed mitigation procedures.

B. Stormwater Management during Construction: All land disturbances shall be conducted in accordance with the Georgia Erosion and Sediment Control Act. Additionally, the Contractor shall implement procedures and practices to eliminate or minimize stormwater pollution during construction activities in accordance with the *Engineering Technical Letter 03-1: Stormwater Construction Standards*. At a minimum, the Contractor shall not allow any debris to get into the storm drainage system. Chemicals, fuels, oils, lubricants, greases, or scrap metal stored on construction sites shall have containment and/or cover to prevent stormwater contact. Also, no materials shall be discharged into a drain, ditch, or ground surface that could result in pollution of stormwater runoff. Minimum control measures must be implemented to prevent degradation of water quality downstream resulting from any construction activity. Activities such as concrete truck washing, cleaning of painting equipment, equipment fueling, and general site housekeeping will require implementation of specific best management practices (BMP) to prevent stormwater contamination. For information on BMPs contact 78 CEG/CEANP or the 78 CEG/CEANQ Water Quality Program Manager.

If the project will disturb one (1.0) acre or more of land surface, coverage under National Pollutant Discharge Elimination System (NPDES) General Permit GAR100001, GAR100002, or GAR100003 shall be obtained through the submission of a Notice of Intent (NOI) to the GA EPD district office. Additionally, the Contractor shall submit an Erosion, Sedimentation, and Pollution Control (ESPC) Plan to 78 CEG/CEAN for review and approval prior to submitting the NOI to GA EPD. The ESPC Plan shall be developed using the Robins AFB template and meet or exceed the requirements of the respective applicable permit and the current edition of the *Manual for Erosion and Sediment Control* in Georgia. Inquiries shall be directed to the 78 CEG/CEAN Water Quality Program Manager.

C. Post Construction Stormwater Management: The Contractor shall implement minimum control measures for stormwater runoff from new development and redevelopment projects that includes the creation or addition of 5,000 square feet or greater of new impervious surface area, or that involves land disturbing area activity of 5,000 square feet of land or greater in accordance with the: (i) *Georgia Stormwater Management Manual (GSWMM)*; and (ii) Section 438 of the 2007 Energy Independence and Security Act (EISA) as specified in the 2010 Department of Defense Memorandum. For each project meeting the above criteria, the predevelopment (pre-project) hydrology must be maintained to the maximum extent technically feasible. Documentation of conformity will consist of inclusion of a post construction stormwater management plan (hydrology report) and associated calculations to the respective Project Manager. The post construction stormwater management plan shall be submitted through the established design review process and shall include calculations and information that meets the requirements of the GSWMM and EISA. The EISA criteria for temperature, rate, volume, and duration of flow must be addressed.

The Contractor shall use the following guidance when developing post construction stormwater management systems: (i) *Unified Facilities Criteria (UFC) 3-210-10, Low Impact Development Manual*; (ii) *US EPA 841-B-09-001: Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act* and *(iii)* Georgia Stormwater Management Manual.

D. Prohibition of Illegal Discharges: The Contractor shall not discharge or cause to be discharged into the municipal storm drain system or watercourses any materials, including but not limited to pollutants or waters containing any pollutants that cause or contribute to a violation of applicable water quality standards, other than stormwater.

The commencement, conduct, or continuance of any illegal discharge to the storm drain system is prohibited except as described below:

1. The following discharges are exempt from discharge prohibitions established by this requirement: water line flushing or other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising groundwater, groundwater infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, non-commercial washing of vehicles, natural riparian habitat or wetland flows, swimming pools (if dechlorinated - typically less than one part per million chlorine), fire fighting activities, and any other water source not containing pollutants.

2. Discharges specified in writing by Environmental Management, 78 CEG/CEAN as being necessary to protect public health and safety.

3. Dye testing is an allowable discharge, but requires a written notification to and approval from Environmental Management, 78 CEG/CEAN prior to the time of the test.

4. The prohibition shall not apply to any non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for any discharge to the storm drain system.

E. Prohibition of Illicit Connections:

1. The construction, use, maintenance or continued existence of illicit connections to the storm drain system is prohibited.

2. This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.

3. The Contractor is considered to be in violation of this requirement if the Contractor connects a line conveying non-stormwater discharges to the stormwater conveyance system, or allows such a connection to continue.

F. Spills: Prevent the spill of chemicals, fuels, oils, grease, bituminous materials, waste washings, herbicides, cement drainage, or any other hazardous materials, including breaking fluorescent or HID lamps and tubes. Immediately report all spills to the Base Fire Department, 778 CES/CEF, and emergency number 911. Ensure to report all emergency information, including name, telephone number, location of spill, and type and amount of material spilled. Notify the CO of the spill immediately following initial reporting to the Fire Department and 911. Take containment action against any hazardous spills, which threaten storm drains and other environmental areas. Ensure clean up of materials spilled.

The Contractor is responsible for the cleanup of material(s) spilled. No spill residue shall be transported off Robins AFB without specific approval from the CO. Spills involving large quantities and/or requiring special protective clothing and/or breathing devices to facilitate clean up may require action by the Base Spill Response Team. When the Base Spill Response Team is utilized, the Contractor shall provide support, as appropriate, for containment and clean up of spills. If the spill exceeds reportable quantity limits, coordinate notification to the National Response Center with 78 CEG/CEAN through the CO.

G. Tree Protection and New Landscaping:

1. Trees marked for removal on approved plans and drawings shall have existing identification tags removed (if present) and forwarded to the CO. Except in areas marked on the plans to be cleared, do not deface, injure, destroy, remove, or cut trees or shrubs without authority from the CO and 78 CEG/CEANR Natural Resources Program Manager. In cases where construction necessitates the removal of a large number of trees, 78 CEG/CEANR will need to first evaluate whether or not a logging contract is warranted (to be arranged by CEANR), as per AFI 32-7064 it is inappropriate to give away forest resources which have significant value.

2. In general, trees shall be protected from either excavation or filling within the root zone closer than the normal drip line of the tree. No ropes, cables, or guys shall be fastened to, or attached to any existing trees for anchorage unless specifically authorized by the CO. The contractor shall not allow vehicles to be routinely parked within the drip zone of trees which are designated for protection, nor will equipment be staged under these trees. The Contractor shall in any event be responsible for any damage resulting from such use.

3. Where, in the opinion of the CO, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment, blasting, dumping, or other operations, the CO may direct the Contractor to adequately protect such trees by placing boards, planks, plastic fence, or poles around them. When directed by the CO, construct barriers to protect trees from earthwork operations. Rocks that are displaced into uncleared areas shall be removed. Monuments, markers, and works of art shall be similarly protected before beginning operations near them.

4. The Contractor shall submit all landscaping plans to the 78 CEG/CEANR Natural Resources Program Manager for review and approval before implementation. Plans shall emphasize the use of native plant and tree species whenever possible, and shall include provisions for conserving water use and minimizing the need for pesticide and herbicide use.

H. Restoration of Landscape Damage: Surface Drainage: Surface drainage from cuts and fills within the construction limits and from borrow and waste disposal areas, shall be held in suitable sedimentation ponds or shall be graded to control erosion. Temporary erosion and sediment control measures such as berms, dikes, drains, or sedimentation basins, shall be provided and maintained until permanent drainage and erosion control measures are completed and operating. The area of bare soil exposed by construction operations at any time shall be held to a minimum. Stream crossings by fording with equipment shall be limited to control turbidity. Fills and waste areas shall be constructed by select placement to eliminate adjacent streams.

Stabilization of permanent steep slopes shall be accomplished as soon as possible to establish vegetation. Apply mulch (no more than 2-3 inches in depth) immediately after finished grading is completed, regardless of season, and delay seeding and fertilizing until the season most favorable for germination.

I. Submittals, Notifications, and Approvals: The following submittals, notifications, and approvals are required to maintain compliance:

1. Permit for Stormwater Management during Construction: If the project will disturb one (1.0) acre or more of land surface, coverage under NPDES General Permit GAR 100001, GAR 100002, or GAR 100003 shall be obtained through the submission of a NOI to the GA EPD district office. Provide the following as a minimum in complying with all applicable local, state, and federal laws:

   a) The Contractor shall submit an ESPC Plan signed and stamped by a Georgia Professional Engineer with Level 2 Certification from the Georgia Soil and Water Conservation Commission to 78 CEG/CEAN for review and approval prior to submitting the NOI to GA EPD. The ESPC Plan shall be developed using the Robins AFB ESPC Plan Template and meet or exceed the requirements of the respective applicable permit and the current edition of the *Manual for Erosion and Sediment Control in Georgia.*

   b) The Contractor shall submit a completed NOI to be covered by a NPDES Permit for stormwater discharge associated with construction activity to 78 CEG/CEAN for review and approval prior to submitting the NOI to GA EPD. After 78 CEG/CEAN approval of the ESPC Plan, the Contractor shall submit the NOI form and pay permit fees to both GA EPD and Houston County Public Works Department, at least 14 days prior to any site work.

   c) The Contractor is responsible for compliance with the NPDES Permit and shall perform all permit-required tasks, including inspections, monitoring, and recordkeeping until such time the site achieves final stabilization. The Contractor shall submit a 78 CEG/CEAN reviewed and approved Notice of Termination (NOT) to the GA EPD after final stabilization is achieved and there is no discharge associated with construction activities. All records shall be maintained for a period of three years from the date the NOT is submitted.

2. Plans for Post Construction Stormwater Management: A stormwater management plan (SWMP) and calculations for sizing of all post construction BMPs shall be submitted for all new development or redevelopment greater than 5,000 ft^2 (of impervious area or land disturbance). The design shall meet the minimum stormwater management standards of the *GSWMM* and Section 438 of EISA. The SWMP shall be submitted as part of the project design documents for the 60 percent design (i.e., intermediate design) submittal.

3.13 BACKFLOW PREVENTION DEVICES (BPDs):

A. General: All BPDs must be installed in accordance with current Uniform Plumbing Code (Section 603.3.4) and AFI 32-1066. BPDs must be selected to address the level of hazard and installed in locations that are readily accessible for inspection and maintenance. All BPDs must be installed by Georgia-certified BPD technicians. Direct all inquiries to Bioenvironmental Engineering, 78 AMDS/SGPB.

B. The Contractor shall coordinate with Government Project Manager to ensure Bioenvironmental Engineering has assigned the level of hazard and identified the appropriate BPD for the application prior to purchase of BPDs.

C. The Contractor shall coordinate the BPD installation location with the Government Project Manager to ensure the installation location is accessible and meets space requirements for inspection and maintenance.

D. The Contractor shall provide an inspection/testing of the BPD(s) in accordance with the manufacturer's instructions for the particular device or using procedures recognized by the tester's certifying agency. At a minimum, all devices shall be tested after installation, cleaning, repair, or relocation.

E. Submittals, Notifications, and Approvals: The following submittals, notifications, and approvals are required to maintain compliance:

1. The Contractor must coordinate location of BPDs with the Backflow Prevention Program Manager prior to installation.

2. The Contractor must submit a copy of BPD Test Report to the Backflow Prevention Program Manager.

---- END OF NARRATIVE SECTION ----

NOTE: Copies of the SWAA form, its tracking document, and monthly waste management report form follow.

Houston County MSW Landfill
2018 Kings Chapel Road
Perry, Georgia 31069
Telephone: (478) 987-0089
Fax: (478) 987-0102

Profile No. _____________
(Assigned by Houston County)

SPECIAL WASTE ACCEPTANCE APPLICATION (SWAA)

Generator Name: ____ Contact: ___________________
Address: ____
Telephone: ___________________________________ Fax: ____________________________________
Description of Waste: ____
Source / Location of Waste: ____
Waste Quantity: _____ Cubic Yards ☐ Tons ☐
Frequency of Disposal: Daily ☐ Weekly ☐ Monthly ☐ One Time ☐ Other __________

LABORATORY DATA (Please attach a hard copy of laboratory test data)

Physical Properties: Physical State: ______________ Solid ☐ Semisolid ☐ Liquid ☐Color: _______________
Halogenated Organics: mg/kg Flash Point: ________ ☐F Odor: Yes ☐ No ☐
Water Content: ______ % by Weight Paint Filter Test Passed ☐ Failed ☐
Reactive: No ☐ Yes ☐ With H2S ____ mg/kg HCN _____ mg/kg Others _____ mg/kg
pH Value: __________(S.U.) Infectious: Yes ☐ No: ☐

Chemical Properties (TCLP): (Concentrations in mg/l)

Arsenic	___	m-Cresol	___	Hexachlorobenzene	___	Pyridine	___
Barium	___	p-Cresol	___	Hexacholorobutadiene	___	Selenium	___
Benzene	___	Total Cresol	___	Hexachloroethane	___	Silver	___
Cadmium	___	2,4-D	___	Lead	___	Tetrachloroethene	___
Carbon Tetrachloride	___	1,4 Dichlorobenzene	___	Lindane	___	Toxaphene	___
Chlordane	___	1,2 Dichloroethane	___	Mercury	___	Trichloroethene	___
Chlorobenzene	___	1,1 Dichloroethylene	___	Methoxychlor	___	2,4,5 Trichlorophenol	___
Chloroform	___	2,4 Dinitrotoluene	___	Methyl Ethyl Ketone	___	2,4,6 Trichlorophenol	___
Chromium	___	Endrin	___	Nitrobenzene	___	2,4,5TP (Silvex)	___
o-Cresol	___	Heptachlor (a hydroxide)	___	Pentachlorophenol	___	Vinyl Chloride	___

None of the above constituents exceed TCLP disposal limits ___________________

Others (List) ____
Other Information: Delivery method: Bulk ☐ Other____
Regulatory Agency Approval Received: Yes ☐ No ☐ Permit Number_______________
Material Safety Data Sheet Provided: Yes ☐ No ☐

Generator's Certification Statement

"I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. To the best of my knowledge, the material described above is not classified as hazardous waste under current regulations, and I agree to notify Houston County MSW Landfill if such classification changes. The attached information provided is true and accurate to the best of my knowledge."

Signature of Authorizing Agent____ Date____________________

Name of Agent (Typed or Printed) _______________________________________ Title____________________

Houston County MSW Landfill **Profile No. _________________**
2018 Kings Chapel Road (Assigned to SWAA)
Perry, Georgia 31069
Telephone: (912) 987-0089

WASTE SHIPMENT TRACKING DOCUMENT

Generator Name:______________________________ Contact: _____________________
Address: ____________________________________
Telephone: ___________________________________ Fax: __________________________
Description of Waste: __________________________
Location of Waste: ____________________________

Date Shipped: _______________________________ Quantity Shipped: ______________

Certification: I certify the waste described above is the waste represented by the Special Waste Acceptance Application (SWAA) of the same Profile Number and no regulated hazardous waste has been introduced into the waste.

Generator's Signature: ___________________________ Date: _________________________

Transporter: ____________________________________ Contact: _______________________
Address: ______________________________________
Telephone: ______________________________________

Certification: I certify no regulated hazardous waste was introduced into the waste while in my custody:

Hauler's Signature: _______________________________ Date: _________________________

Waste Disposal Site: Houston County MSW Landfill

Quantity Received: ______________________________

Certification: I certify receipt and proper disposal of the Special Waste Profiled materials covered by this manifest.

Operator’s Printed Name: ______________________________

Operator’s Signature: ____________________________ Date: _________________________

Waste Management Report (Monthly)

Contract Number: ____________________ Government Inspector: ____________________
Contractor: ____________________ Project # Title: ____________________
Contractor POC: ____________________ Date: ____________________
Phone No: ____________________

I. MSW Landfill Disposal

Quantity (tons): _________
Landfill Site: ___________________
Tip fee/ton ($/ton): ______________
*Total cost of disposal ($): _______
*Total cost/ton ($/ton): __________

II. C&D Landfill Disposal

Quantity (tons): __________
Landfill Site: _________________
Tip fee/ton ($/ton): _____________
*Total cost of disposal ($): _______
*Total cost/ton ($/ton): __________

III. Inert Landfill Disposal

Quantity (tons): __________
Landfill Site: ________________
Tip fee/ton ($/ton): _____________
*Total cost of disposal ($): _______
*Total cost/ton ($/ton): _________

IV. Alternatives to Landfilling (Recycling Strongly Encouraged)

Type of Material	Quantity (pounds or tons)	Destination	* Handling & Transportation Cost ($)	*Expected Revenue & Tip Fee Earnings ($)	* Net Cost ($)	*Cost if Landfilled ($)	* Comparison Cost (+)/Savings (-)
Cardboard							
Dimensional wood							
Beverage containers							
Land debris							
Concrete							
CMU							
Asphalt							
Metals - all types							
Gypsum board							
Paint							
Carpet							
Insulation							
Glass							
Cast stone							
Wood materials							
Electric cable							
PVC piping							
Rubber flooring							
Raised flooring							

IV. Total net cost (+) or savings (-) from all alternatives to landfilling all project waste

V. Means of keeping recyclables free of contamination
All similar materials will be grouped together based on the requirements of the recycling center. All dissimilar materials will be kept in separate containers/bins in order to avoid contamination.

VI. Meetings to be held to address waste management
At regularly scheduled job site coordination/progress meetings and at job safety meetings, waste management requirements will be discussed to clarify any confusion with craftspeople.

* Optional

Robins Air Force Base
Base Facility Standards

Title: **Structural**

Date: **1 August 2011**

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 3A– STRUCTURAL

CRITERIA REFERENCE DOCUMENTS:

ASCE 7, Minimum Design Loads for Buildings and Other Structures (Latest Edition)
ASCE 37, Design Loads on Structures During Construction
International Building Code (Latest Edition)
UFC 1-200-01, General Building Requirements
UFC 3-301--01, Structural Engineering
UFC 3-310-04, Seismic Design for Buildings
UFC 3-310--08, Non-Expeditionary Bridge Inspection, Maintenance & Repair.
UFC 3- 320-03A Structural Considerations for Metal Roofing
UFC-3-320-06A Concrete Floor Slabs on Grade Subjected to Heavy Loads
UFC 3-320-7N Weight Handling Equipment
UFC 3-330-02A Commentary on Roofing Systems
UFC 3-340-01 Design & Analysis of Hardened Structures to Conventional Weapons Effects (FOUD)
UFC 3-340-02, Structures to Resist the Effects of Accidental Explosions
UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings
UFC 4-023-03, Design of Buildings to Resist Progressive Collapse
ACI 318, Building Code Requirements for Structural Concrete (Latest Edition)
ACI 530/ASCE 5/TMS 402, Building Code Requirements for Masonry Structures (Latest Edn)
AF&PA NDS, Natl Design Specification for Wood Construction and Supplement (Latest Edn)
AISC 303, Code of Standard Practice for Steel Buildings and Bridges (Latest Edition)
AISC/ANSI 360, Specs for Structural Steel Bldgs, Allow Stress Design & Plastic Design (Latest Edn)
AISC/ANSI 341, Seismic Provisions for Structural Steel Buildings (Latest Edition)
AISI/COS/NASPEC, North American Specs for the Design of Cold-Formed Stl Structures(Latest Edn)
AWS D1.1, Structural Welding Code - Steel
AWS D1.3, Structural Welding Code - Sheet Steel
AWS D1.4, Structural Welding Code - Reinforcing Steel
Building Construction and Safety Code, (Latest Edition)
MBMA, Low Rise Building Systems Manual, (Latest Revision)
Metal Building Systems Manual, (Latest Edition)
SDI 30, Design Manual for Composite Decks, Form Decks, and Roof Decks
SDI DDM02, Diaphragm Design Manual

1. STRUCTURAL DESIGN REQUIREMENTS:

All Designs, A-E and others, shall incorporate all structural design work necessary to construct a new facility, or to repair or modify an existing facility, as appropriate.
Structural design shall comply with the following Relevant Codes and Standards in addition to those listed above.

2. STRUCTURAL CALCULATIONS:

The A-E designs shall provide all applicable structural calculations at each design submittal level, especially at the pre-final & 100% submittals.

All other designs shall provide all structural calculations at 100% submittal.

The structural calculations shall include the following items:

a. Structural Analysis and Design of the Facility including all Structural Elements, Anchorage and Foundations.
b. The Structure/s & parts thereof shall be analyzed & designed to support safely, all the applicable loads and load combinations, required in Sec. 1.
c. The Analysis and Design shall meet the serviceability requirements of all the applicable loads and load combinations, required in Sec. 1.

3. SPECIAL STRUCTURAL REQUIREMENTS:

a. Unusual floor loads: The designer shall review the project for floor-loading conditions not normally encountered, such as safes, industrial equipment, etc.
b. Mezzanines: The project shall be designed for any special floor loading requirements planned for all mezzanine areas.
c. Fall Protection: The designer shall ensure Fall Protection requirements are included as applicable.
d. Clearances: Minimum clearances shall be allowed in design & construction of walkways, roads and accessories

4. FOUNDATIONS:

No foundation shall be constructed over existing or new water, sewer, steam, natural gas, Chilled-water, industrial waste, communications, computer, and foundation drain lines. All foundations shall be stepped down to an elevation below the bottom of pipe invert elevation, or the pipe relocated.

5. ANTENNAS AND OTHER EXTERIOR USER EQUIPMENT:

a. No antennas or other user equipment shall be mounted on the roof or walls, unless the mounting was analyzed prior to the installation and design standards or calculations Indicate a safe installation.

b. Exceptions may be granted only for small items approved on a case-by-case basis by the Structural Engineer in 778 CES/CEPD or CEPG. Request and approval must be in writing.

<<<<< **END OF BFS STRUCTURAL** >>>>>

Author: Suresh Dalmia, 778 CES/CEPT, 478-327-2926

Reviewer: Jeff Hooper, 778 CES/CEPG, 478-468-5923

Approval: ***Original Signed By***
Terry Landreth, 778 CES/CEPT, 478-327-2910

Revision History

24-Aug05 Separated from combined BFS into its own document
6-Jun-11 Revised the structural module 3A in its entirety.
12-Jul-11 Updated Robins AFB Office Symbols

Robins Air Force Base
Base Facility Standards

Title: Civil, General & Site Plan

Date : 01 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 3B – CIVIL, General & SITE PLAN

CRITERIA REFERENCE DOCUMENTS:

NAD 1983 State Plan Georgia West FIPS 1002

Manual for Erosion and Sediment Control in Georgia

UFC 3-250-04FA, Standard Practice for Concrete Pavements (16 Jan 2004)

UFC 3 –250-03, Bituminous Pavements Standard Practice (May 2001

UFC 3-230-17FA, Drainage in Areas other than Airfields (Jan 2004)

UFC 3-210-10, Low Impact Development

Georgia Stormwater Management Manual

ETL 04-2 with Change 1, Standard Airfield Pavement Marking Scheme with Change 1

American Association of State Highway and Transportation Officials (AASHTO).

AFI 32-7064 Integrated Natural Resources Management

UFC 3-260-01, Airfield and Heliport Planning and Design

AFMAN 91-201, Explosive Safety Standards

USEPA 841-B-09-001, Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act

Georgia Construction General Permits GAR100001, 100002, 100003

BFS Part 2 - Environmental

BFS Part 3G - Stormwater

BFS Part 4B - Architectural Compatibility Plan

BFS Part 7A – Energy Conservation

CIVIL - SITE,

1. GENERAL: This is one part of the Robins AFB Base Facility Standards. Refer questions or exception requests to the Design Chief in 778 CES/CEPT. Any exceptions granted to these requirements shall be noted clearly in the project design analysis by using a Deviation Request.

2. LOCATION PLAN: (Scale 1" = 400'):

a. Facility/project location: The project will be located at Robins AFB, GA.

b. Site access: All commercial construction traffic must enter at Gate 4. Construction projects on the Flightline may be permitted to use Gate 1 only when approved by the Base. The peak traffic flows at the site are from 0700 to 0830 and from 1530 to 1700.

c. Construction material storage areas: The proposed construction storage areas shall be shown on the site plan and shall be available for storage of construction materials throughout the construction contract. The Contractor will be responsible for security measures.

3. SITE PLAN: (Scale 1" = 50').

a. Existing grades and contours shall be shown on the site plan. Use a minimum of one foot contour line intervals.

b. The facility orientation shall be shown on the site plan. All coordinates shall be in NAD 1983 State Plan Georgia West FIPS 1002. All elevations shall be in measurements of feet only. This ensures that when the final drawings are provided to GIS that the ".dwg" or ".shp" files can be inserted into the data base and will be instantly usable with no alterations.

c. Show construction contractor laydown area adjacent to the site. Coordinate with the specific Construction Office COR to determine whether the contractor will be allowed to have a trailer at the site, or whether it must be located elsewhere on the base, then show or describe the trailer location.

d. Erosion Control: The "Manual for Erosion and Sediment Control in Georgia" shall be used to design all erosion control measures. Details shall be included in the plans.

e. Pavements: Existing and proposed pavements shall be shown on the site plan. Describe pavements in detail.

(1) Streets, parking lots, and sidewalks:

(a) Sidewalks shall be constructed of rigid pavement (concrete), or permeable pavement, or consider other approved LID approaches. Rigid pavement shall be designed in accordance with UFC 3-250-04FA, Standard Practice for Concrete Pavements (Jan 2011- Under Review), and flexible pavements (such as asphalt) shall be designed in accordance with UFC 3 –250-03 Bituminous Pavements Standard Practice (May 2001), and UFC 3-210-10, Low Impact Development Structures.

(b) Striping parking spaces: Use larger than minimum space widths and aisle widths in commercial areas such as the Base Exchange and Commissary. Many patrons have SUV's, so the widths must allow for wider and deeper vehicles, as well as greater turning radii. In low turnover areas, the parking stalls shall be 9' wide by 18.5' long. On high turnover areas, the parking stall shall be 9.5' wide by 18.5' long. The parking stripe shall be one stripe only (not doubled) and 4" wide. Reference: Architectural Graphic Standards, Eleventh Edition, American Institute of Architects

(c) Road cuts: Road cuts have to be approved by the Base Civil Engineer. If asphalt road is cut, replacement pavement required will be a minimum of 8" of concrete and 1 1/2" of asphalt. If concrete road is cut, replacement pavement required will be a minimum of 8" of concrete or the thickness of the existing pavement, whichever is greater. The replacement shall rest on no less than 12" of undisturbed soil on each side

(2) Curbs, gutters, culverts, and pads: Provide sufficient curbs, gutters, culverts and other facilities to insure adequate drainage to meet overall stormwater management goals for the respective site. See BFS Stormwater Section for design criteria. No pipe smaller than 18" will be allowed for any culvert under roadways. Do not paint curbs.

(3) Runways, taxiways, aprons, overruns, and shoulders: If the project involves construction of new, or alteration of existing, airfield pavement (including runways, taxiways, aprons, overruns, and shoulders), then the design must be reviewed for technical adequacy by the Base Pavements Engineer. For airfield pavement marking schemes see ETL 04-2 with Change 1.

f. Bridges and fences: If the project involves construction of bridges, the design shall be in accordance with the latest edition of American Association of State Highway and Transportation Officials (AASHTO). If the project involves construction of fences, such fences shall be constructed in accordance with latest AF guidance in AFI's and ETL's. Also see Base Architectural Compatibility Plan criteria for fences.

g. Structures and existing trees <u>over three inches diameter</u> shall be shown on the site plan. Remove only those trees necessary for the construction of the building. The designer shall incorporate as many of the remaining trees as possible into an effective landscaping plan in conjunction with a parking lot plan to accommodate the maximum number of vehicles. Specifically, show these on the site plan:

1) Existing railroads. No new railroads are required or anticipated.

2) Existing industrial and sanitary wastewater piping, manholes, valves, and lift stations.

3) Existing storm piping and structures, drainage ditches/swales, headwalls, and ponds.

4) Existing gas distribution and service lines.

5) Existing water lines and valves.

6) Existing communication lines.

7) Existing UMCS lines.

8) Existing electrical lines.

9) Existing cathodic protection cables and equipment.

10) Existing heat service/steam lines.

11) Existing chilled water lines.

12) Existing POL facilities, including pipelines, valves, etc.

13) Existing fire hydrants.

14) Contractor construction limits for the project.

15) Groundwater monitoring wells/locations.

16) Existing State Waters and Stream Buffers.

4. NARRATIVE DESCRIPTION:

a. Site restrictions: If the project site is in a restricted area, or the type of construction requires some site restrictions, then identify them in accordance with Air Force Standards.

b. Subsoil conditions: The soil in the area generally consists of poorly graded mixtures of sand clays and silty sands with the exception of the Flightline East Area where the soil generally consists of organic gray silty clay. The design Agent shall arrange for soil borings, plate-bearing tests, and CBR tests as required for a thorough subsoil investigation prior to final design. The water table varies basewide but is generally within 15-20 feet of the existing ground surface, with the exception of the Flightline East Area where the water table is generally within 0-5 feet of the existing ground surface.

c. Flood hazard evaluation: The existing elevation of the project site shall determine if is above or below the 100 year flood plain, which is at 258 feet above mean sea level. (In prior years, the level had been 257 feet.)

d. AICUZ (Air Installation Compatible Use Zone) noise level criteria: The project site shall be evaluated for AICUZ noise level criteria to determine if any noise reduction will be required for this project.

e. Erosion/dust control requirements: Erosion control measures shall be designed in accordance with the latest edition of the "Manual for Erosion and Sediment Control in Georgia." Disturbed areas, including trenches, shall receive erosion control in the form of permanent turf established by seeding or installation of sod. Grasses and seeds shall be suitable for the area and season it is to be planted. Seeds shall be either Centipede or Bermuda if planted between April and August and Penntine or Falcon fescue if planted between September and March. Projects involving the disturbance of greater than 5000 square feet of land may be applicable to Energy Independence and Security Act of 2007, Section 438 requirements; and if disturbing greater than one acre of land projects will require coverage under the Georgia Construction General Permit. See BFS Stormwater Section for further details on these requirements.

f. Base Comprehensive Plan (BCP) coordination: Describe conformance or nonconformance with BCP, such as future land use conflicts, etc.

g. Relationship of proposed siting to identified Installation Restoration Program sites. The project site location shall be identified by distance and direction (North, South etc.) from the IRP sites.

h. The use of cranes by construction personnel within the area around the airfield and runway requires formal crane permits. Contact 78 CES/CEAO for assistance and information on the amount of advance notice required.

i. Digging Permits are required to do any excavation or earthwork. The weekly meetings are chaired by 78 CES and are usually held Monday mornings in Bldg. 1555.

5. WETLANDS (AFI 32-7064): The project site shall be evaluated for the requirements of EO 11990.

6. FLOODPLAINS (AFI 32-7064): The project site shall be evaluated for the requirements of EO 11988.

7. ARCHAEOLOGICAL AND HISTORICAL SITES (LEE LTR, 4 JAN 82, PARA 1d): Consultation with State Historic Preservation Officer (SHPO) is required to determine if survey or evaluation indicates the project will or will not affect eligible property.

8. EO 12372, COORDINATION (AFI 32-7064): The project shall be coordinated with all intergovernmental departments as applicable.

9. FAA (AFI 32-7064): The project shall be reviewed for clearance requirements from the regional FAA.

10. NOISE SITING COMPLIANCE (AFI 32-7064): The project shall be reviewed for noise reduction requirements of AFM 19-10. If noise reductions apply, they shall be incorporated into the design and construction.

11. AIRFIELD CLEARANCE CRITERIA COMPLIANCE (UFC 3-260-01, Nov 2008): The project shall be reviewed for compliance with airfield clearance criteria including clear zone and accident potential zones (UFC 3-260-01, Nov 2008).

12. EXPLOSIVE QUANTITY/DISTANCE (Q/D) SITING AND SAFETY CRITERIA (AFMAN 91-201, Explosive Safety Standards) If a project involves munitions storage and explosives or other related facilities, it shall be reviewed for explosive *quantity/distance siting and safety criteria* (AFMAN 91-201, Explosive Safety Standards*). If project* does not involve explosives, it shall be reviewed for Q/D clear zone criteria from any explosives facilities.

13.SOLAR APPLICATIONS: The designer shall review for energy conservation measures. (See Mechanical Considerations) Site lay-out should include consideration for optimum orientation of facility for maximum solar gain during the winter months and minimum solar gain during the summer months.

15. CIVIL CALCULATIONS: Provide all civil design calculations not later than the preliminary design submittal.

<<<<< **END OF SECTION** >>>>>

Author: Ken Scruggs, 778CES/CEPT, 478-327-2928

Reviewer: Wilson Jones, 78CES/CEOS, 478-327-8932

Approval: ***Original Signed By***
Terry Landreth, 778 CES/CEPT, 478-327-2910

Robins Air Force Base

Base Facility Standards

Title: Water Supply

Date: 01 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 3C – WATER SUPPLY

CRITERIA REFERENCE DOCUMENTS:

UFC 3-230-02   O&M Water Supply Systems

UFC 3-230-03A Water Supply

UFC 3-230-04A Water Distribution

UFC 3-230-08A Water Supply Treatment

UFC 3-230-09A Water Supply Water Storage

UFC 3-230-10A Water Supply Water Distribution

AFI 32-1065, Grounding Systems

AFI 32-1066, Backflow Prevention

AFI 32-1067, Water Systems

AFI 48-144, Drinking Water Surveillance Programs

AFMAN 32-1072, Water Well Drilling Operations

ETL 08-10, Alternate Water Sources – Use of non-potable water

ETL 04-5, Design recommendations for Potable Water System Security (FOUO)

Minimum Standards for Public Water Supply Systems (GA EPD)

See BFS 5C – Plumbing

See BFS 7A – Energy Conservation

Senate Bill 370, Water Stewardship Act June 2010

WATER SUPPLY:

a. The existing rated fire flow will be analyzed under a separate design section. See Fire Protection Standards.

b. All potable water on Robins AFB has been treated. The designer shall review to see if any additional treatment is required for the consumptive use.

c. If the proposed project discharges any mixture of chemicals or solid waste into the industrial or sanitary waste water systems, the project shall be reviewed to determine if any additional chemical analysis of water is required to meet the Robins AFB, State of Georgia, and US EPA requirements for industrial or sanitary waste water treatment.

d. The existing Base water storage and distribution system will provide the water for the facility. The system consists of 6 wells with a pumping capacity of 6252 gpm. Typical system pressure is 55 psig. The designer shall design the facilities to ensure adequate water for potable, industrial, and fire fighting requirements. All meters must be commercial/industrial grade and certified for accuracy

e. The designer shall review to see if there will be any unusual peak demand requirements, i.e. filling industrial process tanks, continuous wash processes, etc. A formal hydraulic study shall be provided if a high water demand is expected in an area that marginally meets pipe size and pressure requirements.

f. Cathodic protection shall be provided on all new underground steel systems and piping. Insulating devices shall be used as necessary to isolate dissimilar metal common to an electrolyte (soil, water, etc). All underground steel systems shall be coated and/or wrapped to minimize cathodic protection current requirements. See Corrosion Control Standards. All water service lines and water mains constructed using nonmetallic materials shall be installed using locating tape and locating wire. The wire will be accessible where the service turns up into the facility and in valve boxes.

g. All water lines serving a facility shall be equipped with a water meter. All water meters shall have the capacity to be read remotely and compatible with the existing system.

h. All service lines to new construction or for major facility renovation in which a new service lateral is installed:

1. The backflow prevention device (BPD) shall be accessible for testing, not higher than 5 feet off the floor with ample room to access the test cocks.

2. All BPD installation locations shall be approved prior to installation to ensure ease of access for routine inspection and maintenance.

3. In the case of facilities with a service connection to the Robins AFB public water system, these facilities shall be protected against backflow from the facility by installing an approved BPD in the service line appropriate to the degree of hazard as follows:

A. In the case of any premises where there is an approved auxiliary water supply and it is not subject to any of the rules set out in subsections h.3.B through D of this section, the public water system shall be protected by an approved air gap separation or an approved reduced pressure principle backflow prevention device.

B. In the case of any premises where there is water or any substance that would be objectionable but not hazardous to health if introduced into the public water system, the public water system shall be protected by an approved double checkvalve assembly.

C. In the case of any premises where there is any material dangerous to health which is handled in such a fashion as to create an actual or potential hazard to the public water system, the public water system shall be protected by an approved air gap separation or an approved reduced pressure principle backflow prevention device. Examples of facilities where these conditions exist include sewage treatment plants, boiler/steam plants, production or manufacturing processes using chemicals and rinse systems, aircraft/equipment depainting, plating/anodizing operations, and hospitals.

D. In the case of any premises where there are uncontrolled cross connections, either actual or potential, the public water system shall be protected by an approved air gap separation or an approved reduced pressure principle backflow prevention device at the service connection.

E. In the case of any premises where, because of security requirements or other prohibitions or restrictions, it is impossible or impractical to make a complete in-plant cross connection survey, the public water system shall be protected against backflow from the premises by either an approved air gap separation or an approved reduced pressure principle backflow prevention device on each service to the premises.

i. Adequate controls shall be established to provide for wellhead protection from pollution. An area 25 ft in diameter minimum around the well called a control zone shall be fenced and the gate locked. No sources of pollution shall be allowed within this area including generator storage tanks and electrical transformers. However, electrical generators may be allowed within the area. Inner Management Zones of 100 ft. diameter shall also be established around each well. This area shall be maintained in such a way as to preclude pollution sources wherever possible.

j. Any underground potable water system installed in declared environmental hot zones, close or inside POL areas shall be metallic. PVC is resistant to some chemicals but is not resistant to petroleum products.

k. Any new water main construction shall be chlorinated using AWWA standards before it is connected to the base distribution system. Contractor shall obtain lab tests of water quality after testing and flushing is accomplished and provide test results to Bioenvironmental Engineering and the 78th Civil Engineer Industrial Utilities Shop prior to connecting new water lines to the existing system. Fittings and tools used in hot tapping or connecting to existing system shall be cleaned using a 5% sodium hypochlorite solution.

l. There shall be no potable water line installed in a manner which enters a storm sewer manhole or catch basin, or a wastewater manhole. Any such instances discovered during construction or demolition shall be amended by relocating the potable water piping outside a manhole or catch basin.

m. Any construction project which includes a modification (additions, extensions, repairs) to the Robins AFB potable water system shall prepare and submit an engineering design package. The system modifications shall be designed in accordance with the Minimum Standards for Drinking Water (GA EPD). The design package shall include the (GA EPD) Drinking Water Project Submittal Form and drawings for review and approval through the Environmental Management Branch of the 78th Civil Engineer Group and by GA EPD. This package shall include information and drawings signed and stamped by a Georgia Professional Engineer as follows: a description of modification to public water system, disinfection procedures, as-built utility drawing, proposed changes drawings, and notes and details of all connections and appurtenances. Drawings must be completed at a scale that provides for ease of viewing and understanding.

<<<<< **END OF SECTION** >>>>>

Author: Ken Scruggs, 778CES/CEPT, 478-327-2928

Reviewer: Russ Adams, 78CEG/CEANQ, 478-8304

Approval: ***Original Signed By***
Terry Landreth, 778 CES/CEPT, 478-327-2910

Robins Air Force Base

Base Facility Standards

Title: Waste Water Treatment

Date: 1 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 3D – WASTEWATER TREATMENT

CRITERIA REFERENCE DOCUMENTS:

UFC 4-240-04A, Wastewater Collection (Jan 2004)

UFC 3-240-09A, Domestic Wastewater Treatment (Jan 2004)

UFC 3-220-05, Dewatering and Groundwater Control

UFC 3-240-02N Wastewater Treatment System Augmenting Handbook

UFC 3-240-03N Wastewater Treatment System Augmenting Handbook Operation and Maintenance

UFC 3-240-04A Wastewater Collection

UFC 3-240-06A Wastewater Collection and Pumping

UFC 3-240-07FA Sanitary and Industrial Wastewater Collection: Gravity Sewers and Appurtenances

UFC 3-240-08FA Sanitary and Industrial Wastewater Collection: Pumping Stations and Force Mains

UFC 3-240-09FA Domestic Wastewater Treatment

UFC 3-240-13FN Industrial Water Treatment Operation and Maintenance

UFC 4-832-01N Design: Industrial and Oily Wastewater Control

AFI 32-1061, Providing Utilities to US Air Force Installations

AFI 32-1066, Water Systems

AFI 32-7041, Water Quality Compliance

ETL 08-10, Alternative Water Sources – Use of Non-Potable Water

ETL 86-8, Aqueous Film Forming Foam Waste Discharge Retention and Disposal

ETL 99-1, Treatment and Disposal of Aircraft Washwater Effluent

ETL 89-2, Standard Guidelines for Submission of Facility Operation and Maintenance Manuals

1. WASTEWATER TREATMENT:

a. The designer shall calculate and provide in a Design Analysis the projected industrial and/or functional wastewater discharge for each project being designed. The quantity and quality of wastewater discharged shall be evaluated to see if it can be adequately handled by the existing Base wastewater treatment system. All efforts to incorporate recycling/reuse of wastewater shall be included.

b. All existing sewer lines shall be shown on the site plan. Calculations, sewer profiles, and related hydraulic information for proposed wastewater connections are to be included in design documents. All design drawings for wastewater treatment systems, components, and facilities shall be certified by a State of Georgia Licensed Professional Engineer.

c. Existing flow capacity shall be determined and the type of treatment required. The project shall evaluate the existing wastewater flow and available design capacity for treatment. Adequate capacity shall be assessed for all downstream lift stations. High-volume (>50,000 gallons per day), or large-batch discharges (>5000 gallons) shall consider modeling of the sewer flow characteristics to determine capacity of downstream systems.

d. The existing systems limitations such as wastewater compatibility and required wastewater pretreatment and segregation shall be determined for each project. Wastewater pretreatment systems are required for certain industrial wastewaters, based on contaminant loading and chemical constituents, and will be determined through the design review process. Proposed new process discharges of industrial wastewater that may affect the quality of the effluent shall be listed in the design narrative, and shall include an evaluation of the strength and mass loading of the wastewater constituents. Specifically, the Chemical Oxygen Demand, Solids (including Oil and Grease), metals, nutrients, and toxic pollutants or any other chemical which could affect effluent quality shall be evaluated.

e. The project designer shall determine if any wastewater sludge/solids will be accumulated as part of the project. The designer shall determine how the sludge will be collected, removed, and accumulated.

f. The project designer shall determine if the treatment system requires any improvements in the following areas: treatment plants, pre-treatment systems, trunk mains, manholes, lift stations, fuel/oil-water separator, or storage and bypass restrictions. All new lift stations shall be constructed using a duplex pump system, level controls, visible and audible alarms, lockable perimeter fence where specified, shall connect to the Robins AFB SCADA system, and shall include all appropriate appurtenances. The existing sewer lines shown on the site plan that will be under the proposed new facility shall be removed and relocated. No interruption of sewage flow shall occur during construction.

g. For all new wastewater pretreatment systems, lift stations, or wastewater treatment facility systems, an Operation and Maintenance manual shall be provided by the construction contractor.

h. Laboratory: The designer shall investigate to see if any new laboratory requirements will require modifications or additions to the existing Base Wastewater Treatment laboratory facilities.

<<<<< **END OF SECTION** >>>>>

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Approval: ***Original Signed By***
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Robins Air Force Base
Base Facility Standards

Title: Civil – Stormwater

Date: 01 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 3G – CIVIL - STORMWATER

CRITERIA REFERENCE DOCUMENTS:

Stormwater Local Design Manual for Houston County, Georgia

Georgia Stormwater Management Manual, Volume 2

- General Permit No. GAR100001, Authorization to Discharge Under The NPDES Stormwater Discharges Associated with Construction Activity for Stand Alone Construction Projects
  (Note that General Permit Nos. GAR100002 and 100003, for Infrastructure Construction Projects and for Common Developments, respectively, were reviewed and unique requirements are also described.)

EISA Technical Guidance

ETL 11-8 – Decision Criteria for Installing Vegetative Green Roofs at CONUS Installations

ETL 08-13 – Incorporating Sustainable Design and Development (SSD) and Facility Energy Attributes in the Air Force Construction Program (which references the Air Force Sustainable Design and Development Policy Memorandum)

ETL 08-6 – Design of Surface Drainage Facilities (which references FAA AC 150/5320-5C Surface Drainage Design)

ETL 04-6 – Inspection of Drainage Standards

ETL 03-1 – Stormwater Construction Standards

UFC 2-000-02AN – Installation Master Planning

UFC 3-210-01A – Area Planning, Site Planning, and Design

UFC 3-210-06A – Site Planning and Design

UFC 3-210-10 – Low Impact Development

UFC 3-230-06A – Subsurface Drainage, with Changes 1-2

UFC 3-230-17FA – Drainage in Areas Other than Airfields

UFC 3-260-01 – Airfield and Heliport Planning and Design

1. Stormwater – *See attached GA110286_DesignCriteriaReviewTable.doc* for additional details on RAFB requirements, including local basic analysis of the referenced criteria that designers must apply in their designs.

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Design Criteria Review
Robins AFB, Georgia

Documents Reviewed:

- Local: Stormwater Local Design Manual for Houston County, Georgia
- State:
  - Georgia Stormwater Management Manual, Volume 2
  - General Permit No. GAR100001, Authorization to Discharge Under The NPDES Stormwater Discharges Associated with Construction Activity for Stand Alone Construction Projects
    - Note that General Permit Nos. GAR100002 and 100003, for Infrastructure Construction Projects and for Common Developments, respectively, were reviewed and unique requirements are also described.
- Federal:
  - EISA Technical Guidance
  - Engineering Technical Letters and Unified Facilities Criteria – The following ETLs and UFCs were reviewed based on potential applicability to stormwater management system design. Based on this review, the documents in italics are believed to be most applicable to the Design Criteria Review. Details regarding their content are provided herein.
    - ETL 11-8 – Decision Criteria for Installing Vegetative Green Roofs at CONUS Installations
    - *ETL 08-13 – Incorporating Sustainable Design and Development (SSD) and Facility Energy Attributes in the Air Force Construction Program* (which references the Air Force Sustainable Design and Development Policy Memorandum)
    - *ETL 08-6 – Design of Surface Drainage Facilities* (which references FAA AC 150/5320-5C Surface Drainage Design)
    - ETL 04-6 – Inspection of Drainage Standards
    - *ETL 03-1 – Stormwater Construction Standards*
    - UFC 2-000-02AN – Installation Master Planning
    - UFC 3-210-01A – Area Planning, Site Planning, and Design
    - UFC 3-210-06A – Site Planning and Design
    - *UFC 3-210-10 – Low Impact Development*
    - UFC 3-230-06A – Subsurface Drainage, with Changes 1-2
    - UFC 3-230-17FA – Drainage in Areas Other than Airfields
    - UFC 3-260-01 – Airfield and Heliport Planning and Design

Acronyms:

BMP	Best Management Practice
cfs	cubic feet per second
CPv	Channel Protection Volume
DA	Drainage Area
DoD	Department of Defense
E&SC	Erosion and Sedimentation Control
EISA	Energy Independence and Security Act of 2007
ESPCP	Erosion, Sedimentation, and Pollution Control Plan
ETL	Engineering Technical Letters
FAA AC	Federal Aviation Administration Advisory Circular
GA EPD	Georgia Environmental Protection Division
GSMM	Georgia Stormwater Management Manual
LEED	Leadership in Energy and Environmental Design
LEED AP	Leadership in Energy and Environmental Design Accredited Professional
LID	Low Impact Development
MAJCOM	Major Command
METF	Maximum Extent Technically Feasible
MILCON	Military Construction
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
N/A	Not Applicable
O&M	Operation and Maintenance
Qp2	2-year, 24 hour Storm Peak Discharge Rate
Qp25	25-year, 24 hour Storm Peak Discharge Rate
SCS	Soil Conservation Service
SIC	Standard Industrial Classification
sq ft	Square Feet
SS	Sustainable Sites
SSD	Sustainable Design and Development
TSS	Total Suspended Solids
UFC	Unified Facilities Criteria
WQv	Water Quality Volume

Recommendations:

POST-CONSTRUCTION DESIGN

Project Size: Generally for all projects; at a minimum for projects with land disturbance equal to or exceeding 5,000 sq ft

Water Quantity Criteria/Analysis:

1. DoD Airfield and Heliports – For 2-year storm event; no encroachment of runoff on taxiway and runway pavements (including paved shoulder); ponding around apron inlets limited to 4-inches. Computations should be made to determine critical duration required to produce maximum

runoff rate. For 10-year storm, the center 50% of runways, center 50% of taxiways, and helipad surfaces along the centerline should be free from ponding.

2. For Areas other than Airfields:
    a. Retain the 95th percentile storm event where technically feasible.
    b. No increase in runoff rates allowed at any discharge point on-site for the 1-, 2-, 5-, 10-, 25-, 50- and 100-year, 24-hour design storms.
    c. Downstream analysis – provide a comprehensive picture of the downstream areas and stormwater conveyance structures, and their capacity to accommodate stormwater runoff from the proposed development, to the 10% point, defined as where the project area represents 10% of the total drainage basin.
    d. For applicable projects (existing imperviousness >50%, 25% decrease in volume of stormwater runoff from the 2-year, 24-hour design storm.
3. Stormwater Management System Components – Use guidance from Stormwater Local Design Manual for Houston County, Georgia.

Water Quality Criteria:
BMPs shall be designed to remove 80-90% of post-development TSS (i.e., sized to treat the WQv, runoff from the first 1.2 inches of rainfall). Appropriate BMPs include stormwater ponds, wetlands, bioretention, sand filters, enhanced swales, filter strips, grass channels, organic filters, underground sand filters, and submerged gravel wetlands. BMPs shall be designed, constructed, and maintained in accordance with criteria in the GSMM.

Documentation – Hydrology and Hydraulic Report. Contents to include:

- Certification
- Project Description
- Existing Conditions Hydrologic Analysis
- Post-Development Hydrologic Analysis
- Stormwater Management System Design
- Downstream Analysis
- EISA Compliance
- SSD Compliance
- Evidence of Acquisition of Local and Non-local Permits
- Waiver Requests
- Planting/Landscaping Plan
- O&M Plan
- Notes:
    - E&SC Plan to be provided under separate cover using the Robins AFB template
    - EISA Compliance calculations can be included in existing and post-development hydrologic analysis, and referenced to those sections.
    - Waiver Requests is intended to be a summary of design criteria that will not be met, with rationale, including but not limited to EISA Compliance, SSD Compliance, Downstream Analysis, etc.
    - Stormwater Management System Design shall address water quality criteria requirement and provide design calculations for selected BMPs.

CONSTRUCTION DESIGN

Applicability - All discharges of stormwater associated with construction projects that will result in land disturbance equal to or greater than 1 acre

Requirements include:

- Inspections as described in the NPDES General Permit
- Monitoring as described in the NPDES General Permit
- Development of an ESPCP (use Robins AFB template, supplemented to meet ETL- 03-1 content requirements)
- BMPs implemented in accordance with design specifications contained in the "Manual for Erosion and Sediment Control in Georgia"

Permit compliance documents include:

- Notice of Intent, with return receipt for submittal to GA EPD
- GA EPD Fee Form
- Fee, payable to Houston County
- Erosion, Sedimentation, and Pollution Control Plan
    - With checklist established by Georgia Soil and Water Conservation Commission
    - With requirements specific to ETL 03-1
        - NPDES Permit Declaration
        - Site identification (watershed name, 8-digit hydrologic unit code, permit references)
        - Impervious and non-impervious site areas (before and after)
        - Construction cost (total cost of construction and estimated cost to implement Stormwater Control Site Plan)
- Inspection Reports
- Monitoring Results, with return receipt for submittal to GA EPD
- Notice of Termination, with return receipt for submittal to GA EPD

<table>
<tr><td colspan="2">Source</td><td>Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the EISA December 2009; UFC 3-210-10 Low Impact Development 15 November 2010</td></tr>
<tr><td colspan="2">Applicability</td><td>EISA applies to Federal facilities with a footprint (disturbed area) that exceeds 5,000 sq ft; LID techniques apply to the extent practical</td></tr>
<tr><td colspan="2">Goal/Purpose</td><td>• Site planning, design, construction, and maintenance strategies for the property to maintain or restore to METF, predevelopment hydrology with regard to temperature, rate, volume, and duration of flow
• Performance based approach rather than prescriptive requirement
• Rationale
o Wet ponds and similar practices (extended detention) do not fully protect downstream hydrology because of poor peak control for small frequently occurring storms, negligible volume reduction, and increased duration of peak flow, resulting in flows erosive to stream channel stability from smaller storms
o Goal to infiltrate and recharge, evapotranspire, or harvest and use precipitation</td></tr>
<tr><td rowspan="3">Criteria – Water Quantity</td><td>Analysis</td><td>1. Retain the 95th percentile storm event where technically feasible; OR
2. Site Specific Hydrologic Analysis, which estimates the volume of infiltration, evapotranspiration, or on-site stormwater harvesting and use based on site-specific hydrologic conditions</td></tr>
<tr><td>Stormwater Management System Components</td><td>N/A</td></tr>
<tr><td>Design Guidance Available & Source</td><td>• Appendix A provides design guidance for bioretention areas, porous/permeable pavement, cisterns, and green roofs
• Includes guidance for general hydrologic parameters of depression storage and Horton infiltration parameters
• The U.S. Air Force has developed a Microsoft Excel tool, "EISA 2007 Section 438 Compliance Documentation", to assist with documenting compliance with Section 438 of the EISA, using TR-55 calculation methodology. The point of contact for the tool is Larry K. Isaacs, PhD, PE, AFCEE/TDNQ; Robins AFB has version 1.9.0 for distribution to contractors</td></tr>
<tr><td colspan="2">Criteria – Water Quality</td><td>N/A</td></tr>
<tr><td colspan="2">Approved Calculation Methodologies</td><td>Direct Determination, Rational Method, TR-55, SWMM</td></tr>
<tr><td colspan="2">Reporting Requirements</td><td>• Documentation should include:
o Site evaluation and soils analysis
o Calculations for the 95th percentile rainfall event, or pre-development runoff volumes (At Robins AFB, the 95th percentile rainfall event is equal to 1.76 inches)
o Documentation of modifications to the performance design objective based on technical constraints
o Site design and stormwater management practices
o Design calculations for selected stormwater management practices
o Respective volumes managed by each practice
o O&M
o Cost estimate of compliance
• To document infeasibility, show that strategies have been used to the METF, and that full employment is infeasible due to site constraints. Documentation should include engineering calculations, geologic reports, hydrologic analyses, and site maps that demonstrate the infeasibility of an adequate combination. Pages 17-18 include acceptable reasons for infeasibility. Note that the facility should still install on-site stormwater practices to infiltrate, evapotranspire, and/or harvest and use the maximum amount of stormwater technically feasible.</td></tr>
</table>

<table>
<tr><td colspan="2">Source</td><td>Stormwater Local Design Manual for Houston County, Georgia
Adopted 15 November 2005</td></tr>
<tr><td colspan="2">Applicability</td><td>Stormwater Management Systems implemented in Houston County, GA</td></tr>
<tr><td colspan="2">Goal/Purpose</td><td>Minimize “potentially adverse impact resulting from development of a property”. Adverse impact defined as when:
• Post-development discharges rates for the 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storms, exceed pre-developed conditions;
• Downstream conditions indicate that the conveyance or storage capacity of existing infrastructure could be inundated by the post-developed conditions; or
• Existing structures could be impacted by the post-developed conditions</td></tr>
<tr><td rowspan="3">Criteria – Water Quantity</td><td>Analysis</td><td>1. No increase in runoff rates allowed at any discharge point on-site, for the 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour design storms. Note that for new development, pre-developed conditions shall be wooded and undisturbed.
2. Downstream Analysis – provide a comprehensive picture of the downstream areas and their capacity to accommodate stormwater runoff from the proposed development; include maps showing the drainage basin delineation to the point where the contributing area of the project represents 10% of the total drainage basin (i.e., 10% point), and the structures that convey the stormwater runoff to the “10% point”.</td></tr>
<tr><td>Stormwater Management System Components</td><td>• <u>Detention</u>: Required if analysis indicates a potentially adverse impact prior to implementation of stormwater management system. Channel protection (i.e., extended detention for the 1-year storm event over 24-hours) required.
• <u>Bridges:</u> 100-year, 24 hour design storm with no overtopping
• <u>Culverts and Pipes:</u>
<table>
<tr><th>Roadway Classification / Use</th><th>Design Storm</th></tr>
<tr><td>Arterial / Emergency Evacuation Roadway</td><td>100-Year</td></tr>
<tr><td>Collector Roads</td><td>50-Year</td></tr>
<tr><td>Neighborhood Roads</td><td>25-Year</td></tr>
<tr><td>Roads with No Other Outlet</td><td>100-Year</td></tr>
<tr><td>Parking Lots / Material Storage Areas / Landscape Areas</td><td>10-Year</td></tr>
</table>
o For headwalls/flared end sections of culverts, maximum flooding depth = will not result in a bypass of the inlet
o For inlets to a closed pipe system, maximum flooding depth =
<table>
<tr><th>Roadway Classification / Use</th><th>Flooding Depth</th></tr>
<tr><td>Arterial / Emergency Evacuation Roadway</td><td>8.0 ft Maximum Gutter Spread</td></tr>
<tr><td>Collector Roads</td><td>8.0 ft Maximum Gutter Spread</td></tr>
<tr><td>Neighborhood Roads</td><td>8.0 ft Lane Width Open</td></tr>
<tr><td>Roads with No Other Outlet</td><td>One Lane Width Open</td></tr>
<tr><td>Parking Lots</td><td>Maximum 0.5 ft Depth</td></tr>
<tr><td>Detention Areas utilized for other purposes (i.e. parking lot detention, etc.) with flood warning sign</td><td>Maximum 1.5 ft Depth</td></tr>
<tr><td>Material Storage Areas / Landscape Areas with flood warning sign if area is utilized by the public</td><td>Maximum 2.0 ft Depth</td></tr>
</table>
• <u>Channels and Ditches:</u>
o Roadside ditches
<table>
<tr><th>Roadway Classification / Use</th><th>Design Storm</th></tr>
<tr><td>Arterial / Emergency Evacuation Roadway</td><td>100-Year</td></tr>
<tr><td>Collector Roads</td><td>50-Year</td></tr>
<tr><td>Neighborhood Roads</td><td>25-Year</td></tr>
<tr><td>Roads with No Other Outlet</td><td>100-Year</td></tr>
</table>
o Channels discharging to a culvert or pipe system shall be designed for the storm event specified for the pipe system
o Channels conveying runoff to detention ponds shall be sized to accommodate the 100-year design storm
• <u>Energy Dissipation:</u>
o Required when velocity exceeds 5 ft/s or erosion velocity of downstream area channel area (whichever is less)
o Outlets meet standards in GSMM</td></tr>
<tr><td>Design Guidance Available & Source</td><td>• GSMM serves as the technical manual for design and specification of individual components within the system
• Requirements for material types for system construction included in this manual
• Rainfall table for SCS methodology available in this manual</td></tr>
<tr><td colspan="2">Criteria – Water Quality</td><td>BMPs shall be designed to remove 80% of post-development TSS (i.e., sized to treat WQv, runoff from first 1.2 inches of rainfall)
• Controls selected, designed, constructed, and maintained according to criteria in manual and GSMM
• Allowed BMPs: Stormwater Ponds, Wetlands, Bioretention, Sand Filters, Enhanced Swales, Filter Strips, Grass Channels, Organic Filter, Underground Sand Filter, Submerged Gravel Wetlands</td></tr>
<tr><td colspan="2">Approved Calculation Methodologies</td><td>• Rational Method – for culverts with DA <10 acres and detention ponds with DA < 1 acre; see Section 2.1.4 and Table A-8 of the GSMM
• SCS – use for remainder of calculations; see section 2.1.5 and Table A-8 of GSMM</td></tr>
<tr><td colspan="2">Reporting Requirements</td><td>Hydrologic and Hydraulic Report. Contents to include:
• Certification
• Existing Conditions Hydrologic Analysis
• Post-Development Hydrologic Analysis
• Stormwater Management System Design
• Downstream Analysis
• E&SC Plan
• Planting Plan
• O&M Plan</td></tr>
</table>

Source		*ETL 08-13 – Incorporating Sustainable Design and Development (SSD) and Facility Energy Attributes in the Air Force Construction Program;* 14 September 2008 *Air Force Sustainable Design and Development (SSD) Policy Memorandum*; 31 July 2007
Applicability		• 100% of each MAJCOM's MILCON vertical construction projects with climate control shall be designed so that it is capable of achieving LEED silver certification • For horizontal, utility, and industrial projects, guidance has been provided to assist in determining which credits appropriate to the project type are applicable for successful incorporation of the policy – Stormwater Design Credits 6.1 and 6.2 are appropriate • Projects not selected for formal LEED registration must be evaluated by a LEED AP and found to be compliant with this policy
Goal/Purpose		Sustainable development for the Air Force is defined as the process of planning, programming, designing, constructing, operating, maintaining, and disposing/reusing facilities; promoting high-performance buildings and energy efficiency; infrastructure that minimizes the environmental burden; and providing a healthy and safe working environment. Therefore, the Air Force ensures the "best fit" of the built environment to the natural environment.
Criteria – Water Quantity	***Analysis***	SS Credit 6.1 – Stormwater Design – Quantity Control • Sites with Existing Imperviousness <50% – post-development flow rate and quantity must not exceed pre-development conditions for the 1- and 2-year, 24-hour design storms; or protect receiving stream channels from excessive erosion; • Sites with Existing Imperviousness >50% – 25% decrease in volume of stormwater runoff from the 2-year 24-hour design storm
	Stormwater Management System Components	N/A
	Design Guidance Available & Source	N/A
Criteria – Water Quality		SS Credit 6.2 – Stormwater Design – Quality Control • Treat stormwater runoff from 90% of the average annual rainfall using acceptable BMPs (capable of removing 80% of average annual post-development TSS load)
Approved Calculation Methodologies		N/A
Reporting Requirements		• Document compliance using LEED checklists on website, or include supporting documentation reporting LEED credits • Design analysis should include stormwater calculations and design requirements captured on drawings (SS Credit 6, Stormwater Management)

Source		*ETL 08-6 – Design of Surface Drainage Facilities;* 5 February 2008 *FAA AC 150/5320-5C Surface Drainage Design;* 29 September 2006
Applicability		All DoD military facilities in the US
Goal/Purpose		Designers must be familiar and comply with Federal, state, and local regulations, laws, and ordinances that may impact the design of storm drain systems
Criteria – Water Quantity	***Analysis***	1. DoD Airfields and Heliports – for 2-year storm event, no encroachment of runoff on taxiway and runway pavements (including paved shoulders); ponding around apron inlets limited to 4-inches. Computations should be made to determine critical duration required to produce maximum runoff rate. For 10-year storm, the center 50% of runways, center 50% of taxiways serving the runways, and helipad surfaces along the centerline should be free from ponding 2. Areas other than airfields (roadways, administrative, industrial, housing) – 10-year storm event; see local regulatory agency for additional design storm criteria
	Stormwater Management System Components	• Culverts: design storm based on local design requirements but not less than the 10-year event for protection of facilities against flood flows; headwater depth for appropriate design storm shall not exceed 1.25 or the local requirement • Drainage Channels: o Roadside and median drainage channels – carry 5- to 10-year design flows o Temporary channel linings - 2-year return period o Freeboard - 0.5 feet for permanent channels, or freeboard height equal to flow depth to compensate for large variations in flow caused by waves/splashing/surging for steep gradient channels • Inlets/Pipes: design sag points where runoff can be moved only through the system for a minimum 50-year frequency storm • Check Storm: 100-year frequency storm, and consult local criteria
	Design Guidance Available & Source	Detailed guidance provided for how to design stormwater management system components and materials specifications; local guidance recommended.
Criteria – Water Quality		Table 11-1 provides a matrix of site selection criteria for appropriate BMPs
Approved Calculation Methodologies		Rational Method, SCS TR-55, and USGS regression equations are described for typical use
Reporting Requirements		N/A

Source		*Georgia Stormwater Management Manual, Volume 2 Technical Handbook* August 2001
Applicability		• New development creating or adding 5,000 sq ft of new impervious surface area or with land disturbing activity of 5,000 sq feet • Redevelopment creating or adding 5,000 sq feet of new impervious surface or with land disturbing activity of 1 acre • Commercial or industrial new development, regardless of size, with an SIC code that falls under the NPDES Industrial Stormwater Permit program or hot spot land use • Hot spot land use defined as "land use or activity on a site that produces higher concentrations of trace metals, hydrocarbons or other priority pollutants than are normally found in stormwater runoff. Examples include gas station, vehicle service and maintenance areas, salvage yards, material storage sites, garbage transfer facilities, and commercial parking lots with high-intensity use" • For redevelopment > 5,000 sq ft but < 1 acre: (i) must meet requirements for E&SC during construction; (ii) attempt to meet stormwater quality standards; (iii) and prepare pollution prevention and O&M plans for stormwater system
Goal/Purpose		• Set of minimum performance standards for stormwater management for development activities in the state of Georgia • Recommended; has been adopted by Houston County as stormwater management development requirements
Criteria – Water Quantity	***Analysis***	1. Stream Channel Protection – downstream and on-site channels; a. Extended detention of 1-year 24-hour storm for 24 hours using structural stormwater controls – CPv (not required for post-development discharge rates < 2 cfs); b. Implement velocity control, energy dissipation, streambank stabilization, and erosion prevention practices and structures as necessary to prevent downstream erosion and streambank damage; or c. Establish riparian stream buffers on the site. 2. Downstream Overbank Flood Protection – prevent post-development 25-year, 24 hour storm peak discharge rate (Qp25) from exceeding pre-development discharge rate (if CPv not used, than peak flow attenuation of Qp2 through Qp25 must be provided). Criteria may be adjusted on local basis for areas where downstream conveyances are designed to handle runoff from the full buildout 25-year storm, or where it can be demonstrated that no downstream flooding will occur as a result of a proposed development. Local jurisdiction can waive criteria in lieu of provision of safe and effective conveyance to a major river system, lake, wetland, estuary, or tidal waters that have capacity to handle flow increase at the 25-year level. 3. Extreme Flood Protection – control and/or safely convey 100-year 24 hr storm event (Qf) through structural stormwater controls or size on-site conveyance system to safely pass and discharge into a receiving water whose protected floodplain is sufficiently sized to account for extreme flow increases without causing damage. 4. Downstream Analysis – provide downstream peak flow analysis to the point in the watershed downstream of the site or system where site area comprises 10% of the total drainage area. Assess the downstream infrastructure and their capacity to accommodate stormwater runoff from the proposed development. If it does increase peak flow, local authority can waive requirement. 5. Groundwater Recharge – implement recharge to groundwater to extent practicable to attempt to match pre-development conditions. For hot spot areas, pretreatment is required prior to recharge. Conflict exists with Chapter 391-3-16-.02(3)(n) of the Rules of the State of Georgia, in which "Permanent stormwater infiltration basins shall not be constructed in areas having high pollution susceptibility." Certain areas of the Base may be considered to have high pollution susceptibility; at this time, infiltration should be considered on a site-by-site basis.
	Stormwater Management System Components	• <u>System Components that do not convey runoff under public roadways:</u> o 10- to 25-year design storm for pipe and culverts, inlet design o 50-year design storm for sumped inlets • <u>Roadway Culverts</u> – 25- to 100-year design storm, or Georgia Department of Transportation standards, whichever is more stringent. Consider roadway type, depth of flow over road, structures and property subject to flooding, emergency access, and road replacement costs • <u>Open Channel</u> – 25-year design storm • <u>Energy Dissipation</u> – 25-year design storm • <u>Check Storm</u> – 100 year design storm
	Design Guidance Available & Source	Chapter 4 provides design guidance
Criteria – Water Quality		Treat runoff from 85% of storms that occur in an average year to remove at least 80% of calculated average annual post-development TSS loading from the site. This quantity of runoff is defined as the WQv, calculated as the runoff generated by 1.2 inches of rainfall. Design guidance for approved BMPs is provided in Chapter 3.
Approved Calculation Methodologies		Chapter 2 provides Stormwater Hydrology approved methods
Reporting Requirements		Stormwater Site Plan. Contents to include: • Existing Conditions Hydrologic Analysis • Post-Development Hydrologic Analysis • Stormwater Management System Design • Downstream Analysis • E&SC Plan • Landscaping Plan • O&M Plan • Evidence of Acquisition of Applicable Local and Non-Local permits • Waiver Requests

Source		*General Permit No. GAR100001, Authorization to Discharge Under The NPDES Stormwater Discharges Associated with Construction Activity for Stand Alone Construction Projects* 1 August 2008
Applicability		• All discharges of stormwater associated with construction projects that will result in land disturbance equal to or greater than 1 acre • Construction activity defined as "the disturbance of soils associated with clearing, grading, excavating, filling of land, or other similar activities which may result in soil erosion. Construction activity does not include agricultural and silvicultural practices, but does not include agricultural buildings."
Goal/Purpose		Regulates point source discharges of storm water to the waters of the State of Georgia from construction activities
Requirements	***Inspections***	• 7-Day Inspection after BMP Installation (by design professional who prepared ESPCP) • Daily – areas of petroleum product storage, usage, or handling; vehicle entrances/exits, and rainfall measurement • Every 7 calendar days and within 24 hours of a 0.5-inch qualifying rainfall event – disturbed areas that have not undergone final stabilization, material storage areas exposed to precipitation that have not undergone final stabilization, structural control measures, and accessible discharge locations o For Infrastructure Construction Projects, these inspections are required every 14 days as opposed to every 7 days • Monthly – areas that have undergone final stabilization, and accessible discharges locations • Performed by Certified Personnel
	Monitoring/Sampling	• All receiving waters or outfalls, or a combination of receiving waters and outfalls • Two samples: (i) first rain event that reaches or exceeds 0.5-inch that allows for monitoring during normal business hours, that occurs after all clearing and grubbing operations have been completed in the drainage area of the sampling location; and (ii) first rain event that reaches or exceeds 0.5-inch and allows for monitoring during normal business hours, that occurs either 90 days after the first sampling event, or after all mass grading operations have been completed in the drainage area of the sampling location, whichever comes first • Measure Nephelometric Turbidity Units (NTUs): limit defined as a change of 10 NTU for trout stream receiving waters, 25 NTU for warm water fisheries receiving waters, or limit established in Appendix B of the permit for outfalls
	Other	• Development of ESPCP, whose contents must include Site Description, Controls, Inspections, Maintenance, and Sampling • Additional BMP requirements for discharges into, or within one mile upstream of and within the same watershed as any portion of a biota impaired stream segment • Additional documentation requirements for projects disturbing more than 50 acres
	Design Guidance Available & Source	BMPs implemented in accordance with design specifications contained in the "Manual for Erosion and Sediment Control in Georgia"
Reporting Requirements		Permit compliance documents include: • Notice of Intent, with return receipt for submittal to GA EPD • GA EPD Fee Form • Fee, payable to Houston County • Erosion, Sedimentation, and Pollution Control Plan, with checklist established by Georgia Soil and Water Conservation Commission • Inspection Reports • Monitoring Results, with return receipt for submittal to GA EPD • Notice of Termination, with return receipt for submittal to GA EPD

Source		*ETL 03-1 – Stormwater Construction Standards* 24 March 2003
Applicability		All Air Force installations
Goal/Purpose		Prescribe procedures and practices to eliminate or minimize stormwater pollution results from Air Force construction activities • Offset increase in imperviousness of an affected construction area to the maximum extent possible with BMPs to reduce stormwater discharges and pollutant loadings to pre-construction levels, or better • Use construction management and operations practices that focus on source control • Plan and schedule the installation of final storm drainage facilities and post-construction stormwater BMPs to render their maximum usage during the construction period
Requirements	***Inspections***	• Inspection schedule to be noted in the site log, as part of the Stormwater Control Site Plan
	Monitoring/Sampling	N/A
	Other	• Obtain an NPDES stormwater construction permit and comply with its requirements • Stormwater Control Site Plan – required for sites with construction area exceeding 1 acre o Contents include NPDES Permit declaration, site narrative, site map, site log, certification, and journal entries. ETL-specific content includes: ▪ Site identification (watershed name, 8-digit hydrologic unit code, permit references) ▪ Impervious and non-impervious site areas (before and after) ▪ Construction cost (total cost of construction and estimated cost to implement Stormwater Control Site Plan) o For sites with an affected construction area exceeding 5 acres, plan must be prepared by a qualified stormwater professional, and a qualified professional must be on-site during construction to oversee implementation of the plan
	Design Guidance Available & Source	Includes guidance related to source control and housekeeping BMPs (i.e., solid waste management, material delivery and storage, concrete waste, paint and painting supplies, vehicle fueling, maintenance and cleaning, and hazardous waste management); and stormwater control site work (i.e., structural BMPs, retention, perimeter controls, inlet protection, and stabilization)
Reporting Requirements		Permit compliance documents include: • Notice of Intent • Stormwater Pollution Prevention Plan – Stormwater Control Site Plan should be tailored to address all requirements specified for the SWPPP in the construction general permit; Plan should be consistent with Base-wide Stormwater Management Plans for MS4 compliance

Robins Air Force Base
Base Facility Standards

Title: Architectural - General

Date: 10 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS
PERFORMING DESIGN SERVICES & CONSTRUCTION FOR ROBINS AFB

PART 4A – Architectural - General

CRITERIA REFERENCE DOCUMENTS:

AFI 32-1001 Operations Management	09-01-2005	386 KB	
AFI 32-1002 Snow and Ice Control	10-01-1999	284 KB	
AFI 32-1012 Reserve Component Facilities Program	07-22-1994	91 KB	
AFI 32-1021 Planning and Programming Military Construction (MILCON) Projects	06-14-2010	456 KB	
AFI 32-1022 Planning and Programming Non-Appropriated Fund Facility Construction Projects	05-20-2009	502 KB	
AFI 32-1023 Design and Constructing Military Construction Projects	04-21-2010	332 KB	
AFI 32-1024 Standard Facility Requirements	05-31-1994	115 KB	
AFI 32-1032 Planning and Programming Appropriated Funded Maintenance, Repair, and Construction Projects	10-15-2003	522 KB	
AFI 32-1051 Roof Systems Management	05-13-1994	181 KB	
AFI 32-1052 Facility Asbestos Management	03-22-1994	77 KB	
AFI 32-1053 Integrated Pest Management Program	06-23-2009	256 KB	
AFI 32-1054 Corrosion Control	03-01-2000	120 KB	
AFI 32-1061 Providing Utilities to U.S. Air Force Installations **NEW**	02-23-2011	701 KB	
AFI 32-6001 Family Housing Management, with Changes 1-2 incorporated and Interim Change 3	08-21-2006	602 KB	
AFI 32-6002 Family Housing Planning, Programming, Design, and Construction	01-15-2008	1.5 MB	
AFI 33-118 Electromagnetic Sprectrum Management	07-18-2005		
Engineer Technical Letters (ETL) Index **NEW**	04-26-2011	77 KB	
ETL 08-13 Incorporating Sustainable Design and Development (SDD) and Facility Energy Attributes in the Air Force Construction Program	08-14-2008		
ETL 07-4 Air Force Carpet Standard	03-28-2007	121 KB	
ETL 04-3 Design Criteria for Prevention of Mold in Air Force Facilities, with Change 1	04-06-2004	123 KB	
ETL 02-9 Construction Signs	05-12-2002	65 KB	
ETL 01-1 Reliability and Maintainability (R&M) Design Checklist	10-11-2001	381 KB	
ETL 97-22 Competing Facility Keying Systems, with Change 1	12-05-1997	20 KB	
ETL 96-5 Hangar Concrete Floor Reflective Coating Criteria, with Change 1	08-26-1996	78 KB	
ETL 89-2 Standard Guidelines for Submission of Facility	05-23-1989	61 KB	

Operating and Maintenance Manuals			

UFC'S			
UFC 1-200-01 General Building Requirements	08-16-2010	135 KB	
SERIES 1-300: PROCEDURES AND GUIDANCE			
UFC 1-300-01 Criteria Format Standard, with Change 2	02-28-2006	290 KB	
UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard, with Changes 1-4	09-01-2004	116 KB	
UFC 1-300-07A Design Build Technical Requirements	03-01-2005	210 KB	
UFC 1-300-08 Criteria for Transfer and Acceptance of DoD Real Property, with Change 1	04-16-2009	536 KB	
UFC 1-300-09N Design Procedures, with Change 8	05-25-2005	454 KB	
SERIES 1-900: MISCELLANEOUS			
UFC 1-900-01 Selection of Methods for the Reduction, Reuse and Recycling of Demolition Waste	12-01-2002	319 KB	
SERIES 2: MASTER PLANNING			
UFC 2-000-02AN Installation Master Planning	03-01-2005	1.4 MB	
UFC 2-000-05N (P-80) Facility Planning Criteria for Navy/Marine Corps Shore Installations	01-31-2005		
SERIES 3: DISCIPLINE-SPECIFIC CRITERIA			
SERIES 3-100: ARCHITECTURE AND INTERIOR DESIGN			
UFC 3-110-03 Roofing	09-26-2006	646 KB	
UFC 3-110-04 Roofing Maintenance and Repair	01-11-2007	88 KB	
UFC 3-120-01 Air Force Sign Standard	02-06-2003	8.4 MB	
UFC 3-120-10 Interior Design, with Change 1	06-15-2006	644 KB	
UFC 3-190-06 Protective Coatings and Paints	01-16-2004	953 KB	
UFC 3-450-01 Noise and Vibration Control	05-15-2003	1.8 MB	
SERIES 3-700: COST ENGINEERING			
UFC 3-701-01 DoD Facilities Pricing Guide for FY2011, with Change 1; see also Supplemental Documentation (zip, 100MB)	03-2011	958 KB	
UFC 3-710-01A Code 3 Design with Parametric Estimating	03-01-2005	356 KB	
UFC 3-730-01 Programming Cost Estimates for Military Construction **NEW**	06-06-2011	1.8 MB	
UFC 3-740-05 Handbook: Construction Cost Estimating, with Change 1	11-08-2010	1.1 MB	
SERIES 4: MULTI-DISCIPLINARY AND FACILITY-SPECIFIC DESIGN			
UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings, includes Change 1	10-08-2003	277 KB	

UFC 4-010-02 DoD Minimum Antiterrorism Standoff Distances for Buildings (FOUO), includes Change 1	10-08-2003	53 KB	
UFC 4-022-02 Selection and Application of Vehicle Barriers, with Change 1	06-08-2009	1.4 MB	
UFC 4-023-03 Design of Buildings to Resist Progressive Collapse with Change 1	07-14-2009	3.7 MB	
UFC 4-023-07 Design to Resist Direct Fire Weapons Effects	07-07-2008	1.4 MB	
UFC 4-030-01 Sustainable Development	12-21-2007	1.3 MB	
SERIES 4-100: OPERATIONAL AND TRAINING FACILITIES			
UFC 4-121-10N Design: Aircraft Fixed Point Utility Systems	01-16-2004	520 KB	
UFC 4-141-04 Emergency Operations Center Planning and Design, with Change 1	07-15-2008	546 KB	
UFC 4-141-10N Design: Aviation Operation and Support Facilities	01-16-2004	1.4 MB	
UFC 4-171-01N Design: Aviation Training Facilities	01-16-2004	1.6 MB	
UFC 4-171-04AN Band Training Facilities	03-01-2005	6.6 MB	
SERIES 4-200: MAINTENANCE AND PRODUCTION FACILITIES			
UFC 4-211-01N Aircraft Maintenance Hangars: Type I, Type II and Type III, with Change 3; also see the Supplement ITG FY10-01	10-25-2004	1.7 MB	
UFC 4-211-02NF Corrosion Control and Paint Finishing Hangars, with Changes 1-4	01-10-2005	1.3 MB	
UFC 4-214-03 Central Vehicle Wash Facilities	01-16-2004	871 KB	
SERIES 4-300: RESEARCH, DEVELOPMENT, TEST AND EVALUATION FACILITIES			
UFC 4-310-02N Design: Clean Rooms	01-16-2004	2.6 MB	
UFC 4-390-01 O&M: Unmanned Pressure Test Facilities Safety Certification Manual	07-23-2003	928 KB	
SERIES 4-400: SUPPLY FACILITIES			
UFC 4-440-01A Storage Depots	03-01-2005	891 KB	
UFC 4-442-01N Design: Covered Storage	01-16-2004	2.5 MB	
UFC 4-451-10N Design: Hazardous Waste Storage	01-16-2004	149 KB	
SERIES 4-500: HOSPITAL AND MEDICAL FACILITIES			
UFC 4-510-01 Design: Medical Military Facilities, with Change 3	02-18-2009	3.8 MB	
SERIES 4-600: ADMINISTRATIVE FACILITIES			

UFC 4-610-01 Administrative Facilities	05-06-2008	481 KB	
SERIES 4-700: HOUSING AND COMMUNITY FACILITIES			
UFC 4-711-01 Family Housing; see also Unified Facilities Spreadsheet	07-13-2006	700 KB	
UFC 4-722-01 Dining Facilities	07-02-2007	202 KB	
UFC 4-730-01 Family Service Centers, with Change 1; see also Unified Facilities Spreadsheet	04-07-2006	782 KB	
UFC 4-730-04AN Military Police Facilities	03-01-2005	3 MB	
UFC 4-730-10 Fire Stations; see also Unified Facilities Spreadsheet	06-15-2006	1.8 MB	
UFC 4-740-01NF Design: Bowling Centers	04-16-2004	4 MB	
UFC 4-740-02 Fitness Centers; see also Unified Facilities Spreadsheets	09-26-2006	2.3 MB	
UFC 4-740-06 Youth Centers; see also Unified Facilities Spreadsheet	01-12-2006	1.3 MB	
UFC 4-740-14 Design: Child Development Centers	08-01-2002	1.9 MB	
UFC 4-740-15 Continuous Child Care Facilities; see also Unified Facilities Spreadsheet **NEW**	04-14-2011	580 KB	
UFC 4-740-16 Design: Military Recreation Centers; see also Unified Facilities Spreadsheet	05-25-2005	618 KB	
UFC 4-740-20 Libraries	05-01-2006	2.2 MB	
UFC 4-750-01NF Design: Golf Clubhouses	04-16-2004	4.7 MB	
UFC 4-750-02N Design: Outdoor Sports and Recreational Facilities	12-04-2003	5.4 MB	
SERIES 4-800: UTILITIES AND GROUND IMPROVEMENTS			
UFC 4-860-01FA Railroad Design and Rehabilitation	01-16-2004	1 MB	
UFC 4-860-03 Railroad Track Maintenance and Safety Standards	02-13-2008	2.1 MB	
ENGINEERING TECHNICAL LETTERS (ETLs)			
ETL 07-4 Air Force Carpet Standard	28 Mar 07		
ROBINS AFB SPECIFICATION STANDARDS			
Section 13 34 19 PreEngineered Metal Buildings			

1. GENERAL:

a. This is one part of the Robins AFB Base Facility Standards. Refer questions or exception requests to the Technical Design Chief in 778 CES/CEPT. Any exceptions granted to these requirements shall be noted clearly in the project design analysis by using a Deviation Request.

b. All design shall be in accordance with applicable UFC's, AFI's, ETL's, and all other applicable codes and regulations as referenced herein. Also conform to NFPA 101 - Life Safety Code and the current International Building Code (IBC). If there is a conflict, normally use the more stringent requirement. The specifications shall require all materials and equipment to be current production items.

c. The facility shall be barrier-free and designed to meet the ABA Accessibility Standard for Department of Defense Facilities.

d. In addition to this part of Robins AFB Base Facility Standards, all facilities shall be coordinated and meet the requirements all parts of the Base Facility Standards.

e. Utilize requirements of the Unified Facilities Guide Specifications (UFGS) for additional requirements for each specification division.

f. The architectural aspects of the overall facility should take into account all energy saving opportunities. Exterior elements should closely follow the design guidelines for energy efficiency and USGBC guidelines for Silver certification. Facility orientation for optimum efficiency with relation to solar gains during summer and winter months. Exterior lighting should be kept to a minimum, without hindering safety and aesthetics, with day light sensors installed on all fixtures. Windows should be a minimum of double pain and placed to allow maximum day light to penetrate the interior areas. Optimum utilization of prevailing winds with operable windows and vents with screens were applicable. Energy efficient roofing materials are mandatory. Interior design should capitalize on, space utilization for optimum air flow, mechanical efficiency, lighting effectiveness and water fixture types. These measures should follow the USGBC guidelines for Silver Certification. *See BFS Part 7A, Energy Conservation and Part 7C, Sustainable Design & Development.*

2. EXTERIOR DESIGN STANDARDS:

Refer to the Base Facility Standard on Architectural Compatibility for the aesthetic requirements for the exterior buildings on Robins AFB. Components chosen to meet the Architectural Compatibility Standards must also meet the Architectural – General Standard for material types and installation requirements. *See BFS Part 4B, RAFB Architectural Compatibility Plan.*

3. INTERIOR DESIGN STANDARDS:

a. GENERAL:

(1) Interior finishes and furnishings are an important and integral part of facility construction, upgrade, and maintenance programs. While we often have design guidelines and budget limitations, we still expect quality professional design that does not have a "military" look. For instance, the use of dark wood paneling is no longer a required status symbol for executive offices. Dark blue or black doorframes are also outdated. If we are to achieve a clean, efficient "corporate look," we do not wish to perpetuate the mistakes of the past. We want to exceed the "minimum needs of the government" by addressing physical and psychological needs and providing a comfortable work or living environment. Function, maintainability, energy efficiency, and a pleasing general atmosphere are all-important elements of the design.

(2) Interior structural materials and finishes are part of the design of all buildings. This includes anything attached to the building such as wall covering, wall bases, flooring, door and window trim, millwork and cabinetwork, hardware, interior signage, and all items with colors, patterns, or textures. Projects that contain only interior finishes are referred to as a Structural Interior Design (SID).

(3) A project with furnishings is identified as a Comprehensive Interior Design (CID). Furnishings must include systems furniture or conventional office furniture, artwork, plants, window treatment, bedspreads, waste receptacles, and other decorative or functional accessories.

(4) Systems furniture (Prewired workstations) shall be included as part of the construction requirements for all new administrative facilities and all administrative areas of any new facility when the administrative area contains at least 1,000 square feet of contiguous net office area. Refer to Engineering Technical Letters (ETL's) 90-2, 88-10, and 90-04 for systems furniture guidelines.

(5) Furniture shall be durable, easily maintained, and selected from current GSA vendors. Upholstery shall be selected from manufacturer's standard fabrics. Avoid using Customer's Own Material (C.O.M.) except in unique situations.

(6) Equipment and furniture catalog cuts and price, presentation color/material boards, and interior perspectives shall be submitted for approval as part of the CID package.

(7) The following Air Force publications are applicable to interior design and can be obtained from the applicable Design Section in 778 CES/CEPD:

------- AFMC Facility Quality Standards
------- AF Carpet Selection Handbook
------- AF Interior Design Presentation Format

ETL 07-4	Air Force Carpet Standard
UFC 3-120-01	Sign Standards
AFP 88-41	Interior Design Guidance
ETL 90-7	AF General Interior Design Policy
ETL 90-2	General Policy for Prewired Workstations and Systems Furniture
ETL 90-4	Systems Furniture Guide Specifications
ETL 89-10	Pre-Wired Workstations Guide Specifications

(8) Lighting solutions need to be explored to avoid boring uniformity and glare. Combinations of natural light, indirect lighting, general and task lighting can produce a more flexible and efficient plan. Fixtures shall be easily maintained and have easily obtainable replacement bulbs (or lamps). Consider the color rendition of lamp selection for its appropriateness to the area and function.

(9) Furnishings shall reflect the general style of the building but shall not be so trendy that they will be outdated in four or five years. Upholstery fabrics shall be durable and soil-hiding with brighter colors and patterns allowed. GSA vendors offer a wide variety of styles and upholstery options. Avoid using COM (customer's own material) because of expense and complication of ordering process.

(10) Artwork and plants are finishing touches that shall be included if the budget allows. Landscapes or local themes are appropriate for public areas. Frames shall harmonize with other furnishings. Artificial plants soften formal arrangements and fill awkward corners.

b. DORMITORIES:

(1) Well-coordinated, neutral color schemes hold up over longer periods. Good design extends beyond aesthetics to provide durability, acoustical, and energy-saving value, as well as morale enhancement for the inhabitants.

(2) Finishes, Materials, and Colors: All permanent finishes shall be neutral colors. Medium range accent colors may be used only in small areas. Select neutral colors for surfaces that will have a long life, such as ceramic tile, mosaic, solid-surface, laminates, window blinds, etc., to facilitate future finish material upgrades. Provide a pleasing color scheme in durable finish materials. Use color in non-permanent finishes to add interest and vitality, but do not allow color to dominate the environment. Coordinate materials, finishes, color, and texture selection to compliment the overall building design and image.

(3) Carpet: Removal of carpet to be replaced (if applicable) should be handled according to pre-approved plan for recycling. Carpet must be capable of recycling by down-cycling, waste-to-energy-conversion or another disposal strategy that keeps the carpet out of a landfill. Carpet shall comply with Carpet and Rug Institute's Green Label Indoor Air Quality. Carpet must comply with guidelines of Presidential Executive Order

13101 and meet the intent of Section 6002 of the resource and Recovery Act (RCRA). Carpet with a small pattern, tweed design, or random design is preferred for its appearance retention. Solid color carpet is not authorized. Level-loop or combination or loop and cut pile carpet is recommended for corridors. Select a pattern that will not accentuate the length of corridor. A cut pile is recommended for living unit. Provide a solid walk-off area if the living unit opens to the exterior. Heavy-duty commercial quality carpet cushion may be used in the living units, but cannot be used in the corridors. Living /bedroom areas have a heavy wear classification for carpet, and public areas (corridors, television and game rooms, etc.) have a severe wear classification.

(4) Walk Off: Provide hard surface walk-off areas at exterior entrances to type B or C modules.

(5) Hard Surface Flooring: Use commercial quality vinyl composition tile (VCT) with a full depth pattern in the walk off area, vanity area, and the kitchen. Avoid white as a predominant color, “No wax” surfaces are not recommended, due to low durability.

(6) Walls:

(a) Use vinyl wall covering as over smooth walls. Accent walls are optional, but must not be so bright or so dark as to shorten the room or negatively affect the interior lighting. Consider a texture wall covering as an accent instead of dramatic contrasting colors. Accent colors can also be used as textiles such as draperies and upholstery fabrics.

(b) Paint may be substituted for vinyl wall covering (VWC), but VWC is preferred. Where paint is used, multi-colored, speckled paint systems are preferred.

(7) Ceiling: Paint ceilings off-white in a flat or eggshell finish.

(8) Bathrooms: Use slip resistant ceramic floor tiles in bathrooms. Specify a mottled or shaded tile to hide discoloration from detergents, etc. Use ceramic wall tiles from floor to ceiling around bathtubs and showers. Colored grout is recommended for low maintenance and good appearance. Other areas may be at wainscot height. Install shower curtain rod instead of glass shower doors for ease in maintenance. Specify rod at proper height for conventional shower curtains 1800 mm x 11800 mm (72”x 72”).

(9) Window Treatment: Mini blinds, vertical blinds, draperies or combination are authorized. All window treatments must pass NFPA 701-1/702-2 Standard Method Fire Test for Flame Resistant Textiles and Films.

(10) Furnishings. Furnishings shall reflect the general style of the building but shall not be so trendy that they will be outdated in four or five years. Upholstery fabrics shall be durable and soil-hiding with brighter colors and patterns allowed. GSA vendors offer a wide variety of styles and upholstery options. Avoid using COM (customer’s own material) because of expense and complication of ordering process. Refer to

Unaccompanied Housing Design Guide and QIP (Quarters Improvement Plan) for additional guidance on standards.

4. MATERIALS: The following requirements govern the design and use of various materials and components used as a part of the facility construction. It is the designer's responsibility to thoroughly evaluate each material and component used with respect to the overall design and sustainability of the facility. These are Robins AFB specific requirements for specific components. All materials and components, whether listed or not, are still subject to the appropriate applicable codes and standards

a. DIVISION 4 – MASONRY

(1) GENERAL: Typical masonry units utilized in facilities include CMU (concrete masonry units) and brick. CMU provides a durable surface with structural properties suited for high abuse areas. Brick is typically used on the exterior only for facilities requiring enhanced aesthetics.

(2) WYTHES: Single wythe (layer) exterior walls should be constructed of CMU and be limited to industrial/storage facilities as follows: full height - <3,000 sf; partial height – larger facilities (CMU is typically 4 to 10 ft. high). Do not use single wythe exterior walls for fully conditioned facilities or interior walls separating conditioned/unconditioned spaces – use double wythe appropriately insulated.

(3) CAVITIES: Double wythe exterior walls shall have a cavity with a minimum **free air space** of 1". Cavity insulation shall not decrease this requirement. Provide cavity ventilation at both the bottom and top of the cavity and drainage weeps at the bottom (exterior walls). Provide waterproofing/dampproofing on exterior face of the inner wythe for exterior walls. Provide mortar nets at the bottom of cavities.

(4) FLASHING: Provide continuous flashing from the interior wythe to the exterior face of the exterior wythe. Coordinate with roof flashing to provide continuous watertight membrane protection at high/low roof conditions and prevent moisture intrusion into lower interior walls.

b. DIVISION 5 – METALS

(1) GENERAL: *Reference BFS Part 3A Structural* for all structural design requirements. This includes all metals whether used for building structural, architectural or other engineering.

(2) COLD FORMED METAL FRAMING: Framing in this division refers to load bearing metal framing (vertical and/or horizontal loading), 20 ga. or thicker. Light gauge interior partitions are covered in Division 09.

(3) METAL STAIRS: Stairs shall have solid risers with concrete-filled steel pan treads. Grating and/or checkered plate treads and risers may be used for equipment

platforms (confirm with Proj. Mgr.). Provide sufficient bracing to limit stringer deflection due to side loads on attached railings. Design shall limit deflection to 1/4" measured at the top of the handrail based on required design loads (l/180).

(4) METAL GRATINGS AND FLOOR PLATES: Provide with appropriate coatings compatible with corrosive conditions expected to be encountered.

c. DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

(1) WOOD - General: Reference BFS Part 3A Structural for all structural design requirements. This includes all wood whether used for building structural, architectural or other engineering.

(2) WOOD CONSTRUCTION: Wood construction has limited usage on Robins AFB. Obtain approval from 778 CES/CEPT prior to allowing new wood construction.

(3) WOOD FRAMING, SHEATHING AND DECKING: Materials to be exposed to moisture will require pressure treating. Note EPA restrictions on use of CCA pressure treatment. Provide fire retardant wood where required by codes. Design shall take into consideration the protection of fasteners and attachments (including allowable load reduction factors) with respect to the treating chemicals used.

(4) ARCHITECTURAL CASEWORK: Casework shall be Custom Grade as defined by AWI. Countertops and vanity tops shall be solid surface for durability. Finishes will be either plastic laminate or stained/clear coated depending on usage (verify with Project Manager based on individual usage). Cabinets and countertops for lab will be lab grade materials and construction compatible with the intended usage (durability, chemical resistance, etc.).

d. DIVISION 7 – THERMAL AND MOISTURE PROTECTION

(1) DAMPPROOFING AND WATERPROOFING: Under slabs, at a minimum provide minimum 10 mil vapor barrier (except exterior slabs). Provide membrane products compatible with conditions to be encountered to prevent moisture intrusion into the building. Install waterstops as required for hydrostatic conditions in concrete and masonry joints

(2) ROOF DRAINAGE: Utilize sloped system draining to the perimeter of building in lieu of internal drains. Internal drains must be approved by 778 CES/CEPT before utilized in a building design.

(3) ROOFING: The preferred roofing system is mechanically seamed prefinished standing seam roofing. Structural systems are preferred over architectural watershedding systems. Where metal is not practical on low sloped roofs, fully adhered TPO roofing (minimum 60 mil) is preferred. Modified bitumen is allowed but is subject to approval from 778 CES/CEPT. Minimize penetrations to the maximum extent possible. Provide thickened surface walk surfaces on membrane roofs for maintenance activities.

(4) ROOF WARRANTY: Standard is 20 yr. weathertightness, either reasonable replacement cost for metal (ie. AMS Level III) or NDL (metal or membrane). Metal roofs shall also carry a 20 yr. finish and penetration (ie. corrosion) warranty.

(5) FINISHES: Metal roof shall have a 20 yr. painted finish. High thickness galvanized finish (ie. "Galvalume") require approval from 778 CES/CEPT. Membrane roofing on low slope roofs shall have a light or white finish for energy reduction.

(6) ROOF HATCHES: Provide roof hatches for internal roof access in lieu of external ladders due to antiterrorism requirements. Hatches will require exterior fall protection railing and gate per OSHA standards. Protection is not required to be attached to the hatch but must have proper structural supports and sufficient clearance for proper roof flashing.

e. DIVISION 8 – OPENINGS

(1) LOCKING DEVICES:

(a) The door hardware shall be compatible with the Base Master Keying System. The keying system shall have seven pin interchangeable cores and interchangeable construction cores. The interchangeable cores as a design basis shall be Best Lock or equivalent. The lockset shall be compatible with the Base Master System and shall be equal to Arrow, Falcon, Best Lock, or other locks that will accept the 7-pin Best-type core.

(b) For those facilities that are not covered by the Base Master Keying System, provide keys and locks for any addition or renovation that are compatible with any existing master key and lock system that is to remain.

(c) Furnish two master keys. These are to be sent direct to the Government's representative by registered mail.

(d) Furnish two copies of keying control transcripts with 100% expansion per complex as listed in hardware set. These are to be sent direct to the Government's representative by registered mail or other certified means of delivery.

(e) Maintenance Control: Furnish maintenance repair kits and manuals as listed in hardware set. These are to be sent direct to the Government's representative by registered mail or other certified means of delivery.

(f) All padmounted transformers, exterior padmounted switchgear cabinets, etc. are to be equipped with a Best Lock Corporation padlock, lock number 21B720L-R with core number 8A59, 1 1/2" short shank. This is the same lock that is used on all other high voltage equipment on Robins AFB, and it is imperative that exterior electrical personnel have one-key access to all high voltage equipment.

(2) EXTERIOR PERSONNEL DOORS: Keep these to a minimum. Doors, including glazing, shall meet applicable antiterrorism requirements. Wood

exterior doors shall not be used. Where steel hollow metal doors are used between the exterior and conditioned spaces, the door shall have an insulated core. The following doors are required:

(a) Main ingress and egress doors for personnel.

(b) Utility room exterior doors.

(i) Main Mechanical and Electrical Rooms shall be located on the exterior walls of the facility, and their doors shall be on the exterior walls to improve accessibility for CEG shop personnel and to minimize disruptions to user personnel.

(ii) Comm Rooms and non-main utility rooms may be located in the interior of the facility with interior doors.

(iii.) All shall be provided with locks such that only CE has the keys for these rooms.

(3) INTERIOR PERSONNEL DOORS: Construction may be either wood (solid core only) or metal as appropriate. Provide fire rating as required by codes. The use of vertical door view lites adjacent to the door latchset/lockset are highly encouraged where privacy is not an issue to promote safety. Where metal doors are used between conditioned and unconditioned areas, units will be insulated core.

(4) WINDOWS: Follow force protection requirements to prevent flying glass shards in accordance with UFC 4-010-01. (Under Development)

(a.) Industrial Casement

(b.) Storefront

(c.) Residential

f. DIVISION 9 – FINISHES

(1) COLOR SCHEDULES

(a.) All interior finishes and colors shall be coordinated and approved by the Base Project Manager and/or Contracting Officers Representative. Provide an Interior Color and Material Presentation board in a binder format (8 1/2” x 11”) with heavy samples mechanically fastened with color and material legends referenced on floor plans. Color boards are required with the Preliminary (60%) and First Final (85%) Design Submittal Packages.

(b.) All interior finishes shall be easily maintained, durable, and classic rather than trendy.

(c.) Permanent finishes such as ceramic tile, toilet partitions, solid surface and plastic laminate countertops shall be in neutral colors.

(d.) Accent colors in brighter hues must be used in limited quantities such as a tile border or painted accent wall.

(e.) Light colors shall be avoided for floor covering and high traffic areas.

(2) GYPSUM BOARD

(a.) Provide paperless water-resistant gypsum wallboard in restrooms. Where acoustical ceiling is used in restrooms, gypsum board around the perimeter of the restroom (along with the underlying wall system) shall extend to the bottom of the floor or roof deck for privacy.

(b.) Provide impact resistant gypsum wallboard in potential high abuse areas.

(c.) Provide exterior water resistant gypsum sheathing for exterior cavity installations.

(3) CERAMIC TILE

(a.) Ceramic tile installed over framing shall have cement backer board as the immediate underlayment surface. Other sheathing materials are allowed between the cement backer board and framing if required.

(b.) Provide L-shaped profile with integrated anchoring leg, continuous at top of tile wainscot.

(c.) Provide inside corner profile strip with integrated anchoring leg, continuous both horizontal and vertical where base of wall tile and floor tile meet.

(d.) Provide outside corner profile strip with integrated anchoring leg, continuous vertically at outside corner details.

(4) ACOUSTICAL CEILINGS

(a.) Provide tegular-edged ceiling tile in conference rooms and commanders suites.

(b.) Provide fine-textured square-edged ceiling tile in all other rooms, unless noted otherwise.

(c.) Provide washable, mildew resistant ceiling tiles in all kitchen and restroom areas, where gypsum wallboard is not used.

(d.) Center the tile grid on the center of the room. Space the tiles such that fractional pieces are of identical shape on the outside edges on opposite sides of the room.

(5) RESILIENT FLOORING

(a.) Provide commercial vinyl composition tile (VCT) in maintenance or industrial shop areas as well as break rooms.

(b.) Provide pre-molded corners at all wall base.

(6) SPECIALTY FLOORING

(a.) Provide access flooring system at computer labs, automated data processing support facilities, and all other areas as required. Access flooring system shall be aluminum stringer type.

(b.) Running track surface shall consist of a poured-in-place recycled rubber safety surface. Rubber safety surface should have “cushion-like” feel for shock absorption when running/jogging. Provide cast-in-place formed concrete border at perimeter of outdoor track.

(c.) Provide rubber composition tile flooring in weight rooms, aerobic rooms, and other gymnasium areas as required to provide shock absorption during physical fitness activities.

(7) CARPET

(a.) A patterned design or multicolored bold tweed has soil-hiding capabilities, where solid colors are recommended only for narrow borders and some billeting areas. Carpet tile is required only in areas with systems furniture or access floors. Avoid stripes and lines running parallel to walls and corridors.

(b.) Removal of carpet to be replaced (if applicable) should be handled according to pre-approved plan for recycling. Carpet must be capable of recycling by down-cycling, waste-to-energy-conversion or another disposal strategy that keeps the carpet out of a landfill. Carpet shall comply with Carpet and Rug Institute’s Green Label Indoor Air Quality. Carpet must comply with guidelines of Presidential Executive Order 13101 and meet the intent of Section 6002 of the resource and Recovery Act (RCRA).

(8) WALLCOVERING

(a.) Provide type II vinyl wall covering (flame and smoke resistant) must be used in neutral colors and subtle textures for upgraded areas.

(9) PAINT

(a.) Wall colors shall be neutral, light-reflecting colors in a semi-gloss finish, if not directed otherwise.

(b.) Ceilings shall be off-white in a flat or eggshell finish.

(c.) Dark accent walls and murals are not recommended because of difficulty of repairing or maintaining.

(d.) Semi-gloss or gloss paint is required for all trim, doors, and walls in areas that have moisture such as kitchens, restrooms, and bathrooms.

(e.) For previously painted areas, site investigation is mandatory to determine proper surface preparation for new coatings or wall covering.

(10) PAINT FOR HANGAR FLOORS; AFMC POLICY ON PAINTING CONCRETE FLOORS:

(a.) In general, concrete floors are not to be painted unless approved by 778 CES/CEPT. For utility rooms, sealed concrete is sufficient. For industrial floors, painting is provided by the user since surface markings (aisle, safety, etc.) are defined by the user's safety office. The exception may be if a special chemical hardening and/or surface treatment is required by the user which requires application either during the concrete placement or immediately after. If concrete floors are approved to be painted/repainted the following two paragraphs must be followed:

(i.) Concrete floors shall only be painted or repaired with materials having anti-skid ingredients. The materials should have a friction coefficient of 0.5 for level surfaces and 0.8 for sloped surfaces. Painting floors with non anti-skid coatings for cosmetic appearances is not permitted. However, urethane, latex or paints of similar composition may be used for demarcation lines, safety zones, and security warnings. All projects involving the repair of concrete floors shall be submitted through Civil Engineering channels for evaluation of floor coating specifications and application. Final approval shall be with the center/base safety office.

(ii.) Concrete floors that had been painted without anti-skid materials must be evaluated for removal prior to replacement with anti-skid coatings. The removal of floor coatings can present health hazards, so evaluations by local Safety, Environmental and Bio-Environmental Engineering Offices are necessary and required. Removal options, such as abrasive blasting where the dust residue is contained by vacuum equipment, or solvent/chemical stripping must be approved by the local safety, health and environmental offices. In any case, the organization requesting the removal must meet all health and safety requirements.

g. DIVISION 10 – SPECIALTIES

(1) INTERIOR SIGNAGE

(a.) Shall be in compliance with UFC 3-120-01 Air Force Sign Standards and ABA Accessibility Standard for Department of Defense Facilities.

(b.) Interior signage shall be part of SID (Structural Interior Design) and shall include building directories. Workstation identification signs shall be included with systems furniture packages in the CID (Comprehensive Interior Design).

(2) TOILET COMPARTMENTS

(a.) Provide solid core phenolic toilet partitions, urinal screens and entrance screens.

(3) WALL AND CORNER GUARDS

(a.) Corner guards, chair rails, and/or bumper guards shall be used depending upon the degree of wall protection required.

(4) TOILET ACCESSORIES

(a.) The current custodial contractor shall be able to maintain easily the toilet accessories such as soap and towel dispensers. Avoid expensive multiple function units that are difficult to maintain.

h. DIVISION 11 – EQUIPMENT

(1) WINDOW BLINDS

(a.) Provide horizontal blinds 2” wide slats. Blinds shall be capable of being full-height raised, no partially-height raised, and mounted inside the opening.

(2) ENTRANCE FLOOR MATS

(a.) All new buildings shall have recessed entrance mats installed in recessed aluminum angle frame with foot grille with propylene brush inserts.

(b.) Walk off matting shall be used at all building entrances and in transition from shop areas to carpeted administrative areas.

(3) LOADING DOCK LEVELERS: At raised loading docks where levelers are required, use minimum 6’x8’ hydraulic pit levelers with manual release.

(4) LOADING DOCK ACCESSORIES: At raised loading docks, provide dock bumpers as required to prevent damage to the foundation due to truck

backing operations. Also provide trailer latching equipment to prevent trailer creep away from the dock during loading and unloading operations. Where the facility is conditioned (heated and/or cooled), provide dock seals around the door opening.

i. DIVISION 12 – FURNISHINGS

j. DIVISION 13 – SPECIAL CONSTRUCTION

(1) Pre-Engineered Metal Buildings (PEMB): PEMBs are a viable alternative to conventional framed metal buildings and provide for a single source manufacturer for a metal building and the weathertight envelope. Where PEMBs are used, comply with the Robins AFB specification Section 13 34 19.

k. DIVISION 41 – MATERIAL PROCESS AND HANDLING EQUIPMENT

(1) BRIDGE CRANES: May be floor or building structure supported (Reference BFS Part 3A Structural for all structural design requirements). All bridge cranes require pendant and/or wall mounted controls (project specific). Consider using remote controllers for bridge cranes mounted over 20 ft. above floor surface. Controllers shall be either IR (infrared - preferred) or FCC Part 90 RF (radio frequency). FCC Part 15 RF controllers are **NOT** permitted for AF facilities. Remote controllers do not eliminate controls listed above which will provide redundancy should the remotes become inoperative (when remote controller is being used, pendant controller will be unplugged and pendants coiled and anchored to the crane)

<<<<< **END OF ARCHITECTURAL GENERAL SECTIONS** >>>>>

Author: Stefanie Dawson, 778 CES/CEPD, 478-327-2948

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Approval: ***Original Signed By***
Terry Landreth, 778 CES/CEPT, 478-327-2910

Robins Air Force Base
Base Facility Standards

Part 4B

Architectural Compatibility Standards

1 September 2011

78ABW **WR/ALC** **78CEG**

TABLE OF CONTENTS

1. **EXECUTIVE SUMMARY**

> "The intention is not to limit creativity, but to aid the designer in reaching decisions consistent with the goal of this program and to create a unified AFMC image."AFMC Facility Quality Program (1996)

A. INTRODUCTION

- In accordance with the goals of the AFMC Facility Quality Program, Robins AFB has developed Architectural Compatibility Standards to ensure consistency in future design and construction and renovation projects.

VISION - As mission and process change over time, Robins Air Force Base (RAFB) will continue to adapt and grow. The design of new and renovated facilities at RAFB shall incorporate the following objectives

- to support the mission
- to function efficiently to the maximum extent
- to be sustainable and minimize impact to the environment
- to enhance morale by providing high design standards for the work environment to provide a sense of community for the military and civilian personnel

How to Use This Document

- Critical elements of this plan are identified in the table of contents. Specific compatibility standards and illustrations are included on the pages that follow. This document maps out the Vision for future facility and development at Robins AFB. It is intended to be used by program managers, project managers, and designers to plan and execute projects to support the objectives described herein. Detailed reference documents are listed at the end of this document. This planning document is intended to be a guide and reference tool to ensure architectural compatibility in all future maintenance, repair and construction projects.

B. ARCHITECTURAL COMPATIBILITY GOALS

Identity. Improve the quality of the built environment and develop a greater sense of architectural identity at Robins AFB

Functionality. Encourage expression of building function and mission while maintaining a consistent design context

Innovation. Encourage the inclusion of new expression of technologies and incorporation of climate responsive elements into all facility design

Maintainability. Encourage design consideration for maintenance needs

C. **DESIGN IMPLEMENTATION** .

- Designers are encouraged to explore innovative solutions utilizing the latest technology available while achieving a balance between current Air Force Guidance and Standards, budget constraints, site conditions, and user requirements.
- A number of architectural elements have been identified as particularly relevant and are highlighted below.
- Incorporate Basewide Architectural Guidelines to the extent possible for all new buildings as compatible with adjacent zone facilities and elements.

This plan is not intended to stifle creativity. It communicates and illustrates current design standards which will unify and strengthen the architectural fabric of Robins Air Force Base (RAFB) and the Warner Robins Air Logistics Center (WR-ALC). Exterior standards apply to all organizations on base including hosted units, Georgia Air National Guard, USMC, Army Corps of Engineers, AAFES, Commissary, DLA, AFRC, and commercial organizations.

Architectural Compatibility Manager

The 78 CEG/CE Base Architectural Compatibility Manager is the **CE Technical Support Chief**. The compatibility manager is responsible for ensuring that all facility projects are compatible with the standards set forth in this document, and for maintaining and updating this plan.

2. ARCHITECTURAL COMPATIBILITY ZONES

A. Zones

Robins AFB has been divided into eight Architectural Compatibility Zones identifying areas where any construction of new or the renovation of existing facilities, compatibility with adjacent facilities **is required.** Some architectural components, including paint, roofing, and signage systems , do not vary from zone to zone and become unifying elements in the overall base plan. The zones are summarized below.

A. INDUSTRIAL FLIGHTLINE

B. OPERATIONAL AIRCRAFT UNITS & FLIGHTLINE

C. ADMINISTRATIVE & INDUSTRIAL FACILITIES

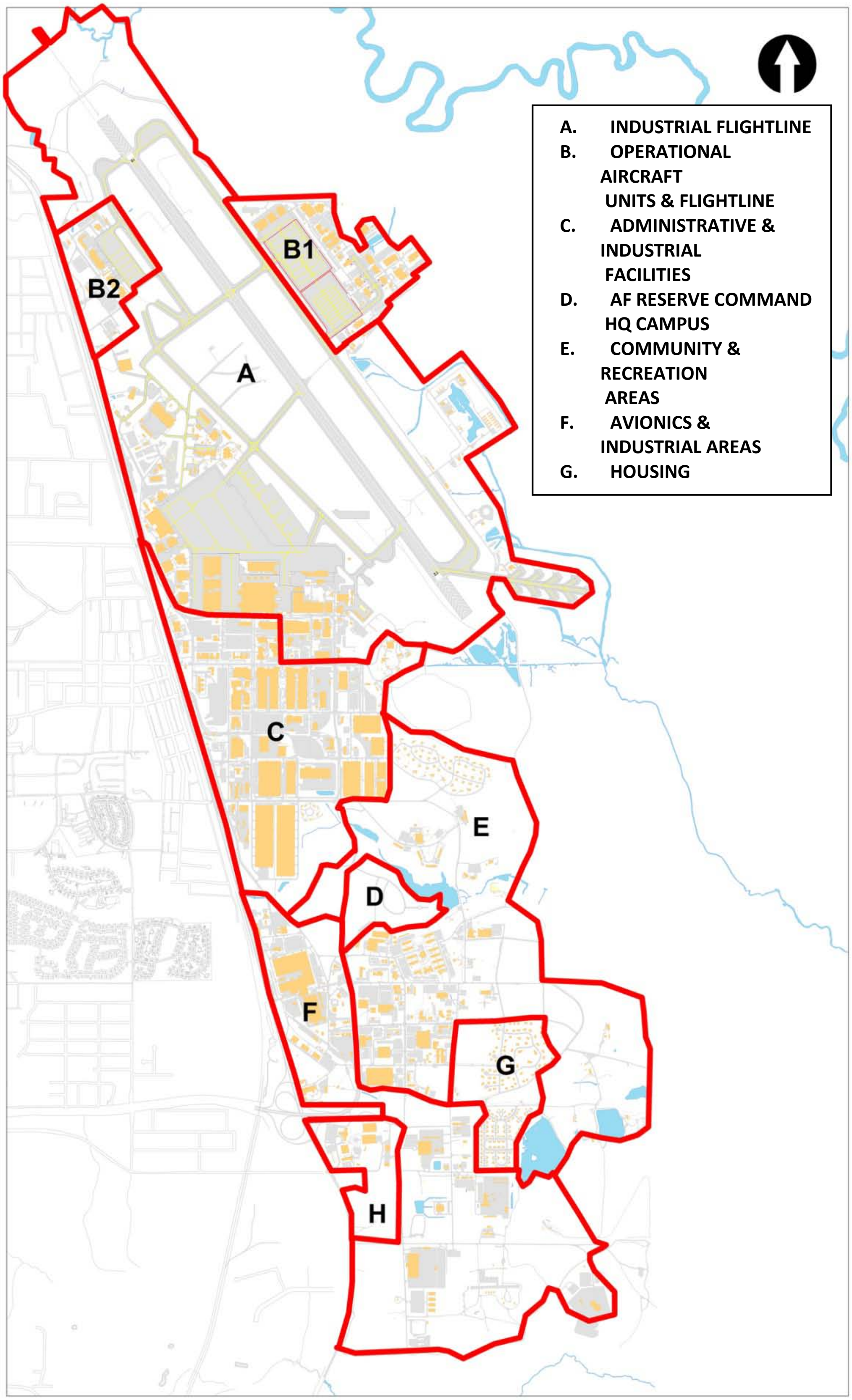
D. AF RESERVE COMMAND HQ CAMPUS

E. COMMUNITY & RECREATION AREAS

F. AVIONICS & INDUSTRIAL AREAS

G. HOUSING

H. MUSEUM


A. INDUSTRIAL FLIGHTLINE
B. OPERATIONAL AIRCRAFT UNITS & FLIGHTLINE
C. ADMINISTRATIVE & INDUSTRIAL FACILITIES
D. AF RESERVE COMMAND HQ CAMPUS
E. COMMUNITY & RECREATION AREAS
F. AVIONICS & INDUSTRIAL AREAS
G. HOUSING
A
B1
B2
C
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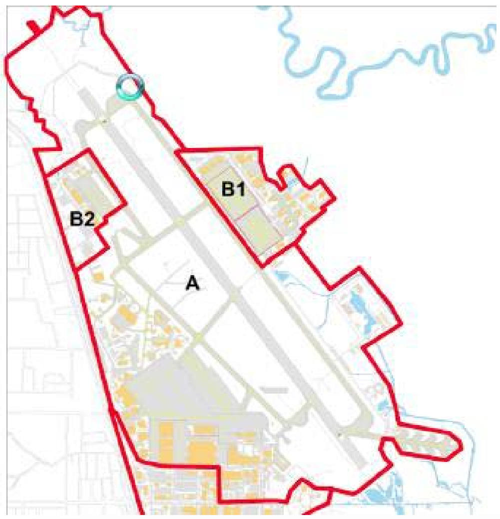
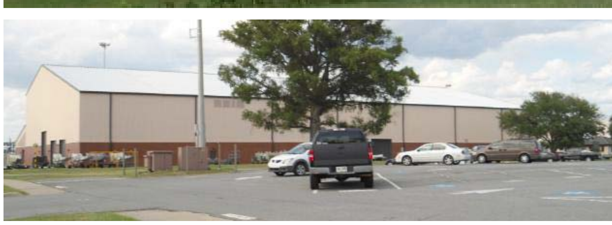
G
H

ZONE A. Is the secure area which defines the active Flightline excluding Zone B, to the east and west. A great majority of the facilities are large hangars to support the Programmed Depot Maintenance (PDM) of the F-15, C-130, and C-141 aircraft. Secondary maintenance and administrative facilities are also scattered throughout the zone.

The Industrial Flightline District is dominated by large aircraft hangars with related ancillary buildings. The majority of facilities are metal skinned. Future construction projects will specify factory-painted metal finishes with a 20-year warranty, which are compatible with existing facilities and the color standards in Section 6.F. Roof surfaces shall be compatible with the lighter-colored base color standards in order to maximize reflectivity



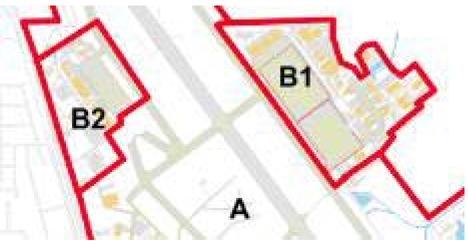


ZONE B – Operational Aircraft Units & Flightline

Zone B is the remaining portion of the secure Flightline located to the east and west of the runway. A majority of the administrative and maintenance facilities in this zone are brick with bronze standing seam metal roofs. Hangar facilities are metal clad. Some facilities are concrete block painted to match the RAFB standard colors. The zone includes the Joint STARS (Air National Guard & Georgia Air National Guard) areas, US Marine Corps and US Army Air National Guard facilities...

Every effort shall be made to coordinate new construction or maintenance and repair projects with the design standards prepared for the Joint STARS mission bed-downs and RAFB Standards. Brick shall be the architectural finish of choice for all administrative facilities. Hangars shall be prefinished metals consistent with the base color standards found in Section 6.0 or a combination of brick and metal.

B1 – EAST

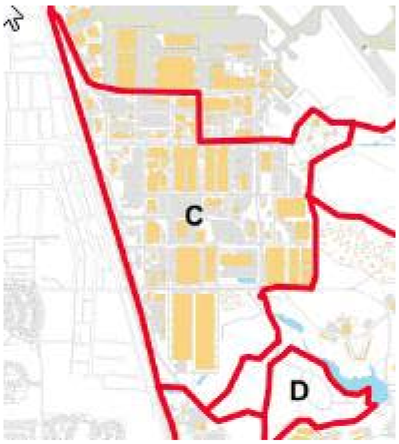


B2 - WEST

ZONE C – Administrative/Industrial

This zone identifies multiple administrative, industrial and warehousing facilities; Zone C. is comprised of many facilities which have been constructed with a multitude of architectural finishes. Careful attention to compliance with the standard architectural materials and finishes defined in Section 6.0 is critical. Future facilities construction or renovation shall be consistent with existing present and/or adjacent facilities, to ensure compatibility and continuity.

The Weapons System Support Center, B/301, is a 1992 Air Force Design Award winner and is a focal point for successful renovation of an existing facility. Similar projects should strive to emulate this quality of design while taking into consideration consistency with the Base Architectural Compatibility Standards.



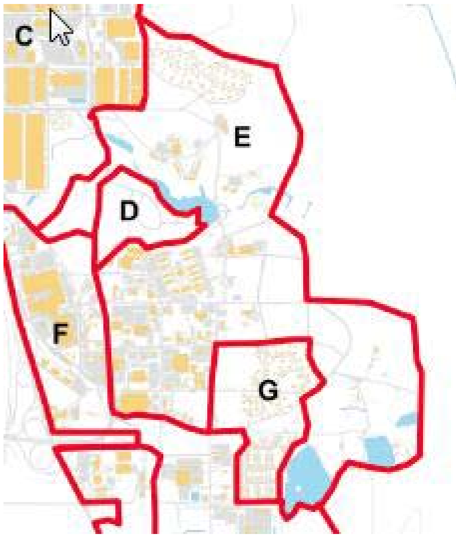




ZONE D – Air Force Reserve Command Headquarters Campus

The new DNFC facility, the first element of the future campus, is a brick faced, EIFS paneled structure, with CMU and cast stone components, and a standing seam metal roof. This is the first phase of a future multi-building HQ Campus. Future construction is required to be consistent and compatible with design elements and construction materials.

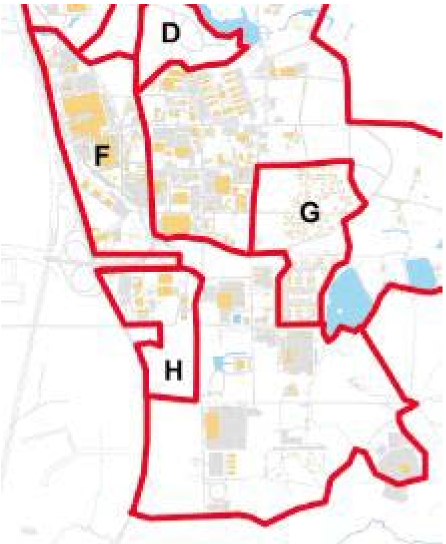
ZONE E – Community & Recreation Areas
The zone has high visibility, caters to all base and many off-base (retired community) and public users. Community use facilities include, Medical, Administrative, educational, Service, AFFES, Commissary and Dormitory uses. Existing structures are primarily brick and/or EFIS faced with standing seam metal roofs. Recreation Areas include Fitness/Gym facilities, athletic fields, a golf course and picnic areas. Any future construction is required to be compatible with existing adjacent facilities.



All Base tenant facilities, to include AAFEs and Commissary facilities shall also meet Architectural Compatibility Design Standards.

ZONE F – Avionics/Industrial

An Avionics Complex in the North part of this zone is primarily composed of metal or precast concrete surfaces. The other industrial users in the more open South portion of the zone include CE and Combat Communications facilities with a combination of brick-faced/standing seam metal roofs at administrative buildings and metal clad facilities at industrial type use structures. . Future construction or alteration shall be consistent with adjacent structures are in this district.



ZONE G – Housing

Is comprised of 359 Military Officer and Enlisted Family Housing units. These are privatized and maintained/operated by a contractor. The design and construction of any new facilities, is required to be compatible with existing structures and contingent on contractor and RAFB approval.

ZONE H - Museum Area - The zone consists of Museum Hangars, Administrative Facilities, outdoor Display Areas and ancillary structures. Hangar construction consists of primarily metal clad buildings**.** The facility colors, Blue and Gray, reflect a separate identity and vary from standard RAFB colors. All other design standards are applicable. Any future construction/renovation requires RAFB and Museum Director approval.

BASE ENTRIES – For Base Image purposes, the configuration and design of any future Base Entries shall be consistent with the design and materials of existing base entry new structures (Gates 3, 5 and 14).

B. Historic Preservation

Robins AFB and AFMC are dedicated to complying with all federal legislation pertaining to the preservation of historic facilities.   Coordination between the base and the State Historic Preservation Officer (SHPO) is required.

- All facilities 50 years of more must be considered as candidates for the National Register of Historic Places.
- Examples of Robins AFB facilities considered for historic preservation are Building 220 (HQ AFRC), Building 110 (Base Ops), and Building 125 (Depot Maintenance Hangar), and all General Officers' Quarters (GOQs).

Chiefs Circle Houses

Base Historic Preservation Officer (BHPO)

- Environmental Management (78CEG/CEAN) is responsible for the coordination of all historic preservation issues with the State of Georgia, 78 CEG/CE, and all appropriate using agencies. All potential candidates for the National Register of Historic Places at Robins AFB shall be determined by the BHPO and approved by the SHPO.

State Historic Preservation Officer (SHPO)

- Throughout the state of Georgia, The State Historic Preservation Officer (SHPO) is responsible for validating candidates for the National Register of Historic Places. The SHPO is the sole authority in the approval of candidates for the National Register of Historic Places.

- Once a facility has been identified as a potential candidate, or actually placed on the National Register, all potential designs to maintain, repair, or alter the facility in any way whatsoever must be approved by the SHPO.

- Design documents for potential construction projects must be sent to the SHPO for approval. The state of Georgia has thirty days to approve or deny proposed construction projects.

4. Handicapped Accessibility

Robins AFB is dedicated to providing adequate handicapped accessibility in all facilities basewide. All accessibility issues shall conform to the codes and guidance provided by the Uniform Federal Accessibility Standards (UFAS) or the Americans with Disabilities Act (ADA) whichever is more restrictive. All maintenance-repair and new construction projects must be reviewed to assure compliance with these standards.

Uniform Federal Accessibility Standards (UFAS)

The UFAS and the ADA are the applicable standards pertaining to handicapped accessibility in facilities at Robins AFB. The UFAS standardizes handicapped accessibility requirements in all DOD facilities.

The UFAS and ADA documents present uniform standards for the design, construction, and alternation of buildings so that physically handicapped persons will have ready access to them and use of them.

Military Exclusions

As a goal, Robins AFB will strive to provide adequate accessibility to all facilities regardless of the military exclusions granted by the USAS in Section 4.1.4.

4. Base Comprehensive planning

All Planning and Facilities Siting must be coordinated and approved by the Office of the Base Community Planner and **t**hrough the base's Facility Board, The Base Commander and the Air Logistics Center Commander will also approve all siting requests for new construction.

A. SITING COMPATIBILITY GUIDELINES

Proper siting, orientation and the configuration of a building are critical design decisions and have great impact on the quality of construction projects. Key factors are:

- Orient buildings to take advantage of summer shading and winter passive solar heating.
- Maximize natural lighting while controlling solar gain.
- Orient windows, decks and balconies to utilize natural breeze.
- Consider prevailing wind direction; locate building entrances in a protected area if possible.

Consider vehicular and pedestrian circulation to and from the facility SITING. Proper siting, orientation and the configuration of a building are critical design decisions and have great impact on the quality of construction projects. Key factors are:

- Orient buildings to take advantage of summer shading and winter passive solar heating.
- Maximize natural lighting while controlling solar gain.
- Orient windows, decks and balconies to utilize natural breeze.
- Consider prevailing wind direction; locate building entrances in a protected area if possible.
- Consider vehicular and pedestrian circulation to and from the facility

Facility Siting

- Proper facility siting in accordance with the Robins AFB land use plan is critical to ensure that every effort is made to avoid incompatible land usage. Through the base's Facility Board, the Air Logistics Center Commander will approve all sitting requests for new construction.

Area Development Plans (ADP)

- When proposed construction requires planning beyond the limits of a single facility, designers should pursue the creation of area development plans in order to facilitate thoughtful planning of the relationship facilities have with one another.

B. Air Installation Compatibility Use Zone (AICUZ)

- The Robins AFB study provides an assessment of noise levels, and statistical analysis to determine aircraft Accident Potential Zones (APZ). The goal of the study is to provide protection of the public and compatible development adjacent to the airfield.

C. The Base Comprehensive Plan

- The Base Comprehensive Plan is on the Robins AFB Web at www.gis.robins.af.mil. The plan features detailed narratives and figures (maps). There are four primary categories: (1) Constraints and Opportunities; (2) Land use; (3) Infrastructure; and (4) Capital Improvements. New projects should be compatible with the comprehensive plan.

5. ARCHITECTURAL COMPATIBILITY DESIGN GUIDELINES

BUILDINGS

Style / Form

- Place buildings at grade and express main entrance and related features as an architectural feature.
- Rectangular elements are the standard for major building masses. In general, use clean and simple forms. .
- Emphasize horizontal proportions.
- Develop a strong relationship between buildings and exterior spaces.

Scale / Massing

- Reduce the monumental appearance of large structures by including smaller components.
- Combine functions whenever possible to avoid proliferation of small independent structures.
- Break up the mass of large structures or reduce plan dimensions to reduce roof volume in low height buildings.

Existing Buildings

- Match the existing materials for any addition/alteration projects unless a significant change to the exterior envelope is desired and approved.
- Whenever possible bring existing facilities into compliance.

6.0 Architectural Finishes and Components

A. Metal and Plastic

- Metal siding is used extensively in most hangar and industrial facility construction. All metals shall be factory-finished with the manufacturer's standard paint colors to match the Robins AFB standard paint scheme as closely as possible.

- Metal conduit and cables are often mounted on the sides of facilities. These shall be factory-finished with the manufacturer's standard paint colors, or field-finished (minimum two covering coats), to match the Robins AFB standard paint scheme as closely as possible.

B. Concrete

- Concrete elements provide an acceptable accent to masonry construction, concrete should be avoided as an entire architectural finish. The use of pre-cast concrete panels may be acceptable with approval.

C. Brick

- Brick is the predominant and recommended architectural finish throughout all non-Flightline or Industrial zones at Robins AFB due to its low maintenance needs and durability. All bricks shall be laid in a running bond except accent elements. "Classic Velour Red" is the preferred Base brick color. Other brick colors may be used for accents. Keep in mind the basic colors for Robins AFB a shades of Tan and Bronze.

CLASSIC VELOUR RED

VELOUR LIGHT GRAY

VELOUR DIXIE ROSE

- The brick colors at existing RAFB facilities are no longer manufactured. Since several brick types have been used in past construction, the design goal is to match the brick types used in adjacent facilities, .Design basis for the Robins AFB standard bricks are Classic Velour Red, Velour Dixie Rose and Velour Light Gray as manufactured by Cherokee Brick & Tile, Macon, GA; or equal approved by the Base Architectural Compatibility Manager.

- Renovation, repair, additions of or/ to existing facilities or new construction shall match existing and/or adjacent facilities.

- Mortar color and joint finish to be used with the standard brick colors, should normally be gray or natural Colored mortar for accent purposes may be used if approved by the Architectural Compatibility Manager.

D. Concrete Masonry Unit(s) (CMU)

- Concrete masonry units are an acceptable and common building material at Robins AFB. Standard 8- by 12- by 16-inch CMUs shall be laid in a running bond and are acceptable with the following finishes:

  Smooth
  - *Standard smooth-finished CMUs are also acceptable when specified to be painted in accordance with the base color scheme or when selected with the inherent color to match the design basis shown below.*

- Design basis for CMUs shall be approved by the Base Architectural Compatibility Manager prior to incorporation in the project. All mortar color shall match the CMU color.


- Split-face CMU Color to be TAN or to match adjacent structures.

E. Exterior Insulation Finish System (EIFS)

- When compatible with the base standard colors, use of EIFS products such as Dryvit, Synergy, and Durock are acceptable to accents to masonry construction.

- This product shall not be designed to grade. Brick or CMU wainscots provide a more desirable and durable alternative.

-

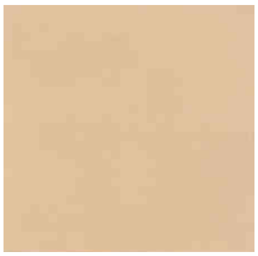
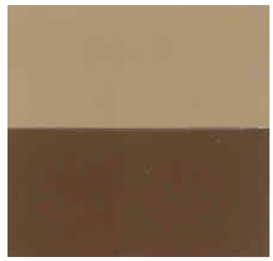

- Insulated Metal Panels may be used if they match finish color of adjacent facilities. And meet LEED Standards.Design basis for metal panels is “To Be Determined” (several are under consideration at this time).

[Add image]

F. Paint

- Industrial, Commercial and Administrative: All painting shall conform to the following color standards.

STANDARD COLORS

Base Color Robins 42	Contrast Color Robins 62	Accent Colors Robins 68 Robins 48	Highlight Color Devoe 1UM21A Garrison
			
Main Walls Downspouts Vents/Louvers	Standing Seam Roofs Meta Fascia Gutters Doors/Door Frames	Hangars Other Buildings Contrast Colors for Large Buildings Option for Small Doors Transformers	Handrails Lamp Posts

Exempt Buildings

300 301 541 542 545 547 551 552 553 557 560 591 593
594 595 Museum

- Officers Club and Conference Center: Due to the historical nature of the Officer’s Club and its architectural style and the Conference Center, those facilities should be painted white.

7. Roofing

Roofing is a high visibility and significant component for the visual integrity and continuity of architectural compatibility at Robins AFB

USAF Sloped Roof Policy

- HQ USAF has published policy directives for the conversion of flat roofs to sloped roofs. This policy authorizes conversion of built-up roofs to sloped roofs provided.

  - The existing roof needs to be replaced due to its deteriorated condition.

  - No functional space is added to the facility.

  - The useful life of the facility exceeds the life of the roof system selected.

  - The selection of the sloped roof system is justified as the most economical method based on a life-cycle economic analysis

Built-Up Roofing (BUR)

- BUR is not recommended for the construction of new facilities.

- In some instances existing industrial facilities may be reroofed with a BUR when metal roofs are not economical or feasible.

Roof-Top Equipment

If at all possible, the placement of roof-top mechanical and utility equipment shall be avoided. However, if no other viable alternative exists, the designer shall consider concealment of this equipment through color or screening compatible with the existing facility. Any exceptions must be approved by 78CES/CEO.

B. Standing Seam Metal Roofs

The NEW base standard of a SIERRA TAN, standing seam metal roof with a 3:12 slope shall be insulated and have a Cool reflective coating, and is recommended for use as much as feasible basewide to meet LEED. (See BFS Part 7A, Energy Policy for further detail.) standards at Flightline and Industrial Facilities Lower sloped roofs may be used, depending on the application, with the approval of the project architect. To maintain continuity and a consistent aesthetic appearance present high public use and visibility areas, such as Zone E, community facilities, the existing DARK BRONZE roof color shall be maintained, with approval of the Base Architectural Compatibility Manager, and shall include a "Cool Roof Coating". Separate major new complexes, such as the Dorm Campus Master Development Plan shall use the Sierra Tan Standard.

SIERRA TAN DARK BRONZE PEARL

- Solar efficient roof panels are highly recommended for LEED and energy conservation purposes , if project cost permits.
- Solar Panels to supplement water heating requirements shall be components of all future RAFB facilities**. They may be part of the roof structure or independent elements.**
- Existing Hangars in the flightline area have “Pearl” colored metal roofs**.** Replacement roofs in this area shall utilize the same color to match existing.

Low Slope Roofs

Light colored roofs provide significant heat radiation benefits in most situations. They should be considered by the designer in industrial areas and/or where the roof has limited or no visibility from the primary visitors traffic routes.

8. Fascias, Gutters and Downspouts

- Incorporate continuous metal fascias that are scaled to match the roof. Size them 8 inches minimum and 14 inches maximum in height.
- Fascias shall match the roof color when used with metal roofing.
- Gutters on sloped roofs are encouraged and shall be factory finished to match the roof color.
- Integrate downspouts with architectural details and match their color with that of adjacent wall surfaces.
- Limit the use of angle rain water leaders to the extent possible.
- Use underground drainage where possible. At a minimum, provide concrete splash blocks to carry water away from foundations.
- Interior roof drains and open scuppers are allowed only with approval.

Roof Vents and Elements

- Minimize, consolidate, and organize roof penetrations on the least visible side of the building.
- Paint vent pipes and other roof elements to match the roof color.
- Do not use rooftop mechanical units. When required, minimize the negative visual effects with screening to match the roof color.
- Consider the use of dormer vents to conceal and screen exhaust fans..
- Make mechanical vent sizes and shapes consistent with architectural elements.
- Avoid roof-mounted antennas.

9. WINDOWS AND DOORS

All windows and doors are to meet AT requirements as specified in AT/PP regulations and guidelines.

Openings

- Use window type, size, placement and mullion pattern to emphasize the overall architectural design.
- Coordinate window and door placement horizontally and vertically.
- Set windows back at least 4 inches from the building façade.
- Use operable windows with screens as possible.
- Transom windows are encouraged.
- Provide shading and lighting devices to minimize solar gain and maximize interior lighting. (e.g., light shelves)
- In open office areas locate windows above the height of potential open office partitions.

Doors and Frames

- For exterior doors requiring glazing, use dark bronze aluminum storefront systems with thermal-break construction.
- Hardware shall be of same color.
- All secondary-use and service doors and frames shall be painted to match adjacent wall color.
- Limit hollow metal frames to security doors and utility rooms matching wall color.
- Sealants applied adjacent to windows and doors shall match the frame color.
- Solid exterior doors shall be of steel construction, factory primed, field painted, with stainless steel hinges and brushed chrome hardware.
- Consider wind loading and direction when designing exterior entry and service doors.

Glazing

- Use bronze tinted, dual-pane insulated glass.
- The inside of dual-pane windows must use a minimum of ¼" laminated glass and be framed in accordance with UFC 04-010-01 to meet AT/FP requirements.
- Avoid mirrored, spandrel, and plastic glazing. Glass block may be used with ACRB approval.
- Translucent insulated panels are acceptable. Use Kalwall Crystal panels with Bronze color finish on frames or equal product.

Clerestories and Skylights

- Develop clerestories or low-profile skylights integrally with the building design.
- Use clerestories in open office spaces where partitions may be placed against an exterior wall.
- Use tubular skylights to maximize natural lighting. As possible.

10. PARKING

Develop functional lots with clear circulation and a positive appearance that complements the facility.

General

- Parking layout must address maintenance, safety, and accessibility.
- Combine parking areas for multiple facilities, where possible.
- Use the 90-degree parking configuration when possible.
- Provide a greenbelt of 20 feet from parking lots to streets.
- Use shrubs in groupings and landscaped berms around the perimeter to screen and soften the impact of parking areas.
  - Wherever possible, provide tree shading or shade canopy for parking areas. Incorporation of solar panels in shade canopy design is encouraged. 78 SPS is the authority for assigning reserved parking spaces. Requests for reserved parking should be submitted to them along with justification and organization point-of-contact.

  - Parking stall width should be determined by the use of the lot. For example, parking spaces for BX or Commissary lots where drivers have to deal with packages should be wider than employee parking with low turnover. In general, spaces should not be smaller than 9 feet wide.

- Handicapped parking spaces should match the required standard from the UFAS or the ADA, whichever is predominant

Medians and Islands

- Reduce visual mass of large parking areas with landscaped islands and planting strips. Consider shading where possible..
- For landscaped medians and planting islands, provide a minimum dimension of 6 feet to accommodate root system.
- Use trees in medians and islands to create shade and interest.
- Use decomposed granite or approved rock in medians and islands for ease of maintenance. Allow for breaks in the medians where necessary for pedestrian cross circulation.
- Provide medians for every four rows of vehicle and planting islands for every 20 stalls where there is adequate space.
- Coordinate layout for light poles with landscape islands and minimize their number to provide the required illumination.
- Provide designated areas for pedestrian cross traffic.

Paving

- Provide 4 inch wide white striping for all pavement markings.
- Asphalt paving is the standard.
- Use concrete where required for heavy vehicles, motorcycle parking, and where fuel spills may occur.
- To obtain LEED points, use heat reflective concrete or pervious concrete when financially feasible in parking lots.

11. EXTERIOR SIGNAGE

Consistent, compatible signage throughout the base is a tool that serves to visually tie together various built and natural environments. See Attachment UFC 3-120-01 Air Force Sign Standards.

Standard Facility Signs

- Exterior facility signs at Robins AFB are the sole responsibility of the Base Sign Manager and the 78 CES sign shop. The Robins AFB Sign Standards have been developed in accordance with UFC 3-120-01, Sign Standards. Types B1 and B2 are modified to replace the logo at the top with the building number.

- Traffic Signs – Follow the Manual on Uniform Traffic Control Devices

Facility Identification

- Given the approval of the Base Sign Manager and the Architectural Compatibility Manager, lettering will be allowed on the exterior of prominent facilities. Size, type, and color of lettering will be approved on a case by case basis.

Logos and Supergraphics

- Painted logos and racing stripes are not acceptable. .

Special Signs

- Special Signs will be permitted for unique situations subject to the approval of the Base Architectural Compatibility Manager.

12. LANDSCAPING

Landscape Architecture goals are the enhancement of the environment, conservation and reduced maintenance and water use.

Landscape themes include planting treatments, site elements, barriers and screening, pedestrian environments, and open space; which contribute to the environment and visual quality of Robins AFB.

Recommended Plantings (see BFS 4C – Landscaping)

A. LANDSCAPING GOALS

Promote landscape design that relates to the facility and relates to the neighborhood. Where appropriate, create outdoor places with landscape design in addition to enhancing building improvements.

Ecology - Create an overall basewide landscape image that is unique to Central Georgiaa and emphasizes the native natural setting of Robins Air Force Base. Eliminate the use of potentially invasive species. Consider landscape design as an extension of the local ecosystem. Provide habitat for the preservation of indigenous species.

Context - Promote landscape design that relates to the facility and relates to the neighborhood. Where appropriate, create outdoor places with landscape design in addition to enhancing building improvements.

Maintenance - Reduce maintenance requirements such as pruning, trimming, mowing, weeding, and mulching. Considerations should be given to dropping of seeds and resin, fragile tree limbs and other maintenance concerns. Longevity and disease resistance are also key considerations.

Shade - Use shade trees as possible in public seating areas and parking lots.

B. **LANDSCAPING DESIGN GUIDELINES** - Use landscaping design to enhance facilities and neighborhoods. Organize landscape features to connect individual facilities to walkways, roadways, and open spaces.

Maintenance
- Establish a maintenance program, as part of the design and in consideration of future maintenance costs.
- Prep planter and mulch beds by spraying with pre-emergent herbicide and cover with weed control fabric.
- Xeriscape planting is preferred. Provide irrigation system only if necessary and only until plants are established.
- Concrete or masonry raised planting beds are acceptable where consistent with and integrated with hardscape design. Use split-face or Allen Block.

Edging
- Separate and define all planting areas from sod areas with edging.
- Provide concrete mow strips at planting beds as the standard.

Landscape Screens
- Where possible, use landscaping instead of walls or fencing for screening.
- Reduce the negative visual impacts of open utility elements and unsightly features with landscape screening.
- Use a three-tier landscaped screen that combines ground cover, shrubs and small trees.

- Plant street trees on the building side of sidewalks as possible.

Retaining Walls shall be of Split-face Block or Allen Block in a natural or tan color'

Allen Block Retaining Wall

Split-face CMU retaining Wall with cap

13. SITE COMPONENTS/ELEMENTS

Consistency is the most critical factor in the selection of various site elements such as benches, trash receptacles, lighting fixtures, pavilions, and street furniture.
Designers shall consider maintaining compatibility with similar site elements within a particular architectural zone on Robins AFB.
When practical, a dark bronze anodized finish shall be selected for all site elements on base.

A. Fencing and Screening

Comprehensive screening considerations are a major element in strengthening the visual image of RAFB. Several screening types are acceptable. Consistency and durability are essential Well-designed screens should not draw attention and shall be kept to a minimum. Screening shall be considered and /incorporated into the design of facilities to address the following types of items: Dumpsters, exterior mechanical and electrical equipment, storage/service areas, etc.

Brick fencing

- Selection of brick must be compatible with the standards defined in Section 6.0 of this document.
- Brick fencing may be solid or perforated for ventilation reasons.

Brick Fence

Brick fence to have limestone or exposed precast coping. Height not to exceed 7'- 0". All bricks shall be laid in a running bond.

Metal fencing

- Provide metal fencing in the "shadow box" configuration. To be 8' high and dark bronze color or match adjacent facility wall color.

Chain Link Fencing

- This type of fencing is only acceptable when required by security regulations. When required, screen with shrubbery. If not possible, provide fabric screening attached to the fence .in colors compatible with adjacent facilities and RAFB color standards.

Perimeter Fencing and Fence Gates

All perimeter fencing shall meet AT/FP Standards. Two types of fence are recommended and presently used. Steel Security Fencing – Design Standard "Ameristar" Trident Steel Fence, 8'-0" high.

Chain Link fencing – with black vinyl coating – 7'-0" high with 3 strands of Barbed wire on 1' high outriggers.

Vynl Coated Chain Link **Steel Security Fence**

Mow Strips

Any new fencing/or screen wall shall require a concrete mow strip if adjacent to a grassed/ or planted area

Screen Walls

Screen walls may consist of perforated brick or CMU components to allow for ventilation. Steel security fence components may be incorporated. The below image is a combination of Split-face block with a brick course and a concrete cap, used along Watson Blvd.

Watson Blvd Screen Wall

Dumpster Enclosure Screens

- Use Shadowbox Dark Bronze Matal Fencing. Height to be 8'- 0"
- Locate dumpsters to minimize visual impact.
- In high-visibility locations provide metal gates to screen dumpsters.

B. Bollards

- Provide bollards where required to protect structures or equipment.and shall meet AT/FP Requirements.
- Precast concrete Bollards are required at high visibility amd high vulnerability locations that include major administrative and secure locations.

High Security Area Bollards

Entry Area Bollards with Steel Chain   Removable Bollards for AT/FP

C. Pavilions/Shade Structures (Gazebos)

Use centrally located pavilions between several facilities to create multipurpose use shaded spaces.

- A ventilation cupola is highly recommended.
- Pavilions shall be pre-manufactured metal structures. They may be square or hexagonal in shape and shall have a dark bronze finish or match adjacent facilities.
- Pavilions may include attached matching benches or recycled plastic furnishings.

Large Pavilion at Dorms Plaza

Small Pavilion

All pavilions, gazebos or shade structures, erected on Robins Air Force Base must be approved by the Base Civil Engineer. Requesters must submit to the Base Civil Engineer a proposed site plan layout showing the distance from existing buildings and concept drawings of the proposed gazebo for approval. Requests should be submitted to 778 CES/CEPT.

D. CANOPIES

Canopies are to be prefinished metal, with a standing seam metal roof to match building roof color.

[Insert Future Picture]

E. PLAZAS/PAVING

Any new plaza, courtyard or major building entry area shall use a permeable paving, surface allowing for drainage into the soil beneath it

Permeable Pavers

Airplane Plaza

F. RAMPS/RAILS

Handrails shall meet ADA standards.
Handrails shall be finished with a dark brown powder-coated surface. Integrate handrail designs with the facility design.

G. WALKWAYS

Develop a consistent pedestrian circulation system of walkways and paths to enhance the community. Connect passenger waiting shelters, outdoor plazas, parks, and other pedestrian gathering sites into the overall circulation network.

Sidewalks

- Provide minimum 5-foot wide walkways along all primary, secondary, and access roadways.
- Maintain a minimum 3-foot wide landscaped parkway between curb and sidewalk.
- Curvilinear and meandering walks are preferred where appropriate.
- Size sidewalks appropriately for the visual scale of the facility and the amount of pedestrian traffic volume.
- Use natural colored concrete with a broom finish and troweled edges.

Crosswalks and Ramps

- Ensure that paths lead to the safest crossing point possible, and cross roadways at 90-degree angles.
- Incorporate ADA accessible curb ramps and white-color crosswalk markings.
- Provide for adequate drainage away from the ramp.

H. BIKE PATHS

The incorporation of a bike path leading to any new facility is highly encouraged.
Bike Paths/trails shall be constructed of asphalt and/or concrete.. They may be incorporated into new roadways. n addition to existing or as a separate component. Appropriate identification signage is required. They may be separate components or alongside an existing roadway.

Dorms Area Concrete Bike Path

Robins Pkwy, Asphalt Bike Path

14. SITE FURNISHINGS

Outdoor Furniture

Picnic Tables
Place picnic Tables at gathering areas. Use recycled tan color plastic with steel frame.

Benches Seating
- Provide seating along walkways, building entries, courtyards, and plazas.
  Place benches within a paved area

- Place surface-mounted or portable litter and ash receptacles at building entrances, pathways, outdoor seating, and picnic areas.
- Locate these to be functional, yet visually unobtrusive

Trash Receptacles
Place surface-mounted or portable litter and ash receptacles at building entrances, pathways, outdoor seating, and picnic areas.
Locate these to be functional, yet visually unobtrusive

Bike Racks
- Provide bicycle parking areas for all facilities. Combine areas for densely sited buildings.
- Incorporate bike racks into hardscape design within 200 yards of building entrance.

DRINKING FOUNTAINS

Are to be 2-tier ADA compliant with a concrete aggregate finish.

15. MODULAR BUILDINGS

Temporary
Temporary leased facilities are to be comprised of multiple modular units (usually 12' x 60') combined for temporary use as office or classroom facilities. They shall have a common roof and exterior wall finish. This is usually EIFS and must be compatible with adjacent structures. A permanent foundation is not required. The facility lease costs shall include provision for removal and site restoration. All ADA and other regulatory requirements shall be met.

16. SUSTAINABLE DESIGN AND ENERGY EFFICIENCY GOALS (See *BFS Part 7C – Sustainable Design and Development* for details)

All projects shall achieve sustainability and energy efficiency to the maximum extent possible as defined by Presidential Executive Order 13423.

All new major construction projects or renovations shall be at least LEED Silver certifiable as defined by the USGBC.

Aspects of energy efficiency and LEED sustainability are relevant to Robins AFB. Designers are encouraged to incorporate these elements into facility design:

Climate Responsive Design
- Solar orientation
- Solar gain control
- Passive solar design
- Daylighting
- Shading for outdoor spaces

Water Use Reduction
- Use low flow fixtures
- Use smart or Computer Controlled and monitored irrigation systems where feasible
- Eliminate permanent landscape irrigation or use high efficiency systems
- Use of reclaimed water for irrigation where possible

Energy Use Reduction
- Use of EMCS to monitor and control energy use within facilities
- Use of high efficiency equipment and fixtures
- Provide sensor and controls to reduce unnecessary use

Renewable Energy
- Incorporate solar panels into architectural design where cost effective and appropriate.
- All new construction or renovation shall use solar panels as a supplement to water heating systems.
- Solar panel arrays shall be arranged in an aesthetically pleasing manner and be accessible for maintenance.

17. AT-FP/Security

Plan facility to accommodate standoff distance for present and future projects.
Determine if vehicular barrier is required. If it is, plan for establishment of a larger protected area with adjacent facility with same requirements. Consider visibility from surrounding streets to allow for security patrol.

Building Function

- Orient service side of the facility away from main roads and streets.
- Consider noise, light, traffic and other impact generated by the facility to surrounding areas and facilities.
- Consider desired sightline for the facility mission, such as a view of the flightline.
- Provide for necessary adjacency to other facilities.

Utilities

- Consider existing utilities and available points of connection. Minimize relocation of utilities where possible. When site utilities modification is required, consider future demands and routing.

18. References

This document is intended to provide references to specific details critical to successful architectural compatibility at Robins AFB.

1.0 Executive Summary
- AFMC Facility Quality Program
- AFMC Commander's Desktop Guide to Excellence in Base Operating Support (BOS)

2.0 Architectural Zones
- AFMC Facility Quality Program
- Architectural and Landscape Design Criteria for Joint STARS Mission Beddown (ACC)

3.0 Historic Preservation
- The Secretary of the Interior Standards for Rehabilitation and Guidelines for Rehabilitating Buildings

4.0 Handicapped Accessibility
- Uniform Federal Accessibility Standards
- The Americans with Disabilities Act (ADA)

5.0 Base Comprehensive Planning
- Robins AFB Base Comprehensive Plan
- Air Installation Compatibility Use Zone (AICUZ)
- Joint Land Use Study (JLUS)
- DOD Minimum Antiterrorism Standards for Buildings, UFC 04-010-01

7.0 Roofing
- Air Force Sloped Roof Policy

8.0 Exterior Signage
- Robins AFB Sign Standards
- UFC 3-120-01 Sign Standards

9.0 Traffic Considerations
- Robins AFB Curbing Plan
- Manual of Uniform Traffic Control Devices (MUTCD)

10.0 Landscaping
- Robins AFB Base Facility Standards

<< END OF ARCHITECTURAL COMPATIBILITY STANDARD >>

Author: Heinz Butt, 778CES/CEPT, 478-327-2913

Reviewer: Bill Deaver, 778CES/CEPT, 478-327-2930

Approval: ***Original Signed By***
Terry Landreth, 778 CES/CEPT, 478-327-2910

Revision History

24 Aug 2005	Separated Architectural General from combined BFS into its own document, and included the Architectural Compatibility Standard as part of it.
28 Jul 2011	Grand Update of BFS Architectural Compatibility Standards

Robins Air Force Base
Base Facility Standards

Title: Landscape Design

Date: 1 September 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 4C – LANDSCAPE DESIGN

LANDSCAPE DESIGN:

a. Approved plantings for the area include all those plants commonly used for landscaping in the area and in keeping with adjacent existing plantings. The Base Architectural Compatibility Standard and the Base Land Management Plan will provide additional information concerning desired and approved plants.

b. Facility setbacks shall be as shown in the Base Land Management Plan.

c. Types of turf shall be as shown in the Base Land Management Plan.

d. Seeding and sodding requirements over utility lines and at project site vary depending upon location.

e. Automatic sprinkler systems shall be installed for those areas that require regular maintenance and watering. See the Civil Section for detailed requirements.

f. Plants approved for Robins AFB are as follows (per Bob Sargent in 78CEG/CEAN), as shown in the attached document:

"Best Practices For Landscaping At Robins Air Force Base", March 2011

Author: Bob Sargent, 78CEG/CEANR, 478-327-3974

Reviewer: Heinz Butt, 778CES/CEPT, 478-327-2913

Approval: ***Original Signed By***
Terry Landreth, 778 CES/CEPT, 478-327-2910

FINAL

BEST PRACTICES FOR LANDSCAPING
AT
ROBINS AIR FORCE BASE

78th Civil Engineer Group, Environmental Management Branch
Robins Air Force Base, Georgia

March 2011

FINAL

BEST PRACTICES FOR LANDSCAPING AT ROBINS AIR FORCE BASE

Contract No. W12978-09-D-0092
Delivery Order No. CV01

Prepared for:
78th Civil Engineer Group
Environmental Management Branch
Robins Air Force Base, Georgia
78 CEG/CEAN Project Manager: Bob Sargent

Prepared by:
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645 Tallulah Trail, Suite 202
Warner Robins, Georgia 30328-5648

March 2011

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SECTION **PAGE**

ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
ANSI	American National Standards Institute
BASH	Bird/Wildlife Aircraft Strike Hazard
EO	Executive Order
FEMP	Federal Energy Management Program
INRMP	Integrated Natural Resources Management Plan
NRCS	Natural Resources Conservation Service
RAFBI	Robins Air Force Base Instruction
USDA	United States Department of Agriculture

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1 INTRODUCTION

Robins Air Force Base (AFB) contains approximately 1,788 acres of improved land, 1,476 acres of semi-improved land, and 3,120 acres of unimproved land (URS, 2007). The maintenance of these lands follows Natural Resources Conservation Service (NRCS) guidelines and existing Air Force standards and specifications, i.e., The Robins AFB Site & Landscape Development Plan (AFCEE, 1998a), the USAF Landscape Design Guide (AFCEE, 1998b), and the Robins AFB Integrated Natural Resources Management Plan (INRMP [URS, 2007]). The INRMP is the primary driver for compliance with and enforcement of natural resources laws and regulations at the Base, and provides general guidance on grounds maintenance. The INRMP emphasizes the conversion of improved grounds to semi-improved or unimproved grounds where possible, and the use of native, drought-resistant vegetation in future landscape plans.

BACKGROUND

Robins AFB is located within the Sand Hills portion of the Southeastern Plains Ecoregion (GADNR, 2005), and is situated south of the Fall Line and west of the Ocmulgee River. The climate is humid, and typified by hot summers and mild winters (URS, 2007). Average annual rainfall is about 45 inches, and February, March, and July are normally the wettest months (URS, 2007). Despite the relatively high level of rainfall, Georgia is currently facing a severe water supply problem following a period of prolonged drought and continuing population growth (Wade et al., 2007). Xeriscape landscape principles have been developed to minimize outdoor water consumption and reduce the overall effort and cost of traditional landscape maintenance (Wade et al., 2007). These principles are in line with water conservation and grounds maintenance guidance provided in Sections 7.7 and 7.8 of the INRMP (URS, 2007).

PURPOSE OF GUIDELINES

The purpose of this document is to enhance and support existing landscape directives on Robins AFB by incorporating xeriscape principles and industry standard practices. Specifically, this document identifies current best practices for landscaping at Robins AFB for new project proponents, facility managers, and contractors, and guides the implementation of low-maintenance landscaping consistent with Robins AFB Instruction (RAFBI) 32-7064.

INDUSTRY STANDARDS

Landscaping practices on Robins AFB should conform to the American National Standards Institute (ANSI) industry standards:

- **ANSI A300** – American National Standard for Tree Care Operations – Standard Practices Series (available for purchase at http://www.treecareindustry.org/public/gov_standards_a300.htm)
- **ANSI Z60.1-2004** – American National Standard for Nursery Stock (available at http://www.jerseygrown.nj.gov/jgstandards.pdf)
- **ANSI Z133.1-2006** – American National Standard for Arboriculture Operations – Safety Requirements (available for purchase at http://www.treecareindustry.org/public/gov_standards_z133.htm)

RESOURCES

- The University of Georgia Cooperative Extension website (http://www.caes.uga.edu/extension/index.cfm) provides valuable resources on species selection, xeriscaping principles, landscape design, and plant/landscape maintenance.
- Houston County Cooperative Extension Office (http://www.ugaextension.com/houston/) is located in Perry, GA. The office can process soil nutrient analyses and provide guidance on plant/landscape maintenance.
- AFCEE (The Air Force Center for Environmental Excellence). 1998. *The Robins Air Force Base Site & Development Plan*. Prepared for the 78th Civil Engineer, Environmental Management Division. June 1998.
- AFCEE (The Air Force Center for Environmental Excellence). 1998. *USAF Landscape Design Guide*. September 1998.
- Local nurseries are a valuable source of information on plant selection, pest control, and maintenance.

GUIDELINE ORGANIZATION

The guidelines are organized into ten sections, which may be used individually or in conjunction with other sections. Each section provides information on best practices, and refers the reader to more detailed sources of information, when appropriate. The sections are described below:

Section 2 **LANDSCAPE PLANNING:** Establishes basic rules for proper landscaping

Section 3 **WHAT TO PLANT:** Identifies appropriate landscape plants

Section 4 **WHAT NOT TO PLANT:** Identifies inappropriate landscape plants

Section 5 **PLANTING:** Describes proper planting techniques

Section 6 **MULCHING:** Details suitable mulching materials and methods

Section 7 **FERTILIZING:** Highlights appropriate fertilization practices

Section 8 **IRRIGATING:** Provides information on irrigation and irrigation systems

Section 9 **PRUNING:** Specifies correct pruning methods

Section 10 **PEST MANAGEMENT:** Outlines an integrated pest management strategy

Section 11 **PROTECTING PLANTS DURING CONSTRUCTION:** Describes how to protect plants during construction

2 LANDSCAPE PLANNING

- **Landscape and planting plans must be reviewed and endorsed by the grounds maintenance manager and the natural resources manager (RAFBI 32-7064).** This provision should be included in all landscaping sections of bid documents and standard contract language.
- **Landscape plans should include planting design, plant species, planting details, and how new transplants would be monitored and maintained, such as how supplemental or permanent irrigation would be performed.** Transplants will require supplemental irrigation for at least the first year after planting (see Section 8 – Irrigation).
- **The Environmental Management Branch will provide low-maintenance landscaping and xeriscape requirements for all new construction and landscape improvements through standard contract language (RAFBI 32-7064).**
- **New construction projects shall implement low-maintenance landscaping, incorporating xeriscape principles (RAFBI 32-7064).** A well designed xeriscape planting naturally requires minimal maintenance, water, fertilizer, and pesticide use.
- Landscape concept design should reflect the base landscape theme, plant list, and existing site conditions.
- Landscape design should consider principles of proportion and scale, harmony, emphasis, contrast, variety, plant form, texture, and color in creating a visually pleasing and functional landscape.
- Functional uses of plants include wind and surface erosion control, temperature modification, noise abatement, and glare control.
- New plantings should create an attractive landscape, minimize future maintenance needs and water use, and enhance biodiversity. Select plants and develop landscape plans that reduce the need for future weeding, irrigation, pruning, etc.
- **Always consider the mature growth potential (height and spread) of the plant relative to the size of the landscape area.** When the plant reaches mature growth potential, will it physically contact, or obstruct access or maintenance to, elements of the built environment (buildings, doorways, windows, utility poles or lines, underground utilities, outdoor lighting, signage, sidewalks, or lines of sight around intersections or roadways, etc.)? If the answer is yes, then the plant is not appropriate for the space.
- Foundation plantings should provide a transition or connection between vertical and horizontal planes, and can range from a formal arrangement of shrubs to a blend of trees, shrubs, groundcovers, annuals, and perennials that soften the intersection of building and ground.
- **Do not plant large trees or large shrubs near buildings.** Use grasses, ground covers, or smaller shrubs that exhibit slow growth, low height profiles, and small canopy spreads. As a rule of thumb, large trees should be planted at least 30 – 40 feet from buildings, and small trees should be planted at least 10 – 15 feet from buildings.

- **Do not plant trees under or near utility poles, utility lines, or outdoor lighting.**
- **Do not plant large trees in small medians or islands in roadways or parking lots.** Ideally, an unpaved island would extend at least to the drip line or crown edge of the mature tree.
- **Plants used in parking areas should be hardy varieties that can thrive in confined growing areas and are tolerant to drought, heat, and pollution.** Plant selection should consider nuisances such as fruit and sap.
- **Do not plant trees or shrubs near intersections** (including connections between roadways and driveways or sidewalks) or in any area where plants could possibly obstruct the line of sight required for safe travel on roadways.
- Landscape design should consider wildlife habitat enhancement or creation where applicable by using plants that provide food, shelter, water, and space to meet wildlife needs.
- Spacing of new landscape plantings should be driven by the projected uses or maintenance requirements of the area, and the mature growth form of the plants. **Do not overcrowd new plantings.** If the area will need to be accessed in the future, then new plantings should be spaced to allow for continuous ease of access even when the vegetation reaches mature growth potential.
- The use of native, naturally-occurring plants and high-efficiency water delivery systems in landscape design will create sustainable landscapes, save money, and reduce irrigation and maintenance requirements.
- Purchased plants should conform to the ANSI Z60.1-2004 standards for nursery stock.

For additional information:

AFCEE (The Air Force Center for Environmental Excellence). 1998. *The Robins Air Force Base Site & Development Plan*. Prepared for the 78th Civil Engineer, Environmental Management Division. June 1998.

AFCEE (The Air Force Center for Environmental Excellence). 1998. *USAF Landscape Design Guide*. September 1998.

RAFBI 32-7064. *Integrated Natural Resources Management*. 2010. Available at http://www.e-publishing.af.mil/shared/media/epubs/ROBINSAFBI32-7064.pdf

3 WHAT TO PLANT

The following list identifies species that are well suited to landscaping needs on Robins AFB. Emphasis was placed on selecting native species that are adapted to the climate and resistant to the pests of the region. Native Plants are identified (*). Virtually all plants are used in some capacity by wildlife; however, plants considered to be of special importance to wildlife at Robins AFB are identified (†). The "Leaf" column indicates the persistence of foliage (D = deciduous, E = Evergreen). The "Size" column details the mature height / width (feet) of the plant. The "Sun" column specifies exposure preferences (F = full sun, P = partial shade, S = shade). The "Water" column specifies moisture requirements (L = low, M = medium). The "Poison" column identifies plants that are poisonous. Taxonomy follows USDA, NRCS (2010).

Botanical Name	Common Name	Leaf	Size	Sun	Water	Poison[1]
Grasses						
*Andropogon ternarius**	Splitbeard Bluestem	D	4/4	F/S	L	
*Andropogon virginicus**	Broomsedge	D	3/3	F	M	
*Chasmanthium latifolium**	Indian Woodoats	D	4/3	F/S	M	
Cortaderia selloana	Pampas Grass	D	8/6	F	M	
Eremochloa ophiuroides	Centipede grass	D	1/1	F/P	M	
*Panicum virgatum**	Switch Grass	D	5/4	F	M	
Pennisetum spp.	Fountain Grasses	D	4/4	F	L	
*Sorghastrum nutans**	Indiangrass	D	6/3	F	M	
Ground Covers						
*Asclepias tuberosa**, †	Butterfly Milkweed	D	3/2	F	L	
*Chrysogonum virginianum**	Green and Gold	D/E	1/1	F/P	L	
*Galax urceolata**	Galax	E	1/1	P/S	M	
*Glandularia canadensis**	Rose Mock Vervain	D	1/1	F/P	L	
Hemerocallis spp.	Daylily	E	3/2	F/P	M	
Hypericum calycinum	Aaron's Beard	D/E	1/2	F/S	M	
Juniperus davurica 'Expansa'	Parsons Juniper	E	2/4	F	M	X
Juniperus horizontalis	Creeping Juniper	E	2/4	F	M	X
Liriope muscari	Big Blue Lilyturf	E	1/1	F/S	L	
Liriope spicata	Creeping Liriope	E	1/1	F/S	L	
*Lycopodium digitatum**	Fan Clubmoss	E	1/1	P/S	M	
*Monarda spp.**, †	Beebalm/Bergamot	D	2/2	F/P	M	
*Rudbeckia spp.**, †	Coneflower	D	1/1	F	M	
*Solidago spp.**, †	Goldenrod	D	4/2	F	M	
*Tiarella cordifolia**	Foam Flower	D	1/1	P/S	M	
*Yucca filamentosa**	Beargrass	E	6/2	F	L	
*Thelypteris kunthii**	Maiden Fern	D	3/3	P/S	M	

Botanical Name	Common Name	Leaf	Size	Sun	Water	Poison[1]
Athyrium asplenioides*	Lady Fern	D	3/3	P/S	M	
Vines						
Bignonia capreolata*, †	Cross Vine	D/E	40/NA	F/S	L	
Campsis radicans*, †	Trumpet Creeper	D	40/NA	F/P	L	X
Gelsemium sempervirens*, †	Trumpetflower	E	20/NA	F/P	M	X
Lonicera sempervirens*, †	Trumpet honeysuckle	E	20/NA	F/S	M	X
Parthenocissus quinquefolia*, †	Virginia Creeper	D	50/NA	F/S	L	X
Passiflora incarnata*, †	Purple Passionflower	D	20/NA	F/P	L	
Trachelospermum jasminoides	Confederate Jasmine	E	20/NA	F	M	
Vitis rotundifolia*, †	Muscadine	D	30/NA	F/P	M	
Shrubs						
Abelia grandiflora	Glossy Abelia	E	6/6	F/P	M	
Aesculus parviflora*, †	Bottlebrush Buckeye	D	20/15	P/S	M	X
Aesculus pavia*, †	Red Buckeye	D	25/20	P/S	M	X
Agarista populifolia*	Florida Hobblebush	E	12/10	P/S	M	
Callicarpa americana*, †	Am. Beautyberry	D	8/6	F/S	M	
Calycanthus floridus*, †	Eastern Sweetshrub	D	6/6	F/S	M	X
Hamamelis Virginiana*	American Witchhazel	D	30/25	P/S	M	
Hydrangea arborescens*, †	Wild Hydrangea	E	8/8	F/S	M	X
Hydrangea quercifolia*, †	Oakleaf Hydrangea	D	6/8	F/S	M	X
Ilex decidua*, †	Possumhaw	D	30/30	F/P	L	X
Ilex verticillata*, †	Common Winterberry	D	20/10	F/P	L	X
Ilex vomitoria*	Yaupon Holly	E	25/20	F/P	M	X
Ilex vomitoria* 'Nana'	Dwarf Yaupon Holly	E	5/5	F/P	M	
Illicium parviflorum*, †	Yellow Anisetree	E	20/10	F/P	M	X
Itea virginica*, †	Virginia Sweetspire	D	5/6	F/S	M	
Juniperus chinensis	Juniper (various)	E	15/6	F	L	
Loropetalum chinense	Loropetalum	E	12/6	F/P	M	
Myrica cerifera*	Wax Myrtle	E	20/20	F/P	M	
Nerium oleander	Oleander	E	20/10	F/P	L	X
Osmanthus americanus*	Devilwood	E	35/20	F/S	M	
Ostrya virginiana*	Hophornbeam	D	40/30	F/S	M	
Rhododendron arborescens*, †	Smooth Azalea	E	10/8	P/S	M	X
Rhododendron austrinum*, †	Orange Azalea	E	10/8	P/S	M	X
Rhododendron calendulaceum*, †	Flame Azalea	E	10/8	P/S	M	X
Rhododendron canescens*, †	Mountain Azalea	E	10/8	P/S	M	X

Botanical Name	Common Name	Leaf	Size	Sun	Water	Poison[1]
*Rhus copallinum**, †	Winged Sumac	D	8/8	F	L	
Rosmarinus officinalis	Rosemary	E	5/5	F/P	L	
*Symplocos tinctoria**	Common Sweetleaf	D	20/15	P/S	M	
*Vaccinium arboreum**, †	Farkleberry	D/E	20/15	F/S	M	
*Vaccinium elliottii**, †	Elliott's Blueberry	D	9/6	F/P	M	
*Vaccinium stamineum**, †	Deerberry	D	12/6	F/P	M	
*Viburnum acerifolium**, †	Mapleleaf viburnum	D	6/6	F/P	M	
Viburnum macrocephalum	Snowball Viburnum	D	15/15	F/P	M	
*Yucca aloifolia**	Aloe Yucca	E	15/5	F/P	L	
*Yucca gloriosa**	Moundlily Yucca	E	6/3	F/P	L	
Trees						
*Acer rubrum**	Red Maple	D	50/35	F/P	M	
*Acer barbatum**	Southern Sugar Maple	D	80/40	F/P	L	
Acer saccharum 'Legacy'	Legacy Sugar Maple	D	80/40	F/P	L	
*Aesculus sylvatica**, †	Painted Buckeye	D	40/25	F/P	M	X
*Betula nigra**	River Birch	D	90/60	F/P	M	
*Carpinus caroliniana**	American Hornbeam	D	30/30	F/S	M	
*Carya glabra**, †	Pignut Hickory	D	80/60	F/P	L	
*Carya alba**, †	Mockernut Hickory	D	80/61	F/P	L	
Cedrus deodara	Deodar Cedar	E	80/50	F	M	
*Celtis laevigata**	Sugarberry	D	120/70	F	M	
*Cercis canadensis**	Eastern Redbud	D	35/30	F/S	M	
*Chionanthus virginicus**	White Fringetree	D	20/20	F/S	M	
*Cornus florida**	Flowering Dogwood	D	30/35	F/P	M	
*Diospyros virginiana**, †	Common Persimmon	D	40/40	F/P	M	
*Fagus grandifolia**, †	American Beech	D	70/70	F/P	M	
*Fraxinus pennsylvanica**	Green Ash	D	50/40	F	M	
*Halesia carolina**	Carolina Silverbell	D	40/25	F/P	M	
*Ilex opaca**	American Holly	E	50/40	F/S	M	X
*Juniperus virginiana**	Eastern Red Cedar	E	40/20	F/P	L	
*Liriodendron tulipifera**	Yellow Poplar	D	90/50	F	M	
*Magnolia grandiflora**	Southern Magnolia	E	80/50	F/P	M	X
*Magnolia virginiana**	Sweetbay	E	60/40	F/P	M	
*Oxydenrum arboreum**	Sourwood	D	40/25	F/P	M	
*Pinus echinata**	Shortleaf Pine	E	10/60	F/P	L	
*Pinus taeda**	Loblolly Pine	E	165/30	F/P	L	
*Prunus caroliniana**, †	Carolina Laurelcherry	E	40/25	F/S	L	X

Botanical Name	Common Name	Leaf	Size	Sun	Water	Poison[1]
*Prunus serotina**, †	Black Cherry	D	80/45	F/P	L	X
*Quercus alba**, †	White Oak	D	100/60	F/P	M	
*Quercus falcata**, †	Southern Red Oak	D	100/60	F/P	L	
*Quercus hemisphaerica**, †	Laurel Oak	D	90/60	F/P	M	
*Quercus lyrata**, †	Overcup Oak	D	80/60	F/P	M	
*Quercus nigra**, †	Water Oak	D	90/60	F/P	M	
*Quercus phellos**, †	Willow Oak	D	100/60	F	M	
*Quercus prinus**, †	Chestnut Oak	D	80/60	F/P	L	
*Quercus virginiana**	Live Oak	E	80/100	F/P	M	
*Sassafras albidum**	Sassafrass	D	60/40	F/P	L	
*Ulmus alata**	Winged Elm	D	50/40	F/P	L	
Ulmus parvifolia	Lacebark Elm	D	50/50	F	M	

[1] - May not represent a comprehensive list. Plants indicated as poisonous are known to have toxic effects when ingested, but the severity of symptoms differs according to many variables. Poisonous plants should not be planted near residential areas or playgrounds.

Information adapted from:

Westerfield, R.R. and G.L. Wade. 2009. *Poisonous Plants in the Landscape*. The University of Georgia Cooperative Extension, Circular 957, September 2010. www.caes.uga.edu/applications/publications/files/pdf/C%20957_1.pdf

SPECIAL SITUATIONS

The Airfield Environment

Recommended plants for the airfield environment include bermudagrass (*Cynodon dactylon*; Robins AFB, 2009) and tall fescue (*Festuca arundinacea*; Washburn and Seamans, 2004). Both of these grasses tend to be invasive, which is a desirable trait for turf grasses. Active management may be required to prevent the undesired invasion of these plants into natural areas.

Erosion Control

Recently disturbed or other highly erodible sites may require the rapid establishment of vegetation to prevent soil erosion. In this case a mix of annual and perennial grasses is recommended and may be applied with hydroseeding techniques. An annual grass, such as Italian ryegrass (*Lolium perenne*), should be used for fast germination and root establishment. A perennial grass, such as bermudagrass, germinates more slowly but provides long-term vegetative cover.

4 WHAT NOT TO PLANT

MISUSED PLANTS

The following list highlights species that are not recommended for use in landscaping on Robins AFB. Species on this list may be intolerant of local pests, unsuitable for the local climate, prone to problems with growth structure, or overused in the landscape. Taxonomy follows USDA, NRCS (2010).

Botanical Name	Common Name
Cupressocyparis leylandii	Leyland Cypress
Cupressus arizonica	Arizona Cypress
Lagerstroemia indica	Crapemyrtle
Photinia spp.	Photinia
Pinus elliottii	Slash Pine
Platanus occidentalis	American Sycamore
Prunus spp. (exotic ornamentals)	Ornamental Cherry (including Yoshino Cherry)
Pyrus communis	Bradford Pear

PLANTS TO AVOID

The following list highlights plants appearing on the *List of Non-native Invasive Plants in Georgia* (Georgia Exotic Pest Plant Council, 2008). Generally, these plants should not be planted. Three exceptions are bermudagrass, tall fescue, and *Vinca* spp. (periwinkles) which are suitable for use as turf grasses and a ground cover, respectively. However, the use of these plants may require additional management to control their invasiveness. Taxonomy follows USDA, NRCS (2010).

Botanical Name	Common Name
Achyranthes japonica	Japanese Chaff Flower
Ailanthus altissima	Tree Of Heaven
Akebia quinata	Chocolate Vine
Albizia julibrissin	Silktree
Alliaria petiolata	Garlic Mustard
Allium vineale	Wild Garlic
Alternanthera philoxeroides	Alligatorweed
Alternanthera sessilis	Sessile Joyweed
Alysicarpus vaginalis	Alyceclover
Ampelopsis brevipedunculata	Amur Peppervine

Botanical Name	Common Name
Anthoxanthum odoratum	Sweet Vernalgrass
Ardisia crenata	Coral Ardisia
Artemisia vulgaris	Mugwort
Arthraxon hispidus	Small Carpgrass
Arundo donax	Giant Reed
Berberis thunbergii	Japanese Barberry
Bidens bipinnata	Spanishneedles
Bidens pilosa	Hairy Beggarticks
Bromus secalinus	Rye Brome
Bromus tectorum	Cheatgrass
Broussonetia papyrifera	Paper-Mulberry
Carduus nutans	Musk Thistle
Celastrus orbiculatus	Oriental Bittersweet
Centaurea cyanus	Cornflower
Cinnamomum camphora	Camphortree
Cirsium vulgare	Bull Thistle
Clematis terniflora	Sweet Autumn Virginsbower
Colocasia esculenta	Coco Yam, Wild Taro
Commelina benghalensis	Benghal Dayflower
Cynodon dactylon	Bermudagrass
Cytisus scoparius	Scotch Broom
Daucus carota	Queen Anne's Lace
Dioscorea alata	Winged Yam
Dioscorea bulbifera	Air-Potato
Dioscorea polystachya	Chinese Yam
Egeria densa	Brazilian Egeria
Eichhornia crassipes	Waterhyacinth
Elaeagnus pungens	Thorny Olive
Elaeagnus umbellata	Autumn-Olive
Eragrostis curvula	Weeping Lovegrass
Euonymus alatus	Winged Burning Bush
Euonymus fortunei	Winter Creeper
Fallopia japonica	Japanese Knotweed
Fallopia sachalinensis	Sakhalin Knotweed
Fatoua villosa	Mulberryweed
Festuca arundinacea	Tall Fescue
Firmiana simplex	Chinese Parasoltree
Hedera helix	English Ivy
Hemerocallis fulva	Tawny Daylily

Botanical Name	Common Name
Hibiscus syriacus	Rose Of Sharon
Hydrilla verticillata	Hydrilla
Ilex cornuta	Chinese Holly
Ilex crenata	Japanese Holly
Imperata cylindrica	Cogongrass
Ipomoea coccinea	Red Morningglory
Ipomoea cordatotriloba	Tievine
Ipomoea purpurea	Tall Morningglory
Jacquemontia tamnifolia	Smallflower Morningglory
Kummerowia stipulacea	Korean Lespedeza
Kummerowia striata	Common Lespedeza
Lantana camara	Largeleaf Lantana
Lespedeza bicolor	Shrubby Lespedeza
Lespedeza cuneata	Sericea Lespedeza
Lespedeza thunbergii	Thunberg Lespedeza
Leucanthemum vulgare	Oxeye Daisy
Ligustrum japonicum	Japanese Privet
Ligustrum lucidum	Glossy Privet
Ligustrum sinense	Chinese Privet
Limnophila sessiliflora	Limnophila
Liriope muscari	Monkeygrass
Liriope spicata	Creeping Liriope
Lonicera fragrantissima	Sweet Breath Of Spring
Lonicera japonica	Japanese Honeysuckle
Lonicera maackii	Amur Honeysuckle
Lygodium japonicum	Japanese Climbing Fern
Mahonia bealei	Leatherleaf Mahonia
Marsilea minuta	Dwarf Waterclover
Melia azedarach	Chinaberry
Melinis repens	Natalgrass
Mentha x piperita	Peppermint
Microstegium vimineum	Nepalese Browntop
Miscanthus sinensis	Chinese Silvergrass
Morus alba	White Mulberry
Mosla dianthera	Miniature Beefsteakplant
Murdannia keisak	Marsh Dayflower
Myriophyllum aquaticum	Parrotfeather
Myriophyllum spicatum	Eurasian Watermilfoil
Najas minor	Brittleleaf Naiad

Botanical Name	Common Name
Nandina domestica	Sacred Bamboo
Nasturtium officinale	Watercress
Orobanche minor	Small Broomrape
Paederia foetida	Skunk-Vine
Panicum repens	Torpedograss
Paspalum notatum	Bahiagrass
Paspalum quadrifarium	Tussock Paspalum
Paspalum urvillei	Vaseygrass
Paulownia tomentosa	Princesstree
Persicaria longiseta	Oriental Lady's Thumb
Persicaria maculosa	Spotted Lady’s Thumb
Phragmites australis	Common Reed
Phyllostachys aurea	Golden Bamboo
Poa annua	Annual Bluegrass
Poncirus trifoliata	Trifoliate Orange
Potamogeton crispus	Curlyleaf Pondweed
Pueraria montana	Kudzu
Pyracantha coccinea	Scarlet Firethorn
Pyrus calleryana	Callery Pear (Bradford Pear)
Quercus acutissima	Sawtooth Oak
Rosa laevigata	Cherokee Rose
Rosa multiflora	Multiflora Rose
Rottboellia cochinchinensis	Itchgrass
Rubus armeniacus	Himalaya Blackberry
Rubus phoenicolasius	Wine Raspberry
Salvinia molesta	Giant Salvinia
Securigera varia	Crownvetch
Sesbania herbacea	Bigpod Sesbania
Sesbania punicea	Red Sesbania
Sesbania vesicaria	Bagpod
Setaria faberi	Giant Foxtail
Setaria pumila	Yellow Foxtail
Setaria viridis	Green Bristlegrass
Solanum viarum	Tropical Soda Apple
Sonchus asper	Spiny Sowthistle
Sonchus oleraceus	Annual Sowthistle
Sorghum halepense	Johnsongrass
Spiraea japonica	Japanese Spiraea
Stachys floridana	Florida Betony

Botanical Name	**Common Name**
Tamarix gallica	French Tamarisk
Torilis arvensis	Hedgeparsley
Triadica sebifera	Chinese Tallowtree
Verbascum thapsus	Common Mullein
Verbena bonariensis	Tall Vervain
Verbena litoralis	Brazil Vervain
Vernicia fordii	Tungoil Tree
Vinca major	Big Periwinkle
Vinca minor	Common Periwinkle
Wisteria floribunda	Japanese Wisteria
Wisteria sinensis	Chinese Wisteria

SPECIAL SITUATIONS

The Airfield Environment

Reducing the bird/wildlife aircraft strike hazard (BASH) in the airfield environment is a primary safety goal at Robins AFB. Plants that are especially attractive to wildlife are generally suitable for planting in other portions of the base, but should not be planted in the vicinity of the airfield. Plants producing fruits, seeds, or browse that are particularly desirable to wildlife should be avoided in the airfield environment. The Robins AFB BASH Plan (Robins AFB, 2009) details specific vegetation management actions and suggests reducing the diversity of vegetation in the airfield environment. Suitable grasses for the airfield environment are discussed in Section 3.

5 PLANTING

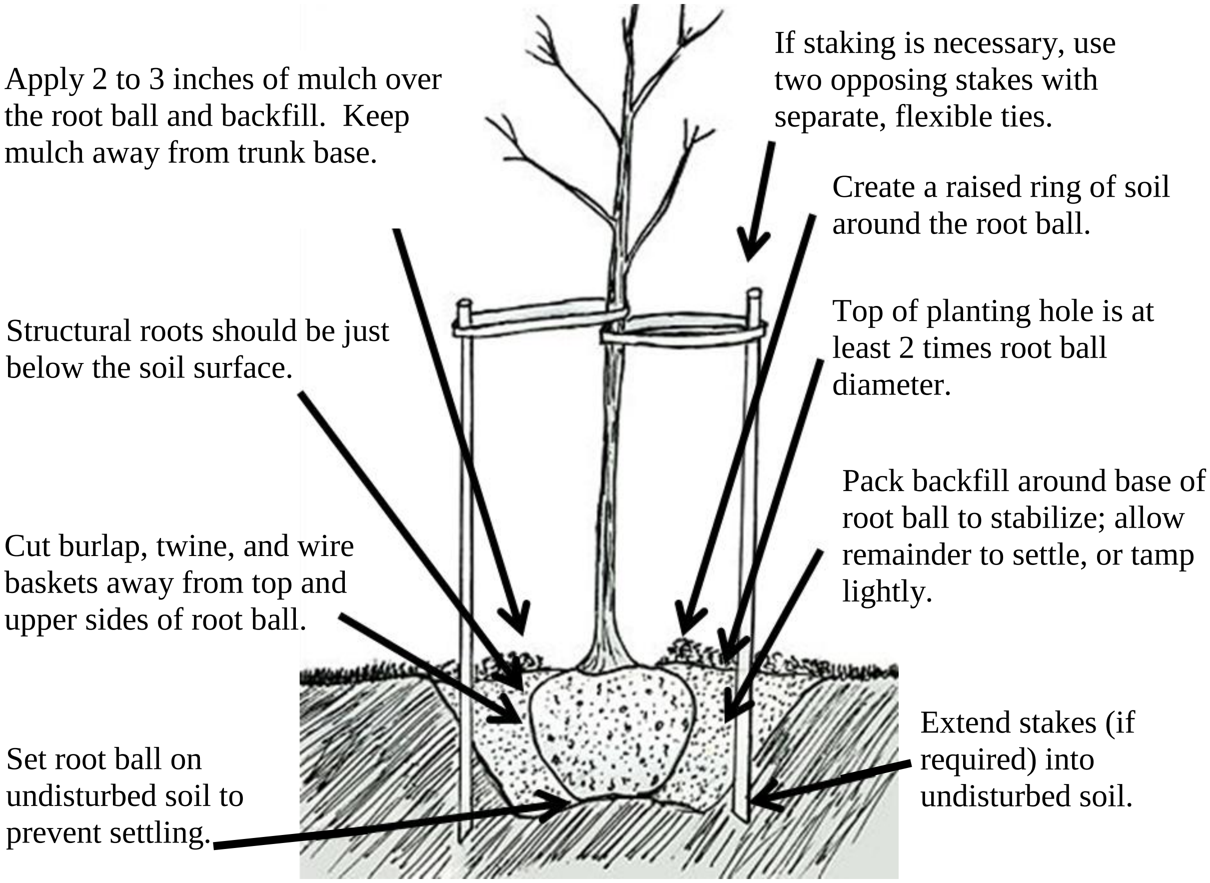
WHEN TO PLANT

- All planting/transplanting should conform to ANSI A300 (Part 6) - *Transplanting*.
- Transplant woody plants in the fall (October through December) to minimize heat and drought stress and allow for the development of a strong root system. If planting during the growing season is necessary, then bare-root plants should be avoided in favor of containerized plants or plants with root balls.
- Transplant annuals and plants with cold requirements according to their specific recommended planting dates.

HOW TO PLANT

- **Landscape and planting plans must be reviewed and endorsed by the grounds maintenance manager and the natural resources manager (RAFBI 32-7064).**
- All planting/transplanting should conform to ANSI A300 (Part 6) - *Transplanting*.
- Planting beds should be tilled to a depth of 8 – 12 inches.
- For individual plants, holes should be dug with sloping sides and be at least twice the diameter of the root system. The appropriate depth of the planting hole will vary.
- The top of the root system should be level or slightly higher than the soil surface, and the upper-most, structural roots should be within 1 – 3 inches of the soil surface.
- Prior to filling in the planting hole, remove burlap, twine and/or rope root coverings from the top and upper sides of the root ball. Synthetic wrapping materials should be completely removed, and wire baskets should be cut off to 6 inches below the shoulder of the root ball.
- Loosen and spread out girdling or encircling roots (when possible), or else cut and remove.
- Fill the hole with the excavated soil, tamp gently, and water deeply. Soil amendments are generally not recommended, especially in clay soils, as they may result in water pooling and subsequent drowning of the vegetation.
- If fertilization is desired, then a slow-release fertilizer should be added to the planting hole. Avoid granular, general-purpose fertilizers.
- A raised ring of soil can be created to direct water to the root ball.
- See the Tree Planting Diagram and the Planting Checklist on the following page.
- Hydroseeding techniques are appropriate when establishing areas of turf grass and when establishing grasses on highly erodible sites.

TREE PLANTING DIAGRAM



PLANTING CHECKLIST

Adapted from Watson and Himelick (2005)

- Are structural roots at the correct depth?
- Is the trunk/main stem vertical?
- Have co-dominant, dead, broken, or weakly attached stems been pruned?
- Has the plant been mulched without covering the base of the main stem(s)?
- Has the plant been watered thoroughly?
- Have extra soil, root ball wrappings, pots, pruned branches, and other debris been removed from the site?
- If a support system was installed, does it allow for growth and movement of the plant? Have plans been made for timely inspections and future removal of support systems?
- Have plans been made to ensure proper care will be given to the plant?

Maintaining New Transplants

- Maintenance of all transplants should conform to ANSI A300 (Part 1) – *Pruning*, (Part 2) – *Fertilization*, (Part 3) – *Supplemental Support Systems*, and (Part 6) – *Transplanting*.
- Remove any trunk wrappings and unnecessary rope, tags, etc.
- Prune broken, weak or interfering branches or co-dominant leaders. Delay intensive pruning until the specimen is well established.
- Support systems (staking, guying, or bracing) should consist of canvas straps or hose-enclosed wire, only be used when necessary, follow established guidelines, and be removed within one year after planting.
- Fabric weed guards should be installed prior to mulching, especially for beds and rows of shrubs or hedges, to minimize the need for weeding.
- Mulch promptly to minimize weed competition and conserve soil moisture. Possible mulching materials include bark, wood chips, pine straw, or composted materials. The mulching depth should not exceed 3 inches, and a gap of 3 inches should be left between the trunk and the mulch (see Section 6 – Mulching).
- Transplants should be monitored regularly for the first year after planting. Look for signs of moisture stress, e.g., gray-green color or wilting. Irrigation should specifically target the root ball (see Section 8 – Irrigating). The method of irrigation (temporary or permanent) should be based on the size of the site, plant material requirements, and correctly planned for the growing season.
- Fertilization of transplants, if necessary, should be based on soil nutrient analysis and only slow-release fertilizers should be used (see Section 7 – Fertilizing).

For additional information:

Watson, G. and E.B. Himelick. 2005. *Best Management Practices: Tree Planting*. International Society of Arboriculture. Champaign, IL.

Westerfield, R.R. and G.L. Wade. 2009. *BMP in the Landscape*. The University of Georgia Cooperative Extension, Circular 873, September 2010. www.caes.uga.edu/applications/publications/files/pdf/C%20873_2.pdf

RAFBI 32-7064. *Integrated Natural Resources Management*. 2010. Available at http://www.e-publishing.af.mil/shared/media/epubs/ROBINSAFBI32-7064.pdf

6 MULCHING

- Proper mulching suppresses weeds, reduces soil erosion, reduces soil temperature in summer, elevates soil temperature in winter, adds organic matter to the soil, and conserves soil moisture.
- Mulching materials may include bark, wood chips, pine straw, or composted materials (e.g., leaf litter or other landscape debris).
- Selecting the appropriate mulch material is a site specific process. The mulch material should blend with surrounding architectural structures. Always consider the future maintenance requirements of various mulch materials.
- Organic mulches generally provide greater benefit to the soil and plants, but require more frequent maintenance and replacement.
- Fabric weed guards minimize weedy competition with landscape plants and reduce future maintenance requirements. Fabric weed guards should be installed prior to mulching, especially for beds and rows of shrubs or hedges, to reduce the need for weeding. Weed guards should be maintained in accordance with manufacturer guidelines. **Do not use plastic as a weed guard.**
- New transplants should immediately receive 2 – 3 inches of mulch.
- Mulch around established plants should be maintained at 2 – 3 inches.
- **Never pile mulch around trunks or main stems. Always leave at least a 3 inch gap around trunks or main stems.**

For additional information:

Watson, G. and E.B. Himelick. 2005. *Best Management Practices: Tree Planting*. International Society of Arboriculture. Champaign, IL.

Westerfield, R.R. and G.L. Wade. 2009. *BMP in the Landscape*. The University of Georgia Cooperative Extension, Circular 873, September 2010. www.caes.uga.edu/applications/publications/files/pdf/C%20873_2.pdf

7 FERTILIZING

- **All fertilization should conform to ANSI A300 (Part 2) – *Fertilization*.**
- Fertilize only to rectify visible nutrient deficiencies, eliminate nutrient deficiencies detected through soil analysis, or to increase plant vitality.
- A fertilization prescription should be based on the type of vegetation to be fertilized and the existing nutrient content of the soil. Soil samples can be submitted to the Houston County Cooperative Extension office for nutrient analysis (http://www.ugaextension.com/houston/). Soil analysis will determine the appropriate rate and type of fertilizer to apply, and determine whether lime is needed to adjust soil pH.
- **DO NOT OVER-FERTILIZE!** When in doubt reduce the application rate.
- Do not fertilize during periods of extreme heat or drought.
- **Use slow-release fertilizers** to minimize the risk of over-fertilization, reduce the frequency of applications, and protect water quality.
- For established plants, apply slow-release fertilizer prior to bud break. One application will generally suffice for the growing season.
- Newly transplanted woody plants do not require immediate fertilization, but a slow-release fertilizer should be applied during the first growing season.
- Annuals and herbaceous-perennials lack the energy reserves of woody plants, and should receive a light application of water-soluble fertilizer when transplanted.
- **Do not apply weed-and-feed fertilizers near ornamental plants.**
- Broadcast application of dry fertilizer is the most practical application method, and should be completed prior to rainfall or irrigation. Broadcast evenly over landscaped beds, and only when foliage is dry. Brush fertilizer from foliage prior to irrigation.
- For trees, broadcast the fertilizer over an area equal to the canopy spread. Trees growing in turf will derive nutrients from fertilizer applied to the turf, and do not require additional application. If the turf is not fertilized, then trees should be fertilized as above.
- Shaded areas generally require less fertilizer than areas receiving full sun.
- Sandy soils generally require more frequent fertilization than clay soils.

For additional information:

Smiley, E.T., Lilly, S.J. and P. Kelsey. 2002. *Best Management Practices: Tree and Shrub Fertilization*. International Society of Arboriculture. Champaign, IL.

Westerfield, R.R. and G.L. Wade. 2009. *BMP in the Landscape*. The University of Georgia Cooperative Extension, Circular 873, September 2010.
www.caes.uga.edu/applications/publications/files/pdf/C%20873_2.pdf

8 IRRIGATING

- **All outdoor water use must comply with RAFBI 32-7064 and the State of Georgia's Rules for Outdoor Water Use (RSG-391-3-30).**
- **Water conservation at Robins AFB is required by Federal Energy Management Program (FEMP) Executive Order (EO) 13423, which requires a reduction in water consumption intensity, relative to the baseline of water usage in fiscal year 2007.**
- Watch for signs of moisture stress (wilting or a pale-green color) before deciding when to irrigate. Irrigate only those plants that need water.
- **DO NOT OVER-WATER!** Over-watering may lead to root rot, which can kill plants.
- Healthy, mature woody species can survive weeks of low rainfall without irrigation.
- Annual and herbaceous-perennials have limited root systems, and generally require more frequent irrigation than woody species.
- Irrigate in the evening or early morning to conserve water.
- Watering deeply encourages healthy, water-efficient root systems. Avoid light, frequent irrigation.
- Transplants will require supplemental irrigation for at least the first year after planting. Contracts should include a plan and budget for supplemental watering of new transplants. The method of irrigation (temporary or permanent) should be based on the size of the site, plant material requirements, and correctly planned for the growing season.
- Permanent irrigation systems should follow established specifications (e.g., AFCEE 1998b and RAFBI 32-7064), and should not be installed without a detailed plan for future operation, inspection, and maintenance. Permanent systems should use drip irrigation whenever practicable.
- **Plants shall receive no more than 1 – 2 inches of water per week, even during periods of drought, and they shall not be watered when rainfall is adequate (RAFBI 32-7064).**
- **Lawns shall be watered no more often than every four days during dry periods, less often during rainy periods. Lawns need three-quarters of an inch of water each time they are watered (RAFBI 32-7064).**

For additional information:

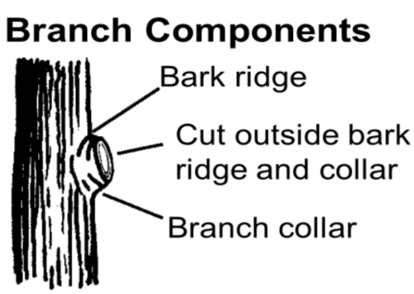
AFCEE (The Air Force Center for Environmental Excellence). 1998. *USAF Landscape Design Guide*.

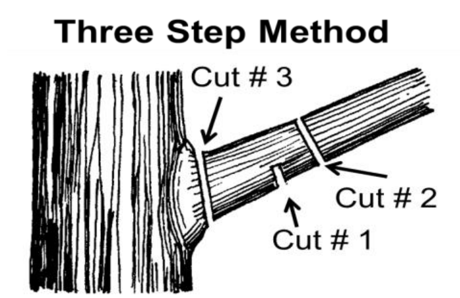
RAFBI 32-7064. *Integrated Natural Resources Management*. 2010. Available at http://www.e-publishing.af.mil/shared/media/epubs/ROBINSAFBI32-7064.pdf

Westerfield, R.R. and G.L. Wade. 2009. *BMP in the Landscape*. The University of Georgia Cooperative Extension, Circular 873, September 2010. www.caes.uga.edu/applications/publications/files/pdf/C%20873_2.pdf

9 PRUNING

- **All pruning should conform to ANSI A300 (Part 1) – *Pruning* and ANSI Z133.1 safety standards.**
- Always have a reason to prune. If in doubt, then don't take it out.
- **Always prune back to a branch collar or just above a bud facing away from the trunk.** Never flush cut or leave a stub. Never damage important parts of the plant such as the branch collar or bark ridge. Never use heading cuts (e.g., topping, dehorning, and hedging) or bench cuts (i.e., cutting a vigorous vertical limb back to a horizontal limb).
- **Always use the Three Step Method to prune large or very long branches.**
- Light, annual pruning is better than severe, irregular pruning.
- Spring-flowering woody plants should be pruned after they bloom. Summer-flowering woody plants should be pruned during the dormant winter period. Grasses should be cut back close to the ground level in late winter, prior to the new growing season.
- **Pruning should encourage a large central trunk, create well-spaced lateral branches, eliminate co-dominant leaders, remove branches with tight/narrow crotch angles, and encourage tapered trunks and branches.**
- **Avoid intensively pruning live branches during times of plant stress.**
- Remove damaged, diseased, dying, or dead limbs as soon as possible.
- **Never remove more than 25% of the canopy in one pruning cycle.**
- Always disinfect tools between trees to prevent disease spread.
- Do not use wound or tree dressings.





SPECIAL SITUATIONS

Crapemyrtles

Crapemyrtles are not recommended for planting on Robins AFB due to historical overuse in the landscape; however, crapemyrtles already existing on the base will require pruning. The general pruning practices outlined above should also be used for crapemyrtles. **Avoid the common practice of severely pruning or "heading back" crapemyrtles**. In general, pruning should remove sprouts near the ground and along the primary trunk(s). Interior, horizontal sprouts should also be removed. The remaining sprouts should be vertical or lean slightly toward the outside of the plant, and these sprouts can be shortened back to the point where they are approximately one-half to one-fourth inch in diameter. See the pictures below for guidance.

Bradford Pears
The general pruning practices outlined above should also be used for Bradford pears. Select the strongest/tallest central trunk to be the central leader. Shorten by half any other branches growing parallel to the leader. If two branches have sprouted along the central trunk within 15-inches of each other, then remove the weaker sprout. Try to leave only those branches growing at a 45-degree angle from the main trunk.

Roadways and Right-of-Ways
Pruning along roadways and right-of-ways should be guided by the general pruning practices outlined above. Pruning should be done by hand and comply with ANSI A300 (Part 1) and ANSI Z133.1. Mechanical trimming or "boom bush-hogging" shall not be permitted.

Root Pruning and Root Barriers
When the roots of existing vegetation threaten the integrity of the built environment, root pruning and/or the installation of root barriers may be appropriate. Root pruning and the installation of root barriers should only be conducted in consultation with a licensed arborist because such practices are relatively uncommon and can result in damage to the vegetation.

For additional information:

Gilman, E.F. and S.J. Lilly. 2008. *Best Management Practices: Tree Pruning*. International Society of Arboriculture. Champaign, IL.

Wade, G.L. and R.R. Westerfield. 2009. *Basic Principles of Pruning Woody Plants*. The University of Georgia Cooperative Extension, Bulletin 949, April 2009.
http://www.caes.uga.edu /applications/publications/files/pdf/B%20949_2.PDF

10 PEST MANAGEMENT

- **All pest management should comply with the *Integrated Pest Management Plan* (Robins AFB, 2011).**
- Pest management should focus on biological, cultural, and mechanical controls to reduce the use of chemical pesticides.
- Minimizing pest problems starts with selecting the proper plant species. Select species that are appropriate for the site. Select pest-resistant species/varieties. Use high-quality nursery stock. Incorporate a diversity of species.
- Plants that are stressed are more susceptible to pest outbreaks. Minimize plant stress by practicing proper mulching, fertilization, irrigation, and pruning.
- Proper landscape sanitation reduces the risk of pest outbreaks. Excessive plant litter or debris should be removed annually, and disposed of properly.
- Good pest management requires good monitoring. Pay attention to your plants, and closely inspect those that show signs of stress.
- Pruning and destroying diseased or infested portions of plants can effectively control small or isolated pest outbreaks.
- **You must first identify the pest in order to develop an effective control response.** The University of Georgia Cooperative Extension website (http://www.caes.uga.edu/extension/anr/#pest) provides valuable resources for the identification of pests and effective control responses.
- The local County Extension office can assist in pest identification and suggest effective controls (http://www.ugaextension.com/houston/).
- **Approval from the Pest Management Shop is required prior to pesticide application, and contractors must report the amount (pounds) of active ingredient applied.**
- **The purchase, storage, and application of certain pesticides may be subject to state and/or federal law, and may require appropriate licenses.**
- **Always apply pesticides in accordance with manufacturer guidelines for dosage, timing, frequency, and application technique.**
- **The only herbicide authorized for use by contractors is Roundup.** If alternative selective pesticides are needed, a treatment plan and herbicide recommendation should be submitted to the natural resources manager for approval.

For additional information:

Robins Air Force Base. 2011. *Integrated Pest Management Plan for Robins AFB*. Effective dates January 1 to December 31, 2011. The Environmental Management Directorate, Pest Management Section.

Wiseman, E.. 2007. *Best Management Practices: Integrated Pest Management*. International Society of Arboriculture. Champaign, IL.

11 PROTECTING PLANTS DURING CONSTRUCTION

- **Plant protection strategies should conform to ANSI A300 (Part 5) – *Management of Trees and Shrubs During Site Planning, Site Development, and Construction*.**
- Proper plant maintenance (i.e., monitoring, mulching, pruning, fertilization, irrigation, and pest management) should be practiced before, during, and after construction.
- **Plant protection measures should be discussed with the architect, project manager, or contractor as early in the development phase as possible.** If desired, a landscape protection contract should be developed and signed by the builder and all contractors.
- **Soil compaction presents the biggest threat to preserving trees on construction sites.** If possible, work with the architect or contractor during the project planning phase to reduce or minimize the non-structural construction footprint (e.g., storage areas, traffic routes, temporary offices, etc.). Soil compaction can be minimized by using heavy equipment mats or at least 6 inches of wood chips.
- Obtain a complete set of site development plans. Plants located at least 10 feet outside of the construction footprint may be good candidates for preservation if: they are desirable species, they are healthy, the mature growth form of the species will be compatible with future site use, minimal effort will be required to protect them during construction.
- Plants that are undesirable, unhealthy, over-mature, or located inside or within 10 feet of the construction footprint should be removed.
- **Clearly mark plants that are to be protected.**
- **Use fencing/barricades to establish plant protection zones. For trees, the ideal protection zone should extend at least to the drip line of the canopy.** Exclude all construction activities or equipment from plant protection zones. Plant protection zones should be clearly marked, and all contractors and equipment operators should be made aware of the protection measures.
- **Do not allow debris or chemical wastes to be buried on the construction site.**
- Monitor the construction site to ensure the protection measures are respected.
- All preserved plants should be carefully inspected after construction. Damaged branches should be pruned. Trees with extensive trunk/bark damage should be removed. Small areas of trunk/bark damage should be cleaned by removing loose bark. Wound dressings are not necessary.

For additional information:

Matheny, N., and J.R. Clark. 1998. *Trees and Development: A Technical Guide to Preservation of Trees During Land Development*. International Society of Arboriculture. Champaign, IL.

12 REFERENCES

AFCEE (The Air Force Center for Environmental Excellence). 1998a. *The Robins Air Force Base Site & Development Plan*. Prepared for the 78th Civil Engineering Squadron, Robins AFB.

AFCEE (The Air Force Center for Environmental Excellence). 1998b. *USAF Landscape Design Guide*.

GADNR (Georgia Department of Natural Resources). 2005. *A Comprehensive Wildlife Conservation Strategy for Georgia*. Prepared by Wildlife Resources Division, Georgia Department of Natural Resources, Atlanta, Georgia. August 2005.

Georgia Exotic Pest Plant Council. 2008. *List of Non-native Invasive Plants in Georgia*. September 2010. www.gainvasives.org/gaweeds.cfm

Gilman, E.F. and S.J. Lilly. 2008. *Best Management Practices: Tree Pruning*. International Society of Arboriculture. Champaign, IL.

Matheny, N., and J.R. Clark. 1998. *Trees and Development: A Technical Guide to Preservation of Trees During Land Development*. International Society of Arboriculture. Champaign, IL.

RAFBI (Robins Air Force Base Instruction) 32-7064. *Integrated Natural Resources Management*. 2010. Available at http://www.epublishing.af.mil/shared/media/epubs/ROBINSAFBI32-7064.pdf

Robins Air Force Base.

2011. *Integrated Pest Management Plan for Robins AFB*. Effective dates January 1 to December 31, 2011. The Environmental Management Directorate, Pest Management Section.

2009. *Robins Air Force Base Bird/Wildlife Aircraft Strike Hazard (BASH) Plan*, 91-212. June.

Smiley, E.T., Lilly, S.J. and P. Kelsey. 2002. *Best Management Practices: Tree and Shrub Fertilization*. International Society of Arboriculture. Champaign, IL.

USDA (United States Department of Agriculture), NRCS (Natural Resources Conservation Service). 2010. *The PLANTS Database*. September 2010. http://plants.usda.gov.

URS (URS Corporation). 2007. *Robins Air Force Base Integrated Natural Resources Management Plan 2006—2010*. Prepared for the 78th Civil Engineer, Environmental Management Division. May 2007.

Wade, G.L., Midcap, J.T., Coder, K.D., Landry, G., Tyson, A.W and N. Weatherly, Jr.. 2007. *Xeriscape™ a guide to developing a water-wise landscape*. The University of Georgia

Cooperative Extension, Bulletin 1073, May 2007.
www.marex.uga.edu/advisory/Library/CSCPpdfs/Xeriscape.pdf

Wade, G.L. and R.R. Westerfield. 2009. *Basic Principles of Pruning Woody Plants*. The University of Georgia Cooperative Extension, Bulletin 949, April 2009.
http://www.caes.uga.edu/applications/publications/files/pdf/B%20949_2.PDF

Watson, G. and E.B. Himelick. 2005. *Best Management Practices: Tree Planting*. International Society of Arboriculture. Champaign, IL.

Westerfield, R.R. and G.L. Wade. 2009. *BMP in the Landscape*. The University of Georgia Cooperative Extension, Circular 873, September 2010.
www.caes.uga.edu/applications/publications/files/pdf/C%20873_2.pdf

Westerfield, R.R. and G.L. Wade. 2009. *Poisonous Plants in the Landscape*. The University of Georgia Cooperative Extension, Circular 957, September 2010.
www.caes.uga.edu/applications/publications/files/pdf/C%20957_1.pdf

Wiseman, E.. 2007. *Best Management Practices: Integrated Pest Management*. International Society of Arboriculture. Champaign, IL.

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Robins Air Force Base
Base Facility Standards

Title: MECHANICAL STANDARDS

Date: 01 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS
PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 5A – MECHANICAL, GENERAL

CRITERIA REFERENCE DOCUMENTS:

ETL 01-1 Reliability and Maintainability (R&M) Design Checklist

ETL 08-13 Incorporating Sustainable Design and Development (SDD) and Facility Energy Attributes in the Air Force Construction Program.

ETL 88-6, Heat Distribution System Outside of Buildings.

UFC 3-400-01 Energy Conservation

UFC 3-400-02 Design: Engineering Weather Data

UFC 3-401-01FA Utility Monitoring and Control Systems

BFS Part 5E – Fire Suppression

BFS Part 7A –Energy Conservation

BFS Part 7C – Sustainable Design & Development

MECHANICAL STANDARDS

a. This is one part of the Robins AFB Base Facility Standards. Refer questions or exception requests to the Technical Support Flight Chief in 778 CES/CEPT. Any exceptions granted to these requirements shall be noted clearly in the project design analysis by using a Deviation Request.

1. DESIGN STANDARDS:

a. *Mechanical systems shall be designed in accordance with current ASHRAE Standards, UFC's, AFI's, ETL's, NFPA Standards, and other codes and standards referenced in this Standard.*

b. Fire Protection: *(Also see BFS Part 5E – Fire Suppression)*

(1) A Registered Fire Protection Engineer shall provide all fire protection system design. The fire protection engineer shall be a professional engineer, registered by the fire protection written examination of the Council of Examiners for Engineers and Surveyors (NCEE).

(2) Comply with all Air Force Engineering Technical Letters for fire protection.

(3) Under **no** circumstances will any fire suppression or alarm system be left inoperative overnight.

c. Energy Conservation: *(Also see BFS Part 7A – Energy Conservation)*

(1) Integrate energy reduction and sustainable development principles into the mechanical system selection and design.

(2) Purchase premium efficient electric motors, air conditioning and refrigeration equipment. Purchase Energy Star and FEMP-designated products when procuring energy-consuming items covered by the Energy Star program, except when purchasing such items is not cost-effective or does not meet functional requirements of the agency.

(3) Integral sized electric motors should be NEMA PREMIUM type motors that conform to NEMA MG 1, minimum Class F insulation system. Motors with efficiencies lower than the NEMA PREMIUM standard may only be used in unique applications that require a high constant torque speed ratio.

(4) Recovered and renewable energy shall be used in each design to the maximum extent that is life cycle cost effective.

2. MAINTENANCE CONSIDERATIONS: Consideration shall be given to maintenance requirements of all mechanical equipment. The following shall be incorporated into mechanical designs:

a. Provide access doors for all equipment requiring maintenance such as valves, dampers, smoke detectors, filters and control components.

b. Provide manufacturer's recommended service clearance and coil pull space for all equipment. Locate all valves, pumps, strainers, controls, sensors, and other items requiring regular service such that they can be maintained from floor level where possible. All units shall be mounted on a concrete housekeeping pad. Permanent Maintenance platforms and access ladders shall be provided to all suspended mechanical units in hangers and high bay areas or above ceilings. Roof mounted units shall incorporate protection for roofing to allow regular maintenance.

c. Provide snap-on plastic pipe labeling only (no tape or stenciling). Comply with ANSI A13.1. Label all valves, instruments, piping, etc. Provide a special tag on system isolation valves identifying area served (e.g. "chilled water shutoff to AHU's 1 - 4"). Require "valve" chart identifying all labeled items. Provide piping diagrams framed under glass in mechanical rooms.

d. Provide metal identification tag attached to each steam trap. Provide in the O&M manual a listing of each trap, trap capacity, type, and location.

3. STORM DRAINAGE SYSTEM: *See BFS Part 3G, Stormwater*.

4. UTILITY DISTRIBUTION SYSTEM: Plans of the existing utility distribution lines will be provided by Base Civil Engineer if available. Utility meters, compatible with Robins' Advanced Metering Infrastructure (AMI) system, shall be installed on all utilities. Meters shall be connected to the base wide energy and utility monitoring and control system either directly or via the building HVAC control system.

a. Steam and Condensate: The designer shall evaluate the feasibility of using the central utility steam system and submit a recommendation to the Base. The Base shall make the decision to use the central system.

b. Chilled Water Piping: Central chilled water shall be used when appropriate. Contact the Base project manager to discuss availability of central chilled water prior to design. New underground chilled water distribution piping, 4 inches and larger, shall be insulated PVC Carrier pipe with an HDPE polyethylene jacket, 200 psi pressure class at 73.4 deg F, SDR 21, and conform to ASTM D2241. Chilled water piping smaller than 4 inches shall be insulated schedule 40 carbon steel pipe with an HDPE jacket. Provide tracer wire and warning tape for locating buried PVC piping.   Provide cathodic protection for all underground steel pipe.

c. Natural gas: All underground natural gas lines installed on Robins AFB shall be polyethylene type PE 3408 as designated by ASTM D2513. Minimum wall thickness shall correspond to a standard dimensional ratio (SDR) of 11. If pressure requirements exceed the PE 3408 capability, ASTM A53B carbon steel pipe (minimum schedule 40) shall be used. All aboveground or exposed piping shall be ASTM A53B carbon steel. All underground metal piping shall be coated per the corrosion control section and shall have cathodic protection installed. Also install tracer wires and warning tape placed on the lines using #10 AWG Cu with nicked TW insulation to facilitate detection of the wire with pipe locators.

d. Installation: Install all utilities (including potable water, fire water, Chilled Water/Hot Water Heating Piping, Steam and Condensate, Natural gas, drainage piping, etc.) following applicable current codes, i.e. International Mechanical codes, International Plumbing and Gas codes and including the following: Minimum depth for all new utilities shall be 3 ft from the top of the piping to the grade elevation and maximum depth shall be 7 ft to the top of the piping. Install tracer wires and warning tape placed on the lines using #10 AWG Cu with nicked TW insulation to facilitate detection of the wire with pipe locators for all plastic and CPVC, PVC, PE and ABS piping. Warning tape shall be located 6 inch to 12 inch below grade.

e. The project design engineer or the design build contractor shall be responsible to locate all underground utilities which shall be shown on the project site plans.   GPR (Ground penetrating radar) and/or pot holing is required as part of the design/RFP development to accurately locate all underground utilities unless excluded in writing.

5. PETROLEUM, OILS, AND LUBRICANTS:

a. Design of all petroleum, oils, and lubricants (POL) systems shall be IAW Military Handbook 1022, American Petroleum Institute (API), and other industry standards, including all applicable NFPA regulations.

b. Welders shall be certified in accordance with API and MH 1020 and shall do all welding outside the fuels area.

c. All valves and piping accessories are required to be rated for fuels being handled.

d. All electrical equipment shall be explosion proof per Division 1, Class 1.

e. Tank refill access shall be readily available to tank trucks.

f. Surge suppressors will be used to prevent pressure build-up in the lines.

g. All above ground tanks shall be diked in accordance with EPA requirements.

h. All below ground tanks shall meet the latest editions of the EPA regulations, be double walled, and have cathodic protection.

i. Safety rails and platforms (for gauging tanks) will be provided for above ground tanks.

j. All pumps will be rated specifically for the fuel they will be handling.

k. The system will be designed such that the metals being used in the system will not react with fuel.

l. All pipes shall be painted with the proper POL color coded markings.

m. Below ground piping will be double wall, properly coated, and cathodically protected per applicable EPA regulations. The designer will evaluate the use of underground fuel pipe and submit recommendations to the Base. The Base will make the decision on the use of underground piping.

n. Design shall include emergency precautions to stop fuel flow, shut down pumps, etc., including a cutoff switch in an easily accessible location.

o. Pumps to below ground tanks shall have leak detectors for piping pressure loss.

p. WARNING signs will be properly displayed.

q. Underground tanks shall be anchored properly so that flotation will not occur.

r. Pea gravel backfill shall be used to fill around tanks.

s. All tanks shall have manways with access ladders.

<<<<< END OF PART 5A >>>>>

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Robins Air Force Base
Base Facility Standards

Title: Heating, Ventilation, and Air Conditioning

Date: 01 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS
PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 5B – HEATING, VENTILATION, AND AIR CONDITIONING

CRITERIA REFERENCE DOCUMENTS:

AFI 32-1068 Heating Systems and Unfired Pressure Vessels

ETL 04-3 Design Criteria for Prevention of Mold in Air Force Facilities, with Change 1

ETL 90-10 Commissioning of Heating, Ventilating and Air Conditioning Systems Guide Specification

ETL 86-16 Direct Digital Control of Heating, Ventilation and Air Conditioning Systems

ETL 83-1 Design of Control Systems for HVAC

UFC 3-410-02A Heating, Ventilating, and Air Conditioning (HVAC) Control Systems

UFC 3-410-02N Heating, Ventilating, Air Conditioning and Dehumidifying Systems

UFC 3-410-04N Industrial Ventilation

UFC 3-430-01FA Heating and Cooling Distribution Systems

UFC 3-430-11 Boiler Control Systems

ASHRAE Standard 90.1, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings

International Mechanical Codes.

International Gas Codes.

BFS Part 5F – Utility Monitoring & Control Systems (UMCS)

BFS Part 7A –Energy Conservation

BFS Part 7B – Corrosion Control & Cathodic Protection

BFS Part 7C – Sustainable Design & Development

1. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC):

a. General:

(1) When providing new HVAC and suspended ceilings in existing unconditioned spaces, such as when converting warehouse space to admin space, design shall include a structural analysis to ensure the structural system can handle the additional weight of the ceiling and ductwork. Include in the design analysis documentation and engineer PE certification.

(2) Provide modular VAV unit type which shall be capable to shut down the supply air to 25% of the diffuser specified air flow rate with a minimum setting device. Design basis is Therma-fusers from Accutherm zoned systems.

(3) Outside air intakes shall be installed above ten feet or on the roofs of single story buildings in compliance with force protection requirements and a minimum of 10 feet from any exhaust duct or plumbing vent.

(4) New facilities and facilities undergoing major and minor renovation are required to be analyzed to determine the most cost effective and practical fuel source(s) and heating and cooling system types. The designer shall evaluate all energy conservation items that appear to have potential for savings, such as heat recovery for HVAC and service water heating, thermal energy storage, desiccant dehumidification, plastic door strips for loading docks, etc., and include those items in the design that are life cycle cost effective. Ensure that all operation and maintenance costs are included in the life cycle cost analysis.

(b) Existing Systems

(1) Existing steam systems. The designer shall consult with the Energy Manager in 78 CEG/CEAE for him/her to make the choice on reusing the steam central feed or convert to natural gas feed. Document the Energy Manager’s choice in the Design Analysis. Where steam is used, convert to hot water at the building entrance. Also, for systems over 1000MBH, evaluate flash tank and pre-heat heat exchanger to determine cost effectiveness and energy savings. Piping downstream of steam traps shall be sized for 2-phase flow assuming zero backpressure. Minimum pipe size is 1".

(2) Distribution Piping and/or Ducting: All distribution piping 3 inches and smaller shall be type K copper. Piping larger than 3 inches shall be domestic ASTM A53 or ASTM A120 sch 40 steel with all welded joints. Water velocities in distribution piping shall not exceed 3 ft/sec. Piping shall be routed to provide the greatest accessibility possible for maintenance. Pipe chases shall have removable covers, which allow access to the entire piping system. Converters, pumps, expansion tanks, and other items requiring maintenance shall be located such that they can be easily serviced from floor level. Provide drain valves to allow complete system drainage and air vents at high points and at coils.

(3) Chilled Water/ Hot Water Pumps: Provide redundancy for the chilled water pumping station and the hot water pumping station. Provide DDC control to alternate pump operation.

(4) Chilled and cold water pipes and supply air ducts insulation shall be designed such, that the surface temperature of the insulated pipe or duct anywhere inside the interior space of the building (including duct and pipe chases) is above the dew point, to prevent condensation and mold issues.

(5) Any work which requires the shutdown of the building chilled water system (or hot water heating system) during the occupied or unoccupied modes, the contractor shall be responsible for draining the chilled water (or hot water heating) system prior to the starting of the construction work and refill the chilled water (or hot water heating) system after the completion of the work. Line block method can be used in lieu of draining the chilled water system.

c. <u>Ventilation/Air Conditioning/Refrigeration Systems</u>:

(1) All air-handling units (AHUs) shall be specified with adequate space. A minimum of 12” access section (sizes to be as recommended by the manufacturer) shall be provided between heating and cooling coils to allow for cleaning and repair. All mechanical rooms shall have adequate space for the service and maintenance of the AHUs in accordance with the manufacturer’s recommendations.

(2) Projected cooling/heat loads: the designer in accordance with ASHRAE procedures shall calculate the design heating load requirements. Submit building heat load calculations using Trane Trace software or as approved equal to size all the building HVAC equipment for review and approval. The building heat load calculations shall be prepared and stamped by a registered professional HVAC engineer.

(3) Distribution Piping and Ducting: See paragraph 1.a. above.

(4) Typical space, supply air, ventilation, and temperature requirements: All administrative areas shall be designed for 75 deg F Dry Bulb (DB) and 50% Relative Humidity (RH) for summer and 70 deg F DB and between 30%RH to 50% RH for winter. Install humidifiers in the AHU discharge to provide re-humidification.
All classrooms shall be designed for 73 deg F Dry Bulb (DB) and 50% Relative Humidity (RH) for summer and 70 deg F DB and between 30%RH to 50% RH for winter. Heat load calculation for the classroom shall include the heat load generated from the total number of the students in the classroom. Shop areas shall be maintained at 82 F in the summer and 55 F in the winter.

Typical conditioned supply air flow rate to the space shall be equal to or greater than 1.2 CFM per sqft area for office spaces. For the therma-fuser design, the 1.2 CFM is required for the minimum at full open.

(5) Mechanical Rooms: Install unit heaters to keep the temperature above 55 deg F DB. Provide forced ventilation with thermostat control.

(6) Electrical Rooms: Provide HVAC systems to maintain the space to no more than 30 degrees C, or 86 degrees F. Provide unit heaters as needed to maintain the temperature above 55 deg F DB.

(7) Communications (Telephone, LAN, etc) Rooms: Provide a dedicated independent conditioned air for required load.

(8) Combined Mechanical and Electrical Rooms: Provide physically separate rooms in all new construction. For existing combined rooms, physically separate the two areas, and provide cooling to the electrical area.

(9) Comply with ASHRAE Standard 62.1-2004 (Ventilation for Acceptable Indoor Air Quality) to calculate the outside air requirement for the building HVAC equipment sizing.

(10) Provide pressure independent control valves and associated control system for heating coils and cooling coils for the air handling units. The pressure independent control valves shall be sized and selected per the manufacturer's recommendations based on the air flow requirements. The valves shall be provided with automatic control system to maintain chilled/hot water coils delta T and supply air temperatures as specified.

(11) Refer to Part 5F – for Utility Monitoring & Control system

(12) Refrigeration Systems: All new HVAC equipment shall be provided with either R-407C, R-134a or R-410a refrigerant. All new residential HVAC window units shall be provided only with THR-03.

Do not provide any service or product with any specification, standard, drawing, or other document that requires the use of a Class I or Class II ODS in the test, operation, or maintenance of any system, subsystem, item, component, or process.

Refer to section 01560 for the list of products which are Class I and Class II ODS:

2. HVAC SYSTEM WATER TREATMENT:

a. General:

(1) Base the equipment installation upon specific information obtained at the construction site and upon existing Base water treatment methods. Information includes data such as current analysis of Base water.

(2) All water treatment design must be performed by an NACE accredited "Corrosion Specialist" with at least five years experience in this design.

(3) Chemical pot feeders:

(a) Use at least 5-gallon capacity.

(b) Provide pressure gauge on intake side of protected system.

(c) Completely serviceable from floor level.

(d) Chemical feed tank shall not be connected to the recirculation pump suction side. Chemical feed tank inlet and outlet can be both connected to the pump discharge side across the isolation valve.

(4) Use interlocks to insure chemicals will not feed when main system is off; e.g., on condenser pumps.

(5) Automatic chemical feed shall use one of these methods:

(a) Water meter - timer method, where chemicals are added in relation to water make-up.

(b) Solids controller to control boiler blow down and chemical feed based upon manual setting.

(6) Inject chemicals downstream of pumps.

b. Chilled Water:

(1) Closed System:

(a) 100 tons or less: Provide chemical pot feeders.

(b) Over 100 tons: Provide automatic system or manual system as determined by the base project engineer.

(2) Open system (cooling towers): Provide automatic system.

c. Hot Water (Closed System):

(1) 1000 MBTU/H or less: Provide chemical pot feeders.

(2) Over 1000 MBTU/H: Provide automatic system or manual system as determined by the base project engineer.

d. Steam:

(1) Provide automatic system.

(2) Inject oxygen scavengers directly into the deaerator tank.

(3) Inject boiler water chemicals into feed water line right before the boiler drum.

(4) Blowdown Dumping:

(a) At main plant, dump to industrial waste.

(b) Dump elsewhere to sanitary sewer.

(c) Blowdown must be run through a cooler to limit discharge temperature to 120F. This will ensure it is compatible with the IW/SS piping.

(5) Provide for manual blowdown of bottom drum.

3. SYSTEM COMMISSIONING OF HVAC:

a. Special Requirements:

(1) On-site training shall be provided to instruct Government personnel in each phase involved with the sequence of operation for the system. The training shall be accomplished by the manufacturer's representative, and take between two and seven days as determined by the scope of the project. This training will include the set up, operation, and balance of the system for the respective Government shops. Specify that the training shall be conducted and completed prior to Prefinal inspection.

(2) An independent firm certified by the American Association of Balancing Contractors (AABC) or the National Association of Balancing Contractors (NABC) shall accomplish test and balance of the system. The Government reserves the right to spot check the contract. The contractor shall be spot checked by the balancing contractor in the presence of a Government representative. If 25% of the systems checked are not within the required allowance (allowance being: 10% of what is stated on the plans) the balancing contractor will return to the site and completely redo the testing and balancing. If the system is dependent upon steam or chilled water, testing and balancing shall be accomplished during the time of year when they are available.

(3) All required test results, equipment O&M manuals, and schematics shall be turned over to the Government two weeks prior to the Prefinal inspection.

(4) Other requirements will be provided in the project description if necessary.

(5) Specifications shall require construction contractor to demonstrate the proper operation of each function described in the sequence of operation.

4. AIR CONDITIONING/HEAT LOAD ESTIMATES: The designer shall provide complete load calculations with the preliminary design. If the designer uses a computer program to compute the loads, a description of the program and copies of all input data shall be included in

the design analysis. Robins AFB Weather Data shall be used for all HVAC calculations. Design data is available at https://www.afccc.af.mil/ .

5.0 System Maintainability

(a) System maintainability is a critical, but often overlooked, aspect of a facility. Provide adequate clearances around all pieces of equipment for periodic maintenance, inspection and cleaning. Service of one piece of equipment shall not require disturbance of adjacent equipment. This shall be coordinated with all systems (for example it is unacceptable planning to install lights, then block access to them with pipes and conduit). System maintainability has three broad categories. The design analysis and O&M manuals shall address these features/procedures in detail:

(1) Routine Maintenance (filters, lights, lubrication, inspection, etc.):
This requires the most frequent and easiest access. The need for portable or fixed ladders (no more than 10 feet (3 m)) should be minimized and, where needed, ensure that space is available to use them properly.

(2) Component Replacement (coils, fans, motors, boiler/chiller tubes, etc.): This requires less frequent access, but when the need arises, this work must be done quickly and efficiently, since normally this has the greatest impact on the user. Everything needed to perform these tasks shall be provided (work platforms, equipment access hatches/panels, hoists, cranes, freight elevators, etc.).

(3) Equipment Replacement (air handling unit, switchgear, boilers, chillers, etc.): This occurs very seldom that permanent equipment to support these tasks is not required. However, equipment replacement must be accommodated and the facility shall include items such as removable wall sections, access routes, etc. to allow replacement with the least amount of collateral damage.

(b) Ensure that all equipment, including filters, controls, control valves, backflow preventers, and coils are easily accessible and have ample room for servicing, inspection, and cleaning. Isolation valves shall be provided for each terminal unit, zone, branch, long runs, etc. as necessary for proper isolation and maintenance. Coils shall be fully removable without requiring demolition of any building components. Piping configuration at all coils shall include unions to facilitate easy removal.

(c) The design-build contractor shall ensure that all maintenance and repair activities can be performed safely and efficiently without needing to bring in extensive material handling (e.g. A-frames) or access equipment (e.g. ladders).

(d) Locate all valves, pumps, strainers, controls, sensors, and other items requiring regular service such that they may be maintained from floor level when possible. If not accessible from floor level, then permanent maintenance access shall be provided.

(e) Ensuring maintainability requires careful coordination of piping, conduit, etc., to avoid blocking access by cranes, hoists, ladders etc. The contractor shall make this a priority, recognizing that this will generally result in longer runs of pipe/conduit.

(f) All above ceiling utilities (cable trays, ductwork, junction boxes, utility piping, etc.) shall be accessible for a worker to reach two sides plus the service side with a minimum 3'3" (1 m) learance (greater if required for component maintenance/disassembly).

g) Permanent maintenance access shall be provided for all suspended mechanical equipment. Provide catwalks for all equipment requiring servicing located above ceilings.

(h) Mechanical equipment is not permitted on the roof. Only secondary items that do not require maintenance or access such as vents are permitted. Anything penetrating the roof shall be painted the same color as the roof. Mechanical equipment may not be permitted on the roof, but some type of innovative method needs to occur so that the vertical stacks from the painting shop tanks are vented into short (~30' or less under roof) runs overhead directly into the ventilation fan/scrubber assemblies, who in turn, need to be directly vented to the outside or on a short run (~20' or less) of ducting.

(i) Water treatment systems for boilers/chillers (if provided) shall be designed and installed such that chemical handling is accomplished at the floor level.

END OF PART 5B

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78TH CIVIL ENGINEER GROUP

REFRIGERANT MANAGEMENT PROGRAM

OPR: 78 CES/CEOS
ENVIRONMENTAL FLIGHT

List of Acronyms

AEL	Allowable Exposure Limit
ALJ	Administrative Law Judges
ALKY	alkylbenzene lubricant
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
CAA	Clean Air Act
CAS	Chemical Abstracts Service (http://www.epa.gov/spdpublc/ods.html)
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFC	chlorofluorocarbon
CFR	Code Federal Regulation
DOJ	Department of Justice
DOT	Department of Transportation
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratory
GLFW	Gross Legal Fill Weight
GWP	Global Warming Potential (http://www.epa.gov/spdpublc/ods.html)
HBFC	Hydrobromofluorocarbon
HCFC	Hydrochlorofluorocarbon
HFC	Hydroflourocarbon
HMMP	Hazardous Material Management Process
ID	Identification
MACS	Mobil Air Conditioning Society
MSDS	Material Safety Data Sheet
MVAC	Motor Vehicle Air Conditioning
NFPA	National Fire Protection Association
ODP	Ozone Depletion Potential
ODS	ozone-depleting substances
OEM	original equipment manufacturer
PAFT	Program for Alternative Fluorocarbon Toxicity
PAG	polyalkylene glycol lubricant
PEL	Permissible Exposure Limit
POE	polyolester lubricants
ppm	parts per million
psig	pounds per square inch (gauge)

RCM	Refrigerant Compliance Manager™ software
RCP	Refrigerant Compliance Plan
RCRA	Resource Conservation and Recovery Act
SAE	Society of Automotive Engineers
SNAP	Significant New Alternatives Program
TAE	Technical Assistance Evaluation
TLV	Threshold Limit Value
TW	Tare Weight
UL	Underwriters Laboratories
WC	Water Capacity

17 Contractor Requirements

17.1 Objective

To define requirements for managing refrigerant service contractors and contractors installing new equipment. The Shop Refrigerant Monitor, Refrigerant Program Manager, Engineering, and Contracting departments shall work as a team to modify construction/renovation contracts and service contracts to meet the requirements of this chapter.

17.2 Contract Amendments

Use the following text to develop a contract amendment for all refrigerant service contractors or provide a copy of this text and implement the requirements.

Contractor shall be responsible and accountable for compliance with the EPA Clean Air Act (CAA) Section 608, 40 CFR Part 82 and any state and local codes for all refrigerant-related work. Contractor shall ensure that all contractor employees are made aware of the content of these practices prior to beginning work on refrigerant containing equipment.

Contractor shall provide only proper level EPA-certified technicians using EPA-certified and registered recovery/recycle units to perform work on Robins AFB refrigerant equipment.

Contractor shall submit the following information prior to starting any work.

- A list of all service technicians along with legible copies of each technician's EPA Certification Card.
  - Note: ID number on card may be blacked out as long as Testing program name and EPA level are readable.

17.3 Documentation and Recordkeeping

Contractor shall provide service records with all required information to the Shop Refrigerant Monitor. The service documentation required is as follows:

- Equipment ID tag number
- Manufacturer model and serial number
- Location of equipment
- Refrigerant type and unit charge
- Date of service
- Service, repair or disposal description
- Quantity of refrigerant added
- Quantity of refrigerant recovered, recycled or disposed of
- Quantity of lubricant disposed of, and method of disposal

- Detailed information and exact location of any leaks discovered and repaired
- Initial and Follow-up Leak Verification tests
- Name(s) of EPA certified service technicians who performed work
- Note if recovery unit was used

The Shop Refrigerant Monitor will provide a copy of the records to the Refrigerant Program Manager when requested. Please note: A Service Invoice that is only sent to accounts payable does not meet the requirement for site records.

17.4 Consequences for Non-Compliance

Robins AFB shall have the right to stop work under any contract at any time if the work fails to meet the EPA regulations.

Robins AFB shall have the right to withhold payment for services if the proper documentation of refrigerant work or related work is not completed.

17.5 New Equipment Guidelines

When possible (i.e., does not violate a Department of Defense Technical Order), all new equipment installed shall utilize non-CFC refrigerants. The goal is to limit the number of new alternative refrigerants utilized on site. Maintenance and inventory costs will be reduced by standardizing and limiting refrigerant types.

- Each shop, with assistance from the Refrigerant Program Manager, shall determine what refrigerants are presently in use and set standards for all future refrigerant equipment purchases.
  - Further maintenance and parts inventory cost savings can be achieved by standardizing on equipment manufactures.
  - Service history and existing parts inventory shall be considered in this analysis and the recommendations presented to purchasing.

The Shop Refrigerant Monitor shall assure all new equipment is properly tagged with equipment ID numbers.

For shops using the RCM software, New Equipment needs to be entered into the RCM software.

17.5.1 New Equipment ID Tags

All new equipment shall be tagged with a Robins AFB Unit ID number as specified.

- For shops using the RCM software, this number shall be used as the equipment id number by the RCM software.

17.5.2 New Equipment Leak Testing

All new equipment shall be leak tested prior to or during startup, including: packaged equipment (factory charged or field charged), split systems, and/or field-constructed systems with field installed refrigerant piping.

- The leak testing process shall utilize the appropriate electronic leak testing equipment and shall be witnessed by the Shop Refrigerant Monitor or a designated HVAC technician.
- If a leak is detected the following shall occur:
  1. Notify the Shop Refrigerant Monitor
  2. Document the leak
  3. Repair the leak.
  4. Leak test to verify the leak was repaired.
  5. **Schedule and provide a 30-day follow-up verification leak test**.
  6. Repeat the above process if follow-up leak is detected.
  - For shops using the RCM software, document follow-up leak testing on the RCM Service Order form.
- For new equipment installed by a contractor, the contractor or installing party shall submit a verified leak test and submit results to the Shop Refrigerant Monitor.

17.6 Demolition Procedure for Equipment Removed by Contractors

Contract language for any refrigerant handling work by contractors shall include:

- A requirement for the contractor to provide technician EPA certification cards showing the testing organization and certification level of all persons who will be performing the refrigerant equipment demolition and refrigerant recovery.
- A written record of the work performed shall be filled out by the certified contractor technician and forwarded to the Shop Refrigerant Monitor upon completion of the job.
  - For shops using the RCM software, an RCM Service Order Form shall be filled out and entered upon completion of the work.

Note: *If a properly certified contractor technician removes the refrigerant, the unit tagged as such, then a non-certified person may perform the actual demolition.*

In all cases the contractor technician shall tag the unit indicating that the refrigerant was removed.

An example of an Environmental Safety Notice is shown below:

ENVIRONMENTAL SAFETY NOTICE

ENVIRONMENTALLY HARMFUL REFRIGERANTS AND OIL HAVE BEEN REMOVED FROM THIS UNIT IN COMPLIANCE WITH SECTION 608 OF THE CLEAN AIR ACT

REMOVED BY: (PRINT)__________________________

COMPANY NAME: (PRINT)______________________

ADDRESS: (PRINT)______________________________

____

TELEPHONE:______________________DATE:__/__/__

SIGNATURE_____________________________________

Figure 1: Environmental Safety Notice

The contractor shall (in contractor-provided refrigerant recovery cylinders) take ownership of the recovered refrigerant and transport off site to a proper disposal company or certified reclaimer (**unless otherwise directed by Robins AFB**). The quantity removed from each unit and from the site shall be documented.

Robins Air Force Base
Base Facility Standards

Title: Plumbing

Date: 15 September 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 5C – PLUMBING

CRITERIA REFERENCE DOCUMENTS:
AFI 32-1066 Backflow Prevention Program

ETL 04-4 Trenchless Technology (TT) for Crossing Air Force Pavements, with Change 1

ETL 08-10 Alternative Water Sources -- Use of Non-Potable Water

UFC 3-420-01 Plumbing Systems

Senate Bill 370, Water Stewardship Act June 2010

Georgia and International Plumbing and Gas Codes

BFS Part 7A –Energy Conservation

BFS Part 7B – Corrosion Control & Cathodic Protection

BFS Part 7C – Sustainable Design & Development

PLUMBING:

a. General: Plumbing systems will be designed in accordance with the *Georgia and* International Plumbing Code. Plumbing systems will include water service pipes, building soil and waste drains and building storm drains, all pipes, fixtures, vents, branches, rain leaders and special piping systems necessary for fire protection. Individual shut-off valves shall be provided for each fixture. Floor drains shall be provided in all toilets, janitor closets, and mechanical rooms to prevent flooding. Provide trap primers for all floor drains.

b. Building Water Supply:

(1) Potable Water Source: The water supply will be from the nearest Base water distribution main line. Domestic water supply must have reduced pressure principle type backflow prevention. Any solder used in domestic water supply system must be 90/10 or 95/5.

(2) Backflow preventer shall be located in an accessible location as approved by the Plumbing Shop. Provide adequate clearance space for maintenance and repair of the backflow preventer in accordance with AFI 32-1066 and the International Plumbing Codes.

(3) Hot Water Requirements: Domestic hot water shall be provided by the most cost-effective means.

(4) All plumbing hot and cold water piping shall be provided with 1" thick insulation.

c. Drinking Fountains: Provide refrigerated drinking fountains when fountains are required. Drinking fountains are required in office and shop areas.

d. Sanitary Sewer System: See BFS Civil Standards.

e. Piping Systems:

(1) Plumbing: Sanitary piping shall be schedule 40 PVC or cast iron. Domestic water piping shall be type L copper (above ground), or type K copper (below ground) or CPVC SDR 11 (Design basis is FlowGuard Gold CPVC for piping equal or smaller than 2" diameter). CPVC pipe and fittings shall meet or exceed the requirements of ASTM D2846. Do not use CPVC pipe under the slab.

(2) Hot/Chilled Water Systems: All hot and chilled water piping systems shall contain the following as a minimum.

(a) Make-up water system with reduced pressure principle backflow preventer.

(b) Freeze protection for exposed piping by means of drain-down capabilities, or heat tape and insulation, or a combination of the above depending on the specific situation (discuss with the AF Project Manager prior to making a decision in order to agree on specific approach to be used). Also, when using a Heat Tape freeze protection system, it shall be thermostatically controlled based on the outside air temperature, not based on the pipe temperature.
(c) Drains at low points of the piping system and vents at high points.
(d) Expansion tank for water expansion and air separator for air control.
(e) Balancing valves at the discharge of all pumps and at coils requiring metered flow.
(f) Water treatment sampling and injection ports for all closed loops.
(g) System design shall include water treatment capability.
(h) Provide air relief valves at all high points.
(i) Provide floor sinks with basket for all air handling units' condensate drain lines in the mechanical rooms.

f. Restroom Equipment: Provide wall mounted water closet when possible. Water closets shall incorporate flush valve operation. Tank type water closets shall not be provided. Provide wall-mounted urinals in men's restrooms. All wall-mounted fixtures shall incorporated closet carriers or fixture carriers as applicable. Low water flow urinals should be provided for the new projects. Any new construction project that requires the installation of toilets, shower heads, and faucets must follow the standards related to high-efficiency plumbing fixtures. These shall include:

(1) A water closet or toilet that:

(A) Is a dual flush water closet that meets the following standards:
(i) The average flush volume of two reduced flushes and one full flush may not exceed 1.28 gallons;
(ii) The toilet meets the performance, testing, and labeling requirements prescribed by the following standards, as applicable:
(I) American Society of Mechanical Engineers Standard A112.19.2-2008; and
(II) American Society of Mechanical Engineers Standard A112.19.14-2006 'Six-Liter' Water Closets Equipped with a Dual Flushing Device.

(B) Is a single flush water closet, including gravity, pressure assisted that meet the following standards:
(i) The average flush volume may not exceed 1.28 gallons;
(ii) The toilet must meet the performance, testing, and labeling requirements prescribed by the American Society of Mechanical Engineers Standard A112.192/CSA B45.1 or A112.19.14.

(2) A shower head that allows a flow of no more than 2.5 gallons per minute at 60 pounds per square inch of pressure;

(3) A urinal and an associated flush valve that:
(A) Uses no more than 0.5 gallons of water per flush;
(B) Meets the performance, testing, and labeling requirements prescribed by the American Society of Mechanical Engineers Standard A112.19.2/CSA B45.1;
(C) For flushing urinals, meets all WaterSense™ specifications for flushing urinals.
(D) Nonwater urinals are not to be employed on Robins AFB.

(4) A lavatory faucet or lavatory replacement aerator that allows a flow of no more than 1.5 gallons of water per minute at a pressure of 60 pounds per square inch in accordance with American Society of Mechanical Engineers Standard A112.18.1/CSA B.125.1 and listed to the WaterSense™ High-Efficiency Lavatory Faucet Specification;

(5) A kitchen faucet or kitchen replacement aerator that allows a flow of no more than 2 gallons of water per minute.

g. Installation: Install all utilities (including potable water, fire water, Chilled Water/Hot Water Piping, Steam and Condensate, Natural gas, drainage piping, etc.) following applicable codes, i.e. International Mechanical codes, International Plumbing and Gas codes and including the following:

(1) Minimum depth for all new underground utilities shall be 3 ft from the top of the piping to the grade elevation. Install tracer wires and warning tape placed on the lines using #10 AWG Cu with nicked TW insulation to facilitate detection of the wire with pipe locators for all plastic and CPVC, PVC, and PE piping. Warning tape shall be located 6 inch to 12 inch below grade.
(2) All above-ground piping which is equal to or greater than 2” in diameter shall be labeled for the type of utility and arrows showing direction of flow. Use only snap-on plastic pipe labeling which complies with ANSI 13.1. Do not use tape or stenciling.

<<<END OF PART 5C>>>

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Approval: ***Original Signed By***
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Robins Air Force Base
Base Facility Standards

Title: Fire Suppression

Date: 15 September 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS
PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 5E – FIRE SUPPRESSION

CRITERIA REFERENCE DOCUMENTS:

NFPA-13 Standard for the Installation of Sprinkler Systems

UFC-3-600-1 Fire Protection Engineering for Facilities

ETL 02-15 Fire Protection Engineering Criteria - New Aircraft Facilities

ETL 01-18 Fire Protection Engineering Criteria - Electronic Equipment Installations

ETL 98-8 Fire Protection Engineering Criteria - Existing Aircraft Facilities, with Change 1

ETL 95-1 Halon 1301 Management Planning Guidance, with Change 1 (if we have any left)

ETL 94-6 Fire Protection Engineering Criteria and Technical Guidance - Removal of Halogenated Agent Fire Suppression Systems, with Change 1 (if we have any left)

ETL 86-8 Aqueous Film Forming Foam Waste Discharge Retention and Disposal (coordinate with environmental management - this may have been superseded by later regulations/law).

BFS Part 7A –Energy Conservation

BFS Part 7C – Sustainable Design & Development

FIRE PROTECTION (See Electrical Section for Detection and Alarms)

a. Construction Submittal Requirements: Contractor shall submit fire protection system shop drawings, as-builts, and hydraulic calculations prepared and stamped by a Registered Fire Protection Engineer. A level III Technician certified by the National Institute for Certification in Engineering Technologies (NICET) in the Automatic Sprinkler System Layout sub-field of Fire Protection Engineering Technology in accordance with NICET 1014 is acceptable for design of new areas or new additions of less than 4000 SF where no fire riser or fire pump is required.

b. Suppression:

(1) Water supply analysis/modification requirements: The designer is fully responsible for all water supply analyses required for each project, including making water flow tests, fire pump tests, etc. The Civil Engineering Plumbing Shop will assist the project A-E in making the tests and will provide previous flow test data when available. All the fire water flow tests shall be performed in the presence of the Base Fire Department and the Plumbing/Utilities Shop personnel.

(2) Calculations: Provide a hardcopy printout of the sprinkler hydraulic calculations in the HASS format (by HRS Systems, Atlanta, GA) or other Base Approved agencies. Provide the final sprinkler design in the form of both the specified hardcopy printout plus the design data file compatible with the HASS sprinkler hydraulics program on a CD Rom.

(3) Provide a preliminary sprinkler design by at least the Preliminary (65%) design stage. Hydraulic calculations shall be provided by at least the First Final (85-90%) design stage.

(a) Design shall be IAW NFPA 13, Factory Mutual (FM), UL, UBC, Unified Facilities Criteria-UFC 3-600-01 (Fire Protection Engineering for Department of Defense Facilities), and the System Safety Analysis for each project.

(b) In some cases, only sprinkler head locations need be shown, with calculations to be performed by the construction contractor. This must be approved during design fee negotiations for each project.

(4) Fire hydrants: Provide additional fire hydrants as needed.

(5) Fire extinguishers shall be in cabinets flush mounted to the wall.

(6) Warehouses shall have large drop sprinkler heads.

(7) Electronic equipment shall not have halon protection. Use wet pipe water suppression with early detection and shutdown of equipment.

(8) Fire Pumps are discouraged. If used, feed from another building or place a sign on the transformer feeding the building warning the Shops to not disconnect the transformer during a fire.

(9) Drawing Requirements: Drawings shall be prepared and stamped by a licensed Professional Engineer practicing in Fire Protection.

(10) Use water motor gongs at each riser.

c. Limiting: Provide dampers, vents, partitions, fire rated doors, and other materials as needed.

d. Pipe: Do not use any type plastic, CPVC, PVC, or polybutylene pipe in any fire protection piping systems. Do not use any schedule 10 pipe. Provide steel schedule 40 or heavier pipe for fire suppression system that complies with NFPA-13.

e. All fire suppression piping in the attic areas, above suspended ceilings, and any other unheated spaces must be provided with freeze protection. Also, connect freeze protection circuit to the fire alarm panel to provide a "trouble signal" if the freeze protection system becomes inoperative.

f. All exposed piping in inhabited spaces shall be painted to match with the existing surrounding conditions. In all other locations, the piping shall be painted in red. Do not paint sprinkler heads.

g. All fire sprinkler piping which is equal to or greater than 2" in diameter shall be identified and labeled every 20 feet apart. The labels shall be snap-on plastic only, and shall indicate "Sprinkler" and shall have "Arrows" that show direction of flow.

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Robins Air Force Base
Base Facility Standards

Title: Facility Electrical, General

Date: 25 JULY 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 6A – Facility Electrical, General

CRITERIA REFERENCE DOCUMENTS: The publications listed below form a part of this document to the extent referenced. The publications are referred to in the text by the basic designation only.

NEMA MG-1

NFPA 70 (2011), National Electrical Code

UFC 1-200-01, General Building Requirements

UFC 3-501-01, Electrical Engineering

UFC 3-520-01, Interior Electrical Systems

BFS Part 7A –Energy Conservation

BFS Part 7C – Sustainable Design & Development

1. LISTING: All electrical devices and components shall be listed for their intended use by UL or FM.

2. LOAD LEVELS: Calculate load levels for at least the following items
   NOTE :Consider derating for 50 degree C ambient in uncooled spaces.

a. Branch and feeder circuits.

b. Panelboards and switchboards.

c. Generators and automatic transfer switches.

d. Transformers.

3. DEMAND FACTORS: Size service entrance, pad mount transformers, downstream panelboards, dry type transformers, feeders, etc., as listed below.

a. General Purpose Convenience Receptacles:

(1) First 10 KVA, use 100 percent demand. PF = .95 lagging.

(2) 50 percent demand factor for remaining over 10 KVA. PF = .95 lagging

(3) Note: This does not include system furniture receptacles in office areas, individual office rooms, and large open office areas without system furniture.

b. Mechanical Equipment: Assume 100 percent demand load, PF = .80 lagging.

c. Lighting: Assume 100 percent demand load at PF = .95 lagging. Lighting shall be considered a continuous load with circuits serving such loads not loaded more than 80 percent of their rating.

d. System Furniture: Assume each cubicle contains one (3 amp) 720 VA CPU computer and a (2 amp) 240 VA computer monitor. Design on each six cubicles sharing a (8 amp) 960 VA printer. Include in load calculations an additional 180 VA per cubicle for typical furniture task lighting and miscellaneous loads (such as calculators, electric pencil sharpeners, etc.) Assume 80 percent demand load at PF = 0.95.

e. Individual Office Rooms: Assume each room contains one (3 amp) 720 VA CPU computer, one (2 amp) 240 VA computer monitor, and one (8 amp) 960 VA printer. Include in load calculations an additional 180 VA per room for typical desktop task lighting and miscellaneous loads (such as calculators, electric pencil sharpeners, etc.) Assume 100 percent demand load at PF = 0.95.

f. Large Open Offices (250 SF and above) w/o system furniture: Design using 15 VA per SF at 80 percent diversity at PF = 0.95.

g. Busways (and Bus Ducts):

(1) Only use busways to supply plug-in busway for shop areas with large pieces of equipment. Do not use them to feed downstream loads from the service entrance such as panelboards and MCC's.

(2) Protective device and feeder to each busway shall have an ampacity not less than the busway ampacity.

(3) Each busway shall be fed with a separate protective device and homerun feeder.

h. Facility Transformers and Service Lateral Conductors - No additional diversity or demand factor shall be applied to the pad mount transformers and service lateral conductors.

i. Service Entrance Rated Equipment - Service entrance rated equipment shall be sized based on a summation of the individual demand loads. No additional diversity or demand factor shall be applied to the service entrance rated equipment.

j. Feeders - These shall be sized to carry the anticipated current. Demand factors may be specific depending on a certain application. Demand factors not listed, or proposed that are different from this standard, must be approved by 778 CES/CECE at Robins AFB.

4. POWER SYSTEM PROTECTION STUDIES

a. Design: Perform a short-circuit study during design to determine proper AIC ratings of all electrical equipment. Include calculations in the design analysis.

b. Time Current Coordination Study: For projects that contain adjustable trip settings, a short circuit and time current coordination study will be needed to properly set the settings on the breaker trip units. The study needs to be based on the actual equipment that will be supplied on the project. Include in the study all cut sheets on the electrical equipment, breakers, and trip units being furnished on the project. The study and the equipment cut sheets shall be provided in a single 3 ring binder.

(1) For Design-Bid Build Projects

Specify in the specifications that the Contractor perform a short-circuit study and time-current coordination study prior to procurement of any equipment/material. Both the short-circuit study and the time-current coordination study shall be performed by the same company, either consulting engineering services with the equipment manufacturer or an independent Registered Professional Engineer regularly engaged in performing these studies. Specify all equipment material submittals be provided with the study in a single 3 ring binder.

(2) Design – Build Projects

After design is completed, but prior to procurement of any material, the Design Build Contractor shall obtain a short circuit and time-current coordination study. Both the short-circuit study and the time-current coordination study shall be performed by the same company, either consulting engineering services with the equipment manufacturer or an independent Registered Professional Engineer regularly engaged in performing these studies. The study will be based on the actual equipment that will be supplied on the project. The Engineering group with the Design Build Contractor shall review the study and make any recommended changes if needed to the design. Submit all equipment material submittals with the study in a single 3 ring binder.

c. MVA: At a minimum, use 400 MVA with X/R = 15 available at the primary side of the main transformer.

d. Scope: Include the protective system from the nearest upstream devices beyond the transformer primary fuses down to and including all adjustable or selectable low-voltage protective devices.

e. Limiters: Do not use low voltage cable limiters to achieve short-circuit limitation for equipment.

f. Transient Voltage Surge Suppression (TVSS) is required at the main service entrance as a minimum. Double-ended switchboards will require a TVSS on each side.

5. MOTORS

a. Size: Motors of 1 HP and more shall be 3-phase.

b. Reduced Voltage Starting: Use reduced voltage motor starting on 75 HP and up. For smaller motors, evaluate motor-starting voltage drop and provide reduced voltage starting if over 10% drop.

c. Efficiency of polyphase squirrel-cage induction motors shall be premium, design E per NEMA MG-1 - 1993, rev. 1.
INTERIOR POWER

a. General.

(1) In existing facilities fed at 208V, convert to 480V. In new facilities the service voltage shall be 480Y/277 unless the Civil-Electrical Engineer in 778 CES/CEPD gives approval for 208Y/120 volts.

(2) Provide small distributed dry-type transformers (delta-wye) as needed for 208Y/120V to step the voltage down from 480Y/277. In administrative areas, locate dry type transformers and branch panelboards in electrical closets distributed throughout the facility to keep the branch circuits below 200 feet.

(3) Use reduced voltage motor starting on 75 HP and up. For smaller motors, evaluate motor-starting voltage drop and provide reduced voltage starting if over 10% drop.

(4) Power Factor Correction: Install capacitors to correct power factor to 95% at full load for motors 50 HP and larger. Show every capacitor next to the motor. Install as close to the motor terminals as possible. Do not install capacitors on any motor with variable frequency drive (VFD).

(5) The Contractor shall have an electrician with a Master’s License on site during all installations.

(6) Use generic “off the shelf” equipment. Field fabrication of panels, switches, etc., is not allowed.

(7) Equipment that is obsolete or scheduled to be obsolete is not allowed.

(8) Provide a submittal at the final inspection that lists the vendors for all equipment, so CE shops can contact them later as needed.

(9) The following wiring methods shall not be used: Armored Cable (Type AC), Flat Cable Assemblies (Type FC), Flat conductor Cable (Type FCC), Integrated Gas Spacer Cable (Type IGS), Metal-Clad Cable (Type MC), Mineral-Insulated, Metal-Sheathed Cable (Type MI), Nonmetallic-Sheathed Cable (Types NM, NMC, and NMS) {except for residential use}, Power and Control Tray Cable (Type TC) {unless specifically called for in project scope documents}, Underground Feeder and Branch-Circuit Cable (Type UF), Nonmetallic Underground conduit with Conductors (Type NUCC), Flexible Metallic Tubing (Type FMT), Electrical Nonmetallic tubing (Type ENT), and similar wiring methods with various manufacturer's name brands.

(10) All wiring shall be rated 600 volts, single copper conductor, with Type THHN, THWN, or XHHW insulation rated for 75°C or higher as applicable.

(11) All wiring shall be installed in metallic conduit raceways above grade or PVC (schedule 40 or 80 as appropriate) below grade.

(12) Wireway (rectangular shells with top covers into which cables are laid) are highly discouraged and allowed by exception only.

(13) Cable tray as a raceway for power wiring is highly discouraged and is approved only by exception upon request.

(14) Raceways shall be concealed wherever practical in finished spaces.

(15) Motor Control Centers shall have disconnects, branch circuit overload protection, and controllers mounted in a single assembly. Whenever the starter is located in the MCC, use thermal magnetic or instantaneous trip circuit breaker with separate adjustable overloads. If the unit contains no starter, and the starter is located at the machine, then a thermal-magnetic circuit breaker shall be used to supply the motor feeder.

(16) Electric - Operated Projector Screens in Conference Rooms, Classrooms, and Training Rooms: Coordinate locations with user. Provide power and wall switches for control.

(17) Main electrical rooms shall be a separate room with no other trades sharing the electrical room. Main electrical room shall be located on an exterior wall with exterior double doors, and without a center support, in the opening for removal of equipment. Doors shall contain an exterior lock.

(18) Electrical closets within the facility shall be separate rooms with no other trades sharing the closets. Electrical closet doors shall contain a lock.

(19) Unless special permission is granted by Civil Engineering, all dry-type transformers shall be installed within the main electrical room and the electrical closets within the facility.

b. Branch Circuits.

(1) On all new circuits, allow for future expansion by loading less than the NEC maximum.

(2) 20 Amp receptacle circuits, place no more than 10 duplex outlets on a circuit. All circuits supplying convenience receptacles shall be protected with a 20-amp circuit breaker.

(3) Do not use multi-wired circuits (shared neutrals) for single-phase loads. Run a separate neutral.

(4) Do not use under floor duct systems.

(5) Provide a separate green grounding equipment conductor in all conduits. Raceway shall not be used as a sole equipment ground. Ground shall be sized in accordance with Table 250 of the NEC.

(6) Do not use ground fault breakers for 120 volts, 20-ampere circuits.

(a) Use only individual ground fault receptacles.

(b) Provide GFCI receptacles in all bathrooms, locker rooms, within all wet areas of a facility, and at all outside locations.

(7) Branch circuits shall be rated a minimum of 20 amperes, except where lesser ratings are required for specific applications. Branch circuit conductors will in no case be less than No. 12 AWG.

(8) Maximum of three phases or poles shall be installed in any conduit system, which includes single-phase circuits, regardless of derating tables in the NEC.

(9) The combined voltage drop on feeders and branch circuits will not exceed 5 percent. Individual voltage drop on feeder and branch circuits shall not exceed the recommendations of the NEC.

c. Dry-type Transformers:

(1) Use dry-type general purpose (delta-wye) in the facilities except in cases listed below which require K = 13 non-linear dry type transformers.

(2) Use K-rated (K=13) non-linear dry types when providing power to the following areas:

(a) Office administrative areas

(b) Cubicles or System Furniture

(c) Individual office Rooms

(d) Large open office areas

(e) Computers

(f) Electronic Equipment

(g) Electronic Test Labs

(3) Dry type transformers shall be not be ceiling-mounted or wall-mounted. Mount the transformer on a concrete pad on the floor with rubber pad isolators.

(4) Maximum size dry type shall not exceed 300 KVA.

d. <u>Low voltage cable and conduit</u>:

(1) Use only copper conductors.

(2) Use Type THHN, THWN, or XHHW as appropriate.

(3) Base conductor size on the above.

(4) Do not use setscrew or die cast conduit connectors on EMT conduit. Use zinc coated steel compression fittings only.

(5) Screw-in flex connectors are not allowed. Connectors for flexible metal conduit shall be malleable iron/zinc plated and of the 2-screw clamp type with insulated throats conforming to UL 514B & NEMA FB-1.

(6) For areas without conditioned air, apply the ambient correction factors in NEC, article 310.

e. <u>Computer areas</u>:

(1) Locate separate emergency shutdown switches (inside hinged covers to prevent accidental activation) for all computerized operations, including their air handling and computer room units. Locate switches at each exit door of the computer room.

(2) Activation of the fire alarm system shall also shut down the computer equipment, computer room units, and air-handling units.

f. Air Handling Equipment and Devices:

(1) Device Plates: All device plates shall be type 302, 0.035 inch thick, brushed finish, and UL Listed stainless steel.

(2) Disconnect Switches:

(a) Heavy duty type.

(b) NEMA 3R outdoors, NEMA 4X in corrosive areas.

(c) When fused, use rejection type R fuses.

g. Grounding:

(1) Ground rods - ¾" X 10' copper clad. Use exothermic weld to connect to grounding system.

(2) Service Entrance Ground Electrode: Connect a tripod of three ground rods spaced 20 feet apart to the service entrance electrode connection. Tripod shall be at least 10 feet from the facility.

(3) For new construction: In addition to the service entrance ground electrode listed above, install a ground ring with ground rods around the entire new facility with connections to the steel beams evenly spaced around the perimeter of the structure. Connect the electrical service entrance ground bus to the ground ring at a single point copper ground bus bar located in the main electrical room.

(4) Grounding shall be provided for all new communications rooms. Refer to the communications section of this BFS. For new construction, connect the grounding in each communication room to the single point ground bus located in the main electrical room.

(5) Grounding shall be provided for all new raised floor systems. Due to the various methods of grounding computer raised floors, details are left to be provided by others.

(6) Static ground receptacles shall be provided for all new hangars and painting facilities. Receptacles shall be interconnected together with the grounding system and steel structure in the facility.

(7) All raceways shall have an insulated equipment ground conductor sized in accordance with the NEC.

h. Wall switches:

(1) 20 Amp minimum.

(2) Industrial Specification Grade, not general or standard grade.

i. Convenience Receptacles - General:

(1) An outlet is defined as 20 Amp minimum, NEMA 5-20R, and duplex. Locations shall be as described for convenience receptacles in this standard.

(2) Industrial Specification Grade, not general or standard grade.

(3) When weatherproof, use spring-hinged flap covers.

(4) Convenience receptacles shall be located 18 inches AFF, to the center of the outlet. Exception: 24 inches AFF to bottom of outlet plate is allowed in explosion proof areas.

(5) Explosion proof convenience receptacles shall be provided at all explosion proof areas within a facility. Locations shall be as described for convenience receptacles in this standard. Explosion proof convenience receptacles shall be rated in accordance with Article 500 of the National Electrical Code.

(6) Explosion proof convenience receptacles shall be rated 20 amperes.

(7) Provide a plug for each explosion proof convenience receptacle.

j. Areas - Convenience Receptacles shall be provided in all the following areas listed below:

(1) At Communication Outlets - adjacent to each communication outlet

(2) Small Individual Office Rooms (less than 250 SF) - one outlet on each wall.

(3) Conference Rooms:

(a) One outlet ceiling mounted approximately 18 feet from the center wall where a projection screen would be installed.

(b) An outlet on each wall but mounted at 16 ft maximum separations around the perimeter of the room. I

(c) Install one outlet in the corner of the room opposite where a projection screen would be used.

(d) Install a floor mounted receptacle in the front of the room for a podium.

(4) Communication Rooms: Provide two outlets in the center of each wall.

(5) Receptacles for Pre-wired System Furniture:

(a) Prewired system furniture is defined as follows: furniture that contains pre-wired powered panels with plug-in receptacles and communication outlets mounted in the furniture base. Prewired system furniture would have the power and communication wiring extended into the furniture channel through a power pole or flexible whip.

(b) If furniture is included in the Design Build RFP or Statement of Work, then all raceway, wiring, and power capacity should be provided. Wiring should be extended to the furniture and terminated on the outlets.

(c) If the project does not provide the prewired systems furniture, but it will be procured by the user at a later date, then the project shall include future provisions for the furniture. This shall consist of all loads in the design calculations, capacity in all feeders and panelboards, breaker space in all panelboards, branch wiring with associated raceway to the point of connection, etc. Design Build RFP or Statement of Work should indicate who will provide the final connections to the furniture. If final connections will be performed by others, then the wiring should be left terminated in a junction box above the ceiling near the future power poles or in a wall mounted junction box.

(d) In design/build projects, the location of furniture or quantity of workstations in each area should be included in the RFP.

(6) Administrative areas larger than 250 square feet with or without prewired systems furniture (now or later):

(a) In these spaces, install one outlet at 8 feet intervals around all walls and one outlet on each furred out interior column.

(b) These outlets shall be installed flush in the walls and interior columns. This is in addition to the outlets specified for prewired system furniture cubicles.

(7) Non-Prewired Systems Furniture - If furniture is installed in areas of the facility, which is not prewired system furniture, but uses the outlets in the walls, then provide the following:

(a) Two outlets shall be installed in the center of each cubicle flush mounted in the wall. Maximum separation shall not exceed 8 feet on the walls. Maximum two cubicles shall share a circuit.

(b) In design/build projects, the location of furniture or quantity of workstations in each area shall be included in the RFP.

(8) Mechanical, Electrical rooms and Mechanical Mezzanines: One outlet at 20 ft intervals around all walls. Provide additional outlets as needed to coordinate with equipment locations.

(9) Mechanical and Electrical Equipment: One outlet shall be installed within 16 feet to 20 feet of each piece of equipment. This shall be provided wherever equipment is located, whether inside or outside, roof, mezzanines, etc.

(10) Corridors: Provide one outlet at every 20-ft interval along the length of the corridor (on one side of wall or alternate wall).

(11) Lobby: Two outlets total, on opposite walls.

(12) Warehouses, Shop Areas, Storage Areas, and Hangars: One outlet at 40 feet intervals around the perimeter of all walls and on outlet at all interior columns. Locate outlets in the web of interior columns.

(13) Each DDC Control Panel - Provide one receptacle outlet at each DDC control panel. This is used for maintenance personnel to use portable tools, laptops, etc.

(a) This is in addition to a hardwired connection for the panels' power.

(b) At each DDC panel, provide a dedicated hardwired circuit for the DDC panel power requirements.

(14) All other areas within a facility not specifically addressed above shall have outlets installed as follows:

(a) Install one outlet at 16 ft maximum intervals around the perimeter of all walls and one outlet on each interior column. Locate outlets in the web of interior columns.

(b) Walls less than 16 feet shall have minimum one outlet installed on each wall; this outlet shall be centrally located on the wall but may be the same outlet as outlets spaced 16 ft on center around the room.

(15) Receptacles outside the facility shall be as follows:

(a) One outlet shall be installed at each personnel door on the outside.

(b) One outlet shall be installed at each roll-up door on the inside.

(c) One outlet shall be installed at all mechanical equipment outside within 16 feet to 20 feet of the equipment.

(16) Coordination Notes: The above is based on the minimum requirements. A/E shall be responsible to coordinate with the user on the exact location for the outlets during the design stage. This shall be based on final equipment locations, users' needs, and workstation or desk locations. This statement applies to design projects and design/build contracts.

k. <u>Special Receptacles for Hangars</u>: Obtain special requirements from user or project scope of work.

6. SYSTEM GROUNDING

a. <u>Soil Resistivity</u>: The median value runs in the 25,000 ohm-cm range for soil near buildings at Robins AFB. This would normally result in a single ground rod having a resistance of nearly 100 ohms. To meet the NEC requirement of 25 ohms or less a tripod set of ground rods 20 feet apart with thermit-welded bare copper 4/0 wire between them is usually sufficient, provided the closest ground rod is at least 10 feet from the facility.

b. <u>Buildings under 4,000 SF roof size and larger buildings without any admin space or office</u>: When a bldg or structure meets this description after the work of this project, the system ground may meet the NEC requirement of 25 ohms or less.

c. <u>Buildings of 4,000 SF and larger roof size with any admin space or office</u>: Provide maximum of 10 ohms of resistance to hard earth ground in the system ground connected to the electrical service entrance.

7. SWITCHBOARDS, PANELBOARDS, AND MOTOR CONTROL CENTERS

a. <u>Choice of type</u>:

(1) Use switchboard construction when 1000 Amps or larger.

(2) Use power distribution panelboard construction when equal to 800 Amps. Boxes shall be minimum 9 ½ inches deep.

(3) Use panelboards when 600 Amps or less.

b. General:

(1) Use NEMA 3R outdoors. NEMA 4X may be specified in cases where the corrosion potential is high. Fiberglass is preferred over stainless steel for NEMA 4X.

(2) Use copper bus only.

(3) Size to allow for a 25% increase in power demand.

(a) A 25% spare capacity over calculated load (20% of the equipment rating) shall be provided for all electrical equipment including transformers, motor control centers, switchboards, panelboards, feeders, and associated overcurrent protective devices.

(b) Calculations shall clearly demonstrate how the spare capacity is included for each bus in the system. Include hand written calculations or a spreadsheet to demonstrate how the spare capacity is included in each bus and feeder in the system.

(4) Spare pole/space capacity shall be minimum 25% of total pole/space capacity.

(5) Panelboards, switchboards, or motor control centers shall not be tapped to feed new loads. If there is no space for protective devices in the existing piece of equipment to feed the new load, then a new panelboard, new switchboard (add section if feasible), or new motor control center (add section if feasible) shall be provided.

(6) Existing Equipment: When installing breakers in existing panels, insure the manufacturer can still supply them and at reasonable price and delivery schedule.

(7) When doing any work involving the main service entrance, install or re-install a laminated riser diagram of the electrical system on the wall near the panel.

(8) Provide typed directories in each cabinet.

(a) Clearly label each circuit as to type load and specific location.
Example – Receptacles N. Wall

(b) Note on the directory from where the cabinet is fed. Example - “Fed From Panel PA in Mech Room, Ckt. 4”

(9) All service entrance equipment shall contain a main breaker. If the facility requires double ended design, as stated elsewhere in this standard, then two main breakers with a normally open tie breaker shall be provided, with Kirk key interlock.

(10) Feeders to service entrance and any panelboard within the facility shall not contain any derated neutrals. As a minimum, neutrals shall have an ampacity of the phase conductors. Feeders to panels with 200 percent rated neutral busses shall have the neutral conductors rated 200 percent of the feeder phase conductors.

(11) New construction shall be designed with one service entrance, except as noted for transformer requirements over 5,000 KVA.

(12) Labeling of Panel Schedules and Drawings for Branch Circuits: Each homerun symbol on the drawings shall be labeled in accordance with the pole numbers instead of a circuit number.

(a) Three-phase loads shall be designated by the three-pole numbers, such as HB - 1,3,5 or HB - 8,10,12. The single pole number, such as LA-12, shall designate single-phase loads.

(b) Panel schedules shall be numbered with odd numbers on the left side, top to bottom, and even numbers on the right side top to bottom.

c. <u>Distribution Panelboards and Switchboards</u>:

(1) Protect by breakers. Fuses are not permitted.

(2) All switchboards and panelboards shall be 3-phase, 4-wire, with ground bus. Install a neutral conductor to all switchboards and panelboards regardless of load.

(3) If the main breaker has ground fault protection, provide it as well on the feeder breakers.

(4) Show future frame space in all service entrance rated or distribution panelboards or switchboards, with full mounting hardware provided for plugging the breakers into them.

(a) Switchboards. 1000 - 1200 Amps, provide:

<u>1</u>. 1-400 amp frame space.

2. 2-225 amp frame spaces.

3. 1-100 amp frame space.

(b) Switchboards. 1600 Amps and above, provide:

1. 1-800-amp frame space.

2. 2-400 amp frame spaces.

3. 2-225 amp frame spaces.

3. 1-100 amp frame space.

(c) Double-ended switchboards. Provide for each side (a) or (b) above for future frame space sizes.

(d) 800 amp panelboards. Provide:

1. 2-225 amp frame spaces.

2. 2-100 amp frame spaces.

(e) 600 amp panelboards and below. Provide:

1. 1-225 amp frame space.

2. 3-100 amp frame spaces.

(f) All frame space sizes shall be based on three pole breakers.

(5) Use an electronic multi-meter in the main panelboard or switchboard instead of ammeters,

(6) On double-ended switchboards, control switches and meters shall be connected to the side of the energized source. As soon as power is de-energized from one of the incoming sides of the double-ended switchboard, all control power shall automatically transfer to the other side of the available energized source.

(7) Switchboards

(a) Main through bus shall be fully rated and non-tapered copper bus.

(b) Distribution sections shall have the same depth as the main service section.

(c) TVSS units may be located integrally with service entrance equipment.

d. Panelboards - Other:

(1) All panelboards shall be “main breaker interior” type unless the upstream circuit protective device is within sight of the downstream bus being fed.

(2) Gutter taps, sub-feed lugs, feed-thru panels, and taps of conductors inside junction boxes are unacceptable circuit feeds to panelboards.

(3) All panelboards shall be fed from a separate circuit breaker in an upstream bus. The only exception to this shall be when no more than two panelboards shall share the same feeder circuit from a dry type transformer. The second panelboard shall be connected from a feeder breaker in the first panelboard. The second panelboard shall be installed adjacent to the first panelboard or inside the same room.

(4) If multiple (three or more) 208Y/120 volt panelboards are fed from the same dry type transformer, then a 208Y/120 volt distribution panelboard shall be installed downstream from the dry type transformer. Each panelboard shall be connected to a dedicated circuit breaker in the distribution panelboard.

(5) Minimum panelboard size:

(a) Use minimum 225 Amp bus rating and main breaker, 42 poles.

(b) If the demand load is 40 Amps or less, then a 100 Amp panel, minimum 30 poles, is permitted.

(6) Mount main breakers at the top or bottom in a vertical position specifically designed for that purpose. Exceptions only apply for approved applications of 100 Amps of less and 30 poles or less.

(7) Do not use load center type panelboards except for military family housing construction and temporary lodging facility construction.

(8) Panelboards with 200 percent rated neutrals shall be used when supplying power to the following areas:

(a) Office administrative areas

(b) Cubicles or System Furniture

(c) Individual office Rooms

(d) Large open office areas

(e) Computers

(f) Electronic Equipment

(g) Electronic Test Labs

(9) When supplying panelboard feeders to panels with 200 percent rated neutrals, the neutral conductors to the panel shall have an ampacity of twice the phase conductors in the feeder.

(10) When supplying panelboard feeders to panels with 100 percent rated neutrals, the neutral conductors to the panel shall not be derated less than the phase conductors in the feeder.

(11) Column width panelboards are unacceptable.

(12) Panelboards shall not contain integral TVSS units. Any TVSS units installed at panelboards shall be separate units and installed adjacent to the panelboards.

e. Circuit Breakers:

(1) Use only bolt-on type or I-Line type.

(2) Do not use ground fault breakers. Use only individual ground fault receptacles.

(3) Magnetic only switches shall not be installed in any switchboard or panelboard. All breakers shall have thermal-magnetic characteristics.

f. Main Breakers and Feeder Breakers shall be as follows:

(1) Main and Tie Breakers in Main Switchboards – (Including Double-Ended)- Service Entrance Rated.

(a) Insulated-case.

(b) 100% rated.

(c) Individually mounted (drawout in 2000 amp bus and above).

(d) Solid state trips with digital integral ammeter display with the following trip functions:

Main Breakers: Adjustable LT, Adjustable ST, Adjustable GF, with separate adjustable time delay settings for LT, ST, GF.

Tie Breaker: Adjustable LT, Adjustable ST, Adjustable Instantaneous, Adjustable GF, with separate adjustable time delay settings for LT, ST, GF. Same long time pickup setting as main breakers.

(e) Electrical operation with backup manual operation.

(2) Feeder Circuit Breakers in Main Switchboards – (Including Double-Ended) Service Entrance Rated.

(a) Molded-case.

(b) 80% rated.

(c) Group mounted - stationary.

(d) Solid state trips with digital integral ammeter display with the following trip functions:

Adjustable LT, Adjustable ST, Adjustable Instantaneous, Adjustable GF, with separate adjustable time delay settings for LT, ST, GF.

(3) Main Circuit Breakers in Main Distribution Panels (MDP) - Service Entrance Rated (800 Amp Bus).

(a) Molded-case.

(b) 80% rated

(c) Stationary mounted.

(d) Solid state trips with integral digital ammeter display with the following trip functions:

Adjustable short time pickup with adjustable delay bands, and adjustable instantaneous pickup.

(4) Feeder Circuit Breakers in Main Distribution Panels (MDP) - Service Entrance Rated (800 Amp Bus).

(a) Molded-case.

(b) 80 % rated.

c) Use standard thermal magnetic breakers. Breakers shall contain adjustable magnetic trip on all 225 amp breakers and larger where available.

(5) Breakers Used in Service Entrance Rated Panelboards 600 Amps and below shall be standard molded-case thermal magnetic.

(6) Circuit Breakers within a Sub-distribution Panelboard and 1000 Amps or Greater.

(a) Molded-case.

(b) 80 % rated.

(c) RMS digital solid-state trip with adjustable short time and instantaneous pickup.

(7) Circuit Breakers within a sub-distribution panelboard and 800 Amps or less may be standard molded-case thermal magnetic.

(8) If required by the project scope, breakers shall have additional metering functions for the solid-state trips.

(a) Functions shall include the following:

1. Energy (KWH, MWH)

2. Real Power (KW, MW)

3. Total Power (KVA, MVA)

4. Frequency (HZ)

(b) Provide device monitor to serve as a central location for reading and displaying all data at each solid-state trip unit and the facility meters. Connect monitor to all devices with a RS-485 network. Device monitor shall be a separate device from the facility meter.

g. Startup: Provide special startup along with training on setting and maintaining the breakers to CE shops. Use an independent testing firm registered with NETA or manufacturer's service engineer to set the adjustable devices. Include:

(1) Startup in the field.

(2) CE Shop training.

(3) O&M manuals.

(4) Schematics of electronic devices.

(5) Solid state trips tested in field with a portable test kit.

(6) Specified equipment used in the startup provided to CE shops for future maintenance.

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Approval: ***Original Signed By***
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Robins Air Force Base
Base Facility Standards

Title: Interior Lighting

Date: 18 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 6B – INTERIOR LIGHTING

CRITERIA REFERENCE DOCUMENTS: The publications listed below form a part of this document to the extent referenced. The publications are referred to in the text by the basic designation only.

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

IESNA HB-9	(2000; Errata 2004; Errata 2005; Errata 2006) IES Lighting Handbook

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(2007; Errata 06-1; TIA 07-1; TIA 07-2; TIA 07-3; Errata 07-2; TIA 08-4; TIA 08-5; TIA 08-6; TIA 08-7; TIA 08-8; TIA 08-9; TIA 08-10; TIA 08-11; TIA 09-12; TIA 09-13; TIA 09-14; Errata 09-3; TIA 09-15; TIA 09-16; TIA 10-17) National Electrical Safety Code
IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE Stds Dictionary	(2009) IEEE Standards Dictionary: Glossary of Terms & Definitions

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI ANSLG C78.41	(2006) For Electric Lamps--Guidelines for Low-Pressure Sodium Lamps
ANSI ANSLG C78.42	(2009) For Electric Lamps: High-Pressure Sodium Lamps SECTION 26 51 00.00 40 Page 9
ANSI C78.1381	(1998) American National Standard for Electric Lamps - 250-Watt, 70 Watt, M85 Metal-Halide Lamps
ANSI C82.1	(2004) American National Standard for Electric Lamp Ballasts - Line Frequency Fluorescent Lamp Ballasts

ANSI C82.11	(2002) American National Standard for High-Frequency Fluorescent Lamp Ballasts—Supplements
ANSI C82.2	(2002) American National Standard for Lamp Ballasts--Methods of Measurement of Fluorescent Lamp Ballasts
ANSI C82.4	(2002) American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium (LPS) Lamps (Multiple-Supply Type)
ANSI/ANSLG C78.43	(2007) American National Standard for Electric Lamps - Single-Ended Metal-Halide Lamps
ANSI/IEC C78.81	(2010) American National Standard for Electric Lamps--Double-Capped Fluorescent Lamps--Dimensional and Electrical Characteristics
ANSI/IEC C78.901	(2005) American National Standard for Electric Lamps - Single Base Fluorescent Lamps--Dimensional and Electrical Characteristics
ANSI/NEMA C78.LL 1256	(2003) Procedures for Fluorescent Lamp Sample Preparation and the Toxicity Characteristic Leaching Procedure (TCLP)
NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2011) National Electrical Code
NFPA 90A	(2009; Errata 09-1) Standard for the Installation of Air Conditioning and Ventilating Systems

ENGINEERING TECHNICAL LETTERS

ETL 10-2	Light-Emitting Diode (LED) Fixture Design and Installation Criteria for Interior and Exterior Lighting Applications

UNIFIED FACILITIES CRITERIA

UFC 3-530-01	Interior and Exterior Lighting and Controls
UFC 3-520-01	Interior Electrical Systems

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System UNDERWRITERS LABORATORIES (UL)
UL 1029	(1994; Reprint Jun 2010) High-Intensity-Discharge Lamp Ballasts SECTION 26 51 00.00 40 Page 10
UL 1598	(2008; Reprint Jan 2010) Luminaires
UL 844	(2006; Reprint Nov2008) Standard for Luminaires for Use in Hazardous (Classified) Locations

ROBINS AFB FACILITY STANDARDS

BFS Part 6K	*Emergency Lighting Systems*
BFS Part 7A	*Energy Conservation*
BFS Part 7C	*Sustainable Design & Development*

INTERIOR LIGHTING

a. Calculate lighting levels based upon IES (Illumination Engineering Society) for maintained levels. Maintained level is defined as a calculated foot-candle level taking into consideration all depreciation light loss factors (LLF).

b. General Lighting

(1) For fluorescent, tube shall be rapid start, 4’, 32W, T8, 3500K color, CRI of greater than 75, and a minimum output of 2900 lumens.

(2) When service voltage is 480Y/277 Volts, feed lights at 277 volts.

(3) Modular wiring systems are not allowed.

(4) Install a junction box and 6 feet of flexible metal conduit to all light fixture connections above suspended ceilings, acoustical or gypsum.

(5) In open office areas with systems furniture, include a light loss partition factor in calculations. Design illumination at task level shall be not less than 30 foot-candles, after applying all light loss factors and a partition factor. Include all tables from industry standards that show the source of partition factors used in the calculations. Assume the offices contain partitions with a 50 percent reflectance factor having dimensions 6 ft long by 6 ft wide by 6 ft tall. Any additional required lighting levels will be obtained using task lighting within the partitions.

(6) Lighting systems in new, retrofitted facilities shall have the correct light level for the tasks being performed and be equipped with Energy Star or FEMP designated lighting technologies. Utilize task lighting to provide light where it is needed rather than increased ambient lighting.

(7) Provide proper controls including occupancy sensors and/or daylight-responsive dimming to reduce or shut off the lights when they are not needed. Establish zoned lighting in large areas so that groups of lights may be operated independently of other groups. Interior lighting in buildings larger than 5000 ft^2 must be controlled with an automatic control device to shut off building lighting in all spaces. Achieve a minimum daylight factor of 2% in 75% of all spaces occupied for critical visual tasks.

c. General Patterns: In general, lighting within a facility shall be as follows:

(1) Entry way In Front Of Facility at the Exterior of the Facility:

(a) Provide uplight or downlight on both sides to light the entrance into the facility and any planters at the entryway.

(b) Fixture shall be architecturally pleasing with the location and enhance the appearance of the entryway into the facility.

(2) Entry Way or Vestibule:

(a) Small Areas: Compact fluorescent downlights.

(b) For large areas, consider a combination of cove lighting with compact fluorescent downlights, fixtures to match the hallways/corridors, and recessed metal halide in high ceilings.

(c) Pictures on walls -- Directional floods

(3) Facilities with a Built-in Service Desk:

(a) Provide down task lighting directly over the entire service desk counter.

(b) Provide switch next to entrance into the service desk area.

(4) Foyer/Halls/Corridors: Fixtures shall be 2X2 or 2X4 with refractive acrylic lens troffer. Maximum of three lamps shall be used in a fixture.

(5) Administrative Office Spaces:

(a) In small individual offices, minimum two 2 ft X 4 ft light fixtures (three tubes) shall be installed.

(b) The following fixture types are allowed where noted:

1. Nominal 5 1/2 inch deep, para-contoured housing, die formed code gauge, prime cold rolled steel. Fixture shall be 18-cell semi-specular louvered, 2 ft X 4 ft parabolic with three 32-watt T8 four-foot fluorescent lamps.

2. 2 ft X 4 ft recessed direct/indirect lighting with three 32-watt T8 four-foot fluorescent lamps. (Use this application in small individual offices only.) Design Basis -- Lithonia AV.

3. Large office areas (500 square feet and larger) with system furniture and high ceilings (10 feet and above), consider pendant mount 8 feet long direct/indirect lighting. Support fixtures from 3/32-inch diameter cable. 8 feet length fixtures shall contain four F32T8 lamps. Fixtures shall be installed in continuous rows. All four lamps may be on the same ballast to conserve energy. The color of fixture shall be determined during design with the user. Fixture shall contain a parabolic louver that meets RP24 direct glare requirements as defined in IES publication, RP24 VDT Lighting. Parabolic louver shall be constructed of semi-specular aluminum.

4. Large open office areas (500 square feet and larger) with system furniture and ceiling heights less than 10 feet, use 2 X 4 fixtures with refractive acrylic lens.

(6) For Computer Rooms, Classrooms, Training rooms, Conference Rooms:

(a) The following types are permitted for general room lighting:

1. Nominal 5 1/2 inch deep, para-contoured housing, die formed code gauge, prime cold rolled steel. Fixture shall be 18-cell semi-specular louvered, 2 ft X 4 ft parabolic with three 32-watt T8 four-foot fluorescent lamps.

2. 2 ft X 4 ft recessed fixtures with three F32T8 lamps and injection molded absolute cut-off lens with specular silver 1/2 inch X 1/2 inch X 1/2 inch square in-line cube cell, 45 degree shielding.

3. Consider other fixtures as needed to reduce glare on a projection screen.

(b) For conference rooms: Provide supplemental dimmable incandescent fixtures in addition to the general room lighting listed above. Incandescent dimmable fixtures shall be located as follows:

1. Around the perimeter of the room at approximately 4-6 feet on center in conference rooms greater than 400 SF.

2. Incandescent at the perimeter of the room shall be switched separately from the general room lighting.

(c) Switching of General Room Lighting in Classrooms, Training Rooms, Conference Rooms, and Computer Rooms:

1. Provide switches for multiple lighting levels of the fluorescent fixtures.

2. Consider switching the room as three distinct areas: front one third, middle one third, and back one third. This applies in all cases except the computer room.

3. Consider switching with inboard/outboard lamps separately. In other words, in three tube fixtures, the outer two lamps shall be switched separately from the inner lamp.

(7) Restroom Areas

(a) Acoustical ceilings: 2X2 is preferred, with refractive acrylic lens troffer.

(b) Gypsum Ceilings: Same type fixture except use ceiling brackets provided by the manufacturer for gypsum ceilings.

(c) Over Mirrors: Provide supplemental lighting directly over all mirrors.

(8) HID Fixtures:

(a) Highbay fixtures may be used in applications where the bottom of the fixture is 25 feet and higher above the floor.

(b) Lowbay fixtures may be used in applications where the bottom of the fixture is less than 25 feet above the floor.

(c) Metal reflectors should only be used in industrial areas where architectural aesthetics is not a concern.

(d) Uplight should be considered to minimize a “cavern effect.”

(e) Where application permits by code for the environment, provide a quick disconnect with a receptacle/plug assembly. Pendant drops shall be rigid conduit. All fixtures shall be installed at a constant elevation above the finished floor. Fixture hangars shall allow for a plumb and level installation. Fixture support shall consist of a threaded malleable iron hangar rated for 120 LBS and permit a maximum 20 degree swing. Connect fixture hangar to a threaded raceway (rigid metal conduit) with conduit supports within eighteen inches of either side of the fixture support.

(f) All lighting shall be metal halide.

(9) Aisle Lighting in Warehouses:

(a) Use fixture with elongated narrow asymmetric or wide asymmetric lighting pattern. Use low bay or high bay depending upon height. Install light fixtures between all isles or racks and on each side.

(b) Conduit shall be installed perpendicular to the isles or racks. Fixture support shall be malleable iron hangar rated for 120 LBS and permit 20-degree swing. At the fixture ballast, provide quick disconnect and receptacle/plug assembly. Pendant drops shall be rigid conduit.

(c) Design for a maintained level of 75 foot-candles.

(d) All lighting shall be metal halide.

(10) Mechanical and Electrical Rooms:

(a) Provide open industrial fluorescent lighting F32T8 lamps. Provide clear guards or a screen over all lamps. Fixture shall be of a type that requires a forced movement along the longitudinal axis of the lamp for insertion and removal of the lamp.

(11) Janitor Rooms: Provide fixture with a wrap-around lens. Switch fixture inside room.

(12) Canopies:

(a) Consider wrap around fixtures (four feet) with two F32T8 fluorescent lamps.

(b) Design using 20 foot-candles at floor level if not a loading dock.

(13) Loading docks:

(a) Consider wrap around fixtures (four feet) with two F32T8 fluorescent lamps.

(b) Design using 50 foot-candles at floor level.

(14) Switching - General

(a) Circuit Breakers shall not be used to switch any lighting circuits.

(b) Provide switches at each doorway to control all lighting spaces within the room or area.

(c) Classrooms, training rooms, conference rooms, and computer rooms: See above.

(d) When required by project scope, provide a low voltage relay controller next to panelboards to control lighting. Panelboards with lighting relays are unacceptable.

(e) Occupancy Sensors - Provide these in private or small offices and restrooms (types specially suited for restrooms), as a minimum. Provide in other suitable areas for energy conservation. Locate the switches to avoid nuisance activation by personnel walking by the doorway and to avoid being covered by an open door or furniture.

(15) Interior Sports Lighting:

(a) All interior sports lighting shall be based on Class of Play Type II per IES.

(b) Lamps shall be metal halide.

(16) Spare Parts: The Contractor shall turn in the following after final inspection:

(a) 10% of each type of lamp for spare stock.

EMERGENCY AND EXIT LIGHTING

a. General:

(1) Facilities over 25,000 square feet shall use a small permanent generator and/or an Emergency Lighting Inverter (uninterruptible power supply) to feed the circuits in the emergency system.

(a) In areas with metal halide lamps, selected overhead metal halide fixtures shall be connected to the emergency system to provide the emergency lighting. Connect the entire overhead metal halide fixture, including quartz lamp if provided, to the system. Quartz lamps may be used in selected fixtures to provide initial foot-candles until the metal halide lamp strikes and starts to illuminate.

(b) In areas with fluorescent lighting, connect selected fixtures to the emergency system for emergency lighting. Connect the entire fixture to the system. Exit signs within the facility shall be connected to the system.

(c) Emergency lighting fixtures shall not be switched except by branch circuit breakers in the emergency system.

(d) Emergency lighting located within conference rooms should have an internal battery pack located within the fixture to allow the entire fixture to be switched off for presentations.

(2) Wall packs with integral battery units are not acceptable within the facility. For facilities less than 25,000 SF, emergency lighting shall be provided with integral battery packs in the fixtures.

(3) Clearly mark the emergency fixtures with a label designated “emergency” and a printed label with the circuit number, so Shop personnel can find them easily. Install a laminated plastic nameplate on the fixture. Nameplate shall have an orange background with white letters (minimum ¼ inch letters), which describe the emergency lighting circuit number. All raceways shall be marked with a 3 inch orange tape band every ten feet. All junction boxes used in the wiring shall have orange covers.

(4) Install an emergency light in each electrical and mechanical room.

(5) Place a laminated drawing of the system near the emergency unit, or near the main electrical panel for a system of individual fixtures, but always on the building interior.

b. <u>Exit Signs</u>

(1) For facilities greater than 25,000 SF, exit signs shall be connected to a central emergency unit.

(2) For facilities less than 25,000 SF, exit signs shall contain an integral battery for 90 minutes of illumination.

(3) All exit signs shall be LED type. Exit signs in lobby or vestibule shall be clear with red lettering.

(4) Self-illuminating or reflective types are not allowed.

<<<END OF SECTION>>>

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Approval: ***Original Signed By***
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Robins Air Force Base
Base Facility Standards

Title: Fire Alarm and Mass Notification Systems

Date: 24 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 6C – FIRE DETECTION AND ALARM SYSTEMS, INDIVIDUAL BUILDING MASS NOTIFICATION SYSTEMS

CRITERIA REFERENCE DOCUMENTS: The publications listed below form a part of this document to the extent referenced. The publications are referred to in the text by the basic designation only.

NFPA 70 (2011), National Electrical Code

NFPA 72 (2010), National Fire Alarm and Signaling Code

NFPA 101 (2009) Life Safety Code

UFC 3-600-01, Fire Protection for Facilities

UFC 4-21-01, Design and O&M: Mass Notification Systems

ETL 01-18, Fired Protection Engineering Criteria – Electronic Equipment Installations

BFS 4D - Elevators and Lifts

a. <u>General</u>

(1) Fire Alarm (FA) and Mass Notification Systems (MNS) for new buildings and replacement or upgraded systems for existing buildings shall at a minimum be designed, installed, and tested in accordance with UFC 3-600-01, UFC 4-21-01, ETL 01-18, NFPA 70, NFPA 72, and NFPA 101.

(2) All equipment, devices, and materials used for FA and MNS shall be listed for its intended purpose by UL or FMS.

(3) FA and MNS shall be designed and installed as addressable Class A systems.

(4) Conduit

(a) All FA and MNS wiring installed in or on buildings shall be installed in metallic conduit. Conduit installed underground shall be permitted to be Schedule 80 Polyvinyl Chloride Conduit (PVC).

(b) Metallic conduit shall be Rigid Metallic Conduit (RMC), Electrical Metallic Tubing (EMT), Flexible Metallic Conduit (FMC) or Liquid Tight Flexible Metallic (LTMC). RMC shall be installed for FA and MNS. EMT shall be permitted to be installed inside buildings as permitted by NFPA 70. FMC and LTMC shall be permitted to be installed where it is not possible or is impractical to install rigid conduit (such as inside existing hollow walls), or where movement of the raceway is anticipated (such as on duct work or fire water risers).

(c) The minimum size of conduit shall be ¾”, except that conduit carrying 120VAC power from a circuit breaker panel to the FA or MNS shall be permitted to be ½”.

(d) EMT and flexible conduit shall be factory coated red. RMC shall be painted red if factory coating is not available. PVC shall be permitted to be the manufacturer’s standard color (gray, white, etc.). Raceway carrying 120VAC power shall be permitted to be galvanized or zinc coated.

(d) Raceway shall be installed in accordance with NFPA 70 and NFPA 72.

(e) Raceway fill shall be in accordance with NFPA 70.

(f) All conduit shall be “deburred” or reamed prior to installation.

(5) All Fire Alarm and MNS wiring shall be new.

(6) Wiring shall be selected and installed in accordance with NFPA 70, Article 760; and NFPA 72; and equipment manufacturer’s recommendation.

(7) FA systems shall be addressable Class A.

(8) MNS shall be wired as a Class A systems.

(9) All wiring shall be continuous from device to device and shall not have a splice in a backbox or junction box.

(10) Wiring shall be in accordance with NFPA 70, NFPA 72, and as recommended by the manufacturer of the Fire Alarm System. Number and size of conductors shall be as recommended by the Fire Alarm System manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.

(11) All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

(12) When the Authority Having Jurisdiction or his duly appointed representative approves installation of wire and cable to be installed in other than conduit, the wire and cable shall be installed in a manner permitted by NEC Article 760 and shall have a fire resistance rating suitable for the installation as indicated in NEC Article 760 (e.g., FPLR).

(12) Wiring used for the multiplex communication circuit (SLC) shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. <u>The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit.</u>

(13) All field wiring shall be electrically supervised for open circuit and ground fault.

(14) The FACP Signaling Line Circuit (SLC) shall be Class A. The SLC circuits hall not be t-tapped for any reason.

(15) All field-wiring colors shall be the same throughout the circuit to which it is connected.

(16) <u>For all new systems:</u> Provide an Autonomous Control Unit (ACU) also know as a voice evacuation panel with a <u>combined</u> FA and MNS. The combined system shall be permitted to be installed in separate cabinets. The combined system shall use speakers for notification with white/clear strobes marked "FIRE" for fire alarm and amber strobes marked "ALERT" for the mass evacuation system. Separate circuits shall be provided for the FA strobes and the mass evacuation strobes. Provide a local microphone for emergency messages in an accessible location at the front entrance of the facility. The system shall be redundant to the paging system or intercom system. Design the MNS in accordance with UFC 4-21-01. Wiring for the mass notification devices shall be Class A, same as the indicating appliance circuits for the FA system. Provide a transceiver that will communicate with the Base Wide Federal Signal “Big-Voice” system.

(17) The FA Control Panel (FACP) and related equipment such as an externally battery pack, the FA transmitter, the ACU for the MNS, the transceiver for the MNS, and the FA transmitter shall be installed in an accessible location in an air-conditioned space.

(18) The FACP shall distinguish between supervisory trouble and system trouble.

(19) Use only two-conduit looped system; i.e., there shall be an outgoing and an incoming conduit to the FACP. Also, the FA riser shall be drawn as a two-loop conduit system.

> (a) Install wiring with no splices between devices.
>
> (b) Do not connect notification devices to the style 6 wiring loop using addressable modules. Indicating appliance circuits shall be connected directly to the FACP terminals or to expansion power supply panels.

(20) Use manufacturer’s representative or NICET Level II qualified individual to supervise and verify wiring in the FA and MNS. Manufacturer’s representative or NICET Level II qualified individual shall be present at testing of the fire alarm system.

(21) As-built drawings shall be done on CADD.

(22) Use alarm by-pass switches in the Fire Alarm Control Panel (FACP) for HVAC shutdown.

(23) Contractor shall provide:

(a) Submittals in accordance with Specifications.

(b) As-builts and schematics.

(c) O&M manuals.

(d) Spare parts and parts list.

(e) Testing before acceptance.

(f) Complete training for CE Shop personnel .

(24) In out buildings or other locations where detectors are connected by underground conduits to the main building, provide MOV-type surge arresters on both ends.

(25) Spare Parts, Minimum: Detectors - 10%, and no less than two of each type.

(26) Place spare parts in a Contractor-furnished metal cabinet near the FACP.

(27) Place a laminated drawing of the system near the FACP.

(28) Keep detectors away from HVAC vents.

(29) FACP shall disable all air conditioning computer room units in the event of any alarm within the facility.

(30) FACP shall disable all air handling systems and exhaust fans over 5000 CFM in the event of an alarm within the facility.

b. Detection: Provide the following in addition to requirements in the NFPA Codes. In the case of a conflict between this standard and the NFPA codes, the requirements in this standard shall govern. Items listed shall be considered as minimum contractual requirements.

(1) Smoke Detectors

(a) Project scope may add to the smoke detector locations listed in this standard. For Design/Build projects, additional detector locations may be defined in the project scope of work or the RFP.

(b) In facilities with raised flooring systems, provide smoke detectors below the raised floors when required by UFCs, ETLs, or NFPA 72.

(c) Install duct mounted smoke detectors in HVAC ducts, fed from the 24 volt DC fire alarm panel, not from the HVAC controls.

1. Supply: Provide duct detectors in all supply ducts greater than 2000 CFM.

2. Return: Provide duct detectors in any return duct in return systems over 15,000 CFM.

(d) In administrative areas, communication rooms, computer facilities, or testing labs with preaction sprinkler systems, provide ceiling mounted smoke detectors to electrically activate the preaction system through the FACP. If the facility contains a raised flooring system, provide additional smoke detectors below the raised floor if required by UFCs, ETL, or NFPA 72.

(e) All smoke detectors shall be photoelectric type only unless stated otherwise. Ionization may be used if requested for special applications.

(f) Spacing of smoke detectors shall provide the spacing and location in accordance with manufacturer's recommendations and the requirements of NFPA 72. However, spacing shall not exceed 30 ft by 30 ft per detector and 30 linear feet per detector along corridors. Do not locate detectors within 3 feet of air supply diffusers and registers, or within 12 inches of lighting fixtures.

(g) In dormitory rooms, provide local alarm smoke detectors and centrally alarmed heat detectors.

(h) Provide a smoke detector above the FACP.

(2) Heat detectors:

(a) All areas that are not protected by an automatic wet pipe sprinkler system shall contain heat detectors. Heat detectors shall be spaced in accordance with NFPA 72.

(b) Provide one in each mechanical and electrical room.

(c) In industrial areas with a preaction sprinkler system, provide ceiling mounted heat detectors to electrically activate the preaction system through the FACP.

(3) Manual Pull Stations

(a) Provide at all exits from the facility and along long walls at every 200' per NFPA 101.

(b) Provide at each exit from an electrical room and a mechanical room when these rooms exit the facility.

(c) In areas with preaction sprinkler systems, install a manual pull station at each exit from the preaction sprinkler zone of protection.

(4) Sprinkler Risers:

(a) Wet Pipe Sprinkler System:

1. Provide pressure type switch with retard chamber. Pressure switch shall have 0-90 second field-adjustable delay.

2. Install tamper switch on all OS&Y valves, including OS&Y valves at all backflow preventers.

(b) Preaction systems:

1. Provide pressure type switch with retard chamber. Pressure switch shall be instantaneous delay.

2. Provide low air switch that will activate the FACP whenever the pressure drops 10 pounds below normal. Supervision shall be provided by an independent and dedicated air supply system for fire protection piping only. No shop air or facility air shall be used for air supervision.

3. Install tamper switch on all OS&Y valves, including OS&Y valves at all backflow preventers.

4. Preaction Systems Riser shall have an electrically actuated solenoid that is tripped by the FACP only. The FACP shall be programmed to trip the solenoid under the following conditions:

aa. Any manual pull station within the exit path of the preaction sprinkler zone of protection.

bb. Any combination of two detectors that occur at the same time, such as two detectors ceiling mounted, two detectors under a raised floor, or one ceiling mounted detector and one detector below the raised floor.

(c) Dry Pipe System Risers:

1 Provide pressure type switch that shall alarm the FACP when the dry pipe system is activated.

2. Install tamper switch on all OS&Y valves, including OS&Y valves at all backflow preventers.

(5) Install tamper switch on each PIV valve.

(6) Provide system alarm signals for waterflow and supervisory trouble for valve tamper switches.

(7) Elevators: See BFS 4D - Elevators and Lifts for fire alarm requirements for these types of equipment.

c. Notification:

(1) Provide audible/visual devices in the following areas:

(a) All corridors.

(b) Open administrative rooms larger than 500 square feet.

(c) All warehouses and interior large storage areas.

(d) Other areas as required by code or the project requirements.

(2) Provide visual only type devices in the following spaces:

(a) All restroom facilities.

(b) Classrooms and training rooms.

(c) Other areas as required by code or the project requirements.

(3) Provide a remote annunciator with LCD display in the main lobby or entrance of all facilities and as required by NFPA 72

(4) Do not provide a water motor gong or alarm.

d. Fire Alarm Control Panel (FACP):

(1) The FACP shall distinguish between supervisory trouble and system trouble.

(2) Batteries: Provide sealed gel-type for best life and reduced maintenance.

(3) Provide built-in Digital Alarm Communicator Transmitter (DACT) capable of contact ID format, compatible with the radio transceiver.

(4) Provide FACP and radio transmitter in separate enclosures.

(5) Provide connectivity as required by BFS Part 4D – Elevators & Lifts.

e. Fire Alarm Reporting System, Radio Type Transmitter

(1) Provide an AES IntelliNet 7788F Fire Alarm Radio Transmitter. The 7788F shall have the appropriate Fire Data Tap installed (7768 or 7068). Work out the type with AES Corp before picking an FACP. Order the 7788F by site for either Robins Security Alarms or Robins Fire Alarms. CE Alarm Shop personnel will program the AES radio, with the contractor providing all Zone information for the FACP. The FACP shall transmit Contact ID thru the AES Radio System. The contractor must contact AES Corp to find out the current FACP listing, since AES frequently updates the list of control sets, found at www.AES-IntelliNet.com.

(2) The AES 7788F must be mounted within three feet of FACP.

(3) Mount a tamper switch in the FACP, connected to zone 2 in the radio.

(4) Mount a tamper switch in the AES 7788F cabinet, connected to zone 1.

(5) The AES 7788F must be powered from the same 120 V breaker as the FACP.

(6) The AES 7788F must have its own battery backup installed in the cabinet.

(7) Install an RJ31X Jack between the DACT and AES 7788F.

(8) If for any reason the FACP cannot transmit Contact ID, then the FACP must transmit Alarms, Supervisory, and Trouble conditions separately by using the supervised inputs on the AES 7750F Zone Card in the 7788F Radio. There are only eight zones.

f. Individual Building Mass Notification System, Radio Type Transceiver

(1) A stand alone Autonomous Control Unit (ACU) shall be available from the same manufacturer of the main Fire Alarm System.

(2) This ACU shall work either Stand-Alone or as a Slave Unit to the Main FACP.

(3) The minimum requirements of the ACU shall be:

(a) Contain an integral 25 watt, 25 Vrms audio amplifier with optional converter for 70.7-volt systems.

(b) The speaker circuit shall be wired Class A.

(c) Integral Digital Message Generator with a memory capacity for up to 60 seconds of messaging per message. The Digital Message Generator shall be capable of producing eight distinct messages. These messages shall field programmable without the use of additional equipment. The messages shall be in a female voice. The messages shall be of the type listed below.

[NOTE: ***The RCP and Comm Squadron do the external MNS (to the building), base wide (Big Voice) system and CEG Facility Projects handle the building internal MNS.***

1) Message #1: Delta Alert. Five seconds of wail are played, followed by the message:

"Attention, attention, Robins Air Force Base is in Force Protection Condition Delta. All personnel immediately implement FPCON Delta actions."

2) Message #2: Charlie Alert. Five seconds of wail are played, followed by the message:

"*Attention, attention, Robins Air Force Base is in Force Protection Condition Charlie. All personnel immediately implement FPCON Charlie actions."*

3) Message #3: Bomb Threat Warning. Horn sound for 5 seconds followed by the message:

Attention, attention. A bomb threat alert has been issued for this building. All personnel are to evacuate immediately using the nearest exit. Further instructions will be issued outside the building by emergency response teams.

4) Message #4: Terrorist Threat Warning. Horn sound for 5 seconds followed by the message:

"May I have your attention, please? A terrorist threat has been received. Effective immediately, we are operating secure and lockdown procedures. All personnel should remain calm and stay where you are. Please await further instructions."

5) Message #5: Severe Weather Warning. One round of code 3 horn is played, followed by the message:

"Your attention, please. Robins Air Force Base has issued a severe weather warning. Take required actions and tune into local radio or television for the latest update."

6) Message #6: All Clear. No alerting tone is used. The message played is:

"May I have your attention, please? All clear. The emergency has ended."

7) Message #7: Building Test. A 1-kHZ tone is sounded for 5 seconds, followed by the message:

"May I have your attention, please? This is a test of the building mass notification system. Repeat, this is only a test."

8) Message #8: (Not Used).

(e) Built in alert tone generators with steady, slow whoop, high/low and chime tone field programmable.

(f) The ACU shall be capable of detecting and annunciating the following conditions: Loss of Power (AC and DC), System Trouble, Ground Fault, Alarm, Microphone Trouble, Message Generator Trouble, Tone Generator Trouble, and Amplifier Fault.

(g) The ACU shall transmit these conditions on the AES IntelliNet 7788 input card installed in the AES IntelliNet radio.

(h) The ACU shall have a line level input to interface with the Base-Wide Alert System. An 18guage, three conductor, shielded cable shall be provided to the location of the alert system control panel that will be installed on the outside of the building. All messages that pass through the Base-Wide Alert System shall be broadcasted on the ACU's output circuits. The mass notification system messages shall override the fire alarm messages. The combined system shall use speakers for notification with white/clear strobes marked "FIRE" for fire alarm and amber strobes marked "ALERT" for the mass evacuation system.

(4) Separate circuits shall be provided for the fire alarm strobes and for the mass evacuation strobes. Provide a local microphone for emergency messages in an accessible location at the front entrance of the facility. The system shall be redundant to the paging system or intercom system. Design the system in

accordance with UFC 4-21-01, dated 09 April 2008 including change 1 dated January 2010. Wiring for the mass notification devices shall be Style Z, same as the indicating appliance circuits for the Fire Alarm System.

(5) Provide a transceiver that will communicate with the Base Wide Federal Signal "Big-Voice" system.

(6) The ACU shall be fully supervised including microphone, amplifier output, message generator, speaker wiring, and tone generation.

(7) Speaker outputs shall be fully power-limited.

(8) Amplifiers will be supplied power independently to eliminate a short on one circuit from affecting other circuits.

(9) The ACU will provide full supervision on both active (alarm or Base -Wide Alert System) and standby conditions.

(10) An optional zone splitter version shall be available that permits splitting speaker circuits into eight specific zones.

(11) An optional distributed amplifier unit shall be available that permits splitting speaker circuits into up to a total of 24 zones when two distributed amplifiers are combined with the master unit.

(12) Provide a phone line connection as a backup connection to the radio transceiver.

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Approval: ***Original Signed By***
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Robins Air Force Base
Base Facility Standards

Title: AUXILIARY POWER

Date: 22 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 6D – AUXILIARY POWER
[Emergency Generators/Uninterruptible Power Supplies]

CRITERIA REFERENCE DOCUMENTS: The publications listed below form a part of this document to the extent referenced. The publications are referred to in the text by the basic designation only.

AFI 32-1062	Electrical Power Plants and Generators
AFI 32-1063	Electrical Power Systems
ETL-10-7	Connection Methods for Standby Generators – 600 Volts or Less
UFC 3-520-01	Interior Electrical Systems
UFC 3-540-04N	Diesel Electric Generating Plants

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 115	(2009) Guide for Test Procedures for Synchronous Machines: Part I Acceptance and Performance Testing; Part II Test SECTION 26 32 13.00 20 Page 6 Procedures and Parameter Determination for Dynamic Analysis
IEEE C2	(2007; Errata 06-1; TIA 07-1; TIA 07-2; TIA 07-3; Errata 07-2; TIA 08-4; TIA 08-5; TIA 08-6; TIA 08-7; TIA 08-8; TIA 08-9; TIA 08-10; TIA 08-11; TIA 09-12; TIA 09-13; TIA 09-14; Errata 09-3; TIA 09-15; TIA 09-16; TIA 10-17) National Electrical Safety Code
IEEE C50.12	(2005) Standard for Salient Pole 50 HZ and 60 Hz Synchronous Generators and Generation/Motors for Hydraulic Turbine Applications Rated 5 MVA and above

INTERNATIONAL CODE COUNCIL (ICC)

ICC UBC	(997; Erratas Vol 1, 2 & 3 01/2001; Vol 1 & 2 03/2001; Vol 2 10/2001) Uniform Building Code

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2009) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 60034-2A	(1974) Rotating Electrical Machines Part 2: Methods for Determining Losses and Efficiency of Rotating Electrical

	Machinery from Tests (Excluding Machines for Traction Vehicles)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 3046	(1986; Am. 1) Reciprocating Internal Combustion Engines - Performance
ISO 8528	(1993; R 2005) Reciprocating Internal Combustion Engine Driven Alternating Current Generator Sets

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA C50.10	(1990) Rotating Electrical Machinery - Synchronous Machines
NEMA ICS 6	(1993; R 2006) Enclosures
NEMA MG 1	(2009) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30	(2008; Errata 08-1) Flammable and Combustible Liquids Code
NFPA 37	(2010; TIA 10-1) Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
NFPA 70	(2011) National Electrical Code

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-DTL-5624	(2004; Rev U; Notice 1 2008) Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-STD-461	(2007; Rev F) Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-52557	(Rev A; Notice 1) Fuel Oil, Diesel; for Posts, Camps and Stations

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 60	Standards of Performance for New Stationary Sources

BFS Part 7A –Energy Conservation

BFS Part 7C – Sustainable Design & Development

GENERATORS, TRANSFER SWITCHES, AND FUEL TANKS

a. Generators: Base actual size on load analysis for 60-80% loading, based upon field readings when possible.

b. Fuel Tanks:

(1) Provide tank large enough for generator to run 72 hours at 100% rated load. Exception: Tank may be allowed to be smaller (approx 12 hour runtime) when the generator set is used as backup source for emergency lighting only.

(2) Fuel tank shall be above ground, similar to Convault construction. The fuel tank shall be encased with secondary 3000-PSI concrete container. Concrete sub-base tanks are not acceptable. Tank may be allowed to be skid-mounted when the generator set is used as a backup source for emergency lighting only. In this case, a weatherproof enclosure shall cover the generator set and the fuel tank

(3) A day tank is not required. The fuel shall be fed directly to the diesel fuel pump intake line.

(4) Include a high level alarm in the fuel tank to prevent overflow.

(5) Include an interstitial leak monitoring system to monitor and prevent tank leakage from the tank into the tank enclosure.

(6) Copper tubing is not allowed. Use only threaded black steel.

(7) Install a ¾" X 10' ground rod in a ground well. Extend a #1/0 copper conductor from the ground rod to the tank.

(8) Include on all four sides of the fuel tank the following markings:

(a) Flammable

(b) No Smoking within 50 Feet

(c) Diesel Fuel

(d) Capacity of Tank

(9) If the top of the tank is greater than 42” above finished grade, include steps.

(10) A 3.0-PSI anti-siphon check valve shall control fuel feeding into the diesel fuel pump.

(11) For Above Ground Storage Tanks: Provide a ball cut-off valve on each side of the supply and return fuel line.

d. Transfer switches:

(1) All new or replacement transfer switches shall be four-pole (switched neutral). Installation of three-pole transfer switches for new installations requires MAJCOM approval.

(2) Provide maintenance capability for all transfer switches. Use bypass feature for critical facilities per design guidance.

(3) Automatic transfer switches and controls shall be installed in electrical rooms and not in areas where steam piping or other high humidity “generators” are present. Transfer switches shall not be installed outdoors unless service entrance rated and incorporating an approved NEMA outdoor classification. Service entrance rated transfer switches shall have ground fault protection installed.

(4) All transfer switches shall be of the automatic type.

e. Generator SCADA Reporting System, Radio Type:

(1) Provide a Remote Transmitting Unit (RTU) at the generator set for the base SCADA System. The RTU shall be compatible and capable of interfacing with the base SCADA system manufactured and programmed by Advanced Control Systems of Atlanta, Georgia. The RTU unit shall be radio controlled, and transmit the following points to the central base monitoring system: start/stop; volts/phase; amps/phase; KW, KVAR; breaker status as open/close; water temp and oil pressure.

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Approval: ***Original Signed By***
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Robins Air Force Base
Base Facility Standards

Title: Lighting Protection

Date: 25 JULY 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 6E – LIGHTNING PROTECTION

CRITERIA REFERENCE DOCUMENTS:
The publications listed below form a part of this document to the extent referenced. The publications are referred to in the text by the basic designation only.

NFPA 70 (2011), National Electrical Code

NFPA 780 (2011), Standard for the Installation of Lightning Protection Systems

AFI 32-1065, Grounding Systems

ETL 11-12, Grounding, Bonding, Testing, and Recordkeeping for Communications Facilities

ETL 01-1, Reliability and Maintainability (R&M) Design Checklist

UFC 3-501-01, Electrical Engineering

UFC 3-575-01, Grounding/Lightning Protection

DOD 6055.9_STD, Lightning Protection

MIL-HDBK-1004/6, *Lightning Protection*

UL 96A, *Standard for Installation Requirements for Lightning Protection Systems*.

LIGHTNING PROTECTION

a. LISTING: All electrical devices and components shall be listed for their intended use by UL or FM.

b. <u>Mandated Need</u>: Provide on all facilities with explosives or hazardous materials. Ground in accordance with Chapter 7, Lightning Protection, DOD 6055.9_STD and AFI 32-1065, Grounding Systems.

c. <u>Determined Need:</u> Use "NFPA 780 Risk Determination.xls" included as part of the BFS for go/no-go decision on whether to install LPS. The Excel file is based upon NFPA 780 for Lightning Protection. Use value of Lightning Flash Density = 5.

d. <u>Documentation</u>: Present all calculations in the design analysis.

e. <u>Default Design</u> (especially for buildings under 4,000 square feet and all buildings containing explosives or significant quantities of hazardous materials):

(1) Design per UL and NFPA 780.

(2) Conductors:

(a) Use only copper, except on galvalume or other aluminum roof materials.

(b) All conductors on roofs shall be treated as main conductors.

(3) Install Transient Voltage Surge Suppression (TVSS) on the service entrance of each protected facility. Assume one service entrance per facility unless field checking or RAFB record drawings indicate otherwise. Our specification master is labeled 16672, Transient Voltage Surge Suppression.

(4) Installation:

(a) Methods shall conform to UL 96A.

(b) Components shall conform to UL 96.

(c) Contractor shall obtain a UL letter of findings for the facility. The UL letter of findings shall be provided to the Government directly by UL after inspection by UL personnel. The Contractor shall make all corrections listed in the UL letter of findings.

(d) Use adhesive <u>and</u> bolted connections on metal roofs, installed to minimize potential roof leaks due to penetrations.

(e) Thru roof penetrations are not allowed except at downlead locations at the perimeter of the facility. If possible, locate penetrations at soffits.

(f) All down conductors shall be concealed in the wall with CPVC sleeve.

(g) If the facility contains a structural steel support system, <u>do not</u> use the structural steel for the downlead connections. Use UL Listed Class conductors installed in PVC concealed in the walls.

(h) A counterpoise with ground rods shall be installed around the entire facility. Counterpoise shall be minimum #1/0 bare copper and installed 2 feet below grade per NFPA 780. All below grade connections shall be exothermic type.

f. . Design for all other buildings (at this time there is no waiver currently in force from HQ AFCESA for the EASE system; some existing facilities have the EASE system installed and must be maintained as such, but no new EASE systems are permitted at this time):

(1) Existing Facilities Only that need EASE systems repaired…Use the Electronically Activated Streamer Emission (EASE) system: Design basis is Prevectron IV by National Lightning Protection Corporation.

(2) Use of conventional Franklin multi-rod system is permitted instead of EASE if less expensive and acceptable to user of the facility.

(3) Design per manufacturer's requirements.

(a) Our specification master is labeled 16671- Lightning Protection – EASE for existing systems only.

(b) Install Transient Voltage Surge Suppression (TVSS) on the service entrance of each facility within the protected radius if not previously installed. Assume one service entrance per facility unless field checking or RAFB record drawings indicate otherwise. The RAFB specification master is labeled 16672, Transient Voltage Surge Suppression.

(4) Existing Facilities: For repair projects only where EASE systems currently exist…Mount each EASE device on a pole or mast 15' – 20' horizontally to the side of the nearest building roof edge. Consider roof mounting for very tall facilities.

(5) Design Criteria: State on drawings:

(a) Soil resistivity is 25,000 Ohm-cm, unless actual values at the site are known.

(b) The highest elevation of any object on each building.

(7) Shielding Ground Bed: Provide vegetation as first choice and fencing as second choice over the top of the ground bed to prevent personnel from standing over the ground bed and being harmed by voltage gradients in the soil during a lightning strike.

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Approval: ***Original Signed By***
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Robins Air Force Base
Base Facility Standards

Title: Communications

Date: 12 July 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA

(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS
PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 6F – COMMUNICATIONS

Revised July 2011

This section is maintained and updated by the
Communications Directorate's Plans and Programs Branch (78 ABW/SCXP)
472-2019 or 472-0050

SECTION 1

1.1. Purpose. This section contains the communications Premise and Outside Plant requirements for Military Construction (MILCON) projects, Non-MILCON Construction Projects, building renovations and Simplified Acquisition of Base Engineer Requirements (Saber projects). All Plans for construction and renovations projects that require communications must be reviewed and approved by the Base Communications and Information Systems Officer (BCSO) or designated representative. The Communication Directorate (SC) Plans and Programs Branch (78 ABW/SCXP) is the SC focal point for this approval. Be sure to include 78 ABW/SCXP in all planning, designs and review meetings.

1.1.1. Request for Proposal (RFP)/Construction Projects. The information provided in this document will be incorporated in all RFP Scope of work and contracts for construction and renovations projects.

1.1.2. Conflicts. The Base Communications and Information Systems Officer is responsible for all base communications and is the final authority on any communications issues and conflicts.

1.2. Standards. All designs, plans and work product will be in accordance with the "*TELECOMMUNICATIONS BUILDING CABLING SYSTEMS PLANNING AND DESIGN*" UNIFIED FACILITIES CRITERIA (UFC 3-580-01) AND THE ENGINEERING TECHNICAL LETTER (ETL) 02-12: "*COMMUNICATIONS AND INFORMATION SYSTEM CRITERIA FOR AIR FORCE FACILITIES*", with the exceptions identified in this document.

2. MILCON Communications.

2.1. General. All MILCON design and construction will provide all wiring, cabling, fiber optic cables (FOC), conduits, ducts, manholes, and pathways from the facility's wall outlets to the point where the new facility will receive dial tone and data connectivity. Will include:

2.1.1. All termination devices (cross-connects, patch panels, distribution frames, network protectors).

2.1.2. Communications equipment rooms (CER) and telecommunications closets (TC) as required.

2.1.3. Pathways such as cable trays and stubbed up, conduits duct banks, manholes and handholes.

NOTE: All communication design, installation, termination and testing must be performed by certified telecommunications professionals and technicians.

2.2.1. Local Area Network. For Local Area Network (LAN) connectivity, the MILCON contractor will provide twelve (12) strands of individual 9/125 micron single mode fiber optic cable (FOC) to the nearest Information Transfer Node (ITN) identified by the BCSO's representative. Install the FOC in MaxCell inner-duct. The MILCON contractor will terminate both ends of the FOC in rack mounted fiber distribution panel using ST connectors.

2.2.2. Telephone Dial Tone. For telephone dial tone, the MILCON contractor will provide a copper outside plant cable to the nearest Expansion Port Network (EPN) identified by the BCSO's representative.

2.3. Communication Equipment Room (CER) Power Requirements. Provide a minimum of two dedicated un-switched 20-amp NEMA 5-20 duplex receptacle power outlets or equivalent on three CER walls and the bottom of all equipment racks. Provide L6-30 outlets at the bottom of the equipment racks if required by SC. Each equipment outlet will be on a separate branch circuit. Provide additional 120-VAC convenience outlets for maintenance and housekeeping. Backup all electrical loads in the CER with standby generator power where available.

2.4. Telecommunication Room (TR) Power Requirements.
Provide a minimum of two dedicated un-switched 20 amp NEMA 5-20 duplex receptacle power outlets or equivalent on three TR wall and the bottom of all equipment racks. Provide L6-30 outlets at the bottom of the equipment racks if required by SC. Each equipment outlet will be on a separate branch circuit. Provide additional 120-VAC convenience outlets for maintenance and housekeeping. Backup all electrical loads in the TR with standby generator power where available.

2.5. Telecommunication Outlet.
Provide one telephone and two data jacks per outlet.

2.6. Copper Voice and Data Horizontal Cables. All data and voice horizontal cables will be Category 6.

2.7. Copper Termination.
All copper terminations will be in accordance with TIA/EIA T568B.

2.8. Fiber Optic Cable Terminations.
All Fiber Optic Cabling will be terminated using ST connectors.

2.9. Air Force Family Housing.
For Government Communications use Category 6 Horizontal Cables.

2.10. Public Address Systems (PA). PA Systems will not be installed in the CER or TRs unless approved by the BCSO. Under no circumstances will PA microphones be installed in CER or TCs. These must be installed in an area accessible to the occupying organization.

2.11. Acceptance Documentation and Records. An "as-built" set of drawings and electronic copies in micro-station and .pdf Adobe format will be provided to the BCSO showing, but not limited to: all cable routes, outlet locations and identification markings and communication room/closet locations. Site drawing showing the route of all manhole and duct systems installed in support of the MILCON.

2.12. Telecommunications System Management Records. Telecommunications system labeling, management records, and drawings must comply with TIA/EIA-606. Existing base standard numbering practices may be used as long as they incorporate the following requirements: all outlets, patch panel positions, and cables must be labeled as to their function with a unique identifier code; and as-built drawings and management records must show the location of all outlets, equipment, and cabling. These records must be provided as a deliverable item under any construction procurement contract. They will form part of the base Communications and Information Systems Installation Records (CSIR) and must be delivered to the BCSO CSIR manager upon contract completion according to AFI 33-104, *Base Level Planning and Implementation*, and AFI 21-404, *Developing and Maintaining Communications and Computer Systems Installation Records*.

3. Construction, Additions and Renovations Projects.

3.1. General. All construction, additions and renovations designs, plans and contracts that will require communications or information systems must be approved by the BCSO or designated representative. Contracts must be approved before being advertised for award. The communications organization's Plans and Implementation Branch is the focal point for this approval. Be sure to include this office in all planning and review meetings. The occupying organization will provide funding to the BCSO for all equipment, cables, cross connects, jumpers and programming, identified by the BCSO representative as required, to provide communications for users in the new facility.

3.2. Communications Spaces. All new construction, additions and renovations must provide a CER or TC as part of the project. The CER/TC will be appropriately sized to support the facility size and number of users. The CER/TC will be to the specifications outlined in the section 2.3., *Facility Communications Space Requirements*. Areas being converted to administrative space must include a CER/TC.

3.3. Telecommunications Distributions Systems. All new construction, additions and renovations must include a telecommunications distribution system.

3.3.1. Interior Raceways. Install a complete raceway between each telecommunications outlet and the CER/TC. Use cable trays in administrative areas and when possible. Use conduit when it is not feasible to use cable trays or where code prohibits the use of cable trays. Provide outlet boxes and stubbed up conduits where telephone, data or cable TV connectivity is required. Provide power polls for access to system furniture. Install two each four-inch conduits with pull ropes, between TCs and the CER.

3.3.2. Entrance Conduits. Install two each four-inch entry conduits with pull ropes to the nearest communications manhole for new facilities. Include hand-holes if required due to distance. Install the same for exiting facilities if required.

3.3.3. Communications Wiring. Typically premise wiring for minor construction, renovations and SABER projects is done by the 78 ABW/SC base telecommunications contractor (BTS). On the rare occasion where plans for projects/contracts deviate from the above, it must be approved by the BCSO. If approved, the installing contractor must adhere to all criteria listed in Section 2 of this standard.

3.4. Telecommunications Cabling. Unless otherwise approved by the BCSO, all LAN and voice cabling will be installed by the base telecommunications contractor. When planning occupancy dates provide a minimum of ten working days after the construction, renovation and system furniture installation is totally completed, for BTS to complete the communications wiring.

3.5. Acceptance Inspection. All communications systems installed by the construction contractor or their sub-contractors, must be accepted by the BCSO before telephone or LAN equipment can be installed in the new facility or the facility can be added to the base infrastructure. To schedule acceptance inspection contact the 78 CS/SCX Plans and Programs office.

End

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7/26/2011

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UFC-3-580-01
22 June 2007

UNIFIED FACILITIES CRITERIA (UFC)

TELECOMMUNICATIONS BUILDING CABLING SYSTEMS PLANNING AND DESIGN

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

UNIFIED FACILITIES CRITERIA (UFC)

TELECOMMUNICATIONS
BUILDING CABLING SYSTEM
PLANNING, DESIGN, AND ESTIMATING

U.S. ARMY CORPS OF ENGINEERS (Preparing Activity)

NAVAL FACILITIES ENGINEERING COMMAND

AIR FORCE CIVIL ENGINEER SUPPORT AGENCY

Record of Changes (changes indicated by **1**\ ... /**1**/)

Change No.	Date	Location

This UFC supersedes MIL-HDBK-1012/3, dated MAY 1996.

FOREWORD

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD(AT&L) Memorandum dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States is also governed by Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA.) Therefore, the acquisition team must ensure compliance with the more stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC), and Air Force Civil Engineer Support Agency (AFCESA) are responsible for administration of the UFC system. Defense agencies should contact the preparing service for document interpretation and improvements. Technical content of UFC is the responsibility of the cognizant DoD working group. Recommended changes with supporting rationale should be sent to the respective service proponent office by the following electronic form: Criteria Change Request (CCR). The form is also accessible from the Internet sites listed below.

UFC are effective upon issuance and are distributed only in electronic media from the following source:

- Whole Building Design Guide web site http://dod.wbdg.org/.

Hard copies of UFC printed from electronic media should be checked against the current electronic version prior to use to ensure that they are current.

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UNIFIED FACILITIES CRITERIA (UFC)
NEW DOCUMENT SUMMARY SHEET

Subject: UFC-3-580-01 Telecommunications, Building Cabling System

Cancels:

Description: This UFC (Unified Facilities Criteria) document provides guidance on how to design and implement building telecommunications cabling systems for military construction. An acceptable building cabling system encompasses, but is not limited to, copper and fiber optic (FO) entrance cable, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, workstation outlets, racks, cable management, patch panels, cable tray, cable ladder, conduits, grounding, and labeling.

Reasons for Development: This UFC is designed to satisfy Army Installation Information Infrastructure Architecture (I3A) policy, UFC 3-580-10 Design: Navy and Marine Corps Intranet (NMCI) Standard Construction Practices Information System (IS), and Engineering Technical Letter (ETL) 02-12: Communications and Information System Criteria for Air Force Facilities requirements within a facility.
The design of building telecommunications cabling systems is a specialized technical area that does not fall in the normal skill record and resume of commanders, architects, engineers and project managers. This UFC provides guidance to those parties tasked with implementing existing and emerging building telecommunications cabling system requirements.

Impact: The following direct benefits will result from the publication of UFC-3-580-01:

- Creation of a single source reference for the design and construction of building telecommunications cabling systems
- Reduced facility project costs and efficiencies achieved by a better-educated Command, designer, and project management staff for the specialized technical area of building telecommunications cabling systems.

FIGURES

TABLES

CHAPTER 1 TELECOMMUNICATIONS BUILDING CABLING SYSTEM

1-1 OVERVIEW

This UFC is intended to provide a telecommunications manager with a means for designing new Building Cabling Systems (BCS) or additions to existing BCS. Sufficient reference material is provided to allow for a basic understanding of a BCS and the components. The provisioning of telecommunications support for MILCON projects is outlined in MIL-HDBK-1190. This guide is intended to address only the requirements for BCS telecommunications pathways and cabling necessary to support voice, data and video systems required for new and renovated facilities. This UFC will establish an implementation concept that can be used to shape architectural templates and influence the design process for Installation Information Infrastructure Architecture (I3A). It will identify proven infrastructure construction techniques, define common practices, and serve as an authoritative implementation guide.

This UFC is consistent with Department of Defense (DoD) Policy Memorandum of June 29, 1994, regarding the use of commercial standards in lieu of military specifications. Unless otherwise specified by the major claimant, or where deemed inadequate for safety reasons, or inappropriate because of the function of the facility, commercial standards must be employed in the planning, design and installation of inside cable plant in support of U.S. Army U.S. Navy and U.S. Air Force sponsored military construction and refurbishment projects. A partial listing of Commercial, Federal and DoD standards, that addresses telecommunications design and installation practices, are provided in Appendix A. The major claimant and the BCS Engineer must jointly review this list to confirm the adequacy of the commercial standards to meet the telecommunications requirements of the particular facility.

1-2 REFERENCES

The documents listed in Appendix A are not necessarily all of the documents referenced herein, but are the ones that are needed in order to fully understand the information provided by this handbook. Unless otherwise specified, the issues of the documents cited herein are those listed in the latest issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplements thereto.

1-3 ACRONYMS AND ABBREVIATIONS

ADN	Area Distribution Node
AFCESA	Air Force Civil Engineering Support Agency
AFH	Army Family Housing
ANSI	American National Standards Institute
AWG	American Wire Gauge
BCS	Building Cabling Systems
BICSI	Building Industry Consulting Service, International, Inc.
CATV	Cable Television
CCB	Construction Criteria Base
CCTV	Closed Circuit Television

CP	Consolidation Point
CTTA	Certified TEMPEST Technical Authority
DAA	Designated Accreditation Authority
dBmV	Decibel (reference to millivolt)
DC	Direct Current
DCO	Dial Central Office
DDC	Direct Digital Controller
DOIM	Directorate of Information Management
DPW	Directorate of Public Works
DoD	Department of Defense
DODISS	Department of Defense Index of Specifications and Standards
EES	Earth Electrode Subsystem
EIA	Electronics Industry Alliance
EMT	Electrical Metallic Tubing
EUB	End User Building
FOCIS	Fiber Optic Connector Intermateability Standard
FOUO	For Official Use Only
GE	Grounding Equalizer
GHz	Gigahertz
HVAC	Heating, Ventilation and Air Conditioning
I3A	Installation Information Infrastructure Architecture
IMA	Information Mission Area
IS	Information System
LAN	Local Area Network
MHz	Megahertz
MILCON	Military Construction
MRI	Magnetic Resonance Imaging
MUTOA	Multi-User Telecommunication Outlet Assembly
NAVFAC	Naval Facilities Engineering Command
NEC	National Electrical Code
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association, Inc.
NMCI	Navy and Marine Corps Intranet
NSI	National Security Information
OSP	Outside Plant
PDS	Protected Distribution System
PET	Protected Entrance Terminal
RCDD	Registered Communications Distribution Designer
RUS	Rural Utilities Service
TBB	Telecommunications Bonding Backbone
TC	Telecommunications Closet
TEF	Telecommunications Entrance Facility
TGB	Telecommunications Grounding Busbar
TIA	Telecommunications Industry Association
TMGB	Telecommunications Main Grounding Busbar
TR	Telecommunications Room
UFC	Unified Facilities Criteria

UL	Underwriters Laboratory, Inc.
USACE	United States Army Corps of Engineers
UTP	Unshielded Twisted Pair

1-4 RESPONSIBILITIES

The agency responsible for construction of facilities within the Department of Defense (DOD) is the United States Army Corps of Engineers, the Naval Facilities Engineering Command (NAVFAC), or the Air Force Civil Engineer Support Agency (AFCESA), as assigned within the respective geographic areas by the Office of the Secretary of Defense. DOD directives 5136.10 and 6015.16 provide additional information on responsibilities. The provisioning of telecommunications support for Military Construction (MILCON) projects is outlined in MIL-HDBK-1190. UFC-3-580-01 is intended to address only the requirements for telecommunications pathways and cabling necessary to support voice, data and video systems housed in new facilities. Other system's cabling requirements, such as security, fire alarms and environmental monitoring are not addressed here. In general the construction agency is responsible for providing inside and outside cabling and support structures (pathways) necessary to provide a complete and usable telecommunications distribution system.

1-5 SCOPE

This UFC is intended to support the necessary requirements gathering, site surveys, analysis, design and implementation of Information Technology. This guide specifically assists the designer in the integration of the building cabling system. Note: Each service handles telecommunications and information technology funding in different ways. This UFC does not address the funding responsibilities and procedures for military construction projects. Refer to the specific services construction program guidance for funding issues.

1-6 OBJECTIVE

The objective of this UFC is to provide planning guidance for the development of an input to the building cabling system telecommunications portion of the DD 1391. This baseline figure is a composite of the costs projected to design, furnish and install requisite BCS cabling systems to support the anticipated user population over the expected life cycles of both the voice and data systems and backbone cabling and pathways designed to support upgrades in the BCS for the life of the structure. Base telecommunications support is predicated on the availability of the existing telephone, data and distribution systems to provide the necessary connectivity and system access to the increased user population.

CHAPTER 2 BUILDING TELECOMMUNICATIONS CABLING SYSTEM SPECIFICATIONS

The BCS is designed to satisfy Army Installation Information Infrastructure Architecture (I3A) policy, UFC 3-580-10 Design: Navy and Marine Corps Intranet (NMCI) Standard Construction Practices Information System (IS), and Engineering Technical Letter (ETL) 02-12: Communications and Information System Criteria for Air Force Facilities requirements within a facility. The BCS must be installed in accordance with the Telecommunications Industry Association (TIA) and Electronics Industry Alliance (EIA) Building Telecommunications Wiring Standards general guidelines with modifications and clarifications provided below. TIA/EIA specifications can be purchased at http://www.tiaonline.org/standards/. Telecommunications design must be performed and stamped by a Registered Communications Distribution Designer (RCDD) for all projects. For projects that involve the Navy Marine Corp Intranet (NMCI), coordinate infrastructure design with UFC 3-580-10 Design: Navy and Marine Corps Intranet (NMCI) Standard Construction Practices. For projects that involve the US Air Force coordinate infrastructure design with ETL 02-12.

2-1 CLASSIFIED INFORMATION INFRASTRUCTURE

Engineers engaged in the design of classified (collateral or higher) Information Infrastructure must coordinate the infrastructure design with the Certified TEMPEST Technical Authority (CTTA) and Designated Accreditation Authority (DAA) responsible for that area. This Technical Guide cannot attempt to replace the publications that have been produced to support the design of Red/Black infrastructure. The engineer must consult the following applicable documents for consideration and design guidance: NSTISSAM TEMPEST/2-95 (FOUO) defines the guidance to consider during design and installation, and provides potential solutions, DCID 6/1 and 6/9 (U) define the physical security requirements in construction of secure facilities, NSTISSP 300 (U) provides the National Policy on the Control of Compromising Emanations, and NSTISSI 7003 (U) provides guidance on Protected Distribution Systems. NSTISSAM TEMPEST/2-95 states that the National Policy on the Control of Compromising Emanations (NSTISSP 300) and its implementing instructions, TEMPEST Countermeasures for Facilities (NSTISSI 7000), and NONSTOP Countermeasures (NSTISSI 7001) establish the policy that certain systems and facilities that process national security information (NSI) must be reviewed by a CTTA, and AI PUB-5239-22 Information Assurance Protective Distribution System (PDS) Publication FOUO for Navy projects. If a CTTA review is required, and the review determines that TEMPEST countermeasures are required, the CTTA will consider a variety of methods that can be applied to the system/facility to achieve TEMPEST security. The RED/BLACK guidance contained in NSTISSAM TEMPEST/2-95 (FOUO) will be considered by the CTTA along with other measures (e.g., TEMPEST Zoning, TEMPEST suppressed equipment and shielding) to determine the most cost-effective countermeasures to achieve TEMPEST security. Only those RED/BLACK criteria specifically identified by the CTTA will be implemented. Additional information on grounding can be found in MIL-STD-188-124B and MIL-HNBK-419-A. Information on Protected Distribution Systems can be found in NSTISSI No.7003, 13 December 1996.

2-2 SYSTEM OVERVIEW

An acceptable building cabling system encompasses: copper and fiber optic entrance cable, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, workstation outlets, racks, cable management, patch panels, cable tray, cable ladder, grounding, and labeling. Figure 1, of Appendix B, provides an overview of the cable entrance and backbone distribution. Figure 2, of Appendix B, provides and overview of the horizontal distribution.

2-3 WORKSTATION OUTLET

The following specifications pertain to telecommunications outlets and connectors:

2-3.1 Outlet Box

Specify double gang electrical boxes of at least 2-1/8" (54 mm) depth to provide dedicated space for current and possible future fiber optic cable installation. For single connector outlets, such as voice-only, cable television (CATV) or closed circuit television (CCTV), use a single gang 2" by 4" by 2-1/4" (51 mm x 102 mm x 57 mm), electrical box recess mounted, with the faceplate flush with the wall surface. Locate a service power outlet within 6 inches (152 mm) of all outlets. The power outlet circuits must be based on a loading assumption that each location of two duplex receptacles will power one personal computer with a monitor along with typical office appurtenances such as task lights; also assume that there will be no diversification of this load. For Navy projects, utilize 4-inch (102 mm) square by 2-1/4 inch (57 mm) deep boxes for single gang, four outlet copper telecommunications configurations that do not have provision for fiber optic cabling. For Army projects, specify 4-11/16-inch (119 mm) square by 2-1/4 (57 mm) boxes for 1-inch (27 mm) conduit installations and outlet boxes that have or may require fiber optic cabling.

2-3.2 Outlet Faceplate

Use a full (double gang) faceplate for standard administrative outlet locations, with connectors for all copper and (if used) fiber optic cable. Standard administrative outlets may, by specific user request, use single gang outlet faceplates in conjunction with a reducing ring. For single gang outlet boxes, use a single gang outlet faceplate with appropriate connector locations and, if required, mounting lugs for wall phones. Outlet faceplate must include two blanks position for future applications.

2-3.3 Outlet Connectors

The following specifications pertain to copper, fiber optic and coaxial cable outlet/connector. The category for cable, jacks, termination blocks, and patch panels must be the same throughout each circuit and system. Specify more than one category only if providing more than one system requiring different categories. In general for horizontal cable, use Category 6 for all voice and data circuits on Army and Navy projects, and use Cat 5 or better for USAF projects.

2-3.3.1 Copper Outlet/connector

Copper outlet/connector must be TIA/EIA category 6 (Cat 6) for Army and Navy projects, and Cat 5 or better for USAF projects.. All connectors must be 8-pin/8-position insulation displacement terminations wired per T568A. The T568B configuration must only be used by exception if required to maintain system configuration uniformity, security or other user-specified reasons. Category 3 (Cat 3) rated connectors must not be used in new construction, or rehabilitation projects. Copper outlet/connector and plugs should be unkeyed unless the user requires keyed outlet/connector and plugs to maintain system uniformity, security, or other user specified reasons.

2-3.3.2 **Fiber Optic Outlet/connector**

Terminate all fiber optic work area cables in dual 568SC connectors. Provide fiber optic connectors in accordance with the paragraph entitled “Fiber Optic Terminations” in this UFC. The default choice for fiber optic outlet/connector must be TIA/EIA “SC” type (568SC). Other type connectors (small-form-factor) (MT-RJ, VF-45, etc.) may be substituted as required by the user. Small form factor connectors (available from several manufacturers), offer a potential for significant installation cost reduction. Any type of fiber connector used must meet the performance requirements specified within Annex A of TIA/EIA-568-B.3, and meet the requirements of the corresponding TIA Fiber Optic Connector Intermateability Standard (FOCIS) document.

2-3.3.3 **Coaxial Outlet/connector**

Coaxial outlet/connector should normally be “F” type connectors. Use of other type connectors (i.e., BNC, etc.) should be considered only if specifically required by the user. The designer must coordinate with the cable service provider where franchise agreements are in place. The Navy requires that all passive CATV devices support 1 GHz bandwidth.

2-3.4 **Outlet/Connector Markings**

Each communications outlet must have a unique identifying number in accordance with TIA/EIA 606-A. In the telecommunications room (TR), this unique identifying number must be associated with the position on the patch panel or cross-connect to which the outlet is connected. Each horizontal cable must be labeled both at the outlet and patch panel or cross-connect position in the communications closet. Connector voice and data dedication use may be reassigned as requirements dictate. Note: in the standard cabling scheme, the designations “voice” and “data” are arbitrary and do not imply that one outlet is better than the other, the outlets are identical in capability.

2-3.5 **Outlet Types and Density**

The following outlet types are commonly used in military construction projects. Sketches of these outlets are included in Figure 6, of Appendix B. The outlet types do not cover all possible user required configurations. The designer must certify that all user-defined outlets have a corresponding valid requirement, such as fiber for various levels of classification. Outlet configurations must comply with this UFC, TIA/EIA-568-B, and TIA/EIA-569-B. Outlet densities are provided for planning purposes, when actual outlet locations are not known and cannot be determined with available information. The designer can develop reasonably accurate total outlet count estimates based on the size and dedicated usage of the space. These factors fall within the ranges given in TIA/EIA-569-B, and are based on gross area (overall building footprint without deducting for hallways, equipment rooms, restrooms, etc.). See Figure 9, of Appendix

B, for a typical building floor plan. For USAF projects all administrative facilities and administrative spaces in other types of facilities must be equipped with one standard telecommunications outlet for each 48 square feet (4.5 square meters) of net office space. Outlet densities and locations for all special-purpose spaces and non-administrative facilities must be determined by the user and the BCSO and must follow the guidelines in TIA/EIA-569-B.

Table 2-1 Outlet Types

Facility Space Category	Outlet Configuration	Planning Area (SF(SM)) per Outlet
Administrative space, to include Classrooms, and Medical/Clinics	Two 8-pin modular (RJ45 type) outlet/connector in a double gang outlet faceplate, one connector labeled voice use and one labeled data use.	80(7.5)
Headquarters and Special Users	Minimum of two 8-pin modular (RJ45 type) outlet/connector in a double gang outlet faceplate, one connector labeled voice use and one labeled data use, with additional 8-pin modular and/or fiber outlet/connectors as required.	80(7.5)
Systems Furniture	Two 8-pin modular (RJ45 type) outlet/connector in a modular furniture outlet faceplate with outlet box extender, one connector labeled voice use, and one connector labeled data use.	See below
Non-Admin Spaces (CDCs, Chapels, Rec-centers, etc.)	Two 8-pin modular (RJ45 type) outlet/connector in a double gang outlet faceplate, one connector labeled voice use and one labeled data use.	500(46.5)
Barracks Space/Bachelors Quarters	See below	See below
Warehouse space	Two 8-pin modular (RJ45 type) outlet/connector in a double gang outlet faceplate, one connector labeled voice use and one labeled data use.	5000(465)

Wall and Pay Phone Outlet	One 8-pin modular (RJ45 type) connector in a single gang outlet faceplate with mounting lugs, labeled voice use.	As needed
Family Housing units	See below	See below

2-3.5.1 Family Housing Units

2-3.5.1.1 Army Family Housing

The designer must determine the minimum outlet quantity for Army Family Housing (AFH) units based upon the number of rooms in the AFH unit. In general provide one telephone outlet and one CATV outlet (as a minimum) in each of the following rooms: kitchen, living room, dining room, family room/area, each bedroom, and any other logical location deemed appropriate. Copper outlet/connector must be TIA/EIA category 6 (Cat 6) for Army and Air Force projects.

2-3.5.1.2 Navy Family Housing

The designer must provide a complete structured telecommunications system in accordance with TIA/EIA-570-B for Navy family housing units. Provide Grade 1 wiring for units with less than 1500 square feet (140 sq m) and Grade 2 wiring (excluding optical fiber) for units with 1500 square feet (140 sq m) or more. Locate the distribution device adjacent to the residential load center. In addition to outlet locations required by TIA/EIA-570-B, provide two outlets on opposite walls in the living room, family/great room, den/study, and each bedroom. Provide one outlet in dining room and garage if provided. Copper outlet/connector must be TIA/EIA category 6 for Navy and Marine Corps Intranet (NMCI) projects.

2-3.5.1.3 Air Force Family Housing

The designer must provide a complete structured telecommunications system in accordance with TIA/EIA-570-B for Air Force family housing units. Residential Telecommunications Cabling Standard Telephone outlets must consist of 4-pin/4-position non-keyed CAT 3 or better modular USOC RJ-11 jacks. CATV outlets must be “F”-type jacks. Locate jacks in the kitchen, living room, family room, and all bedrooms adjacent to a 120-VAC, 60-Hz (or host country standard voltage and frequency as applicable) duplex electrical receptacle. Telephone and CATV outlets must be wall-mounted. Locate outlets or provide additional outlets to enable maximum furniture placement flexibility.

2-3.5.1.4 Barracks/Bachelor Quarters

For Army barracks projects provide one 8-pin modular (RJ45 type) connector in a single gang outlet faceplate, labeled voice use. In BEQ/BOQ/SEBQ/etc, provide one single RJ-45 outlet in each room of the suite; i.e., bedroom & living room, configured per TIA/EIA-570-B. For Navy projects provide two telecommunications outlets for each resident on opposite walls consisting of two 8-pin modular (RJ45 type) outlets wired per

T568A, except in open bay berthing. For example: a 1+1E suite is designed to house 1 occupant by assignment therefore a minimum of 1 separate line and 2 outlets on opposite walls are required. A 2+2 suite is designed to house up to 2 occupants; therefore 4 outlets (two per room) are required. For Air Force quarter's telephone outlets must consist of 4-pin/4-position non-keyed CAT 3 or better modular USOC RJ-11 jacks. CATV outlets must be "F"-type jacks. Locate jacks in the kitchen, living room, family room, and all bedrooms adjacent to a 120-VAC, 60-Hz (or host country standard voltage and frequency as applicable) duplex electrical receptacle.

2-3.5.2 Systems Furniture Wiring

The designer must specify a minimum of one systems furniture outlet per single occupancy cubicle. The designer must specify a minimum of two systems furniture outlets per cubicle designated for servers, printers, copiers or faxes. When systems furniture is installed as part of the construction contract, insure that systems furniture specifications include TIA/EIA-568-B and TIA/EIA-569-B cabling and raceway standards.

2-3.6 Utility Rooms and Closets

All utility rooms and closets, such as electrical, mechanical and telecommunications, must be wired with at least one wall mounted telecommunications outlet, with a mounting lug face plate.

2-3.7 Elevators

For buildings with elevators, a four-pair copper cable with an eight-position modular outlet adapter must be installed for each elevator. The exact location of the outlet assembly must be verified with the elevator installer or Contractor.

2-3.8 Safety, Courtesy, & Convenience

Provide wall outlets at all logical locations to support safety, courtesy, & convenience. Examples include safety: barracks hall, laundry room; courtesy: building lobby/entrance, stairways; convenience: break rooms, rear (unmanned) entrances.

2-3.9 Building Automation Systems

When requested by the building support systems planner, provide wall outlets at identified locations to support building automation systems. For example, one such outlet may be a direct digital controller (DDC) outlet for the HVAC system. The IS/IT-designer does not have primary responsibility for identifying these circuits, and should defer to the building support systems planner.

2-4 BUILDING TELECOMMUNICATIONS WIRING

The following information pertains to horizontal cable and backbone cable. All horizontal and backbone wiring must be designed in a star-configuration as defined in TIA/EIA-568-B.1. All Cables must be terminated within telecommunications rooms, telecommunications equipment rooms, and work areas.

2-4.1 **Horizontal Cable**

The following information pertains to copper and fiber optic cable and cable run lengths.

2-4.1.1 **Copper Voice and Data**

One Category 6 (for Army and Navy) or one Category 5 or better (for USAF) unshielded twisted pair (UTP) cable must be installed to each standard 8-pin modular connector provisioned at the outlet. For example, install two 4-pair UTP cables to a standard administrative outlet, or one 4-pair UTP cable to each single connector outlet. Copper cables must not be split between multiple modular connectors. Use only cable that has passed the Underwriters Laboratory (UL) LAN certification program and is labeled with UL acceptable markings. Plenum cables must be provided in accordance with National Fire Protection Association, Inc. (NFPA) 70, or when directed by the facility safety officer or local building code. Provide terminations in accordance with the paragraph entitled "Copper Termination" in this UFC. The designer must not use 150 ohm shielded twisted pair for new construction. Category 3 (Cat 3) rated cable must not be used in new construction, or rehabilitation projects.

2-4.1.1.1 **Copper Termination**

Terminations must be performed using an 8-pin (RJ45 type) connector, rated for the category of the installed cable. In a standard cabling scheme, horizontal cables are arbitrarily designated "voice" and "data" to identify and differentiate their purpose. Copper distribution cable must be terminated at the TR on 110-type cabinet or rack-mounted patch panels compliant with Category 6 for Army and Navy projects, or Category 5 or better for USAF projects. Very small projects (i.e., one or two phones) may use a TIA/EIA Category qualified block or backboard mounted patch panel. Cables from the same outlet must be terminated on the same patch panel and individually identified. All terminations must be wired to the TIA/EIA T568A configuration. Do not use T568B wiring configurations unless specifically requested by the user and approved by the authority having jurisdiction. Copper cables must not be split between multiple modular connectors.

2-4.1.1.2 **Copper Patch Cables**

Copper patch cables must be 4-pair, 24 American Wire Gauge (AWG) stranded UTP cable, rated for Category 6 (for Army and Navy) or Category 5 or better (USAF), with 8-pin modular connectors at each end. Provide sufficient copper patch cables, of various appropriate lengths, to terminate all copper patch panel appearances.

2-4.1.2 **Fiber Optic Cable**

Provide fiber optic cable to each outlet only at the specific request of the user, or the DAA. As a minimum, administrative (including hospital) outlet boxes and faceplates must be sized and configured to allow for the future installation of two strands of fiber optic cable. When the user requires fiber optic cable, multi-mode 50/125-micron cable or 62.5/125-micron should be installed. Single-mode fiber optic cable may be substituted as required by the user. Plenum cables must be provided in accordance with NFPA 70, or when directed by facility safety officer or local building code.

2-4.1.2.1 Fiber Optic Termination

All fiber optic distribution cable must be terminated in cabinet/rack-mounted patch panels, and at the outlet. Do not use ST style adapters for new construction unless specifically required for interface with existing equipment reused on installations. Check with activity for specific requirements for ST adapters. The default choice for fiber optic adapters and connectors must be TIA/EIA "SC" type (568SC). TIA/EIA 604-3A "SC" type connectors are preferred in new systems as the international standard now accepted by the Federal Government. Other type connectors (small-form-factor) (LC, MT-RJ, VF-45, etc.) may be substituted as required by the user. Provide fiber optic adapters and connectors in accordance with TIA/EIA-604 Fiber Optic Connector Intermateability Standard (FOCIS) and the corresponding FOCIS for the type of connector used.

2-4.1.2.2 Fiber Optic Patch Cables

Fiber optic patch cables must be using the same fiber optic cable type and connectors as the patch panels they are interconnecting. Duplex patch cables must be used. Provide sufficient fiber optic patch cables, of various appropriate lengths, to terminate all fiber optic patch panel appearances plus 25% spare.

2-4.1.3 Cable Length

Copper data cable length must be limited to 295 feet (90 m) from patch panel termination in the TR to the data outlet termination in accordance with TIA/EIA-568-B.1. Adjust the average cable length for planning purposes as required (i.e., average measured length). Exception: buildings with collapsed backbones that use fiber optic cables for all data and copper UTP for voice-only, may exceed the 295 foot length.

2-4.2 Backbone Cable

The following subparagraphs pertain to copper and fiber optic backbone cable. The building backbone must have no more than two hierarchical levels of cross-connects. Copper backbone cable must be used only for voice circuits. Data backbone circuits must be fiber optics.

2-4.2.1 Copper Backbone Cable

Multi-pair voice backbone cable must meet the requirements of Insulated Cable Engineers Association (ICEA) S-80-576 and TIA/EIA-568-B.2 for riser rated unshielded twisted pair cable. Conductors must be solid un-tinned copper, 24 AWG. The copper backbone cable originating in the main TR or main cross connect must be terminated in each TR on 110 type, insulation displacement, wiring blocks mounted on the telephone backboard. Provide at least two backbone cable pairs for Army projects and 1.5 pairs for Navy projects, for every outlet connected to the TR served by the backbone cable. Plenum cables must be provided in accordance with NFPA 70, or when directed by the facility safety officer. ICEA specifications are listed in the references, and can be purchased at http://global.ihs.com.

2-4.2.2 **Copper Termination**

Termination must be performed using an 8-pin (RJ45 type) connector, rated for the installed cable. All terminations must be wired in accordance with TIA/EIA T568A. In a standard cabling scheme, horizontal cables are arbitrarily designated "voice" and "data" to identify and differentiate their purpose. Twisted pair OSP cable is terminated on the Protected Entrance Terminal (PET). See Figures 4 and 5, of Appendix B, for details. Cross-connects can then be placed from the PET to the first set of 110-type terminal blocks as needed. The first set of terminal blocks provides connection for all backbones and for outlets served by the main TR. For example, in a three-floor building, one backbone cable must be terminated on 110-type blocks on the same backboard as the PET; one backbone cable should be terminated on 110-type blocks in the 2nd-floor TR; and one backbone cable should be terminated on 110-type blocks in the 3rd-floor TR. A backbone cable connects a second set of 110-type blocks in each TR to a rack mounted, 8-pin (RJ45 type) connector voice patch panel. This panel can be patched to the distribution patch panel, which in turn terminates the Category 6 (Army and Navy) or Category 5 or better (USAF) outlet wiring. Cross-connects can be done by the DOIM/BCSO/Telephone personnel, and jumpers can be installed by the user/Information Mission Area (IMA) department, providing the desired connectivity between the OSP and the inside plant wiring. This design allows maximum flexibility for future moves, additions, and changes.

2-4.2.3 **Fiber Optic Backbone Cable**

For all Army and NMCI projects, a minimum of 12 strands of 50/125-micron or 62.5/125-micron multimode fiber optic cable and 12 strands single mode fiber optic cable must be installed between the main telecommunications room or main cross connect and each TR. If requested by the user, only 12 strands of one type of fiber may be used. For Navy projects, except medical facilities, a minimum of 12 strands of 50/125-micron or 62.5/125-micron multimode fiber optic cable must be installed between the main telecommunications room or main cross connect and each TR. Navy medical facilities require 12 strands single mode and 12 strands of 50/125-micron or 62.5/125-micron multimode fiber optic cable between the main telecommunications room or main cross connect and each TR. Plenum cables must be provided in accordance with NFPA 70, or when directed by local regulations. For all USAF projects the backbone cable must be 12-strand, 62.5/125-micron multi-mode FOC. The backbone cable must be terminated in a patch panel with duplex SC-type connectors installed in an equipment rack or cabinet

Note: The Army Gigabit Ethernet data network architecture dictates the use of single mode fiber optic cable between TRs.

For Navy projects a general guideline in premises applications for backbone cabling is as follows:

- 62.5/125 µm or 50/125 µm multimode optical fiber is recommended for:
  - Distances less than 1.2 mi (2 km)
  - Data rates up to 155 Mb/s.

- Single-mode fiber is recommended for greater distances or higher data rates:

- Distances less than 1.9 mi (3 km)
- Data rates up to 10 Gb/s

2-4.2.3.1 **Fiber Optic Termination**

All fiber optic backbone cable must be terminated in cabinet/rack-mounted patch panels, at each end. Do not use ST style adapters for new construction unless specifically required for interface with existing equipment reused on installations. Check with activity for specific requirements for ST adapters. The default choice for fiber optic adapters and connectors must be TIA/EIA “SC” type (568SC). TIA/EIA 604-3A “SC” type connectors are preferred in new systems as the international standard now accepted by the Federal Government. Other type connectors (small-form-factor) (MT-RJ, VF-45, etc.) may be substituted as required by the user. Provide fiber optic adapters and connectors in accordance with TIA/EIA-604 Fiber Optic Connector Intermateability Standard (FOCIS) and the corresponding FOCIS for the type of connector used.

2-4.3 **CATV or CCTV Cable**

When CATV or CCTV requirements are identified, either a 75-ohm broadband coaxial cable or single-mode fiber optic cable system should be installed. Refer to the paragraphs above for fiber optic cable. When a coaxial system is installed, care must be taken to ensure the correct cable is used. The designer must coordinate with the cable service provider where franchised agreements are in place. Plenum cables must be provided in accordance with NFPA 70, or when directed by the facility safety officer. The table below lists cable types with corresponding distance limitation. This table is derived from vendor specifications (Anixter) for coaxial cable. RG-59 must not be used for CATV projects; however, RG-6 should be used to outlet locations and RG-11 for feeder and trunk cables.

Table 2-2 Coaxial Cable

Cable	Distance (feet)	Distance (meters)
RG-6	<=250	<=76
RG-11	<=400	<=122
625 Series	>400	>122

2-4.3.1 **Community Antenna Television (CATV) Systems**

Community Antenna Television Systems are generally referred to as Cable TV. CATV systems must be designed in accordance with the following: Where required, provide a complete system to be owned and maintained by the government including backbone consisting of backboards/cabinets and wire and conduit with outlets and jacks in all offices, and other locations as required by the user. System must be designed in accordance with applicable TIA/EIA, BICSI, and NFPA 70 standards, and must be coordinated with the local CATV service provider. System must include headend amplifier when required by the local provider, amplifiers, splitters, combiners, line taps, cables, outlets, tilt compensators and all other parts, components, and equipment necessary to provide a complete and usable system. System must provide a high quality signal to all outlets with a return path for interactive television and cable modem access. The system must be designed to operate within the 5 to 1000 MHz bandwidth using 1000 MHz passive devices and a minimum of 750 MHz active devices. Each outlet must have a minimum signal level of 0 decibel millivolts (dBmV) (1000 microvolts) and a maximum of 15 dBmV at 55 and 750 MHz.

Distribution system must be star topology with each outlet connected to a communications closet with a feeder cable or a drop cable and each communications closet connected to the head end equipment with a trunk cable.

Provide cable installed in conduit as follows:

a. Trunk Cable, RG-11 or 625 series

b. Feeder cable, RG-11

c. Drop Cable, RG-6

2-4.4 **Building Infrastructure**

See Figures 1 through Figure 8, of Appendix B, for details. Figure 9, of Appendix B, provides a typical floor plan used in designing a building or office cabling system.

2-4.4.1 **Cable Tray**

Solid bottom, slotted bottom, or welded wire cable tray should be used to provide a centralized cable management/distribution system. See Figure 4, of Appendix B, for details. Provide 1 sq inch (650 sq mm) cross-sectional area of the tray or wireway for each outlet location served. Cable trays shall be designed to accommodate a maximum calculated fill ratio of 50% to a maximum inside depth of 6 in (150 mm). For barracks, the designer should provide 1 sq inch (650 sq mm) cross-sectional area of the tray or wireway for each barracks unit, and not exceed the 50% fill ratio. Ladder cable tray should be avoided for horizontal distribution. Provide 12 inches of clearance above cable trays for future access. Designers must coordinate with other disciplines to insure clearances can be achieved.

2-4.4.2 **Enclosed Duct (Raceway)**

When a building design does not provide for installation of cable tray, enclosed square duct may be installed. Enclosed duct may also be used in place of cable tray when cable plant requires physical security. For initial design guidance, provide 650 sq mm (1 sq inch) of cross-sectional area of the enclosed duct per outlet location. During actual design, the designer must plan for an optimal fill ratio of 40%. Under no circumstances must a fill ratio of 50% be exceeded. Provide 12 in (300 mm) of clearance above cable trays for future access, as per TIA/EIA-569-B paragraph 4.5.6.2.

2-4.4.3 **Conduit**

Electrical metallic tubing (EMT) conduit must be installed from the cable backbone distribution system, whether cable tray or enclosed duct, to each outlet. Conduit for standard outlets must be a minimum of 1 in (27 mm) EMT conduit. When cable tray or enclosed duct is not used, individual conduits should be installed from the TR to each outlet. Conduit bend radii must be coordinated with cable bend radius. Conduit entries at outlet and junction boxes must be arranged so that cables passing through the box must enter and exit at opposite sides of the box. Do not use metal flex conduit for telecommunications wiring except when installing floor-access boxes in a raised floor, where floor-access box must be relocated within a specified service area: i.e., 15-20 foot radius typical. An optimal conduit fill ratio of 40% should be accommodated for conduit. Under no circumstances should the designer exceed a fill ratio of 50%. No more than four, four-pair cables may be in a 1 in (27 mm) conduit. Note: conduit must not be used in family housing projects unless it is a high-rise apartment building.

2-4.4.4 **Pull Boxes**

Pull boxes must be placed in conduit runs where a continuous conduit length exceeds 100 feet, or where there are more than two 90-degree bends. Pull boxes must be placed in straight runs of conduit and not be used in lieu of a bend.

2-4.4.5 **Open Office Wiring**

2-4.4.5.1 **Systems Furniture Wiring**

Design systems furniture wiring connections in accordance with TIA/EIA-568-B and TIA/EIA-569-B.

2-4.4.5.2 **Multi-User Telecommunication Outlet Assembly (MUTOA)**

TIA/EIA-568-B.1 allows MUTOAs in an open office environment. This option provides greater flexibility in an office that is frequently reconfigured. A multi-user telecommunications outlet assembly facilitates the termination of single or multiple horizontal cables in a common location within a furniture cluster or similar open area. The cables from MUTOAs to work stations in system furniture or open office are simply long work area cables supported by the systems furniture raceway. MUTOAs do not include an additional connection, and are limited to terminating a maximum of 12 users. Follow the guidance of TIA/EIA-568-B.1 section 6.4.1 for MUTOA application and design.

2-4.4.5.3 **Consolidation Point (CP)**

The consolidation point is an interconnection point within the horizontal cabling using TIA/EIA-568-B.2 or TIA/EIA-568-B.3 compliant connecting hardware. It differs from the multi-user telecommunications outlet assembly in that it requires an additional connection for each horizontal cable run. CP’s are limited to terminating a maximum of 12 users. Follow the guidance of TIA/EIA-568-B.1 section 6.4.2 for CP application and design

2-4.4.5.4 **Direct Connection**

Figure 7, of Appendix B, shows two possible solutions for direct wiring to the systems furniture. This concept is one of a continuous home run from the TR to the furniture outlet. Continuous runs are not the recommended method, and should only be used in open office environments that cannot be readily reconfigured. Testing of the installed cable plant is simplified by providing an end-to-end circuit, without an additional connection point. Follow the guidance of TIA/EIA-569-B, section 6.3.2 for direct connection application and design. Direct connection must not be used on Air Force, Navy and NMCI projects.

2-4.4.5.5 **Protection and Separation**

The implementers must ensure the cable is protected at all transition points, and that metallic separation is provided between telecommunication and power wiring in the power pole and/or systems furniture track in accordance with TIA/EIA-569-B 10.3 and Article 800-52 of NFPA 70.

2-4.4.6 **Optional Customer Premise Items**

In new construction, particularly in large administrative or medical facility buildings, cable distribution systems must use the cable tray (or duct) and conduit systems as described. In new construction involving small, mixed use (non administrative) facilities, or construction projects involving renovation of existing buildings, use of "J" hooks (Army only), flexible cable tray, and alternative support systems specifically certified for Category 6 (Army and Navy) or Category 5 or better (USAF), cable is permissible, though not desirable. Surface mounted non-metallic raceway may be used in renovation projects where access to the walls for installation of conduit and outlet boxes is not possible, or where historical requirements prohibit the alteration of the building structure. See Figure 8, of Appendix B, for details.

2-5 **TELECOMMUNICATIONS ROOM**

See Figures 3, 4, and 5, of Appendix B, for sample closet layouts. TIA/EIA-568-B.1 has replaced telecommunications closet (TC) with telecommunications room (TR). The engineer must use the reference to telecommunications room to more accurately describe the space needed for telecommunications equipment. In new construction or renovation, take into account the heat load of all active electronic equipment to be installed in TRs and equipment rooms. The designer must estimate these loads and coordinate HVAC requirements. Active electronics must be placed in a conditioned space. Follow requirements of TIA/EIA-569-B when active electronics are to be located in telecommunications closets and equipment rooms.

2-5.1 **Multi-Story Buildings**

In multi-story buildings, a minimum of one TR should be located on each floor (small facilities, i.e., air traffic control towers, firing ranges, etc., may use one TR for the entire facility). Collapsed backbone buildings, i.e.: major C2 facilities, may reduce the number of TRs to a minimum in line with the collapsed wiring architecture. TRs on successive floors should be vertically stacked wherever possible. A minimum of three 4-inch (103 mm) rigid steel conduits must be installed between stacked closets on successive floors, in accordance with TIA/EIA-569-B.

2-5.2 **Telecommunications Room Sizing**

TRs must be sized in accordance with TIA/EIA-569-B for all new construction projects with primarily administrative function (small mixed-use facilities should not require full compliance with TIA/EIA-569-B). Generally, the TR should be sized to approximately 1.1% of the area it serves. For example, a 10,000 square foot (1,000 sq meter) area should be served by a minimum of one 11 ft x 10 ft (3.4 m x 3 m) TR. Large Floor areas should be divided into "serving areas" with TRs for each serving area. Each serving area can be no larger than 10,000 square feet (1,000 sq m) as stipulated in TIA/EIA-569-B. TR sizing allowances should be made only in cases of construction projects involving building renovation, and under most circumstances a TR must not be smaller than 11 ft x 7 ft (3 m x 2.2 m). The designer must avoid irregular sized TRs, such as narrow rooms or odd shapes. Provide adequate space in telecommunications rooms to facilitate tenant owned telecommunications system support equipment requirements in tenant installed freestanding cabinets or racks. Total TR space (as a percentage of the building's area) must be scale upward, to reflect the increased number of circuits in buildings with more than the standard number of circuits to each workspace. Smaller building TRs are covered in Annex B of TIA/EIA-569-B.

2-5.3 Room Interior Finishes

Floors, walls, and ceilings must be treated to eliminate dust. Finishes should be light in color to enhance room lighting. Dropped ceilings must not be installed in TRs.

2-5.4 Room Door

TR doors must be a minimum of 36" (1 m) wide, 80" (2 m) tall, without doorsill, hinged to open outward and be fitted with a lock to control access to the room.

2-5.5 Room Location

TRs must be dedicated spaces not shared with other functions (i.e., electrical rooms, mechanical rooms, etc). TRs should be located centrally in the area they serve. TRs must be located such that maximum copper cable distance from the patch panel through the structured cabling system to the furthest outlet does not exceed 295 feet. In rehabilitation projects, rooms containing transformers, air handling units, etc., should be avoided if at all possible. If shared facilities cannot be avoided, ensure that proper electrical/telecommunications cable separations are maintained per NESC and NEC.

2-5.6 Telephone Backboards

A minimum of one wall should be covered with rigidly fixed 3/4 in (20 mm) A-C plywood, preferably void free, 8 ft (2440 mm) high, capable of supporting attached equipment. Plywood must be fire-rated. Fire rated backboards are TIA/EIA approved and are easier to field verify than the fire retardant paint. When renovating an existing closet that does not have adequate space, the backboard must be sized as large as possible to accommodate the PET and 110-type blocks. See Figure 4 and 5, of Appendix B, for sample backboard layouts.

2-5.7 Equipment Racks

Equipment racks must be floor mounted 19 inches (475 mm) wide located at or near the center of the TR. If mounting requirements for oversize equipment are anticipated, 23 inches (580 mm) may be substituted, however, use only 19-inch (475 mm) equipment racks on Navy projects. In narrow or crowded closets, equipment racks may be floor mounted adjacent to a wall, but must provide a minimum 36 inches (900 mm) space both in front and in back of the rack, behind any installed equipment, and a minimum side clearance of 24 inches (600 mm) on end racks. Provide 100% spare rack capacity based on the amount of rack capacity utilized by the patch panels provided. Spare racks must be provided for the mounting of government purchased and installed LAN equipment. Wall mounted racks may be utilized in small buildings or for small systems.

2-5.8 Equipment Cabinets

Equipment cabinets should be used where physical security is required, to mount secure or mission critical equipment, in circumstances where controlled access is desired, such as CATV or CCTV, distribution in barracks, or by specific user request. Cable may be terminated in an enclosed 19-inch (475 mm) cabinet to provide enhanced protection for terminations and patching facilities. Use only 19-inch (475 mm) equipment cabinets on Navy projects. Cabinets must provide, at a minimum, sufficient space for current and anticipated future equipment requirements. Equipment cabinets may be floor or wall mounted and should be logically grouped based on the purpose of the equipment they enclose. Cooling fans must be provided in all equipment cabinets.

2-5.9 Unshielded Twisted Pair Patch Panels

UTP patch panels should be installed in, or adjacent to, the equipment racks or cabinets, which will house LAN equipment. Patch panels should consist of eight-position modular jacks, with rear mounted type 110 insulation displacement connectors, category rated for the UTP system being installed, and arranged in rows or columns on 19-inch (475 mm) rack mounted panels. Nineteen-inch (475 mm) wall mounted may be utilized when necessary, such as at MRI and Radiology locations in Navy medical projects. Jack pin/pair configuration must be T568A per TIA/EIA-568-B. The modular jacks must conform to the requirements of TIA/EIA-568-B, and must be rated for use with the installed cable plant. Provide a minimum spare capacity of 10% for Army projects and 25% for Navy projects. Provide a maximum panel size of 48 jacks for Navy projects.

2-5.10 Fiber Optic Patch Panels

Fiber optic patch panel should be installed in, or adjacent to, the equipment racks or cabinets, which will house LAN equipment. Patch panel connectors and couplers must be the same type and configuration as used elsewhere in the system. Utilize 568SC duplex connectors on 19-inch (475 mm) rack mounted panels, unless otherwise directed. Twenty-three inch (580 mm) rack mounted panels, or minimum 12x10 inch (300x250 mm) wall mounted enclosures may be utilized when necessary, such as at MRI and Radiology locations in Navy medical projects, or small facilities in Army projects. A 3-foot (1-meter) slack loop of fiber must be provided within each panel, and panels must provide strain relief for cables. Patch panels must properly provide termination, splice storage, routing, radius limiting, cable fastening, storage, and cross-connection. Provide a minimum spare capacity of 10% for Army projects and 25% for Navy projects. Provide a maximum panel size of 12 SC or RJ-45 and 24 ST ports for fiber panels for Navy projects.

2-5.11 Ladder and Wire Cable Tray

Ladder type or welded wire cable tray must be used in the TR to provide distribution between the telephone backboard, equipment racks, backbone conduits, and the distribution cable tray.

2-5.12 Room Lighting

Light fixtures must be mounted a minimum of 9-feet (3-meters) above the finished floor and provide a minimum of 50 foot candles (500 lx) of illumination measured 3-feet (1-meter) above the finished floor.

2-5.13 Room Climate Control

Each TR must be independently climate controlled, capable of providing year round ambient temperature control (24 hours/day, 365 days/year) to protect all installed electronic equipment. Rooms must be provided with positive atmospheric pressure to exclude dust.

2-5.14 Room Contaminants

Information system equipment must not be installed in spaces where moisture, liquid or gaseous spillage, or other contaminants may be present.

2-5.15 Electrical Power

Provide a minimum of two dedicated 120 volt, 20-amp duplex receptacles in each telecommunications room. Each receptacle must be on a separate 20-amp branch circuit serving only that receptacle. Additional convenience receptacles must be provided at 6 ft (1800 mm) intervals around the perimeter walls. For all projects, provide a dedicated 20-amp circuit and a quadraplex receptacle for each 19 in (480 mm) rack or cabinet.

2-5.16 Voice Communications

Each TR should have one wall-outlet, installed at or near the entry door.

2-6 EQUIPMENT ROOM

TIA/EIA-569B defines a telecommunications equipment room as "An environmentally controlled centralized space for telecommunications equipment that usually houses a main or intermediate cross-connect." The designer should consider utilizing an equipment room for areas that exceed 10,000 square feet (929 sq meters) or buildings that house substantial IT electronics.

2-6.1 Equipment Room Provisioning

Provision the equipment according to the guidelines established in TIA/EIA-569-B, section 7.12.

2-6.1.1 Power Requirements

Provide a minimum of two dedicated un-switched 20- amp, 120-VAC, 60-Hz (or host country standard voltage and frequency) duplex receptacle power outlets, each on a separate branch circuit, for telecommunication equipment. Increase these minimum requirements as necessary to meet equipment loads. Support the equipment with UPS units where continuous equipment operation is required or where economically justified. Provide additional 120-VAC convenience outlets for maintenance and housekeeping.

Back-up all electrical loads in the ER with standby generator power where continuous equipment operation is required or where economically justified.

2-7 GROUNDING

All unclassified TRs must be connected to the building earth electrode subsystem (EES) in accordance with MIL-STD-188-124B for Army installations and J-STD-607-A for Air Force, Navy and Marine Corps installations. Information on grounding of classified facilities can be found in MIL-STD-188-124B and MIL-HNBK-419-A. Figures 10 and 11, of Appendix B, provide detailed schematics for the signal grounding system. An acceptable grounding system encompasses: fault protection grounds, lightning protection grounds, signal reference grounds, and DC power grounds (when applicable). Refer to NFPA 780 and MIL-HNBK-419-A for proper lightning protection and NFPA 70 for proper fault protection grounding. The telecommunications designer must review project drawing to ensure that the lightning and fault protection grounds are addressed by the appropriate disciplines. The telecommunications designer must ensure that the different grounding systems are not mixed within the building.

2-7.1 Building Earth Electrode Subsystem (EES)

The building EES forms the primary electrical, life-safety grounding system. Typically, a grounding electrode conductor connects the main building-grounding electrode to the main electrical entrance panel or cabinet. NFPA 70, Article 250 Section III provides guidance on the grounding electrode system and conductor. End user buildings (EUB) and area distribution nodes (ADN) should have a resistance-to-earth of 10 ohms or less, following MIL-STD-188-124B. The switch manufacturers may specify the resistance-to-earth as 5 ohms or less for a telephone switch or Dial Central Office (DCO). The designer should be conscious of the proposed utilization of the facility, and plan accordingly. Sites must provide proper supporting documentation and specifications to the designer to support resistance-to-ground requirements more stringent than that of NFPA 70 or MIL-STD-188-124B for non-voice switch buildings. Proper documentation includes international, national or local codes, Department of Defense and Department of the Army standards, or manufacturers' equipment specifications.

2-7.2 Cable Entrance Grounding

All metallic shields and strength members for outside plant cable entering a building must be connected to the lightning protection ground system. The designer must ensure that the lightning protection is in accordance with MIL-STD-188-124B and NFPA 780, Standard for the Installation of Lightning Protection Systems, latest issue.

2-7.2.1 Building Point of Entrance

NFPA 70 defines the point of entrance as the location where "the wire or cable emerges from an external wall, from a concrete floor-slab, or from a rigid metal conduit or an intermediate metal conduit grounded to an electrode in accordance with 800.400(B)." The Telecommunications Entrance Facility (TEF) is the space housing the point of entrance of the telecommunications service.

2-7.2.2 Copper Cable Entrance

The OSP copper cable shield, armor, and metallic strength member must be bonded to the Lightning Protection Subsystem as close as possible to the building point of entrance with a No. 6 AWG or larger ground wire. The designer should use a non-bonded splice case for the transition from OSP rated cable to interior rated cable, or must indicate that the implementer not install the splice case carry-through bonding conductor. If the designer must extend the OSP copper cable past 50 feet (15 m) in accordance with NFPA 70 section 800.50, the metallic strength member must be bonded to the lightning protection ground as close as possible to the conduit egress point with a No. 6 AWG or larger copper ground wire.

2-7.2.3 Fiber Cable Entrance

The OSP fiber optic cable armor and metallic strength member must be bonded to the Lightning Protection Subsystem as close as possible to the building point of entrance with a No. 6 AWG or larger ground wire. The designer should use a non-bonded splice case for the transition from OSP rated cable to interior rated cable, or must indicate that the implementer not install the splice case carry-through bonding conductor. If the designer must extend the OSP fiber cable past 50 feet in accordance with NFPA 70 section 770.50, the metallic strength member must be bonded to the lightning protection ground as close as possible to the conduit egress point with a No. 6 AWG or larger copper ground wire. If inside/outside cable is used, a cable shield isolation gap must be incorporated.

2-7.2.4 Copper Protector Block

All OSP copper cables must be terminated on primary protector blocks, equipped with 5-pin solid state or gas protector modules. The protector blocks must be bonded to the Lightning Protection Subsystem with a No. 6 AWG or larger copper ground wire. Blocks must be UL listed. Place the protector block as close as possible to the lightning protection ground.

2-7.3 Telecommunications Room Signal Ground

All TRs must have a high frequency signal ground designed in accordance with MIL-STD-188-124B for Army installations and J-STD-607-A for Air Force, Navy and Marine Corps installations. The signal ground should consist of a ground ring around the inside perimeter of the room for TR or a ground bus bar for telecommunications closets. The signal ground ring or bar should be connected to the building EES by using the building steel girders or a ground cable if the girders are not accessible. The size of the grounding electrode conductor of a grounded or ungrounded ac system shall not be less than given in NEC Table 250.66 (Army) or Figure 5.4.4.1 of J-STD-607-A (AF and Navy). The values in NEC Table 250.66 are based on the size of the service-entrance conductors but the grounding electrode conductor is not required to exceed 3/0 AWG copper or 250-kcmil aluminum. The telecommunications designer must ensure that the different signal grounding system does not interconnect with the fault protection and lightning protection sub-systems within the building.

J-STD-607-A uses the following terms for signal grounding: the telecommunications main grounding busbar (TMGB) and the telecommunications-grounding-busbar (TGB) in place of a signal ground bus bar, the telecommunications bonding backbone (TBB) in place of the ground conductor, and the grounding equalizer (GE).

2-7.4 Telecommunications Rack and Supporting Structure

All telecommunications racks and supporting structures (cable trays, ladders, conduits and baskets) within a TR must be bonded to the TR signal ground ring or bus bar as defined in and TIA/EIA-569-B (TGB or TMGB as defined in J-STD-607-A).

2-8 TELECOMMUNICATIONS SYSTEM LABELING

The following subparagraphs pertain to patch panel, distribution facilities, and outlet labeling.

2-8.1 Outlet/Patch Panel Labels

The telecommunications systems labeling must be done in accordance with TIA/EIA-606-A. All outlets and patch panel positions must be labeled as to their function and with a unique identifier code. All devices, outlet locations, and designations must also appear on the system drawings. As a minimum the following must be reflected in the outlet/patch panel labeling:

- Security Level (if applicable)
- Room Number
- Alpha or Numeric Designator
- Labeling must be a minimum of ¼-inch (6mm) high
- Handwritten labels must not be used for the final configuration

2-8.2 Conformance to Existing Standards

It is desirable that the labeling system conforms to any existing labeling, to the Director of Information Management (DOIM) or Base Communications Systems Officer (BCSO) standard, or if neither exists to the method described above. All designations must be done in standard commercial labeling. Handwritten labels must not be used for the final configuration.

2-8.3 Telecommunications Outlet Labeling

Outlet labeling must be done in accordance with TIA/EIA-606. Each outlet location must be labeled with a unique designator and level of classification, in sequence starting with “A” or “1” and proceeding clockwise around the room. The left or top 8-pin (RJ-45 type), Category 6 (Army and Navy), or Category 5 or better (USAF) compliant connector should be designated for voice and be labeled "VOICE." The right or bottom 8-pin (RJ-45 type), connector should be designated for data and be labeled "DATA.” All LAN components in the system must also be labeled with similar designations in accordance with TIA/EIA 606. For fiber optic connections, the left or top fiber optic connection should be labeled "A" and the right or bottom fiber optic connection should be labeled "B."

2-8.4 Telecommunications Patch Panel Labeling

Patch panel labeling must be done in accordance with TIA/EIA 606. Each position must be labeled with a unique designator corresponding to the outlet location. In addition to TIA/EIA-606-A requirements, the top or left 8-pin (RJ-45 type), Category 6 (Army and Navy), or Category 5 or better (USAF) compliant port for each outlet location should be designated for voice and be labeled "VOICE." The bottom or right 8-pin (RJ-45 type), port for each outlet location should be designated for data and be labeled "DATA." Fiber-optic port labeling must be done in accordance with TIA/EIA 606. The left or top connection should be labeled "A." The right or bottom connection should be labeled "B." Color-coding in accordance with TIA/EIA-606-A may be added to the labeling.

2-8.5 Distribution System Labeling

The distribution system is described in TIA/EIA-606-A for pathways. In addition, all transitions and changes in distribution system size and type must be labeled. Each cabinet must be labeled at the top with a unique designation.

2-9 BUILDING ENTRANCE FACILITY

The building entrance facility (equipment room) is the demarcation point between the outside plant (OSP) cabling and the inside plant distribution cabling.

2-9.1.1 The Telecommunications Entrance Facility (TEF)

The TEF is the space housing the point of entrance of the telecommunications service. The TEF is also the space where the inter- and intra-building backbone facilities join. Telecommunication-related antenna entrances and electronic equipment may also be located in the TEF.

2-9.2 Protected Entrance Terminals (PET)

2-9.2.1 Protector Modules

The Protected Entrance Terminals (PET) must be equipped to protect the inside plant wiring and equipment from power surges. PET must be provided with TIA/EIA-568-B compliant 110 Type connector blocks or cable stubs to terminate on 110 Type connector blocks.

2-9.2.2 Sheath Limitations

If the OSP sheath distance from the building entrance point to the PET or fiber optic connector housing location is greater than 50 cable feet (15 meters); the use of grounded EMT is required.

2-9.2.3 Stencils

All PETs must be stenciled with the terminal number and cable count.

2-9.3 Fiber Termination Device

OSP fiber optic cables are terminated on optical patch panels. The inside plant fiber optic backbone cables are terminated on optical patch panels in the same or adjacent equipment racks. Patch cables are connected between the patch panels to provide the desired connectivity. All patch panels must be stenciled with the panel number and the cable count.

2-10 **TESTING**

The designer must specify that all telecommunications cable, installed as part of a project, be tested to the commercial standards for that cable system. All test results and certifications must be provided in a report upon completion of construction to the DOIM or BCSO responsible for system O&M.

2-10.1 **Unshielded Twisted Pair Tests**

All metallic cable pairs must be tested for proper identification and continuity. All opens, shorts, crosses, grounds, and reversals must be corrected. Correct color-coding and termination of each pair must be verified in the communications closet and at the outlet. Horizontal wiring must be tested from and including the termination device in the communications closet to, and including the modular jack in each room. Backbone wiring must be tested end-to-end, including termination devices, from terminal block to terminal block, in the respective telecommunications closets. These tests must be completed and all errors corrected before any other tests are started.

2-10.2 **Category 5e and 6 Circuits**

All category 5, 5e and 6 circuits must be tested using a test set that meets the accuracy requirements of TIA/EIA-568-B.1 and TIA/EIA-568-B.2-1. All test requirements must be completed as specified in TIA/EIA-568-B.1 and TIA/EIA-568-B.2-1.

2-10.3 **Coaxial Cable**

Cable must be tested for continuity, shorts and opens. Characteristic impedance must be verified over the range of intended operation. Cable length must be verified. Cable must be sweep-tested for attenuation over the range of intended operation.

2-10.4 **Fiber Optic Cable**

All category fiber optic circuits must be tested using a test set that meets the accuracy requirements of TIA/EIA-568-B.1 and TIA/EIA-568-B.3. All test requirements must be completed as specified in TIA/EIA-568-B.1 and TIA/EIA-568-B.3.
Unless stated otherwise, tests must be performed from both ends of each circuit. Connectors must be visually inspected for scratches, pits or chips and must be re-terminated if any of these conditions exist.

APPENDIX A REFERENCES

1. ANSI/TIA/EIA-568-B.1 Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements

2. ANSI/TIA/EIA-568-B.2 Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components

3. ANSI/TIA/EIA-568-B.2 –1 Addendum 1 – Transmission Performance Specifications for 4-pair 100-ohm Category 6 Cabling

4. ANSI/TIA/EIA-568-B.2–4 Addendum 4 - Solderless Connection Reliability Requirements for Copper Connecting Hardware

5. ANSI/TIA/EIA-568-B.3 Commercial Building Telecommunications Cabling Standard, Part 3: Optical Fiber Cabling Components

6. ANSI/TIA/EIA-568-B.3-1 Addendum 1 –Additional Transmission Performance Specifications for 50/125 Optical Fiber Cables

7. ANSI/TIA/EIA-569-B Commercial Building Standard For Telecommunications Pathways and Spaces

8. ANSI/TIA-570-B Residential Telecommunications Infrastructure Standard

9. ANSI/TIA/EIA-526-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant

10. ANSI/TIA/EIA-526-14A Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant

11. ANSI/TIA/EIA-606-A Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings

12. ANSI-J-STD-607-A-2002, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, Telecommunications Industry Association (TIA), October 2002.

13. EN 50173:1996 Information Technology – Generic Cabling Systems

14. EN 50174-1:2001 Information Technology – Cabling Installation, Part 1: Specification and Quality Assurance

15. EN 50174-2:2001 Information Technology – Cabling Installation, Part 2: Installation Planning and Practices Inside Buildings

16. EN 50174-3:2002 DRAFT Information Technology – Cabling Installation, Part 3:Installation Planning and Practices Outside Buildings

17. ISO/IEC 11801:2002 Information Technology – Generic Cabling for Customer Premises

18. ISO/IEC 14763-1:1999 Information Technology – Implementation and Operation of Customer Premises Cabling, Part 1: Administration

19. ISO/IEC 14763-2:2000 Information Technology – Implementation and Operation of Customer Premises Cabling, Part 2: Planning and Installation

20. ISO/IEC 14763-3:2000 Information Technology – Implementation and Operation of Customer Premises Cabling, Part 3: Testing of Optical Fibre Cabling

21. NFPA 70, *National Electrical Code,* 2005 Edition, National Fire Protection Association, Inc., August 2004.

22. NFPA 780, Standard for the Installation of Lightning Protection Systems, latest issue

23. C2-2002, *National Electrical Safety Code, 2002 Edition*, Institute of Electrical and Electronics Engineers, Inc., August 2002.

24. MIL-STD-188-124B, Grounding, Bonding And Shielding for Common Long Haul/Tactical Communication Systems Including Ground Based Communications-Electronics Facilities and Equipments.

25. MIL-HDBK-419A, Grounding, Bonding, and Shielding For Electronic Equipments and Facilities.

26. UFC 1-300-01 Criteria Format Standard

27. UFC 3-580-10 Design: Navy And Marine Corps Intranet (NMCI) Standard Construction Practices Information System (IS)

28. UFGS-16710 09/2004, Structured Telecommunications Cabling and Pathway System.

APPENDIX B FIGURES

Figure 1 TELECOMMUNICATIONS ROOM ENTRANCE AND BACKBONE DIAGRAM

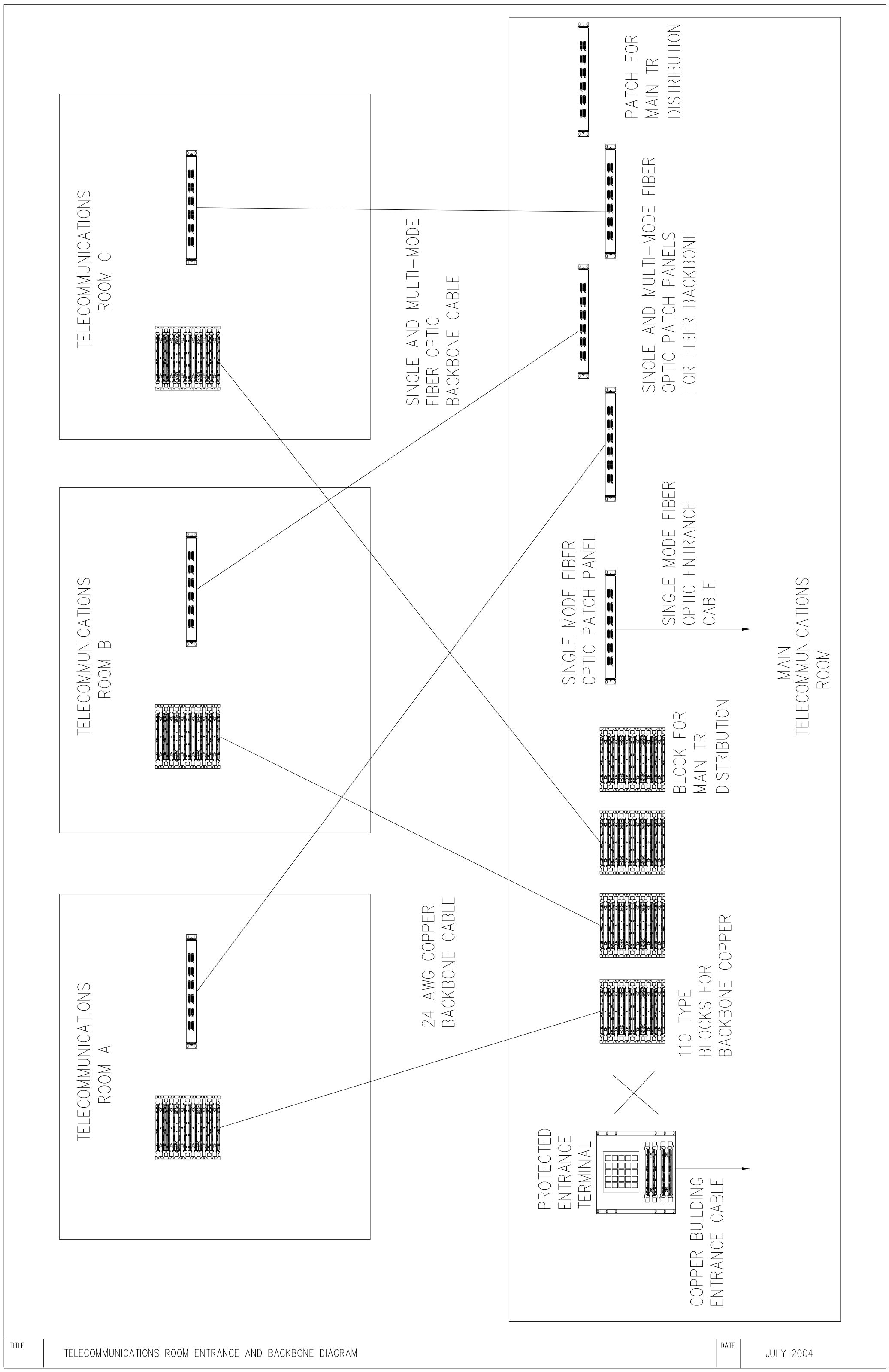


Figure 2 TELECOMMUNICATIONS ROOM HORIZONTAL DISTRIBUTION DIAGRAM

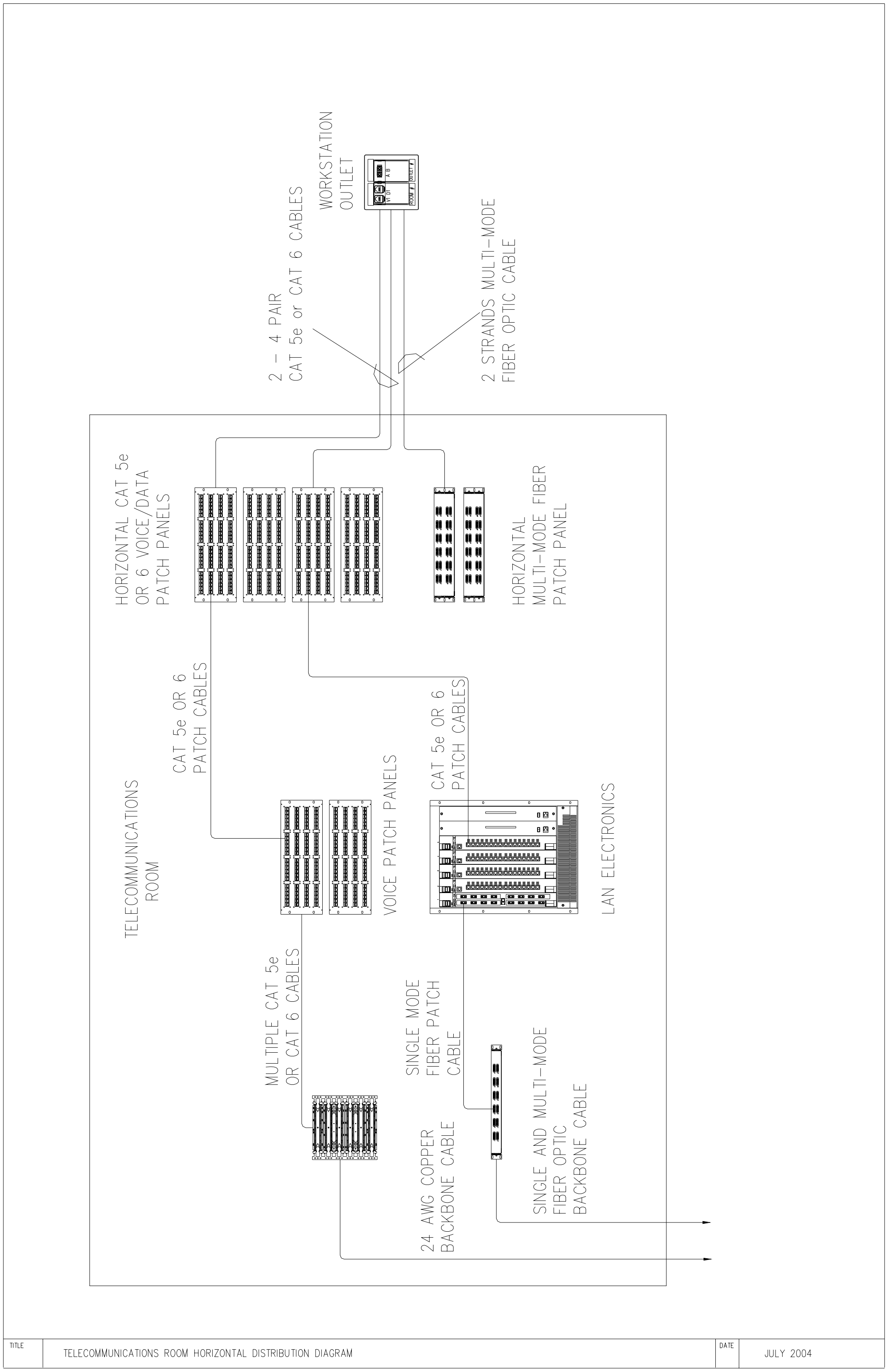


Figure 3 TELECOMMUNICATIONS ROOM STANDARD SUPPORTING STRUCTURE AND BACKBONE

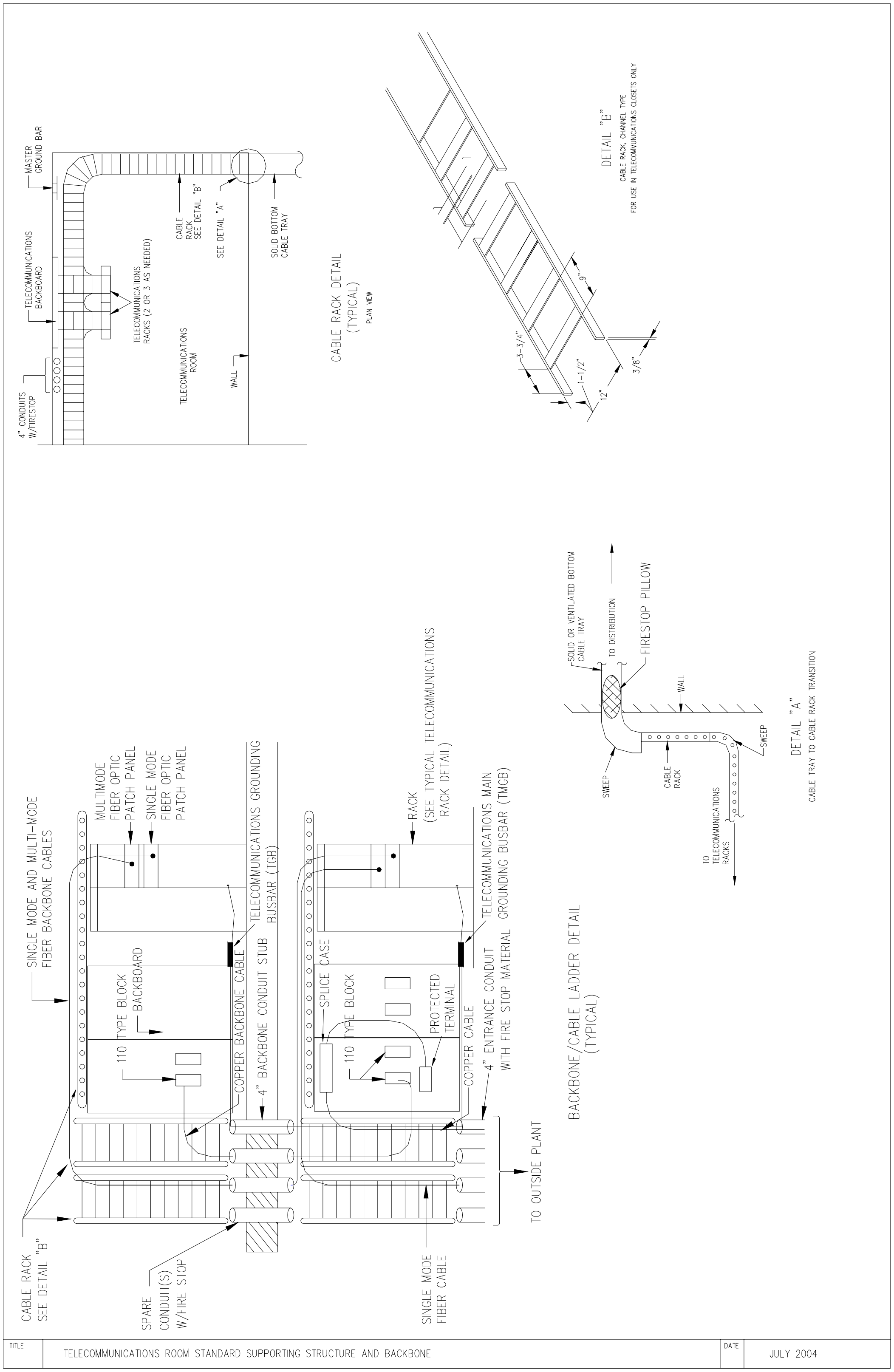


Figure 4 TELECOMMUNICATIONS ROOM STANDARD PREMISE DISTRIBUTION

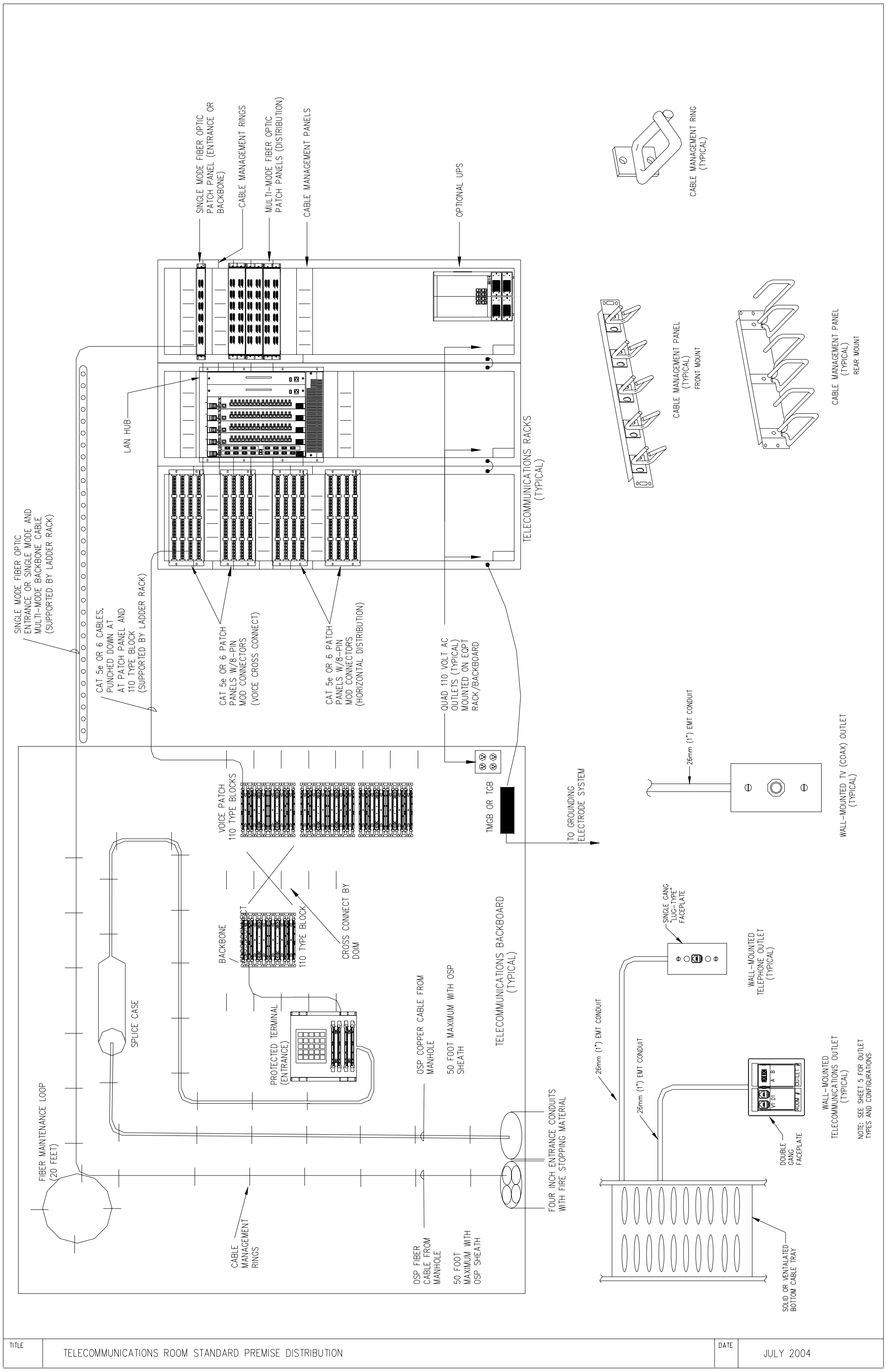


Figure 5 TELECOMMUNICATIONS ROOM HIGH DENSITY PREMISE DISTRIBUTION

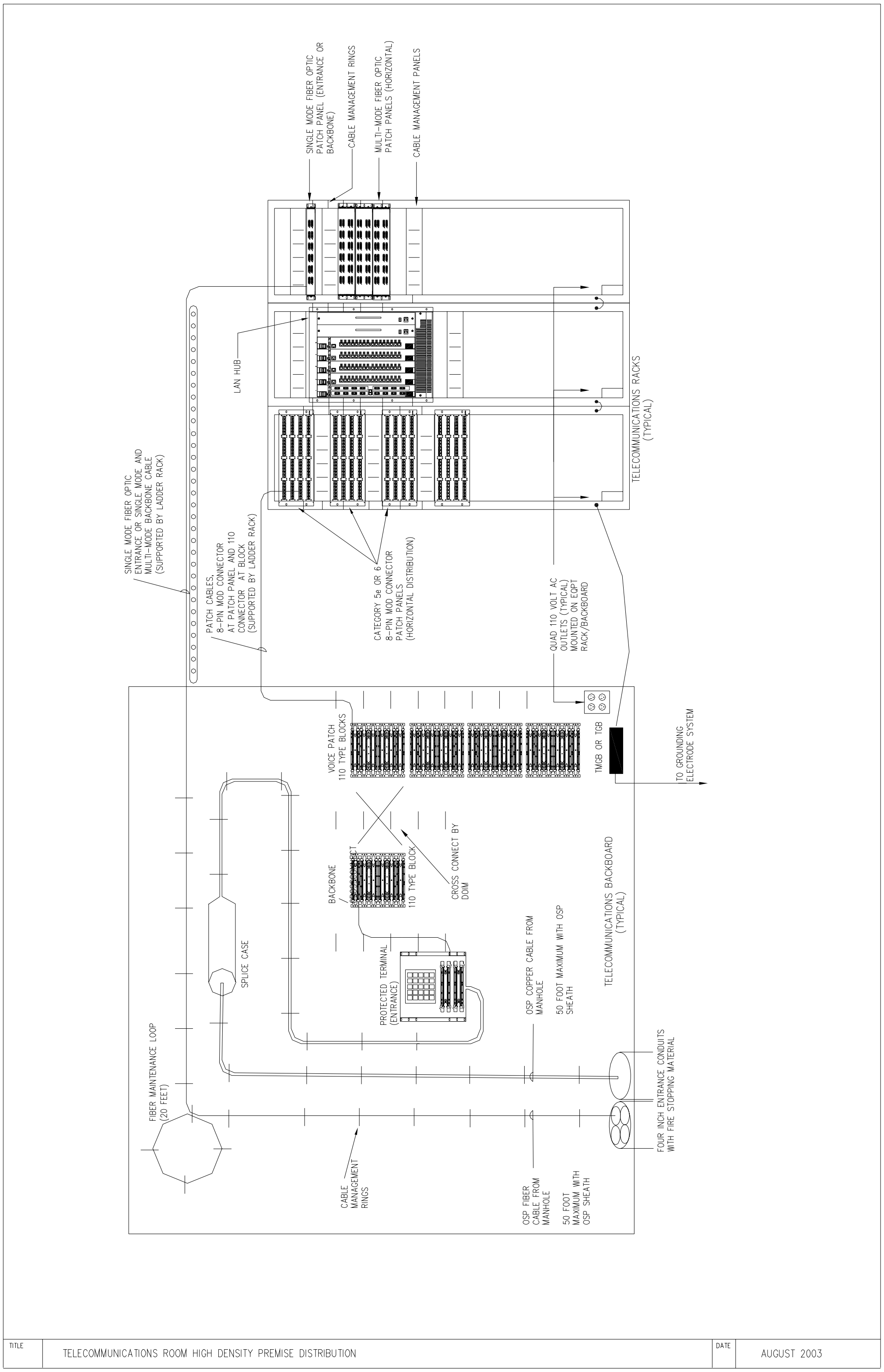


Figure 6 TELECOMMUNICATIONS OUTLET TYPES

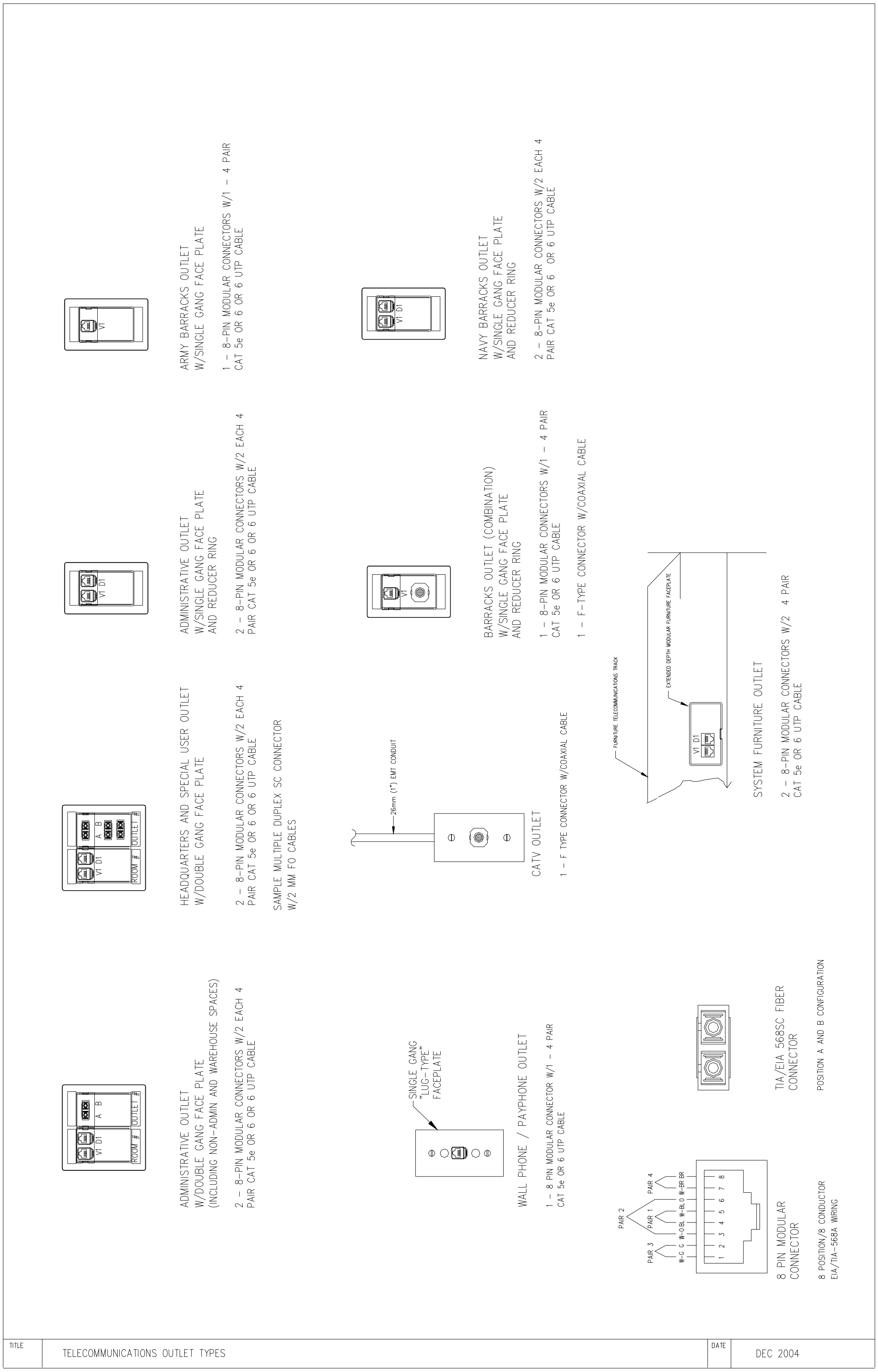


Figure 7 SYSTEMS FURNITURE WIRING

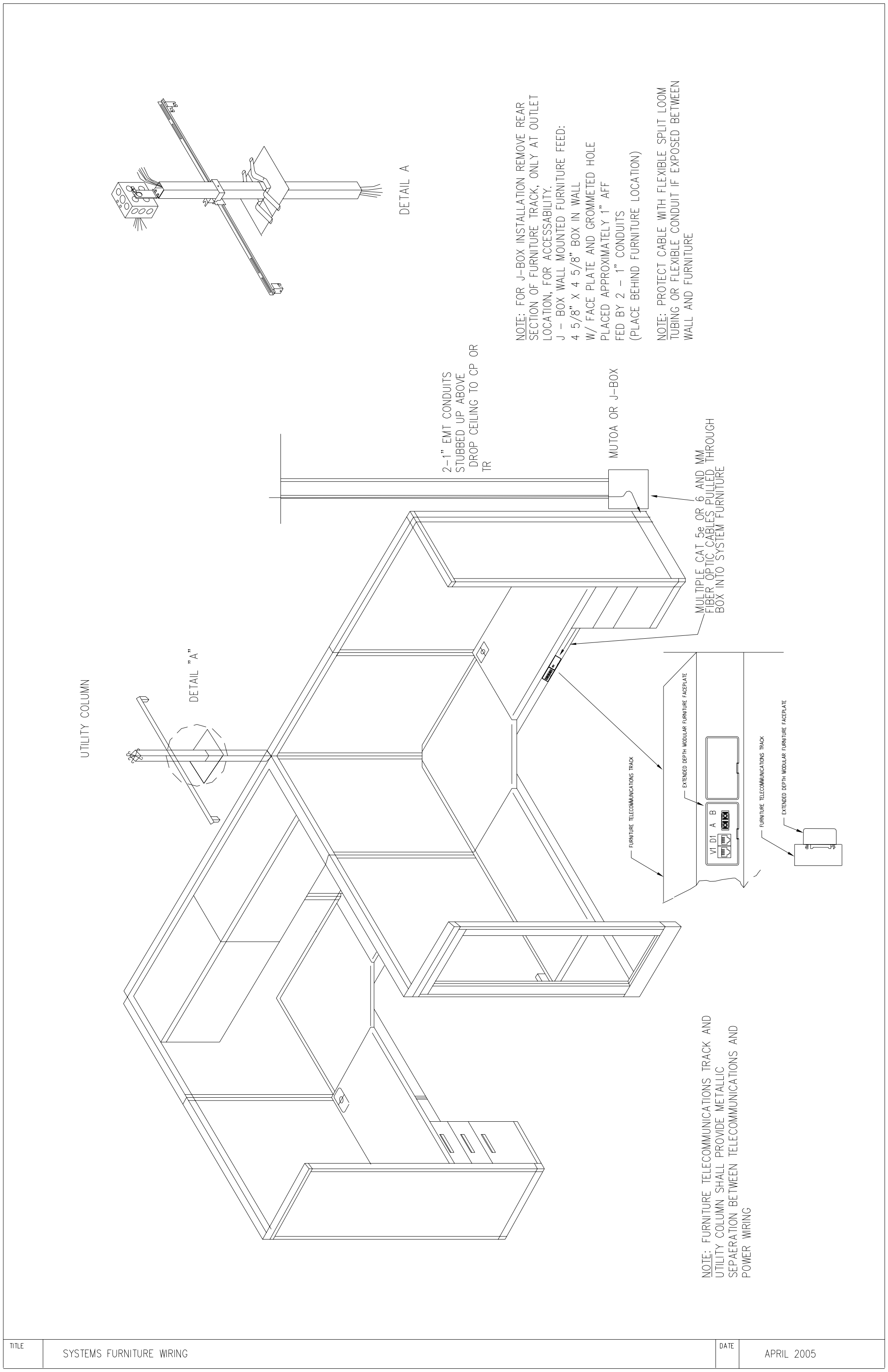


Figure 8 PREMISE DISTRIBUTION SUPPORTING STRUCTURE - RENOVATION

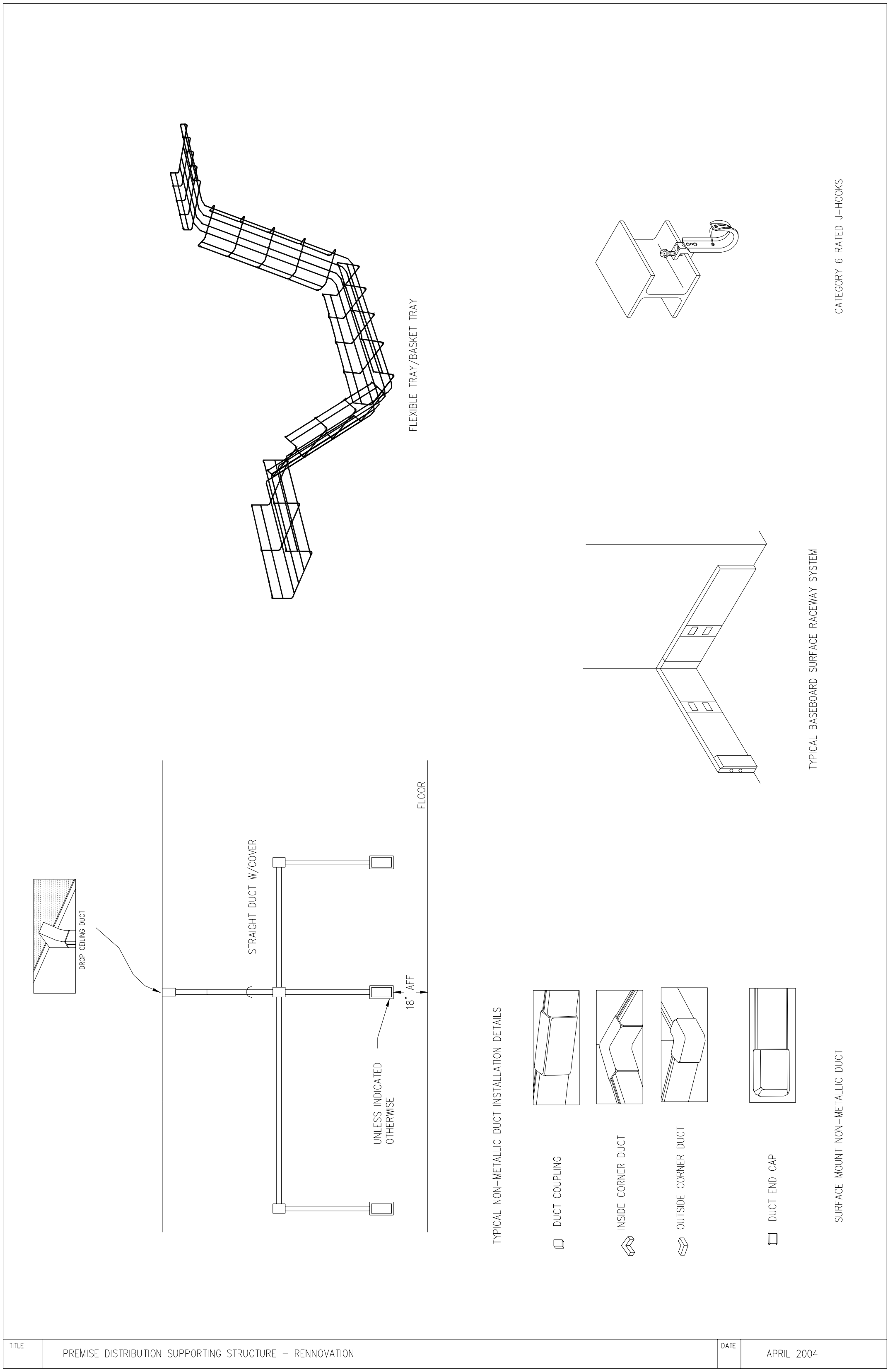


Figure 9 TYPICAL FLOOR PLAN

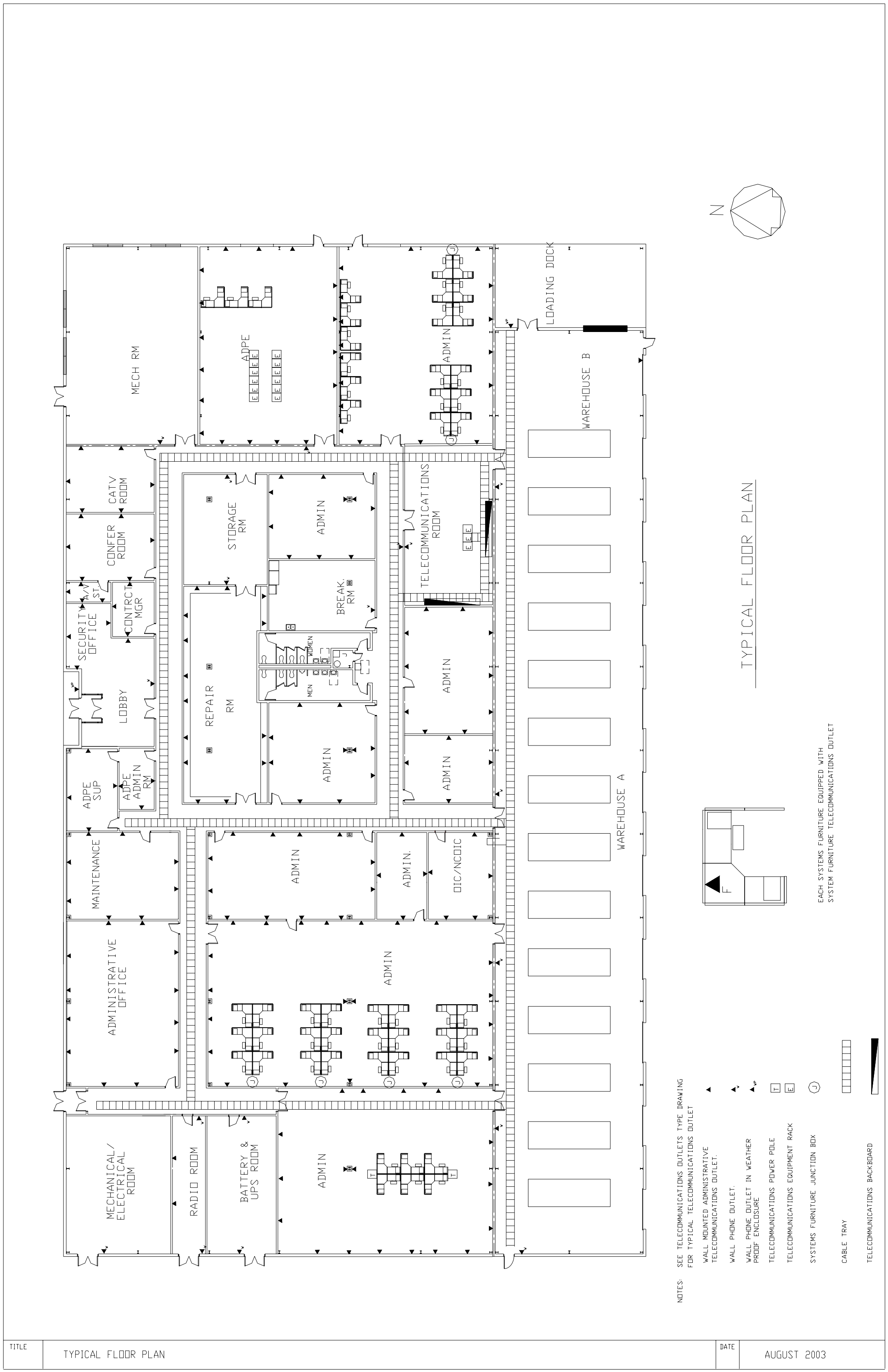


Figure 10 J-STD-607A GROUNDING

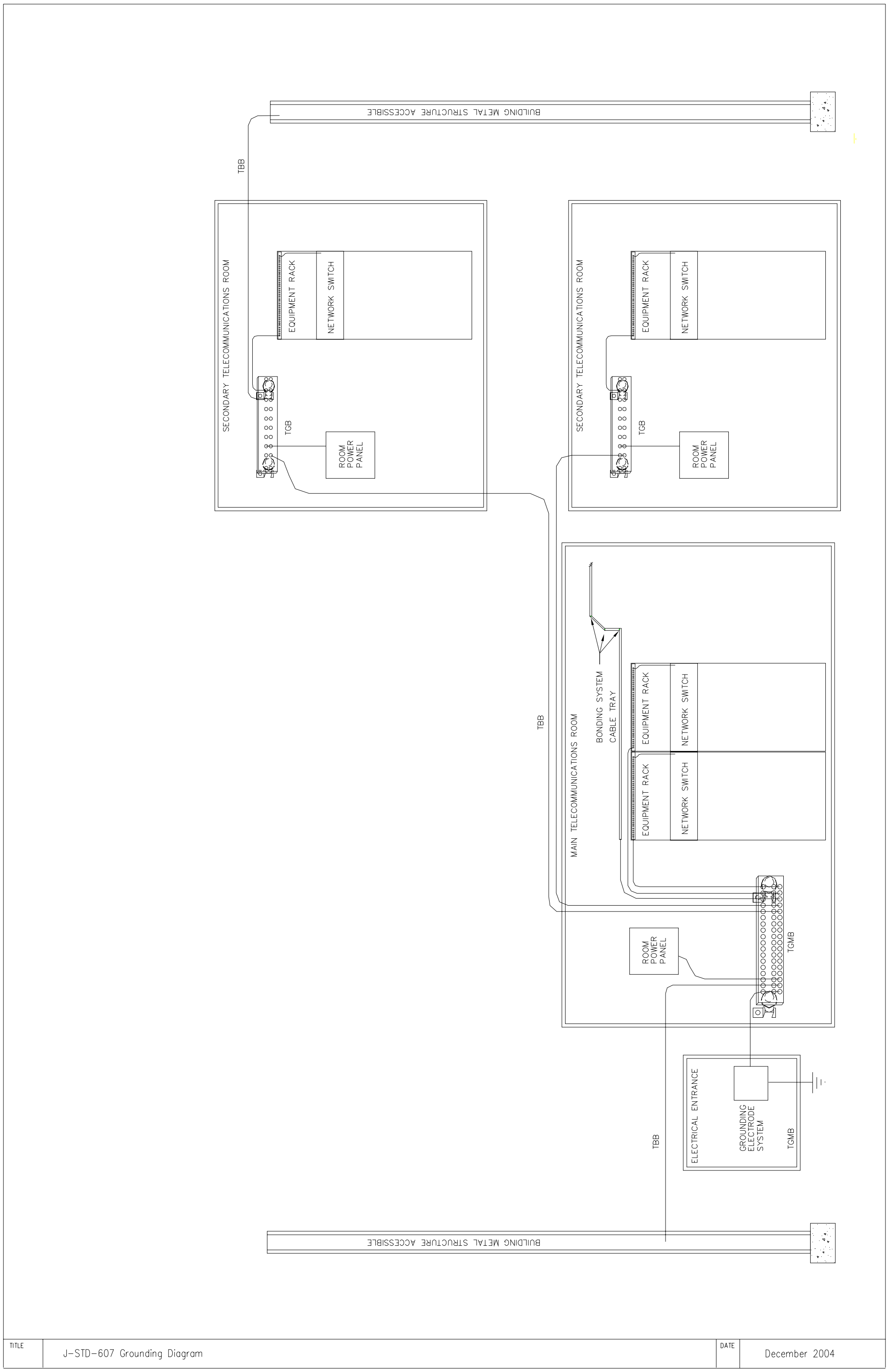
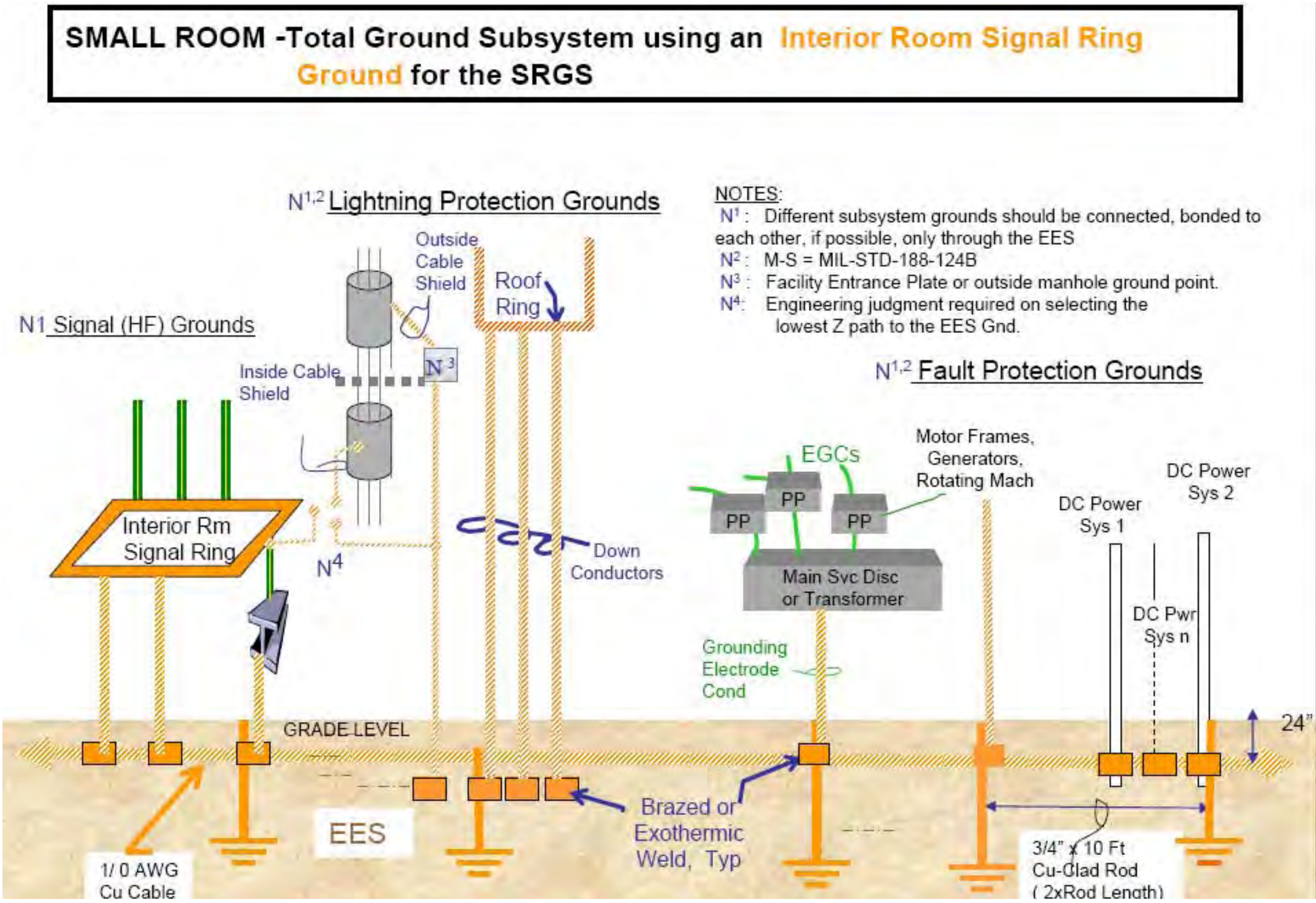


Figure 11 MIL-STD-188-124B GROUND



Robins Air Force Base
Base Facility Standards

Title: Exterior Lighting

Date: 22 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 6G – EXTERIOR LIGHTING

CRITERIA REFERENCE DOCUMENTS: The publications listed below form a part of this document to the extent referenced. The publications are referred to in the text by the basic designation only.

AFI 32-1063, Electric Power Systems

AFJMAN 32-1082, Facilities Engineering – Electrical Exterior Facilities

ETL 10-18, Light-Emitting Diode (LED) Fixture Design and Installation Criteria for Interior and Exterior Lighting Applications

UFC 3-530-01, Including Change 1; Design of Interior and Exterior Lighting Systems and Controls

UFC 3-501-01, Electrical Engineering

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO LTS-5	(2009; Errata 2009; Amendment 2010) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

IESNA RP-8	(2000; Errata 2004; R 2005; Errata 2007) Roadway Lighting

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
IEEE C135.1	(1999) Standard for Zinc-Coated Steel Bolts and Nuts for Overhead Line Construction
IEEE C135.30	(1988) Standard for Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction
IEEE C2	(2007; Errata 06-1; TIA 07-1; TIA 07-2; TIA 07-3; Errata 07-2; TIA 08-4; TIA 08-5; TIA 08-6; TIA 08-7; TIA 08-8; TIA 08-9; TIA 08-10; TIA 08-11; TIA 09-12; TIA 09-13; TIA 09-14; Errata 09-3; TIA 09-15;

	TIA 09-16; TIA 10-17) National Electrical Safety Code
IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2011) National Electrical Code

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-232	(1997f; R 2002) Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange

BFS Part 7A –Energy Conservation

BFS Part 7C – Sustainable Design & Development

EXTERIOR LIGHTING – GENERAL

a. Parking Lot Lighting

(1) General requirements:

(a) Use aluminum poles.

(b) Calculate lighting levels based upon IES (Illumination Engineering Society) for maintained levels for parking lots - design for 2.0 FC average with no point less than 1.0 FC.

(c) Fixtures shall be controlled by individual photocells on each fixture. Photocells shall activate at 3 foot-candles of ambient light.

(d) Feed at 277 V when practical. If feasible, feed by panelboards mounted adjacent to padmounted transformers. Otherwise, feed from adjacent buildings served by the parking lots.

(2) Primary standard is high mast lighting for parking lots with more than two rows of spaces or at least two driving lanes.

(a) Use 100’ poles equipped for up to 12 fixture heads, even if fewer heads are used. Provide raceway and branch circuit wiring sufficient for all 12 fixtures. Holophane is base preference.

(b) The manufacturers do not have recommended foundation designs, so require the contractor to provide a submittal showing their proposal to withstand a 90 mph wind with 12 luminaires on the top of the pole. (NOTE: We have had some installations with a 17’ deep hole 4’ in diameter, with bolts 72 inches long, and a 14’ cage 3.5’ in diameter for concrete reinforcement. The bolts were 2” in diameter, and the rebar was sized at no. 5. The installation included a vertical I-beam 14’ long.)

(c) Fixtures are specially made for this purpose and have 1000 W HPS lamps.

(d) Have the manufacturer provide a printout showing the FC point-to-point calculations for the lot layout.

(e) Include stainless steel hoisting cables with a mechanism that is operated by an electric drill for lowering the fixture set to ground level for maintenance.

(f) Also provide double aircraft warning lights on poles located north of Fifth Street.

(g) Voltage level is 480 V.

(3) Secondary standard is for shorter poles with cobra heads.

(a) Provide 25’ poles with screw-in bases and 6’ or 8’ arms as applicable.

(b) Foundations shall be constructed as follows: 16 inch diameter helix made from hot rolled steel per ASTM A635; base plate size 15 inch diameter bolt circle and constructed of hot rolled steel; shaft size approximately 7 ft 6 inches constructed of steel pipe per ASTM A53. Entire finish shall be hot dipped galvanized per ASTM A123. Design Basis --- Chance Cat # XT112-0284

(c) Fixtures shall be cobra head type with 250W HPS lamps. Use “wide area” lenses and fixtures. Shoebox type fixture heads are unacceptable due to difficulty in maintenance and high first cost.

(d) Voltage level is 277 V.

(4) Last preference, discouraged due to difficulty of maintenance and higher initial cost, is for shorter poles with rectangular box shaped fixtures on short horizontal arms.

(a) Only use these along paths and sidewalks near administrative facilities where a high degree of aesthetics is desirable. These must meet the balanced goals of architectural compatibility, energy budgets, and sustainability.

(b) Provide on poles no taller than 10’ due to maintenance difficulty.

(c) Poles may be colored with anodized aluminum if this better meets the architectural compatibility requirements.

(d) Foundations shall be constructed per manufacturer recommendations. If possible, use screw-in bases and foundations such as for parking lot 25’ poles, but sized smaller as required.

b. Street Lighting

(1) General requirements:

(a) Only provide where adjacent parking lot lighting is insufficient for street level.

(b) Calculate lighting levels based upon IES (Illumination Engineering Society) for maintained levels - design for 1.0 FC with no point less than 0.5 FC.

(c) Fixtures shall be controlled by individual photocells on each fixture. Photocells shall activate at 3 foot-candles of ambient light.

(d) Feed at 277 V. If feasible, feed by panelboards mounted adjacent to padmounted transformers.

(2) Primary standard is high mast lighting as described above.

(3) Secondary standard is for shorter poles with cobra heads as described above.

c. Sidewalk Lighting: Any sidewalk that is not adequately lighted by the parking lot lighting and branches into the entryway of the facility shall be lighted with sidewalk lighting. Design Basis -- Lithonia KBR6 series with 70-watt metal halide lamps.

d. Exterior Doors: Provide fixtures above or next to all exterior doors. Select light fixtures at the main entrance that will accent the architecture.

e. Facility Site Lighting: If security is a concern or parking lot is adjacent to a wall, provide wall pack metal halide fixtures spaced to provide 2.0 FC average to the area.

f. Exterior Storage Area Lighting: Provide lights around the perimeter of the entire storage area.

(1) For most applications, consider a 30 ft tall, round, tapered aluminum pole with two-floodlight type lighting fixtures mounted on 2 tenons 180 degrees apart with 400 watt HPS with a NEMA type 6 X 5 light distribution.

(2) Install pole on a screw-in base.

(3) Poles shall withstand steady wind velocity of 80 MPH and have a 1.3 gust factor based on the effective projected area of the fixtures and brackets provided.

(4) Poles shall be one piece, spun construction, with cast aluminum base, ground lug, handhole, and sanded satin aluminum.

(5) Poles shall be spaced to provide 10 foot-candles.

EXTERIOR LIGHTING, SPORTS: All lighting shall be metal halide. Calculate lighting levels based upon IES (Illumination Engineering Society) for maintained levels.

a. Baseball and Softball Fields: Lighting levels shall be based on Class of Play Type II per IES. Layout poles shall be as recommended by the IES standard.

b. Tennis Courts - Lighting levels shall be based on Class of Play Type II per IES. Layout of poles shall be as recommended by the IES standard.

c. Type: All lighting shall be metal halide.

d. Poles - All pole construction shall be concrete set in a concrete base.

<<<End of Section>>>

Author: Adrian Bell, 778CES/CEPD, 478-327-2404

Reviewer: Phil McGill, 778CES/CEPD, 478-327-2922

Approval: ***Original Signed By***
Terry Landreth, 778 CES/CEPT, 478-327-2910

Robins Air Force Base
Base Facility Standards

Title: Medium Voltage Electrical Distribution

Date: 30 September 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 6H – Medium Voltage Electrical Distribution

CRITERIA REFERENCE DOCUMENTS: The publications listed below form a part of this document to the extent referenced. The publications are referred to in the text by the basic designation only.

NFPA 70 (2011), National Electrical Code

UFC 1-200-01, General Building Requirements

UFC 3-501-01, Electrical Engineering

UFC 3-550-01 Exterior Electrical Power Distribution

BFS 7A – Energy Conservation

BFS 7C –Sustainable Design & Development

LISTING: All electrical devices and components shall be listed for their intended use by UL or FM.

EXTERIOR POWER

a. Underground: Feed all new facilities underground.

(1) All primary underground feeders and secondary feeders from the transformer to the service entrance shall be installed in concrete-encased duct as described below.

(2) Designer shall use double-ended main switchboard on a transformer capacity of 2,000 KVA and larger. In other words, if the load requires 2,000 KVA or larger transformer capacity, the designer shall use two transformers (e.g., two 1,000 KVA) with a double-ended switchboard construction. Double-ended design shall have a main breaker on each side and a tie breaker.

(3) Air switches shall be provided and installed in order to comply with the Electrical Standards. Each exterior transformer shall be connected to a separate air switch compartment. Transformers shall not be looped to feed downstream exterior transformers.

b. Equipment Pads:

(1) Size pads to extend beyond transformer/switch 6” on all sides.

(2) Precast pads are not allowed. Equipment pads shall be poured on site with 3000 PSI and reinforcing steel.

(3) Pads shall have no openings to the dirt below. This is to keep fire ants out. Seal all openings and windows in pads with concrete.

(4) Use a counterpoise around the pad with #4/0 bare copper conductors. Add one ¾” X 10’ copper clad ground rod at all four corners. Extend a separate #4/0 bare copper conductor, in a PVC sleeve, to each equipment section (in the primary and secondary sections of padmount transformers and all four sections of padmounted switches). All connections below grade shall be exothermic type. Show detail on drawings.

c. Duct Bank:

(1) For main 15 KV lines (from manhole or switch to manhole), run 4-way 5 inch PVC (Sch. 40 or Type DB) concrete-encased, as a minimum. No EB (thin wall) will be accepted.

(2) Minimum size conduit from manhole to transformer shall be 2-4” PVC (Sch. 40 or Type DB) concrete-encased. No EB (thin wall) will be accepted.

(3) For last turn up into a pad, use Sch. 80 PVC if concrete is not encasing the last piece.

(4) Provide pull wires (nylon, Greenlee #430, 210 tensile strength) in each empty conduit.

(5) Use sweeping bends if only one turn of less than 90 degrees.

(6) Turns of 90 degree or more for 500 MCM, 15 KV shall have a manhole at the turn. Handholes are allowed for two runs (single-phase or three-phase) of #2, 15 KV only.

(7) Run neutral with phase conductors in each conduit.

(8) Use metallic backed warning tapes above all 15 KV duct banks. Show detail section for duct on drawings.

(9) Install low-voltage underground secondary conductors in RGS or PVC conduit sized and at the required depth per the NEC. Concrete-encasement is not required.

d. <u>Cable</u>: Main line is defined as cable running from switch to switch or riser pole to switch.

(1) Primary cable shall be 1/C, 15 KV, copper, XLPE (MV-90), shielded with 100% insulation.

(2) Neutral conductor shall be 600 volt with THWN insulation.

(3) Main line - 500 MCM, with #4/0 neutral.

(4) Transformer feeders shall be 3 1/C #2 XLP with #2 THWN neutral, except for 2,000-2,500 KVA which shall use 4/0 conductors.

e. Manholes and Handholes:

(1) Primary manholes:

(a) Use minimum size 8' x 8' x 7'.

(b) Place no more than 450' apart.

(c) Provide four 5" cast-in-place inserts on each inside wall.

(d) A manhole shall be provided at each switch location. Connect to manhole with one 5" duct entering each switch section.

(2) Primary (for #2, 15 KV cable only) and secondary handholes shall be 4' X 4' X 4'. All sides and bottom shall be concrete.

(a) 500 MCM, 15 KV cable shall be installed in manholes only.

(b) Turns of 90 degrees or more shall use secondary handholes or runs greater than 300'.

(3) Provide sumps.

(4) Provide circular metal covers and not removable tops, since these often require power equipment to remove.

(a) Provide minimum clear opening of 32".

(b) Provide H20 wheel loading.

(5) Core drill all existing manholes/handholes.

f. Connections:

(1) Use no primary cable T-splices! This includes inside manholes and handholes.

(2) Use only padmounted air switches for primary connections.

(3) Exterior transformers shall not be looped to connect downstream transformers. Each transformer shall be connected to a dedicated air switch compartment.

g. Padmount Air Switch Features - Design basis is S&C PMH-10

(1) 4-way, Air type.

(2) Live front, rated 600 amps with viewing window.

(3) Gang switched.

(4) No mechanical interlocks.

(5) Switches shall be factory painted Brown, Robins AFB #48.

(6) Furnish with the following options:

(a) Dual-purpose front barrier

(b) Grounding stud

(c) 18-inch carbon steel base spacer, noncompartmented to match enclosure.

(7) Furnish 6 locks and one key for each switch installed. Use locks manufactured by Best Lock Corporation, lock number 21B720L-R with core number 8A59, short shank. Keys provided shall be blank and uncut, also manufactured by Best Lock Corporation.

h. Riser Pole Connections When Specified.

(1) Use 5" rigid steel for 500 MCM and 4" rigid steel for #2.

(2) Make transition from overhead riser to underground with rigid steel elbow.

(3) Use fiberglass arms only on pole.

i. Service Entrance Transformers (General Requirements):

(1) Primary transformers shall not be installed indoors.

(2) Individual transformer sizes shall not exceed 2500 KVA.

(3) A separate transformer shall feed each facility or building.

(4) Designer shall use double-ended main switchboard on a transformer capacity of 2000 KVA (two 1000 KVA) and larger. Each transformer, service lateral, and side of the double ended main switchboard shall be sized for 25% spare capacity over the calculated demand, or at 20% spare capacity of the equipment rating.

(5) All new facilities shall be fed with 480/277 volts, unless special permission is granted by Civil Engineering at Robins AFB. On facilities with 480/277 volts and 208/120 volts, service into the facility shall be 480/277 volts with interior dry type step down transformers to supply the 208/120-volt system. Using separate exterior transformers to supply the 480/277-volt system and 208/120-volt system is not acceptable.

(6) Voltages: Primary - 12,470V Delta, Secondary - 480/277 volts.

(7) Pad mount transformers shall be factory painted Brown, Robins AFB #48.

(8) Furnish 1 lock and one key for each transformer installed. Use locks manufactured by Best Lock Corporation, lock number 21B720L-R with core number 8A59, short shank. Keys provided shall be blank and uncut, also manufactured by Best Lock Corporation.

(9) Unless stated elsewhere, the standard average winding temperature rise of 65 degrees, OA Class should be provided. Do not use forced air cooling to provide KVA capacity for demand load or spare capacity.

(10) Dry type primary transformers are not allowed.

(11) Transformers shall have an insulating fluid of the less flammable type, either a high fire point fluid or a silicone fluid.

j. Service Entrance Transformers (Construction Types):

(1) Use low profile utility type in residential areas.

(2) Pad Mount Transformer Standards:

(a) Pad mount construction may be used for applications rated at 1500 KVA and less. Due to the fusing arrangement specified herein, dead-front transformers rated 2000 – 2500 KVA are not readily available in pad mount construction. For larger transformers above 1500 KVA, use fused load interrupter switch with liquid filled substation transformer.

(b) Dead-front construction.

(c) Loop-feed construction with universal bushing wells. Install primary cable feed on one side with surge arrestors on the loop feed bushings.

(d) Load-break connectors

(e) Load-break on-off primary switch

(f) Fuses (Side-wall mounted "Bay-O-Net" oil-immersed expulsion fuses in series with coordinated oil-immersed current limiting fuses). Bay-O-Net fuses are to be externally replaceable with a hot stick without opening the transformer tank.

(g) External tap changer.

(h) 9 KV Lightning/surge arresters.

(i) Parking stands

(j) Four 2-1/2% high voltage taps, two above and two below rated voltage.

(k) Sufficient clearance for access to drain plugs.

(l) Full height isolating barriers between high voltage and secondary section.

(3) Fused Load Interrupter Switch with Substation Transformer

(a) Medium voltage fused switch and transformer shall be located on the exterior of the facility. New facilities shall be designed with the service entrance equipment located inside the main electrical room.

(b) Provide current limiting fuses in the Fused Load Interrupter Switch.

k. Walk-In Enclosures:

(1) Use exterior walk-in enclosures for equipment when renovating an existing facility with insufficient space inside electrical rooms to install new equipment. New facilities shall be designed with adequate interior floor space inside the facility electrical rooms for the new electrical equipment.

(2) Thermally insulate the walk-in housing.

(3) Provide ventilation fans, lights receptacles, and heating and air conditioning. Provide power from a small panelboard inside the enclosure.

(4) Feeder busway (if permitted) attached to a walk-in enclosure shall have the connection to the walk-in enclosure on the upper wall sides, not the top or roof.

(5) The same manufacturer shall manufacture the housing, transformer, and switchgear.

l. Facility Metering (SCADA and Other Central Systems)

(1) Provide metering and data recorders as needed for monitoring of all power, water, and gas utilities.

(2) Each transformer will require a separate meter mounted on a stand next to the transformer. Each data recorder has capability for four metering points. Each facility transformer will use a dedicated metering point on the data recorder. Provide the quantity of data recorders as needed to meet the data collection requirements.

(3) The Electrical Contractor shall provide the material and installation of the metering and data recorders at the transformers and throughout the system to provide a complete and operational installation. The RAFB standard electrical meter is an A3 ALPHA Meter, Type A3T, as manufactured by Elster Electricity LLC. See attached catalogue sheets for details.

(4) The Electrical Contractor shall provide a 1 1/2-inch conduit from the bottom of the transformer to the metering cabinet.

(5) The Electrical Contractor shall provide a 1 -inch conduit from each metering cabinet to the telephone backboard. The electrical Contractor will need to install a 4 pair cable from each data recorder (located in the metering cabinet) to the telephone backboard.

(6) Other metering functions shall be connected to the data recorder, such as monitoring of data pulses from water meters and gas meters. Each meter will occupy a data point in the data recorder. Provide data recorders as needed to monitor all points in the facility.

(7) This metering shall be in addition to the multifunction metering requirements listed elsewhere for service entrance switchboards.

m. Exterior Service Entrance Feeders

(1) Secondary Cables

(a) Run underground.

(b) Use single conductor copper with THWN insulation.

(c) Use no conductors larger than 500 MCM.

(2) Feeder busway may be used for liquid filled substation type transformers rated 2000 – 2500 KVA. However, their use is discouraged and considered only upon request.

<<<End of Section>>>

Author: Phil McGill, 778CES/CEPD, 478-327-2922

Reviewer: Adrian Bell, 778CES/CEPD, 478-327-2404

Approval: ***Original Signed By***
Terry Landreth, 778 CES/CEPT, 478-327-2910

A3 ALPHA® Meter

The A3 ALPHA Meter

Elster Electricity's A3 ALPHA meter builds upon the strengths of existing ALPHA meter designs. Like its predecessors, the A3 ALPHA meter uses Elster Electricity's patented digital measurement techniques that offer high accuracy, repeatability, and low ownership costs. In support of open architecture standards, the A3 ALPHA meter is the first Elster Electricity meter with full ANSI C12.18, C12.19 and C12.21 communication protocol support. Other features include advanced four quadrant metering, transformer and line loss compensation, and interval data recording of instrumentation values.

Interval Data Recording and Self Reads

The main circuit board in the A3 ALPHA meter has more than 40 KB of nonvolatile memory for storing profile, data logs, and self read data. Recording options include interval profiles of instrumentation data and up to 15 self reads. Additionally, an extended memory option board can be easily added to increase total memory by 1 MB.

When the optional instrumentation profiling is enabled, the A3 ALPHA meter stores two separate sets of instrumentation data. Each data set has an independent interval length and up to 16 channels (32 total). With instrumentation profiling, each meter becomes a powerful data collection tool to monitor data and diagnose problems without installing expensive temporary monitoring equipment. One of over 50 instrumentation quantities can be assigned to each channel, and the storage algorithm for each channel can be independently selected. Four storage algorithms are available:

- minimum value per interval
- maximum value per interval
- average value per interval
- end of interval snapshot

Instrumentation

Each A3 ALPHA meter, including the most basic demand version, can display over 50 different instrumentation quantities. With this highly integrated capability, the A3 ALPHA meter can provide the equivalent function of all of the following devices:

- voltmeter
- wattmeter
- VA meter
- distortion indicator
- ammeter
- VAR meter
- phase angle meter
- phase rotation indicator

Revenue Metering

The A3 ALPHA meter is a very accurate revenue meter (0.2 accuracy Class). Existing ALPHA meter users will find the basic A3 ALPHA meter types familiar. The A3 ALPHA meter provides advanced four quadrant revenue functions, transformer and line loss compensation, and increased data profiling without adding hardware option boards.

Meter type	No. of measured quantities
A3D	1 (Watthours only)
A3T	1 (Watthours only)
A3Q, A3K, A3R	2 (user configurable selections)
A3QA, A3KA, A3RA	6 (user configurable selections)

Each measured quantity is stored in nonvolatile memory and includes energy, demand, and TOU data. Note. TOU data is not available for A3D.

Technology to Empower Utilities

ELSTER

Power Quality Monitoring

Power quality monitoring (PQM) provides continuous service condition monitoring 24 hours a day. PQM looks for exceptions to user-defined thresholds for items such as voltage, current, and total harmonic distortion. Each of the 12 PQM tests can be configured to control relay activation, LCD warning, date/time stamp log entry, and even an automatic telephone call to report the condition.

ANSI Communications Protocols

As the industry moves to the ANSI communications protocols, more system/communications options will become available, enabling A3 ALPHA meter users to benefit from a more competitive environment for data collection and analysis. The A3 ALPHA meter provides full support for ANSI C12.18, C12.19 and C12.21 communications protocols and data structures to prepare you for the future.

A Communication Enabler

Data can be retrieved using the standard optical communications port. Additional communications interfaces are available for A3 ALPHA meters as a simple add-on option board:

- 2400 bps internal telephone modem with outage reporting capabilities
- RS-232
- RS-485
- external serial interface
- 20 mA current loop
- internal LAN controller (ILC1)
- internal LAN node (ILN1)
- Itron 50ESS ERT®

Communications interfaces can be combined with alarming options in the A3 ALPHA meter to permit immediate notification of critical events.

The relay option boards of all existing ALPHA meters are compatible with the A3 ALPHA meter. When relay option boards are used with the A3 ALPHA meter, the relay functions are fully programmable.

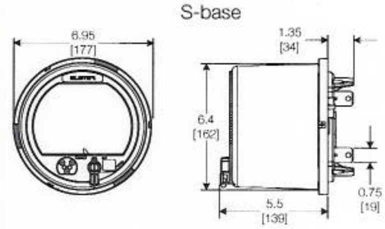
Optional AnyPhase™ Power Supply

With the optional AnyPhase power supply installed, the A3 ALPHA meter is powered from all wires of the electrical service. If one or more service wires are disconnected, the meter is automatically powered from any two service wires including line-to-line or line-to-neutral.

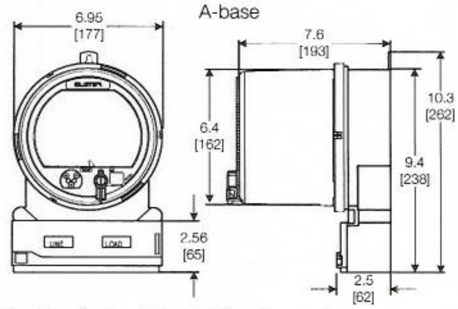
A3 ALPHA Specifications and Technical Data

Absolute Maximums		
Voltage	Continuous 528 VAC (AnyPhase option: L-L or L-N)	
Surge voltage withstand	*ANSI C37.90.1 Oscillatory*	2.5 kV, 2500 strikes
	Fast transient	5 kV, 2500 strikes
	ANSI C62.41	6 kV at 1.2/50 µs, 10 strikes
	IEC 61000-4-4	4 kV, 2.5 kHz repetitive burst for 1 minute
	ANSI C12.1 insulation	2.5 kV, 60 Hz for 1 minute
Current	Continuous at Class amperes	
	Temporary (1 second) at 200 % of meter max. current	
Operating Ranges		
Voltage	*Nameplate nominal range*	120 V to 480 V
	Operating range	96 V to 528 V
Current	0 to Class amperes	
Frequency	Nominal 50 Hz or 60 Hz ±5 %	
Temperature range	-40 °C to +85 °C inside meter cover	
Humidity range	0 % to 100 % noncondensing	
Operating Characteristics		
Power supply burden	Less than 4 W	
Per phase current burden	0.1 milliohms typical at 25 °C	
Per phase voltage burden	*120 V*	0.008 W
	240 V	0.03 W
	480 V	0.04 W
Accuracy	Meets ANSI C12.20 accuracy for accuracy class 0.2 %	
General Performance Characteristics		
Starting current	*Form 1S and Form 3S*	10 mA for Class 20 100 mA for Class 200 160 mA for Class 320
	All other forms	5 mA for Class 20 50 mA for Class 200 80 mA for Class 320
Creep 0.000A (no current)	No more than one pulse measured per quantity, conforming to ANSI C12.1 requirements	
Primary time base	Power line frequency (50 Hz or 60 Hz), with selectable crystal oscillator	
Secondary time base	Meets the ANSI limit of 0.02 % using the 32.768 kHz crystal. Initial performance is expected to be equal to or better than ±55 seconds per month at room temperature	
Outage carryover capacity	6 hours at 25 °C. Supercapacitor rated at 0.1 Farads, 5.5 V	
Battery (optional)	$LiSOCl_2$ battery rated 1000 mAhr, 3.6 V and shelf life of 20+ years. 5 years continuous duty at 25 °C	
Communications rate	*Optical port*	300 to 28,800 bps
	Remote port	1200 to 19,200 bps
ANSI Standards	C12.1; C12.10; C12.18; C12.19; C12.20; C12.21	
Shipping Weights *All values are approximate*		
S-base	*Single*	5.06 lbs [2.30 kg]
	4-pack	13.46 lbs [6.11 kg]
A-base	*Single*	7.38 lbs [3.35 kg]
	4-pack	26.02 lbs [11.82 kg]

S-base



A-base



Dimensions in inches [millimeters]. For reference only. Do not use in construction.

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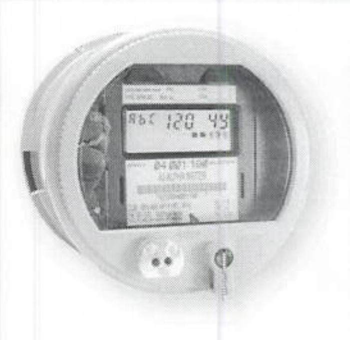
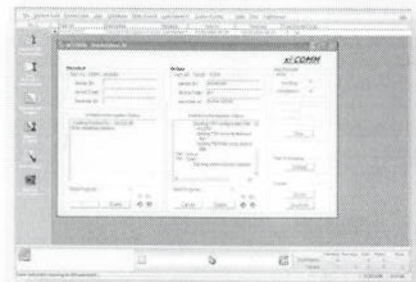
METRUM TECHNOLOGIES

Digital Cellular Under Glass

PRODUCT INFORMATION:

OV-2000IP Wireless Modem for the ELSTER A3 ALPHA® Meter





OV-2000IP A3

Metrum Technologies' CDMA/1xRTT integrated solution combines with the Elster Electricity A3 ALPHA meter to provide utilities with the ideal wireless C&I metering technology.

Contained completely "Under the Cover", this true pass through technology makes remote communications, data acquisition, and wireless meter programming easy and dependable by utilizing the CDMA/1xRTT public network and the Utility's existing MV-90 meter reading systems and practices.

Available for all forms and voltages, the OV2000IP features true pass through communications, auto-ranging power supply, remote diagnostics and programming, over-the-air activation and configurability for circuit switched or packet switched data, automated error code and power restoration notification, telnet communications, meter programming and much more.

With the OV2000IP A3, utilities can leverage the most reliable high speed wireless data networks and their existing investments in data acquisition systems to meet the increasing need for remote communications.

Specifications:

Meter Compatibility
Elster A3 ALPHA

Voltage
120 to 480 ranging

Operating Temperature
-30 to 70 degrees C

Meter Interface
TTL

Software
MV-90 and Metercat®

Communications
CDMA 1xRTT – IS-95,
Static IP, Dynamic IP

DATA Transmission
up to 153Kbps

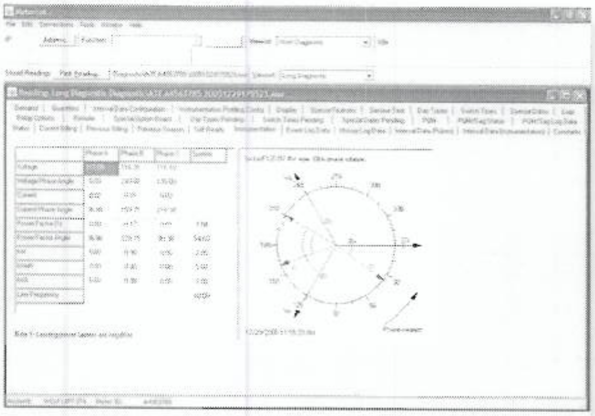
Antenna
Internal or External Dual Band

For More Information: Metrum Technologies / P.O. Box 154385 / Waco, Texas 76715-4385 U.S.A.
www.metrum.us / TEL: 254.799.8553 / FAX: 254.799.0266

METRUM TECHNOLOGIES

Digital Cellular Under Glass

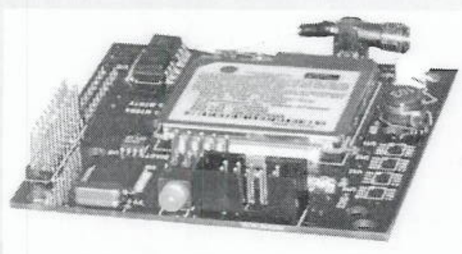
True Pass Through Communications



Benefits:

- Under Glass Solution - No external devices to install, maintain, or replace
- Read with existing MV-90 system - no new software or monthly reading charges
- Completely compatible with Meter Manufacturer's Software
- Over the Air Activation and Configurability
- Leverage the existing high speed wireless public networks
- Analog modem replacement
- Compatible with all forms and voltages
- On demand wireless communications and full LP reads
- Power restore notification
- Error codes returned in SMS or email message
- Deploying and using is as easy as installing a meter
- Get the data you need when you need it

- Auto Ranging Power Supply
- Full Functionality with Meter Manufacturer's Software
- Over the Air Activation, Diagnostics and Configurability



verizon wireless
We never stop working for you.®

alltel

For More Information: Metrum Technologies / P.O. Box 154385 / Waco, Texas 76715-4385 U.S.A.
www.metrum.us / TEL: 254.799.8553 / FAX: 254.799.0266

Robins Air Force Base
Base Facility Standards

Title: Intrusion Detection Systems (IDS)

Date: July 25, 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 6I– INTRUSION DETECTION SYSTEMS (IDS)

CRITERIA REFERENCE DOCUMENTS: The publications listed below form a part of this document to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)
ASTM B 32 (2004) Standard Specification for Solder Metal
ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
IEEE Std. 100 (2000) the Authoritative Dictionary of IEEE Standards Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
NEMA ICS 2 (2000; Errata 2002; R 2005; Errata 2006)

STANDARD FOR INDUSTRIAL CONTROL AND SYSTEMS
Controllers, Contractors, and Overload Relays Rated Not More than 2000 Volts AC or 750 Volts DC: Part 8 - Disconnect Devices for Use in Industrial Control Equipment
NEMA ICS 6 (1993; R 2006) Standard for Industrial Controls and Systems Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA 72)
NFPA 70 (2007) National Electrical Code, Article 725, 800

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
47 CFR 15 Radio Frequency Devices

UNDERWRITERS LABORATORIES (UL)
UL 2050 Industrial Intrusion Detection Standard
UL 1076 UL Standard for Safety Proprietary Burglar Alarm Units and Systems
UL 1610 (1998; Rev thru Aug 2005) Central-Station Burglar-Alarm Units
UL 1635 (1996; Rev thru Aug 2005) Digital Alarm Communicator System Units
UL 1638 (2001; Rev thru Nov 2003) Visual Signaling Appliances - Private Mode Emergency and General Utility Signaling
UL 464 (2003; Rev thru Oct 2003) Standard for Audible Signal Appliances
UL 609 (1996; Rev thru Mar 2005) Local Burglar Alarm Units and Systems
UL 634 (2000) Connectors and Switches for Use with Burglar-Alarm Systems
UL 639 (2007) Intrusion Detection Units
UL 681 (1999; Rev thru Jan 2001) Installation and Classification of Burglar and Holdup Alarm Systems
UL 796 (2006; Rev thru Jun 2007) Printed-Wiring Boards
UL 827 Standard for Central-Station Alarm Services
UL 864 Standard for Control Units for Fire-Protective Signaling Systems

1. Intrusion Detection Systems Approval

    a. This standard covers Intrusion Detection Systems (IDS) consisting of Commercial Off the Shelf (COTS) equipment which is limited to a full range of interior point protection devices, duress sensors, volumetric (space) protection sensors, alarm signal data communications media, and alarm reporting and monitoring systems. System requirements shall conform to this standard for Intrusion Detection Systems (IDS) installed at Robins Air Force Base. IDS installed at Robins Air Force Base shall meet or exceed National Industrial Security Program and UL 2050. All firms or contractors must be listed with UL under National Industrial Security Systems. All IDS must be approved by the 78 Security Forces Electronic Security Specialist (78SFS/ESS) before any purchasing or contracting for installation of an Industrial Intrusion Detection System. A drawing showing the proposed area and layout of intrusion detection devices must be submitted for this approval process. If there are questions concerning system design, Contact the 778 CES/CEPD. 78 Security Forces should be consulted for the amount of coverage needed for a given area. Comments and suggestions on this guide specification are welcome and should be directed to the778CES/CEPD. Compliance to this specification is mandatory and shall not be deviated from without written permission from the 78SFS/ESS.

    b. The following information shall be shown on the project drawings:

(1) Protection Plans: Location of security devices, control units, alarm display equipment, electrical power closets, and communications closets.
(2) Site Plan: Show Entry Control Point (ECP) and all exit doors in the proposed protected area.
(3) Assessable Portals: Show any windows, air vents, and crawl spaces that can be used to gain access to the area.
(4) Solid Walls: Use distinguished lines for all exterior walls, fire walls, and temporary walls that are located in the area.
(5) Sensitive Areas: Show within the space the area of most concern. (Safes, server racks, weapon storage, or high level work areas).

2. References: See above.

3. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products. Items of equipment shall essentially duplicate equipment that have been in satisfactory use at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

    a. Definitions:

        (1) Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE Std. 100.

(2) Active mode: That in which some type of signal is continuously sent across the link, resulting in simple link breaks being readily detected.

(3) Element: Constituent part of a complex signal such as AC or DC voltage or current, AC phase, or frequency duration.

(4) Fail Secure: Capability to monitor for system functions and to report an alarm when a failure is detected in a critical system function.

(5) Installer: Either the Contractor or a subcontractor with whom the Contractor has a firm contractual agreement.

(6) Intruder: Animate object at least 48 inches in height, 75 pounds in weight 4 cubic feet in volume, moving through protected zones or portals at a velocity of 0.1 to 10 feet per second.

(7) Sensor zone: Geographic position for which an intrusion must be identified and displayed and may be the combination of multiple detection devices.

(8) In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

b. System Descriptions:

Provide new Intrusion Detection System (IDS), including associated equipment and appurtenances. Provision of Intrusion Detection System shall include supervising installation of rigid or flexible conduit for Intrusion Detection System during site preparation, running system wires and cables, and system component installation, component testing, and system checkout. Each system shall be complete and ready for operation. Equipment, materials, installation, workmanship, inspection, and testing shall be as specified herein. Premise Control Unit shall be manufactured by Honeywell, shall be model number Vista 128BP or Vista 250BP, and shall use an AES 7788-8 transceiver with a 7094 IntelliPro Digital Dialer Interface installed. The Premise Control Unit shall have a telephone backup line installed and shall be supervised by the AES 7094 for line-cut. New equipment shall be compatible with and shall operate accurately and reliably with the Base Central Station.

4. Submittals:

NOTE: Government approval is required for all submittals. Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

a. Submittal Procedures:

The Contracting Officer's Technical Representative will review and approve submittals requiring special review in this section. Drawings and descriptive data shall be approved prior to procurement, fabrication, and installation. A schedule of required submittals shall be prepared to be integrated with the overall construction management schedule to ensure adequate review and necessary corrective work before installation. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. Submittals shall include the nameplate data, size, and capacity. Submittals shall also include applicable federal, military, industry, and technical society publication references.

b. Quality Assurance:

(1) Drawings: Provide one hard copy for review of proposed protection. At the end of the project provide one hard copy of the as-built and one digital copy in DWG format.

(2) Intrusion Detection System Components: Provide drawings that clearly and completely indicate the function of each component of the IDS. Indicate termination points of devices and indicate interconnections required for operation of the system. Indicate interconnection between modules and devices. In addition, provide a layout drawing which shows spacing of components, location, and details of mounting and positioning.

(3) Overall System Schematic: The overall system schematic shall indicate the sequence of operation, the relationship of integrated components on one diagram, and show power source, system controls, impedance matches, plus number, size, identification, and maximum lengths of interconnecting wires. Drawings shall not be less than 11 by 17 inches.

(4) Experience and Qualifications: Only UL certified installers will be allowed to install devices on an Intrusion Detection System at RAFB.

(a) Installer's Qualifications: Prior to installation, submit data for approval by the Contracting Officer’s Technical Representative of the installer's experience and certified qualifications under UL National Industrial Security Program. Show that the installer who will perform the work has a minimum of three years experience successfully installing Intrusion Detection Systems of the same type and design as specified herein. Include names, locations, and points of contact of at least five installations of the same type and design as specified herein where the installer has installed such systems. Indicate the type of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than one year.

(b) Instructor's Qualifications: Prior to installation, submit data of the instructor's experience and certified qualifications. Show that the instructor, who will train operating and maintenance personnel, has received a minimum of 24 hours of Intrusion Detection System training from a technical organization such as the National Burglar and Fire Alarm Association, and has two years experience installing Intrusion Detection Systems of the type specified.

(5) IDS Operational Test Plan: Submit for approval at least 30 days prior to commencement of formal operational testing. Include detailed procedures for operational testing of each Intrusion Detection System component and subsystem, and for performance of an integrated system test.

(6) IDS Equipment: Submit manufacturer's certification of UL listing.

c. Regulatory Requirements:

(1) Reference Standard Compliance: Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), Underwriters Laboratories (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.

(2) Independent Testing Organization Certificate: In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard Provide only UL listed ESS equipment for Both exterior and interior ESS sensors, access control, and closed-circuit television (CCTV) components.

d. Standard Products:

(1) Materials: Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design, and workmanship.

(2) Product Service Period: Products shall have been in satisfactory commercial or industrial use for two years prior to bid opening. The two year period shall include applications of equipment and materials under similar circumstances and of similar size.

(3) Market: The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the two year period.

(4) Single Manufacturer: Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

(a) Alternative Qualifications: Products having less than a two year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

(b) Material and Equipment Manufacturing Date: Products manufactured more than two years prior to date of delivery to site shall not be used, unless specified otherwise.

e. Warranty:

(1) Service Organizations: The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of one year after acceptance.

(a) Service Time: During the one year period the installing company shall provide 24 hour repair service of the Intrusion Detection System.

(b) Response Time: The contractor shall respond within four hours on being notified that repairs are needed to the affected Intrusion Detection System.

(c) Qualifications of Responder: The responding alarm technician must be qualified to service the Intrusion Detection System.

5. Products

a. IDS Subsystems:

(1) Integration Requirements: provide a complete integrated Intrusion Detection System consisting of the following major subsystems:

(a) Detection

(b) Arm/disarm multiple function Security Control Pad

(c) Communications

(d) Assessment

(e) Alarm reporting

(f) Power

b. Integrated System Functional Requirements:

(1) Functional Requirements: Ensure that the Intrusion Detection System is fully integrated with the physical security and other elements of the overall facility security system. Except for multiple function Security Control Pads, other subsystems may be housed in a single enclosure. Specific subsystem functional requirements are as follows:

(a) Detection subsystem: Subsystem shall consist of sensors to detect intrusion attempts and provide means to indicate a tamper condition.

(b) Arm/disarm multiple function Security Control Pads: Subsystem shall consist of electronic digital Security Control Pad to monitor and control personnel movement through normal access routes in and out of the facility and between protected areas within the facility.

(c) Communications subsystem: Subsystem shall consist of elements required to ensure that pertinent data is transferred from the point of origin to the point where appropriate actions can be taken.

(d) Assessment subsystem: Subsystem shall consist of electronic devices required to visually and audibly verify the validity of Intrusion Detection System alarms.

(e) Alarm reporting subsystem: Subsystem shall consist of electronic devices to control, process, integrate, and annunciate Intrusion Detection System data at the Law Enforcement Center.

(f) Power subsystem: Subsystem shall consist of components required to ensure continuous operation of the entire Intrusion Detection System for 24 hours of power loss.

c. Intrinsically Safe:

NOTE: Do not locate control communicator within a hazardous area. If point sensors and volumetric sensors are required in hazardous areas, clearly identify their location on the plans.

(1) System components located in areas where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or filings shall be rated and installed according to NFPA 70. Classification of area and corresponding equipment ratings and installation procedures shall be as defined and specified in Chapter 5 of NFPA 70.

d. Integrated System Performance Requirements:

(1) The installed and operating Intrusion Detection System shall be integrated into the overall protected area to detect intrusion and shall perform as an entity, as specified below.

(a) Detection Coverage: Provide and adjust sensors so that coverage is overlapping and maximized without mutual interference. Intrusion Detection System coverage shall include the facility perimeter and critical spaces within the facility.

(b) Detection Resolution (Sensitivity): Sensitivity shall be capable of the following requirements:

1) Locating intrusions at individually protected assets or at an individual portal.

2) Locating intrusions within volume/areas to within the coverage on any single volumetric sensor.

3) Locating failures or tampering at individual sensors.

(2) Detection Alarm and Reporting Capacity: The Intrusion Detection System shall have the capacity to collect, communicate, and display a minimum of 128 programmable sensor zone alarms and to enable control of one or more response devices in each of the sensor zones. When a sensor zone includes a combination of multiple detection devices, the system shall maintain the capability to identify individual detection devices in an alarm state. A single alarm shall be annunciated within approximately 2 seconds after sensor transducer or other detection device activation.

(a) Alarms: Alarm shall include, but not be limited to, the following:

1) Intrusion detection

2) Tamper detection

3) Fail secured operation

4) AC power loss detection

5) Low battery in control communicator

(b) Intrusion Detection: Sense and respond with visible and audible signals the activation of detection sensors.

(c) Tamper Detection: Tamper protection can be physical protection, line supervision, encryption, and tamper alarming of enclosures and components.

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NOTE: Each tamper loop requires a dedicated sensor zone in the control communicator. Do not use one tamper loop for an entire building since it would be difficult to trace the violated device or box. Instead, zone tamper loops by areas and devices to more conveniently locate a violated device or area. All tamper points shall be labeled with an odd number.

e. Tamper Requirements: All intrusion detection, access control, assessment systems, and their associated data transmission media must be protected commensurate with the classification of asset being protected.

(1) Enclosures: All intrusion detection sensors and access control readers must have tamper resistant enclosures and integral tamper protection switches.

(a) All enclosures, cabinets, housings, and boxes, having hinged doors or removable covers that contain processors or connections must have tamper protection switches.

(2) Tamper Signals: All tamper alarm signals must be monitored continuously (24hr.) whether the system is in the access or secure mode of operation.

(3) Tamper alarms shall be annunciated to be clearly distinguishable from intrusion detection alarms.

(4) Tamper switches on doors which must be opened to make normal maintenance adjustments to the system and to service the power supplies shall be normally closed, automatic-reset type.

(5) Tamper switches shall have the following features:

(a) Inaccessibility until the switch is activated

(b) Under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating

(c) Spring-loaded and held in the closed position by the door or cover protected.

(d) Wired to break the circuit when the door or cover is disturbed.

(e) Fail Secure: Provide a fail secure capability in critical elements of the Intrusion Detection System, including, but not be limited to, the capability to monitor communication link integrity and to provide self-test. When diminished functional capabilities are detected, the system shall provide annunciation of the fault. Fail secure alarms shall be annunciated to be clearly distinguishable from other types of alarms.

(f) Line Fault: As a minimum, fault isolation at the systems level shall have the same geographic resolution as provided for intrusion detection. Communication links of the Intrusion Detection System shall have an active mode for line fault detection. The system shall be either a static system or a dynamic system. In a static system, the "no-alarm" condition shall always be represented by the same signal, which shall be different than the signal originally transmitted. The dynamic system shall represent "no-alarm" with a signal which continually changes with time.

(6) Power Loss: Provide the capability to detect when a critical component of the system experiences temporary or permanent loss of power and to declare an alarm. The alarm shall be annunciated to clearly identify the component experiencing power loss.

(7) Electrical Power: Electrical power shall be obtained by the normal commercial or base electrical distribution system. Power shall be continuously monitored and, if interrupted, automatic switching from primary to emergency backup sources shall be accomplished without interruption or degradation of critical system function. Intrusion alarms shall not be generated by power switching; however, an indication of power switching and on-line source shall be provided at the alarm monitor. Upon restoration of primary power, the system shall automatically switch back to the primary source. Low voltage condition of an on-line battery and battery charger circuit failure shall be detected and reported as a fault condition.

(a) Primary Power: Furnish 120 volt AC service, transformed through a hard wired two-winding isolation transformer and stepped down to 16.5 volts AC for system operation.

(b) Provide a dedicated circuit to power the Intrusion Detection System from a panel board at the location indicated.

(c) Label the circuit breaker in that panel board and provide a lock for the breaker. Label shall state: “IDS Do Not Turn Off."

(8) Backup Power: Provide backup power to the primary power by dedicated batteries in remotely located system elements such as individual sensors and in control communicators.

(a) When radio frequency (RF) operation is required, batteries shall be an integral part of dispersed system elements.

(b) Batteries shall be capable of operation in any position and shall be protected against venting caustic chemicals or fumes within an equipment cabinet.

(c) Batteries shall also be capable of continuous operation for up to 24 hours without recharge or replacement.

(d) If the sensors power requirements exceed the allowable UL rated capacity of the control communicator battery, provide the number of separate power supplies required to power the sensors.

(e) Provide each power supply with its own rechargeable battery and charger.

6. System Performance Requirements:

a. Provide Commercial off the Shelf (COTS) system components to operate as described herein within the context of the integrated system performance previously described. Where inconsistencies occur between the following component performance requirements and integrated system level performance descriptions, integrated system performance descriptions shall take precedence.

b. Modularity: Provide system components to facilitate modular subassembly and part replacement. Electronic components of the system shall be of the solid-state type, mounted on printed circuit boards conforming to UL 796. Circuitry shall not be so densely placed as to impede maintenance. Power dissipating components shall incorporate safety margins of not less than 25 percent with respect to dissipation ratings, maximum voltages, and current carrying capacity. Light duty relays and similar switching devices shall be solid-state or hermetically sealed electromechanical type.

c. Reliability: Provide only components in current manufacturing production. Components shall be manufactured to meet requirements specified herein and shall be free from characteristics and defects which affect appearance or serviceability or which render equipment unsuitable for the intended purpose. Provide components designed for continuous operation at specified conditions.

d. Maintainability: Components shall be capable of being maintained using commercially available standard tools and equipment. Components shall be arranged and assembled to be readily accessible to maintenance personnel without compromising the integrity of the Intrusion Detection System.

e. Environmental Conditions:

   (1) Interior Conditions: Equipment installed in environmentally protected interior areas shall meet performance requirements specified by UL for the specific equipment or device.

   (2) Exterior Conditions: Components mounted in locations exposed to weather shall be housed in corrosion-resistant enclosures with appropriate environmental protection. Component performance shall not degrade because of improper housing design. Components in enclosures shall meet performance requirements when exposed to ambient conditions specified by UL for the specific equipment or device.

f. Transient Voltage Surge Suppression: Intrusion detection and communication circuits shall be protected at both ends against transient voltage surges. Transient Voltage Surge Suppressors (TVSS) or surge protection devices (SPD) are required for the protection, within specified limits, of AC electrical circuits and electronic equipment from the effects of lightning induced voltages, external switching transients and internally generated switching transients. Individual suppressors shall be installed where shown on the drawings.

g. Electromagnetic Interference (EMI): Intrusion Detection System components employing electromagnetic radiation shall be designed and constructed to provide maximum practical invulnerability to electronic countermeasures.

h. Electromagnetic Radiation (EMR): Provide only Intrusion Detection System components which are FCC licensed and approved. Provide system components which are electromagnetically compatible.

i. Interchangeability: Like components shall be physically and functionally interchangeable as complete items, without modification of either the original items or of other components with which the items are used.

j. Safety: Intrusion Detection System components shall conform to application rules and requirements of NFPA 70 and applicable Underwriters Laboratories publications.

k. Human Engineering: Aural considerations shall include location of annunciators, tone pitch, quality, and intensity.

   (1) The number of different audible signals shall not exceed four. Component design shall provide for ease of accessibility for maintenance.

l. Visual Annunciators: Annunciators shall be either liquid crystal displays (LCDs) or light emitting diodes (LEDs).

(1) Annunciators shall be so connected in the circuit that failure of the annunciator, socket, or protective circuitry shall not result in an improper or indeterminate signal. LCDs and LEDs shall be compatible with standby power supplies.

(2) LEDs shall be brightly lit and visible from a distance of 30 feet in an area illuminated at 807 l x 75 foot-candles.

(3) LEDs shall be used in outdoor applications or in the presence of sunlight.

m. Controls: Provide to ensure ease of operation of specified characteristics. Controls, switches, visual signals, and indicating devices, input and output connectors, terminals, and test points shall be clearly marked or labeled on hardware to permit quick identification, intended use, and location.

(1) Terminal markings and labels shall be of a permanent and legible type and located to be visible when the associated system wiring is in place.

(2) Identification markings shall be associated with each adjustment device or item requiring periodic maintenance.

(3) Safety warning or cautions shall be marked in conspicuous red letters. Control and indicator identifications that are exposed outside enclosures shall be permanent machine engraved letters, and painted to contrast with the background color.

(4) Controls not required for operation of the system shall be inaccessible to the system operator.

n. Test Points: Test points, controls, and other adjustments inside enclosures shall be readily visible and accessible with minimum disassembly of equipment. Test points and other maintenance controls shall not be readily accessible to operator personnel.

o. Component Enclosures: Annunciator housings, power supply enclosures, sensor control, and terminal cabinets, control communicators, wiring gutters, and other component housings, collectively referred to as enclosures, shall be formed, and assembled to be sturdy and rigid.

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Note: Main Premise Control Unit cabinet shall have no modifications to the cabinet to facilitate conduit or other devices. Only the conduit knock-outs that were provided by the manufacture shall be used and these knock-outs shall not be made larger to allow larger pipe sizes.

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p. Metal Thickness: Thicknesses of metal in cast and sheet metal enclosures of all types shall not be less than those in Tables 8.1, 8.2, and 8.3 of UL 1610 for alarm components, NEMA ICS 2, and NEMA ICS 6 for other enclosures.

q. Doors and Covers: Doors and covers shall be flanged. Where doors are mounted on hinges with exposed pins, hinges shall be of the tight-pin type, or ends of hinge pins shall be tack welded to prevent ready removal.

   (1) Provide doors having a latch edge length of less than 24 inches with a single lock.

   (2) Where the latch edge of a hinged door is 24 inches or more in length provide the door with a three-point latching device with lock; or alternatively with two locks, one located near each end.

   (3) All knock-outs shall be plugged with hardware that cannot be removed from outside the box or cabinet.

   (4) Covers of junction boxes provided to facilitate initial installation of the system shall be held in place by tack welding, brazing, or one-way screws.

r. Ventilation: Ventilation openings in enclosures and cabinets shall conform to the requirements of UL 1610.

s. Mounting: Unless otherwise indicated, sheet metal enclosures shall be designed for wall mounting with top hole slotted. Mounting holes shall be in positions which remain accessible when major operating components are in place and the door is open, but shall be inaccessible when the door is closed.

t. Enclosure Locks: Locks and key-lock operated switches required to be installed on component enclosures shall be UL listed, round-key type with three dual, one mushroom, and three plain pin tumblers, or shall have a pick resistance equal to a lock having a combination of five cylinder pin and five-point three-position side bar in the same lock.

   (1) Keys shall be stamped "U.S. GOVT. DO NOT DUPLICATE." Key-lock operated switches shall be keyed differently and shall be two-position, with the key retractable from either position.

   (2) Furnish two keys for each lock. Maintenance locks shall be of the one-way key-pull type arranged so that the key can be withdrawn only when the lock is in the locked position.

   (3) Locks on components for maintenance access shall be keyed alike; furnish only two keys for such locks.

   (4) Deliver keys, tagged with metal tags, accompanied by a manufacturer's certificate which records the number of each key made.

7. Detection Sensors: Sensors shall detect penetration of the facility perimeter and protected zones by unauthorized personnel or intruders, and shall conform to UL 634 or UL 639, as applicable. Unless otherwise specified, required sensor power shall be 12 volts DC.

   a. Interior Point Sensors

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NOTE: Only Balanced Magnetic Switches will be accepted on IDS at RAFB

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(1) Door and window open detection: Balanced Magnetic Switch (BMS) shall be surface mounted or recessed.

(a) Balanced Magnetic Switch shall have a magnetic field tamper circuit with a high probability of alarm if an external magnet is introduced in defeat attempts.

1) Provide each magnetic switch with an over current protective device, rated to limit current to 80 percent of switch capacity.

2) The magnetic switch housing shall be protected from unauthorized access by encapsulating reed switches in a polyurethane potting compound.

3) The magnetic switch shall have a tamper resistant enclosure, a pry tamper and integral tamper switch.

4) Magnetic switch shall be rated for a minimum lifetime of one million operations.

5) BMS shall be installed with the proper mounting hardware provided by the manufacture.

6) Conductors running from the door to alarm circuits shall be unimpaired within a flexible armored cord constructed from corrosion-resistant metal.

7) Each end of the armored cord shall terminate in a junction box or other enclosure.

8) Armored cord ends shall be mechanically secured to junction boxes by clamps or bushings.

9) Conductors and the armored cord shall experience no mechanical strain as the door is moved from fully open to close.

10) The switch circuit shall initiate a tamper alarm if a short circuit is applied to the door cord.

(b) Recessed Balanced Magnetic Switch: The recessed Balanced Magnetic Switch shall have a gap up to 1/2 inch (3/8 inch in steel).

1) Field adjustments in the fixed space between magnet and switch housing shall not be possible.

2) Ball-bearing door trips shall be mounted within vault door headers such that when the locking mechanism is secured, the door bolt engages an actuator, mechanically closing the switch.

3) The door bolt locking mechanism shall be completely engaged before the ball-bearing door trip is activated.

4) The magnetic switch shall have a tamper resistant enclosure and integral tamper switch.

(c) Glass Breakage Sensors: Sensors shall detect window breakage by responding to sonic or vibration frequencies that accompany breaking glass.

1) Sensors shall selectively filter input to detect only frequency of breaking glass and to minimize false alarms from sources such as jangling keys, ringing phones, and slamming doors.

2) Glass Breakage Sensors shall initiate alarm when the glass they protect is cracked or broken.

3) Sensors shall provide positive detection of breakage of plate, safety, laminated, and tempered glass.

4) Sensor shall have a sensitivity adjustment controlling the output voltage from the detecting element which triggers a solid-state latching device. Provide the sensor with an LED for adjusting the sensitivity.

5) Sensor shall be contained in a fire-resistant ABS plastic housing and shall be ceiling or wall mounted, as indicated.

6) Sensor shall provide coverage of large glass areas up to 35 feet wide. Sensor housing shall be tamper resistant and designed for screw mounting.

7) Sensor shall not initiate alarm in response to seismic vibrations or other ambient stimuli.

8) The sensor shall have a tamper resistant enclosure and integral tamper switch.

(d) Dual Technology Glass Break Sensor: Sensor shall detect window breakage by responding to acoustic frequencies that accompany breaking glass.

1) The sensor shall be combined with a passive infrared motion detector (PIR) for the purpose of eliminating occupant-generated false alarms. It will extend coverage to occupied areas, allowing the sensors to be armed while people are present.

2) The sensor shall have a tamper resistant enclosure and integral tamper switch.

(e) Recessed Glass Break Sensor: A recessed glass break sensor is to be used when appearance is a consideration. Recessed models can be mounted directly to the wall or ceiling or can be installed on a single gang box.

1) The sensor shall employ pattern recognition technology that listens for the actual pattern of breaking glass.

2) The sensor shall be able to detect the difference from breaking glass and normal room sounds by listening across the glassbreak frequency spectrum.

3) The sensor shall provide 25 feet, 360 degree coverage of the area to be protected.

4) The sensor shall have a tamper resistant enclosure and integral tamper switch.

(f) Screening: Construct security screens from a maximum of 26 AWG insulated hard-drawn copper. Connect screens to an alarm circuitry by means of flexible armored cords.

1) Security screen circuitry shall provide end-of-line resistors in series or equivalent methods ensuring alarm activation if short-circuiting of the screen is attempted. If screen corners are not installed as a break wire sensor (wire traps), provide tamper switches.

2) Provide tamper switches in frames as required with not less than one switch on each side if dimensions are 2 feet square or less, and two switches if dimensions exceed 2 feet square. Tamper switches shall be corrosion resistant; spring operated, and shall initiate an alarm with a movement of 2 inches or less and before access to the switch is possible. Electrical characteristics of the switch shall match alarm system requirements. The sensor shall have a tamper resistant enclosure and integral tamper switch.

(2) Object Protection: Safes and Vaults

(a) Capacitance proximity sensor: Capacitance proximity sensor shall detect changes in the established capacitance to ground of a protected object. When the protected object is touched and a ± 20 pf - (variable) change in the capacitance is detected an alarm shall be generated. Circuits measure the ratio between the charging current and the resultant rate of change of voltage with time.

(b) Sensor shall protect objects up to a 50,000 Pico farad capacitive load. The system shall provide means of indicating an alarm condition at the protected objects during installation and calibration. Provide the indicator with a disabling device within a tamperproof enclosure.

(c) The number of objects protected by a single capacitance detector shall not exceed the unit's maximum capacitance at the desired sensitivity.

(d) Protected objects shall be insulated from ground by insulating pads which shall have a dielectric constant such as glass or thermoplastic materials. If screen grids or radiators are employed as antennas, insulate from ground. Wires used for grids shall be larger than No. 14 AWG, 30 percent copper-clad steel covered with a minimum of 1/32 inch vinyl coating. Space grid elements at 6 inches maximum, and construct in a symmetrical manner.

(e) Provide sensor with sensitivity controls inaccessible to operating personnel.

(f) Sensor shall be insensitive to human body movements in excess of 36 inches from the antenna circuit.

(g) Sensor sensitivity to alarm-producing stimuli shall be readily adjustable from contact to 36 inches with a heavily gloved hand.

(h) Sensor shall not initiate nuisance alarms in response to normal ambient conditions.

(i) Provide sensors with tamper switches. Interconnecting lines and tamper switches shall remain under constant supervision, even when the system is set for authorized access.

(j) Sensor shall not reset upon restoration of SECURE mode if the antennas were altered during authorized entry to disable detection capability.

(1) Vibration vault sensor: Sensor shall sense short duration, large amplitude signals like those produced in attacks from explosions, hammering or chiseling. It shall also detect long duration, small amplitude signals like those produced in attacks from torches, thermal lances, drills, grinders, or cutting discs.

(a) The sensor enclosure base shall be constructed of die-cast aluminum with a stamped 22 gauge steel cover.

(b) The sensor shall have a tamper resistant enclosure and integral tamper switch.

(2) Vibration sensors: Sensors shall sense and selectively amplify signals generated by forced penetration of a protective structure.

(a) Sensors shall initiate alarms upon detecting drilling, cutting, or blasting through walls, or other methods of forced entry through a structure.

(b) Mount vibration sensors directly contacting the surface to be protected.

(c) Sensors shall be designed to give peak response to structurally conveyed vibrations associated with forcible attack on the protected surface.

(d) Provide at least one sensor on each monolithic slab or wall section, even though spacing closer than that required for midrange sensitivity may result.

(e) House sensors in protective mountings and fasten to the surface with concealed mounting screws or an epoxy.

(f) Provide sensors with tamper switches. Removal of a sensor from the surface shall initiate an alarm.

(g) An adjustable alarm discriminator shall function to prevent incidental vibrations which may occur from triggering the alarm circuit. Adjust the discriminator on the job to the precise needs of the application.

(h) Connect sensors to an electronic control unit by means of wiring or fiber optics cable run in rigid steel conduit or EMT.

(i) Sensor sensitivity shall be individually adjustable unless sensor is designed to accommodate vibration ranges of the specific surface type on which it will be mounted.

(j) Sensitivity adjustments shall not be accessible without removing the cover on the sensor.

(k) Sensor shall not be responsive to airborne sound.

NOTE: Utility inlet openings are protected in a variety of methods, the correct one being dependent on two variables: the nature of the intrusion threat (e.g., physical penetration, electrical, electro-optical) and the characteristics of the utility inlet opening (e.g., discharge water, office air duct, electric conduit). Subsequent to such analysis, almost any of the intrusion detection sensors described herein could provide the necessary protection. Normally a break-wire trap sensor is used for this application.

(3) Protection of utility inlet openings: Provide protection by a sensor of the wire trap type consisting of up to 26 AWG hard-drawn copper wires with a tensile strength of 17.8 N 4 pounds maximum interlaced throughout the opening such that no opening between wires shall be larger than 4 inches on center.

(a) Terminate sensor so that attempts to cut the wire or otherwise enlarge openings between wires shall cause an alarm.

(b) Sensor termination shall be tamper protected.

(4) Interior Volumetric (Space) Sensors

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NOTE: Include a schedule of sensors on the plans when the size of areas and pattern coverage is different from one sensor to another.

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(a) Passive infrared (PIR) sensors: Sensors shall detect intruder presence by monitoring the level of infrared energy emitted by objects within a protected zone.

1) Sensor shall initiate an alarm upon observing increased or fluctuating infrared energy caused by the presence and motion of an intruder whose temperature is as little as 3 degrees F different from the background temperature.

2) Sensor shall be passive in nature; no transmitted energy shall be required for detection.

3) Sensor shall be sensitive to infrared energy emitted at wavelengths corresponding to the human body and other objects at ambient temperatures.

4) Detection pattern for wall-mounted sensors shall be 50 ft by 50ft, unless otherwise indicated, and shall be housed in a tamper-alarmed enclosure.

5) Detection pattern for ceiling-mounted sensors shall be 360 degrees, unless otherwise indicated, and have a tamper resistant enclosure or integral tamper switch.

6) Sensor shall provide some means of indicating an alarm condition during installation and calibration. A means of disabling the indication shall be provided within the sensor enclosure.

7) Sensor shall alarm if an intruder moves within the area of protection more than 5 feet at a velocity of 0.1 foot per second, and one step per second, assuming 6 inches per step. Detection sensitivity shall be irrespective of the direction of motion.

8) Sensor shall also alarm at velocities faster than 0.1 foot per second, up to 10 feet per second. Sensor optimum detection range shall be as indicated.

9) Sensor shall not alarm in response to general area thermal variations.

10) Sensor shall have RFI and white light immunity.

(b) Dual technology sensors: Provide sensor combining passive infrared and microwave sensors designed and manufactured specifically to be mounted in a single enclosure.

(c) Microwave sensor: Sensor shall detect intruder presence by transmitting electromagnetic energy into a protected zone, receiving direct and reflected energy, and monitoring frequency shift between transmitted and received signals.

1) If more than one device is used in an area, devices shall operate on different frequencies. Provide for selective filtering by sensor to minimize nuisance alarms due to moving metal objects such as fan blades and blinds, interference from radar, or other sources of electronic interference.

2) Transceivers shall consist of a combined transmit/receive antenna and an adjustable-gain preamplifier in a single housing. Provide transceivers with sensitivity adjustments. Transceiver controls shall permit adjustment of transmission range and alarm signal threshold.

3) Sensitivity controls shall be inaccessible to operating personnel. Sensitivity requirements shall be met with sensitivity controls set approximately at midrange.

4) The sensor shall have a tamper resistant enclosure and integral tamper switch.

(d) Additional dual technology sensor requirements: The enclosure containing two sensor sections shall be tamper alarmed.

1) Both microwave and PIR sections shall activate simultaneously to generate an alarm.

2) Only an intrusion characterized by volumetric motion and radiant body heat shall be detected.

3) Sensor shall provide some means of indicating an alarm condition during installation and calibration. A means of disabling the indicator shall be provided within the sensor enclosure.

4) Sensor shall alarm if an intruder moves within the area of protection more than 5 feet at a velocity of 0.1 foot per second, and one step per second, assuming 6 inches per step.

5) Detection sensitivity shall be irrespective of the direction of motion. Sensor shall also alarm at velocities faster than 0.1 foot per second, up to 10 feet per second.

6) Sensor shall not alarm in response to general area thermal variations.

7) Mount sensors as indicated. Electronic circuitry shall be solid state and mounted on printed circuit boards. Sensor elements shall contain circuitry for transmitter drive, signal processing, tamper circuitry, and power supplies.

8) Circuitry shall provide an alarm relay with Form C contacts capable of carrying 2 amperes at 100 volts DC minimum.

9) The sensor shall have a tamper resistant enclosure and integral tamper switch.

(e) Audio Sensors: Sensors shall consist of microphones which detect audio information and transmit signals to an audio amplifier in a central control unit.

1) Multiple units may be connected to a central control unit.

2) Audio sensors shall be designed to be especially sensitive to generic audio intrusion signature of either breaking glass, splintering wood, fracturing of cement block, or normal voice conversation.

3) Sensors shall have sensitivity adjustments which shall be inaccessible to operating personnel. Sensitivity adjustment shall permit operating ranges up to a maximum of 5000 square feet. Sensors shall have a detection sensitivity of unidirectional design.

4) Sensors shall be capable of installation in a concealed configuration and shall be inherently self-protecting.

(f) Photoelectric Sensors: Sensors shall detect intruder presence by establishing a series of infrared beams and detecting beam disruptions.

1) Transmitters shall be dual beam type and shall be designed to emit no perceptible light. The beam may be reflected by one or more mirrors before being received and amplified. Disruption of the beam by an opaque body shall

initiate an alarm. The transmitted beam shall be uniquely modulated to prohibit an intruder from shining another light source into the receiver to escape detection.

2) Provide some means of local alarm indication on the sensor for use at the protected zone during installation and calibration.

3) Provide with an indicator disabling device within the sensor enclosure. Sensor shall consist of modulating transmitter, focusing lenses, mirrors, demodulating receiver, power supply, and interconnecting lines housed in tamper-alarmed enclosure.

4) The receiver unit shall provide an alarm relay with contacts capable of carrying 2 amperes at 120 volts AC minimum.

5) The protective beam shall be focused in a straight line. The installed beam distance from transmitter to receiver shall not exceed 80 percent of the manufacturer's maximum recommended rating.

6) Mirrors may be used to extend the beam or to establish a network of beams. Each mirror used shall degrade the maximum system range by no more than 50 percent.

7) Mirrors and photoelectric sources used in outdoor applications shall have self-heating capability to eliminate condensation and shall be housed in weatherproof enclosures.

8) The system shall utilize automatic gain control or be provided with sensitivity adjustments to allow for various beam lengths. Controls shall be inaccessible to operating personnel. With controls set at approximately midrange, the system shall initiate an alarm whenever the beam is interrupted.

9) Test the system by walking through the beam. Systems that use multiple beams to establish a fence shall be tested by attempting to crawl under and jump through and over the beams.

10) Systems shall provide cutoffs of at least 90 percent to handle a high percentage of light cut-off prior to initiating an alarm.

11) Sensor shall have RFI immunity.

(5) Duress Alarms:

(a) Hardwire Duress Alarms: Install at points within the protected area as indicated.

1) Alarms shall be capable of being secretly activated by the foot or hand of an average adult in both standing and seated positions.

2) Alarms shall not be visible or audible from the sensor.

3) The alarm signal shall lock-in upon activation until manually reset with a key or similar device and shall be readily identifiable by the Intrusion Detection System.

4) Sensors shall be easy to operate and designed to minimize the possibility of accidental activation.

5) Hardwire duress alarms shall be rated for a minimum lifetime of 50,000 operations. Securely mount sensors in rugged, corrosion-resistant housing.

6) Duress alarms shall be silent at the reporting location and clearly distinguishable from intrusion detection alarms at the central monitoring station.

(b) Radio Frequency Duress Alarms: Duress alarms shall consist of a compact and lightweight transmitter enclosed in a case that can be easily worn at the waist on a belt.

1) Transmitter shall have a unique identification code.

2) Transmitter shall transmit up to times on the power provided by internal batteries.

3) Provide transmitter in a corrosion-resistant case.

4) Transmitter shall be FM modulated to ensure reception and decoding of the alarm signal.

5) The signal transmitted shall readily interface with the Intrusion Detection System communications subsystem as specified.

6) Activation of the sensor shall be by hand-operated switch protected from accidental activation.

(c) Security Control Pad Activated Duress Alarms: Duress alarms shall consist of programmable Security Control Pad activated push buttons or a Security Control Pad activated Duress code, a user code programmed as a Duress code.

1) Dedicated keys on the Security Control Pad shall be individually enabled via programming to initiate an alarm signal. Each programmed key shall also

have the capability to initiate an auxiliary output for additional alarm signaling.

b Communications:

(1) Communications shall link together the subsystems of the Intrusion Detection System. Intrusion Detection System communications links shall be via AES IntellInet radio using a telephone line as backup (standard pots line).

(2) AES IntelliNet: AES Radio shall follow the following requirements;

(a) Communications link to the AES shall be supervised.

(b) AES IntelliNet communications interface devices shall be provided for the Premise Control Unit (PCU).

(c) Sensor device interfaces shall be by polling loop, except as specified otherwise.

(d) Premise Control Unit to central alarm reporting Digital Receiver shall be digital, asynchronous, or multiplexed data.

(e) The Premise Control Unit primary communication shall be the AES IntelliNet radio mesh network system. Backup communication shall be monitored telephone lines.

(f) The format used to communicate to the Base Central Station shall be contact ID.

(g) Premise Control Unit shall be capable of communication by means of a 128 Bit AES Encryption process certified by NIST (National Institute of Standards and Technology) to a Digital receiver with a built-in Encryption Alarm Router.

(h) The Premise Control Unit shall meet DCID 6/9 and JAFAN 6/9 requirements.

(3) The AES IntelliNet radio must operate on the base IDS frequency and have the IDS Cipher code installed. The IDS Cipher code is installed only by the Alarm Shop personnel.

(a) The AES Radio shall be installed only by an AES authorized dealer.

(b) Where required an outside antenna shall be installed to felicitate commutations to the Robins Central Monitoring Station.

(c) A NET-CON reading of 5 or less is required by UL No installs with NET-CON reading of 6 and 7 will be accepted or connected to the base AES system.

(d) The AES Radio shall be installed by UL 2050 guide lines and must meet the following requirements:

1) The AES radio must be tan and factory finished paint.

2) The AES radio must have a tamper switch install and connected to zone one on the input board of the radio.

3) The AES radio shall have a AES IntelliPro installed and connected to the Premise Control Unit telephone connection.

4) The IntelliPro shall be programmed for contact ID.

5) The Premise Control Unit shall have a telephone line connected to the IntelliPro and monitored for “telephone line cut”.

6) The AES IntelliPro has an “off-line” voltage output that shall be monitored by a zone on the Premise Control Unit. This zone shall be programmed to be non-bypassable in the Premise Control Unit.

7) The AES radio has a relay output for “antenna cut” this must be monitored by a zone on the Premise Control Unit and programmed as a 24hr alarm type.

8) All cabinet tampers installed on Premise Control Unit equipment shall be connected to a zone input on the AES Radio.

9) All knock-outs not used by the install shall be plugged.

10) The AES radio shall be powered by a hardwired transformer install in a tampered cabinet.

11) The AES radio main AC power should be the same as the Premise Control Unit.

(e) Sensor Device: Sensor devices to Premise Control Unit polling loop supervision shall be provided for hardwire devices.

7) The connection to the polling loop device will be supervised in a way that prevents tampering with the device by way of direct current line supervision.

8) Circuit shall be supervised by monitoring changes in the current that flows through the detection circuit and a terminating resistor of at least 2000 ohm.

9) Devices that have an alarm circuit and a tamper circuit built-in, shall have the alarm circuit supervised by a resistor and a separate 24 hour audible alarm connection for the tamper.

10) Alarm circuitry shall initiate an alarm in response to opening, closing, shorting, or grounding of the conductors by employing Class C, Standard Line Security.

11) Alarm device units shall provide an alarm response in the annunciator in not more than one second as a result of the following changes in normal transmission line current:

i. Five percent or more in normal line signal when it consists of direct current from 0.5 milliamperes through 30 milliamperes.

ii. Ten percent or more in normal line signal when it consists of direct current from 10 microamperes to 0.5 milliamperes.

iii. Five percent or more of any element or elements of a complex signal upon which security integrity of the system is dependent. This tolerance will be applied for frequencies up to 100 Hz.

iv. Fifteen percent or more of any element or elements of a complex signal upon which security integrity of the system is dependent. This tolerance will be applicable for frequencies above 100 Hz.

c. Premise Control Unit (PCU)

NOTE: Locate in secure, indoor, dry location. To determine the number of zones required for a specific project, consider the following as a minimum: two zones for each device (even number alarm point) and (odd number for tamper point).

(1) Premise Control Unit Requirements: PCU shall include a command processor installed in an attack and tamper resistant enclosure. The PCU shall be packaged and include a power transformer, battery(s), network connection cable, Security Control Pad(s), Security Control Pad connection cable(s) and additional components as required. All system electronic components shall be solid-state type, mounted on printed circuit boards. Light duty relays and similar switching devices shall be solid-state type or electromechanical. The Premise Control Unit shall provide at a minimum but not limited to, the following capabilities;

(a) The Premise Control Unit areas and zones shall be programmable, and the system shall store, log, display, and transmit specific custom designations for system areas, zones, and user names.

(b) The Premise Control Unit, user interfaces, zone input devices, relay output devices, and the signal receiving equipment shall be engineered, manufactured, assembled, and must be distributed from a location within the United States of America.

(c) The system shall support user interaction by way of a Security Control Pad.

(d) The Premise Control Unit shall support zone input connections, system Security Control Pads, system zone expansion modules, and wireless zone input modules, and must support zone input connections by way of at least two competitive products. The system shall offer a seamless integrated compatibility with hard-wire and/ or wireless zone expansion equipment for at least 128 zones.

(e) The Premise Control Unit shall be capable zone expansion and Security Control Pad data buses that exceed 10,000 feet of cable must include splitter/repeater modules to boost data voltage and maintain data integrity.

(f) The Premise Control Unit shall provide a seamless capability to provide a minimum 20 addressable relays, which can be located at any connection location upon a zone expansion bus.

(g) Premise Control Unit relay outputs shall have the capability of being triggered as a result of a command from the user interface, changes in system status, changes in zone status, or by a programmable schedule.

(h) Premise Control Unit relay output states shall be programmable for momentary, maintained, pulsed, or must follow the state of an associated zone input.

(i) The Premise Control Unit shall be completely programmable either locally from a Security Control Pad or remotely through a standard dial-up. Remote configuration or control is not permissible for installation that must conform to DCID 6/9 requirements this feature shall be disabled after acceptance test is completed.

(j) The Premise Control Unit shall be equipped with an anti-reversing circuit breaker to prevent damage due to accidental reversal of battery leads.

(k) The Premise Control Unit shall be capable of monitoring a maximum of 128 individual zones and controlling output relays.

(l) User/Authorization Level Capacity shall be capable of operation by 150 unique Personal Identification Number (PIN) codes with each code having one of nine user profiles. This allows for limitation of certain functions to authorized users. The operation of all Security Control Pads shall be limited to authorized users.

(m) The Premise Control Unit shall support a maximum of sixteen 16 Security Control Pads with alphanumeric display. Each Security Control Pad shall be capable of arming and disarming any system area based on a pass code authorization. The Security Control Pad alphanumeric display shall provide complete prompt messages during all stages of operation and system programming and display all relevant operating and test data.

(n) Communication between the Premise Control Unit and all Security Control Pads (SCP) and zone expanders shall be multiplexed over a non-shielded multi-conductor cable, as recommended by the manufacturer. This cable shall also provide the power to all Security Control Pads, zone expanders, output expanders, and other power consuming detection devices.

(o) If at any time a Security Control Pad does not detect polling, the alphanumeric display shall indicate distinct alphanumeric messages.

(p) The Security Control Pad shall include self-test diagnostics enabling the installer to test all Security Control Pad functions.

(q) The Security Control Pad shall provide an easy-to-read English text display. The text shall exactly match the text seen in all software reports, Security Control Pad displays, and central station reports.

(r) The Security Control Pad user interface shall be a simple-to-use, menu-driven help system that is completely user friendly.

(s) The Premise Control Unit shall support sub-control partitions.

(t) A minimum of 8 Class B zones shall be available on the system. The system shall have the capacity for 8 zone expanders or single zone expanders. All Class B zones shall be 2-wire, 22 AWG minimum, supervised by an end-of-line (EOL) device and shall be able to detect open and short conditions in excess of 300ms duration.

(u) Each zone shall function in any of the following configurations:

1) Night, Day, Exit, Fire, Supervisory, Emergency, Panic, Auxiliary
2) 1, Auxiliary 2, Fire Verification, Cross Zone, Priority, and Key
3) Switch Arming.

(v) The digital SLCs bus shall be able to operate at a maximum wiring distance of 10000 feet from the control panel on unshielded, non-twisted cable. This distance may be extended when a bus repeater module are installed.

(w) Provide for Security Control Pad audible indication of device activation. Audible chime shall sound when select devices activate in order to alert personnel of access into an area during normal access times. The audible chime may be activated when a magnetic switch is activated at a main entrance leading into an un-secured area during working hours.

(2) Standalone Electronic Door Access

NOTE: Standalone Electronic Door Access shall be an integral function of the Premise Control Unit. Access assignment shall be configured at the Premise Control Unit via the Security Control Pad or direct PC workstation communications. A failure in the Access system shall not have a cause or effect on the Intrusion Detection System.

(a) The Premise Control Unit shall be capable of integrating area access control capability where specified into the same Premise Control Unit with the ability to have up to 75 user credentials. User access is limited to custom profiles and/or schedules. Anti-pass back shall be available. Networked version shall support a Two-Man Rule feature. The system shall support up to sixteen 16 access doors, connected to the system using a manufacturer-approved interface module. Access Control equipment shall communicate to the system by way of the Premise Control Unit Security Control Pad bus.

(3). Field Fabricated Nameplates: Provided laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic 0.125 inch thick, and white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style. 2.5.1 Manufacturer's Nameplate each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

(4). Factory Applied Finish: Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test. All cabinets shall be painted tan from the manufacture. No paint shall cover schematics, listing labels, or serial numbers.

8. Equipment Installation: Intrusion Detection System equipment and devices shall be installed by the manufactures instructions conforming to this specification and UL requirements.

a. Cable/Wire Runs: All wiring to the Intrusion Detection System shall be installed in a manner that protects against tampering with or spoofing the system in any way. This shall include using Rigid Pipe, IMC, or dual shielded cable. This cable shall be installed in one continuous run and the shielding kept bound together until the end of the loop or area of protection, where an End of Line Resistor will be installed. The cable tamper circuit will be programmed as a 24hr audible zone. The zone shall be labeled Wire Cut Tamper. All junction boxes that contain spliced or tapped conductors shall be protected by a tamper switch. All junction boxes or covers not having tamper protection shall have tamper screws installed. No boxes with punch-out pipe tabs shall be used anywhere in the Intrusion Detection System.

b. Tamper switches shall be an integral part of all intrusion sensor devices. An initiation of an alarm signal will occur when the door or cover is moved as little as 1/4 inch from the normally closed position. Tamper switches shall also be Located within enclosures, cabinets, housings, boxes, raceways, and fittings to prevent direct line of sight to any internal components and to prevent tampering with switch or circuitry. Conceal tamper switch mounting hardware so that the location of the switch within the enclosure cannot be determined from the exterior.

c. Conduit: Install in accordance with NFPA 70.

d. Underground Cable Installation: Underground conductors connecting protected structures and objects to the central alarm updating and display unit shall be run direct burial or in conduit. Coaxial cable shall not be spliced. If permitted, cables connecting protected structures and objects to the security control console shall be sized such that initially only approximately 60 percent of the circuit pairs will be used. Cable pairs not used shall be reserved for future use of additional detection circuits.

9. Intrusion Detection System Operational Test Plan:

a. Test shall ensure that the requisite degree of intrusion detection is provided. Initially, test each sensor and subsystem component individually using the following requirements:

(1) Test glass breakage sensors by using test units supplied by the manufacturer which simulate glass breakage.

(2) When the function of each component within a particular subsystem, such as each sensor within a particular zone, is verified, certify that subsystem of the entire Intrusion Detection System has satisfactorily met the specifications, an account number and the radio will be programmed into the base IDS network.

(3) Test each subsystem similarly until each detection zone has been certified.

(4) Once subsystem certification is completed, test the entire integrated system to ensure that subsystem elements are compatible and function as a complete system.

(5) The integrated system test shall be accomplished in linear fashion, end-to-end, and shall verify that each simulated intrusion performed within each detection zone produces an appropriate alarm or signal, and that alarm is correctly annunciated at the Security Control Pad and Central Station Receiver.

(6) Provide for approval, not later than 30 days prior to formal inspection and test, a detailed operational test plan of how each component, subsystem, and entire Intrusion Detection System will be tested.

(7) When tests are complete and corrections made, submit a signed and dated certificate with a request for formal inspection and tests.

10. System Acceptance Test

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Note: The 78th CES/CEOFA Alarm Shop shall inspect the IDS before it is connected to the Base Central Station Receiver located at Robins Air Force Base. The IDS must pass inspection and testing before it can be placed on-line to the Law Enforcement Desk.

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a. System Acceptance testing shall be performed as follows;

(1) The Security Manager, Security Contractor, and CES/CEOFA Alarm Shop Engineer will conduct final acceptance testing of the system.

(2) Prior to the final acceptance test, security contractor shall conduct a complete test of the entire Intrusion Detection System and provide the CES/CEOFA Alarm Shop Engineer with a written report.

(3) Following completion of the initial testing and correction of any noted deficiencies, conduct a five-day burn-in test, intent of the burn-in test shall be to prove the Intrusion Detection System by placing it in near real operating conditions.

(4) During this period the Intrusion Detection System shall be fully functional and programmed such that all points, interfaces, controls, reports, messages, prompts, etc. can be exercised and validated.

(5) Record and correct any system anomaly, deficiency, or failure noted during this period.

(6) Scheduling of the final acceptance test shall be based on a review of the results of this burn-in period.

(7) Deliver a report describing the results of the functional tests, burn-in tests, diagnostics, calibrations, corrections, and repairs including written certification to the Security Manager, Security Forces SFS/ESS NCO and CES/CEOFA Alarm Shop Engineer that the installed complete Intrusion Detection System has been calibrated, tested, and is fully functional as specified herein.

(8) Prior to the final acceptance test, complete all clean-up and patch work requirements. Security equipment closets and similar areas shall be free of accumulation of waste materials or rubbish caused by operations under the contract at completion of the work, remove all waste materials, rubbish, contractor tools, construction equipment, machinery and all surplus materials.

(9) Upon written notification from the Contractor that the Intrusion Detection System is completely installed, integrated and operational, and the burn-in testing completed, the Security Manager and CES/CEOFA Alarm Shop Personnel will conduct a final acceptance test of the entire system at a mutually acceptable time.

(10) During the final acceptance test, no adjustments, repairs, or modifications to the system shall be conducted without the permission of the Inspectors.

(11) During the course of the final acceptance test by the Security Manager and CES/CEOFA Alarm Shop Personnel, the Contractor shall be responsible for demonstrating that, without exception, the completed and integrated Intrusion Detection System complies with the contract requirements. Physical and functional requirements of the project shall be demonstrated and shown. This demonstration will begin by comparing as-built drawings conditions of the Intrusion Detection System to requirements outlined in this Section, item by item. Following the section compliance review, IDS and SCP equipment will be evaluated.

(12) The functionality of the various interfaces between systems will be tested.

(13) The installation of all field devices will be inspected. This field inspection will weigh heavily on the general neatness and quality of installation, complete functionality of each device, and compliance with mounting, back box and conduit requirements.

(14) All equipment shall be on and fully operational during any and all testing procedures.

(15) Provide personnel, equipment, and supplies necessary to perform all site testing.

(16) Provide a minimum of two contractor employees familiar with the Intrusion Detection System for the final acceptance test. One contractor employee shall be responsible for monitoring and verifying alarms while the other will be required to demonstrate the function of each device. Supply at least two radios or portable telephones for use during the test.

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Note: The Contracting Officer's Technical Representative retains the right to suspend, terminate or reschedule testing at any time when the IDS is found to be incomplete or fails to perform as specified. In the event that it becomes necessary to suspend, terminated, or reschedule the test, *all of the fees and expenses related to the test shall be deducted from the contractor's retainage. In the event it becomes necessary to suspend, terminate, or reschedule the test, the contractor shall work diligently to complete and/or repair all outstanding items as required by the Contract Documents. The contractor shall supply the Security Manager and the Contracting Officer's Technical Representative with a detailed punch list completion schedule outlining task-by-task completion dates and a tentative date for a subsequent retest. During the final acceptance test, no adjustments, repairs, or modifications to the system shall be conducted without the permission of the Contracting Officer's Technical Representative.*

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11. Device Nameplates: Provide number, location, and letter designation of nameplates as indicated.
    a. All Devices installed in the Intrusion Detection System shall be labeled.

    b. All Zone type devices shall be labeled with a zone number.

    c. The Premise Control Unit shall have the account number fixed to the outside bottom right corner.

12. *Certification: Contractor must provide the UL certificate 45 days after the final inspection. The certificate shall be listed for a period of not less than 5 years.*

    a. *Compliance with this requirement is mandatory for all new systems or upgrades installed at Robins Air Force Base.*

--List of Acronyms--

1. ABS--------------Acrylonitrile Butadiene Styrene
2. AC----------------Alternating Current
3. AES--------------AES Corp
4. AWG-------------American Wire Gauge
5. BMS--------------Balanced Magnetic Switch
6. CCTV------------Closed Circuit Television
7. CEOFA----------Civil Engineering Operations Fire Alarms
8. CES--------------Civil Engineering Squadron
9. COTS-------------Commercial Off The Shelf
10. DC----------------Direct Current
11. DCID------------Director of Central Intelligence Directives
12. ECP---------------Entry Control Point
13. EMT--------------Electrical Metallic Tubing
14. ESS---------------Electronic Security Specialist
15. ESS---------------Electronic Security System
16. FCC---------------Federal Communications Commission

17. FM----------------Frequency Modulation
18. IDS---------------Intrusion Detection System
19. JAFAN----------Joint Air Force Army Navy
20. LCD--------------Liquid Crystal Display
21. LED--------------Light Emitting Diode
22. NET-CON------Network Connectivity
23. NIST-------------National Institute of Standards and Technology
24. PCU--------------Premise Control Unit
25. PIR---------------Passive Infrared
26. RFI---------------Radio Frequency Interference
27. SCP---------------Security Control Pad
28. SFS---------------Security Forces Squadron
29. UL----------------Under Writers Laboratory

-- End of Acronyms Table --

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Robins Air Force Base
Base Facility Standards

Title: EMERGENCY LIGHTING SYSTEMS

Date: 18 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 6K – EMERGENCY LIGHTING SYSTEMS

CRITERIA REFERENCE DOCUMENTS: The publications listed below form a part of this document to the extent referenced. The publications are referred to in the text by the basic designation only.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2009; TIA 09-1; TIA 09-2) Life Safety Code
NFPA 70	(2011) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 924	(2006; Reprint Feb 20119) Standard for Emergency Lighting and Power Equipment

UNIFIED FACILITIES CRITERIA

UFC 3-520-01	Interior Electrical Systems
UFC 3-530-01	Interior and Exterior Lighting and Controls

ROBINS AFB FACILITY STANDARDS

BFS Part 6B	***Interior Lighting***
BFS Part 7A	***Energy Conservation***
BFS Part 7C	***Sustainable Design & Development***

EMERGENCY LIGHTING SYSTEMS

a. General:

(1) Facilities over 25,000 square feet shall use a small permanent generator and/or an Emergency Lighting Inverter (uninterruptible power supply) to feed the circuits in the emergency system.

(a) In areas with metal halide lamps, selected overhead metal halide fixtures shall be connected to the emergency system to provide the emergency lighting. Connect the entire overhead metal halide fixture, including quartz lamp if provided, to the system. Quartz lamps may be used in selected fixtures to provide initial foot-candles until the metal halide lamp strikes and starts to illuminate.

(b) In areas with fluorescent lighting, connect selected fixtures to the emergency system for emergency lighting. Connect the entire fixture to the system. Exit signs within the facility shall be connected to the system.

(c) Emergency lighting fixtures shall not be switched except by branch circuit breakers in the emergency system.

(d) Emergency lighting located within conference rooms should have an internal battery pack located within the fixture to allow the entire fixture to be switched off for presentations.

(e)In stairwells, only half of the lights shall be connected to the Emergency Lighting Inverter and/or generator with the other half connected to commercial power. In case work is being done on equipment you still have lighting in stairwell for the safety of personnel.

(2) Wall packs with integral battery units are not acceptable within the facility. For facilities less than 25,000 SF, emergency lighting shall be provided with integral battery packs in the fixtures.

(3) Clearly mark the emergency fixtures with a label designated "emergency" and a printed label with the circuit number, so Shop personnel can find them easily. Install a laminated plastic nameplate on the fixture. Nameplate shall have an orange background with white letters (minimum ¼ inch letters), which describe the emergency lighting circuit number. All raceways shall be marked with a 3 inch orange tape band every ten feet. All junction boxes used in the emergency wiring shall have orange covers and marked with circuit numbers.

(4) Install an emergency light in each electrical and mechanical room.

(5) Place a laminated drawing of the system near the emergency unit, or near the main electrical panel for a system of individual fixtures, but always on the building interior.

<<<END OF BFS PART 6K>>>

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Robins Air Force Base
Base Facility Standards

Title: Energy Conservation

Date: 29 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
Also known as Installation Design Guide (IDG)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS
PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 7A – Energy Conservation

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS:

AFI	Air Force Instruction
ANSI	American National Standards Institute
BCE	Base Civil Engineer
BLCC	Building Life Cycle Cost Program
CO2	Carbon Dioxide
DDC	Direct Digital Controls
DD From 1391	Military Construction Project Data Form
EO	Executive Order
ETL	Engineering Technical Letters
FEMP	Federal Energy Management Program
HQ AFMC	Headquarters Air Force Materiel Command
HVAC	Heating, Ventilation, and Air Conditioning
LCCID	Life Cycle Cost in Design
MBTU	Million British Thermal Unit
MOU	Memorandum of Understanding
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NRG	Designated SRM Funding for Air Force Energy Projects
SDD	Sustainable Design and Development
SEER	Seasonal Energy Efficiency Ratio
SRM	Sustainment, Restoration, and Modernization

References

• Energy Policy Act of 2005, Public Law 109-58, 8 Aug 05
• Energy Independence and Security Act of 2007, 19 Dec 07
• Executive Order 13123, Greening the Government through Efficient Energy Management, 8 Jun 99 (Revoked by E.O. 13423 – (OSD continuing some reporting requirements)
• Executive Order 13423, Strengthening Federal Environmental, Energy and Transportation Management (Jan 07)
• Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance, (OCT 09)
• OSD Memo – Installation Energy Policy Goals, 18 Nov 05
• DODI 4170.11 – Installation Energy Management, 22 Nov 05
• Unified Facilities Criteria (UFC) 3-400-1, Including Change 4, August 2008
• US Department of Energy (DOE) and US Environmental Protection Agency (EPA) Energy Star® Program
• Unified Facilities Criteria (UFC) 3-410-01FA, Including Change 3, August 2008
• American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 62.1 - 2004
• United States Green Building Council (USGBC) Leadership in Energy and Environmental Design Rating System (LEED)

BFS Part 2 – Environmental
BFS Part 6A - Facility Electrical, General
BFS Part 6B - Interior Lighting
BFS Part 7C –Sustainable Design & Development

DIRECTIVES:

- Executive Order (EO) 13327, Federal Real Property Asset Management, 6 Feb 04
- Energy Policy Act (EPAct) 2005, 8 Aug 05
- Public Law 109-58, Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding and Guiding Principles, 24 Jan 06
- EO 13423, Strengthening Federal Environmental, Energy and Transportation Management, 26 Jan 07
- Public Law 110-140, Energy Independence and Security Act (EISA), 2007, 19 Dec 07
- EO 13514, Federal Leadership in Environmental, Energy, and Economic Performance, 8 Oct 09
- Deputy Under Secretary of Defense (Installations and Environment), Memorandum, 19 Jan 10, Subject: DoD Implementation of Storm Water Requirements under Section 438 of the energy Independence and Security Act (EISA 2007)

1. GENERAL: This is one part of the Robins AFB Base Facility Standards. Any exceptions granted to these requirements shall be noted clearly in the project design analysis by using a Deviation Request. Robins AFB, while being committed to purchasing and consuming energy in the most efficient, cost effective, and environmentally responsible manner possible, must develop facilities which are designed and operated in the most efficient manner with today's technology. It is the intent of this program to require immediate and sustained action, otherwise Robins will continue on an irrevocable path of ever increasing demands on limited energy resources and diversion of funds that could be used for other critical mission requirements. This program will address all building criteria that can affect the use or misuse of energy.

a. All design shall be in accordance with applicable UFCs, ETLs, AFIs, and all other applicable codes and regulations as referenced herein. Also conform to NFPA 101 – Life Safety Code and the current International Building Code (IBC). If there is a conflict, normally use the more stringent requirement. All materials and equipment shall be current production items.

b. All AE firms shall apply energy conservation measures throughout the development and design phases, within the budget goals, so that the energy consumption per gross square footage of the facility is at its most efficient operation at the time of beneficial occupancy Energy efficient and sustainable building design shall be a collaborative and coordinated effort of architects, electrical, mechanical and structural engineers. It cannot be achieved through analysis and optimization of the individual components and subsystems. A holistic "whole building" design approach shall collaboratively integrate different building elements and systems to optimize the overall project sustainability, water, and energy efficiency. Creative design of the building floor plan and configuration, envelope, orientation and fenestration can minimize energy needed to ventilate condition and light the facility. Integration of the mechanical systems design must be coordinated with the designs of other involved building systems and features including the building envelope, lighting system, and occupant activities. Understanding how one system (or individual components within a given system) affects another is essential to making the most of the available opportunities for energy savings. All facilities should be designed 30% below American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) standards or the International Energy Code.

2. GOALS (EPAct2005, EO 13423, EISA 2007):

- Energy Reduction: Reduce energy intensity (MBTU/SF) 30% by the end of FY15 based on a 2003 baseline.
- Renewables: Meet goals for electricity generated with renewable, 5% in FY10-12, 7.5% in FY13 and beyond and 25% by 2025, 50% must be from new sources (after Jan 1999). (EPAct 2005, 10 USC 2911, EO 13423). This has been established as an Air Force goal, not an individual Command or Base goal by AFCESA.
- Building Performance/Sustainability: Energy consumption must be 30% below ASHRAE 90.1 standards (EPAct 2005), 15% of MILCON and major renovation projects must comply with MOU on sustainability by FY15 (EO 13423); High Performance Green Federal Buildings (EISA 2007). 100% capable of achieving LEED Silver certification Program SDD costs at 2% of primary facility cost 5% per FY for formal LEED certification
  10% LEED certified in FY10 and after
  All SRM projects shall consider using LEED principles where financially feasible (AF Policy)

- Advanced Utility Meters: Meter all facilities electrically when economically feasible by 2012 (EPAct 2005). Add natural gas and steam meters by 2016 (EISA 2007). Consider every facility over 35,000 square feet in size and each fence line meter. Add water meters for those facilities that consume over 2 M Gals per year and at the fence line. (AF Meter Policy)
- Utility Meter Reporting: Report to HQ annually number of meters required and those installed (EPAct 2005) and benchmark metered facilities (EISA 2007).
- Energy Star Products: All products for new construction and replacements will be Energy Star rated or FEMP designated products.
- Electric Motors: All electric motors from 1 to 500 HP will be premium energy type. A/C refrigeration equipment will meet minimum SEER requirements (EPAct 2005).
- Solar Hot Water: New and renovated facilities with a hot water requirement will be 30% solar generated (EISA 2007).
- Fossil Fuel: Reduce fossil fuel usage in facilities by the following goals: 55% by 2010, 65% by 2015, 80% by 2020, 90% by 2025 & 100% by 2030, as compared with such energy consumption by a similar building in fiscal year 2003 (as measured by Commercial Buildings Energy Consumption Survey or Residential Energy Consumption Survey data from the Energy Information Agency) (EISA 2007).
- Commissioning: Verification and documentation during the period beginning on the initial day of the design phase of the facility and ending not earlier than one year after the date of completion of construction (EISA 2007).
- Audits: Audit 25% of facility Square footage per year in "covered" facilities. Must be "comprehensive" audits for energy and water (EISA 2007).
- Water Conservation: Reduce water intensity (Gals/SF) 2% per year or 16% by the end of FY15 from a FY07 baseline. Additionally, EO 13514 extended the reduction goal for water intensity to 26% by the end of FY20 from a FY07 baseline. All new and replacement fixtures and toilets will be water saving (EO 13423).
- Greenhouse Gases: Reduce greenhouse gas emissions through reduction of energy intensity (EO 13514).

3. NEW CONSTRUCTION: Meet or exceed the energy performance standards set forth in Title 10, Codes of Federal Regulations (CFR), Part 435 (10 CFR 435), Energy Conservation Voluntary Performance Standards for Federal Buildings.

a. The majority of current MILCON projects are to replace or modernize current missions, future missions and infrastructure associated with each. These types of design and construction projects should be capable of a minimum of "Silver" certified Leadership in Energy and Environmental Design—new construction (LEED-NC) as designated by the U.S. Green Building Council (USGBC). **All MILCON projects starting with the FY12 Program are to be LEED Silver-Certified.** Construction agents for these projects shall include applicable SDD practices as outlined in the LEED rating system, in designing for sustainable siting, energy, water conservation, air quality preservation, material recycling, and construction waste recovery by complying with 40% better than ASHRAE standard 90.1 current version (2007), and by meeting a minimum of 15 points in water efficiency and energy and atmosphere points per LEED-NC and a minimum of 35 points overall. **For all Non-MILCON Projects, primarily Minor Construction and Major Renovation projects, by the directions from the Energy Office, per project, will specify whether a particular project will be certified and registered by the USGBC or be certified through self-assessment led by a LEED accredited professional on the project team.** Additional renewable energy production efforts specific to a facility may be directed such as solar roofs, solar water heating and/or transpired walls (solar walls).

b. All new construction will include solar hot water in its design. However, after technical evaluation if the data can demonstrate that solar hot water is not an appropriate process at that location due to the siting or the functions in the facility, then the design agent can propose to the Energy Office that this particular facility be excluded from the requirement to incorporate solar hot water. Solar hot water installation also must be considered for any major modifications to facilities, with an analysis provided to the Energy Office, requesting approval if it is not being proposed. A LEED silver capable/certification and life cycle cost should be considered where economically feasible.

c. Energy efficient technologies that support sustainability and/or energy efficiency, i.e., ground source heat pumps, solar water, thermal storage systems, etc., shall be considered for all new construction and major renovations of buildings on base, subject to the review and coordination of the RAFB Energy Office. A LEED silver capable/certification and life cycle cost associated with this particular requirement should be considered where economically feasible.

d. Guidelines for minor energy efficiency components in facilities energy efficiency components, such as motion detectors or infrared sensors if more appropriate, must be included in all new construction and modifications to facilities in all rooms unless it can be shown that they would interfere with the mission of that room. The ability to do automatic temperature setbacks needs to be included in all new construction and any modifications to the central HVAC system of facilities. New facilities will include meters for electricity, natural gas, steam, chilled water, and potable water, if provided in the facility. Requests for modifications or waivers of these guidelines for minor energy efficiency components shall be made in writing to the Robins AFB Energy Office.

e. Incorporation of energy saving practices at Robins AFB will help HQ AFMC, the Air Force and DOD meet federal energy requirements, reduce energy consumption, and improve our energy intensity while improving life-cycle facilities cost. Each project will address all building criteria that can affect the use or misuse of energy.

f. The Department of Defense (DOD) Energy Management Program is based on compliance with public law and Federal policy. There are several program goals and objectives designed to complement each other by forming a synergy to improve operating efficiency, enhance mission capability, and improve personnel comfort and productivity.

g. Meet or exceed the energy performance standards set forth in Title 10, Codes of Federal Regulations (CFR), Part 435 (10 CFR 435), *Energy Conservation Voluntary Performance Standards for Federal Buildings.* LEED Silver capable/certification and life cycle cost should be considered where economically feasible. Minimize the life cycle cost of new facilities by using energy efficient measures.

h. Guidelines for selecting Cool Roofs: Cool roofs will be utilized on all new or major renovationprojects unless demonstrated to exceed a 10-year payback and an exception to policy approved by the 78 CEG/CD. Cool roof minimum requirements are a minimum Solar Reflectance Index (SRI) of 64 on flat roofs (pitch of 9.5 degrees or less) or 36 SRI on all other roofs with a combination of a minimum of R-36 roof insulation value. The roof R value is calculated using all other components of the roof structure. SRI values lower than the Cool Roof minimum can be installed with an offsetting and proportional increase in roof structure R value (excluding the cool roof impacts on R value) using R-60. Submit cool roof policy exception requests and supporting documentation to the Director of Civil Engineering through the Base Energy Office. A LEED silver capable/certification and life cycle cost should be considered where economically feasible.

i. Guidelines for Solar Hot Water - All new construction will automatically consider including solar hot water in its design. However, after technical evaluation, if the data can demonstrate that solar hot water is not an appropriate process at that location due to the siting or the functions in the facility, then the design agent can propose to the Energy Office that this particular facility be excluded from the requirement to incorporate solar hot water. Solar hot water installation also must be considered for any major modifications to facilities, with an analysis provided to the Energy Office, requesting approval**,** if it is not being proposed. A LEED silver capable/certification and life cycle cost should be considered where economically feasible.

j. Guidelines for Minor Energy Efficiency Components: In Facilities Energy efficiency components, such as motion detectors or infrared sensors if more appropriate, must be included in all new construction and modifications to facilities in all rooms unless it can be shown that they would interfere with the mission of that room. The ability to do automatic temperature setbacks needs to be included in all new construction and any modifications to the central HVAC system of facilities. New facilities will include meters for electricity, natural gas, steam, chilled water, and water, if provided in the facility. Requests for modifications or waivers of these guidelines for minor energy efficiency components shall be made in writing to the Energy Office.

4. DESIGN REVIEWS: Work with your design section and review projects for energy conservation. Milestones for review are the Preliminary/ Final Designs. The Commissioning Agent shall review the Design Plans and Specifications, the Basis of Design, and the Robins AFB Project Requirements prior to 60% completion of the design. The Commissioning Agent shall assess the completeness and clarity of the Base's Project Requirements, verify that the requirements stated in the Base's Project Requirements are addressed in the Basis of Design, and verify that the Design Plans and Specifications are prepared in accordance with the Basis of Design and the Base's Project Requirements. The Commissioning Agent shall back check the reviewed documents at 95%completion of the design. The Commissioning Agent shall provide a Design Review Report which shall identify any discrepancies between the reviewed documents, deviations in the design from the Basis of Design or Base's Project Requirements, or deficiencies that would prevent the building energy systems from operating effectively in accordance with the sequence of operation. The Design Review Report shall individually list each deficiency and the corresponding proposed corrective action necessary for proper system operation. The report shall be submitted with the final design submission to the Government. The Contracting Officer's Representative, the Commissioning Agent, and the Designers shall meet, discuss, and resolve any items contained in the report no later than 14 calendar days after submission of the report.

Design Review (Design-Bid-Build): The Commissioning Agent shall review the Contract Plans and Specifications and advise the Contracting Officer's Representative of any deficiencies that would prevent the building energy systems from operating effectively in accordance with the sequence of operation specified. The Commissioning Agent shall review the Basis of Design and Base's Project Requirements. The Commissioning Agent shall compare the Basis of Design and the Base's Project Requirements against the Contract Plans and Specifications and advise the Contracting Officer of any discrepancies. The Design Review shall be performed before the first submission of building energy system related submittals. The Commissioning Agent shall provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper system operation.

The report shall be submitted to the Contracting Officer no later than 14 days after approval of the Commissioning Agent. The Contracting Officer, the Commissioning Agent, and the Designer shall meet and discuss any items contained in the report no later than seven calendar days after submission of the report. All items will be resolved at that meeting. The building including the building envelope, HVAC systems, service water heating, power, and lighting systems shall meet the Mandatory Provisions and the Prescriptive Path requirements of ASHRAE 90.1-2004. Substantiation requirements are defined in Design all building systems and elements to meet the minimum requirements of ANSI/ASHRAE/IESNA 90.1-2004. Design the buildings, including the building envelope, HVAC systems, service water heating, power, and lighting systems, to achieve an energy consumption that is at least 30% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1-2004.

5. PROJECTS: Work with BCE & Command Energy Manager to program, design and execute 'NRG' projects that are identified by you or the energy audits. Energy Manager will be the POC for other offices within CE that may be involved.

6. LIFE CYCLE COST (LCC) ANALYSIS: Work with Command Energy Manager to develop LCC's for projects selected as 'NRG' Projects. Use BLCC5 software to perform the Life Cycle Cost Analysis to justify and select the energy options for the project.

7. THERMAL PERFORMANCE**:** Energy Management and Control System (EMCS): EMCS will be utilized in each facility with 10 tons of A/C or more. Provide timers or some type of method to allow occupants to extend the period that is temperature controlled. Contractor shall program night setback as a part of the installation of the EMCS. During setback and times system is not in use, the dampers for outdoor air and exhaust dampers shall automatically close (2009 International Energy Conservation Code, Sec 503 Jan 2009). A building's cooling and heating needs are affected by the performance of interrelated building systems and characteristics, including building envelope characteristics; passive solar design elements, such as day lighting, lighting systems, plug-in and other internal loads. The appropriate HVAC design solution shall be determined only after the requirements and contributing thermal loads of these interrelated systems have been thoroughly reviewed and all possible efficiency gains through sustainable design strategies have been carefully considered.

a. Building system shall be laid out with a perimeter zone and at least one interior zone. Perimeter zone shall extend from the outside walls to 15 feet away from the walls. For buildings with less than a 50 foot long wall, one zone may be used.

b. Smaller individual units and facilities too small for economical use of EMCS will use programmable thermostats. Contractor shall program the thermostat.

c. Demand Ventilation: Demand control ventilation is required for spaces larger than 500 SF and a flow greater than 1,200 CFM. (2009 International Energy Conservation Code, Sec 503.2.6 Jan 2009)

d. Ventilation shall be provided by one or more of the following:

- A set automatic outdoor airflow in the occupied mode, which shall be closed when the building space is in the unoccupied mode.
- CO2 monitoring demand ventilation systems for buildings with highly variable occupancy if directed by the base project engineer.

e. Design Conditions: Outdoor and indoor design conditions shall be in accordance with UFC 3-410-01FA. Outdoor air and exhaust ventilation requirements for indoor air quality shall be in accordance with ASHRAE 62.1.

f. Design systems in geographical areas that meet the definition for high humidity in UFC 3-410-01FA in accordance with the special criteria for humid areas therein. Cooling equipment may be oversized by up to 15 percent to account for recovery from night set forward. Heating equipment may be oversized by up to 30 percent to account for recovery from night setback. Design single zone systems and multi-zone systems to maintain an indoor design condition of 50% relative humidity for cooling only. For heating only where the indoor relative humidity is expected to fall below 20% for extended periods, add humidification to increase the indoor relative humidity to 30%. Where fan coil units are used, provide a non-permeable wall covering behind the unit. Provide ventilation air from a separate dedicated air handling unit. Do not condition outside air through fan coil units. Avoid the use of direct expansion cooling coils in air handling units with constant running fans that handle outside air.

g. Building Envelope Sealing: Design and construct the building envelope for operational maintenance buildings, administrative buildings, office portions of mixed office and open space, dining, dormitories, medical facilities, and instructional/training facilities with a continuous air barrier to control air leakage into, or out of, the conditioned space. Clearly identify all air barrier components of each envelope assembly on construction documents and detail the joints, interconnections and penetrations of the air barrier components. Clearly identify the boundary limits of the building air barriers, and of the zone or zones to be tested for building air tightness on the drawings.

h. Energy Management Systems: Establish, maintain and maximize use of Energy Management and Control Systems (EMCS, SCADA, etc.) to centrally monitor and control utility and building systems. EMCS should be sustainable and non proprietary.

i. Provide adjustable ranges on thermostats so that occupants can change their set point up or down 3 degrees.

j. Programmable thermostats: Provide 7-day electronic programmable thermostats with lockout capability in facilities areas where EMCS is not available or applicable. Contractor shall program the thermostat as a part of installation. The programmable thermostat shall be capable to automatically change from the cooling mode to the heating mode and vice-versa as required.

k. High efficiency systems that require less energy to operate should be incorporated in lighting, HVAC, and other systems. Buildings should meet high standard, measurable goals for energy management.

8. LIGHTING: Lighting shall comply with the recommendations of the Illumination Engineering Society of North America (IESNA), DRAFT Robins Air Force Base energy policy letter, and all applicable guidelines set forth in Part 6A-Facility Electrical, General and Part 6B-Interior lighting, of this BFS. Typically, use T-8, T-32 or 28 watt fluorescent lamps for administrative areas and the lamps with the greatest efficiency in other situations. Lighting for administrative areas should be designed at a level of 1 watt/SF (2009 International Energy Conservation Code, Sec 505 Jan 2009).

a. Use switches (remote from the panel board located at main entrances and other locations) to allow user control of lighting. For facilities larger than 25,000 SF, use the EMCS as a secondary control to turn lights off during unoccupied times. Motion sensors will be utilized in small offices/bathrooms and other similar locations.

b. Day-lighting controls for fixtures located within 15 feet of open light sources such as windows and skylights will be utilized. Skylights will be utilized wherever feasible.

c. Utilize emergency lighting with individual back-up batteries (for small applications) or IPS systems in larger buildings. Continuous lighting (24/7) or “night-lighting” shall be discouraged.

d. Warehouses shall use high output fluorescents (preferably T-5 technology).

e. All outside lights shall be induction (ETL 10-2) and shall be controlled by an EMCS system or by astronomical/photo-cell combination controller.

f. Compact Fluorescent Lamps (CFL)(ETL 07-7: This ETL requires the use of CFLs for locations where incandescent lamps incorporation Edison Type A (standard incandescent) sockets are traditionally installed. This ETL provides design and replacement criteria and guidance for replacing incandescent lamps with CFLs. The use of incandescent lamps is restricted to very limited applications. CFLs may be used in canopies or porches/overhangs that are less than 10 feet above the floor and at doors.

g. Interior Lighting: Interior lighting shall utilize electronic ballast and energy efficient fluorescent lamps with a Correlated Color Temperature of 4100K. Compact fluorescent fixtures shall have a Color Rendering Index of (CRI) of 82 or higher. Linear fluorescent fixtures shall have a CRI of 85 or higher. Fluorescent lamps shall be the low mercury type qualifying as non-hazardous waste upon disposal. Surface mounted fixtures shall not be used on acoustical tile ceilings. An un-switched fixture with emergency ballast shall be provided at each entrance to the building.

h. Light-Emitting Diode (LED) Fixture Design and Installation Criteria for Interior and Exterior Lighting Applications; ETL 10-18: This ETL provides technical guidance and criteria for specifying, designing, and installing LED luminaries for interior and exterior lighting applications at air Force installations. This ETL does not apply to LED airfield lighting systems, including but not limited to, taxiway, obstruction, runway edge, threshold, or approach lighting systems (consult ETL 11-13)

i. Use of LED Fixtures in Airfield Lighting Systems on Air Force Installations and Expeditionary Locations (ETL 11-13): This ETL supersedes ETL 10-15, Use of Light-Emitting Diode (LED) Fixtures in airfield Systems on Air Force Installations and Expeditionary Locations, dated 24 September 2010.

j. Alternative Water Sources, (ETL 08-10) – Use of Non-Potable Water: This ETL provides technical requirements for using alternative water sources to supply non-potable water where it is appropriate for use in Air Force facilities and on Air Force property. This ETL does not apply to the use of alternative water sources for use as potable water.

9. ENERGY CONSERVATION RATED EQUIPMENT: Purchase Energy Star or FEMP designated products. The term “Energy Star product” means a product that is rated for energy efficiency under an Energy Star program. The term “FEMP designated product” means a product that is designated under the Federal Energy Management Program of the Department of Energy as being among the highest 25 percent of

equivalent products for energy efficiency. When selecting integral sized electric motors, choose NEMA PREMIUM type motors that conform to NEMA MG 1, minimum Class F insulation system. Motors with efficiencies lower than the NEMA PREMIUM standard may only be used in unique applications that require a high constant torque speed ratio (e.g., inverter duty or vector duty type motors that conform to NEMA MG 1, Part 30 or Part 31).

10. WATER: The availability of potable and non-potable water at Robins is a primary issue for the future of the installation. Design for development sustainability must incorporate consideration for limiting water requirements and preserving water supply. The use of native plants in landscaping reduces irrigation requirements. If some irrigation is necessary, high efficiency irrigation systems greatly reduce water consumption. Surface water retention ponds can be included to reduce flooding, and to hold water on-site to be utilized as an irrigation source. Gray water can be used for irrigation, and to flush toilets.

a. Waterless urinals and low-flow toilets and showers reduce the use of water. Also, new technology in the use of recycled rainwater and treated effluent may offer water saving alternatives in the future.

b. Use tank-less electric heating for facilities with less than/equal to 4 restrooms.

c. Temperature setting for hot water will be 110 degrees (180 degrees for feeding establishments).

d. Hot water pipes will be insulated with at least 1 inch insulation.

e. Hot water recirculation system(s) will implement a means to shut off the system during low occupancy or low use periods.

f. Low Flow Devices: All new water devices shall be limited to a maximum as follows:

Item	Flow Rate
Toilets	1.28 GPF
Urinals	0.5 GPF
Showerheads	1.5 GPM
Hand washing faucets	0.5 GPM

11.LANDSCAPE: The management of energy source is a design concern for the future. Concerns for energy are inherent in the orientation of buildings to take advantage of breezes and reduce heat generation in summer. The selection and placement of deciduous trees can provide cooling shade in summer while allowing sun to warm the building in winter.

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Robins Air Force Base
Base Facility Standards

Title: Corrosion Control & Cathodic Protection
Date: 15 September 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA

(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 7B – Corrosion Control & Cathodic Protection

CRITERIA REFERENCE DOCUMENTS:

AIR FORCE INSTRUCTION 32-1054, CORROSION CONTROL

ETL 88-4, Engineering and Services Reliability and Maintainability (R&M) Design Checklist, June 1988, Section 14, "Corrosion Prevention and Control"

ETL 1110-3-474, Engineering and Design, Cathodic Protection

ETL 1110-9-10 (FR), Engineering and Design, Cathodic Protection System Using Ceramic Anodes

UFC 3-570-02A - Cathodic Protection

UFC 3-570-06 - Operation and Maintenance: Cathodic Protection Systems

MIL-HDBK-1004/10, Electrical Engineering, Cathodic Protection [UFC 3-570-02N]

MIL HDBK 1022, Petroleum Fuel Facilities [UFC 3-460-01]

MIL HDBK 1110/1, Paints and Protective Coatings [UFC 3-190-06]

MIL-HDBK 1136, Maintenance & Operation of Cathodic Protection Systems [UFC 3-570-06]

MIL-HDBK 1164, Operations and Maintenance of Water Supply Systems [UFC 3-230-02]

BFS Part 2 - Environmental

BFS Part 7A –Energy Conservation

BFS Part 7C – Sustainable Design & Development

1. GENERAL

a. Chilled Water/Hot Water Piping: Provide cathodic protection for underground steel pipe.

b. Natural gas - All underground natural gas lines with metal piping shall be coated and shall have cathodic protection installed.

c. Cathodic protection shall be provided on all new underground steel systems and piping. Insulating devices shall be used as necessary to isolate dissimilar metal common to an electrolyte (soil, water, etc). All underground steel systems shall be coated and/or wrapped.

d. All below ground tanks shall meet the latest editions of the EPA regulations, be double walled, and have cathodic protection.

e. Provide cathodic protection test station if directed by the base project design engineer.

f. Provide sampling port near the pump inlet. For temperatures above 120F, provide a cooler.

g. All below ground steel tanks and piping shall be provided with either sacrificial anodes (high potential magnesium) or impressed current cathodic system or both as directed by the Base Project Engineer.

2. GENERAL CRITERIA FOR EXTERIORS OF UTILITY SYSTEMS

All above ground portions of utility lines and equipment shall be protected against corrosion by galvanizing or protective coatings. All underground lines and equipment made of metal shall be either uncoated or coated and cathodically protected. Details follow:

a. Metal Posts, Columns, and Bollards in contact with or embedded in concrete: Coal tar epoxy system for electrical insulation before placing on or in concrete. Final dry thickness of coats shall be 6 mils.

b. Metallic Parts in Concrete Pits: When no provisions are made to prevent water in the pits, add a zinc anode (min. 3 lb.) at the lowest metallic point.

c. Water Tanks:

(1) Exterior: Use an approved primer and two coat system.

(2) Internal: Provide impressed current cathodic protection with hi-silicon cast iron anodes.

d. Above Ground Tanks with Underground Lines: Provide protection of lines based upon type of substance stored.

e. Underground Tanks:

(1) Use double lined fiberglass tanks. Follow latest guidance from 78CEG/CEAN on leak detection and other environmental standards.

(2) Provide protection of lines based upon type of substance stored.

f. POL Tanks shall have the bottoms coated and cathodically protected with isolation from other systems.

g. POL Lines shall be factory coated black steel with cathodic protection and isolating flanges. Provide surge arresters across the flanges to prevent sparks.

h. Natural Gas Lines shall be high-pressure polyethylene (PE) with PE valves and joints.

(1) Field locating (to enable path detection and to connect metal sections of the lines):

(a) Install marking tape with metal tracing wire 1 foot above pipe.

(b) Also install tracer wires placed on the lines using #14 AWG Cu with nicked TW insulation.

(2) Use metal riser assemblies at facilities (with isolating joints for metallic lines) and 1-pound hi-pot magnesium anodes connected.

i. Steam And Condensate Lines shall be metallic meeting **ETL 88-6** with exterior coatings and cathodic protection.

(1) Use isolating flanges at facilities and major above ground transitions.

(2) Locate anodes at least 15 feet from lines to prevent drying out the ground around the anodes.

(3) Do not allow anode wires to cross either set of lines.

(4) insulate the lines from the concrete in pits to prevent touching and accidentally protecting rebar.

(5) If using COE specification, modify it to require cathodic protection regardless of soil resistivity, to counter effects of anaerobic bacteria.

j. Domestic Water Lines shall be one of these:

(1) Plastic:

(a) Field locating (to enable path detection and to connect metal sections of the lines):

1. Install marking tape with metal tracing wire 1 foot above pipe.

2. Also install tracer wires placed on the lines using #14 AWG Cu with nicked TW insulation.

(b) Use metal riser assemblies at facilities with 1-pound hi-pot magnesium anodes connected.

(2) Cast iron lines.

(a) Do not coat the cast iron.

(b) Bond the joints with No. 4 Cu AWG insulated wire. Coat both ends of the Thermit wire connections.

(3) Ductile iron.

(a) Coat ductile iron:

1. Factory applied coating with field verification and correction is first choice.

2. Coal tar epoxy system is second choice.

(b) Bond the joints with No. 4 Cu AWG insulated wire. Coat both ends of the Thermit wire connections.

(c) Provide cathodic protection.

1. Use isolating flanges at facilities and major aboveground transitions.

2. Insulate the lines from the concrete in pits to prevent touching and accidentally protecting rebar.

k. Chilled and Hot Water Lines shall be metallic with exterior coatings and cathodic protection.

(1) Use isolating flanges at facilities and major aboveground transitions.

(2) Insulate the lines from the concrete in pits.

l. Industrial Waste Lines shall be one of these:

(1) PVC or other plastic is the first choice, provided the designer determines this is compatible with the waste products.

(a) Field locating (to enable path detection and to connect metal sections of the lines):

1. Install marking tape with metal tracing wire 1 foot above pipe.

2. Also install tracer wires placed on the lines using #14 AWG Cu with nicked TW insulation.

(b) Use metal riser assemblies at facilities with 1-pound hi-pot magnesium anodes connected.

(2) Cast iron.

(a) Do not coat the cast iron.

(b) Bond the joints with No. 4 Cu AWG insulated wire. Coat both ends of the Thermit wire connections.

(3) Ductile iron.

(a) Coat ductile iron:

1. Factory applied coating with field verification and correction is first choice.

2. Coal tar epoxy system is second choice.

(b) Bond the joints with No. 4 Cu AWG insulated wire. Coat both ends of the Thermit wire connections.

(c) Provide cathodic protection.

1. Use isolating flanges at facilities and major aboveground transitions.
2. Insulate the lines from the concrete in pits to prevent touching and accidentally protecting rebar.

m. Sanitary Waste Lines shall be one of these:
(1) Cast iron.
(a) Do not coat the cast iron.
(b) Bond the joints with No. 4 Cu AWG insulated wire. Coat both ends of the Thermit wire connections.
(2) PVC or Concrete. For field locating (to enable path detection and to connect metal sections of the lines):
(a) Install marking tape with metal tracing wire 1 foot above pipe.
(b) Also install tracer wires placed on the lines using #14 AWG Cu with nicked TW insulation.

n. Electrical Lines when metal shall be coated but not cathodically protected. Do not use direct buried concentric neutral cables.

3. GENERAL CRITERIA FOR INTERIORS OF UTILITY SYSTEMS

a. Potable water shall be in accordance with MIL-HDBK 1005/7A, DATED 1SEP99 **[Now UFC 3-230-19N]**. Our well water is very corrosive and non-scaling.

b. Hot or Chilled Water systems for heating or cooling shall have equipment and chemicals installed for chemical water treatment in accordance with AFR 91-40. This applies to both closed and open-type recirculating systems.

c. Steam systems for heating shall have equipment and chemicals installed for chemical water treatment in accordance with AFR 91-40. This applies to both closed and open-type recirculating systems.

d. Storage Tanks for liquids shall be protectively coated on the interiors with interior cathodic protection when water is the liquid stored.

e. Other Utility systems do not require interior corrosion treatments.

4. DETAILED CRITERIA FOR EACH CORROSION PROTECTION METHOD
[Note - Insure drawings and specifications address these items.]

a. Material Selection: Provide quality details to insure industry minimums are not used by installers when higher-level materials are required.

b. Protective Coatings:

(1) Prepare coating specifications for above and below ground high value metallic structures per AFM 85-3, "Paints and Protective Coatings" **[Now UFC 3-190-06]**, except as modified below.

(2) Prepare metal surfaces using Rust Deoxidizing Primer (RDP) by Total Rust and Corrosion Control, Inc., in Atlanta, GA, or approved equal. Blasting systems may be substituted, but must be individually approved for use at Robins AFB.

(3) On all metallic structures where we have approved surface preparation by blasting to white or near white finish, no blasted surface will be left unprimed beyond the normal workday. Any such unprimed surface must be reblasted.

(4) Do not use thin plastic film tapes, such as electrical tape, to coat underground structures or wiring. Reference NACE Standard RP-01-69.

(5) All protective coatings shall be mildew resistant.

(6) Verify coatings on underground utilities in field with "holiday" detector before burial.

(7) Coal Tar Systems:

(a) When using standard coal tar mastic on buried lines, use on RDP-prepared or near white blasted surfaces a primer and two coats of the coal tar to give a final dry thickness of 125 mils.

(b) When using coal tar epoxy on buried lines, use on RDP-prepared or near white blasted surfaces a primer and two coats of the coal tar epoxy to give a final dry thickness of 6 mils.

(8) Coat major cathodic structures like brass valves and copper lines underground to minimize corrosion of adjacent structures.

(9) Insulate thrust blocks on systems that have cathodic protection.

c. Cathodic Protection:

(1) Soil pH in the area generally ranges from 5.0 to 6.2.

(2) Soil resistivity on Base generally ranges from 10,000 ohm-cm to over 100,000 ohm-cm with anaerobic bacteria actively present.

(3) Base all cathodic protection design upon designer field tests made at the construction site. Tests include soil resistivity and water conductivity. We have soil resistivity grid maps of Robins for review.

(4) At Robins AFB, we now prefer deep well ground beds to conventional or distributed shallow bed designs. Obtain approval for other than deep well designs.

(5) Bury each pipeline in a separate trench with at least 2 feet separation from nearby utilities to preclude galvanic cells between different metals or new and old metals in case inadvertent metallic connections between the two ever occur.

(6) Install test stations and interference bonds for operational checks of cathodic protection systems and prevention of impressed current interferences between unprotected and protected pipeline systems.

(7) All cathodic protection designs not by Base specialists must be performed by a National Association of Corrosion Engineers (NACE) accredited "Corrosion Specialist." The

Corrosion Specialist must have a minimum of five years experience in the design of cathodic protection systems.

(8) Criteria of Protection:

(a) All installed cathodic protection systems must comply with the instant off rule.

(b) Due to the presence of anaerobic bacteria at Robins, our minimum criterion is -1.0V.

(c) No other criteria are allowed.

(9) Remember to connect the rectifier "+" terminal to the anodes in the field.

d. Industrial Water Treatment:

(1) General:

(a) Base the equipment installation upon specific information obtained at the construction site and upon existing Base water treatment methods. Information includes data such as current analysis of Base water.

(b) For the Automatic chemical feed system, all water treatment design not by Base specialists must be performed by an NACE accredited "Corrosion Specialist" with at least five years experience in this design.

(c) Chemical pot feeders:

1. Use at least 5-gallon capacity.
2. Provide pressure gauge on intake side of protected system.
3. Completely serviceable from floor level.
4. Sight Glass.
5. Funnel with isolation valve. Screw-on covers prohibited.

(d) Use interlocks to insure chemicals will not feed when main system is off; e.g., condenser pumps.

(e) Automatic chemical feed will use one of these methods:

1. Water meter - timer method, where chemicals are added in relation to water make-up.
2. Solids controller, to control boiler blow down and chemical feed based upon manual settings.

(f) Inject chemicals downstream of pumps. A full-size valve could be required to divert sufficient flow into the pot feeder, but this is not usually needed provided the line connections are at least 15 - 20 feet apart. NEVER feed chemicals near the pump inlet.

(2) Chilled Water:

(a) Closed Systems:

1. 100 Tons or less: Use chemical pot feeders.
2. Over 100 Tons: Use automatic system or manual system as determined by the base project engineer.

(b) Open Systems (Cooling Towers): Use automatic system.

(3) Hot Water (Closed Systems):

(a) 1000 MBTU/H or less: Use chemical pot feeders.

(b) Over 1000 MBTU/H: Use automatic system or manual system as determined by the base project engineer.

(4) Steam:

(a) Provide automatic system.

(b) Inject oxygen scavengers directly into the deaerator tank.

(c) Inject boiler water chemicals into feed water line right before the boiler drum.

(d) Blowdown Dumping:

1. At main plants, dump to industrial waste.
2. Dump elsewhere to sanitary waste.

(e) Provide for manual blowdown of tank bottom.

5. PETROLEUM, OILS, AND LUBRICANTS

a. All below ground tanks shall meet the latest editions of the EPA regulations, be double walled, and have cathodic protection.

b. Below ground piping will be double wall, properly coated, and cathodically protected per applicable EPA regulations. The designer will evaluate the use of underground fuel pipe and submit recommendations to the Base. The Base will make the decision on the use of underground piping.

c. Provide leak detector monitor system for the double walled tanks and double walled product fuel piping.

<<<End of Section>>>

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Approval: ***Original Signed By***
Terry Landreth, 778 CES/CEPT, 478-327-2910

Robins Air Force Base
Base Facility Standards

Title: Base Sustainable Design Program

Date: 17 August 2011

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 7C – BASE SUSTAINABLE DESIGN PROGRAM

CRITERIA REFERENCE DOCUMENTS:

Executive Order 13423

Air Force Instruction 32-1021

Engineering Technical Letter 08-13

Unified Facilities Guide 04-030-01

Air Force Sustainable Design and Development (SDD) Implementing Guidance, 02June2011

Atch 1 - LEED 2009 Minimum Program Requirements (MPR)

Atch 2 - LEED 2009 MPR Supplemental Guidance

Atch 3 - Air Force MILCON Sustainability Requirements Reporting Score sheet, LEED 2009

Atch 4 - Guidance on Applying LEED Principles to Air Force Horizontal Construction Projects

Atch 5 - Guidance on Applying LEED Principles to Air Force Utility Construction Projects

Atch 6 - Guidance on Applying LEED Principles to Air Force Industrial Construction Projects

Atch 7 - Implementing Guidance to Meet EISA 2007 Section 438 Requirements

BFS Part 7A –Energy Conservation

BFS Part 2 - Environmental

GENERAL:

a. This is one part of the Robins AFB Base Facility Standards. Refer questions or exception requests to the Technical Design Chief in 778 CES/CEPT. Any exceptions granted to these requirements shall be noted clearly in the project design analysis by using a Deviation Request.

b. The Contractor/Designer shall incorporate sustainable design in all designs and projects in accordance with the applicable UFC's, AFI's, ETL's, Memorandums and all other applicable regulations as referenced herein. Also conform to NFPA 101 - Life Safety Code and the current International Building Code (IBC). If there is a conflict, coordinate with the Project Manager to determine the more stringent requirement.

<<<<< **END OF SUSTAINABLE DESIGN SECTION** >>>>>

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ATTACHMENT 6

APPLYING LEED™ 2009, NC PRINCIPLES TO AIR FORCE INDUSTRIAL FACILITIES*

Project Checklist

Sustainable Sites			15 Possible Points
	Prereq 1	Construction Activity Pollution Prevention	Required
	Credit 1	Site Selection	1
	Credit 3	Brownfield Redevelopment	1
	Credit 4.2	Alternative Transportation - Bicycle Storage & Changing Rm	1
	Credit 4.3	Alternative Transportation - Low Emitting & Fuel Efficient Vehicles	3
	Credit 4.4	Alternative Transportation - Parking Capacity	2
	Credit 5.1	Site Development - Protect or Restore Habitat	1
	Credit 5.2	Site Development: Maximize Open Space	1
	Credit 6.1	Stormwater Design - Quantity Control	1
	Credit 6.2	Stormwater Design - Quality Control	1
	Credit 7.1	Heat Island Effect - Non-Roof	1
	Credit 7.2	Heat Island Effect - Roof	1
	Credit 8	Light Pollution Reduction	1
Water Efficiency			10 Possible Points
	Prereq	Water Use Reduction – 20% Reduction	Required
	Credit 1	Water Efficient Landscaping	2-4
	Credit 2	Innovative Wastewater Technologies	2
	Credit 3	Water Use Reduction	2-4
Energy and Atmosphere			26 Possible Points
	Prereq 1	Fundamental Commissioning of Building Energy Systems	Required
	Prereq 2	Minimum Energy Performance	Required
	Prereq 3	Fundamental Refrigerant Management	Required
	Credit 1	Optimize Energy Performance	1-10
	Credit 2	On-Site Renewable Energy	1-7
	Credit 3	Enhanced Commissioning	2
	Credit 4	Enhanced Refrigerant Management	2
	Credit 5	Measurement & Verification	3
	Credit 6	Green power	2
Materials & Resources			14 Possible Points
	Prereq 1	Storage & Collection of Recyclables	Required
	Credit 1.1	Building Reuse - Maintain Existing Walls, Floor & Roof	1-3
	Credit 1.2	Building Reuse - Maintain 50% Interior Non-Structural	

	Elements	1
Credit 2	Construction Waste Management	1-2
Credit 3	Materials Reuse	1-2
Credit 4	Recycled Content	1-2
Credit 5	Regional Materials	1-2
Credit 6	Rapidly Renewable Materials	1
Credit 7	Certified Wood	1

Indoor Environmental Quality		10 Possible Points
Prereq 1	Minimum IAQ Performance	Required
Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required
Credit 1	Outdoor Air Delivery Monitoring	1
Credit 2	Increased Ventilation	1
Credit 3.1	Construction IAQ Management Plan - During Occupancy	1
Credit 3.2	Construction IAQ Management Plan - Before Occupancy	1
Credit 4.1	Low-Emitting Materials - Adhesives & Sealants	1
Credit 4.2	Low-Emitting Materials - Paints & Coatings	1
Credit 4.3	Low-Emitting Materials - Carpet Systems	1
Credit 4.4	Low-Emitting Materials - Composite Wood & Agrifiber Products	1
Credit 5	Indoor Chemical & Pollutant Source Control	1
Credit 8.1	Daylight & Views – Daylight	1

Innovation & Design Process		6 Possible Points
Credit 1.1	Innovation in Design	1
Credit 1.2	Innovation in Design	1
Credit 1.3	Innovation in Design	1
Credit 1.4	Innovation in Design	1
Credit 1.5	Innovation in Design	1
Credit 2	LEED Accredited Professional	1

Regional Priority		4 Possible Points
Credit 1.1	Regional Priority	1
Credit 1.2	Regional Priority	1
Credit 1.3	Regional Priority	1
Credit 1.4	Regional Priority	1

Project Totals 85 Possible Points

* Projects may pursue other LEED2009, NC credits, not listed, towards meeting benchmark.

APPLYING LEED™ 2009, NC PRINCIPLES TO AIR FORCE
INDUSTRIAL FACILITIES

MET BENCHMARK LEVELS

Certified	30 - 37 points
Silver	38 - 44 points
Gold	45 - 59 points
Platinum	60 - 85 points

Attachment 7 - Implementing Guidance to Meet EISA 2007 Section 438 Requirements

Applicability. This guidance applies to projects that construct facilities with a footprint greater than 5,000 gross square feet, or expand the footprint of existing facilities by more than 5,000 gross square feet (See attached DoD policy memorandum, 19 Jan 2010, Subject: DoD Implementation of Storm Water requirements under Section 438 of the Energy Independence and Security Act (EISA) for details). The designer shall evaluate applicability and design appropriate storm water management controls.

*NOTE: "**Footprint**" includes land areas disturbed as part of any construction project, including disturbance for building, utilities, parking, soil stockpiling, etc, as defined by USEPA Technical Guidance on Implementing Stormwater Requirements Under Section 438 of EISA 2007.*

Estimating pre- and post-development hydrologic parameters. Air Force planners and designers and Construction Agents use standard engineering practices to estimate development hydrologic parameters. Unified Facilities Criteria 3-230-01 1 Aug 2006, Surface Drainage Design reviews three methods appropriate to the scope of EISA 2007 Section 438 compliance. These are: 1) the rational method, 2) National Resource Conservation Service (formerly Soil Conservation Service) technical release 55 (TR-55) method, and 3) the U.S. Geological Survey (USGS) regression equations. Planners and designers should choose a method that is practical and appropriate to the scope of the project. For example, watershed continuous models like EPA's BASINS and HSPF would not typically be appropriate.

Maximum Extent Technically Feasible (METF). Project designers are to design storm water management LID practices to the METF for applicable projects to manage either: 1) the 95th percentile rain event, or 2) Site specific hydrologic analysis which estimates the volume of infiltration, evapotranspiration, or on-site storm water harvesting and use based on site-specific hydrologic conditions. Restoring predevelopment hydrology can be difficult to achieve and Congress recognized this potential difficulty by including the METF language in the statute. For projects where technical infeasibility exists, document and quantify that storm water strategies, such as infiltration, evapotranspiration, and harvesting were employed to the METF. If the design objective cannot be met within the project footprint, LID measures may be applied at nearby locations on DoD property (e.g., downstream from the project) within available resources. The land surrounding the project site is available to implement the appropriate Green Infrastructure (GI)/LID practices where optimal. Although the performance requirements of EISA Section 438 apply only to the project footprint, the flexibility exists to utilize the entire federal property in implementing the storm water strategies for the project.

Required Documentation: All site-specific technical constraints that limit the full attainment of the design objective shall be documented and retained in the project record. Documentation of technical infeasibility should include, but may not be limited to, engineering calculations, geologic reports, hydrologic analyses, and site maps. The installation construction project engineer validates the designer has met METF.

Retention / Detention Ponds. Any construction of permanent retention or detention ponds is strongly discouraged. If retention/ detention option is selected, written documentation for options considered and justification for the choice should be included in the design analysis, Additionally Bird Aircraft Strike Hazard (BASH) as well as other storm water management, maintenance and real property issues should be addressed. Where cost effective and allowed, LID measures should consider on site reuse of storm water for landscape/irrigation purposes to meet the water conservation requirements of EO 13514.

Post-construction analysis: Installations verify the effectiveness of as-built storm water features by periodic site visits to document the storm water LID systems and practices are functioning as intended.

EISA REFERENCE MATERIAL

1. US EPA Technical Guidance on Implementing the Stormwater Requirements of Energy Independence and Security Act of 2007, Section 438.
http://www.epa.gov/oaintrnt/stormwater/requirements.htm

2. 19 Jan 2010 DUSD Policy Memo (Attached)

3. EISA 2007 Section 438 Compliance Tool (TR-55 based, assists programmer in determining and documenting applicability, and develops files for project record)
Available by CD-ROM through Robins AFB, Bldg 359, or for .mil users at the link:
https://org.eis.afmc.af.mil/sites/78abw/78ceg/LID/default.aspx

4. UFC 3-210-10, Low Impact Development
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_210_10.pdf

OFFICE OF THE UNDER SECRETARY OF DEFENSE
3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

ACQUISITION, TECHNOLOGY AND LOGISTICS

JAN 19 2010

MEMORANDUM FOR ACTING ASSISTANT SECRETARY OF THE ARMY (INSTALLATIONS AND ENVIRONMENT)
ACTING ASSISTANT SECRETARY OF THE NAVY (INSTALLATIONS AND ENVIRONMENT)
ACTING ASSISTANT SECRETARY OF THE AIR FORCE (INSTALLATIONS, LOGISTICS, AND ENVIRONMENT)

SUBJECT: DoD Implementation of Storm Water Requirements under Section 438 of the Energy Independence and Security Act (EISA)

Reducing the impacts of storm water runoff associated with new construction helps to sustain our water resources. In October 2004, DoD issued Unified Facilities Criteria on Low Impact Development (LID) (UFC 3-210-10), a storm water management strategy designed to maintain the hydrologic functions of a site and mitigate the adverse impacts of storm water runoff from DoD construction projects. Using LID techniques on DoD facility projects can also assist in fulfilling environmental regulatory requirements under the Clean Water Act. Since 2004, DoD has implemented LID techniques for controlling storm water runoff on a number of projects.

EISA Section 438 (Title 42, US Code, Section 17094) establishes into law new storm water design requirements for Federal development and redevelopment projects. Under these requirements, Federal facility projects over 5,000 square feet must "maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow." Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance* (October 5, 2009), directed the U.S. Environmental Protection Agency (EPA) to issue EISA Section 438 guidance. DoD shall implement EISA Section 438 and the EPA *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act*, using LID techniques in accordance with the policy outlined in the attachment.

EISA Section 438 requirements are independent of storm water requirements under the Clean Water Act and should not be included in permits for storm water unless a State (or EPA) has promulgated regulations for certain EISA Section 438 requirements (i.e., temperature/heat criteria) that are applicable to all regulated entities under its Clean Water Act authority.

The attached policy will be incorporated into applicable DoD Unified Facilities Criteria within six months. My points of contact are Thadd Buzan at (703) 571-9079 and Ed Miller at (703) 604-1765.

Dorothy Robyn
Deputy Under Secretary of Defense
(Installations and Environment)

Attachment:
As stated

DoD Policy on Implementing Section 438 of the Energy Independence and Security Act (EISA)

1. EISA Section 438 requirements apply to projects that construct facilities with a footprint greater than 5,000 gross square feet, or expand the footprint of existing facilities by more than 5,000 gross square feet. The project footprint consists of all horizontal hard surfaces and disturbed areas associated with the project development, including both building area and pavements (such as roads, parking, and sidewalks). These requirements do not apply to internal renovations, maintenance, or resurfacing of existing pavements.

2. The overall design objective for each project is to maintain predevelopment hydrology and prevent any net increase in storm water runoff. DoD defines "predevelopment hydrology" as the pre-project hydrologic conditions of temperature, rate, volume, and duration of storm water flow from the project site. The analysis of the predevelopment hydrology must include site-specific factors (such as soil type, ground cover, and ground slope) and use modeling or other recognized tools to establish the design objective for the water volume to be managed from the project site.

3. Project site design options shall be evaluated to achieve the design objective to the maximum extent technically feasible. The "maximum extent technically feasible" criterion requires full employment of accepted and reasonable storm water retention and reuse technologies (e.g., bio-retention areas, permeable pavements, cisterns/recycling, and green roofs), subject to site and applicable regulatory constraints (e.g., site size, soil types, vegetation, demand for recycled water, existing structural limitations, state or local prohibitions on water collection). All site-specific technical constraints that limit the full attainment of the design objective shall be documented. If the design objective cannot be met within the project footprint, LID measures may be applied at nearby locations on DoD property (e.g., downstream from the project) within available resources.

4. Prior to finalizing the design for a redevelopment project, DoD Components shall also consider whether natural hydrological conditions of the property can be restored, to the extent practical.

5. Estimated design and construction costs for implementing EISA Section 438 shall be documented in the project cost estimate as a separate line item. Final implementation costs will be documented as part of the project historical file. Post-construction analysis shall also be conducted to validate the effectiveness of as-built storm water features.

The following flowchart illustrates the DoD implementation process for EISA Section 438, consistent with the U.S. Environmental Protection Agency's *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act* (December 2009) (http://www.epa.gov/owow/nps/lid/section438/.

Flowchart for EISA §438 Implementation

1. Determine applicability

Requirement: apply to all Federal projects with a footprint greater than 5,000 square feet

2. Establish design objective

Requirement: maintain or restore predevelopment hydrology

OPTIONS

1
Total volume of rainfall from 95th percentile storm is to be managed on-site.

2
Determine predevelopment hydrology based on site-specific conditions and local meteorology by using continuous simulation modeling techniques, published data, studies, or other established tools. Determine water volume to be managed onsite.

Design water volume
(to be retained)

3. Evaluate design options

Design water volume
(to be retained)

Requirement: meet design objective to maximum extent technically feasible (METF)

TYPICAL ON-SITE DESIGN OPTIONS

- **Bio-retention areas**
- **Permeable pavements**
- **Cisterns / recycling**
- **Green roofs**

Use any combination of on-site options to achieve the design objective to the METF. Document site-specific constraints.

TECHNICAL CONSTRAINT EXAMPLES

- Retaining storm water on site would adversely impact receiving water flows
- Site has shallow bedrock, contaminated soils, high groundwater, underground facilities or utilities
- Soil infiltration capacity is limited
- Site is too small to infiltrate significant volume
- Non-potable water demand (for irrigation, toilets, wash-water, etc.) is too small to warrant water harvesting and reuse systems
- Structural, plumbing, or other modifications to existing buildings to manage storm water are infeasible
- State or local requirements restrict water harvesting
- State or local requirements restrict the use of green infrastructure/LID

remaining water volume?

OFF-SITE OPTIONS
(optional)

Selected on-site design options

Selected off-site design options

4. Finalize design and estimate cost

Robins Air Force Base
Base Facility Standards

Title: **GeoBase Program**
Geographic Information System (GIS Procedures)

Date: **July 20, 2011**

BASE FACILITY STANDARD (BFS) -- ROBINS AFB, GA
(Also known as Installation Design Guide)

FOR ARCHITECT-ENGINEER FIRMS AND CONTRACTORS
PERFORMING DESIGN SERVICES AND CONSTRUCTION FOR ROBINS AFB

PART 7D– GEOBASE PROGRAM (GIS PROCEDURES)

Revised: 20 July 2011

CRITERIA REFERENCE DOCUMENTS:

US Army Corps of Engineers, Engineering and Construction Bulletin
http://www.wbdg.org/ccb/ARMYCOE/COEECB/ecb_2006_15.pdf

A/E/C Architectural/Engineering/Construction (AEC) CADD Standard (for CAD data)

AFI 32-10112 Installation Geospatial Information and Services (Installation GI&S)

1. GENERAL

a. To ensure that all design and construction projects make use of the most up to date utility and planimetric data and post construction updates are properly submitted to keep the base utility and planimetric data current. The Robins AFB GeoBase system is the sole data repository of Utility, Planimetric and Environmental data on Robins AFB.

b. Responsibility for the overall content and format of the Robins AFB GIS belongs with the 78th CEG GeoBase Office. Planimetric and utility features are the primary responsibility of the 78 CES/CEOS office. The Environmental features are the responsibility of the 78 CEG/CEANP office. Any questions regarding the overall responsibility of the GIS content should be directed to the GeoBase Office before work on the project is initiated.

c. All Base construction projects that make changes to the existing Base infrastructure planimetric and environmental features must adhere to the following requirements.

2. Data Ownership

a. Robins AFB GIS program is divided and managed by two separate offices. The 78CES/CEOS office maintains all the Planimetric and Utility data. The 78CEG/CEAN office maintains all the Environmental data.

78 CES/CEOS
Planimetric Data: Airfield, Roads, Sidewalks, Buildings, Geodetic, hydrography, landform, pedestrian, land status.
Utility Data: Air, electrical, fuel, gas, heating/cooling, industrial, storm, wastewater, and water.

78 CEG/CEAN
All Environmental Data: Air Quality, groundwater quality, pollution control, regulated tanks, solid waste, hazmat/hazwaste, remediation, cultural, fauna, flora, wetlands.

3. Drawing Submittal Requirements

a. All Projects that make changes to the existing base infrastructure must include as-built drawings and must be submitted to the 78 CES/CEOS before the project closeout is completed.

b. Facility orientation shall be shown on the site plan to include clearly marked coordinates and elevations. All coordinates shall be in NAD83, State Plane Coordinate System, GA West FIPS 1002 Feet. All elevations measurements shall be NAVD 88 US feet and tied to the base survey control network.

c. The contractor shall ensure that all data, metadata, and attributes are fully populated based on the current SDSFIE standard. Upon request the GeoBase office will provide the contractor with a current SDSFIE compliant GIS template to be used for populating the GIS deliverables as required under the contract.

d. Final drawing submittals shall be in AutoCAD and GIS (ESRI) format. Electronic ".dwg" and ".shp" files must be compatible with Robins AFB GeoBase system and require no alterations before acceptance. Contact the 78 CEG/CEOS, GeoBase office for the latest software version requirements.

4. Survey Control

a. If installing temporary or permanent ground control, benchmarks shall be set by a Georgia licensed surveyor and tied into the existing base survey network.

b. Newly installed benchmarks shall be surveyed-in to not less than 3rd order, Class I accuracy or 1:10,000 using NAD83, State Plane Coordinate System, GA West FIPS 1002 Feet, NAVD88 Feet.

c. Any new permanent ground control benchmarks shall be submitted in separate detailed report showing data for each point, including Northing, Easting, and Vertical coordinates. The report must be verified and stamped by a Georgia licensed surveyor and submitted to the 78 CEG/CEOS GeoBase Office.

d. Contact the 78th CEG/CEOS, GeoBase Office for the latest survey network control report.

5. Points of Contact

a. 78 CES/CEOS, Geobase Office
Building 1555, 775 Macon Street Robins AFB
Phone: 478-327-8924

b. 78 CEG.CEAN, Environmental Management
Building 359, 775 Macon Street, Robins AFB
Phone: 478-327-8104

Author: Josh Winters, 78 CES/CEOS, 478-327-8924

Reviewer: David Trescott, 778CES/CEPG,

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