

# FORT CAMPBELL, KENTUCKY

# **TECHNICAL DESIGN GUIDE**

## Instructions for Use

This Document has been prepared jointly by the Fort Campbell Directorate of Public Works and the Louisville District Army Corps of Engineers. Contents of the document are controlled by Public Works. It is updated and housed on the Directorate of Contracting website under LINKS. The document contains mandatory criteria, policies, and procedures that apply to all design and construction at Fort Campbell.

To aid the reader, the document utilizes (blue) hyperlink text, which can be accessed by “clicking” the colored text. In addition, much of the document is formatted using construction-industry “CSI” standards and Unified Facilities Guide Specifications (UFGS).

Highlighted text is part of the most recent document update 15 November 2010.

# FORT CAMPBELL, KENTUCKY

## TECHNICAL DESIGN GUIDE

### Table of Contents

**CHAPTER 1**  
**CHAPTER 2**  
**CHAPTER 3**

**General Information and Administrative Requirements**

**General Requirements and Instructions**

**Technical Requirements and Instructions**

Division 00800

Division 01000

Section 01356: Storm water Pollution Protection

Section 01560: Environmental Protection

Section 01572 – 01670: Construction and Demolition

Waste Removal/Diversion Recycle of Recovered  
Materials

Division 02000

02080: Removal and Disposal of Asbestos Containing  
Materials

02090: Demolition of Buildings with Lead- Based Paint,  
Removal and Disposal of Lead-Based Paint

02220: Demolition

02226: Removal and Salvage of Historic Building  
Materials

02315 – 02316: Excavation, Filling and Backfilling

02364: Termiticide Treatment Measures for  
Subterranean Termite Control

02510: Water Distribution System

02531 – 02532: Sanitary Sewers

02552: Pre-Engineered Underground Heat Distribution  
System

02556: Gas Distribution System

02630: Storm-Drainage System

02744 – 02745: Bituminous Roadways

02753 – 02754: Concrete Pavements

02770: Concrete Sidewalks and Curbs and Gutters

02930: Exterior Painting

Division 03000

Section 03300: Cast-in-Place Structural Concrete

[Section 03307: Concrete for Minor Structures](#)  
[Section 03330: Cast-in Place Architectural Concrete](#)

Division [04000](#)  
[Section 04200: Masonry](#)

Division [05000](#)  
[Section 05500: Metals](#)

Division [06000](#)  
[Section 06200: Finish Carpentry](#)  
[Section 06650: Solid Polymer \(Solid Surfacing\) Fabrications](#)

Division [07000](#)  
[Section 07000: Roofing, General](#)  
[Section 07311: Roofing, Strip Shingles](#)  
[Section 07412: Non-Structural Metal Roofing](#)  
[Section 07416: Structural Standing Seam Metal Roofing \(SSSMR\)](#)  
[Section 07510: Built-Up Roofing](#)  
[Section 07530: Elastomeric Roofing \(EPDM\)](#)  
[Section 07551: Modified Bitumen Roofing](#)

Division [08000](#)  
[Section 08330 – 08331: Overhead Coiling/Rolling Doors](#)  
[Section 08360: Overhead Sectional Doors](#)  
[Section 08700: Hardware](#)

Division [09000](#)  
[Section 09000: Finishes, General](#)  
[Section 09200: Exterior Insulating Finish Systems \(EIFS\)](#)  
[Section 09400: Metal Panel Siding](#)  
[Section 09900: Painting, General](#)

Division [10000](#)  
[Section 10160: Toilet Partitions](#)  
[Section 10430: Exterior Signage](#)  
[Section 10440: Interior Signage](#)  
[Section 10800: Toilet Accessories](#)

Division [11000](#)  
[Section 11400: Food Service Equipment](#)

Division [13000](#)  
[Section 13100: Lightning Protection System](#)  
[Section 13120 – 13121: Metal Buildings](#)  
[Section 13202 – 13216: Petroleum/Fuel Storage Tanks](#)  
[Section 13280: Asbestos Abatement](#)  
[Section 13281: Lead Hazard Control Activities](#)  
[Section 13721: Small Intrusion Detection System](#)  
[Section 13801: Energy Monitoring and Control System \(EMCS\)](#)

[Section 13850 – 13851: Fire Detection and Alarm Systems](#)

[Section 13900: Fire Protection Systems](#)

**Division 15000**

[Section 15080: Insulation](#)

[Section 15100: Hydronic Piping](#)

[Section 15190: Gas Piping](#)

[Section 15400: Plumbing, General Use](#)

[Section 15550: Water and Steam Heating](#)

[Section 15620: Chillers](#)

[Section 15700: Air-Conditioning System \(Unitary Type\)](#)

[Section 15702: Computer Room Units](#)

[Section 15895: Air Supply, Distribution, Ventilation and Exhaust System](#)

[Section 15940: Vehicle Tailpipe Exhaust](#)

[Section 15951: Direct Digital Control \(DDC\)](#)

[Section 15990: Testing, Adjusting and Balancing HVAC Systems](#)

[Section 15995: Commissioning HVAC Systems](#)

**Division 16000**

[Section 16000: Electrical Work, General](#)

[Section 16264 – 16265: Standby Electric Generator Sets](#)

[Section 16370: Electrical Distribution System, Aerial](#)

[Section 16375: Electrical Distribution System, Underground](#)

[Section 16415: Electrical Work, Interior](#)

[Section 16528: Exterior Lighting Including Security](#)

[Section 16700+: Communications Systems and Premises Distribution System](#)

**APPENDIX A**

**[Environmental Topics](#)**

[Appendix A-1: Occupational Health Considerations](#)

[Appendix A-2: Clean Air Act](#)

[Appendix A-3: Clean Water Act](#)

[Appendix A-4: Safe Drinking Water Act](#)

[Appendix A-5: Toxic Substances Control Act \(TSCA\)](#)

[Appendix A-6: Federal Insecticide, Fungicide and Rodenticide Act \(FIFRA\)](#)

[Appendix A-7: Solid Waste Disposal Act](#)

[Appendix A-8: Hazardous Waste Disposal Act](#)

[Appendix A-9: Emergency Planning and Community Right-To-Know Act](#)

[Appendix A-10: National Emission Standards for Hazardous Air Pollutants \(NESHAP\)](#)

<b>APPENDIX B</b>	<a href="#"><u>Intentionally Left Blank</u></a>
<b>APPENDIX C</b>	<a href="#"><u>Digging/Excavation Permits</u></a>
<b>APPENDIX D</b>	<a href="#"><u>Building Interior and Exterior Finishes</u></a>
<b>APPENDIX E</b>	<a href="#"><u>Fort Campbell Landscape Plant List</u></a>
<b>APPENDIX F</b>	<a href="#"><u>Utility Procedures</u></a>
<b>APPENDIX G</b>	<a href="#"><u>Mold and Humidity Control</u></a>
<b>APPENDIX H</b>	<a href="#"><u>Network Enterprise Center, Fort Campbell Requirements</u></a>
<b>APPENDIX I</b>	<a href="#"><u>Erosion and Sedimentation Control</u></a>
<b>APPENDIX J</b>	<a href="#"><u>Installation of ICIDS Equipment in Arms Rooms</u></a>

# Technical Design Guide

## CHAPTER 1

### General Information and Administrative Requirements

#### PARAGRAPH

- 1-1 [Purpose](#)
- 1-2 [Document Format](#)
- 1-3 [Application](#)
- 1-4 [Design Submittals](#)
- 1-5 [Improvements and Deviations](#)

#### 1-1 Purpose

1-1.2 Prior to the development of this Technical Design Guide, the source for Ft. Campbell specific Engineering and design guidance was contained in the “*Fort Campbell Installation Design Guide (IDG)*” and the “*Louisville District Architect-Engineer Design Guide (AEDG) for Military Construction.*” The “**Fort Campbell, Kentucky, Technical Design Guide**” has been developed to provide a single-source comprehensive resource for technical requirements regarding all MILCON and OMA program projects located on post. The technical guidance and criteria in this document is considered specific to Fort Campbell and it applies to all engineering and construction efforts completed by the Directorate of Public Works (DPW), The US Army Corps of Engineers (COE), and all Contract A-E designers.

1-1.2 The “**Fort Campbell, Kentucky, Technical Design Guide**” is the result of ongoing joint efforts between Fort Campbell and Louisville District. The document is the property of the Fort Campbell, Directorate of Public Works. It is maintained by the Directorate of Public Works and is made available on the Directorate of Contracting website (<http://www.campbell.army.mil/ima/sites/installation/contracting.asp>) under LINKS. A joint DPW and COE committee oversees maintenance, evaluation, and revision of the technical contents. Specific guidance and criteria contained within are developed through specialized sub-committees with representatives from engineering, construction, and maintenance personnel from Ft. Campbell and Louisville COE. It is intended by the committee that the document continuously grows to accept additional information, accept changes in technology, and reflect changes in Army guidance, policies and visions.

1-1.3 The Fort Campbell DPW vision includes the need for consistent design and construction of environmentally sound, energy efficient, easily maintainable facilities. . This technical document is part of an ongoing commitment to bring that vision into reality at Ft. Campbell.

## 1-2 Document Format

1-2.1 The technical content of this document uses Construction Specifications Institute (CSI) format.

1-2.2 Fort Campbell Requirements are considered mandatory. Requirements shall be reflected on construction contract documents and support data.

1-2.3 Instructions to Designers provide technical directions and describe where Fort Campbell Requirements shall be stated in contract and supporting documents.

## 1-3 Application

1-3.1 Contents of this document shall apply to design and construction effort for all MCA funded and OMA funded projects completed by the DPW and/or the Louisville District COE. It applies to both in-house staff and to contracted designers.

1-3.2 This document shall be used in collaboration design and Urgan Design requirements described in companion document: ACSIM, [Installation Design Standards](#), also available on the Internet.

## 1-4 Design Submittals

1-4.1 All MILCON funded project designs shall follow design and submittal procedures outlined in the Project Management Plan (PMP) together with the A-E Scope of Services, or the in-house Quality Control Plan/Contract.

1-4.2 All OMA funded project designs shall follow design and submittal procedures identified in the designer prepared “**Scope Definition Document**” and Scope of Services or Contract.

1-4.3 It is the responsibility of the Designers of Record to insure technical contents of this document are incorporated into design documents prior to submission for review.

## 1-5 Document Improvements and Deviations

1-5.1 The committee considers this to be a “Living Document.” Recommended changes, additions and requests for deviation are invited from anyone who uses it. Recommended changes, additions, additional guidance topics and requests to deviate from the guidance are accepted at any time. Recommendations can be offered electronically or in paper form or by verbal request. To assist those reviewing recommendations, a sample form containing the needed information is available in

**Figure 1.** Completed forms shall be provided to the DPW or Louisville COE Committee Members identified below:

Sally P. Castleman  
Phone (270) 798-7319  
Email: sally.p.castleman@us.army.mil

**[Return to Chapter Table of Contents](#)**

# Chapter 1

## Figure 1: Recommended Document Change

**Please Indicate the Type of Proposed Change:**

\_\_\_\_ Modification          \_\_\_\_ New Topic

**Please Indicate the Recommended Priority:**

\_\_\_\_ Routine                  \_\_\_\_ Urgent

**Please Explain the Proposed Change:**

**Please identify any guidance, criteria, or reasons causing the proposed change:**

**Please Provide the Point of Contact who generated this proposal:**

Name: \_\_\_\_\_

Phone: \_\_\_\_\_

Email: \_\_\_\_\_

[Return to Section](#)

# TECHNICAL DESIGN GUIDE

## CHAPTER 2

### General Requirements

#### PARAGRAPH

#### 2.0 General Design Provisions

[General Design Criteria](#)

[Deliverables](#)

[Antiterrorism / Force Protection](#)

[Fire Protection/Life Safety](#)

[Metric Design](#)

[Surveying and Mapping Requirements](#)

[Geotechnical Requirements](#)

[Cost Engineering](#)

[Engineering Instructions for Field Personnel](#)

[Transfer and Acceptance](#)

#### 2.1 Special Ft. Campbell Criteria

[Energy Program](#)

[Historic District](#)

[Environmental](#)

[Underground and Aboveground Storage Tanks](#)

[Solid Waste Disposal / Recycling Diversion Practices](#)

[Erosion and Sedimentation Control](#)

[Permits](#)

[Fort Campbell DPW Computer Software Capabilities](#)

[Installation Internet Addresses](#)

#### 2.0 General Design Criteria

##### MILCON Projects

For new construction in the MILCON program, design effort will be completed in accordance with the approved Project Management Plan (PMP), design contract scope of services, and identified criteria. The ACSIM, [Installation Design Standards](#), together with this document shall both apply to engineering and construction actions.

## OMA Projects

For Operations and Maintenance projects, design effort will be completed in accordance with the DPW contract scope of services. Scope of design services shall be based upon the designer prepared project specific [Scope Definition Document](#) that is completed after a pre-design conference and site evaluation.

### **2.0.1 Deliverables**

#### Hard-copy Drawings

Final construction contract drawings and as-built drawings submitted for official government records shall be digital and placed on 24" x 36" plastic film (Mylar) sheets. Sheet border shall be provided by DPW-EDB. A graphic scale shall be shown on each sheet of the drawings.

Electronic drawings submitted for review shall be reproduced on 8-1/2" x 11" or 11" x 17" paper using a laser printer.

#### Digital Drawings

CADD Drawings containing Geographic data (Site Plan, Survey and Mapping Plan, Storm Sewer Plan, Electrical Utilities Plan...) will use the Tennessee (TN) State Plane Coordinate System. The Datum used will be the North American Datum of 1983 (NAD83). The mapping units will be US feet. Vertical upland topographic surveys will use North American Vertical Datum (NAVD) 1988.

Digital geographic data will have accuracy within two feet unless otherwise stated in the Scope of Work.

Digital geographic data will be 99% free of topological errors including, but not limited to: the absence of dangling nodes, undershoots, overshoots, and snapped nodes for line segments ( road centerlines, edge-of-curb, elevation contours...); the existence of features that have area square footage ( building footprints, parking lots, sidewalks...) will have polygon representations in the CADD drawings.

All CADD drawings shall be done on Intergraph Microstation Release 5 or a compatible approved equal system.

The CADD Drawing file naming convention shall follow Chapter 2 of the "A/E/C CADD Standards" Document within the Spatial Data Standards Facilities/Infrastructure/Environment (SDS/FIE) model maintained by the CADD/GIS Technology Center (<http://tsc.wes.army.mil>).

Layer/Level assignments of feature data within the CADD drawings will follow 'Appendix A: *Model File Level/Layer Assignment Tables*' of the "A/E/C CADD Standards" Document within the Spatial Data Standards Facilities/Infrastructure/Environment (SDS/FIE) model maintained by the CADD/GIS Technology Center (<http://tsc.wes.army.mil>).

The "A/E/C CADD Standards" Document (26MB) are available at the following internet site: <http://tsc.wes.army.mil/products/tssds-tsfmts/tssds/projects/sds/>  
To request an "A/E/C CADD Standard" CD, go to [http://tsc.wes.army.mil/comments/aecstds\\_comments/AECSDS-CommentForm.asp](http://tsc.wes.army.mil/comments/aecstds_comments/AECSDS-CommentForm.asp) and fill out the CD request form.

The 'CADD Drawing file naming convention' is referenced in the '*Release 2\_x Document*' folder on of the "A/E/C CADD Standards" CD. It is an Adobe Acrobat PDF document named 'volume1.pdf'. See Chapter 2 for 'CADD Drawing Naming Convention' standards.

The 'Layer/Level assignments of feature data within CADD drawings' is referenced in the '*Release 2\_x Document*' folder on the "A/E/C CADD Standards" CD. It is an Adobe Acrobat PDF document named 'volume1.pdf'. See 'Appendix A: *Model File Level/Layer Assignment Tables*' within the PDF document.

For MILCON projects, Drawings shall also be prepared in accordance with COE Standards available from the PE/A.

For OMA projects, Drawings shall also be prepared in CADD format using standard 24" X 36" sheets.

Drawings for all projects that are Ready to Advertise (RTA) shall be in the approved electronic format.

#### Specifications-

For MILCON projects, specifications for projects that are RTA shall be included only in the approved electronic format.

For OMA projects, Construction specifications shall be prepared as agreed in the Scope Definition Document. Specifications for projects that are RTA shall be included only in the approved electronic format.

#### Design Analysis

For MILCON projects, design support documentation shall be provided. The Design Analysis shall be completed in the approved format. At the conclusion of the design effort, the documentation shall be provided in an approved electronic format.

## 2.0.2 Antiterrorist / Force Protection

All new construction projects including additions and alterations shall include antiterrorist / Force Protection (AT/FP) features in accordance with UFC 4-010-01, DOD Minimum Antiterrorism Standard for Buildings.

## 2.0.3 Fire Protection/Life Safety

Every project including MILCON and OMA shall be designed using only the following DOD directed criteria:

- [UFC 1-200-01, General Building Requirements](#) shall be used mandatory guidance concerning required model building codes for design and construction.
- Fire Protection requirements shall comply with [UFC 1-300-01, Fire Protection Engineering For Facilities](#).
- Exiting requirements shall comply with the Life Safety Code, NFPA 101.
- No asbestos containing materials shall be used for construction.

## 2.0.4 Metric Design

Consideration of Metric dimensioning (SI) is required for all MILCON projects. Project specific guidance is available through the Louisville District project PE/A. For OMA projects, metric dimensioning is used on a case-by-case basis: If the original project was developed in English (IP) units, follow-on OMA projects can also use English inch-pound (IP) units. If the original documents were developed in metric units, the OMA projects must also be executed in metric.

## 2.0.5 Surveying and Mapping Requirements

Fort Campbell has the following control point network and datum requirements for every MILCON project.

- Two new control monuments shall be established on site and tied to Tennessee State Plane Coordinate System NAD 83.
- The survey control points are GPS Class I and Class II Horizontal with additional elevation coming from an off-post USGS Class I bench mark to establish Second Order Class II vertical on all survey control points.
- Hardcopy books of existing points (including sketches) are maintained at both Fort Campbell (POC Scott Slade (270) 798-9724) and the Louisville District (POC Chris Heintz (502) 315-6408).
- For work contracted by Louisville District, the contractor is required to establish a permanent baseline at the project. In areas where existing concrete monuments are abundant, iron pins with caps are allowed. The contractor supplies CELRL-ED-M-SM (Survey and Mapping Section) with description sheets for the points they establish and the District forwards the information to Fort Campbell.

- Similarly, OMA work performed by Fort Campbell will have the survey control point data reported to the DPW POC for forwarding to the District.

## 2.0.6 Geotechnical Requirements

The following is a list of aggregate sources for concrete, asphalt, stone-base, sub-base, and DGA which met or exceeded the quality standards set forth in the technical sections of the COE specifications for Fort Campbell projects:

Coarse material sources for base course, bituminous paving, cast-in-place structural concrete, concrete pavements, and pre-cast architectural concrete.

- Hopkinsville Stone, Hopkinsville, KY, Ledges 11 to 17, about 85 feet.
- KY Stone Company, Canton, KY, Ledges 2 and 3, about 33 feet.
- Vulcan Materials, Gilbertsville, Kentucky. Ledges 4 and 26, about 393 feet.
- Martin-Marietta Aggregates, Smithland, Kentucky, Ledges 16 to 19, about 51 feet.
- Vulcan Materials, Clarksville, TN, Ledges 16 & 17, about 30 feet.
- Winn Materials, Clarksville, TN, Ledge 3, about 20 feet.

Natural fine aggregate sources for concrete, asphalt, stone-base, subbase and DGA are listed below.

- Delta Materials, Henderson, Kentucky.
- Ingram Materials, Paducah, Kentucky.
- Mayfield Aggregates, Mayfield, Kentucky.
- Delta Materials, Cairo, Illinois Manufactured fine aggregates for concrete:
- Hopkinsville Stone Company, Hopkinsville, Kentucky.

POC for further information at the Louisville District contact:

Mr. David Black (502) 315-6436  
Mr. David Kiefer (502) 315-6445

## 2.0.7 Cost Engineering

Every project both MILCON and OMA requires a construction cost estimate. For MILCON projects the estimate shall be prepared using M-CACES software. Cost estimates for OMA projects shall be provided to the DPW at the time of submittal for bid issue. Official government cost estimates are not to be made public. They remain the property of the Government, and FOR OFFICIAL USE ONLY.

## 2.0.8 Engineering Considerations and Instructions for Field Personnel

This documentation is required for all MILCON projects, and is normally a part of the Design Analysis. It offers the designers an opportunity to provide a written document

providing important design facts to the construction field personnel. An example format of the [Engineering Instructions](#) is provided, which shall be revised and reflect project specific information.

## 2.0.9 Transfer and Acceptance

Completion of the Transfer and Acceptance of Military Real Property, DD Form 1354 is required for all projects. A draft copy of this information must be submitted with the Final Design submittal. This requirement applies to both MILCON and OMA program projects.

## 2.1 Special Ft. Campbell Criteria

### 2.1.1 Army Energy Program

2.1.1.1. AR 420-1, Chapter 22-4k(5), "Provide and require a prescriptive energy design guide for every scope of work at every installation if one is not in use or available."

2.1.1.2. Title I, Subtitle A, Section 104 of EPACT 2005, "To meet the requirements of an Agency for an energy consuming product, the head of the agency shall...procure an Energy Star product or FEMP designated product."

2.1.1.3. Title V, Subtitle C, Section 523 of EISA 2007, "[I]f lifecycle cost-effective, as compared to other reasonably available technologies, not less than 30 percent of the hot water demand for each new Federal building or Federal building undergoing major renovation be met through the installation and use of solar hot water heaters."

2.1.1.4. Title II, Subtitle A, Section 203a, Energy Policy Act (EPACT) of 2005 "... of the electric energy the Federal Government consumes during any fiscal year, the following amounts shall be renewable energy: (1) Not less than 3 percent in fiscal years 2007 through 2009"

2.1.1.5. Section 2, Executive Order 13423 "ensure that at least half of the statutorily requires renewable energy comes from new renewable sources."

2.1.1.6. The National Defense Authorization Act (NDAA) of 2007 signed on October 17, 2006 codified DoD's voluntary renewable energy goal of using 25% renewable energy by 2025.

### 2.1.2 Historic District

The "Clarksville Base" portion of Ft. Campbell cantonment area is eligible for the National Register of Historic Places as a significant Cold War historic district. Designers are

required to consult with the State Historic Preservation Office (SHPO) and the federal Advisory Council on Historic Preservation for any projects that are sited at the Clarksville Base. POC is DPW Environmental Division Cultural Resource Manager at 270-798-7437.

### 2.1.3 Environmental

The Environmental Division is under the guidance of the Directorate of Public Works at Fort Campbell. The [Environmental Division](#) Internet address will provide added information and points of contact.

**Environmental Compliance** is mandatory for all projects.

- **Designers shall NOT contact Kentucky or Tennessee regulators** regarding environmental issues. Contact the Ft. Campbell Environmental Div.
- A 40-hour "Environmental Quality Officer" course is available bi-monthly on post by Ft. Campbell's Environmental Division. Designers are encouraged to attend.
- Designs shall take into consideration wetlands and endangered species on the installation.
- Several environmental topics contained in this document include the following:

APPENDIX A:

[Occupational Health Considerations](#)

[Clean Air Act](#)

[Clean Water Act](#)

[Safe Drinking Water Act](#)

[TSCA \(Lead Based Paint and Lead Containing Paint\)](#)

[\(Radon\)](#)

[FIFRA \(Pesticides\)](#)

[Solid Waste Disposal/Diversion Practices](#)

[Hazardous Waste Disposal Practices](#)

[Emergency Planning and Community Right to Know](#)

[NESHAP National emission standards for hazardous air pollutants](#)

APPENDIX B:

[State Water and Sewer State Submittals](#)

### 2.1.4 Underground and Aboveground Storage Tanks

Aboveground and underground petroleum product storage tanks shall not be permitted at new construction projects without design review and approval by the Directorate of Public Works, Environmental Division Petroleum Storage Tank Program Manager.

**Underground Storage Tanks (USTs) shall not be installed without approval from the DPW Environmental Division. If permitted, USTs shall be double walled steel fiberglass coated with interstitial monitoring and automatic tank gauging. The monitoring system shall be compatible with the systems already in use and capable of being remotely monitored by the Environmental Division. No used oil USTs shall be installed.**

**Above Ground Storage Tanks (ASTs) shall not be installed without approval from the DPW Environmental Division. If permitted, ASTs shall follow requirements outlined in the Ft. Campbell: [Standard Design Requirements For Aboveground Fuel Tanks](#) prior to submission for permit requests.**

Design for used petroleum products holding and storage shall not include tanks. Only 55-gallon drum containers shall be used that are placed on approved pavement materials properly designed for hazardous spill containment.

## **2.1.5 Solid Waste Disposal / Recycling Diversion Practices**

In the interest of reducing waste, Fort Campbell is actively recycling and reducing waste in all on-post operations. Contractors are required to participate in on-post programs. They are encouraged to find ways of reducing waste. Recycling shall be practiced to the maximum extent possible. Refuse materials shall be separated in accordance with installation policies and practices.

It is the intent of the installation to divert at least 50% (by weight) of all construction, renovation, and demolition debris from the Woodlawn C/D landfill. Recyclable waste materials shall not be landfilled on or off post. Recyclable materials shall be transported to designated locations for recycling or reuse.

Contractors must evaluate all diversion options and make good-faith effort to achieve the highest diversion rate within the project schedule and budget.

Contract specifications shall require at least a 50% diversion of construction and demolition (C & D) waste materials such as wood, plumbing fixtures, electrical materials (lights and panels), windows, doors, toilet partitions, HVAC equipment, and scrap metals be diverted from the landfill. Diversion can be accomplished by deconstructing the wood buildings and components per instructions below or by moving the structure off-post. Construction specifications shall require a C&D Waste Management Diversion Plan to be submitted and approved by DPW.

All material disposal and diversion shall be handled in accordance with Appendix A-7, [Solid Waste Disposal/Diversion Practices](#). Salvageable materials shall be disposed of as per the contract specifications. If salvageable materials are transported off the installation, the contractor shall provide the project COR with the following information, type of material, method of disposal, and weights of material.

## 2.1.6 Erosion and Sedimentation Control

Erosion and sedimentation control is required for activities that result from opening, operating, and closing all site excavation and excavation at present and planned borrow pits on the Fort Campbell Military Reservation.

The requirements contained in the Appendix I, [Erosion and sedimentation Control](#) shall apply at Fort Campbell, KY by its military units and all authorized subcontractors. It provides step-by-step procedures to help plan, design, and install soil and water Best Management Practices (BMP). It does not override any local, city, county, state, or federal rule, regulation, or law, including job safety and utility safety laws. Where there is a difference between this plan and any language contained in any contractual document, the contractual document must be followed.

The guidance provides criteria for the design, installation, and maintenance of water management and sediment control practices to abate nonpoint source (NPS) Pollution. Those responsible for design of these practices should evaluate the conditions existing on a particular site and determine if the minimum criteria contained in these standards are adequate or if more stringent criteria should be used.

Properly applied, this information will provide an efficient plan to operate the borrow pit site(s) while ensuring maximum safety and minimizing adverse impact to the environment. By following these guidelines, it is the intent of this management tool to furnish a uniform plan that will provide continuity throughout the life of the borrow pit.

## 2.1.7 Permits

Local permits are required for construction activities at Ft. Campbell. These permits must be Contractor completed and submitted prior to beginning any construction effort. Contract documents must identify and contain permits that will apply to the contract. . Local permits shall include demolition, digging, excavation, compaction, electrical, fuel tank installation, and environmental. Several of the specific permit forms that apply are located within sections this document along with information identifying appropriate installation drop-off locations and points of contact.

### [Digging and Excavation Permits](#) [Borrow Permits](#)

In addition, Specifications requirements shall include Contractor requirements for obtaining all utility and state (Kentucky or Tennessee) permits. These are related to utility services and various environmental topics.

## **2.1.8 Mold and Moisture Control:**

Design features identified in [Appendix G](#) are critical to long term building environmental quality. They shall be incorporated into all projects.

## **2.1.9 Fort Campbell DPW Computer Software Capabilities:**

Software capabilities may vary within the DPW. To assure that electronic files can be accessed, the following versions of software are commonly utilized in the DPW:

Microstation, version 8, 2004 (8.5)

Microsoft Office  
2003

**Digital files being transferred to Fort Campbell should be saved to allow accessibility with the above software. Files shall not be “write protected” or “view only”.**

## 2.1.10 Installation Internet Addresses

[Ft. Campbell](#)

[The Directorate of Public Works](#)

[Return to Chapter Table of Contents](#)

### **GENERIC SCOPE DEFINITION DOCUMENT**

The following 2 pages contain a generic example standardized “Scope Definition Document” which is required for each military O&M task order.

Items in black are part of the standard format.

Items in red are project task order specific, and should be changed for each customer request.

Items in blue are options to be considered.

**DEPARTMENT OF THE ARMY  
U. S. ARMY ENGINEER DISTRICT, LOUISVILLE  
CORPS OF ENGINEERS**

**SCOPE DEFINITION DOCUMENT**

For

**PROJECT NAME**

At

**LOCATION**

**Date**

1. **BACKGROUND:** Public Works Center, Detroit Arsenal defined a need for roof replacement on Buildings 229 & 231 at the Warren, MI facility (Site Map - see Enclosure 1), due to leaks and the age of the existing roofing material. There is also work slated to repair & replace air-handling units on these roofs under a separate contract prior to this replacement. Nick Ballard (ED-D-A) attend the meetings, surveyed the structures and obtained photographs and drawings for COE Louisville. This is a year-end funded design Project and must be finalized by mid-September 2000.

Information for this Scope of Work was acquired during a site visit to Detroit Arsenal on June 27, 2000 with the following personnel in attendance at meetings or the site. Kirk Dailey & Nick Ballard COE – Louisville; Jim Park (DPW Director), Bob Novak (Chief of Engineering Plans and Services) & Nabil Tominna (Project PE/A) of PWC Detroit Arsenal.

2. **DESCRIPTION OF WORK:** Each building is approximately 42,000 S.F. with 5400 S.F. of Penthouse roof and 36,600 S.F. of main roof with typical rooftop equipment. (Bldg. Photos - see Enclosure 2). All building equipment and problems were surveyed during the site visit and noted for review and plan preparation. (Field Notes - see Enclosure 3). PWC Detroit Arsenal provided 11 existing drawings pertinent to this roof project. (Reference Drawings - see Enclosure 4) They will also provide information as to equipment to be abandoned, capped off, removed and utility line rerouting. The customer has requested informal reviews when construction contract documents are approximately 50% complete, and a final review when 100% complete.

Initial discussions derived at the site visit and discussions indicated that the customer preferred replacement be a Modified Bitumen Roof. Existing built-up roofing is approximately 20 years old, and although in very good condition, will soon need replacement. No major environmental hazardous conditions exist. (Asbestos Reports – see Enclosure 5).

The customer also stated that he would like to receive contractor furnished an Operations and Maintenance Manual, including the manufacturers' cut-sheets showing recommended future roof penetration methods.

- Special Environmental Concerns or Requirements and Responses:
- Lead Based Paint Removal: **None**
- Asbestos Abatement: **(4) Roof samples being taken contained no asbestos.**
- Other: **None**
- Fire Protection or Life Safety Concerns or Requirements: **None**
- Special work sequencing or Optional items: **None**

1. SCOPE OF DELIVERABLES TO BE PROVIDED:

Design: **[Simplified Design Method Plans and Specs]**

Review: **?? sets ½ full size CAD prints & Specs – hard copy**

Contract: **(1) Electronic CD/Hard disc to DOC**

Post Award: All final records, and (1) electronic version Microstation drawings & specs

4. TYPE OF CONSTRUCTION CONTRACT: **Job Order Contractor (JOC)**

5. DESIGN TEAM & DPW REVIEWERS:

- COE Louisville: **N. Ballard, J. Jagers, G. Minter (QC) / M. Mirzaian (PE/A)**
- DPW: Engineering:
  - Master Planning:
  - Environmental
  - Maintenance Shops:
  - Safety:
  - Fire Department:
  - ITBC:
  - End User:

6. DESIGN COST ESTIMATE: **\$15,000 (See Attachment 1)**

7. DESIGN SCHEDULE: **10 July to 10-12 September 2000**

8. CONSTRUCTION COST ESTIMATE: **Base Bid: \$480,000  
Option 1: \$518,000**

9. QUALITY EXPECTATIONS: Minimum QCP w/ one A/E reviewer. When signed by all parties, this document becomes the contract with the ED customer.

This package has been completed and assembled by the PE/A: **Nicholas M. Ballard**

This assembled complete package has been checked for completeness and compliance with the Engineering Division Quality Operating System.

Any change in any one of the items above will require a modification of this contract.

ED PE/A Name: Nicholas M. Ballard Customer Name: Kirk P. Dailey  
ED Unit Name: ED-D-A Customer Office Symbol: PM – M  
Signature: \_\_\_\_\_ Signature: \_\_\_\_\_  
Date Signed: 11 August 2000 Date Accepted: 11 August 2000

[Return to Section](#)

# **EXAMPLE**

## **Engineering Considerations and Instructions for Field Personnel**

### **B-1 General**

B-1.1 Contractor's construction trailers on site must be wired per NEC, meet separation clearances, have electric meters but no water meters. COE is to coordinate with DPW Master Plans and utility personnel.

### **B-2 Civil**

B-2.1 Notification of road closures during construction shall be given to the following agencies:

- Provost Marshall Office, Traffic Section (270) 798-6812.
- Directorate of Directorate of Public Works , Master Plans, (270) 798-2909.

### **B-3 Geotechnical**

B-3.1 During stripping and rough grading, positive surface drainage should be maintained to prevent the accumulation of water. The exposed subgrade materials are likely to be soft in some locations. Also, if conditions are encountered which are different from those described in the plans, the geotechnical engineer should be notified. Once subgrades are established, concentrated loads from construction equipment could cause pumping of the subgrade and require re-compaction.

B-3.2 Foundation designs are based on the subsurface investigation program. To verify that the foundation designs are appropriate for the structures, inspection by Corps of Engineers of the footings and undercutting is very important. Linda Davis (502) 315-6437 or Steve Durrett should be notified of the contractor schedule for performing earthwork and foundations so that inspections of the materials can be performed.

### **B-4 Utilities / Landscaping**

B-4.1 Care should be taken in placement of underground utilities so as not to cause interference with landscaping trees.

B-4.2 Railroad crossings for gas and water piping are to be included in the drawings. The portion of the AREA-03 (the reference from which the details are taken) dealing with railroad crossings is included with these instructions.

B-4.3 Where gas and water piping are shown to be valved and capped for future expansion, the valve should be a gate valve. These are installed to prevent the need to

shut down a section of the main and interrupt service in order to connect a new service line.

B-4.4 Valves should be placed to isolate each building from the main service (water and gas), and to allow only for minimal main shut down when tying to existing main lines.

## **B-5 Architectural**

B-5.1 Hold metal roofing pre-submittal meeting, with construction, supplier, and contractor to discuss standing seam metal roof system specifications.

[Return to Section](#)

# Fort Campbell Standard Design Requirements For Aboveground Fuel Tanks (ASTs)

Effective date: 1 January 1999

This S.O.P. has incorporated the National Electrical Code (NEC), National Fire Protection Association (NFPA Code), Underwriters Laboratories (UL), and Industry standards.

## 1.0 General:

- 1.1 All aboveground petroleum/fuel tanks, (ASTs) shall conform to all Federal, State, Local regulations and guidelines, and with these design requirements. This includes tanks for permanent placement as part of new construction, as replacement of existing storage systems, and tanks used for temporary storage by construction Contractors and military units.
- 1.2 All ASTs shall be double-walled type tanks. Means shall be provided to establish the integrity of the secondary containment.
- 1.3 When there is a discrepancy between any or all of these guidelines, these requirements will be the final authority over all others except NFPA.
- 1.4 The Directorate of Public Works , Environmental Division, Petroleum Storage Tank Manager is the Installation Local Authority Having Jurisdiction (AHJ) who must approve any design proposal and construction before any installation of an AST.

## 2.0 Definitions:

**Fuel tank:** is any vessel containing more than 60 U.S. gallons of Class I or Class II flammable liquids.

**Emergency Vent:** An opening, construction method, or device that will automatically relieve excessive internal pressure due to an exposure fire.

**Normal Vent:** as a minimum size, all vents shall be at least 1-¼ inches in inside diameter. It must have a bug proof, rain cap secured on top of the vent. The vent must be at least 3 feet higher than the highest point within a 10-foot radius of the ATS.

**Anti-siphon valve:** a device to prevent any siphoning due to damaged fuel lines, broken pumps, leaky or leaking fuel pumps. This device is not a check valve.

**Overfill protection device:** a device to serve as a catch basin to prevent any and all overfill spillage. Minimum size shall be 5 gallons.

**Fuel Level Gauge:** a device that is easily readable that automatically indicates the actual fuel level in the AST. A standard float type gauge is acceptable.

**Temporary AST:** a fuel tank that will be used for up to 90 calendar days. At which time, it then becomes a permanent installed tank.

**Emergency shut-off valve:** A device to immediately shut off the fuel supply in case of an emergency or a fire.

**Portable Fuel Tank:** Any closed vessel having a liquid capacity over 60 U.S. gallons, and less than 2,000 U.S. gallons, and not intended for fixed installation.

**Day Tank:** A fuel tank, located inside a structure that provides fuel to a engine. The standard size of a day tank is 25 U.S. gallons, but may have the capacity of up to 100 U.S. gallons.

**Secondary Containment Tank:** A tank having an inner and an outer wall with an interstitial space between the walls and having means for monitoring the interstitial space for a leak.

**Flammable Liquid:** Any Liquid within the scope of this S.O.P. and subject to the requirements of this S.O.P. shall be known generally as either a flammable liquid or a combustible liquid and shall be defined and classified in accordance with this S.O.P.

**Gasoline:** Is a Class I B liquid that has a flash point below 73° F and a very high boiling point between 100° and 400° F. The Flash point of Gasoline is -40° to -50° F.

**Diesel Fuel:** Is a Class II Combustible Liquid, with a flash point of 125° F.

**Combustible Liquid:** A combustible liquid shall be defined as any liquid that has a closed-cup flash point at or above 100° F, as determined by the test procedures and apparatus set forth in 1-7-4, of NFPA 30.

### **3.0 Location of AST:**

- 3.1 All proposed installations sites of ASTs must have written prior approval by the Local Authority Having Jurisdiction.
- 3.2 All permanently installed ASTs shall be of the concrete encased, double walled type. The concrete encased tanks shall be of at least 3,500-psi density and be at least 6 inches in thickness.

### 3.3 Clearance distances:

- 3.3.1 No AST shall be installed closer than 5-feet from any type of an electrical disconnect device.
  - 3.3.2 All ASTs between the size of 60 U.S. gallons and 2,000 U.S. gallons shall be located no closer than 10-feet from any building, lean-to, or property line.
  - 3.3.3 All ASTs shall have at the minimum of 5 ft of unobstructed clearance on all sides to facilitate refueling, maintenance and serviceability.
  - 3.3.4 No AST shall be installed without having at least a 15-foot aerial clearance from overhead or underground electrical lines, which includes but limited to weather heads, transformers, and fuses.
  - 3.3.5 The minimum distance between any two ASTs shall be 3-feet.
  - 3.3.6 The minimum distance between an AST with Gasoline or Diesel fuel and a LP tank shall be 20-feet.
- 3.4 All ASTs shall rest on the ground or on foundations, made of concrete, masonry, piling, or steel. Tank foundations shall be designed to minimize the possibility of uneven settling of the tank and to minimize corrosion in any part of the tank resting on the foundation.

## **4.0 Aboveground Fuel Lines:**

- 4.1 Below ground fuel, lines shall not be permitted for use with an AST.
- 4.2 Aboveground supply and return lines.
  - 4.2.1 Fuel lines shall be suspended a minimum of 6 inches off the ground and be supported every 3-feet with some type of approved support.
  - 4.2.2 All AST fuel lines shall be protected against corrosion.
  - 4.2.3 All ASTs shall have some type of protective features that prohibit any collision from motor vehicles.
  - 4.2.4 All above ground fuel lines shall be insulated, heat traced, and protected with a covering equal to vinyl.
  - 4.2.5 The fuel lines shall be separated by a minimum distances of 6 inches.
  - 4.2.6 All AST aboveground fuel lines shall be of black carbon type steel.
  - 4.2.7 All AST aboveground supply fuel lines shall be ½-inch inside diameter, unless otherwise directed.
  - 4.2.8 All AST aboveground supply fuel lines shall have a shut off valve located as close as possible to the AST.
  - 4.2.9 All AST aboveground return fuel lines shall be ¾-inch inside diameter, unless otherwise directed by the Local Authority having Jurisdiction.
  - 4.2.10 There shall be no traps or check valves in the return fuel line to the AST.
  - 4.2.11 All pipe joints shall be of the threaded type, no welding of pipes or of the joints shall be permitted.

- 4.2.12 Joints shall be made liquid tight and shall be threaded, except that listed flexible connectors shall be permitted where installed with prior written approval of the Local Authority Having Jurisdiction.
- 4.2.13 All threaded joints shall be made up tight with a suitable thread sealant or lubricant. Joints in piping systems handling Class I liquids shall be welded when located in concealed spaces within buildings.

## **5.0 Normal Venting for aboveground Tanks:**

- 5.1 Venting requirements shall be in accordance with current Unified Facilities Guide Specifications, Section 13202, Fuel Storage Systems requirements. Stage I vapor recovery is the process of recovering vapors when a storage tank is filled. Stage I vapor recovery is mandatory on all Army Facilities. Stage II vapor recovery is the process of recovering vapors during vehicle fueling operations. Stage II vapor recovery is optional and will be included if required by state and local clean air regulations.
- 5.2 Prevent the development of vacuum or pressure sufficient to exceed the design pressure due to filling or emptying and the atmospheric temperature changes.
- 5.3 If any tank has more than one fill or withdrawal connection and simultaneous filling or withdrawal can be made, the vent size shall be based on the maximum anticipated simultaneous flow.
- 5.4 The outlet of all vents and vent drains on tanks equipped with venting to permit pressures exceeding 2.5 psig shall be arranged to discharge in such a way as to prevent localized overheating of, or flame impingement on, and part of the tank, in the event vapors from such vents are ignited.
- 5.5 Where vent pipe outlets for tanks storing Class I liquids are adjacent to building or public ways, they shall be located so that the vapors are released at a safe point outside of buildings and not less than 12 ft. above the adjacent ground level. In order to aid their dispersion vapors shall be discharged upward or horizontally away from closely adjacent walls. Vent outlets shall be located so eaves will not trap the flammable vapors or other obstructions and shall be at least 5 ft from building openings.

## **6.0 Emergency Venting for Fire Exposure for Aboveground Tanks.**

- 6.1 Every aboveground tank shall have some form of construction or device that will relieve excessive internal pressure caused by exposure fires. This requirement shall also apply to each compartment of a compartmented tank, the interstitial space of a secondary containment type tank, and the enclosed space of tanks of closed top dike construction.

6.2 The outlet of all vents and vent drains on tanks, equipped with emergency venting to permit pressures exceeding 2.5 psig shall be arranged to discharge in such a way as to prevent localized overheating of or flame impingement on any part of the tank, in the event vapors from such vents are ignited.

**7.0 Miscellaneous Requirements:**

- 7.1 All ASTs permanently installed shall have a device(s) for fuel leak detection, fuel level, and all other monitoring requirements.
- 7.2 All ASTs shall be marked in accordance with N.F.P.A. 704.
- 7.3 All ASTs shall be grounded, and wired in accordance with NEC 70.
- 7.4 All ASTs shall have some type of spill containment that will hold 100% of the AST capacity.
- 7.5 All ASTs that have filling and emptying connections for any Class I or Class II, flammable liquids shall be closed and liquid tight when not in use and shall be properly identified.
- 7.6 All ASTs fill caps shall have an AHJ approved means of locking when not being refueled.
- 7.7 All ASTs shall have some device of fire fighting equipment in the immediate area. (Contact Fort Campbell Fire Prevention Section for further details).
- 7.8 Means shall be provided for determining the level of liquid in the tank. This means shall be accessible to the delivery operator.
- 7.9 Precautions shall be taken to prevent the ignition of flammable vapors. Sources of ignition include, but are not limited to:
- a. Open Flames
  - b. Lightning
  - c. Hot surfaces
  - d. Radiant heat
  - e. Smoking
  - f. Cutting and welding
  - g. Spontaneous ignition
  - h. Frictional heat or sparks
  - i. Static electricity
  - j. Electrical sparks
  - k. Stray currents
  - l. Ovens, furnaces, and heating equipment.

End

[Back To Section](#)

# TECHNICAL DESIGN GUIDE

## CHAPTER 3

### Technical Requirements and Instructions

#### Division 00800 – General Provisions

#### Section

00800      [Special Contract Requirements](#)

#### SECTION 00800 Special Contract Requirements

##### Ft. Campbell Requirements

Ft. Campbell Specification Section 00800, Special Contract Requirements, shall apply to all MILCON projects.

Contents shall also be applied to all OMA projects issued by the Ft. Campbell Directorate of Contracting (DOC) or the COE.

##### Instructions to Designers

1. Modify the project specifications paragraphs as necessary to include all applicable portions of the Ft. Campbell 00800 version:  
[Section 00800, Special Contract Requirements](#).
2. For electronic copies of the document, contact the PE/A for MILCON and OMA projects by the COE. A-E's directly serving the installation should contact the PM.

## **Ft. Campbell Version (Partial) Specification**

### **Section 00800: Special Contract Requirements**

20. WARRANTY OF CONSTRUCTION (MAR 1984) ALTERNATE 1 (APR 1984) FAR 52.246-21I.

#### 20.1 General Requirements.

20.1.1 In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph 20.1.10 of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

##### 20.1.1.1 Warranty Payment.

Warranty work is a subsidiary portion of the contract work, and has a value to the Government approximating 1% of the contract award amount. The Contractor will assign a value of that amount in the breakdown for progress payments mentioned in the Contract Clause: Payments Under Fixed-Price Construction Contracts. If the Contractor fails to respond to warranty items as provided in paragraph 20.5, the Government may elect to acquire warranty repairs through other sources and, if so, shall backcharge the Contractor for the cost of such repairs. Such backcharges shall be accomplished under the Changes Clauses of the contract through a credit modification(s).

20.1.1.2 Since the warranty period will extend beyond the construction completion date, this contract shall remain open until the warranty period expires.

20.1.2 This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

(a) As a part of the one year warranty inspection, the Contracting Officer will conduct an infrared roof survey on any project involving a membrane roofing system. This survey will be conducted in accordance with ASTM C1153-90, "Standard Practice for the Location of Wet Insulation in Roofing Systems Using Infrared Imaging". In accordance with paragraph 20.1.3 and 20.1.4, the Contractor shall be required to replace all damaged materials and to locate and repair sources of moisture penetration, at no additional cost to the Government.

20.1.3 The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of--

- (a) The Contractor's failure to conform to contract requirements; or
- (b) Any defect of equipment, material, workmanship, or design furnishes.

20.1.4 The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

20.1.5 The Contracting Officer shall notify the Contractor, in writing, (see para. 20.2.3 and 20.5) within a reasonable time after the discovery of any failure, defect, or damage.

20.1.6 If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, (see para. 20.5) the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

20.1.7 With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--

- (a) Obtain all warranties that would be given in normal commercial practice;
- (b) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and
- (c) Provide names, addresses, and telephone numbers of all subcontractors, equipment suppliers, or manufacturers with specific designation of their area of responsibilities if they are to be contacted directly on warranty corrections; and
- (d) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

20.1.8 In the event the Contractor's warranty under paragraph 20.1.2 of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

20.1.9 Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.

20.1.10 This warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

20.1.11 Defects in design or manufacture of equipment specified by the Government on a "brand name and model" basis, shall not be included in this warranty. In this event, the Contractor shall require any subcontractors, manufacturers, or suppliers thereof to execute their warranties, in writing, directly to the Government.

## 20.2 Performance Bond.

20.2.1 The Contractor's Performance Bond will remain effective throughout the construction warranty period and warranty extensions.

### 20.2.2

(a) In the event the Contractor or his designated representative(s) fails to commence and diligently pursue any work required under this clause, and in a manner pursuant to the requirements thereof, the Contracting Officer shall have the work performed by others, and after completion of the work, will charge the remaining warranty funds established by paragraph 20.1.1.1 of any or all expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

(b) In the event sufficient funds are not available to cover the warranty work performed by the Government at the Contractor's expense, the Contracting officer shall have the right to recoup expenses from the bonding company.

20.2.3 Following oral or written notification of required warranty repair work, the Contractor will respond as dictated by para. 20.5. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Contracting Officer to proceed against the Contractor as outlined in the paragraph 20.2.2 above.

## 20.3 Pre-Warranty Conference.

Prior to contract completion and at a time designated by the Contracting Officer, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this clause. Communication procedures for Contractor notification of warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor will furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, will be continuously available, and will be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the

Contractor of any of his responsibilities in connection with other portions of this provision.

20.4 Equipment Warranty Identification Tags.

20.4.1 The Contractor shall provide warranty identification tags on all Contractor and Government furnished equipment which he has installed.

(a) The tags shall be similar in format and size to the exhibits provided by this specification, they shall be suitable for interior and exterior locations, resistant to solvents, abrasion, and to fading caused by sunlight, precipitation, etc. These tags shall have a permanent pressure-sensitive adhesive back, and they shall be installed in a position that is easily (or most easily) noticeable. Contractor furnished equipment that has differing warranties on its components will have each component tagged.

(b) Sample tags shall be submitted for Government review and approval. These tags shall be filled out representative of how the Contractor will complete all other tags.

(c) Tags for Warranted Equipment: The tag for this equipment shall be similar to the following. Exact format and size will be as approved.

---

EQUIPMENT WARRANTY  
CONTRACTOR FURNISHED EQUIPMENT

MFG                      MODEL NO.  
  
SERIAL NO.  
  
CONTRACT NO.  
  
CONTRACTOR NAME  
  
CONTRACTOR WARRANTY EXPIRES  
  
MFG WARRANTY(IES) EXPIRE

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---

EQUIPMENT WARRANTY  
GOVERNMENT FURNISHED EQUIPMENT

MFG                      MODEL NO.  
  
SERIAL NO.

CONTRACT NO.

DATE EQUIP PLACED IN SERVICE

MFG WARRANTY(IES) EXPIRE

---

(d) If the manufacturer's name (MFG), model number and serial number are on the manufacturer's equipment data plate and this data plate is easily found and fully legible, this information need not be duplicated on the equipment warranty tag. The Contractor warranty expires (warranty expiration date) and the final manufacturer's warranty expiration date will be determined as specified by para. 20.1.

20.4.2 Execution. The Contractor will complete the required information on each tag and install these tags on the equipment by the time of and as a condition of final acceptance of the equipment.

20.4.3 Payment. The work outlined above is a subsidiary portion of the contract work, and has a value to the Government approximating 5% of the value of the Contractor furnished equipment. The Contractor will assign a value of that amount in the breakdown for progress payments mentioned in the Contract Clause: PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS.

20.4.4 Equipment Warranty Tag Replacement. As stated in para. 20.1.4, the Contractor's warranty with respect to work repaired or replaced shall run for one year from the date of repair or replacement. Such activity shall include an updated warranty identification tag on the repaired or replaced equipment. The tag shall be furnished and installed by the Contractor, and shall be identical to the original tag, except that the Contractor's warranty expiration date will be one year from the date of acceptance of the repair or replacement.

#### 20.5 Contractor's Response to Warranty Service Requirements.

20.5.1 Following oral or written notification by the Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer, the Contractor shall respond to warranty service requirements in accordance with the "Warranty Service Priority List" and the three categories of priorities listed below. If the Contractor does not perform the warranty within the timeframe specified, the Government will perform the work and backcharge the warranty payment item established under paragraph 20.1.1.1.

First Priority Code 1 Perform on site inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

Second Priority Code 2 Perform on site inspection to evaluate situation and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.

Third Priority Code 3 All other work to be initiated within 3 work days and work continuously to completion or relief.

The "Warranty Service Priority List" is as follows:

Code 1 Air Conditioning Systems

- a. Recreational support.
- b. Air conditioning leak in part of building, if causing damage.
- c. Not cooling unit

Code 3 Doors

- a. Overhead doors not operational.
- b. Interior/Exterior personnel doors or hardware not functioning properly.

Code 1 Electrical

- a. Power failure (entire area or any building operational after 1600 hours).
- b. Security lights.
- c. Smoke Detectors.

Code 2 Electrical

- a. Power failure (no power to a room or part of building).
- b. Receptacle and lights (in a room or part of building).

Code 3 Electrical

- a. Street Lights.

Code 1 Gas

- a. Leaks and breaks.
- b. No gas to family housing unit or cantonment area.

Code 1 Heat

- a. Area power failure affecting heat.
- b. Heater in unit not working.

Code 1 Hot Water heater Failure

Code 2 Kitchen Equipment

- a. Dishwasher.
- b. All other equipment hampering preparation of a meal.

Code 3 Plumbing  
a. Leaky faucets.

Code 2 Plumbing  
a. Flush valves.  
b. Fixture drain, supply line commode, or any water pipe leaking.  
c. Commode leaking at base.

Code 3 Interior  
a. Floors  
b. Paint chipping or peeling  
c. Casework

Code 1 Roof Leaks  
Temporary repairs will be made where major damage to property is occurring.

Code 2 Roof Leaks  
Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.

Code 2 Water (Exterior)  
No water to facility.

Code 2 Water, Hot  
No hot water in portion of building listed

Code 3 All other work not listed above.

20.5.2 Should parts be required to complete the work and the parts are not immediately available the Contractor shall have a maximum of 12 hours after arrival at the job site to provide the Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer, with firm written proposals for emergency alternatives and temporary repairs for Government participation with the Contractor to provide emergency relief until the required parts are available on site for the Contractor to perform permanent warranty repair. The Contractor's proposals shall include a firm date and time that the required parts shall be available on site to complete the permanent warranty repair. The Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer, will evaluate the proposed alternatives and negotiate the alternative considered to be in the best interest of the Government to reduce the impact of the emergency condition. Alternatives considered by the Contracting Officer or an authorized representative of the installation

designated in writing by the Contracting Officer will include the alternative for the Contractor to "Do Nothing" while waiting until the required parts are available to perform permanent warranty repair. Negotiating a proposal which will require Government participation and the expenditure of Government funds shall constitute a separate procurement action by the using service.

[Return to designer instructions](#)

# TECHNICAL DESIGN GUIDE

## CHAPTER 3

### Technical Requirements and Instructions

#### Division 01000

#### Section

01356	<a href="#">Storm water Pollution Protection</a>
01560	<a href="#">Environmental Protection</a>
01572 - 01670	<a href="#">Construction and Demolition Waste Removal/Diversion</a> <a href="#">Recycle of Recoverable Materials</a>

#### SECTION 01356

#### Storm water Pollution Protection

#### Ft. Campbell Requirements:

Ft. Campbell special requirements apply Section 01356 for all COE and DPW prepared projects.

#### Instructions to Designers:

Project plans and specifications shall include guidance and requirements contained in [Erosion and Sedimentation Control](#):

Additional required guidance is found in [Chapter 2](#).

For electronic copies of the document, contact the PE/A for MILCON and OMA projects by the COE. A-E's directly serving the installation should contact the PM.

[Return to Division Table of Contents](#)

## **SECTION 01560 Environmental Protection**

### **Ft. Campbell Requirements:**

Ft. Campbell specification Section 1560, Environment Protection shall be used instead of UFGS 01355 for all COE and DPW prepared projects.

### **Instructions to Designers:**

Project specifications shall include the Ft. Campbell Specification:

[Section 01560, Environment Protection.](#)

Additional required guidance is found in [Appendix A.](#)

For electronic copies of the document, contact the PE/A for MILCON and OMA projects by the COE. A-E's directly serving the installation should contact the PM.

[Return to Division Table of Contents](#)

**Ft. Campbell version:**  
Section 01560, Environment Protection.

SECTION C-01560

ENVIRONMENT PROTECTION

4/03

PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

1.2 SUBMITTALS

The following shall be submitted in accordance with Section C-01300 SUBMITTAL PROCEDURES:

1.2.1 SD-8, Statements

Work Plans; GA.

1.2.1.1 Environment Protection

Prior to commencement of work at the site, the Contractor will submit within 10 calendar days after Notice to Proceed, his written detailed proposal for implementing the requirements for environmental pollution control specified herein. The contractor will then meet the representatives of the Contracting Officer upon their completion of review of his proposal as needed for compliance with the environmental pollution control program.

1.2.1.2 Preconstruction Survey

Prior to start of any onsite construction activities, the Contractor and the Contracting Officer shall make a joint condition survey, after which the Contractor shall prepare a brief report indicating on a layout plan the condition of trees, shrubs, and grassed areas immediately adjacent to the site of the work and adjacent to his assigned storage area and access routes(s) as applicable. This report will be signed by both the Contracting Officer and Contractor upon mutual agreement as to its accuracy and completeness.

1.2.1.3 Waste Disposal Scheme

As part of his proposed implementation under Paragraph 3.2, and prior to onsite construction, the Contractor shall submit a description of his scheme for disposing of waste materials resulting from the work under this contract. If any waste material is

dumped in unauthorized areas, the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed areas. Where directed, contaminated ground shall be excavated, disposed of as approved, and replaced with suitable fill material, all at the expense of the Contractor.

## PART 2 POLLUTION PREVENTION PLANS

### 2.1 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with all Federal, State, and local regulations.

#### 2.1.1 Environmental Protection Plan

The contractor will develop a site specific Environmental Protection Plan which will address in detail the following:

a. Hazardous materials (HM) to be brought onto the post

Any hazardous materials planned or used on the post by the contractor will be managed with the same intent and purpose as the Hazardous Materials Management Program (HMMP) maintained by the DPW Environmental Division Pollution Prevention Branch. Ft. Campbell's HMMP was established to maintain effective and regulatory compliant management of hazardous materials used on the post. The HMMP provides establishment of source reduction methods, recycling and reuse opportunities, modifications of processes and procedures, shelf life management, authorized HM use list, full visibility of all HM at any given time, the least toxic and least amount of HM acquired, stored, or used, and proper handling, storage, and disposal of all HM. A hazardous material as per 29 CFR 1910.1200 will be included. A hazardous material as per 29 CFR 1910.1200 is any material which is a physical or health hazard. The Contractor shall complete the [FTCKY HAZMAT INVENTORY FORM](#), which appears as an appendix to this section. The inventory form requires a list (including quantities) of HM to be brought to the post and copies of the corresponding material safety sheets (MSDS). The completed form shall be submitted to the Contracting Office representative and to Fort Campbell Environmental Division - Pollution Prevention Branch. In the event the usage of additional Hazardous Materials are found necessary during the project, they will be included into the MSDS package of the Environmental Protection Plan. At project completion, any hazardous material brought onto the post shall be removed from the site by the Contractor. Ft. Campbell is required by Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements", to comply with the

requirements of the Emergency Planning and Community Right-to-Know Act (EPCRA). EPCRA requires Ft. Campbell to identify the amounts of chemicals present on, or released from its facilities, understand the potential problems that hazardous materials pose to the surrounding communities and environment, and provide information to the public and local emergency planning organizations. To comply with EPCRA requirements, Ft. Campbell must track and be accountable for hazardous materials (HM) used throughout the post. As required by the Emergency Planning and Community Right - to - Know Act (EPCRA), the Contractor will account for the quantity of HM brought to the post, the quantity used or expended during the job, and the leftover quantity which (1) may have additional useful life as HM and shall be removed by the Contractor, or (2) may be hazardous waste, which shall then be removed as specified herein. [This information will be provided to the Environmental Division Pollution Prevention Branch on a calendar year basis or project basis if less than a single calendar year, and must be submitted by the end of January following the year reported.](#)

b. Hazardous waste (HW) generated

The Environmental Protection Plan must list, quantify explain how any HW generated during the project will be disposed. Disposal of hazardous waste generated by the contractor shall be disposed off site according to applicable regulations at the contractor's expense. A report must be submitted annually of the generation of hazardous waste on post and must be provided to the Contracting Officer representative and to Environmental Division - Pollution Prevention Branch.

c. Storage of hazardous waste

In accordance with post regulations and 40 CFR 262, hazardous waste shall be stored near the point of generation up to a total quantity of (one quart) 1 L of acutely hazardous waste or (55 gallons) 200 L of hazardous waste (Satellite Accumulation Point). Any volume exceeding these quantities shall be moved to a HW permitted area within 3 days. Locations of hazardous waste storage areas must be approved by DPW-ED-PP. Containers must be labeled in accordance with 40 CFR 262 and must contain the words Hazardous Waste and other words which identify the contents of the container. Prior to shipment of hazardous waste on site or off, the waste must be placed into good condition Department of Transportation (DOT) specification containers for hazardous waste (49 CFR 172.101). Containers must be labeled with required labels for HW and for DOT shipping. The area selected for the storage of hazardous wastes must minimize the threat to human health or the environment in the event of a release.

d. Minimization of hazardous waste

In accordance with post regulations, the Contractor should substitute materials as necessary to reduce the generation of HW and include a statement to that effect in the Environmental Plan.

e. Environmental conditions likely to be encountered during this project

Contact the Contracting officer for conditions in the area of the project which may be subject to special environmental procedures. Include this information in the Preconstruction Survey. Describe in the Environmental Plan any permits required prior to working the area, and contingency plans in case an unexpected environmental condition is discovered.

f. Any Hazardous Waste removal or disposal must be manifested through Environmental Division's Pollution Prevention Branch, Hazardous Waste Program Manager and must be signed and numbered. Permitting plans for any transportation and disposal, excavation, or construction of hazardous waste that will require an environmental permit from an issuing agency

The Contractor is responsible for generating the permits and delivering the completed documents to the Contracting Officer. The Contracting Officer will review the permits and the Contractor shall file the documents with the appropriate agency and complete disposal with the approval of the Contracting Officer. The Contracting Officer shall advise Environmental Plan of any Hazardous Waste generated and shall send contractor to Environmental Pollution Protection Branch. Correspondence with the State concerning the environmental permits and completed permits shall be delivered to the Contracting Officer.

g. Radon mitigation design and testing

All residential and non-residential construction performed at Fort Campbell must have passive radon mitigation features implemented into the design. The contractor will install preliminary features as per drawings. The contractor will hire an independent testing company to perform radon monitoring prior to inhabitation of the units. The testing firm must be EPA accredited and approved to perform work in the State of Tennessee (Kentucky). A list of accredited testing firms in the state of TN (KY) can be obtained through the state Radon Program Coordinator (615) 532-0733. In the event radon concentrations greater than 4 pCi/L (pico curies per liter of air) are revealed consult Fort Campbell DPW through the Contracting Officer's representative for guidance pertaining to retesting. If upon further testing, elevated (unacceptable) levels are present, additional mitigation features will be installed followed by more testing. The buildings will not be inhabited until levels of less than 4 pCi/L have been achieved.

Extend the pipe of the passive radon mitigation system through the roof and leave it open (do not Cap).

Place electrical outlets near (e.g. within 6 feet) of the radon vent pipe riser in the attic.

The riser should be located in an area of the attic with at least 3-4 feet of clearance to allow for easy access to install and maintain the fan.

If at all possible, the aggregate bed under the slab should not be compacted in order to provide the maximum subslab vacuum coverage.

With respect to the number of risers, suggest an interval of 1 for every 3-5000 SF of slab.

#### 2.1.1.1 Environmental Protection Plan Format

The Environmental Protection Plan shall follow the following format:

1. Hazardous materials to be brought onto the post
2. MSDS package
3. Employee training documentation
4. Hazardous materials/waste storage plan
5. Hazardous waste to be generated
6. Pre-construction survey results
7. Permitting requirements identified
8. Waste Disposal Plan
9. Site Specific Spill Contingency Plan

#### 2.1.1.2 Environmental Plan Review

Fourteen days after the environmental protection meeting, submit to the Contracting Officer the proposed environmental plan for further discussion, review, and approval.

#### 2.1.1.3 Commencement of the Work

As directed by the Contracting Officer, following approval.

#### 2.1.2 Storm Water Pollution Prevention Plan

The following Pollution Prevention Plan is incorporated into the contract documents as a portion of the construction activities to be undertaken by the Contractor. The plan as outlined below contains the minimum requirements for the work under this contract.

### POLLUTION PREVENTION PLAN FOR (PROJECT)

The purpose of this plan is to detail the controls that will be utilized for this construction in order to control sediment in the storm water runoff from the construction site drainage area.

Project Location: Fort Campbell Army Base  
Fort Campbell, Kentucky  
**(PROJECT)**  
**(LOCATION)**  
Latitude - 36 38'10" North  
Longitude - 87 27' 40" East  
(Values Approximate for Latitude - Longitude)

Constructed by: U.S. Army Corps of Engineers  
Louisville District  
P.O. Box 59  
Louisville, KY 40201-0059

Description of Site and Construction Activity: This construction is **(INSERT DESCRIPTION)**.

The soil disturbing activity will consist of clearing and grubbing and demolition for the installation of the erosion and sediment control features, grade work, excavation for utilities, and parking lots. The sediment and erosion controls being utilized include straw bale dam, basket curb inlet, stone outlet sediment trap, fabric drop inlet protection, gravel donut inlet protection, construction entrance/exit, silt fence, and silt fence rock overflow, and temporary seeding and mulching. Clearing and grubbing must be held to a minimum necessary for grading and equipment operation.

Temporary seeding and mulching shall be deemed necessary if no construction activity occurs in the disturbed areas for more than fourteen (14) days. Construction must be sequenced to minimize the exposure time of cleared surface areas. Grading activities must be avoided during periods of highly erosive rainfall. Slopes of 2H:1V will be protected using an erosion control blanket. Other slopes that may be seeded and mulched may experience washout problems and require the use of an erosion control blanket. Contractor is to refer to manufacturer's recommendations for the type of erosion control blanket to be used on particular slopes.

Runoff Coefficient: The present runoff coefficient for the site is approximately 0.6 to 0.75. The development of the site will not significantly increase this coefficient. Developed coefficient is approximately **(INSERT COEFFICIENT)**.

Receiving Waters: The water for the disturbed areas will pass through erosion control then into the storm system. The storm system for the majority of the site empties into **(LOCATION)**.

Erosion and Sediment Controls:

STABILIZATION PRACTICES	STRUCTURAL PRACTICES	
Permanent Seeding	Straw Bale Dam	Gravel Donut Inlet
Mulching	Basket Curb Inlet	Protection
	Stone Outlet Sediment	Temporary Construction
	Trap	Entrance/Exit
	Fabric Drop Inlet	Silt Fence
	Protection	Silt Fence Rock Overflow

2.1.2.2 Contracting Officer shall provide Environmental Plan for review to Environmental Division, Pollution Protection Branch.

**2.2 ANTICIPATED SEQUENCE OF ACTIVITY:**

Place erosion control measures in locations in close proximity to those shown on the drawings. Additional erosion control measures may be required to comply with the NPDES permit once demolition and construction begins.

Surface water flowing toward the construction area will be diverted around the construction area to reduce its erosion potential. Silt fence, sediment traps or straw bale check dams shall be properly constructed to detain runoff and trap sediment.

Construct new site amenities including utilities, buildings, parking areas, and sidewalks after completing the necessary demolition.

Landscape and grade remaining areas according to the drawings.

Upon completion, remove any temporary measures not necessary for future phases of the project after stabilization of the area. Any sediment removed from these measures shall be disposed of at a time and location designated by the Contracting Officer. Any other areas disturbed during the removal of the sediment control structures shall be seeded and mulched within 24 hours.

NOTE: The Contractor controls the actual sequence, however, the sediment control measures must be established prior to initiation of work in any area. Contractors for Phased projects will be required to coordinate this work and interface Pollution Prevention Plans to ensure compliance with the intent of the Pollution Control Plans and to maintain continuous pollution prevention. Construction should be staged or phased for this project. Areas of one phase should be stabilized before other phases are initiated. Stabilization shall be accomplished by temporarily or permanently protecting the disturbed soil surface from rain fall impacts and runoff.

## 2.3 DEMONSTRATION OF COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS.

All activities constructed under this contract will be performed in accordance with Federal, State and Local regulations. The construction contractor's specifications require compliance with all applicable regulations.

## 2.4 POLLUTION PREVENTION PLAN AND NOTICE OF INTENT

The Contractor will implement the Pollution Prevention Plan (PPP) as shown on the plans and directed in these specifications. This plan must be implemented in accordance with the NPDES permit. A Notice of Intent (NOI) will be prepared by the U.S. Army Corps of Engineers and submitted to the state of Tennessee (KENTUCKY) fourteen (14) days prior to the notice to proceed being issued. The NOI Contractor Consent form for Tennessee (KENTUCKY) must be signed by the Contractor. A blank [Contractor's Signature Form](#) is attached at the end of this section. The Contractor shall maintain a copy of the PPP in their construction trailer. Any changes made to the plan must be documented and approved by the Contracting Officer.

## 2.5 INVENTORY FOR POLLUTION PREVENTION PLAN

The materials or substances listed below are expected to be present onsite during construction:

These are examples of materials that could be Hazardous Materials and an inventory must be kept using Ft. Campbell's Hazardous Material Form attached. This list is not comprehensive but for illustration only. The Contractor must maintain and update a Hazardous Material list and inventory forms.

Concrete	Fertilizer	Detergents	Paints (Enamel and Latex)
Cleaning Solvents	Wood	Sealants	Metal Rebar/Structural Steel
Concrete Additives	Tar	Asphalt	Petroleum Based Products

## 2.6 SPILL PREVENTION

The following are the material management practices to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff.

### 2.6.1 Good Housekeeping

- a. An effort will be made to store only enough product required to perform the task. Storage shall meet Federal, State and Local regulations to include 150 % containment of bulk storage over 19 liters.

- b. All materials stored onsite will be stored in a neat and orderly manner in their appropriate containers and properly labeled. When possible, material should be stored under a roof or in an enclosed area. If this is not possible, material will be covered with a tarpaulin or suitable replacement to prevent direct contact between storm water and the materials. All runoff from the storage area will be routed through a control structure.
- c. Products will be kept in their original containers with the original manufacturer's label.
- d. Substances will not be mixed with one another unless recommended by the manufacturer.
- e. Whenever possible, all of the product will be used up before disposing of container.
- f. Manufacturer's recommendations for proper use and disposal will be dictated by Federal, State and Local regulations. Manufacturer's recommendations may be followed if as stringent or more than Federal, State and Local.
- g. The contractor will conduct daily inspections to ensure proper use and disposal of materials onsite.

#### 2.6.2 Hazardous Products

These practices are used to reduce the risks associated with hazardous materials and must be incorporated into the Pollution Prevention Plan:

- a. Products will be kept in their original containers unless they are not resealable.
- b. Original labels and material safety data will be retained they contain important product information.
- c. All containers will have the Diamond label affixed per the National Fire Prevention Associations Publication 704.
- d. Disposal of surplus product will be performed as recommended by the manufacturer or as required by State and Local regulations.

#### 2.7 SPILL PREVENTION PRACTICES

In addition to good housekeeping and material management practices discussed in the previous sections of this plan, a Site Specific Spill Contingency Plan must be prepared by the Contractor and submitted to Fort Campbell Environmental Division. The SSSCP must be developed as outlined in the Fort Campbell Environmental Handbook. Guidance and instructions for preparation of the [\*\*SITE SPECIFIC SPILL CONTINGENCY PLAN\*\*](#)

(SSSCP) are included at the end of this section. In addition to the requirements of the SSSCP, the following practices must be followed by the Contractor for spill prevention and clean up:

- a. Materials and equipment necessary for cleanup will be kept in the material storage area. There will be enough equipment to supply at least three (3) men. Equipment and materials will include but not be limited to; brooms, dust pans, mops, rags, gloves, goggles, absorbing compound, and plastic and metal trash containers specifically for this purpose.
- b. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of information and cleanup supplies.
- c. All spills will be cleaned up immediately after discovery. Disposal of the waste from the spill shall be at the Contractor's expense and shall be coordinated with the Pollution Prevention Branch before removal or disposal.
- d. The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- e. All spills of toxic or hazardous materials will be reported to the Ft. Campbell Fire Department and DPW Environmental through the Contracting Officers Representative who will report to the appropriate State or Local government agency if necessary.
- f. Once a spill has occurred, the spill prevention plan will be adjusted to include measures to prevent this type of spill from recurring with a discussion of the appropriate cleanup for that type of spill. Also, a description of the spill, what cleaned it, and the cleanup measures will be included.
- g. The prime Contractor will be responsible for the day-to-day site operations, including spill prevention and will designate an employee, by name, to be the primary cleanup coordinator. Each subcontractor bringing more than 75 liters or 68 kilograms of a spillable substance shall also designate a cleanup coordinator. The cleanup coordinators will designate three (3) additional site personnel for spill prevention and cleanup.
- h. Everyone will be trained in spill prevention and cleanup and shall know the primary cleanup coordinator and any additional site personnel to contact. Fort Campbell's Environmental Handbook (excerpt included below) will be the basis for spill prevention training.

(TAKEN FROM)

FORT CAMPBELL ENVIRONMENTAL HANDBOOK  
Guidance and Instruction

## SPILL PLANNING AND RESPONSE

Spill response equipment is a critical component of an effective response to an unexpected release of hazardous materials. Making an inventory of potential spots for emergency releases and having appropriate and sufficient spill response equipment to deal with those potential releases is required for each unit. Attachment 1 provides spill response materials minimum requirements.

### SPILL PLANNING AND RESPONSE TRAINING REQUIREMENTS:

1) All personnel involved with the management and handling of oil and hazardous materials must be periodically trained in spill prevention and response. The training will be similar to the Hazardous Communication Program - Worker Right to Know and will include the following key features:

- a) Health effects of exposure to oil or hazardous materials;
- b) Applicable first aid procedures to be used following exposure;
- c) Personal Protective Equipment requirements and procedures for using equipment;
- d) Evacuation procedures;
- e) Spill material combustibility and potential for flash-back along vapor trails;
- f) Fire fighting procedures and special hazards of combustible products;
- g) Reactivity of spill material with common materials including water;
- h) Use and maintenance of all alarms and monitoring equipment associated with spill prevention or response;
- i) Initial Notification procedures;
- j) Site specific contingency plans;
- k) Location of posted Site Specific Spill Contingency Plan;
- l) Immediate spill response actions including location of pump controls and valves to stop spill flow; location and use of fire extinguishers, absorbents, neutralizing agents and other immediate spill response procedures;
- m) Visual inspections requirements of the particular areas; and
- n) Purpose and requirements of good housekeeping.

2) Spill response training exercises will be conducted once per year for personnel working at oil and hazardous material sites. Personnel entering one of these positions will be trained within two weeks after starting work and after any significant changes to the spill plan or training program. Records of the type, extent, and frequency of each individual's training will be maintained until closure of the applicable area or until three years after the date the individual last worked in the area. . Refresher training shall be given with the Toolbox Safety Meetings and documented on the Quality Control Reports. Training shall cover what to do, and who to contact in case of a spill and what emergency action must be taken if any.

#### SPILL RESPONSE IS HANDLED BY FOUR DISTINCT OPERATIONS:

##### a) SPILL REPORTING

The first action to be taken in the event of a spill is to report the spill. If you observe a release of a hazardous material, report it to your supervisor and the Fire Department as required below. If the spill is in a Training Area, then the spill will be reported to Range Control, who will then notify the Fire Department. The Fire Department will notify DPW Environmental Division and if required, Installation Safety, Emergency Medical, and Preventative Medicine. The DPW Environmental Division does all reporting to State/Federal Agencies.

The Fire Department (or Range Control) must be promptly notified of any of the following spills:

(1) Any uncontrolled quantity of a hazardous substance, or if assistance is needed by Fire Department or Environmental Division, or as instructed by the MSDS or supervisor's discretion.

(2) Oil and other petroleum products with quantity exceeding 10 gallons or area of spill greater than two feet in any direction or any amount that has spilled into a stream or body of water.

Environmental Division review has determined the material(s) listed requires special reporting at the quantity shown: (To be supplied by environmental staff during plan review.)

##### b. STOP OR CONTAIN THE SPILL

Assess the situation before attempting to contain any hazardous material spilled and proceed only if it is safe to do so. You must have knowledge of the spilled substance and don any required personal protective equipment. If necessary, make the spill scene off limits to any unauthorized personnel. If situation warrants, evacuate the area.

##### c. CLEAN UP THE SPILL

Under no circumstances should untrained and/or ill-equipped persons attempt to perform cleanup. In some instances, spill cleanup may require respiratory protection and other personal protective equipment. If it is within the capability of the unit that caused the spill, then that unit is responsible for its cleanup. Environmental Division will make the decision to obtain assistance and coordinate with other units as required. If you handle/work with the hazardous material as part of your job, you are to be trained and qualified to participate in the cleanup of the spill. **All contractors must have an OSHA 1910.120 qualified spill response contractor available to respond to spills in 4 to 6 hours that require heavy equipment to remove contaminated soils/absorbents. Spill that cannot be removed because of response delays may need to be covered with heavy plastic and or secured to prevent further spread of contamination.**

d. DISPOSE OF SPILLED HAZARDOUS MATERIAL.

**All spilled material and other contaminated material (soil, gravel, absorbents, etc.) must be properly disposed. It is the responsibility of the contractor that created the spill to properly package, dispose of the waste, and ensure the site is properly cleaned at no cost to the government. Some spill incidents may require cleanup, disposal, soil testing and a site closure report by an approved licensed environmental contractor approved by Fort Campbell. Environmental Division will determine the required cleanup and disposal method.**

## 2.8 PRODUCT SPECIFIC PRACTICES

The following product specific practices will be followed on-site:

- a. Petroleum Products - All vehicles will be periodically inspected for leaks and shall receive regular preventative maintenance to reduce the chance of leaks occurring. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Bulk storage areas will be equipped with secondary containment appropriate for risk of loss from the primary container (s). Storage shall meet Federal, State and Local regulations. Secondary containment shall hold 150 % of the bulk amount stored over 19 liters. The Contractor will maintain a specific spill contingency and countermeasures plan for use in a bulk storage area.
- b. Fertilizer - Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. The contents of any partially used bags of fertilizer will be transferred to a sealable container to avoid spills.
- c. Paints, Solvents, and Sealants - All containers will be tightly sealed and kept in the storage area when not in use. Any excesses of these materials will not be discharged

into the storm sewer system, but will be properly disposed of according to manufacturer's instructions or State and Local regulations.

d. Concrete Trucks - Concrete trucks will be allowed to wash out, discharge surplus concrete and drum wash water only in a designated area. All wash water from the concrete trucks must be retained on-site and treated according to Federal, State and Local regulations. Upon completion of the job, all discharges of surplus concrete and any soil contaminated by the concrete wash water will be removed from the site and taken to an approved disposal area. Water with the potential of entering sink holes or storm sewers will not be allowed to be discharged.

## 2.9 INSTALLATION/CONSTRUCTION

### 2.9.1 Inlet Protection

#### 2.9.1.1 Fabric Drop Inlet Protection

- a. Construct a dike on the downslope side of the inlet to prevent runoff from bypassing. Dike should be 150 mm higher than inlet protection.
- b. Cut fabric from a single roll to avoid joints.
- c. Construct the fence as shown on in the drawings.
- d. Space the support posts evenly against the inlet perimeter a maximum of one (1) m apart, and drive them about 0.5 m into the ground.

#### 2.9.1.2 Gravel Donut Inlet Protection

- a. Construct a dike on the downslope side of the inlet to prevent runoff from bypassing. Dike should be 150 mm higher than inlet protection.
- b. Construct as shown in the drawings.

#### 2.9.1.3 Basket Curb Inlet

- a. Install immediately after a new inlet is placed or on existing inlets, before any land disturbing activity.
- b. If necessary, adapt basket dimensions to fit inlet box dimensions, see drawings.
- c. Remove the grate and place basket in the inlet.
- d. Cut and install a piece of filter fabric large enough to line the inside of the basket and extending a minimum of 150 mm beyond the frame.

- e. Replace the inlet grate, which also serves to anchor the fabric.

#### 2.9.2 Silt Fence and Silt Fence Rock Overflow

- a. Construct as shown on the drawings.
- b. Staked and entrenched straw bales must be installed along the base of all fills and cuts and on the downhill sides of stockpiled soil.

#### 2.9.3 Straw Bale Dam

- a. Construct as shown on the drawings.
- b. Staked and entrenched straw bales must be installed along the base of all fills and cuts and on the downhill sides of the stockpiled soil.

#### 2.9.4 Seeding

- a. Test soil to determine its nutrient level or apply a 12-12-12 fertilizer at a rate of 75 to 110 kilograms per hectare.
- b. Work fertilizer into the soil 50 mm - 100 mm deep with a disk or rake operated across the slope.
- c. Select a seed mixture and application rate that best suits the soil type and climate. Also, consult the county soil, water conservation office for assistance.
- d. Apply seed uniformly with a drill or cultipacker seeder, or by broadcasting, and cover to recommended depth.
- e. If drilling or broadcasting, firm the seedbed with a roller or cultipacker.
- f. Mulch seeded area to increase seeding success.

#### 2.9.5 Mulching

- a. Apply at the recommended rate based on the material being used.
- b. Spread uniformly with no more than 25% of the ground surface visible.
- c. If straw or hay is used, it must be anchored immediately.

#### 2.10 INSPECTION AND MAINTENANCE

All measures that are being utilized will be inspected at least once each week and after each storm event. An inspection report shall be written after each inspection and submitted to the Contracting Office representative within 24 hours. Once a problem is found or sediment has reached the clean-out elevation, corrective action shall commence

within 24 hours. Inspections shall continue until the controls are removed or the vegetative cover is firmly established.

## PART 3 EXECUTION

### 3.1 GENERAL

The Contractor shall perform all work in such manner as to minimize the pollution of air, water, or land, and shall, within reasonable limits, control noise and the disposal of solid waste materials, as well as other pollutants. Information contained in the following specifications should also be referenced:

Section 02050	Demolition
Section 02080	Removal and Disposal of Asbestos Containing Materials
Section 02090	Demolition of Buildings with Lead Containing Paint and Disposal of Lead-Based Paint

### 3.2 IMPLEMENTATION

Within 10 calendar days after Notice to Proceed and prior to commencement of the work at the site, the Contractor shall meet the representatives of the Contracting Officer to review and alter his proposal as needed for compliance with the environmental pollution control program.

### 3.3 PROTECTION OF LAND AREAS

Except for any work on storage areas and access routes specifically assigned for the use of the Contractor under this contract, the land areas outside the limits of permanent work performed under this contract shall, in accordance with CONTRACT CLAUSE: PROTECTION OF EXISTING VEGETATION, STRUCTURE, UTILITIES AND IMPROVEMENTS, be preserved in their present condition. Contractor shall confine his construction activities to areas defined for work on the plans or specifically assigned for his use. In accordance with CONTRACT CLAUSE: OPERATIONS AND STORAGE AREAS, storage and related areas and access routes required temporarily by the Contractor in the performance of the work will be assigned by the Contracting Officer. No other areas on Government premises shall be used by the Contractor without written consent of the Contracting Officer.

### 3.4 PROTECTION OF TREES AND SHRUBS

CONTRACT CLAUSE: PROTECTION OF EXISTING VEGETATION, STRUCTURES, UTILITIES AND IMPROVEMENTS, is hereby supplemented as follows: The Contractor shall not deface, injure or destroy trees or shrubs, nor remove or cut them without special authority. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage.

### 3.4.1 Tree Protective Structures

Where, in the opinion of the Contracting Officer, trees may possibly be defaced, bruised, injured or otherwise damaged by the Contractor's equipment or by his other operations, he may direct the Contractor to provide temporary protection of such trees by placing boards, plans, or poles around them.

### 3.4.2 Restoration of Damaged Trees

Any tree scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense. All scars made on trees not designated on the plane to be removed by construction operations shall be coated as soon as possible with an approved tree wound dressing. Trees that are to remain, either within or outside established clearing limits, that are damaged by the Contractor so as to be beyond saving in the opinion of the Contracting Officer, shall be immediately removed, if so directed, and replaced with a nursery-grown tree of the same species and size.

## 3.5 PROTECTION OF WATER RESOURCES

The Contractor shall control the disposal of fuels, oils, bitumen, calcium chloride, acids, or harmful materials, both on and off the Government premises, and shall comply with applicable Federal, State, County and Municipal laws concerning pollution of rivers and streams while performing work under this contract. The contractor should note that the entire cantonment area is within the delineated Well Head Protection Area for Fort Campbell. This means any release in this area has the potential, due to the installations geological features to impact their drinking water source. For this reason special measures need to be taken to prevent chemicals, fuels, oils, greases, bituminous materials, herbicides and insecticides from entering public waters or potentially migrating via sinkholes or other karst related geologic features to drinking water sources. Special measures will include the generation of a site-specific Spill Prevention Control and Countermeasures Plan. Water used in onsite material processing, concrete curing, foundation and concrete cleanup, and other waste waters shall not be allowed to reenter a stream if an increase in the turbidity of the stream could result there from.

## 3.6 BURNING

Air pollution restrictions applicable to this project are as follows. Materials shall not be burned on the Government premises. If the Contractor elects to dispose of waste materials off the Government premises, by burning, he shall make his own arrangements for such burning area and shall, as specified in CONTRACT CLAUSE: PERMITS AND RESPONSIBILITIES, conform to all local regulations.

## 3.7 DUST CONTROL

The Contractor shall maintain all excavations, stockpiles, access roads, waste areas, and all other work areas free from excess dust to such reasonable degree as to avoid causing a hazard or nuisance to the Using Service or to others. Approved temporary methods consisting of sprinkling, chemical treatment, or similar methods will be permitted to control dust. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs.

### 3.8 EROSION CONTROL

Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall be graded to control erosion within acceptable limits. Temporary control measures shall be provided and maintained until permanent drainage facilities are completed and operative. The area of bare soil exposed at any one time by construction operations should be held to a minimum.

### 3.9 CORRECTIVE ACTION

The Contractor shall, upon receipt of a notice in writing of any noncompliance with the foregoing provisions, take immediate corrective action. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs of damages by the Contractor unless it was later determined that the Contractor was in compliance.

### 3.10 POST-CONSTRUCTION CLEANUP OR OBLITERATION

In accordance with CONTRACT CLAUSE: CLEANING UP, the Contractor shall, unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed areas shall be graded and filled and the entire area seeded.

### 3.11 PAYMENT

No separate payment or direct payment will be made for the cost of the work covered under this section, and such work will be considered as a subsidiary obligation of the Contractor.

-- END OF SECTION --

[Return to designer instructions](#)





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Updated 3/25/98

[Back to paragraph 2.1.1](#)

**Construction Activity Water Permitting Requirements  
Contractor's Signature Form**

State of Tennessee  
Department of Environment and Conservation  
Rule 1200-4-10.05  
Division of Water Pollution Control  
NPDS General Permit TNR 100000

To be completed by developer:  
NOI Submission Date: \_\_\_\_\_

Project Name: \_\_\_\_\_

Project Location: \_\_\_\_\_  
County \_\_\_\_\_

I have agreed to perform construction-related professional services,  
described as:

\_\_\_\_\_ that will likely impact the nature of storm water runoff from the named  
construction activity. Erosion control services involve primarily:

- \_\_\_\_\_ Prepare erosion control plan
- \_\_\_\_\_ Inspection of controls
- \_\_\_\_\_ Install, maintain erosion and sediment controls
- \_\_\_\_\_ Other

I understand the terms and conditions of Rule 1200-4-10.05 and that I, and my  
company, as the case may be, are responsible for the legally liable for  
complying with this Rule and the applicable State and Federal Laws. I  
understand that State or EPA or private actions may be taken against me if  
the terms and conditions of the Rule are not met.

Printed Name: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Company Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Phone No. \_\_\_\_\_

Field Person in charge: \_\_\_\_\_ Phone No. \_\_\_\_\_

Owner/Developer: I certify that the above has been retained to perform the  
described construction related services noted above and as outlined in the  
referenced NOI.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

-- End of form --

[Back to Paragraph 2.4](#)

August 17, 1998

**FORT CAMPBELL CONTRACTOR SITE SPECIFIC SPILL**  
**CONTINGENCY PLAN**

**NAME:** \_\_\_\_\_

**CONTRACT NUMBER:** \_\_\_\_\_

**GENERAL DISCRIPTION OF WORK:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**1. RESPONSIBLE PERSONS**

**A. PRIMARY PERSON**

Name: \_\_\_\_\_ TITLE: \_\_\_\_\_  
Work Phone: \_\_\_\_\_ Home Phone: \_\_\_\_\_

**B. ALTERNATE PERSON**

Name: \_\_\_\_\_ TITLE: \_\_\_\_\_  
Work Phone: \_\_\_\_\_ Home Phone: \_\_\_\_\_

**C. SECOND ALTERNATE PERSON**

Name: \_\_\_\_\_ TITLE: \_\_\_\_\_  
Work Phone: \_\_\_\_\_ Home Phone: \_\_\_\_\_

**2. SPECIAL PRECAUTIONARY MEASURES FOR BUILDING(S) AND ASSOCIATED AREAS**

**If more than one building, Specify hazardous materials for those buildings.**

Building (S) # \_\_\_\_\_

- A. Avoid contacts with spilled substances.
- B. Refer to Material Safety Data Sheets (MSDS) for particular hazards and precautionary measures for special handling and spill procedures. Flammable materials will be extinguished as to local fire regulations and the material safety data sheets. If needed, list any materials that need special handling, PPE or special precautionary measures.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**3. EMERGENCY SPILL EQUIPMENT ON HAND**

(For example, sweeping compound and absorbent material, brooms and plastic dust pans, emergency spill kits, non-sparking shovels, other items as needed and required)

BUILDING#: \_\_\_\_\_ BUILDING#: \_\_\_\_\_

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**4. HAZARDOUS MATERIAL AND QUANTITY NORMALLY ON HAND**

A. Attach a listing of Hazardous Materials on hand, using the FTCKY HAZMAT Inventory Form.

B. Material Safety Data Sheets are readily available and located at (the specific location is required).

Bldg. #: \_\_\_\_\_

Bldg. #: \_\_\_\_\_

**5. SPILL RESPONSE AND NOTIFICATION PROCEDURES**

A. **REPORT THE SPILL.**

The first action in the event of a spill is to report the spill. If you observe a release of a hazardous material, report it to your supervisor and the Fire Department as required below. If the spill is in a Training Area, then the spill will be reported to Range Control, who will then notify the Fire Department. The Fire Department will notify Environmental Division and, if required, Installation Safety, Emergency Medical, and Preventative Medicine. The Environmental Division does all reporting to State/Federal Agencies.

The Fire Department (or Range Control) must be promptly notified of any of the following spills:

- Any uncontrolled quantity of a hazardous substance, or if assistance is needed by Fire Department or Environmental Division, or as instructed by the MSDS or supervisor's discretion:
- Oil and other petroleum products with quantity exceeding 10 gallons or area of spill greater than two feet in any direction or any amount that is spilled into a stream or body of water.
- Environmental Division review has determined the material(s) listed requires special reporting at the quantity shown: (To be supplied by environmental staff during plan review.)

Name: \_\_\_\_\_ Quantity \_\_\_\_\_

Name: \_\_\_\_\_ Quantity \_\_\_\_\_

Name: \_\_\_\_\_ Quantity \_\_\_\_\_

**Signature of Environmental Division staff:** \_\_\_\_\_  
**SUPERVISOR** (to notify in case of spill)

NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_  
WORK PHONE: \_\_\_\_\_ HOME PHONE: \_\_\_\_\_

**FIRE DEPARTMENT:** phone 911  
**RANGE CONTROL:** phone (270) 798-3001 or on radio frequency FM 49.95  
**ENVIRONMENTAL** phone (270) 798-3105

1. If required by your **ORGANIZATION**, additional people to be notified within your chain of command: If not required, fill in N/A.

**ALTERNATE PERSON**

NAME: \_\_\_\_\_ RANK: \_\_\_\_\_  
WORK PHONE: \_\_\_\_\_ HOME PHONE: \_\_\_\_\_

**ALTERNATE PERSON**

NAME: \_\_\_\_\_ RANK: \_\_\_\_\_  
WORK PHONE: \_\_\_\_\_ HOME PHONE: \_\_\_\_\_

**The spill report must include the following information:**

- Name/Phone/Unit of individual reporting the spill; \_\_\_\_\_
- Spill (Building Location of Number, etc.); \_\_\_\_\_
- Name of spilled material; \_\_\_\_\_
- Amount spilled; \_\_\_\_\_
- Rate currently spilling; \_\_\_\_\_
- Extent of spill, including drainage features; \_\_\_\_\_
- Injuries, if any; \_\_\_\_\_
- Time spill occurred; \_\_\_\_\_
- Any additional information. \_\_\_\_\_

**B. STOP OR CONTAIN THE SPILL.**

**Assess the situation before attempting to contain any hazardous material spilled and proceed only if it is safe to do so. You must have knowledge of the spilled substance and don any required personal protective equipment. If necessary, make the spill scene off limits to any unauthorized personnel. If situation warrants, evacuate the area.**

**C. CLEAN UP THE SPILL.**

**Under no circumstances should untrained and/or ill-equipped persons attempt to perform cleanup. In some instances, spill cleanup may require respiratory protection and other personal protective equipment. If it is within the capability of the unit that caused the spill, then that unit is responsible for its cleanup. Environmental Division will make the decision to obtain assistance and coordinate with other units as required.**

If you handle/work with the hazardous material as part of your job, you are to be trained and qualified to participate in the cleanup of the spill.

***D. DISPOSE OF SPILLED HAZARDOUS MATERIAL.***

All spilled material and other contaminated material (soil, gravel, absorbents, etc.) must be properly disposed. It is the responsibility of the unit that created the spill to properly package and dispose of the waste. Environmental Division will determine the required disposal method.

**Responsible Person Signature and Date**

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**SECTION 01572 - 01670**

**Construction and Demolition Waste Removal/Diversion Recycle of Recovered Materials**

**Ft. Campbell Requirements:**

Requirements in this section and Appendix A-7. [Solid Waste Disposal/Diversion Practices](#) shall apply to all construction and demolition activities at Fort Campbell. Contract specifications shall require at least a 50% diversion of demolished building materials such as wood, plumbing fixtures, electrical materials (lights and panels), windows, doors, toilet partitions, HVAC equipment, and scrap metals be diverted from the landfill. See Chapter 2, Paragraph 2.1.4 (Click here). Diversion can be accomplished by deconstructing the wood buildings and components per instructions below or by moving the structure off-post.

Demolition materials shall not be salvaged by the contractor and shall not be removed from the installation. Non salvageable demolition materials shall not to be transported off the installation.

Notify the DPW Environmental Division if unknown waste is discovered during site investigations. Waste could be explosive, hazardous or toxic waste.

Dumpster service for new construction and for demolition is not provided by the installation. The contractor shall arrange for dumpster service at the Contractor's own expense.

In general, utilities are not to be abandoned in place; all abandoned utilities are to be removed. There are circumstances where this requirement does not apply. Abandonment of utilities and removal shall be a topic of discussion at design conferences.

### Instructions to Designers:

- 1 Modify UFGS 01572 - 01670 paragraphs to include the building demolition/diversion requirements above and modify contract specifications.
- 2 Construction specifications shall require a Building Materials Diversion Plan to be submitted and approved by DPW.
- 3 When a project requires removal/disposal of environmentally hazardous waste generated at Fort Campbell, the DPW Environmental Division must be involved in the permitting process. Modify project drawings and specifications paragraphs to include each of the above features as they apply to the project. Additional guidance on Environmental Requirements and Hazardous Waste Disposal Practices is contained in [Appendix A](#), and project specifications shall be modified to indicate these requirements.
- 4 For mercury containing light bulb disposal, insert the [Mercury Light Bulb](#) paragraph.

[Return to Division Table of Contents](#)

# CHAPTER 3

## Technical Requirements and Instructions

### Division 02000

#### **Section**

02080	<a href="#"><u>Removal and Disposal of Asbestos Containing Materials</u></a>
02090	<a href="#"><u>Demolition or Buildings with Lead-Based Paint, Removal and Disposal of Lead-Based Paint</u></a>
02220	<a href="#"><u>Demolition</u></a>
02226	<a href="#"><u>Removal and Salvage of Historic Building Materials</u></a>
02315 - 02316	<a href="#"><u>Excavation, Filling and backfilling</u></a>
02364	<a href="#"><u>Termiticide Treatment Measures for Subterranean Termite Control</u></a>
02510	<a href="#"><u>Water Distribution System</u></a>
02531-02532	<a href="#"><u>Sanitary Sewers</u></a>
02556	<a href="#"><u>Gas Distribution System</u></a>
02630	<a href="#"><u>Storm-Drainage System</u></a>
02744-02745	<a href="#"><u>Bituminous Roadways</u></a>
02753-02754	<a href="#"><u>Concrete Pavements</u></a>
02770	<a href="#"><u>Concrete Sidewalks and Curbs and Gutters</u></a>
02930	<a href="#"><u>Exterior Planting</u></a>

#### **SECTION 02080**

#### **Removal and Disposal of Asbestos Containing Materials**

**Ft. Campbell Requirements:**

Removal and disposal of asbestos containing materials shall be conducted in accordance with Ft. Campbell specification section 02080, Removal and Disposal of Asbestos Containing Materials, which shall be included in all projects containing or possibly containing Asbestos products.

Friable and non-friable asbestos containing materials are to be removed from buildings before demolition. Abatement contractors are to notify the TSCA program in writing at least two days prior to beginning asbestos removal. The point of contact for this notification is Russ Godsave at (270) 798-9637.

Contractors must abide with the asbestos regulations in order for the asbestos to be accepted at the Woodlawn Landfill. These procedures include proper notification, manifesting, documentation, vehicle marking, unloading and PPE.

Many contractors depend on refuse contractors to transport the asbestos waste, and their personnel accompanying the asbestos do not normally have asbestos knowledge or training. Therefore, those delivering the materials to the landfill must have proof of medical surveillance and proper PPE.

### **Instruction to Designers:**

1. Asbestos studies have been completed for numerous existing buildings and facilities at Fort Campbell. Designers shall investigate and review the data as required to insure proper identification and notification of asbestos presence at planned OMA and MILCON projects. These studies are available for inspection at the DPW Maintenance Division. POC is **Audie Hardin** at 270-956-1801.
2. All projects containing or possibly containing Asbestos products shall include [Ft. Campbell specification section 02080, Removal and Disposal of Asbestos Containing Materials](#)
3. Additional Environmental guidance applies. See [Appendix A](#).
4. For electronic copies of the document, contact the PE/A for MILCON and OMA projects by the COE. A-E's directly serving the installation should contact the PM

## **Ft. Campbell Specification**

### **Section 02080, Removal and Disposal of Asbestos Containing Materials**

## SECTION 02080

### REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

11/97

#### PART 1 GENERAL

##### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred in the text by basic designation only.

##### AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) PUBLICATIONS:

ANSI Z9.2-79	Fundamentals Governing the Design and Operation of Local Exhaust Systems
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##### CODE OF FEDERAL REGULATIONS (CFR) PUBLICATIONS:

40 CFR 61, Subpart A	General Provisions
40 CFR 61, Subpart M	National Emission Standard for Asbestos
40 CFR 241	Guidelines for the Land Disposal of Solid Wastes
40 CFR 257	Criteria for Classification of Solid Waste Disposal Facilities and Practices
29 CFR 1926.1101	OSHA Construction Industry Asbestos Standard
29 CFR 1910.120	OSHA Hazardous Waste Emergency Response
29 CFR 1910 subpart I	OSHA Personal Protective Equipment Standard

##### NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH

Method 7400	Manual of Analytical Methods, 3rd Ed., Vol. 1, Physical and Chemical Analysis Method (P&CAM)Fibers
Method 7402	Asbestos Fibers

## UNDERWRITERS LABORATORIES, INC. (UL) PUBLICATIONS

UL 586

1986 High Efficiency Particulate, Air Filter

### 1.2 DESCRIPTION OF WORK

The work covered by this section includes the handling of friable and nonfriable asbestos containing materials (ACMs) which may be encountered during removal and demolition operations and the incidental procedures and equipment required to protect workers and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of the removed asbestos-containing materials. Perform work in accordance with 29 CFR 1926.1101; 40 CFR 61, Subpart A; 40 CFR 61, Subpart M; and the requirements specified herein.

Please refer to pages B20-B38 of the Detail drawings, Volume 1 of 7 for specific locations and quantities of asbestos containing materials.

Please see drawing TU 1.0 for locations of underground chilled water lines, steam lines and condensate lines which are insulated with asbestos containing materials. A total of 6002 linear feet (1850m) are assumed to be present. The breakdown of the piping is as follows:

- 100 mm (4") chilled water supply - 425 m (1361 ft)
- 100 mm (4") chilled water return - 425 m (1361 ft)
- 150 mm (6") steam - 350 m (1148 ft)
- 125 mm (5") steam - 150 m (492 ft)
- 80 mm (3") condensate - 250 m (820 ft)
- 50 mm (2") condensate - 250 m (820 ft)

In addition two cooling towers located at buildings 6775 and 6781 are composed of transite panels and have interiors that contain a honey combed fill material which contains asbestos. An estimated total of 160 square feet of asbestos containing materials are present in each of the two units.

#### 1.2.1 Asbestos Survey

An asbestos Survey was conducted in the contract work area(s) to identify the presence of asbestos containing materials as described in 1.2 above. The data collected is contained in the Asbestos and Lead-Based Paint Survey Report for the Third Brigade Barracks, Fort Campbell, Kentucky, prepared by Gobbel Hays Partners, which is on file at the Fort Campbell PW, Environmental Division. Contact must be made through the Contracting officer.

### 1.2.2 Unidentified ACM

If suspect ACM not covered by the drawings or the specifications is encountered, the contractor will stop work and immediately notify the contracting officer. Upon direction from the contracting officer, the contractor may be required to conduct sampling and testing of these suspect materials in accordance with the Industrial Hygienist's recommended procedures.

## 1.3 DEFINITIONS

### 1.3.1 Aggressive method

Removal or disturbance of building material by sanding, abrading, grinding or other method that breaks, crumbles, or disintegrates intact Asbestos Containing Material (ACM).

### 1.3.2 Amended Water

Water containing a wetting agent or surfactant.

### 1.3.3 Area Monitoring

Sampling of asbestos fiber concentrations inside and out of the regulated area, which is representative of the airborne concentrations of asbestos fibers which may reach the breathing zone.

### 1.3.4 Asbestos

Includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, actinolite, and any of these minerals that have been chemically treated and/or altered. For purposes of this standard, "asbestos" includes PACM, as defined below.

### 1.3.5 Asbestos Abatement Contractor

A business entity certified, licensed, or accredited by the state in which a response action involving asbestos-containing building material that is friable, or expected to become friable during the response action.

### 1.3.6 Asbestos Containing Material (ACM)

Any material containing more than one percent asbestos

### 1.3.7 Asbestos Fibers

Asbestos fibers having a length-to-diameter ratio of at least 3 to 1 and a length of 5 micrometers or longer as counted in the NIOSH Method 7400 or Method 7402 procedure using either phase contrast light microscopy (PCM) or transmission electronic microscopy (TEM).

#### 1.3.8 Asbestos Permissible Exposure Limit (PEL)

Legally enforceable level of asbestos fibers in air set by the Occupational Safety and Health Association (OSHA), as an eight (8) hour time weighted average (TWA) of asbestos fibers not to exceed 0.1 fibers per cubic centimeter of air as set forth in 29 CFR 1926.1101

#### 1.3.9 Authorized Person

Any person authorized and required by work duties to be present in regulated areas.

#### 1.3.10 Breathing Zone

A hemisphere forward of the shoulders with a radius of approximately 6 inches to 9 inches.

#### 1.3.11 Category I Nonfriable ACM

Category I Nonfriable ACM includes asbestos-containing packing, gaskets, resilient floor covering, and asphalt roofing products.

#### 1.3.12 Category II Nonfriable ACM

Category II Nonfriable ACM includes any asbestos-containing material not included in Category I that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

#### 1.3.13 Certified Asbestos Supervisor

One certified by the State in which work is to be performed and has passed an examination covering "Supervision of Asbestos Abatement Projects" or similar title training. This training must be the equivalent in curriculum, training, method and length to the EPA Model Accreditation Program (MAP) asbestos abatement workers training 40 CFR part 763 subpart E, Appendix C.

#### 1.3.14 Certified Asbestos Worker

One certified by the National Asbestos Council and holds current cards illustrating the board number.

#### 1.3.15 Certified Licensed Contractor

A Contractor who has been trained at an EPA approved course and certified/accredited by the state for which the work is to be performed in.

#### 1.3.16 Certified Industrial Hygienist (CIH)

One certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene.

#### 1.3.17 Class I Asbestos Work

Activities involving the removal of Thermal System Insulation (TSI) and surfacing ACM and PACM.

#### 1.3.18 Class II Asbestos Work

Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile, sheeting, roofing, siding shingles, and construction mastics.

#### 1.3.19 Class III Asbestos Work

Repair and maintenance operations, where "ACM," including thermal system insulation and surfacing material, is likely to be disturbed.

#### 1.3.20 Clean Room

An uncontaminated, transitional room having facilities for storage of employees' street clothing and uncontaminated materials and equipment.

#### 1.3.21 Competent Person

In addition to the definition in 29 CFR 1926.32(f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure and has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32 (f); in addition, for Class I and Class II work, one who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for project designer or

supervisor, or its equivalent and, for Class II who is trained in an operations and maintenance (O&M) course developed by EPA (40 CFR 763 . 92 (a)(2)).

#### 1.3.21 Critical Barrier

One or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in work area from migrating to an adjacent area.

#### 1.3.23 Decontamination Area

An enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room which is used for the decontamination of workers, materials and equipment contaminated with asbestos.

#### 1.3.24 Demolition

The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

#### 1.3.25 Disturbances

Contact which releases fibers from ACM or PACM or debris containing ACM or PACM. This term includes activities that disrupt the matrix of ACM or PACM, render ACM or PACM friable, or generate visible debris. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount which can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event will the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag which will not exceed 60 inches in length and width.

#### 1.3.26 Employee Exposure

That exposure to airborne asbestos fibers that would occur if the employee were not using respiratory protective equipment.

#### 1.3.27 Encapsulant

A liquid material which can be applied to ACM which controls the possible release of asbestos fibers from the material either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).

### 1.3.28 Encapsulate

The process where by an encapsulant is applied to ACM to control the release of asbestos fibers into the air.

### 1.3.29 Equipment Room (Change Room)

A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

### 1.3.30 Excursion Limit

The contractor will ensure that no employee is exposed to an airborne concentration of asbestos in excess 1.0 fibers per cubic centimeter of air (1.0 f/cc) as averaged over a sampling period of 30 minutes.

### 1.3.31 Fiber

A particulate form of asbestos, 5 micrometers or longer, with a length-to-diameter ratio of at least 3 to 1.

### 1.3.32 Friable Asbestos Material

Material that contains more than one percent asbestos by weight which can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

### 1.3.33 Glovebag Technique

A method with limited applications for removing small sections of asbestos-containing material from HVAC ducts, short piping runs, valves, joints, elbows, and other nonplanar surfaces in a noncontained regulated area. The glovebag is constructed and installed in such a manner that it surrounds the object or material to be removed and contains all asbestos fibers released during the removal process. All workers who are permitted to use the glovebag technique must be highly trained, experienced and skilled in this method. Glovebag techniques must be performed in accordance with 29 CFR 1926.1101 which require at least two persons perform class I removals. Glovebags may not be moved along a piece of pipe.

### 1.3.34 Glovebag

An impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled. Glovebags will be made of 6 mil thick plastic and will be seamless at the bottom. Glovebags are for single use and must be smoke tested for leaks prior to usage.

#### 1.3.35 HEPA Filter Equipment

High-efficiency particulate air (HEPA) filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometer diameter or larger.

#### 1.3.36 Homogeneous Area

An area of surfacing material or thermal system insulation that is uniform in color and texture.

#### 1.3.37 Intact

ACM which has not been crumbled, pulverized, or otherwise deteriorated so that it is no longer likely to be bound with its matrix.

#### 1.3.38 Negative Initial Exposure Assessment

A demonstration based by the contractor, which complies with the criteria in paragraph (f)(2)(iii) of 29 CFR 1926.1101, that employee exposures during an operation are expected to be consistently below the PELs.

#### 1.3.39 Nonfriable Asbestos Material

Material that contains asbestos in which the fibers have been locked in by a bonding agent, coating, binder, or other material so that the asbestos is well bound and may not release fibers in excess of the action level during any appropriate use, handling, storage, transportation, or processing. Nonfriable asbestos containing material must be removed prior to demolition/renovation. Nonfriable asbestos containing materials are to be disposed as special waste at a state permitted subtitle D landfill approved to accept asbestos..

#### 1.3.40 Presumed Asbestos Containing Material (PACM)

Thermal system insulation and surfacing material found in buildings constructed no later than 1980.

#### 1.3.41 Personal Monitoring

Sampling of airborne asbestos fiber concentrations within the breathing zone of an employee.

#### 1.3.42 Prior Experience

Experience required of the contractor, his employees, and his Industrial Hygienist on asbestos projects of similar nature and scope to insure capability of performing the asbestos removal in a satisfactory manner. Similarities will be in areas related to material composition, project size, number of employees and the engineering work practice and personal protection controls required.

#### 1.3.43 Regulated Areas

Areas established to demarcate where Class I, II and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work may accumulate; and a work area within which airborne concentrations of asbestos, exceed or there is a reasonable possibility they may exceed the permissible exposure limit.

##### 1.3.43.1 Enclosed Regulated Area

A regulated area which has been isolated by physical boundaries and maintained under negative pressure to prevent the spread of asbestos dust, fibers, or debris. A local HEPA filtered exhaust system is required.

1.3.44 Regulated Asbestos-Containing Material (RACM) for abatement at Fort Campbell will include the following:

- (a) Friable asbestos containing material
- (b) All category I nonfriable ACM
- (c) All category II nonfriable ACM

#### 1.3.45 Thermal System Insulation (TSI)

ACM applied to pipes, fittings, boilers, breeching, tanks, ducts or other structural components to prevent heat loss or gain.

#### 1.3.46 Thermal System Insulation ACM

Thermal system insulation which contains more than 1 percent asbestos.

### 1.3.47 Time Weighted Average (TWA)

The TWA is an individual's 8-hour time weighted average of airborne concentration of fibers per cubic centimeter of air.

## 1.4 SUBMITTALS

The following will be submitted in accordance with Section 01300 SUBMITTALS to and approved by the contracting officer prior to commencing work involving asbestos materials:

### 1.4.1 SD-01, Data

1.4.1.1 Local Exhaust Equipment;

1.4.1.2 HEPA Vacuum Equipment;

1.4.1.3 Respirators; including fit test records

1.4.1.4 Pressure Differential Monitor;

1.4.1.5 Hazardous Communication Plan (if hazardous materials will be brought onto site)

### 1.4.1.6 Training Data

Submit signed and dated certificates for each employee that has received training for the appropriate task(s) assigned and the required amount of hours for the proper handling of materials that contain asbestos, that the employee understands the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limitations of the respiratory equipment to be used; understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment; and understands engineering and other hazard control techniques and procedures.

### 1.4.2 SD-08 Statements

1.4.2.1 Testing Laboratory;

Submit the name, address, and telephone number of the testing laboratory selected to perform the monitoring, testing, and reporting of airborne concentrations of asbestos fibers. The laboratory will be approved by the American Industrial Hygiene Association

(AIHA) to participate in the AAR program. Submit proof that persons reading the samples have been judged proficient by successful participation within the last year in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program or proof that the individuals reading the air samples are current participants in the Asbestos Analysts Registry (AAR). If bulk sample analysis is necessary the testing laboratory will have to submit their certification of National Laboratory Accreditation Program (NVLAP) participation.

#### 1.4.2.2 Industrial Hygienist;

Submit the name, address, and telephone number of the Industrial Hygienist selected to prepare the asbestos plan, direct monitoring and perform training, and a certification that the Industrial Hygienist is certified by the American Board of Industrial Hygiene, including certification number, and date, and their previous experience in asbestos removal activities. For the purposes of this specification the terms industrial hygienist, Certified Industrial Hygienist and CIH are synonymous. The industrial hygienist will be contracted by the abatement firm performing the work. In addition to being a CIH, the individual must be accredited in the discipline he is performing. The Industrial Hygienist must be an accredited building inspector if he is to collect samples or an accredited designer if he is to perform asbestos design specifications.

#### 1.4.2.3 Prior Experience;

As evidence that the asbestos removal effort will be accomplished by trained and competent personnel totally familiar with safe and legal asbestos working practices, the contractor will furnish for Government approval (for himself or for his selected asbestos removal subcontractor) written documentation of successfully completed asbestos abatement projects of similar nature and scope. A short summary of three (3) asbestos abatement projects performed will include:

- a. The name, address, and telephone number of the contact person (someone specifically familiar with the contractor's work). If available, include copies of letters of reference from previous users of the contractor's service.
- b. A short description of the type of removal (e.g. pipe lagging, sprayed girders and/or ceilings, transite siding, etc.), its extent (square feet, linear feet), and days to complete (scheduled and actual).
- c. Documentation of any licenses or certifications as an asbestos abatement Contractor in the jurisdiction covered. If none, a negative response is required.
- d. The contractor will certify that the firm and its employees are familiar with regulations of the Occupational Safety and Health Administration (OSHA) and the U.S.

Environmental Protection Agency (EPA)cited in the project specification and related to asbestos abatement.

e. The contractor will further document that no RACM will be stripped, removed , or otherwise be handled or disturbed unless at least one on-site representative, such as a foreman, management level, or other authorized representative trained in the provisions of this regulation and the means of complying with them, is present. Annually the trained on-site individual will receive refresher training in the provisions of this regulation. The required training will include as a minimum: applicability; notifications; material identification; control procedures for removals including, at least, wetting, local exhaust ventilation, negative pressure enclosures, glove-bag procedures, and High Efficiency Particulate Air (HEPA) filters; waste disposal work practices; reporting and record keeping; and asbestos hazards and worker protection. Evidence that the required training has been completed will be posted and made available for inspection by the NESHAP administering agency at the demolition or renovation site.

f. A notarized statement, signed by an officer of the asbestos abatement company, containing the following information: (If none, a negative reply is required.)

(1) A record of any citations issued by Federal, State or local: regulatory agencies relating to asbestos abatement activity. Include projects, dates and resolutions.

(2) A list of penalties incurred through noncompliance with asbestos abatement project specifications including liquidated damages, overruns in scheduled time limitations and resolutions

(3) Situations in which an asbestos related contract has been terminated including projects, dates and reasons for terminations.

(4) A listing of any asbestos-related legal proceedings/claims which the contractor (or employees Scheduled to participated in this project) has participated or is currently involved. Include descriptions of role, issue and resolution to date.

#### 1.4.2.4 Asbestos Plan;

Submit a detailed Plan of the work procedures to be used in the removal and disposal of materials containing asbestos. Include in the Plan an explanation of Initial Exposure Assessment. The Plan will be prepared, signed, and sealed, including certification number and date, by the contractor's Certified Industrial Hygienist. Such Plan will include a sketch showing the location, size, and details of regulated areas, location and details of the decontamination area, layout of decontamination area, and locations of local exhaust equipment. The Plan will also include interface of trades involved in the construction, sequencing of asbestos-related work, disposal plan, type of wetting agent

to be used, air monitoring, respirators, protective equipment, pressure differential monitoring device, and a detailed description of the method employed in order to control ambient air conditions within the regulated area. All milestones and schedules will be included within this Plan. The Plan will be approved by the contracting officer prior to the start of any asbestos work. Prior to beginning work, the contractor will meet with the contracting officer to discuss in detail the Asbestos Plan, including work procedures and safety precautions.

#### 1.4.2.5 Notification Requirements;

##### a. Initial Notification

At least 10 working days before asbestos stripping or removal work or any other activity begins such as site preparation that would break up, dislodge or similarly disturb asbestos containing materials.

The contractor will:

(1) Provide the U.S. Environmental Protection Agency (EPA) Regional NESHAP administering agency with the required notice of intention to demolish or renovate. If work is performed in Tennessee, notification shall be in accordance with State of Tennessee regulation Ch 1200-3-11 and Code of Federal Regulations 40 CFR 61, Subpart M. The contractor will send notification forms to:

Department of Environment and Conservation-Division of Air Pollution Control  
9th Floor, L&C Annex  
401 Church Street  
Nashville, Tennessee 37243-1531.

If the work is performed in Kentucky, the NESHAP notification forms are to be sent to the:

Kentucky Division for Air Quality  
Asbestos Branch, Paducah Region  
4500 Clarks River Road  
Paducah, Kentucky 42003

Forms are located at the end of this section. Work will not commence on any dates other than those stated in the notification without re-notification of all parties. Delivery of the notice by U.S. Postal Service, commercial delivery service, or hand delivery is acceptable. The contractor will also provide the Contracting Office representative copies of all notifications and re-notifications.

(2) Update notice, as necessary, including when the amount of asbestos affected changes by at least 20 percent.

(3) The contractor will submit to the Contracting Administrator (CA) a copy of the NESHAP notification on the same day it is sent to the administering agency (state).

The CA will, in-turn, forward a copy of the NESHAP notification to the Directorate of Public Works/Environmental Division/Compliance Branch, Building 2182, 13 ½ Street, IMSE-CAM-PWE, Fort Campbell, KY 42223-5130. The contractor will provide the Contracting Officer Representative (COR) and Environmental Division notification 48 hours prior to the start of removal or disturbance of Asbestos Containing Material (ACM). If the contractor was not required by the state to submit a NESHAP notification, the contractor shall submit to the Contracting Officer Representative (COR) 48 hour electronic notification of intent to start removal of asbestos containing material. Such notification shall include the following:

- Building number
- Anticipated start and end dates
- Description of material being disturbed or abated
- Quantity of material being disturbed or abated including units (SF, LF, CY)
- Description of approximate location of work (e.g. latrines, NW corner of building, 2<sup>nd</sup> floor, etc.)

The COR will in turn forward a copy of the notification to the DPW Environmental Division

b. Re-notification

For asbestos stripping or removal work in a demolition or renovation operation that will begin on a date other than the one contained in the original notice, notice of the new start date must be provided to the NESHAP-administering agency as follows:

(1) When the asbestos stripping or removal operation or demolition operation covered by this paragraph will begin after the date contained in the notice,

(a) Notify the NESHAP administering agency of the new start date by telephone as soon as possible before the original start date, and

(b) Provide the NESHAP administering agency with a written notice of the new start date as soon as possible before, and no later than, the original start date. Delivery of the updated notice by the U.S. Postal Service commercial delivery service, or hand delivery is acceptable.

(2) When the asbestos stripping and removal operation or demolition operation covered by this paragraph will begin earlier than the original start date, provide the NESHAP administering agency with a written notice of the new start date at least 10 working days before asbestos stripping or removal work begins.

(3) In no event will an operation covered by this paragraph begin on a date other than the date contained in the written notice of the new start date.

c. Notification Information

The following will be included in the notice:

- (1) An indication of whether the notice is the original or a revised notification.
- (2) Name, address, and telephone number of both the facility owner and operator and the asbestos removal contractor.
- (3) Type of operation: demolition or renovation.
- (4) Address including specific building number and description of the facility or affected part of the facility including the size (square meters/square feet and number of floors), age, and prior use of the facility.
- (5) Procedure, including analytical methods, employed to detect the presence of RACM and Category I and Category II nonfriable ACM.
- (6) Estimate of the approximate amount of RACM to be removed from the facility in terms of length of pipe in linear meters (linear feet), surface area in square meters (square feet) on other facility components, or volume in cubic meters (cubic feet).
- (7) Location of the facility being demolished or renovated.
- (8) Scheduled start and completion dates of demolition or renovation.
- (9) Description of planned demolition or renovation work to be performed and method(s) to be employed, including demolition or renovation techniques to be used and description of affected facility components.
- (10) Description of work practices and engineering controls to be used to comply with the requirements of this subpart, including asbestos removal and waste-handling emission control procedures.
- (11) Name and location of the waste disposal site where the asbestos-containing material will be deposited.
- (12) A certification that at least one person trained as required by paragraph ( e) of 1.4.2.3 of this section will supervise the stripping and removal described by this notification.
- (13) Description of procedures to be followed in the event that unexpected ACMs are encountered.
- (14) Name, address, and telephone number of the waste transporter.

#### d. Demolition

Refer to Appendix A-10 for demolition NESHAP requirements.

#### 1.4.3 SD-09, Reports

##### 1.4.3.1 Monitoring Results;

Fiber counting will be completed and results reviewed by the Certified Industrial Hygienist within 16 hours. The CIH will notify the contractor and the contracting officer immediately of any exposures to fibers in excess of the acceptable limits. Submit monitoring results to the contracting officer within 3 working days, signed by the testing laboratory, the employee performing air monitoring and the CIH.

##### 1.4.3.2 Local Exhaust System;

Local exhaust systems must be installed and operated in accordance with ANSI Z9.2-79. The local HEPA filtered exhaust system will be operated continuously, 24 hours a day, to maintain the enclosure under negative pressure until the enclosure of the regulated area is removed. Pressure differential recordings for each workday will be reviewed by the Industrial Hygienist and submitted to the contracting officer within 24 hours from the end of each workday. The contractor will notify the contracting officer immediately of any variance in the pressure differential which could cause exposure of adjacent unsealed areas to asbestos fiber concentrations.

##### 1.4.3.3 Job Progress Report;

During abatement activities, the Industrial Hygienist will submit a weekly job progress report to the contracting officer detailing abatement activities. Include review of progress with respect to Asbestos Plan, milestones and schedules, major problems and actions taken, injury reports, equipment breakdowns and a compilation of the weeks bulk material and air sampling results conducted by the contractor's Industrial Hygienist or air sampling professional. Submission of individual monitoring results will be as dictated by SD-09, Reports. The progress report will be signed by the contractor, asbestos abatement subcontractor and the Industrial Hygienist.

1.4.3.4 Within 48 hours after removal of asbestos containing material (ACM), the contractor will provide the Contract Administrator (CA) a copy of the asbestos survey drawings that annotates in blue or red ink the ACM(s) that have been removed as a result of the project. A copy of the building asbestos survey drawings may be obtained at the DPW Environmental Division. The CA will in-turn forward a copy of the survey annotation to the Directorate of Public Works / Environmental Division / Compliance

Branch, Building 2182, 13 ½ Street, IMSE-CAM-PWE, Fort Campbell, Kentucky 42223-5130.

#### 1.4.4 SD-13, Certificates

##### 1.4.4.1 Local exhaust and HEPA vacuum filters;

Local exhaust and HEPA vacuum filters need to be maintained as per manufacturers specifications. Asbestos prefilters need to be replaced daily and HEPA filters changed based upon daily readings of the manometer as described in section 2.7 of this specification.

##### 1.4.4.2 Respirators;

Respiratory protection will be provided by the contractor according to 29 CFR 1926.1101 and the requirements specified in section 2.2 of this specification. The contractor will have developed and implemented a respiratory protection program meeting all the requirements of 29 CFR 1910.134 OSHA's Respiratory Protection Standard.

#### 1.4.5 SD-18, Records

##### 1.4.5.1 Landfill Delivery Records;

Submit written evidence that the contractor plans to use the [Woodlawn](#) Landfill for disposal and will follow all approved procedures for asbestos disposal issued by the EPA, state and local regulatory agencies. Submit copies of all waste shipment records and resulting correspondence. An asbestos waste shipment record appears [at the end of this specification](#).

#### 1.5 TITLE TO MATERIALS

Materials resulting from demolition work, except as specified otherwise, will become the responsibility of the contractor and will be disposed of as specified herein.

#### 1.6 PROTECTION OF EXISTING WORK TO REMAIN

Perform demolition work without damage or contamination of adjacent work. Where such work is damaged or contaminated, restore work to the original condition at no additional cost to the government.

## 1.7 SEQUENCE OF WORK

No other work shall be performed in the asbestos regulated area prior to completion and certification of the asbestos abatement work.

## 1.8 PERMISSIBLE EXPOSURE LIMITS (PELS)

a. Time-weighted average limit (TWA). Ensure that no employee is exposed to an airborne concentration of asbestos in excess of 0.1 fiber per cubic centimeter of air as an eight (8) hour time-weighted average (TWA).

b. Excursion limit. Ensure that no employee is exposed to an airborne concentration of asbestos in excess of 1.0 fiber per cubic centimeter of air (1.0 f/cc) as averaged over a sampling period of thirty (30) minutes.

## 1.9 MEDICAL SURVEILLANCE 29 CFR 1926.1101(m)

### 1.9.1 Medical examinations

Submit evidence of a medical surveillance program for all employees who for a combined total of 30 or more days per year are engaged in Class I, II and III work or are exposed at or above the permissible exposure limit or excursion limit, and for employees who wear negative pressure respirators. The content of the examination shall be consistent with 29 CFR 1926.1101 (m). This examination is not required if adequate records show the employee has been examined as required by 29 CFR 1926.1101 (m) within the past year. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos fibers and within 30 calendar days before or after the termination of employment in such occupation.

### 1.9.2 Medical Records

Maintain complete and accurate records as required by 29 CFR 1926.1101(n) employees' medical examinations for a period of at least 40 years after termination of employment and make records of the required medical examinations available for inspection and copying to: The Assistant Secretary of Labor for Occupational Safety and Health, The Director of the National Institute for Occupational Safety and Health (NIOSH), authorized representatives of either, and an employee's physician upon the request of the employee or former employee.

## I.10 TRAINING

All workers must receive training specific to the tasks performed on the project. In addition, each employee must have received an equivalent level of training within 3

months prior to assignment to asbestos work or shall be instructed for a minimum of 8 hours by the CIH with regard to the methods of recognizing asbestos; the health effects associated with asbestos; the relationship between smoking and asbestos in producing lung cancer; its purposes, proper use, fitting instructions, and limitations of respirators; the nature of operations that could result in exposure to asbestos, the importance of necessary protective controls to minimize exposure and any necessary instructions in the use of these controls and procedures; the appropriate work practices for performing the asbestos removal job; medical surveillance program requirements; and a review of 29 CFR 1926.1101 safety and health precautions and the use and requirements for protective clothing and equipment including respirators. Fully cover engineering and other hazard control techniques and procedures. Maintain complete and accurate records of training for each employee. Records shall be maintained for one year beyond the last date of employment.

Employees who perform Class I or Class II removals will have received the EPA worker 4-day course. Supervisors will have received the EPA 5-day Competent person training.

#### 1.12 PERMITS

Obtain necessary permits in conjunction with this project for the abatement, demolition, transportation and disposal of asbestos containing materials, and provide timely notification of such actions as may be required by Federal, State, regional, and local authorities. Refer, also, to SD-18, Records (Landfill Delivery Records) for additional requirements.

#### 1.13 SAFETY AND HEALTH COMPLIANCE

In addition to detailed requirements of this specifications, comply with laws, ordinances, rules, and regulations of Federal, State, regional, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.1101 and 40 CFR 61, Subpart A and 40 CFR 61, Subpart M. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where specification requirements and referenced documents vary, the most stringent requirements will apply.

### PART 2 PRODUCTS

#### 2.1 EQUIPMENT AND MATERIAL USED IN REMOVAL OPERATIONS

Furnish the contracting officer with two complete sets of personal protective equipment, as required herein, for each entry into and inspection of the regulated area.

## 2.2 RESPIRATORS

The contractor will provide respirators , and ensure they are used in the following circumstances. Respiratory protection is required on all asbestos abatement jobs.

- a. During all class I removal jobs.
- b. During all class II work where the ACM is not removed in a substantially intact state.
- c. During all Class II and III work which is not performed using wet methods, provided, however that respirators need not be worn during removal of sloped roofs when a negative exposure assessment has been made and the ACM is removed in an intact state.
- d. During all Class II and III asbestos jobs where the contractor does not produce a “negative exposure assessment.”
- e. During all Class III jobs where TSI or surfacing ACM or PACM is to be disturbed.
- f. During all Class IV work performed in regulated areas where employees performing other work are required to wear respirators.
- g. During all work where employees are exposed above the PEL or the excursion limit.
- h. During emergencies.

Select respirators approved by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, for use in atmospheres containing asbestos fibers according to the table below. During the performance of work when removal or demolition of asbestos materials is not underway and after the TWA and ceiling limits have been established, the contractor shall provide respirators as required in 29 CFR 1926.1101(h). The contractor shall establish a respirator program as required by ANSI Z88.2-80 and 29 CFR 1910.134.

### RESPIRATORY PROTECTION FOR ASBESTOS FIBERS

<u>Airborne concentration of asbestos or condition of use</u>	<u>Required respirator</u>
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Not in excess of 1 f/cc (10XPEL), or Half-mask air purifying respirator otherwise as required independent other than a disposable, equipped of exposure with high efficiency filters.

Not in excess of 5 f/cc (50XPEL). Full-face piece air purifying respirator equipped with high efficiency filters.

Not in excess of 10 f/cc (100XPEL). Any powered air-purifying respirator equipped with high efficiency filters or any supplied air respirator operated in continuous flow mode.

Not in excess of 100 f/cc (100XPEL) Full-face piece supplied - air respirator operated in pressure demand mode.

Greater than 100 f/cc Full-face piece supplied air (1,000XPEL), or unknown concentration. respirator operated in pressure demand mode, equipped with an auxiliary positive pressure self contained breathing apparatus.

\*Airborne concentrations are based upon the 8 hour TWA - PEL

\*A high efficiency filter means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3 micrometers in diameter or larger.

\*Air purifying respirators must be equipped with high-efficiency particulate air (HEPA) filters. The HEPA filters are not reusable.

In addition to the above selection criteria the contractor will provide tight fitting powered air purifying respirators equipped with high efficiency filters or a full face piece supplied air respirator operated in the pressure demand mode equipped with HEPA egress cartridges or an auxiliary positive pressure self contained breathing apparatus for all employees within the regulated area where Class I work is being performed for which a negative exposure assessment has not been produced and the exposure assessment indicates the level will not exceed 1 f/cc as an 8- hour time weighted average. A full face piece supplied air respirator operated in the pressure demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus shall be provided under such conditions, if the exposure assessment indicates exposure levels above 1.0 f/cc as an 8-hour time weighted average.

## 2.3 SPECIAL CLOTHING

### 2.3.1 Protective Clothing

Protective clothing shall be coveralls or similar whole-body clothing, head coverings, gloves, and foot coverings.

### 2.3.2 Work Clothing

Provide boot covers and cloth work clothes to be worn under the protective coveralls.

## 2.4 HYGIENE FACILITIES

A decontamination area shall consist of an equipment room, shower area, and clean room in series. The equipment room shall be supplied with impermeable, labeled bags and containers for the containment and disposal of contaminated protective equipment. Shower facilities shall be provided which comply with 29 CFR 1910.14(d)(3). The clean change room shall be equipped with a locker or appropriate storage container for each employee's use.

## 2.5 EYE PROTECTION

Provide goggles for personnel engaged in asbestos operations when the use of a full face respirator is not required.

Eye protection will be provided as per 29 CFR 1910.133 OSHA's Eye and Face Protection Standard.

## 2.6 WARNING SIGNS AND LABELS

### 2.6.1 Warning Signs

Warning signs must be of sufficient size to be clearly legible and display the following information:

DANGER

ASBESTOS

CANCER AND LUNG DISEASE HAZARD

AUTHORIZED PERSONNEL ONLY

## RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA

### 2.6.2 Warning Labels

Labels must be of sufficient size to be clearly legible, printed in large, bold letters on a contrasting background, and displaying the following legend:

DANGER

CONTAINS ASBESTOS FIBERS

AVOID CREATING DUST

CANCER AND LUNG DISEASE HAZARD

### 2.7 LOCAL EXHAUST SYSTEM

Provide a local exhaust system in the enclosed regulated areas. Filters on vacuums and exhaust equipment will be UL 586-labeled HEPA filters. Local exhaust equipment shall be sufficient to maintain a minimum pressure differential of minus 0.02 inches of water column relative to adjacent, unsealed areas. The local exhaust system must be equipped with a manometer-type negative pressure differential monitor with minor scale division of 0.02 inches of water and accuracy within plus or minus 10 percent. The manometer must be calibrated daily as recommended by the manufacturer. Provide manually recorded manometer readings of the pressure differential between the enclosed regulated area and adjacent unsealed areas at the beginning of each workday and every 2 working hours thereafter. The local exhaust system will be operated continuously, 24 hours per day, until the regulated area enclosure is removed. Replace filters as required to maintain the efficiency of the system. The building heating, ventilating, and air-conditioning (HVAC) system will not be used as the local exhaust system for the enclosed regulated area.

### 2.8 TOOLS AND MISCELLANEOUS EQUIPMENT

#### 2.8.1 Airless Sprayer

An airless sprayer, suitable for application of sealing material, will be used.

#### 2.8.2 Scaffolding

Scaffolding, as required to accomplish the specified work, shall meet all applicable safety regulations.

### 2.8.3 Transportation Equipment

Transportation equipment, as required, will be suitable for loading, temporary storage, transporting, and unloading of contaminated waste without exposure to persons or property.

### 2.8.4 Vacuum Equipment

All vacuum equipment utilized in the work area will utilize HEPA filtration systems.

### 2.8.5 Water Sprayer

The water sprayer will be an airless or other low pressure sprayer for amended water application.

### 2.8.6 Other Tools and Equipment

The contractor shall provide other suitable tools for the stripping, removal, encapsulation and disposal activities including but not limited to: knives, stiff nylon brushes, sponges, rounded edge shovels, brooms, and carts.

## 2.9 MATERIALS

### 2.9.1 Lockdown Sealant

The sealing agent will be penetrating sealants and will meet the following criteria:

- a. They will withstand most impact or abrasion and protect the surface.
- b. Sealants selected for use by the contractor will be one of those demonstrating probable effective performance under the tests conducted by an independent testing laboratory and are approved by the contracting officer.
- c. They will have high flame retardant characteristics, and a low toxic fume and smoke emission rating.
- d. They will not be noxious or toxic to application workers, or subsequent workers in the area.
- e. They will have some permeability to water vapor to prevent condensation accumulation, and resist solution by common cleaning agents. They will be water insoluble when cured.
- f. They will be acceptable weathering and aging characteristics.

- g. They will be acceptable by architectural standards.
- h. They will be compatible with all insulating material likely to be applied to the stripped surfaces.
- i. They will be demonstrably capable of adhering to the surfaces of the substrate.
- j. They must contain a light blue or red paint tint. (Food coloring is not acceptable.)

## PART 3 EXECUTION

### 3.1 GENERAL

#### 3.1.1 Respirator Program.

Submit evidence of a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134.

#### 3.1.2 Protective Clothing

Provide and require the use of protective clothing for any employee exposed to airborne concentrations of asbestos that exceed the TWA and/or excursion limit, or for which a required negative exposure assessment is not produced, and for any employee performing Class I and II operations (other than roofing felts and mastics) which involve the removal of over 25 linear or 10 square feet of TSI or surfacing ACM and PACM.

#### 3.1.3 Hygiene Facilities

For employees performing Class I work involving over 25 linear or 10 square feet of TSI or surfacing ACM and PACM, establish a decontamination area that consists of an equipment room, shower area, and clean room in series. Ensure that employees enter and exit the regulated area through the decontamination area. Where it is demonstrated that it is not feasible to locate the shower between the equipment room and the clean room, or where work is performed outdoors, ensure that employees remove asbestos contamination from their work suits in the equipment room using a HEPA vacuum before proceeding to a shower.

#### 3.1.4 Warning Signs and Labels

Provide warning signs at approaches to regulated areas containing airborne asbestos fibers. Locate signs at such a distance that personnel may read the sign and take the

necessary protective steps required before entering the area. Provide labels and affix to asbestos materials, scrap, waste, debris, and other products contaminated with asbestos.

### 3.1.5 Accessibility of Work Areas

The Government will rearrange areas to the extent of providing a reasonable, direct, and an unobstructed path to the work sites. During asbestos removal, the Contractor will confine his equipment and employee pattern to these designated areas. Where the building is still occupied during the removal operations, interference with the functional operation of the building occupants outside these areas will not be permitted. Where conflicts arise due to Contractor's operations, the decision of the Contracting officer or his authorized representative will be final.

### 3.1.6 Preparation for Removal

#### 3.1.6.1 Movable Furnishings

Movable furnishings, equipment and fixtures in the work area will be pre-cleaned and removed from the area of work by the Government before asbestos work begins.

#### 3.1.6.2 Pre-Cleaning

All wall and floor surface areas, other than those from which asbestos is to be removed, and all non-movable furnishings, equipment, and fixtures remaining in the work area will be pre-cleaned with a HEPA filter equipped vacuuming device or wet cleaning methods prior to sealing with plastic sheeting. Do not use any methods which would raise dust such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. After pre-cleaning, enclose fixed objects in 6-mil polyethylene sheeting, label, and seal securely with tape, objects which must remain in the work area and that require special ventilation or enclosure requirements will be suitably protected as approved by the contracting officer. Items in the work area which may require access by user during abatement will be designated during the pre-abatement walkthrough and enclosures constructed with access flaps sealed with waterproof tape.

### 3.1.7 Regulated Areas

All Class I, II, and III asbestos work will be conducted within regulated areas. The regulated area will be demarcated in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne concentrations of asbestos. Where critical barriers or negative pressure enclosures are used, demarcate the regulated area. Signs will be provided and displayed pursuant to 29 CFR 1026.1101(k)(6). Access to regulated areas will be limited to authorized persons. All persons entering a regulated area where employees are required to wear

respirators, will be supplied with a respirator. All asbestos work performed within regulated areas will be supervised by a competent person.

#### 3.1.7.1 Enclosed (Critical Barrier) Regulated Area Requirements

Seal openings in areas where the release of airborne asbestos fibers is expected. Establish a regulated area with the use of curtains, portable partitions, or other enclosures in order to prevent the escape of asbestos fibers from the contaminated area. The established regulated area will be provided with protective covering of walls and ceilings with a continuous membrane of two layers of minimum 6-mil plastic sheeting sealed with tape to prevent water or other damage and two layers of 6-mil plastic sheeting over floors extending a minimum of 24 inches up walls. All penetrations of the floor, walls, and ceiling will be sealed with 6-mil polyethylene plastic and duct tape. Seal joints using spray adhesive and duct tape. Openings will be allowed in enclosures of regulated areas for the supply and exhaust of air for the local exhaust system.

### 3.2 ASBESTOS ABATEMENT PROCEDURES

#### 3.2.1 Initial Exposure Assessment

Ensure that a "competent person" conducts an exposure assessment immediately before or at the initiation of the operation to ascertain expected exposures during that operation or workplace. The assessment must be completed in time to comply with requirements which are triggered by exposure data or the lack of a "negative exposure assessment," and to provide information necessary to assure that all control systems planned are appropriate for that operation and will work properly.

An Initial Exposure Assessment will be conducted in accordance with 29 CFR 1926.1101

For Class I asbestos work, until exposure monitoring is conducted, and is documented that employees on the job will not be exposed in excess of the PELs, or otherwise makes a negative exposure assessment, it is presumed that employees are exposed in excess of the TWA and excursion limit. A negative exposure assessment can only be obtained by demonstrating requirements contained in 29 CFR 1926.1101.

#### 3.2.2 Monitoring Requirements

Perform exposure monitoring as required to determine accurately the airborne concentrations of asbestos to which employees are exposed. Determinations of employee exposure will be made from breathing zone air samples that are representative of the 8-hour TWA and 30-minute short-term exposures of each

employee. Representative 8-hour TWA employee exposure will be determined on the basis of one or more samples representing full-shift exposure for employees in each work area. Representative 30-minute short-term employee exposures will be determined on the basis of one or more samples representing 30-minute exposures associated with operations that are most likely to produce exposures above the excursion limit for employees in each work area.

#### 3.2.2.1 Monitoring Prior to Asbestos Work

Provide area monitoring and establish the reference TWA 1 day prior to the masking and sealing operations for each asbestos removal site. The reference TWA is determined by taking at least three general area air samples in each asbestos regulated area.

#### 3.2.2.2 Periodic monitoring

Conduct daily monitoring that is representative of the exposure of each employee who is assigned to work within a regulated area who is performing Class I or II work unless a negative exposure assessment for the entire operation has been made. Conduct periodic monitoring of all work where exposures are expected to exceed a PEL at intervals sufficient to document the validity of the exposure prediction. When all employees required to be monitored daily are equipped with supplied-air respirators operated in the positive-pressure mode, daily monitoring is not required. However employees performing Class I work using a control method which is not listed in Class I Requirements paragraph, will continue to be monitored daily even if they are equipped with supplied-air respirators.

#### 3.2.2.3 Monitoring Adjacent Areas Prior to Asbestos Work

Provide area monitoring and establish the reference TWA inside the building outside the enclosed regulated area 1 day prior to beginning asbestos work.

#### 3.2.2.4 Termination of Monitoring

If the periodic monitoring reveals that employee exposures, as indicated by statistically reliable measurement, are below the PEL and excursion limit, monitoring may be discontinued for those employees whose exposures are represented by such monitoring. Institute additional monitoring whenever there has been a change in process, control equipment, personnel or work practices that may result in new or additional exposures above the PEL and/or excursion limit.

### 3.2.3 Respiratory Protection

Respirators will be provided and used according to the requirements of 29 CFR 1926.1101 and section 2.2 of this specification.

### 3.2.4 Controls and Work Practices

The following controls and work practices will be used in all classes of work regardless of levels of exposure:

- a. Vacuum cleaners equipped with HEPA filters to collect all debris and dust containing ACM or PACM;
- b. Wet methods, or wetting agents, to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup, except where demonstrated that the use of wet methods are infeasible;
- c. Prompt clean-up and disposal of wastes and debris contaminated with asbestos in leak-tight container;
- d. Local exhaust ventilation equipped with HEPA filter dust collection systems;
- e. Enclosure or isolation of processes producing asbestos dust;
- f. Ventilation of the regulated area to move contaminated air away from the breathing zone and toward a filtration or a collection device equipped with a HEPA filter.

The following work practices and controls will not be used for work related to asbestos or the work which disturbs ACM or PACM, regardless of measured levels of asbestos exposure or results of the initial exposure assessments:

- a. High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filters exhaust air;
- b. Compressed air used to remove asbestos, or ACM, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air;
- c. Dry sweeping, shoveling or other dry clean-up and debris containing ACM and PACM;
- d. Employee rotation as a means of reducing employee exposure to asbestos.

### 3.2.5 Class I Abatement Requirements

In addition to all provisions required in control and work methods above, the following controls and work practices will be used for all Class I work.

a. Installation and operation of the control systems, will be supervised by a competent person.

b. Work involving the removal of more than 25 linear or 10 square feet of thermal system insulation or surfacing material; for all other Class I jobs, where a negative exposure assessment, or where employees are working in areas adjacent to the regulated area, while the Class I work is being performed, use one of the following methods to ensure that airborne asbestos does not migrate from the regulated areas:

(1) Critical barriers will be placed over all openings to the regulated area;

(2) Use another barrier or isolation method which prevents the migration of airborne asbestos from the regulated area, as verified by perimeter area surveillance during each work shift at each boundary of the regulated area, showing no visible asbestos dust; and perimeter area monitoring showing that clearance levels contained in 40 CFR Part 763, Subpart 3, or that perimeter area levels are no more than background levels representing the same area before the asbestos work began.

c. HVAC systems will be isolated in the regulated area by sealing with a double layer of 6 mil plastic or the equivalent;

d. Impermeable drop cloths will be placed on surfaces beneath all removal activity;

e. All objects within the regulated area will be cleaned out and covered with impermeable drop cloths or plastic sheeting which is secured by duct tape or an equivalent.

f. Where a negative exposure assessment cannot be produced, or where exposure monitoring shows that a PEL is exceeded, ventilate the regulated area to move contaminated air away from the breathing zone of employees toward a HEPA filtration or collection device.

#### 3.2.5.1.1 Vinyl and Asphalt Flooring Materials

For removing vinyl and asphalt flooring materials which contain ACM in buildings constructed no later than 1980:

a. Flooring or its backing will not be sanded.

b. Vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) will be used to clean floors.

c. Resilient sheeting will be removed by cutting with wetting of the snip point and wetting during delamination. Rip-up of resilient sheet floor material is prohibited.

d. All scraping of residual adhesive and/or backing will be performed using wet methods.

e. Dry sweeping is prohibited.

f. Mechanical chipping is prohibited unless performed in a negative pressure enclosure which meets the requirement of this section.

g. Tiles will be removed intact, unless it is demonstrated that intact removal is not possible.

h. When tiles are heated and can be removed intact, wetting may be omitted.

I. Resilient flooring material including associated mastic and backing will be assumed to be asbestos-containing materials unless an industrial hygienist determines them to be non asbestos containing materials using recognized analytical techniques.

J. Splash guards consisting of 6 mil polyethylene sheeting will be utilized when chemical strippers are used . Splash guards will extend along the wall from the floor to a height of 4 feet.

#### 3.2.5.1.2 Any other Removal of ACM

a. The material will be thoroughly wetted with amended water prior and during its removal.

b. The material will be removed in an intact state unless the employer demonstrates that intact removal is not possible.

c. Cutting, abrading, or breaking the material will be prohibited unless the employer can demonstrate that methods less likely to result in asbestos fiber release are not feasible.

d. ACM removed will be immediately bagged or wrapped, or kept wetted until transferred to a closed receptacle, no later than the end of the work shift.

#### 3.2.5.3 Asbestos Contaminated Soil

Any area of contaminated soil is to be removed of by the following procedures:

- a. Before the soil removal commences, mark the wall in the area(s) at the existing ground elevation.
- b. Using small shovels, all loose soil will be removed to a minimum depth of 3 inches.
- c. Verification of the depth will be made by measurement from the excavation floor to the bottom of the original ground elevation mark or the wall.

### 3.3 COLLECTION

#### 3.3.1 Nonfriable Non-Regulated Asbestos Containing Material (Non-RACM)

The non-friable ACM found in this project will be handled as RACM and will require special collection action as detailed in Para. 3.3.2.

The notification requirements of Para. 1.4.2 also are applicable to Non-RACM.

#### 3.3.2 Regulated Asbestos Containing Material (RACM)

All asbestos containing materials for this project will be treated as RACM due to the nature of the materials present. Asbestos containing material will be removed in manageable sections and maintained in a wet condition. Material should be containerized upon removal and before being moved to any new location.

Maintain surfaces of the regulated area free of accumulations of asbestos fibers. Restrict the spread of dust and debris; keep waste from being distributed over the general area. Do not dry sweep or blow down the space with compressed air.

Collect asbestos waste, scrap, debris, bags, containers, equipment, and asbestos-contaminated clothing which may produce airborne concentrations of asbestos fibers; place in sealed impermeable bags imprinted with a caution label (Para. 2.6.2) and label with the name of the contractor and the location at which the waste was generated. The sealed bags will then be placed in a second sealed impermeable bag also imprinted with the warning label. Bags will be placed in asbestos roll off boxes for shipment to the landfill.

##### 3.3.2.1 Removing Material Intact

Asbestos containing materials should be removed intact whenever possible (removal of pipe and pipe insulation by wrapping, sealing the insulation and cutting the uninsulated ends of the pipe). Asbestos containing materials will not be dropped or thrown to the ground. Materials between 15 and 50 feet above the ground may be containerized at elevated levels or placed into inclined chutes or scaffolding for subsequent collection

and containerization. Asbestos materials in open containers will be kept wet at all times.

### 3.3.2.2 Containers

Containers (drums or 6-mil polyethylene bags) will be sealed when full. Wet material will be heavy and double bagging of waste material is required. Bags, if used, will not be overfilled. They should be securely sealed to prevent accidental opening and leakage by tying the tops of the bags in an overhand knot or by taping in goose neck fashion. Do not seal bags with wire or cord. Bags may be placed in drums for staging and transportation to the landfill. Bags will be decontaminated on exterior surfaces by wet cleaning before being placed in clean drums and sealed with locking ring tops. Where unusual circumstances prohibit use of plastic disposal bags or drums, the contractor will submit, in the asbestos plan, an alternate proposal for removal, containerizing, and disposal of the asbestos containing materials.

### 3.3.2.3 Sharp Edged Components

Asbestos containing or contaminated waste with sharp edged components (e.g. nails, screws, metal lath, tin sheeting) that could otherwise tear polyethylene bags will be placed into drums for disposal.

### 3.3.2.4 Asbestos Contaminated Soil

Any removed soil will be placed in 6-mil plastic bags, sealed and then placed in approved containers such as fiber waste drums for disposal. Do not overfill plastic bags.

### 3.3.2.5 Wastewater

a. Pre-filtering. Any water produced by the decontamination of either equipment or persons will be (1) collected, (2) filtered through a system capable of trapping particles 5 microns and larger, specifically designed to remove asbestos fibers, and (3) filtrate disposed into a local sanitary sewer system.

b. Filter System. The filtration system will contain a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system by large particles. Disposable filters will be treated as asbestos waste.

## 3.4 DISPOSAL OF ACM

### 3.4.1 All Asbestos Containing Materials

3.4.1.1. Prior to delivery of asbestos containing materials at the Woodlawn Landfill the contractor will provide Fort Campbell, DPW Roads and Grounds at least 24 hours notice of when ACM is to be disposed.

3.4.2. Once drums, bags and otherwise containerized asbestos containing materials have been removed from the work area, they will be loaded into an enclosed truck for transportation to the Woodlawn landfill. Asbestos waste will not be allowed to be placed in trucks with non-asbestos waste. All bags utilized will be of 6-mil polyethylene and must be double lined.

3.4.3. All containers will be labeled according to the requirements of 29 CFR 1910.1200 OSHA Hazardous Communication Standard and will contain the following:

DANGER  
CONTAINS ASBESTOS FIBERS  
AVOID CREATING DUST  
CANCER AND LUNG DISEASE HAZARD

3.4.4. The enclosed cargo area of the truck will be free of debris and lined with 6-mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting will be installed first and extend up the sidewalls. Wall sheeting will be overlapped and taped into place so that no materials may escape to the environment.

3.4.5. Drums will be placed on level surfaces in the cargo area and packed tightly together to prevent shifting and tipping. Do not throw containers into the cargo area.

3.4.6. Personnel loading asbestos containing waste will be protected by disposable clothing including head, body and foot protection and at a minimum, half-face piece, air purifying, dual cartridge respirators equipped with high efficiency particulate air (HEPA) filters.

3.4.7. Large steel dumpsters (roll-off boxes) may be used for asbestos waste disposal. These should be lined with polyethylene and should have doors, tops or covers that can be closed to prevent vandalism or other disturbance of the containerized asbestos debris and wind dispersion of asbestos fibers. Uncontainerized asbestos materials will not be placed in these type dumpsters, nor will they be used for non-asbestos waste. Bags will be placed, not thrown, into these containers to avoid splitting.

3.4.8. Disposal of waste asbestos material at Woodlawn Landfill. Contact Fort Campbell-DPW, Environmental Division through the Contracting Officers representative.

3.4.9. For temporary storage, store sealed impermeable bags in asbestos waste drums. If temporary storage is within regulated areas and under negative pressure drums are not required. An area for interim storage of asbestos waste-containing

drums will be assigned by the contracting officer or by an authorized representative. This area must be secure. No ACM wastes, except those properly labeled and properly containerized and physically located in the assigned holding area will be allowed to remain at the site overnight.

3.4.10. Procedures for hauling and disposing will comply with 40 CFR 61 Subpart M, 40 CFR 241, 40 CFR 257, and State, regional and local standards. Vehicles used to transport asbestos containing waste material must be clearly marked. The markings must:

(i) Be displayed in such a manner and location that a person can easily read the legend.

(ii) Conform to the requirements for 51 cm x 36 cm (20 in. x 14 in.) upright format signs specified in 29 CFR 1910.145(d)(4) and this paragraph; and

(iii) Display the following legend in the lower panel with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

Legend

DANGER  
ASBESTOS DUST HAZARD  
CANCER AND LUNG DISEASE HAZARD  
Authorized Personnel only

Notation

2.5 cm (1 inch) Sans Serif, Gothic or Block  
2.5 cm (1 inch) Sans Serif, Gothic or Block  
1.9 cm (3/4 inch) Sans Serif, Gothic or Block  
14 Point Gothic

Spacing between any two lines must be at least equal to the height of the upper of the two lines.

3.4.11. Upon reaching the landfill, trucks are to approach the dump location as closely as possible for unloading of the asbestos containing waste.

3.4.12. Bags, drums and components will be inspected as they are off loaded at the disposal site. Material in damaged containers will be repacked in empty drums or bags as necessary. Uncontaminated drums may be recycled.

3.4.13. Waste containers will be placed on the ground at the disposal site, not pushed or thrown out of trucks since the weight of wet material could rupture containers.

3.4.14. Personnel off-loading containers at the disposal site will wear protective equipment consisting of disposable head, body and foot protection and, at a minimum, half-face piece, air-purifying, dual cartridge respirators equipped with high efficiency particulate air (HEPA) filters. Following the removal of all containerized waste, the truck cargo area will be decontaminated to meet the no visible residue criteria. Polyethylene sheeting will be removed and discarded along with contaminated cleaning materials and protective clothing, in bags or drums at the disposal site. If landfill personnel have not been provided with personal protective equipment for the compaction operation by the landfill operator, the contractor will supply protective clothing and respiratory protection for the duration of this operation.

#### 3.4.15. Shipment Records

a. Maintain waste shipment records, using copies of the [form located at the end of this section](#) and include the following information:

(i) The name, address, and telephone number of the waste generator.

(ii) The name and address of the local, State, or EPA Regional office responsible for administering the asbestos NESHAP program.

(iii) The approximate quantity in cubic meters (cubic feet).

(iv) The name and telephone number of the disposal site operator.

(v) The name and physical site location of the disposal site.

(vi) The date transported.

(vii) The name, address, and telephone number of the transporter(s).

(viii) A certification that the contents of this consignment are fully and accurately described by proper shipping name and are classified, packed, marked, labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.

b. Provide a copy of the waste shipment record, described above to the disposal site owners or operators at the same time as the asbestos-containing waste material is delivered to the disposal site.

c. For waste shipments where a copy of the waste shipment record, signed by the owner or operator of the designated disposal site, is not received by the contractor within 35 days of the date the waste was transported, contact the owner or operator of

the designated disposal site to determine the status of the waste shipment. The contractor will report in writing to the NESHAP administering agency if a copy of the waste shipment record, signed by the owner or operator of the designated waste disposal site, is not received by the contractor within 45 days of the date the waste was transported. Include in the report the following information:

(i) A copy of the waste shipment record for which a confirmation of delivery was not received, and

(ii) A cover letter explaining the efforts taken to locate the asbestos waste shipment and the results of those efforts.

d. Retain a copy of all waste shipment records, including a copy of the waste shipment record signed by the owner or operator of the designated waste disposal site, for at least 2 years.

e. Provide to the contracting officer within 3 working days following delivery of asbestos containing waste material copies of all waste shipment records. Also within 3 working days of initiation, provide to the contracting officer copies of any correspondence with the NESHAP administering agency.

Furnish upon request, and make available for inspection by the NESHAP administering agency, all records under this section.

#### 3.4.16 Wastewater

It is the contractor's responsibility to comply with any local wastewater systems' regulations or policy regarding the disposal of wastewater from asbestos abatement activities.

### 3.5 CLEANUP AND FINAL CLEARANCE

#### 3.5.1 Cleanup

Clean all surfaces in the work area and other contaminated areas with water and/or HEPA vacuum equipment. After cleaning the work area, allow 24 hours for settlement of dust and wet clean or clean with HEPA vacuum equipment all surfaces in the work area. When asbestos removal, disposal, and cleanup are complete, the contractor will certify, in writing, that the area is free of any asbestos material or debris.

#### 3.5.2 Visual Inspection After Cleanup

Prior to the performance of final air monitoring, the contractor and the contracting officer or his representative will perform a visual inspection for asbestos dust/residue. If

residue is found, additional wipedown/vacuuming will be performed to the satisfaction of the contracting officer. If recleaning is required, monitor the airborne fiber concentration after recleaning.

### 3.5.3 Monitoring After Final Cleanup

After the removal site has passed the visual inspection, provide area monitoring of fibers (at least 5 samples per removal site) under aggressive conditions. Collect and analyze the samples to establish airborne asbestos fiber concentration within the area after final cleanup but before removal of the enclosure of the regulated area. The fiber counts from the samples will be less than 0.01 fibers (longer than 5 micrometers) per cubic centimeter of air or not be greater than the levels referenced as background before the work was initiated, whichever is less. Should any of the final sampling indicate a higher value, the contractor will take appropriate actions to reclean the area and will repeat the monitoring.

### 3.5.4 Sampling

Sampling under aggressive conditions will include the following procedures:

- a. Before starting the sampling pumps, direct the exhaust from forced air equipment (such as a 1 horsepower leaf blower) against all walls, ceiling, floors, ledges and other surfaces in the room. This should take at least 5 minutes per 1000 sq. ft. of floor.
- b. Place a 20-inch fan in the center of the room. (Use one fan per 10,000 cubic feet of room space.) Place the fan on low speed and point it toward the ceiling.
- c. Start the sampling pumps and sample for the required time.
- d. Turn off the pump and then the fan(s) when sampling is complete.

### 3.5.5 Air Clearance Failure

Should clearance sampling results fail to meet the final cleanup requirements, the contractor will take appropriate action at no additional cost to the Government, to reclean, resample, and analyze data until final cleanup requirements are met.

### 3.5.6 Site Inspection

While performing asbestos removal work, the contractor will be subject to onsite inspection by the contracting officer who may be assisted by safety or health personnel. If the work is in violation of specification requirements, the contracting officer will issue a stop work order to be in effect immediately and until the violation is resolved. Standby time and expenses required to resolve the violation will be at the contractor's expense.

### 3.5.7 Sealing Permanent Exposed Surfaces (RACM)

After the asbestos material has been removed and HEPA vacuumed to the greatest extent possible, all permanent asbestos exposed interior surfaces will be coated with an approved lockdown sealant to permanently bind any remaining fibers in place. Sealant will be applied by airless sprayers and in accordance with the sealant manufacturers recommendations.

### 3.5.8 Sealant Tint

The sealant will have an adequate tint to easily distinguish between sections sealed and sections not sealed.

### 3.5.9 Reestablishment of the Work Area

Reestablishment of the work area will occur only after the completion of the following to the contracting officers satisfaction: performance of clean-up procedures and the successful achievement/ documentation of clearance air monitoring values.

### 3.5.10 Visual Inspection

The contractor and contracting officer will visually inspect the work area for any remaining visible residue. Evidence of asbestos materials will necessitate additional cleaning requirements.

### 3.5.11 Clearance of Work Area

Following satisfactory clearance of the work area, remaining barriers may be removed and disposed of as asbestos contaminated waste.

### 3.5.12 Remaining Building Demolition Procedures

Contractor may proceed with remaining building demolition procedures as described in SECTION 02050: DEMOLITION.

End of Section

[Return to Designer Instructions](#)

# ASBESTOS WASTE SHIPMENT RECORD

Department of Environment  
and Conservation  
Division of Air Pollution Control



9th Floor, L & C Annex  
401 Church Street  
Nashville, TN 37243-1531  
(615) 532-0554

## ASBESTOS WASTE SHIPMENT RECORD

GENERATOR			
1. Work site name and mailing address	Owner's name	Owner's telephone no. ( )	
2. Operator's name and address		Operator's telephone no. ( )	
3. Waste disposal site (WDS) name, mailing address, physical site location and disposal facility permit number		WDS phone no. ( )	
		Permit no.	
4. Name and address of responsible agency			
5. Description of materials	6. Containers No.      Type	7. Total quantity m <sup>3</sup> yd <sup>3</sup>	
8. Special handling instructions and additional information			
9. OPERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.			
_____	_____	_____	_____
Print/type name & title	Signature	Month	Day      Year
TRANSPORTER			
10. Transporter 1 (acknowledgement of receipt of materials)			
_____	_____	_____	_____
Print/type name & title	Signature	Month	Day      Year
_____	_____	( )	
Address	Telephone No.		
11. Transporter 2 (acknowledgement of receipt of materials)			
_____	_____	_____	_____
Print/type name & title	Signature	Month	Day      Year
_____	_____	( )	
Address	Telephone No.		
DISPOSAL SITE			
12. Discrepancy indication space			
13. Waste disposal site Owner or operator: Certification of receipt of asbestos materials covered by this manifest except as noted in item 12.			
_____	_____	_____	_____
Print/type name & title	Signature	Month	Day      Year

CN-1054

(Instructions on Reverse)

## INSTRUCTIONS

### Waste Generator Section (Items 1-9)

1. Enter the name of the facility at which asbestos waste is generated and the address where the facility is located. In the appropriate spaces, also enter the name of the owner of the facility and the owner's phone number.
2. If a demolition or renovation, enter the name and address of the company and authorized agent responsible for performing the asbestos removal. In the appropriate spaces, also enter the phone number of the operator.
3. Enter the name, address, and physical site location of the waste disposal site (WDS) that will be receiving the asbestos materials. In the appropriate spaces, also enter the phone number of the WDS. Enter "on-site" if the waste will be disposed of on the generator's property.
4. Provide the name and address of the local, State, or EPA Regional office responsible for administering the asbestos NESHAP program.
5. Indicate the types of asbestos waste materials generated. If from a demolition or renovation, indicate the amount of asbestos that is
  - Friable asbestos material
  - Nonfriable asbestos material
6. Enter the number of containers used to transport the asbestos materials listed in item 5. Also enter one of the following container codes used in transporting each type of asbestos material (specify any other type of container used if not listed below):
  - DM - Metal drums, barrels
  - DP - Plastic drums, barrels
  - BA - 6 mil plastic bags or wrapping
7. Enter the quantities of each type of asbestos material removed in units of cubic meters (cubic yards).
8. Use this space to indicate special transportation, treatment, storage or disposal or Bill of Lading information. If an alternate waste disposal site is designated, note it here. Emergency response telephone numbers or similar information may be included here.
9. The authorized agent of the waste generator must read and then sign and date this certification. The date is the date of receipt by transporter.

NOTE: The waste generator must retain a copy of this form.

### Transporter Section (Items 10 & 11)

10. & 11. Enter name, address, and telephone number of each transporter used, if applicable. Print or type the full name and title of person accepting responsibility and acknowledging receipt of materials as listed on this waste shipment record for transport. Enter date of receipt and signature.

NOTE: The transporter must retain a copy of this form.

### Disposal Site Section (Items 12 & 13)

12. The authorized representative of the WDS must note in this space any discrepancy between waste described on this manifest and waste actually received as well as any improperly enclosed or contained waste. Any rejected materials should be listed and destination of those materials provided. A site that converts asbestos-containing waste material to nonasbestos material is considered a WDS.
13. The signature (by hand) of the authorized WDS agent indicates acceptance and agreement with statements on this manifest except as noted in item 12. The date is the date of signature and receipt of shipment.

NOTE: The WDS must retain a completed copy of this form. The WDS must also send a completed copy to the operator listed in item 2.

[Back to Shipment Records Paragraph 1.4.5.1](#)  
[Back to Shipment Records Paragraph 15](#)

NOTIFICATION OF ASBESTOS DEMOLITION OR RENOVATION FORM



DEPARTMENT OF ENVIRONMENT AND CONSERVATION  
DIVISION OF AIR POLLUTION CONTROL

NOTIFICATION OF ASBESTOS DEMOLITION OR RENOVATION

Operator Project #	Postmark	Date Received	Notification #	
<b>I. Type of Notification (O-Orig., R-Revised, C-Cancelled)</b>				
<b>II. Facility Information (Identify Owner, Removal Contractor, Operator)</b>				
Owner Name:				
Address:				
City:	State:	Zip:		
Contact:	Telephone: ( )			
Removal Contractor:				
Address:				
City:	State:	Zip:		
Contact:	Telephone: ( )			
Other Operator (If Different From Owner):				
Address:				
City:	State:	Zip:		
Contact:	Telephone: ( )			
<b>III. Type of Operation (D-Demo., O-Ordered Demo., R-Renov., E-Emer. Renov.)</b>				
<b>IV. Is Asbestos Present? (Yes/No)</b>				
<b>V. Facility Description (Include Building Name, Number and Floor or Room Number)</b>				
Building Name:				
Address:				
City:	State:	Zip:		
Site Location:				
Building Site Total Sq. Ft.:	# of Floors:	Age in Years:		
Present Use:	Prior Use:			
<b>VI. Procedure and Analytical Method Used to Detect the Presence of Asbestos Material</b>				
<b>VII. Approximate Amount of Asbestos in Work Area Including</b>				
1. Regulated ACM to be Removed	RACM To Be Removed	Nonfriable Asbestos Material		Units of Measurement
2. Category I ACM Not Removed		Not To Be Removed	To Be Removed	
3. Category II ACM Not Removed		Cat I	Cat II	
Pipes				LnFT Ln m
Surface Area				SqFT Sq m
Vol. RACM Off Facility Components				CuFT Cu m
<b>VIII. Scheduled Dates for Asbestos Removal</b>		Start:	Complete:	
Scheduled Dates of Preparation		Start:	Complete:	
Days of Week: (circle) ALL Sun Mon Tue Wed Thu Fri Sat		Hours of Day:		
<b>IX. Scheduled Dates for Demo./Renovation</b>		Start:	Complete:	
<b>X. Description of Planned Demolition or Renovation Work, Method(s) to be Used:</b>				
<b>XI. Description of Work Practices and Engineering Controls to be used to Prevent Emissions of Asbestos at the Demolition and Renovation Site:</b>				

<b>XII. Waste Transporter #1</b>		
Name:		
Address:		
City:	State:	Zip:
Contact Person:	Telephone: ( )	
<b>Waste Transporter #2</b>		
Name:		
Address:		
City:	State:	Zip:
Contact Person:	Telephone: ( )	
<b>XIII. Waste Disposal Site</b>		
Name:		
Location:		
City:	State:	Zip:
Telephone:		
<b>XIV. If Demolition Ordered by a Government Agency, Please Identify Below:</b>		
Name:	Title:	
Authority:	Date Ordered to Begin (mm/dd/yy)	
Date of Order (mm/dd/yy):		
<b>XV. For Emergency Renovations</b>		
Date and Hour of Emergency (mm/dd/yy):		
Description of the Sudden, Unexpected Event:		
Explanation of How the Event Caused Unsafe Conditions or Would Cause Equipment Damage or an Unreasonable Financial Burden:		
<b>XVI. Description of Procedures to be Followed in the Event Asbestos is Found or Previously Nonfriable Asbestos Material Becomes Crumbled, Pulverized, or Reduced to Powder.</b>		
<b>XVII. I Certify That an Individual Trained in the Provisions of this Regulation (40 CFR Part 61, Subpart M) Will be On-Site During the Demolition or Renovation and Evidence That Required Training has Been Accomplished by This Person Will be Available for Inspection During Normal Business Hours. (REQUIRED AFTER NOVEMBER 20, 1991)</b>		
_____ (Signature of Owner/Operator)		_____ (Date)
<b>XVIII. I Certify That the Above Information is Correct.</b>		
_____ (Signature of Owner/Operator)		_____ (Date)

Submit Completed Form by U.S. Postal Service / Commercial Delivery Service or Hand Deliver to:

Department of Environment and Conservation  
 Division of Air Pollution Control  
 9th Floor, L & C Annex  
 401 Church Street  
 Nashville, TN 37243-1531  
 (615) 532-0554

WOODLAWN LANDFILL ASBESTOS POLICY

MEMORANDUM OF UNDERSTANDING

WOODLAWN ROAD LANDFILL  
FORT CAMPBELL, KENTUCKY

ASBESTOS POLICY

Woodlawn Landfill is operated under a permit issued by the Division of Solid Waste Management, Department of Conservation, State of Tennessee and in accordance with Federal, State and Local Regulations. A special waste permit was issued by the State of Tennessee for the landfill to accept Asbestos Containing Waste, but only with certain stipulations.

Haulers bringing asbestos waste to the landfill must comply with the Federal, State and Local Regulations and with state permit requirements. The following is a list of some of those requirements:

1. Any vehicle hauling asbestos containing waste must be marked with signs in accordance with APC rule 1200-3-11-02(2)(k)4 providing warning that the vehicle contains asbestos. Improperly marked vehicles will not be accepted at the landfill.
2. Any vehicle hauling asbestos containing waste must be enclosed or in a covered 39-14-503 cartier as described in Tennessee Code Annotated. Vehicles not meeting this requirement will not be accepted at the landfill.
3. The vehicle driver and any passengers must have fit tested respirators to be present or within 100 meters during unloading operations at the landfill. Facial hair that would interfere with a proper air seal around the respirator is not allowed on personnel wearing respirators unless the respirator has been specifically approved for that purpose. Failure to comply with the requirement will bar that individual from future entry into the landfill. A copy of the fit test certificate will be presented to the landfill operator when requested.
4. Asbestos waste will be placed in the area designated by the landfill personnel. The materials will be carefully unloaded to prevent spillage or puncture of the containers. Improper handling of the asbestos waste will prohibit that person from future asbestos operations at the landfill.
5. Asbestos waste will be accepted at the landfill only after receiving a 24 hour notice. A time will be designated for receiving the asbestos waste. Shipments arriving at the landfill more than thirty minutes from that time may be refused entry.
6. The shipper must furnish a copy of the NESHAP 10 day notice and an asbestos waste manifest to the landfill personnel before being accepted. Improperly completed information will be grounds to reject the acceptance of the asbestos waste.

I have read and understand the above requirements. I understand that failure to observe that regulations and requirements will cause me not to be allowed to deliver and dispose of asbestos containing waste at the Woodlawn Road Landfill.

Signature: \_\_\_\_\_

Employer: \_\_\_\_\_

Date: \_\_\_\_\_

Approved respirator fit test date: \_\_\_\_\_

[Back to Shipment Records Paragraph 1.4.5.1](#)

[Back to Instructions to Designers](#)

## SECTION 02090 Demolition or Buildings with Lead-Based Paint, Removal and Disposal of Lead –Based Paint

### Ft. Campbell Requirements:

Removal and disposal of lead-based paint materials shall be conducted in accordance with Ft. Campbell specification section 02090, Demolition or Buildings with Lead-Based Paint, Removal and Disposal of Lead–Based Paint, which shall be included in all projects containing or possibly containing lead-based products.

Lead-based paint materials shall be removed before demolition of buildings.

### Instruction to Designers:

1. All projects containing or possibly containing lead products shall include Ft. Campbell specification section [02090, Removal and Disposal of Lead-Based Materials](#).
2. Additional Environmental guidance applies. See [Appendix A](#).

### 02090 Removal and Disposal of Lead- Based Materials

ous waste drums in interim storage longer than 90 calendar days from the date affixed to each drum.

- c. Handle, store, transport, and dispose lead or lead-contaminated waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification requirements as required by 40 CFR 268.

#### 3.5.4.1 Disposal Documentation

Submit written evidence that the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead disposal by the EPA and state or local regulatory agencies. Submit one copy of the completed manifest, signed and dated by the initial transporter in accordance with 40 CFR 262. **Manifest must be signed by the HW manager as well as transporter before leaving the installation.**

#### 3.5.5 Disposal of Lead Contaminated Non-Hazardous Waste

Any portion of the segregated waste products which does not test as hazardous by the testing requirements stated above, may be disposed at the Woodlawn Landfill.

### 3.5.6 Payment for Hazardous Waste Disposal

Payment for disposal of hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials delivered is returned and a copy is furnished to the Government.

Table 1: Lead Contamination Levels

OSHA Instruction CPL 2-2.58  
 DEC 13 1993  
 Office of Health Compliance Assistance

APPENDIX C  
 APPLICABLE PARAGRAPHS OF 1926.62

Regardless of Level	For Specific Air Lead Levels				During Assessment of Trigger Tasks
	≥ AL		> PEL	> 4 X PEL	
	1 - 30 Days	> 30 Days			
1926.62(d) - Exposure Assessment and Interim Protection  1926.62(h) - Housekeeping  1926.62(j)(5) - Handwashing Facilities  1926.62(l)(1)(i) - Hazcom Training (and/or 1926.21 - Safety Training and Education)	1926.62(d)(4) - Monitoring Representative of Exposure for Each Exposed Employee  1926.62(j)(1)(i) - Initial Medical Surveillance  1926.62(j)(2)(ii) - Follow-up Blood Sampling  1926.62(k) - Temporary Removal Due to Elevated Blood Lead  1926.62(l)(1)(ii)-(iv) - Information and Training	1926.62(j)(1)(ii) - Medical Surveillance Program  1926.62(j)(3) - Medical Exams and Consultation (if required)	1926.62(e) - Engineering and Work Practice Controls  1926.62(f) - Respiratory Protection  1926.62(g) - Protective Clothing and Equipment  1926.62(i) - Hygiene Facilities and Practices  1926.62(m) - Signs	1926.62(g)(2) - Clean Protective Clothing Daily	1926.62(f) - Appropriate Respiratory Protection  1926.62(g) - Protective Clothing and Equipment  1926.62(j)(2) - Change Areas  1926.62(i)(5) - Handwashing Facilities  1926.62(l)(1)(i) - Biological Monitoring  1926.62(l)(1)(i) - Hazcom Training  1926.62(j)(2)(iii) - Respirator Training  1926.21 - Safety Training and Education

Table 1

---End of Section---

[Back to Paragraph 3.1.11](#)

[Return to Section](#)

## **SECTION 02220**

### **Demolition**

#### **Ft. Campbell Requirements:**

Requirements in this section and Appendix A-7. [Solid Waste Disposal/Diversion Practices](#) shall apply to all construction and demolition activities at Fort Campbell. Contract specifications shall require at least a 50% diversion (by weight) of demolished building materials such as wood, plumbing fixtures, electrical materials (lights and panels), windows, doors, toilet partitions, HVAC equipment, and scrap metals be diverted from the landfill (See Chapter 2, para 2.1.4 ([Click here](#))). Diversion can be accomplished by deconstructing the wood buildings and components per instructions below or by moving the structure off-post.

Requirements in this section and Appendix A-10. [National emission standards for hazardous air pollutants \(NESHAP\)](#) regulatory requirements for demolition apply .

Demolition materials shall not be salvaged by the contractor and shall not be removed from the installation. Non-salvageable demolition materials shall not to be transported off the installation.

Notify the DPW Environmental Division if unknown waste is discovered during site investigations. Waste could be explosive, hazardous or toxic waste.

Dumpster service for new construction and for demolition is not provided by the installation. The contractor shall arrange for dumpster service at the Contractor's own expense.

In general, utilities are not to be abandoned in place; all abandoned utilities are to be removed. There are circumstances where this requirement does not apply. Abandonment of utilities and removal shall be a topic of discussion at design conferences.

#### **Instructions to Designers:**

- 1 Modify UFGS 02220 paragraphs to include the building demolition/diversion requirements above and modify contract specifications.
- 2 Construction specifications shall be modified to require a Building Materials Diversion Plan to be submitted and approved by DPW.
- 3 When a project requires removal/disposal of environmentally hazardous waste generated at Fort Campbell, the DPW Environmental Division must be involved in the permitting process. Modify project drawings and specifications paragraphs to

include each of the above features as they apply to the project. Additional guidance on Environmental Requirements and Hazardous Waste Disposal Practices is contained in [Appendix A](#), and project specifications shall be modified to indicate these requirements.

- 4 National emission standards for hazardous air pollutants (NESHAP) regulatory requirements for demolition apply for asbestos abatement and most people understand that. However, in addition [NESHAP](#) notification is also required even if the operation involves removal of "non-regulated" ACM only in any amount, OR even if the operation involves no asbestos removal whatsoever. See this [EPA site](#) for specific items covered. When NESHAP items are encountered, project demolition specifications shall be modified to include the requirements identified in Appendix A.
- 5 For mercury containing light bulb disposal, insert the [Mercury Light Bulb](#) paragraph.

[Return to Division Table of Contents](#)

**The following Mercury Containing Bulbs paragraph shall be included in Spec Section 02220, Demolition in all projects:**

*"3.4.? Mercury Containing Light Bulbs: Mercury containing light bulbs such as mercury vapor, metal halide, high pressure sodium, and fluorescent light bulbs, or any other mercury-containing light bulbs shall be considered and handled as hazardous waste for recycle.. The contractor shall collect these old/used bulbs or tubes and very carefully deliver them to the DPW-PPOC yard before the time of demolition of old buildings or a section of a building. For disposal and recycling of these bulbs, have the Contracting Officer's representative contact the DPW-PPOC yard hazardous waste supervisor before delivery to the yard so that packaging requirements for transport of the bulbs can be determined."*

[Return to Designer Instructions](#)

## **SECTION 02226**

### **Removal and Salvage of Historic Building Materials**

#### **Ft. Campbell Requirements:**

##### **Historic District:**

The “Clarksville Base” portion of Ft. Campbell cantonment area is eligible for the National Register of Historic Places as a significant Cold War historic district. Designers are required to consult with the State Historic Preservation Office (SHPO) and the federal Advisory Council on Historic Preservation for any projects that are sited at the Clarksville Base. POC is DPW Environmental Division Cultural Resource Manager at 270-798-7437.

#### **Instructions to Designers:**

1. Complete the requirements as they apply to specific projects.

[Return to Division Table of Contents](#)

## **SECTION 02315 - 02316**

### **Excavation, Filling and backfilling**

#### **Ft. Campbell Requirements:**

Ft. Campbell requires contractors have buried utilities marked prior to starting any excavation/digging. Fort Campbell does not issue dig permits. Fort Campbell has stopped using dig permits. Instead, Tennessee One Call is now being used to locate buried utilities prior to digging/excavation (800-351-1111). See [Apprndix C](#) for further information. If contractor cuts utility lines after being marked or does not get them marked he should be responsible for making immediate repairs (to be coordinated with the appropriate Government maintenance entity or be billed for repairs if the Government makes the repairs.

If contractor cuts utility lines after being marked or does not get them marked, he is responsible for making **immediate** repairs (to be coordinated with the appropriate Government maintenance entity) or be billed for repairs if the Government makes the repairs. Repairs shall be made to the satisfaction of the appropriate government entity.

Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer need and is properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

Avoid locating new utility lines under pavement where possible. **When utilities are required to cross under roads/streets, boring is required (no cutting of pavement is to be done). Exceptions can be granted with written approval of the Director of Public Works.** When underground utilities are sleeved under roadways, sleeves shall be extended a minimum of 10 feet beyond the roadway on both sides to protect lines from penetration by new road signs, poles, etc.

### **Instructions to Designers:**

1. Meet with DPW utility people to get exact locations of utilities. Fort Campbell has a great deal of underground utility lines (both active and abandoned) that do not show up on Base utility maps. Therefore, any utilities to be installed underground must be coordinated with DPW as soon as possible during the design process. OMA projects shall include in the contract emergency phone numbers for each utility impacted.
2. Specifications Demolition section paragraphs shall incorporate the permit and demolition requirements at all construction projects.
3. Include any [digging/excavation permits](#) being considered.

[Return to Division Table of Contents](#)

## SECTION 02364

### Termiticide Treatment Measures for Subterranean Termite Control

#### Ft. Campbell Requirements:

Termite treatment measures shall be provided on ALL new construction projects.

Environmental quality shall be maintained in delivery, storage, application, and protection of chemicals in accordance with Ft. Campbell policies and procedures.

#### Instructions to Designers:

1. Point of Contact is Joe Whitfill at 270-798-9850.
2. See [Appendix A](#) for environmental requirements.
3. Specifications section UFGS 02364, paragraphs shall be included at all new construction (and additions) projects.

[Return to Division Table of Contents](#)

## SECTION 02510

### Water Distribution System

#### Ft. Campbell Requirements:

The Fort Campbell water distribution was privatized in 2003. The owner of the system is now CH2MHill. All additions/alterations to the system must be done in accordance with the CH2MHill Design Manual. CH2M HILL's "Fort Campbell Water and Wastewater Design and Construction Standards" which is available on the Web. **You will need Adobe Acrobat Reader to open the standards as a .PDF file.**

It is recommended you use an FTP program available from your system administrator or as shareware from many sites on the web such as Smart FTP or Cute FTP. (Typing "FTP" in Google will find dozens.)

URL: <ftp://ftp.ch2m.com/fcpdesignstandards>

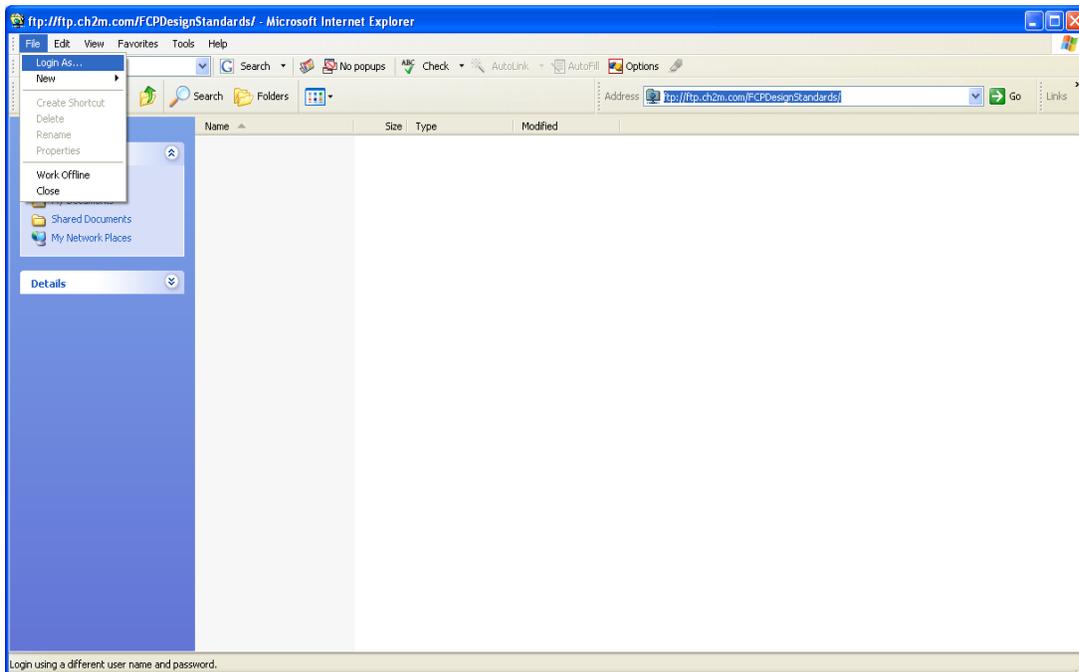
Username: [fortcampbell](#)

Password: [fcpftp](#)

Filename: [FCP W+WW Design Guide and Const Standards Rev3 Feb07.pdf](#)

Alternately, you can use Microsoft Internet Explorer as your FTP program. However, results are often slow & inconsistent. Directions below:

1. Enter the following in the Internet Explorer address bar:  
**ftp.ch2m.com/fcpdesignstandards**
2. Hit return. An error message may appear. Just ignore it.
3. Under the “View” pull-down menu, go to “Open FTP site in windows explorer”. An FTP window will open on your computer.
4. Go to the File→Login As...as shown below:



[Return to designer Instructions](#)

[Return to Plumbing Section](#)

## **SECTION 02531 - 02532 Sanitary Sewers**

**Ft. Campbell Requirements:**

The Fort Campbell wastewater collection and treatment system was privatized in 2003. The owner of the system is now CH2MHill. All additions/alterations to the system must be done in accordance with the CH2MHill Design Manual. CH2M HILL's "Fort Campbell Water and Wastewater Design and Construction Standards" which is available on the Web. **You will need Adobe Acrobat Reader to open the standards as a .PDF file.**

It is recommended you use an FTP program available from your system administrator or as shareware from many sites on the web such as Smart FTP or CuteFTP. (Typing "FTP" in Google will find dozens.)

URL: <ftp://ftp.ch2m.com/fcpdesignstandards>

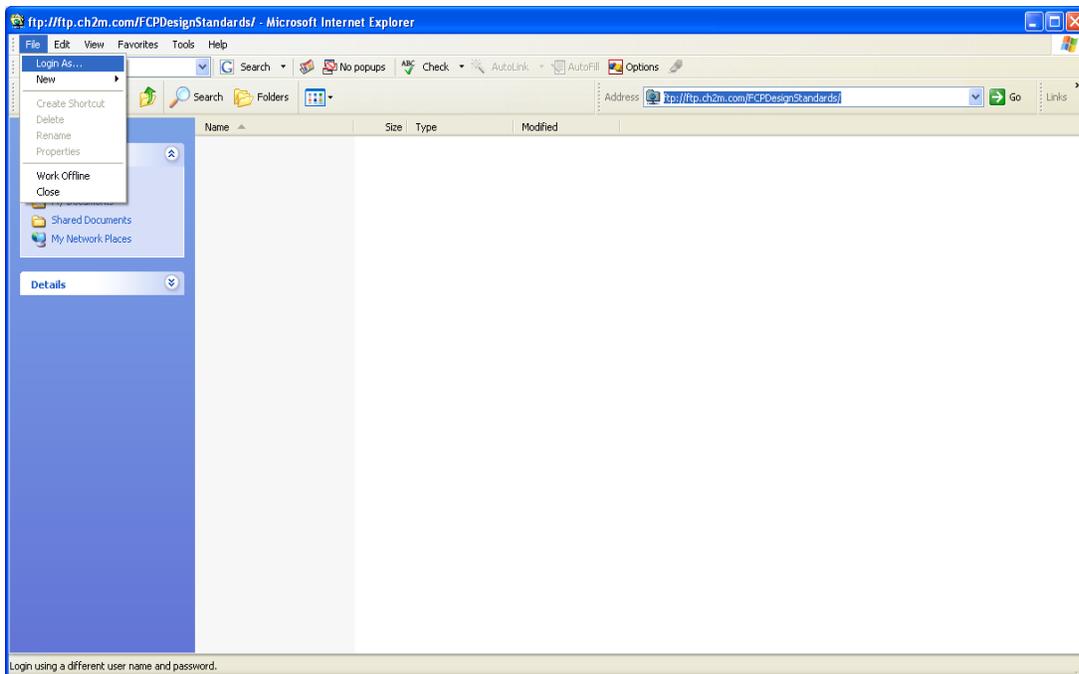
Username: [fortcampbell](#)

Password: [fcpftp](#)

Filename: [FCP W+WW Design Guide and Const Standards Rev3 Feb07.pdf](#)

Alternately, you can use Microsoft Internet Explorer as your FTP program. However, results are often slow & inconsistent. Directions below:

1. Enter the following in the Internet Explorer address bar:  
[ftp.ch2m.com/fcpdesignstandards](ftp://ftp.ch2m.com/fcpdesignstandards)
2. Hit return. An error message may appear. Just ignore it.
3. Under the "View" pull-down menu, go to "Open FTP site in windows explorer". An FTP window will open on your computer.
4. Go to the File→Login As...as shown below:



## **SECTION 02552**

### **Pre-Engineered Underground Heat Distribution System**

#### **Ft. Campbell Requirements:**

Include spec provisions to maintain utilities when executing new work. Think about constructability and coordination of demo with installation of new. Goal is not to leave an occupant or customer without service (gas, water, heat, sewer, etc.).

At design meetings, discuss what outages will be needed and for how long. Generally, Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer need and is properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration.

At design meetings, discuss notification schedule for outages. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

All utility lines installed underground shall be marked with magnetic tape.

Fort Campbell has a great deal of underground utility lines (both active and abandoned) that do not show up on Base utility maps. Therefore, any utilities to be installed underground must be coordinated with DPW as soon as possible during the design process.

Utility lines are not to be abandoned in place. Remove abandoned lines.

Trenching through roadways shall be avoided to the maximum extent possible. Whenever possible utilities shall be pressure-pumped below roadways.

Ft. Campbell requires permit for digging. For MILCON projects the contractor shall coordinate all excavation activities with the construction Project Engineer. For OMA projects the contractor shall notify DPW of scheduled excavation activities and request marking of utilities at least 3 days prior to the start of excavation work. DPW Utilities Branch will mark underground utilities in the vicinity of the excavation no earlier than three days prior to the work being started.

DPW will mark gas/water/sewer/electric/steam/chill water/storm/fuel lines/drain utilities before digging begins. South Central Bell and ITBC will mark phone lines and cable TV. If contractor cuts utility lines after being marked or does not get them marked he should be responsible for making immediate repairs (to be coordinated with the appropriate Government maintenance entity or be billed for repairs if the Government makes the repairs.

Include in contract requirements stating that the contractor is responsible for **IMMEDIATE** repair of existing project site utility lines broken during construction. Repairs shall be made to the satisfaction of the appropriate government entity.

OMA projects shall include in the contract phone numbers for each utility that contractor is to use in case of an emergency.

### **Instructions to Designers:**

1. Point of Contact is Larry Martin at 270-956-1801.
4. Include Discussions of any digging /excavation being considered at the design Meeting.
5. At the design meeting, obtain a current list of points of contact for utilities.
6. Design, contract drawings, and specifications section UFGS 02770 paragraphs shall include each of the above features as they apply to the project.

[Return to Division Table of Contents](#)

## **SECTION 02556 Gas Distribution System**

### **Ft. Campbell Requirements:**

#### Design:

Fort Campbell has a great deal of underground utility lines (both active and abandoned) that do not show up on Base utility maps. Therefore, any utilities to be installed underground must be coordinated with DPW as soon as possible during the design process.

Verify capacity of existing infrastructure, and whether it will be sized sufficiently to handle new construction.

At design meetings, discuss what outages will be needed and for how long. Generally, Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer need and is properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

Include provisions to maintain utilities when executing new work. Think about constructability and coordination of demo with installation of new. Goal is not to leave an occupant or customer without service (gas, water, heat, sewer, etc.).

Provide individual meters on gas, water, and electric service lines for all buildings. Meters shall be capable of receiving a device, which will allow remote monitoring in the future. For most buildings, use residential type gas meter. 3/16" orifice, output range of 5-1/2 to 8-1/2 inches of water column, normally set at 8" W.C.

Additional requirements are found in [Appendix A](#) and [Appendix F](#).

#### Design Criteria:

- Use only 1 regulator to drop pressure from 28lb to 8" W.C. then install the meter.
- Use of plastic piping for gas line mains of up to 6" may be used. Gas lines of 8" and greater shall be steel. If steel piping is used provide insulated flange at building. Cathodic protection shall be provided for steel piping.
- **New requirements with public gas utility company:**
  - Install gas piping to operate at 60 psig. Request you make change orders to on-going work to the maximum extent possible. This is the system operating pressure. If the decision is for the Government to retain ownership, we will also move to this system pressure.
  - Pressure testing new piping at 1.5 (120 psig) times maximum rating of the new pipe.
  - Gas systems must be pressure tested at original construction and documented (records are required to be kept for the life of the system).

#### Construction:

Trenching through roadways shall be avoided to the maximum extent possible. Whenever possible utilities shall be pressure-pumped below roadways.

All utility lines installed underground shall be marked with magnetic tape.

Utility lines are not to be abandoned in place. Remove abandoned lines.

Require use of Kerotest for underground gas lines. [Retain and forward ALL PAPERWORK associated with new gas piping and testing to \(Utilities Branch of DPW\) directly!](#)

Ft. Campbell requires permit for digging. For MILCON projects the contractor shall coordinate all excavation activities with the construction Project Engineer. For OMA projects the contractor shall notify DPW of scheduled excavation activities and request marking of utilities at least 3 days prior to the start of excavation work. DPW Utilities Branch will mark underground utilities in the vicinity of the excavation no earlier than three days prior to the work being started.

Include in contract requirements stating that the contractor is responsible for **IMMEDIATE** repair of existing project site utility lines broken during construction. Repairs shall be made to the satisfaction of the appropriate government entity.

OMA projects shall include in the contract phone numbers for each utility that contractor is to use in case of an emergency.

### Instructions to Designers:

1. Point of Contact at DPW is Audie Hardin at 270-956-1801.
2. Research locations and sizes of proposed utilities during design phase, then meet with DPW utility people to investigate exact location of utilities.
3. Include any [digging/excavation permits](#).
4. At the design meeting, obtain a current list of points of contact for utilities.
5. Design, contract drawings, and specifications section UFGS 02770 paragraphs shall include each of the above features as they apply to the project.

[Return to Division Table of Contents](#)

## **SECTION           02630** **Storm Drainage System**

### Ft. Campbell Requirements:

Verify capacity of existing infrastructure, and whether it will be sized sufficiently to handle new construction.

Drainage of downspouts into storm sewer is encouraged in order to prevent erosion.

Include provisions to maintain utilities when executing new work. Think about constructability and coordination of demo with installation of new. Goal is not to leave an occupant or customer without service (gas, water, heat, sewer, etc.).

Avoid use of odd pipe sizes (i.e. 3").

Trenching through roadways shall be avoided to the maximum extent possible. Whenever possible utilities shall be pressure-pumped below roadways.

All utility lines installed underground shall be marked with magnetic tape.

Include in contract requirements stating that the contractor is responsible for **IMMEDIATE** repair of existing project site utility lines broken during construction. Repairs shall be made to the satisfaction of the appropriate government entity.

OMA projects shall include in the contract phone numbers for each utility that contractor is to use in case of an emergency.

Additional Requirements are found in [Appendix A, Clean Water.](#)

### Instructions to Designers:

1. Point of Contact is Larry Martin at 270-956-1801.
2. Include any [digging/excavation permits](#).
3. At the design meeting, obtain a current list of points of contact for utilities.
4. Design, contract drawings, and specifications section UFGS 02630 paragraphs shall include each of the above features as they apply to the project.

[Return to Division Table of Contents](#)

## SECTION 02744-02745 Bituminous Roadways

### Ft. Campbell Requirements:

Corps of Engineers Guide Specifications shall be used and modified to reference "KDOT" for Asphalt pavement through out the installation except for Airfield pavements.

All new facilities should include waste handling equipment, concrete pads and screens as necessary. The designer should have some idea of the volume of waste to be generated by the final permanent facility. If the facility will generate recyclable materials, capacity for recyclable bins should be included.

### Instructions to Designers:

1. Design, contract drawings, and specifications paragraphs shall include each of the above features as they apply to the project.
2. Include any [digging/excavation permits](#).

## SECTION 02753 - 02754 Concrete Pavements

### Ft. Campbell Requirements:

Fort Campbell has experienced unsatisfactory life and performance in exterior concrete pavements due to alkali-silica reaction (ASR). ASR causes excessive expansion of concrete, leading to degraded load capacity, surface spalling, and eventual premature pavement failure. Secondary damage includes displacing adjoining vertical construction applying threatening lateral loads on adjacent embedded and pavement features.

Concrete for exterior pavements and hardstand areas shall specify and require only low alkali Portland Cement with Class F fly ash as the pozzolanic cement replacement and Ground Granulated Blast-Furnace (GGBF) Slag in combination for the concrete mix design test proportioning. Specific concrete mixture proportions have been developed for concrete pavement in an attempt to mitigate concrete expansion problems currently being experienced at the base.

### Instructions to Designers:

1. Design, contract drawings, and specifications paragraphs shall include each of the above features as they apply to the project.
2. Fort Campbell prefers that military vehicle and equipment parking/hardstand areas be concrete vice asphalt.
3. For new construction projects having concrete pavement for parking hardstand areas, roadways, airfield runways and aprons, one of the following Louisville District COE, Engineering Division technical elements -- ED-T, ED-TC and/or ED-TG -- shall be consulted. These elements will provide specific design instructions and review all site related concrete specifications.
4. Include any [digging/excavation permits](#).

[Return to Division Table of Contents](#)

## SECTION 02770 Concrete Sidewalks and Curbs and Gutters

### Ft. Campbell Requirements:

Use of curbs and gutters is encouraged especially at road corners and radius. Use of parking blocks is not encouraged as this inhibits snow removal.

Handicapped curb ramps must meet ADA requirements.

Concrete for exterior pavements and hardstand areas shall use Class F fly ash as the pozzolanic cement replacement. Specific concrete mixture proportions have also been developed for these features in an attempt to mitigate concrete expansion problems currently being experienced at the base.

All new facilities shall include waste handling equipment, concrete pads and screens as necessary. The designer should have some idea of the volume of waste to be generated by the final permanent facility. If the facility will generate recyclable materials, capacity for recyclable bins should be included

### Instructions to Designers:

3. Design, contract drawings, and specifications shall include each of the above features as they apply to the project.
  1. For MILCON projects, COE in-house units ED-TC and ED-TS shall be consulted for review of all site related concrete specifications.
  2. Include any [digging/excavation permits](#).

[Return to Division Table of Contents](#)

## SECTION 02930 Exterior Planting

### Ft. Campbell Requirements:

Installation grounds keeping is limited. Maintenance free design around facilities and plant areas is required.

Ensure that the landscaping provided does not interfere with overhead power lines when it reaches maturity.

Fort Campbell maintains lists of suitable plant materials for use at the installation. These lists are subdivided into plant sizes. The following Ft. Campbell Landscape Plant Lists are in Appendix E.

[Native Evergreens/Conifers](#)

[Native Deciduous](#)

[Introduced Evergreens](#)

## [Introduced Deciduous](#)

### **Instructions to Designers:**

1. Design, contract drawings, and specifications shall include only approved and listed plant materials.
2. Point of Contact for Landscaping is Linda Alderdice at 270-798-2616

[Return to Division Table of Contents](#)

# **TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 03000**

## **Section**

<b>03300</b>	<u><a href="#">Cast-In-Place Structural Concrete</a></u>
<b>03307</b>	<u><a href="#">Concrete for Minor Structures</a></u>
<b>03330</b>	<u><a href="#">Cast-In-Place Architectural Concrete</a></u>

SECTION 03300  
Cast-In-Place Structural Concrete

### **Ft. Campbell Requirements:**

Concrete used in masonry bond beams should be 9/11 slump and contain plastiziser.

Concrete shall use Class F fly ash as the pozzolanic cement replacement.

To accommodate environmental Radon protection, all specification items identified as “vapor barrier” shall be modified to read “vapor/radon barrier”

[Return to division Table of Contents](#)

**SECTION 03307**  
**Concrete For Minor Structures**

**Ft. Campbell Requirements:**

Concrete used in masonry bond beams should be 9/11 slump and contain plastiziser.

Concrete shall use Class F fly ash as the pozzolanic cement replacement.

To accommodate environmental Radon protection, all specification items identified as “vapor barrier” shall be modified to read “vapor/radon barrier”.

**SECTION 03330**  
**Cast-In-Place Architectural Concrete**

**Ft. Campbell Requirements:**

Concrete shall use Class F fly ash as the pozzolanic cement replacement.

[Return to Division Table of Contents](#)

**TECHNICAL DESIGN GUIDE**  
**CHAPTER 3**  
**Technical Requirements and Instructions**  
**Division 04000**

**Section**

04200      [Masonry](#)

**SECTION      04200**  
**Masonry**

**Ft. Campbell Requirements:**

All exterior split faced units shall be fabricated with integral water repellent and shall be integrally colored during manufacture. Water repellent primer and stain shall also be applied to all exterior split faced CMU after completion of exterior work and split face is not subject to damage by construction activities.

Block filler shall be used on all exposed CMU.

Modify specifications section 04200, Masonry, to incorporate the following paragraphs, specifically including all items highlighted in red:

See Appendix D: [Exterior Finishes](#).

2.4.2.1 Architectural Units

Units shall have patterned face shell. Face shell pattern shall be [fluted] [vertical scored] [split ribbed] [\_\_\_\_\_]. **All exterior architectural units shall be fabricated with integral water repellent and shall be integrally colored during manufacture. Water repellent primer and stain shall also be applied to all exterior architectural CMU walls after completion of exterior work and when the masonry is not subject to damage by construction activities.**

~~Units shall be integrally colored during manufacture.~~ Color shall be [\_\_\_\_\_]. Patterned face shell shall be properly aligned in the completed wall.

## 2.10 MORTAR

Mortar shall be Type [S] [N] in accordance with the proportion specification of ASTM C 270 except Type S cement-lime mortar proportions shall be 1 part cement, 1/2 part lime and 4-1/2 parts aggregate; Type N cement-lime mortar proportions shall be 1 part cement, 1 part lime and 6 parts aggregate; when masonry cement ASTM C 91 is used the maximum air content shall be limited to 12 percent and performance equal to cement-lime mortar shall be verified. Verification of masonry cement performance shall be based on ASTM C 780 and ASTM C 1072. Mortar for prefaced concrete masonry unit wainscots shall contain aggregates with 100 percent passing the 2.36 mm No. 8 sieve and 95 percent passing the 1.18 mm No. 16 sieve. Pointing mortar in showers and kitchens shall contain ammonium stearate, or aluminum tri-stearate, or calcium stearate in an amount equal to 3 percent by weight of cement used. Cement shall have a low alkali content and be of one brand. Aggregates shall be from one source.

**Efflorescence testing of mortar shall be in accordance with ASTM C 67. Any component causing efflorescence shall be rejected.**

## 2.11 GROUT

Grout shall conform to ASTM C 476. Cement used in grout shall have a low alkali content. Grout slump shall be between 200 and 250 mm. 8 and 10 inches. Grout shall be used subject to the limitations of Table III. Proportions shall not be changed and materials with different physical or chemical characteristics shall not be used in grout for the work unless additional evidence is furnished that the grout meets the specified requirements. **Efflorescence testing of mortar shall be in accordance with ASTM C 67. Any component causing efflorescence shall be rejected.**

### 3.26.3 Efflorescence Test

Brick, **split faced and scored CMU** which will be exposed to weathering shall be tested for efflorescence. Tests shall be scheduled far enough in advance of starting masonry work to permit retesting if necessary. Sampling and testing shall conform to the applicable provisions of ASTM C 67. Units meeting the definition of "effloresced" will be subject to rejection.

[Return to Division Table of Contents](#)

# TECHNICAL DESIGN GUIDE

# CHAPTER 3

## Technical Requirements and Instructions

### Division 05000

#### Section

**05500**      **Metals**

**SECTION 05500**  
**Metals**

#### **Ft. Campbell Requirements:**

Avoid painted handrailings and guardrails. Use unpainted galvanized (exterior), stainless steel or aluminum railings (interior).

# TECHNICAL DESIGN GUIDE

## CHAPTER 3

### Technical Requirements and Instructions

#### Division 06000

#### Section

06200 [Finish Carpentry](#)

06650 [Solid Polymer \(solid Surfacing\) Fabrications](#)

#### SECTION 06200

##### Finish Carpentry

#### Ft. Campbell Requirements:

Use finished or painted wood trim instead of plastic for chair rails, and other decorative locations.

DPW is using wood veneer casework instead of plastic laminate on O&M projects. Hollow metal interior doors shall be used in barracks buildings.

#### SECTION 06650

##### Solid Polymer Fabrications

#### Ft. Campbell Requirements:

Prefer using solid surfacing on counter tops and possibly on windowsills for more scratch and stain resistance.

[Return to Division Table of Contents](#)

# TECHNICAL DESIGN GUIDE

## CHAPTER 3

### Technical Requirements and Instructions

#### Division 07000

#### Section

07200	<a href="#"><u>Roofing, General</u></a>
07240	<a href="#"><u>Exterior Insulation and Finish System</u></a>
07311	<a href="#"><u>Roofing, Strip Shingles</u></a>
07412	<a href="#"><u>Non-Structural Metal Roofing</u></a>
07416	<a href="#"><u>Structural Standing seam Metal Roofing (SSSMR)</u></a>
07510	<a href="#"><u>Built-Up Roofing</u></a>
07530	<a href="#"><u>Elastomeric Roofing (EPDM)</u></a>
07551	<a href="#"><u>Modified Bitumen Roofing</u></a>

#### **SECTION 07000**

#### **Roofing General**

All new and/or roof replacement projects will incorporate the installation of a permanent fall protection system which meets the requirements of ASHA Guideline 1926:502 (d) (16) (ii-iii-iv). This system shall be similar or equal to a Super Anchor system as manufactured by Super Anchor Safety, 8522 216<sup>th</sup> Street SE, Woodinville, WA 98072-8009 (Phone 425-488-8868).

## **SECTION 07311 Roofing, Strip Shingles**

### **Ft. Campbell Requirements:**

Shingles shall be of simple seal-down 3-tab design. Use only light colors, and maximum life quality. Minimum slope for shingles shall conform to manufacturer recommendations.

Flat built-up roofs are not to be utilized in new roof system designs. Minimum low slope for roofs shall be ½ inch per foot.

Modified bitumen is the preferred membrane on low slope roof conditions for recover, replacement, and new installations.

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

## **SECTION 07412 Non-Structural Metal Roofing**

### **Ft. Campbell Requirements:**

Metal roofing shall be vertical seam with UL class 90 uplift approval.

Color shall conform to Ft. Campbell approved standard schemes. See Appendix D

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

[Return to Division Table of Contents](#)

## **SECTION 07416**

### **Structural Standing Seam Metal Roof System**

#### **Ft. Campbell Requirements:**

Metal roofing shall be vertical seam with ASTM E 1592 uplift approval.

Color shall conform to Ft. Campbell approved standard schemes. See Appendix D

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

## **SECTION 07510**

### **Built-up Roofing**

#### **Ft. Campbell Requirements:**

Flat no-slope built-up roof systems are to be utilized in new facility designs by approved exception only.

Minimum low slope for new roofs shall be ½ inch per foot.

Modified bitumen is the preferred membrane on low slope roof conditions for recover, replacement, and new installations.

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

## **SECTION 07530**

### **Elastomeric Roofing (EPDM)**

#### **Ft. Campbell Requirements:**

Flat no-slope built-up roof systems are to be utilized in new facility designs by approved exception only.

Minimum low slope for new roofs shall be ½ inch per foot.

Modified bitumen is the preferred membrane on low slope roof conditions for recover, replacement, and new installations.

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

## **SECTION 07551 Modified Bitumen Roofing**

### **Ft. Campbell Requirements:**

Flat no-slope built-up roof systems are to be utilized in new facility designs by approved exception only.

Minimum low slope for new roofs shall be ½ inch per foot.

Modified bitumen is the preferred membrane on low slope roof conditions for recover, replacement, and new installations.

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

**TECHNICAL DESIGN GUIDE**  
**CHAPTER 3**  
**Technical Requirements and Instructions**  
**Division 08000**

**Section**

08330 - 08331 [Overhead Coiling/Rolling Doors](#)  
08360 [Overhead Sectional doors](#)  
08700 [Hardware](#)

**CHAPTER 3**  
**Division 08000**  
**Technical Requirements and Instructions**

**SECTION 08330 - 08331**  
**Overhead Coiling/Rolling Doors**

**Ft. Campbell Requirements:**

Door manufacturer representative shall conduct a final inspection of the door installation(s) and certify the installation is complete and correct, and meets all requirements for the full warranty.

**Instructions to Designers:**

1. Modify UFGS 08331 paragraphs to include the on-site visit and verification requirement.
  
3. Modify the UFGS 08331 paragraphs to include a certification of inspection by the door manufacturer representative.

## **SECTION 08360**

### **Overhead Sectional Doors**

#### **Ft. Campbell Requirements:**

Door manufacturer representative shall conduct a final inspection of the door installation(s) and certify the installation is complete and correct, and meets all requirements for the full warranty.

#### **Instructions to Designers:**

1. Modify UFGS 08360 paragraphs to include the on-site visit and verification requirement.
2. Modify the UFGS 08360 paragraphs to include a certification of inspection by the door manufacturer representative.

[Return to Division Table of Contents](#)

## SECTION 08700 Hardware

### Ft. Campbell Requirements:

Fort Campbell utilizes an "I/C - 7 pin Insta-Key" integrated master keying system. Interchangeable cores provided shall be compatible with the existing "I/C - 7 pin Insta-Key" system. The I/C - 7 pin Insta-Key lock system is the standard lock system for Troop housing. Combination locks used in secured areas shall be Mass Hamilton X09 type. The "I/C - 7 pin Insta-Key" system is *also* encouraged for all other building types. Biting list is to be added to keying schedule. Four blank keys are to be provided with each change key.

Electric locks shall be stand alone Best BASIS "G" system with encoders and kiosk as required (See Attachment at end of this section for ordering data). All key over-rides - see Insta-Key above.

*Prefer knobs instead of levers.*

Panic device hardware shall be touch pad type.

Install kick plates on doors in heavy use areas.

Concealed door closers shall not be avoided without prior DPW approval.

Require door stops at all interior and exterior locations.

Mechanical/ Electrical room doors shall be equipped with *Insta-Key 5DPW.1* as the keying standard. Communication room doors shall be equipped with *Insta-Key 1FZ.1* as the keying standard.

Electrical Pad-mounted Transformer locks shall be included in the contract.

Furniture locks are repaired/replaced on case by case basis by the Ft. Campbell Lockmaster. No standardization of furniture locks is possible.

### Instructions to Designers:

1. Modify specifications paragraphs to include each of the above features as they apply to the project.
2. The Installation POC regarding keys is Mr. Ayers (270) 798-3581.

**STANLEY**

Security Systems

May 6, 2007

Fort Campbell

Attn: Bob Ayers

16<sup>th</sup> & Bastogne  
4245

Fort Campbell, KY

Pete Graham

Sales — Louisville, KY

Stanley Security Solutions, Inc

Best Access Systems

11947 Cumberland Rd.

Fishers, IN 46037

Cell 5024397115 Fax 502 326

pgraham@stanleyworks.com

www.bestaccess.com

127-000994IL

Ref: Basis G Electronic Locksets

Bob,

The following is the list of part numbers for the battery operated electronic Locksets for the barrack doors. All locks are designed for standard 1-3/4" thick doors.

The locks can use the government issued I.D. card. These locks will use track 3 of the magnetic stripe.

Barrack Doors - These are the (3) types of magnetic stripe card readers with lever handle trim.

Cylindrical — 93KG7DVI5MS-S3-626

Mortise - 45HG7DV

Exit Device — EXG7EV1 5MS-626-HAND-MANUF.-TYPE

Example: EXG7EV1 5MS-626-RHR-PH2-RM

Specify one each of the following Manuf. and Type in part number above for exit device trim:

MANUF.- Precision — PHI or PH2

Von Duprin 99 — VD9

Sargent 8000 — SA8 — only available for rim device

TYPE-Rim -RM

Mortise - MO

Vertical Rod VR

The manufacturers the devices through bolt to are Precision 1000 or 2000 series, Von Duprin 99 series or Sargent 8000 series. These will work with either rim, mortise, surface or concealed vertical rod devices. The exit device trim will work with either the night latch or classroom function devices.

The programming equipment for the locksets and for encoding your 1.0. cards, you will need the following parts:

Basis G - BAS-SWS-G - for server - Programming Software

- BAS-SWC-G — for each additional user location — Programming Software
- BASD-CAB - Programming Cable, connects to lockset
- VPD-T15 - Driver Bit, for battery compartment
- VPD-CLN - Magnetic stripe reader cleaning cards (bx 50)
- BASD-MSE- Magnetic stripe card encoder and software
- HP-PDA - PDA programming device
- HP-PDA-CAB- PDA programming cable - connects to BASD-CAB.
- VPD-BB - Replacement battery pack for Basis G lock.

The Kiosk Station allows for a user to obtain a temporary card after hours until a new permanent ID card is re-issued.

BASD - ID Express Station — Kiosk

BASD - IDEXPRESS-SWS - Kiosk Software

VPA-PVC - Magnetic stripe cards, non-encoded (bx 500)

Once you have the software set up you can add any amount of locks to the system. Locks do not have to be re-programmed to handle lost cards or room changes.

\* For high traffic exterior and common doors you will want to hardwire the access control devices such as panic bars, locksets, electric strikes, etc. and use the Basis ET605 System to integrate the Basis G database.

[Return to Division Table of Contents](#)

# TECHNICAL DESIGN GUIDE

## CHAPTER 3

### Technical Requirements and Instructions

#### Division 09000

#### Section

09000 [Finishes, General](#)  
09900 [Painting, General](#)

#### SECTION 09000 Finishes, General

##### Ft. Campbell Requirements:

Exterior and interior finish colors shall conform to [Appendix D.](#)

#### SECTION 09200 Exterior Insulation and Finish System

##### Ft. Campbell Requirements:

Exterior Insulating Finish Systems (EIFS): EIFS may be used as an exterior finish material only in limited applications. Building envelope finishes shall be predominantly brick, split-face block or metal panels (in industrial or otherwise approved land use areas). Unless otherwise approved, EIFS applications shall not exceed 20% of the total exterior building surface, and shall not be applied at grade or in other locations where the material is subject to damage from lawn mowing activities or is easily accessible to vandalism.

**SECTION 09400**  
**Metal Panel Siding**

**Ft. Campbell Requirements:**

Metal panel siding may be used in industrial land use areas. Use of metal panel siding in other land use areas must be approved.

**SECTION 09900**  
**Paint, General**

**Ft. Campbell Requirements:**

Use of semi-gloss, eggshell, and other enamelized paint finishes shall be maximized. Use of flat paints shall be minimized.

[Return to Division Table of Contents](#)

**TECHNICAL DESIGN GUIDE**  
**CHAPTER 3**  
**Technical Requirements and Instructions**  
**Division 10000**

**Section**

<b>10160</b>	<a href="#"><u>Toilet Partitions</u></a>
<b>10430</b>	<a href="#"><u>Exterior Signage</u></a>
<b>10440</b>	<a href="#"><u>Interior Signage</u></a>

10800 [Toilet Accessories](#)

**SECTION 10160**  
**Toilet Partitions**

**Ft. Campbell Requirements:**

Use of solid phenolic partitions is encouraged.

**SECTION 10430**  
**Exterior Signage**

**Ft. Campbell Requirements:**

Exterior signage is classified into three major categories:

- Identification Signage
- Directional and Street Signage
- Regulatory Signage

**Identification signage** shall be metal post and panel type and will be included in the construction contract. Graphics and lettering will not be included in the construction contract, but will be furnished and installed by the Fort Campbell Sign Shop.

Building Number Signs: *Colors:* White letters on standard brown background, single sided. Other data for the sign is as follows:

(1) *Colors.* White reflective letters and numbers on premium 2 mil vinyl mahogany brown background.

(2) *Dimensions.* 1ft-0in. H x 3ft-0in. W.

(3) *Number.* Upper case Helvetica medium, 8-inch capital letter height. Copy—centered. Average line length-5 characters (See Attachment 1 below).

(4) *Material.* .080 gage Aluminum.

Building number signs are required at four corners of each facility. Signs should be located on the sides of the building where rapid identification is possible (See Attachment 2 below). Signs are wall-mounted.

**Unit Signs (Brigade, Battalion & Directorate):** See Attachment 2 for material and dimensions for these signs. Graphics and lettering will not be included in the construction contract, but will be furnished and installed by the Fort Campbell Sign Shop. Other data for the sign is as follows:

- (1) *Colors:* Metal frame – dark bronzetone, Alupalite – Deep Mahogany Brown.
- (2) *Dimensions* – As shown on Attachment 2.
- (3) *Number* – No lettering required.
- (4) *Material* – Metal - 12 gage aluminum (anodized), sign – 30" X 72" X 1/4" Alupalite covered both sides with 2 mil premium vinyl.

**Unit Signs (Company and Motorpool):** See Attachment 3 for material and dimensions for these signs. Graphics and lettering will not be included in the construction contract, but will be furnished and installed by the Fort Campbell Sign Shop. Other data for the sign is as follows:

- (1) *Colors:* Metal frame – dark bronzetone, Aluminum sign – Deep Mahogany Brown.
- (2) *Dimensions* – As shown on Attachment 3.
- (3) *Number* – No letterings required.
- (4) *Material* – Metal frame- 14 gage 1 3/4" X 1 3/4" tube aluminum (anodized), angle – 3/4" X 3/4" X 1/8" aluminum (anodized), sign - 24" X 30", .80" aluminum covered both sides with 2 mil premium vinyl.

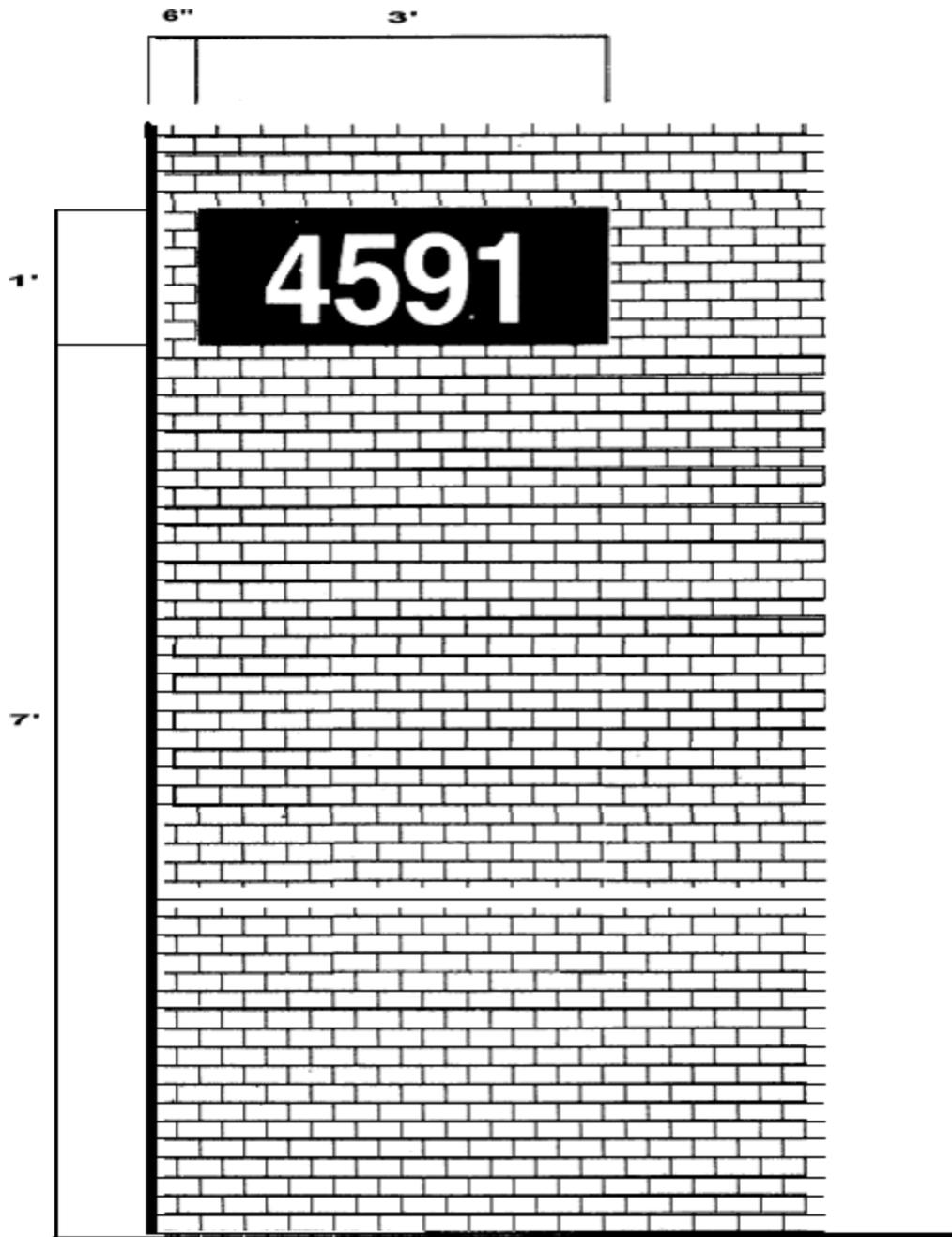
**Street Signs:** See Attachment 4 for details for these signs. Other data for the sign is as follows:

- (1) *Colors:* Sign – Engineer grade prismatic green vinyl background, Engineer grade prismatic 4" white letters.
- (2) *Dimensions* – As shown on Attachment 4.
- (3) *Letters* – 4" Upper case Helvetica medium, engineer grade prismatic white
- (4) *Material* - .80 Aluminum sign, 1 3/4" X 1 3/4" 12 gage galvanized steel post, 2" X 2" 12 gage galvanized steel post.

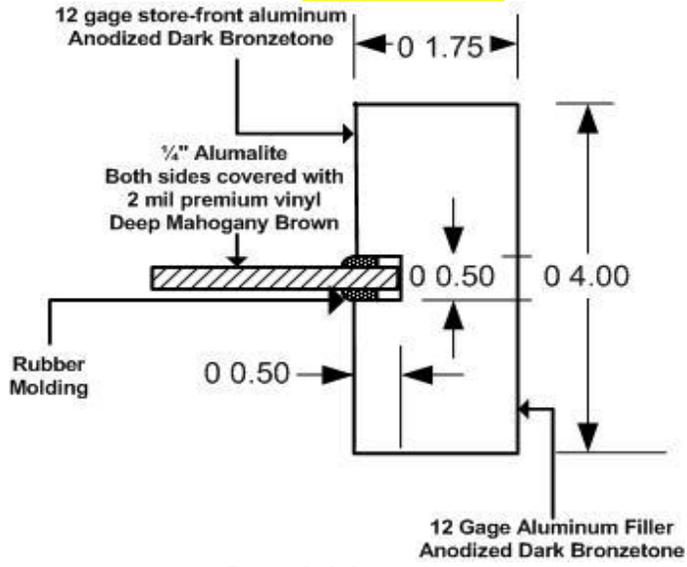
## Regulatory Signage.

**Highway Standards.** Only those permanent-type signs that meet the specifications as set down in the Manual on Uniform Traffic Control Devices for Streets and Highways published by the United States Department of Transportation, Federal Highway Administration, will be erected on this installation. The height and lateral location of signs will conform to the specifications outlined in Manual on Uniform Traffic Control Devices for Streets and Highways, December 2009 ([Click here](#)).

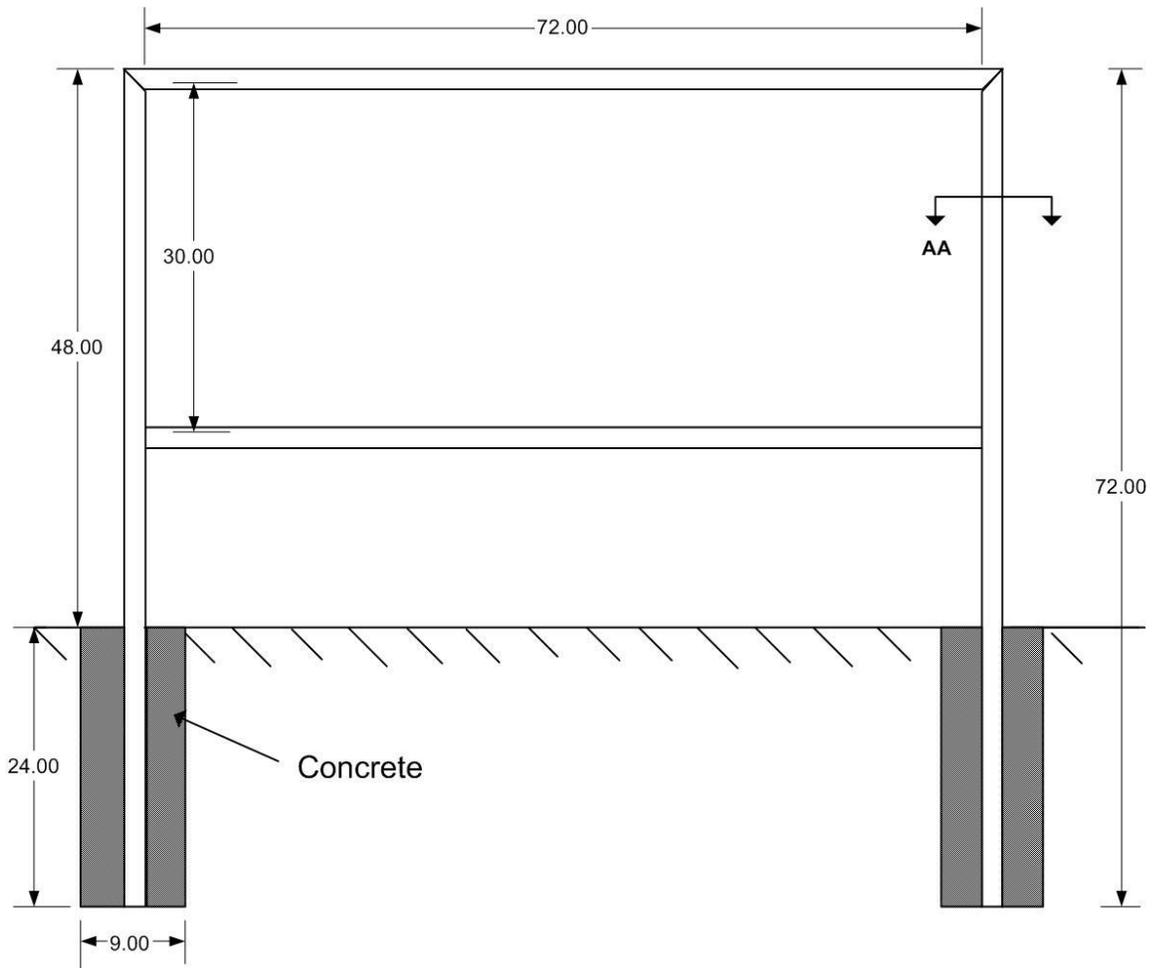
ATTACHMENT 1



**Attachment 2**

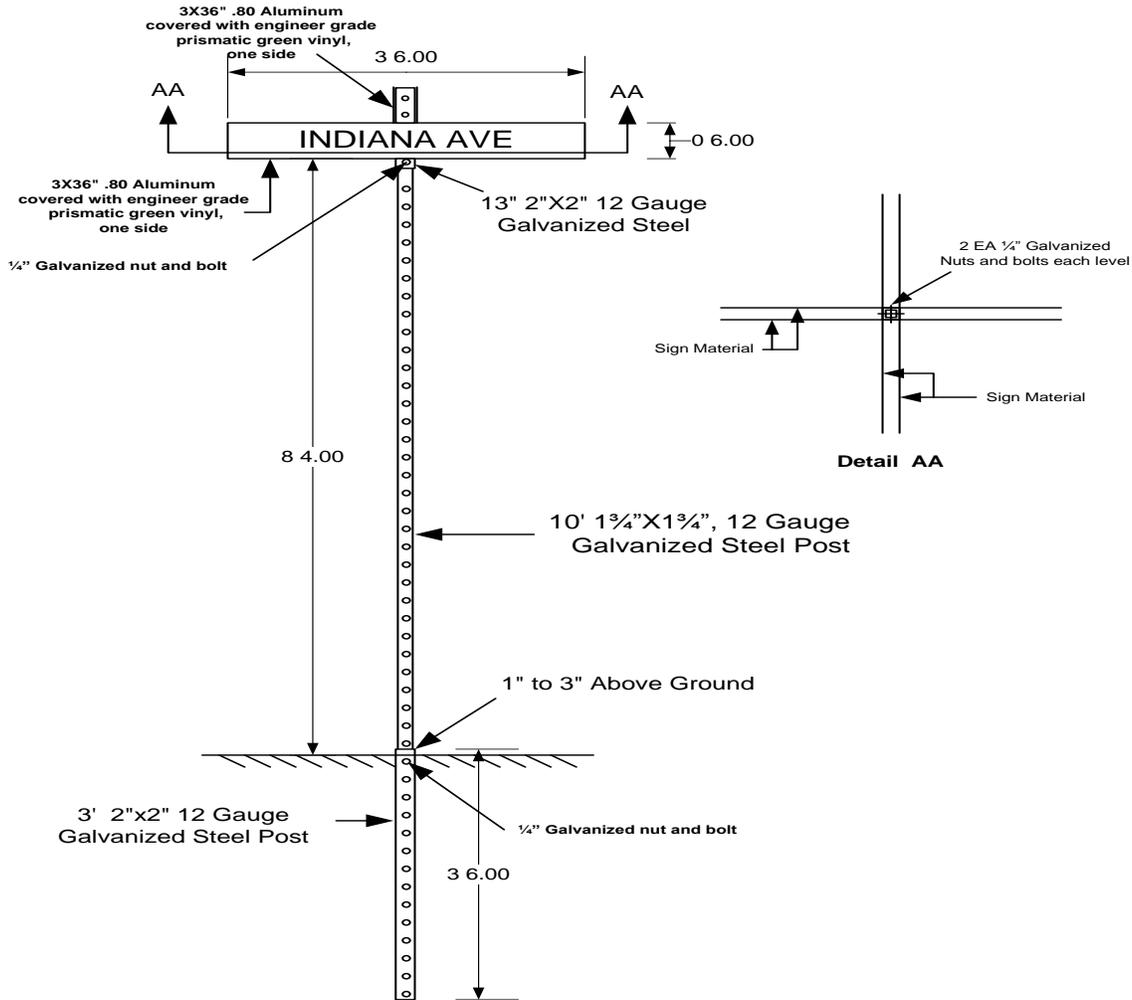


**Detail AA**





## Attachment 4



Projects that include new roads, shall also include street signage in the construction contract.

### Instructions to Designers

1. Incorporate the above Fort Campbell requirements into the project specifications.

[Return to Division Table of Contents](#)

## **SECTION 10440**

### **Interior Signage**

#### **Ft. Campbell Requirements:**

If "addressable" fire alarm system is not used for a building, provide a building map identifying fire alarm zones and mount on wall next to fire alarm system panel.

Interior Designer shall (re)number building spaces for "wayfinding" and provide the information to signage subcontractor on construction drawings.

When interior signage is renumbered from the construction drawing room numbering sequence to accommodate "wayfinding", provide original construction drawing room number in metal slot mounted above door of each room for fire and maintenance purposes when construction drawings typically would be referenced. This confusing problem can be overcome by having "wayfinding" numbering from the beginning of design.

## **SECTION 10800**

### **Toilet Accessories**

#### **Ft. Campbell Requirements:**

Accessories shall not have keyed locking devices.

Toilet tissue dispensers shall be a simple design similar to Bobrick Washroom Equipment, Inc. number B-685 and B-686 series accessories.

Trash receptacles provided in restrooms shall have lids.

Sanitary napkin and tampon dispensers shall not be provided.

[Return to Division Table of Contents](#)

**TECHNICAL DESIGN GUIDE**  
**CHAPTER 3**  
**Technical Requirements and Instructions**  
**Division 11000**

**Section**

11400      [Food Service Equipment](#)

**SECTION    11400**  
**Food Service Equipment**

**Ft. Campbell Requirements:**

Kitchen facilities that use deep fat frying equipment should have equipment for extracting and storing the used cooking oil.

[Return to Table of Contents](#)

**TECHNICAL DESIGN GUIDE**  
**CHAPTER 3**  
**Technical Requirements and Instructions**  
**Division 13000**

**Section**

13100	<a href="#"><u>Lightning Protection System</u></a>
13120 - 13121	<a href="#"><u>Metal Buildings</u></a>
13202 – 13216	<a href="#"><u>Petroleum/Fuel Storage Tanks</u></a>
13280	<a href="#"><u>Asbestos Abatement</u></a>
13281	<a href="#"><u>Lead Hazard Control Activities</u></a>
13721	<a href="#"><u>Small Intrusion Detection System</u></a>
13801	<a href="#"><u>Energy Monitoring and Control System (EMCS)</u></a>
13850 – 13851	<a href="#"><u>Fire Detection and Alarm Systems</u></a>
13900	<a href="#"><u>Fire Protection systems</u></a>

**SECTION 13100**  
**Lightning Protection**

**Ft. Campbell Requirements:**

**Lightning Protection Systems and Snow Guards**

1. **Facilities Requiring Lightning Protection Systems**
  - 1.1 Priority level 1. Must have lightning protection.
    - a) Any facility involved with children, example schools or child development structures
    - b) Communications facilities

- c) Facilities which houses large amounts of computer processing equipment
- d) Facilities which are in isolated areas away from other large structures or wooded areas.

1.2 Priority level 2. These structures are to be evaluated on an as-needed basis with the recommendations from Ft. Campbell's fire marshal and DPW.

- a) Barracks
- b) Maintenance facilities
- c) Family Housing
- d) Administration buildings

## **2. Lightning Protection System Installation Methods**

2.1 Lightning protection equipment manufacturer's mechanical clamps/supports for air terminal base and roof conductor installation shall be the preferred method for all our projects. The use of adhesives in lieu of mechanical clamps/supports is an acceptable method for lightning protection equipment installation provided the following are met:

- a) Roof design/construction does not allow or makes it physically impossible for the mechanical clamps to be utilized.
- b) A variance from the original contract requirements is submitted by the Contractor indicating the type of adhesive and the reason for such variance. Corps must approve.
- c) The proposed adhesive is listed as an approved compound by both the lightning system and roofing manufacturer.
- d) All prep-work and application requirements are carefully followed in accordance with adhesive and roofing manufacturer instructions.

2.2 The use of the S-5 clamps (Cube) is an acceptable method for lightning protection equipment support provided the following are met:

- a) 1.2 a) above is met.

- b) A variance from the original contract requirements is submitted by the Contractor, with installation details, and the reason for such variance. Corps must approve.
- c) The cube is used only as a means for support of the lightning protection equipment and does not compromise the “Lightning Protection System” requirements listed under NFPA 70, NFPA 780, UL 96, and UL 96A.
- d) The cube does not void roofing manufacturer’s warranty.

### **3.0 Snow Guards**

Regardless of the manner or configuration of the mounting of a lightning protection system and equipment, the components are not intended to withstand the forces exerted by masses of ice and snow shifting on the roof. In those instances where lightning protection systems will be exposed to such forces, we recommend the installation of snow guards or snow guard systems.

#### **Instructions to Designers:**

1. For metal roofing systems, modify UFGS 13100 paragraphs to include the building lightning protection requirements above.
2. Construction contract drawings shall include the requirements lightning protection features identified above for projects having metal roof systems.

## **SECTION 13120 - 13121 Metal Buildings**

#### **Ft. Campbell Requirements:**

For new construction, pre-engineered metal structural frames/buildings shall not be structurally tied to masonry. If tied, frame deflection must be limited to L/600, which increases steel frame cost to the point which it exceeds the cost of a designed structure. This fact has been verified by metal building manufacturers, and precludes perceived advantages of pre-engineered structural systems.

See [Appendix D](#) for colors.

See: [TI 809-30, Metal Building Systems](#)

[Return to Division Table of Contents](#)

## **SECTION 13202 - 13216** **Petroleum/Fuel Storage Tanks**

### **Ft. Campbell Requirements:**

New tank installations and replacements shall comply with Section 2.1.3, [Underground and Aboveground Storage Tanks](#).

Construction permits are necessary for all petroleum/fuel storage systems. Permits require Environmental Division design review and approval.

### **Instructions to Designers:**

1. Contact the Directorate of Public Works , Environmental Division, Authority Having Jurisdiction for storage tanks prior to starting and submitting design proposals.
2. Modify project specifications to include requirements identified above.

## **SECTION 13280** **Asbestos Abatement**

### **Ft. Campbell Requirements:**

Asbestos Abatement shall be accomplished in accordance with Fort Campbell requirements identified in specification section 02080: [Removal and Disposal of Asbestos Containing Materials](#).

Section 02080 requirements should be combined and incorporated into the UFGS 13280 section, or the Section 02080 may be renumbered. Requirements of both sections should be coordinated.

[Return to Division Table of Contents](#)

## **SECTION 13281**

### **Lead Hazard Control Activities**

#### **Ft. Campbell Requirements:**

Lead Abatement shall be accomplished in accordance with Fort Campbell requirements identified in specification section 02090: [Removal and Disposal of Lead Containing Materials](#)

Section 02090 requirements should be combined and incorporated into the UFGS 13281 section, or the Section 02090 may be renumbered. Requirements of both sections should be coordinated.

## **SECTION 13721**

### **Small Intrusion Detection System**

#### **Ft. Campbell Requirements:**

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit (FC Form 4183) from the Fort Campbell Electrical Inspector in accordance with [CAM Reg 420-4](#).

In addition to a phone jack inside the arms vault, place an additional phone jack outside the arms vault. The phone line in the arms vault shall be a single line only (no multiple lines on the same phone).

#### **Instructions to Designers:**

1. Installation of ICIDS Equipment in secure communications rooms shall be in accordance with instructions found in [Section 16700+: Telecommunications Systems](#).
2. Installation of ICIDS Equipment in Arms Room shall be in accordance with the following instructions and [Floor Plan Sketch](#):
  - Modify project specifications to insure Contractor will provide all materials (excluding the RADIC, Keypad, LED indicator lamp, and sensors)
  - Modify specifications to insure Contractor will schedule a meeting with the Alarm Administrator prior to commencement of work (270) 798-3990/1225/7587 Note: Type & placement of sensors will be noted at meeting.

1. Mount the Remote Area Data Collector (RADC) to the same side as the interior door opens, approximately two feet to the left or right of the door and five feet up from the floor. (Physical Security office will provide the RADC.)
2. Mount a four square box to the left or right of door as in step one approximately one foot from the doorframe and five feet up from the floor. Half inch EMT must be run from the four square box to the bottom of the RADC can. This is for the mounting the Keypad. (Physical Security will provide and install the keypad.)
3. A foursquare must be mounted to the ceiling (center) of the Arms Room or rear wall facing the door depending on the type of motion sensor to be used. Half inch EMT must be run from the foursquare to the RADC can (top). Note: Placement of sensors will be noted at time of meeting. (Physical Security will provide and install sensors)
4. Drill a half inch hole approximately eighteen inches above and centered on the arms room door to outside for mounting of the LED indicator lamp. (Physical Security will provide and install the LED.) Mount a foursquare box over the drilled hole and run half inch EMT from box to the RADC can (top).
5. Dedicated 120 VAC power must be run to the RADC can through  $\frac{1}{2}$ " or  $\frac{3}{4}$ " EMT.
6. A dedicated phone line must also be run to the RADC can. This wire can be run using the conduit from either sensor.
7. A four conductor 22 AWG wire must be run from motion sensor to the RADC.
8. A two conductor 22 AWG wire must be run from foursquare above arms room door to the RADC. This is for the Balanced Magnetic Switch (BMS) for the door. (Physical Security will provide and install the BMS.)
9. A two conductor 22 AWG wire must be run from the foursquare above door to the foursquare for the keypad installation. This is for the LED indicator to be mounted on the outside of the arms room.
10. A two conductor 22 AWG wire must be run from the foursquare, for the keypad, to the RADC.
11. A two conductor shielded 24 AWG wire must be run from the foursquare for the keypad to the RADC.

NOTE: Leave approximately four feet of wire at both ends.

## Conductors

11.1 Signal wiring: Type of wire to be used (another manufacturer's wire, of equal quality, can be substituted).

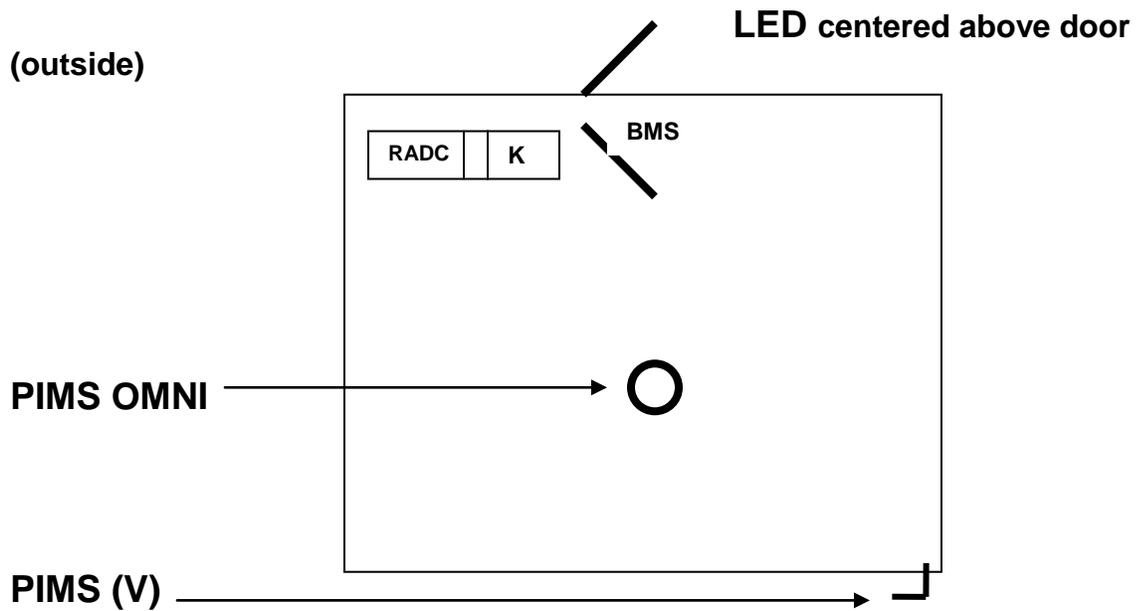
West Penn 220 = 2 conductor 22 AWG

West Penn 240 = 4 conductor 22 AWG

West Penn 2401 = 2 conductor, 24 AWG, shielded

11.2 Power wiring: Black, Red, Green- 12 AWG, stranded, to RADC.

### Installation Floor Plan Sketch ICIDS Equipment Typical Arms Room



[Return to Section](#)

## **SECTION 13801 Energy Monitoring and Control System (EMCS)**

### **Ft. Campbell Requirements:**

Refer to Division 16000 for electrical work.

Connect all new building controls to the EMCS unless directed otherwise.

Refer to Section 15951 for connection requirements.

### **SPECIFICATION FOR BUILDING INTEGRATION INTO FORT CAMPBELL'S EMCS**

#### **Building Integration**

**Note: The terms EMCS, BAS, UMCS and FMCS shall be used interchangeably. Facilities under this contract will be integrated to an FMCS as defined.**

**The Facility Management and Control System (FMCS) shall be comprised of Network Area Controller or Controllers (NAC) within each facility. The NAC shall connect to Fort Campbell's wide area network. Access to the system, either locally in each building, or remotely from a central site or sites, shall be accomplished through standard Web browsers, via the Internet and/or local area network. Each NAC shall communicate to LonMark/LonTalk (IDC) controllers and other open systems/devices provided. The Facility Management and Control System (FMCS) as provided will be based on the Niagara Framework R-2 VERSION (or "Niagara"), a Java-based framework developed by Tridium. Niagara provides an open automation infrastructure that integrates diverse systems and devices (regardless of manufacturer, communication standard or software) into a unified platform that can be easily managed**

## **SECTION 13850 - 13851 Fire Detection and Alarm Systems**

### **Ft. Campbell Requirements:**

#### **General:**

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit per CAM Regulation 420-4 , Quality Assurance "Electrical" Inspection Standards ([see Chapter 3 Section 16000](#)).

All building designs which have a fire alarm system shall have an exterior strobe light alarm device mounted on the street side of the building's exterior. The strobe is to act as a visual indicator to responding fire crew. Response time is decreased since the crew does not need to find the actual building number.

If using flow switch, use only electric bell; do not specify motor gong; Be sure sprinkler alarm specification and alarm specification agree.

No tower is to be designed with out jockey pumps.

Ft. Campbell's fire truck ladder is 85 feet long.

Utilize looped and grid systems.

#### Fire Alarm Systems:

The Fire Alarm Control Panel shall be fully compatible with the existing King-Fisher Industrial Radio Alarm Control System (IRACS) presently in use at Fort Campbell. The fire alarm AM transmitter shall be Government furnished, contractor installed.

An addressable system is fine in almost any building, there are several circumstances where an addressable system is not really necessary and ends up costing more to install and maintain than it is really worth. Therefore, addressable systems shall be installed in all barracks and hangar type buildings. Non-addressable systems will be used in maintenance facilities as well as dining facilities. Non-addressable systems shall also be designed/installed in admin buildings, which are smaller or equal to 15,000 SF with 40-50 rooms. Any admin buildings which exceed these parameters shall receive an addressable system.

Panel boxes within a building should be keyed alike.

Panel boxes should be keyed alike.

Fire detection and alarm systems shall be able to be programmed from the control panel and shall not require a peripheral device (such as a laptop computer) to program them.

Do not design remote fire alarm annunciators into the fire detection and alarm system.

Fire alarm control panels shall be installed only in electrical rooms with access from the outside of the building.

Ensure that smoke detector locations shown on drawings comply with the appropriate NFPA requirements. Contractors typically simply scale locations off drawings without verifying whether the locations actually comply with NFPA location / spacing criteria.

Do not install smoke detectors in vehicle maintenance areas due to false alarm problems. Automatic fire detectors in these areas shall be heat detectors.

Ensure that sleeping room smoke detectors in barracks comply with the requirements of Military Handbook 1008C (10 June 1997), i.e., local alarm only, 120 V, powered from the building's power system. Do not put all detectors on the same circuit. This will cause all detectors downstream of an open circuit to be disabled.

Contractor shall provide a set of fire alarm schematic diagrams and O&M manuals in the electrical or mechanical room (wherever the control panel is located). Each zone shall be identified at fire alarm control panel.

Identify fire alarm zones by means of a diagram posted at the building entrance.

Provide a minimum of 2 days of training for the fire detection and alarm system.

Building designs which have a fire alarm system shall have an exterior strobe light alarm device mounted on the outside of the building on the street side. The strobe acts as a visual indication to the responding firemen. It decreases response time because the firemen don't have to waste time hunting for building numbers.

Fire Alarm systems shall be one of the following brand names:

Firelite  
Siemens  
Quick Start  
GE

[Return to Division Table of Contents](#)

## **SECTION 13900**

### **Fire Protection Systems**

#### **Ft. Campbell Requirements:**

##### **Special Requirements for Backflow preventers in sprinkler systems:**

Do not use a strainer with the backflow preventer.

Provide a means to perform a full flow test of the backflow preventer. NFPA allows. Do not allow removal of the clappers from check valve and fire department connection for this purpose, however this is a nuisance. Provide a test valve for this purpose. Tee into the sprinkler system downstream of the backflow preventer. Route the discharge water outdoors.

Refer to [Section 15400](#) for general backflow preventer requirements.

[Return to Division Table of Contents](#)

# TECHNICAL DESIGN GUIDE

## CHAPTER 3

### Technical Requirements and Instructions

#### Division 15000

#### Section

15000	<a href="#"><u>General</u></a>
15080	<a href="#"><u>Insulation</u></a>
15100	<a href="#"><u>Hydronic Piping</u></a>
15190	<a href="#"><u>Gas Piping</u></a>
15400	<a href="#"><u>Plumbing, General Use</u></a>
15550	<a href="#"><u>Water and Steam Heating</u></a>
15620	<a href="#"><u>Chillers</u></a>
15700	<a href="#"><u>Air-Conditioning System (Unitary Type)</u></a>
15702	<a href="#"><u>Computer Room Units</u></a>
15895	<a href="#"><u>Air Supply, Distribution, Ventilation and Exhaust System</u></a>
15940	<a href="#"><u>Vehicle Tailpipe Exhaust</u></a>
15951	<a href="#"><u>Direct Digital Control (DDC)</u></a>
15990	<a href="#"><u>Testing, Adjusting, and Balancing HVAC Systems</u></a>
15995	<a href="#"><u>Commissioning HVAC Systems</u></a>

#### **SECTION 15000**

#### **General**

#### **Ft. Campbell Requirements:**

Building service areas (mechanical rooms, electric/telephone rooms, cooling towers, grease traps, etc.) shall be easily accessible by maintenance personnel directly from the exterior, and shall include vehicle accessibility (i.e., pavement for utility trucks, etc.).

Make valves, balancing equipment, switches, etc., easily accessible for adjusting and maintenance. Ensure adequate clearances are maintained to pull tubes, filters, etc. on a

heat exchangers, boilers, HVAC coils, etc. Provide adequate space and clearances for maintenance of the equipment. The use of butterfly valves is not acceptable.

Make sure unions are located so that they can be turned with a wrench.

Do not install equipment on metal or sloping roof systems.

For each piece of equipment ask yourself how the maintenance technician will access the equipment for service, repair, and removal and replacement of heavy parts such as motors.

If a VAV system is used, the designer must carefully consider the mounting location of each VAV box. The VAV boxes must be easily accessible from a step ladder. They should be located so that moving furniture is not necessary. VAV boxes must not be located high above a suspended ceiling; this makes access nearly impossible. Designers must show the mounting height and insure access to all sides of the VAV boxes.

The use of copper-finn tube boilers is not acceptable.

Fort Campbell's preferred manufacturers are shown on the following table:

<b>Item</b>	<b>Preferred Manufacturer</b>	<b>Model/Remarks</b>
<b>Plumbing Systems</b>		
Circulating Pump	Taco	Bronze 10-15 gpm with Acqua stat on projects having copper runs over 60 feet
Commodes – flush type	Kohler	1.6 gallons with 3.5 gal Sloan flush valve manually operated
Commodes – tank type	Mansfield	135 bowl with 160 tank bottom flush
Faucet - lavatory	Delta	Single handle – or as specified
Faucet - shower	Simmons	Model 2000 Temp Troll
Urinals	Kohler	Sloan flush valve manually operated. Waterless urinals are not acceptable
Water Boiler	Hesco	With storage tanks, where appropriate
Water Cooler – Floor Mount	Sunrock	As specified
Water Cooler – Wall Hung	Sunrock	As specified
Water Heaters	None Specified	Residential – Gas desired. Instant water heaters are not acceptable
<b>General Notes</b>		
Do not use institutional shower heads		
Provide cleanouts on main runs		
Install 18" clear maintenance chase when six fixtures or more are connected back-to-back		
Type K copper on recirculation systems		

<b>Mechanical Systems</b>	
Air Compressors	Quincy
Air Conditioners	Trane
Chillers	Trane
Furnaces	Trane/Carrier
<b>Electrical Systems</b>	
Building Controls	Johnson or Honeywell
Utility Monitoring & Controls	Tridium

[Return to Division Table of Contents](#)

## **SECTION 15080 Insulation**

### **Ft. Campbell Requirements:**

Do not use all service jacket (ASJ) in humid or unconditioned spaces. The adhesive on this product does not hold in high humidity conditions.

Do not use fiberglass outdoors or anywhere insulation may get wet.

Provide metal or PVC covering over piping or equipment insulation in spaces that are not air conditioned (cooled); mechanical rooms and storage rooms are examples.

## **SECTION 15100**

### **Hydronic Piping**

#### **Ft. Campbell Requirements:**

Provide a location for injecting chemical inhibitors into the system.

Provide a location for pulling water samples.

Provide strainers to remove solids from system.

Avoid using glycol systems. If a glycol system must be used, provide a means to flush the system and show it on the drawings.

Avoid the use of Dual Temperature piping systems.

Install expansion tank valves and unions so the tank can be isolated from the system for maintenance. Valves are to be mechanically tied down so they cannot be inadvertently closed. Provide a drain line and valve connected to the piping between the isolation valve and the expansion tank for draining the expansion tank in order to check the air pre-charge.

Show the required air pre-charge pressure on the drawings.

Install valves and unions to isolate individual equipment. Install valves to isolate individual buildings on central systems servicing several buildings..

Size balance valves to have about 1 psi pressure drop wide open so that they will not operate nearly closed to achieve the necessary flow restriction in the system.

Specify gate valves or ball valves in lieu of butterfly valves.

Avoid valves that function as a combination check, balance, and isolation valve all in one. These triple duty type valves compromise each function. Provide separate valves. Remove triple duty type valves from the specifications.

Detail and specify vents at all trapped high points in the piping.

Detail and specify drains at all trapped low points in the piping.

Use dial type thermometers installed in thermo wells.

Provide spare thermo wells at each temperature sensor.

Use oil filled dial type pressure gauges.

Where domestic water is used for system make-up, use a reduced pressure backflow preventer in the make-up line.

Use separate backflow preventers on the make-up lines to the chilled water and the hot water systems. Otherwise cross flow between the systems can occur (even if check valves are used).

## **SECTION 15190 Gas Piping**

### **Ft. Campbell Requirements:**

Gas lines shall not be used for electrical grounding.

Refer to [Appendix F](#) Utility Procedures for outside service lines.

## **SECTION 15400 Plumbing, General Use**

### **Ft. Campbell Requirements:**

Water lines and gas lines shall not be used for electrical grounding.

#### Water Supply:

- Testing – Conduct sterilization/flushing of new water lines. Perform bacteriological testing of new water lines. See [Ft. Campbell Water Distribution System](#).

#### Fixtures:

- Use of Delta and American Standard fixtures. Discuss with plumbing shop at Pre-design Meeting to obtain fixtures preferences.

- Faucet fixtures shall be metal and not plastic.

#### Drains:

- Be sure equipment drains are sized properly.
- No HVAC drain lines to oil/water separators.

#### Waste:

- Cast iron pipe is preferred under building slabs for waste lines due to its service life and durability. PVC will be considered by Fort Campbell for approval if adequate design information is provided by designer as to its strength and service life.

#### Grease Traps:

- Provide access (i.e. a way for a pumper truck to drive right up to the trap) for maintenance and periodic pump out.

#### Isolation Valves:

- Provide adequate isolation valves to ensure repairs can be made with minimal impact on the facility occupants.

#### Backflow Preventers:

Locate in a visible location with full access to the device for component removal and service no more than than 4 feet above the floor.

Devices must be installed far enough away from walls and other equipment to allow service and repair (nominally 1 foot clearance on either side and 3 feet of clearance top and bottom) such that testing or repair can be performed without interference from adjacent equipment or building structure.

Reduced Pressure Backflow Preventer (RPBP) and Double Check Backflow Preventer (DCBP) devices should be equipped with test cocks.

Testable RPBP and DCBP devices should be equipped with strainers except in fire suppression systems.

All backflow devices must be installed horizontally unless the device is specifically designed for vertical installation.

RPBP relief valves must be vented to a drain of sufficient capacity to handle the full discharge flow of the relief valve.

Large RPBP devices (3”D or greater are best vented to the outside unless a large floor drain with sufficient capacity is available.

Preferred devices include: Watts Regulator Inc., Zurn-Wilkins Inc., or Ames Corporation

RPBP devices must not be installed underground where they are susceptible to flooding. If an outdoor location is required, install the backflow preventer in an insulated box with a heat plate for freeze protection.

Point of Contact for backflow prevention is Gary Sewell in Utilities Management Branch at 270-798-5640.

ALL personnel involved with "backflow devices" shall be Tennessee/Kentucky certified in backflow devices. Contractors shall be required to qualify as a licensed Tennessee/Kentucky "Master Plumbers" Contractor. DPW personnel installing, maintaining, or inspecting will also need to obtain and maintain the Tennessee certification (Master Plumber is optional). Tennessee offers training at no cost at it's training center in Murfreesboro several times a year. Initial training is 4 days, renewal training is 2 days.

Atmospheric Vacuum Breaker Devices (AVB) should be installed with no valves downstream. A minimum of 6 inches must be provided above all downstream piping and flood level rim of receptor (hose bib, sink faucet, etc.).

Consider parallel devices where shutdown for inspection and maintenance is not feasible.

Devices shall have individual serial numbers. Numbers are needed to track a device to ensure it is not relocated or another type of device is installed. This is verified on the annual inspections/testing.

The following are backflow applications and recommended devices:

Building Feed	RPBP	High Hazard
Building Bypass	RPBP	High Hazard
Boiler Make up water	RPBP	High Hazard
Chiller Make up Water	RPBP	High Hazard
Wash Water Systems	RPBP	High Hazard
Dynamometers	RPBP	High Hazard
Film Developers	RPBP	High Hazard
Fire Systems w/ chemicals	RPBP	High Hazard
Water Conditioners	RPBP	High Hazard
Chemical Feed Tanks	RPBP	High Hazard
Pump Seal Flush	RPBP	High Hazard
Sewage Plant Connections	RPBP	High Hazard
Compressor Cooling Water	RPBP	High Hazard
Building Feed	DCBP	Intermediate Hazard
Building Bypass	DCBP	Intermediate Hazard
Garbage Disposal	DCBP	Intermediate Hazard
Irrigation Systems	DCBP or PVB	Intermediate Hazard
Ice Machines	DCBP	Intermediate Hazard

Steam Cookers	DCBP	Intermediate Hazard
Drink Machines	DCBP	Intermediate Hazard
Dental Utility Boxes	DCBP	Intermediate Hazard
Mop Sink	AVB	Intermediate Hazard
Hose Bibs	AVB	Intermediate & Low Haz.
Laboratory Sinks	AVB	Intermediate Hazard
Dishwashers	AVB	Intermediate & Low Haz.
Kitchen Wash Sink	AVB	Intermediate Hazard

Abbreviation:	Type of Device:
RPBP	Reduced Pressure Backflow Preventer
DCBP	Double Check Backflow Preventer
PVB	Pressure Vacuum Breaker
AVB	Atmospheric Vacuum Breaker

**Army Energy Program:** Section 2, Executive Order 13423 states “(a) Improve energy efficiency ...through reduction of energy intensity by 3% annually...” , “(c) Beginning in FY 2008, reduce water consumption intensity...by 2 percent annually...”.

## SECTION 15550 Water and Steam Heating

### Ft. Campbell Requirements:

Environmental Air Quality requirements apply. See Appendix A, [Environmental Topics](#).

Install fire tube boilers in lieu of sectional boilers.

Install emergency boiler shutoff (push button) switches just inside mechanical room door.

In converters, use stainless steel converter tubes instead of copper.

Include manufacturer approved devices installed for testing samples of water and steam in the system (both in the mechanical room and at the ends of the system).

For Steam regulators, use Leslie regulator.

At the steam entrance into a building, install a double-block-and-bleed valve arrangement for positive isolation and venting of the steam during maintenance of the downstream system components.

For oil containing equipment, design a containment curb under the equipment.

Do not install equipment in pits.

Locate laminated copies of as-built drawings and control schematics in mechanical rooms.

## **SECTION 15620**

### **Chillers**

#### **Ft. Campbell Requirements:**

Locate equipment to minimize piping runs.

Do not install roof-top equipment on metal or sloping roof systems.

Where direct expansion units are employed, use only manufacturer standard sized package units.

Install only manufacturer standard sized package chillers.

On outdoor package chillers, provide a circulating pump and bypass to allow flow through the chiller during the heating season (trying to keep from draining the system).

Design for the chiller to have control of the pumps for chiller freeze protection.

Install strainers upstream of chiller barrels and condenser barrels.

Install a single pressure gauge on the chiller barrel piped to read the inlet and outlet pressure.

Install a single pressure gauge on the condenser barrel piped to read the inlet and outlet pressure.

Refer to Section 15951 Direct Digital Control for DDC for the points required to be monitored and controls from the Energy Monitoring and Control System. Specify that the chiller have the capability to communicate this data.

## **SECTION 15700**

### **Air-Conditioning System (Unitary Type)**

#### **Ft. Campbell Requirements:**

Do not install roof-top equipment on metal or sloping roof systems.

Locate equipment to minimize piping runs.

Use only manufacturer standard sized package.

[Return to Division Table of Contents](#)

## **SECTION 15702**

### **Computer Room Units**

#### **Ft. Campbell Requirements:**

Provide soft water for make-up.

Provide automatic blow down for humidifiers.

Oversized computer room units are common. Determining the cooling load by summing all the nameplate amp ratings of all the computer equipment will surely result in an oversized unit and cause inefficient operation. Space humidity may not be a problem only because the computer room unit has reheat capability. The unit adds enough heat to make up for the excess in airflow. Size computer room units to accommodate the actual heat release from the computer equipment; airflows will be decreased, the supply temperatures will be lower for a longer period of time, and the reheat will operate far less frequently. Always consider multiple computer room units to split the cooling load; if one unit fails, the other can keep the space at a reasonable temperature.

## **SECTION 15895**

### **Air supply, Distribution, Ventilation, and Exhaust System**

#### **Ft. Campbell Requirements:**

Solvent cleaning in Arms Rooms - adequate ventilation a concern. Ventilate arms vaults at a rate of 0.1 CFM / Sq.Ft. minimum at all times. Provide separate manually operated ventilation at the rate of 0.5 CFM / Sq.Ft. during solvent cleaning.

Provide balancing dampers in all branch ducts feeding diffusers. Do not use volume dampers at diffusers for balancing because the noise created by a throttled damper at the diffuser is not attenuated.

Avoid over estimating cooling loads and cooling air flow to spaces. Doing so causes high space humidity, especially at part load cooling conditions. Refer to the appendix titled Mold and Humidity for air system considerations with regard to achieving good space humidity conditions.

Size cooling coils handling outdoor air for the design dry bulb temperature day, or the design humidity day which ever gives the greater coil capacity.

Provide dial type thermometers at air handlers to indicate the temperature of the supply air, return air, outdoor air, and mixed air.

Provide pressure gauges at air handlers to measure the supply duct pressure, the filter differential pressure, and the fan differential pressure.

## **SECTION 15940**

### **Vehicle Tailpipe Exhaust**

#### **Ft. Campbell Requirements:**

The designer must verify the type of vehicles being serviced. Large diesel engine driven vehicles can require an exhaust volume much higher than the typical 400 to 600 CFM vehicle exhaust system can handle.

Before sizing the exhaust system components, determine the engine displacement, the engine speed while being run on the exhaust system, whether or not the engine is turbocharged, and whether the engine is operated loaded or unloaded at high idle speed.

[Return to Division Table of Contents](#)

## **SECTION 15951**

### **Direct Digital Controls (DDC)**

#### **Ft. Campbell Requirements:**

##### **General Requirements:**

Provide system control schematic diagrams for each system indicating all required sensors, actuators.

Indicate the valve coefficient, Cv for each control valve.

Locate Freeze stats downstream of the heating coil and be sure manufacturer approved mounting is specified.

Electric actuators are to be oil immersed gear actuated or Belimo type. Do not use electro-hydraulic actuators.

Provide actuator position feedback to the DDC for monitoring the position of all valves and dampers.

Be sure conduit enters the control panel from the bottom only.

Specify that all wiring leaving the panel must be landed on a terminal strip separate from the control devices.

Provide control panel with hasp and pad lock in lieu of the panel lock. Pad lock shall be keyed same as the room door.

Do not use a personal computer (PC) as a router to convert from one protocol to another. PCs should be used as the interface to the system, not as a required component in the network.

Show the location of the control panels on the drawings.

Provide laminated control diagrams in the control panel.

### **EMCS Requirements**

Include the following provisions in the specification, However do not include the notes to the designer in the specifications:

#### **Connection to the Energy Management and Control System (EMCS)**

See section 13801

The control inputs and outputs, the schedules, and the alarms to be transmitted shall be as shown on the drawings.

***Note to the Designer: On the drawings, in addition to the system control schematics, and sequences of operation, provide a table showing for each system indicating the inputs, outputs, trends, schedules and alarms to be available at the EMCS. Refer to the section below titled EMCS Points for the minimum required points to be made available at the EMCS.***

A personal computer (PC) type workstation shall be provided at the building if specified or shown on the drawings for use as a local interface to the building controls.

A personal computer (PC) shall not be used as the building interface to the EMCS, nor shall a PC be used to convert protocol used by the building controllers.

Notify the Contracting Officer 4 weeks in advance of the building connection to the post Ethernet and coordinate with the Directorate of Public Works (DPW) point of contact for Information Technology (IT) issues. The DPW contact is Tim Foe, phone 270-798-6716. DPW will provide IP addresses, install anti-virus software on any building workstations, and coordinate with Fort Campbell Information Technology Business Center (ITBC) concerning the connection to the post Ethernet.

### **EMCS Requirements on Design / Build Projects:**

Include the following words in the Request for Proposal (RFP) in the section dealing with building controls. However do not include the notes to the RFP author in the RFP: The HVAC control system shall be a direct digital control (DDC) system meeting the requirements of and installed in accordance with [Unified Facility Guide Specification UFGS-15951 Direct Digital Controls][Specification Section 15951 Direct Digital

Controls]. The equipment shall be limited to the options contained within the specification.

The connection shall provide the ability to do the following from the existing central workstations: monitor and control inputs and outputs, revise equipment schedules, override schedules, view trend data collected and stored at the building controllers, set up trends at the workstation, and receive alarms from the building controllers.

The connection shall use the existing post Ethernet network as the data transmission media.

The contractor shall be responsible to complete the connection and system integration of the building controls to the existing EMCS including all required programming of the building controls.

***Note to the RFP author: Include a list or table showing typical inputs, outputs, schedules, and alarms to be transmitted to the EMCS, and trends to be maintained by the building controls and available to the EMCS. Include the position of all damper and valve actuators as an input available at the EMCS. Refer to the section below titled EMCS Points for the minimum required points to be made available at the EMCS.***

A portable workstation / tester (lap top type computer) shall be provided with controls set up and diagnostic software installed. This device shall serve as a tool for the maintenance staff to access and modify the controls configuration.

Notify the Contracting Officer 4 weeks in advance of the building connection to the post Ethernet and coordinate with the Directorate of Public Works (DPW) point of contact for Information Technology. The DPW contact is Tim Foe, phone 270-798-6716. DPW will provide IP addresses, install anti-virus software on [any building workstations and on] the portable workstation / tester service tool and coordinate with Fort Campbell Information Technology Business Center (ITBC) concerning the connection to the post Ethernet and opening the communication port.

Inputs and outputs (points) to be connected to the Energy Monitoring and Control System are given below. The designer or author of the RFP should be sure that the procurement documents require that these points are available at the EMCS as a minimum.

Abbreviations that may be used in this section are as follows:

AI – analog input

AO – analog output

CSR – current sensing relay

DI – digital input

DO – digital output

dP – differential pressure

EMCS - Energy Monitoring and Control System

HVAC - Heating Ventilating and Air Conditioning

KW - Kilowatt

LAN – local area network

MZ – Multizone

SZ – Single Zone

VAV – Variable Air Volume

Ethernet Hub and Communication Cable

Verify that there will be an Ethernet hub within the building. This serves as the connection to the EMCS.

New instrumentation and controls such as sensors, control relays, and status indication will be connected to the EMCS. The following is a recommended summary of the minimum EMCS points to connect. Some of the listed equipment may not be used on this project. Some equipment may be missing. However, this list should give a feel for the types of points to connect. Note that some of the points such as damper or valve actuator position may not be needed by the building controls. Such points would be monitoring points.

Air Handler Units - Single Zone, VAV, and Multizone

Digital Outputs:

Start / Stop signal

Vent Delay signal. This is used to disable the outdoor air damper during morning warm up (or cool down) before the building occupants arrive. It is not required if the local controls are taking care of this function.

Analog Outputs: None

Digital Inputs:

Fan on / off status via dP switch is the preferred method. CSR is second preference.

Differential pressure switch across filters.

Economizer status.

Freeze stat status.

Duct Smoke detector status.

Analog Inputs:

Supply air temperature.

Hot deck temperature for MZ units.

Cold deck temperature for MZ units.

Return air temperature.

Mixed air temperature. Add the sensor if it is not part of the normal controls.

Damper positions.

Valve positions.

Space temperature.

Space humidity where sensors are installed for humidity control.

OA temperature sensors will not be added or connected. OA temperature is currently monitored by the EMCS at a central location.

Alarms:

AHU fan failure to start

AHU fan failure to stop

Return Temperature High

Return Temperature Low  
Space Temperature High  
Space Temperature Low  
Mixed Air Temperature Low  
Freeze stat Trip  
Smoke condition  
Trend: Data is stored at the building controller  
Space temperature  
Space humidity  
Supply Air Temperature  
VAV Boxes (applies to normal pressure independent VAV boxes)  
Digital Outputs: None  
Analog Outputs:  
Space temperature set point adjustment.  
Digital Inputs:  
Fan Status, if the box is fan powered.  
Analog Inputs:  
Space Temperature  
Air Flow through the primary air damper  
Damper position  
Valve position  
Alarms: None  
Trend: None  
Hot Water Boiler  
Digital Outputs:  
Control Relay to disable the boiler.  
Analog Outputs: None.  
Digital Inputs:  
Boiler (burner) status will be included.  
Analog Inputs:  
Hot water supply temperature to the building.  
Hot water return temperature from the building.  
Alarms:  
Boiler trouble alarm from ignition controls  
Hot leaving temperature high  
Hot leaving temperature low  
Trend: Data is stored at the building controller  
Hot water supply temperature  
Hot water return temperature  
Steam to Hot Water Converter  
Digital Outputs:  
Control Relay to disable the steam valve.  
Analog Outputs: None.  
Digital Inputs: None.  
Analog Inputs:  
Converter entering water temperature.

Converter leaving water temperature.

Alarms:

Hot leaving temperature high

Hot leaving temperature low

Trend: Data is stored at the building controller

Hot water supply temperature

Hot water return temperature

Chillers

Digital Outputs:

Enable / Disable Signal.

Analog Outputs:

Chilled water set point adjustment.

Digital Inputs:

On / Off Status.

Chiller failure alarm: This is to indicate when there is a local chiller alarm. The specific condition causing the alarm need not be transmitted. The goal is to know when the chiller is in need of service.

Analog Inputs:

Chilled water supply temperature from the chiller to the building.

Chilled water return temperature from the building to the chiller.

Condenser water inlet temperature.

Condenser water outlet temperature.

Alarms:

Chiller failure signal from chiller packaged controls

Failure to stop after Disable command

Trend: Data is stored at the building controller

Chilled water supply temperature

Chilled water return temperature

Condensing Units

Digital Outputs:

Enable / Disable Signal. The signal serves to override the local automatic controls to force the condensing unit to stop.

Analog Outputs: None.

Digital Inputs:

On / Off Status via a CSR or interface to the on-board controls.

Analog Inputs: None.

Alarms:

Failure to stop after Disable command

Trend: None

Pumps

Digital Outputs:

Enable / Disable signal to override the local motor controls and force the pump to stop even if the motor starter is in the HAND position.

Analog Outputs: None.

Digital Inputs:

Pump on / off status; by a dP switch or by CSR.

Analog Inputs: None.

Alarms:

Failure to start.

Failure to stop.

Trend: None

Occupied Space

Digital Outputs: None

Analog Outputs: None.

Digital Inputs: None.

Analog Inputs:

Space temperature. Use VAV box sensors where possible. Use space sensors included for the control of air handlers where possible. In this case the space temperature may be shown as a point associated with the air handler. Additional space sensors may be added if necessary.

Alarms:

Space temperature high

Space temperature low

Trend: Data is stored at the building controller

Space temperature

Computer Room Units (such as Liebert units)

Digital Outputs: None.

Analog Outputs: None.

Digital Inputs: None.

Analog Inputs: None.

Alarms:

Trouble or failure signal from the packaged controls.

Trend: None

Make-up Air Units

As a rule, there is no EMCS control of the process exhaust equipment such as kitchen hoods. Likewise there will be no EMCS control of the associated make up air equipment serving kitchen hoods. However, where space sensors in the areas served by the makeup air units are connected to the DDC, these will be included and connected to the EMCS.

Digital Outputs: None

Analog Outputs: None.

Digital Inputs:

On / Off Status.

Analog Inputs:

Space Temperature where this sensor is interfaced to the DDC.

Trend: None

Infrared Gas Heaters

Digital Outputs: None.

Analog Outputs: None.

Digital Inputs: None

Analog Inputs:

Space Temperature.  
Alarms: None  
Trend: None

## **SECTION 15990**

### **Testing, Adjusting, and Balancing (TAB) HVAC Systems**

#### **Ft. Campbell Requirements:**

Require the TAB technician to measure, balance, and report the building pressure relative to atmosphere.

Where VAV systems are employed, require measurement of the building pressure at full air flow and at minimum air flow.

[Return to Division Table of Contents](#)

## **SECTION 15995**

### **Commissioning of HVAC Systems**

#### **Ft. Campbell Requirements:**

All projects, MILCON and OMA and other funding sources, shall be executed using commissioning procedures and processes per the COE specification.

Any special tools, computers, software, etc., required for operations and maintenance of the new equipment that will assist maintenance personnel maintain the facility shall be turned over to the contracting officer.

Specify training for DPW personnel. Training shall be given by factory authorized personnel.

[Return to Division Table of Contents](#)

# TECHNICAL DESIGN GUIDE

## CHAPTER 3

### Technical Requirements and Instructions

#### Division 16000

#### Section

16000	<a href="#"><u>Electrical Work, General</u></a>
16264 - 5	<a href="#"><u>Standby Electric Generator Sets</u></a>
16370	<a href="#"><u>Electrical Distribution System, Aerial</u></a>
16375	<a href="#"><u>Electrical Distribution System, Underground</u></a>
16415	<a href="#"><u>Electrical Work, Interior</u></a>
16528	<a href="#"><u>Exterior Lighting Including Security</u></a>
16700 +	<a href="#"><u>Communications Systems and Premises Distribution System</u></a>

#### **Section 16000**

#### **Electrical Work, General**

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any existing equipment without first securing an Electrical Permit from the Fort Campbell Electrical Inspector in accordance with CAM Regulation 420-4 (Quality Assurance “Electrical” Inspection Standards). An Electrical Contractor Registration Form must be completed. This form will be attached to the back of your copy of the CAM Regulation. Your Contractor’s license will then need to be validated against the Fort Campbell Review Board list of State Electrical Licenses valid on Fort Campbell KY before you can obtain a permit. To review CAM Regulation 420-4 [click here](#). Permits shall be obtained at DPW, Contract Management Branch Building 846, 16<sup>th</sup> Street and Georgia Ave, Fort Campbell, Kentucky.

## SECTION 16264 - 5 Standby Generator Sets

### Ft. Campbell Requirements:

**NOTE: All of the items to include but not limited to the following items: software, firmware, hardware, cables, interface communication devices used in programming, communicating, diagnostic troubleshooting, to include an electronic device, with memory storage up to 80 gb designed to perform any and all of these functions for the Generator Set, Automatic Transfer Switch, Remote Annunciator Panel and Switch Gear will be provided to Fort Campbell maintenance personnel prior to FINALE ACCEPTANCE.**

### General Requirements:

- All Emergency Standby Generator sets shall employ Diesel Engines using DF 2 fuel and the engine speed shall be 1800 RPMs with manufacturer recommended over-speed protections. No LP, Natural Gas or Gasoline prime movers shall be approved for any reason.
- All Emergency Standby Generator sets shall be sized to the service of the main breaker/fuse. All Emergency Standby Generator sets shall service the entire facility; no partial coverage of a facility shall be permitted.
- All Emergency Standby Generator sets shall have a L.E.D. "YELLOW" Strobe light mounted on top of the all weather housing and wired so when the Generator is running, the Strobe light is working.
- Engines shall be radiator and fan cooled, and shall not be naturally aspirated.
- All emergency/standby generator sets shall conform to NFPA 110 either Level 1 or Level 2 Standards and installation quality.
- All emergency/standby generator sets shall be 1 step load increase to 100% of Service Load.
- Each generator shall start and assume 100% load within 10 seconds.
- Specifications requirements shall include obtaining all local and state (Kentucky or Tennessee) permits prior to beginning construction. Local permits shall include

demolition, digging, excavation, compaction, electrical, fuel tank installation, and environmental. All submittals, site locations, load analysis and designs shall be approved by the Local Authority Having Jurisdiction to include but not limited to the Generator Mechanic for Directorate of Public Works.

**Site Requirements:**

**A. Location:**

- Generator Set shall be located a minimum of 10 feet from any building or structure. The Generator Set shall be located a minimum of 30 feet from any overhead power lines or transformer banks unless otherwise directed. The Generator Set shall have a minimum of 5 feet clearance on all sides to facilitate maintenance. The Generator Set shall be a minimum of 5 feet from any type of vehicular traffic to include but not limited to streets, parking lots, alleys, or access roads and activities including mowing equipment. The Generator Set exhaust stack shall be a minimum of 10 feet from any building or structure or include any protrusions such as an overhangs, eaves, to include any protrusions such as an overhangs, eaves, landscaping, etc., and it shall point away from any air conditioning or other air intake systems.

- The Generator Set shall have adequate access and ample room to be refueled using a standard refueling truck.

- Exterior located Generator Sets shall be placed on a concrete pad. The concrete pad is to include a 5-inch minimum thickness broom finish concrete rectangular pad. The pad shall extend minimum 4-feet beyond the generator set in all directions. The concrete pad area shall be expanded as required to include associated electrical switch enclosures. Provisions for stub-up of electrical conduits shall be integral to design a construction of concrete base pad construction.

- See additional requirements for DAY TANKS.

## **B. Protection:**

- The Generator Set shall have collision bollards placed around the generator pad. Each bollard shall be 6-inch diameter std. weight steel pipe 8 feet long.

- The bollard shall be installed in a 24-inch hole, 4 feet deep, and filled with concrete to include filling the bollard. The bollard shall then be painted caution yellow when finished.

- Bollards shall be placed 5 feet from the pad to prevent any vehicular damage to the generator set. One bollard will be placed at each corner of the generator base pad at a distance of 5 feet. The distance between any two bollards shall not exceed 6 feet. An average size generator set uses 10 bollards. The Local Authority having Jurisdiction will determine the location of each bollard when exceptions are necessary.

- See additional requirements for DAY TANKS.

## **Generator Set Requirements:**

- All emergency/standby generators shall be mounted on spring isolators and flexible connections rated for seismic Zone C.

- It is the intent of this specification to secure an engine-driven generator set that has been prototype tested, factory built, production-tested, and site-tested together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein.
- The equipment shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.
- The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.
- It is the intent of this specification to secure a generator set system that has been tested during design verification, in production, and at the final job site. The generator set will be a commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied shall meet the requirements of the National Electrical Code and applicable local codes and regulations.
- All equipment shall be new and of current production by a national firm that manufactures the generator sets and controls, transfer switches, and switchgear, and assembles the generator sets as a complete and coordinated system. There will be one-source responsibility for warranty, parts, and service through a local representative with factory-trained servicemen.
- All equipment shall be new and of current production by a national firm that manufactures the generator sets and controls, transfer switches, and switchgear, and assembles the generator sets as a complete and coordinated system. There will be one-source responsibility for warranty, parts, and service through a local representative with factory-trained servicemen.
- The generator main circuit breaker: shall be set mounted and wired, UL listed, molded case thermal magnetic type. Each breaker shall be Shunt-Trip and wired to the engine fault conditions. Field circuit breakers shall not be acceptable for generator over current protections.

**Day Tank Requirements: (If required)**

- Sub-base (in skid/belly) fuel tanks will not be acceptable unless specifically specified and or approved by the Local Authority Having Jurisdiction to include but not limited to the Generator Mechanic for Directorate of Public Works.
- **Sub-base (in skid/belly) fuel tanks shall not exceed 18 inches in height. This does not include the seismic Isolators height.**
- All day tanks shall be capable of holding manufacturer recommended tank size for 2-hour 100% continuous load run. For smaller installations not less than 25-gallon day tank fuel storage capacity will be specified.
- All main/day tanks shall be above ground double walled permanently mounted to the floor or exterior concrete pad or they shall be concrete encased vaulted (equal to or greater than CONVAULT Type).
- When the day tank is located outdoors, it shall have an Outdoor Weather Protective Housing installed. (If Required)
- Emergency Standby Generator Sets installed inside of a structure shall have a day tank installed as part of the package.
- Each above ground fuel tank shall be at the minimum distance of 10 feet from any structure, overhang, property line, parking lot, or roadway.
- Each above ground fuel tank shall have 6-inch standard weight steel pipe concrete filled bollards placed around it to prevent accidental collision or impact from vehicles and or mowers. These bollards shall be primed and painted to prevent corrosion. The color shall be yellow.
- All fuel lines, (supply and return), shall be of black steel, non-wielded (threaded) construction. The fuel lines shall not rest on grade. They shall be mounted at the minimum height of at least 6 inches above grade. The fuel lines shall be separated at the minimum distance of 6 inches. The supply fuel line shall be  $\frac{1}{2}$  ID, and the return fuel line shall be  $\frac{3}{4}$  ID unless larger is manufacturer recommended. All fuel lines will have a vinyl or metal protective covering.
- All fuel lines will be insulated and have heat trace installed to prevent gelling of the fuel.
- Each day tank shall include a spin on canister type fuel filter to prevent contamination of the fuel supply.
- Each main fuel tank shall be equipped with an Anti-siphon valve.

- Each tank shall have a manual ball type shut off valve installed as close as possible to the Anti-siphon valve. No check valves shall be used in either the supply or the return fuel lines.

### **Operation:**

- Each day tank shall use 120 VAC, 60 Hz electrical power. Each day tank shall have a supply pump capable of delivering fuel at the rated capacity of 2-gpm rate. It shall have a second pump capable of returning excess due to an overflow condition to the AST at the rated delivery of 3-gpm. Automatic operation. At 50% of fuel, the supply pump will energize and pump fuel from the AST back into the day tank. At 90% fuel level, the supply pump will de-energize.
- Manual operation. The day tank shall be equipped with a manual operation switch to allow the operator to manually energize the supply pump.
- Electronic 120 VAC fuel shutoff solenoid valve shall be installed downstream of the supply fuel pump. It shall be connected as to energize open when the supply pump is energized, and de-energized with the supply pump is de-energized.
- Over-flow activation float switch, shall be automatically activated if the fuel level in the day tank exceeds 95% fuel level. The return fuel shall then be pumped back into the AST.

### **Controls and Functions:**

- The day tank control panel shall have the following minimum indications:
  - Fuel Level
  - Fuel Pump Status
  - Automatic Transfer Switch (ATS):
- Each ATS shall be of the standard type unless otherwise specified to be an Isolation Bypass type ATS. Equipment shall be a standard product of a manufacturer regularly engaged in manufacturing the products whose applications are similar to the required design and rating of ATS equipment. Equipment shall be capable of being serviced by a manufacturer authorized and trained organization that is reasonably convenient to the site.
- Each ATS shall have a fusible disconnect or circuit breaker upstream of the ATS or unless otherwise specifically stated that the ATS shall be a Service Entrance Rated ATS.
- Each ATS shall have an automatic exerciser installed to be able to program the generator set and the ATS to exercise once a week with or without a load.

### **Instructions to Designers:**

1. All project generator set guide specifications shall be revised to include the following mark-up: **Specification 16264-5, Design Specification for Emergency Standby Generators.**
2. Include all above listed features and specific equipment requirements into project design and contract document drawings and specifications as they apply.
3. The Local Authority having Jurisdiction shall approve all designs, drawings and specifications before bid issue of such projects. This is to insure that once the Generator systems has been inspected and accepted by the appropriate people, it will meet all codes, regulations, and SOPs of Fort Campbell and the state of Kentucky or Tennessee. Once it has been accepted, it becomes Real Property, and P.W.B.C. will be responsible to maintain it. As of this time, Nick Overstake, P.W.B.C. Electric shop is the Local Authority having Jurisdiction on all Generators, Deluge Pumps, and above ground Fuel Systems on Fort Campbell. He can be reached at 270-798-5208 or on his cell phone 931-216-6682.

**Note To Designer: Contents of this DRAFT specification shall be reviewed and incorporated into the project specifications.**

## **SECTION 16264-5**

### **DIESEL-GENERATOR SET STATIONARY 15-2,000 KW, STANDBY APPLICATIONS 12/10**

#### **PART 1 GENERAL**

##### **1.1 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

#### **AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)**

**ANSI C12.11 (1987; R 1993) Instrument Transformers for Revenue Metering, 10 kV BIL through 350 kV BIL (0.6 kV NSV through 69 kV NSV)**

**ANSI C39.1 (1981; R 1992) Requirements for Electrical Analog Indicating Instruments**

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM A 53/A 53M (1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 106 (1999e) Seamless Carbon Steel Pipe for High-Temperature Service

ASTM A 135 (1997c) Electric-Resistance-Welded Steel Pipe

ASTM A 181/A 181M (2000) Carbon Steel Forgings for General-Purpose Piping

ASTM A 234M (2000) Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service

ASTM B 395 (1995) U-Bend Seamless Copper and Copper Alloy Heat Exchanger

ASTM B 395M (1995) U-Bend Seamless Copper and Copper Alloy Heat Exchanger and Condenser Tubes (Metric)

ASTM D 975 (1998b) Diesel Fuel Oils

**ASME INTERNATIONAL (ASME)**

ASME B16.3 (1998) Malleable Iron Threaded Fittings

ASME B16.5 (1996; B16.5a) Pipe Flanges and Flanged Fittings NPS 1/2 thru NPS 24

ASME B16.11 (1996) Forged Fittings, Socket-Welding and Threaded

ASME B31.1 (1998) Power Piping

ASME BPVC SEC VIII D1 (1998) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage

ASME BPVC SEC IX (1998) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

**ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)**

AEIC CS5 (1994; CS5a-1995) Cross-Linked Polyethylene Insulated Shielded Power Cables Rated 5 Through 46 kV

AEIC CS6 (1996) Ethylene Propylene Rubber Insulated Shielded Power Cables Rated 5 Through 69 kV

## ELECTRICAL GENERATING SYSTEMS ASSOCIATION (EGSA)

EGSA 101P (1995a) Engine Driven Generator Sets

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (1997) National Electrical Safety Code IEEE Std 1 (1986; R 1992) General Principles for Temperature Limits in the Rating of Electric Equipment and for the Evaluation of Electrical Insulation

IEEE Std 48 (1998) Standard Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5 kV through 765 kV

IEEE Std 81 (1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)

IEEE Std 100 (1997) IEEE Standard Dictionary of Electrical and Electronics Terms

IEEE Std 120 (1989) Electrical Measurements in Power Circuits

IEEE Std 404 (1993) Cable Joints for Use with Extruded Dielectric Cable Rated 5000 V Through 138 000 V and Cable Joints for Use with Laminated Dielectric Cable Rated 2500 V Through 500 000 V

IEEE Std 519 (1992) Harmonic Control in Electrical Power Systems

## MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58 (1993) Pipe Hangers and Supports - Materials, Design and Manufacture

MSS SP-69 (1996) Pipe Hangers and Supports - Selection and Application

MSS SP-80 (1997) Bronze Gate, Globe, Angle and Check Valves

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA AB 1 (1993) Molded Case Circuit Breakers and Molded Case Switches NEMA

ICS 2 (1993) Industrial Controls and Systems Controllers, Contactors, and Overload Relays Rated Not More Than 2,000 Volts AC or 750 Volts DC

NEMA ICS 6 (1993) Industrial Control and Systems, Enclosures

NEMA WC 7 (1988; Rev 3 1996) Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

NEMA WC 8 (1988; Rev 3 1996) Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

NEMA MG 1 (1998) Motors and Generators

NEMA PB 1 (1995) Panel boards

NEMA SG 3 (1995) Power Switching Equipment

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30 (1996; Errata TIA 96-2) Flammable and Combustible Liquids Code

NFPA 37 (1998) Installation and Use of Stationary Combustion Engines and Gas Turbines

NFPA 70 (1999) National Electrical Code

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE ARP 892 (1965; R 1994) D-C Starter-Generator, Engine

SAE J 537 (1996) Storage Batteries

UNDERWRITERS LABORATORIES (UL)

UL 489 (1996; Rev thru Dec 1998) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

UL 891 (1994; Rev thru Jan 1995) Dead-Front Switchboards

UL 1236 (1994; Rev thru Mar 1999) Battery Chargers for Charging Engine-Starter Batteries

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330  
SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Layout; G

Drawings; G

a. Base-mounted equipment, complete with base and attachments including anchor bolt template and recommended clearances for maintenance and operation.

b. Starting system.

c. Fuel system.

d. Cooling system.

e. Exhaust system.

f. Electric wiring of relays, breakers, programmable controllers, and switches including single line and wiring diagrams.

g. Lubrication system, including piping, pumps, strainers, filters, heat exchangers for lube oil and turbocharger cooling, electric heater, controls and wiring.

h. Location, type, and description of vibration isolation devices.

i. The safety system, including wiring schematics.

j. One-line schematic and wiring diagrams of the generator, exciter, regulator, governor, and all instrumentation.

k. Panel layouts.

l. Mounting and support for each panel and major piece of electrical equipment.

m. Engine-generator set rigging points and lifting instructions.

Acceptance; G

Drawings, which accurately depict the as-built configuration of the installation, upon acceptance of the diesel-generator, set installation. Layout drawings shall be revised to reflect the as-built conditions and submitted with the as-built drawings.

SD-03 Product Data

Performance Tests; G

Calculations of the engine and generator output power capability, including efficiency and parasitic load data.

Sound Limitations; G

Sound power level data for the packaged unit operating at 100% load in a free field environment. The data should demonstrate compliance with the sound limitation requirements of this specification.

Generator; G

Each generator KW rating and short circuit capacity (both symmetric and asymmetric).

#### Day Tank; G

Calculations for the capacity of each day tank, including allowances for recirculated fuel, usable tank capacity, and duration of fuel supply.

#### Power Factor; G

Generator capability curve showing generator kVA output (kW vs. kvar) for both leading and lagging power factors ranging from 0 to 1.0.

#### Heat Rejected to Engine-Generator Space; G

Manufacturer's data to quantify heat rejected to the space with the engine generator set at rated capacity.

#### Time-Delay on Alarms; G

The magnitude of monitored values, which define alarm or action, set points, and the tolerance (plus and/or minus) at which the device activates the alarm or action.

#### Cooling System; G

- a. The maximum and minimum allowable inlet temperatures of the coolant fluid.
- b. The maximum allowable temperature rise in the coolant fluid.
- c. The minimum allowable inlet fuel temperature.

#### Manufacturer's Catalog; G

Manufacturer's standard catalog data describing and depicting each engine-generator set and all ancillary equipment in sufficient detail to demonstrate specification compliance.

#### Vibration Isolation; G

Vibration isolation system performance data for the range of frequencies generated by the engine-generator set during operation from no load to full load and the maximum vibration transmitted to the floor. Description of seismic zone C or equivalent qualification of the engine-generator mounting, base, and vibration isolation.

#### Instructions; G

Instructions including: the manufacturer's pre-start checklist and precautions; startup procedures for test mode, manual-start mode, and automatic-start mode, (as applicable); running checks, procedures, and precautions; and shutdown procedures, checks, and precautions. Instructions shall include procedures for interrelated equipment (such as heat recovery systems, co-generation, load-shedding, and automatic transfer switches). Instructions shall be weatherproof, laminated in plastic, framed, and posted where directed. Posted data shall include wiring and control diagrams showing the key mechanical and electrical control elements, and a diagrammatic layout of the system.

#### Experience; G

Statement and locations showing that each component manufacturer has a minimum of 3 years experience in the manufacture, assembly and sale of components used with stationary diesel-engine generator sets for commercial and industrial use of similar generator set size, location and function as that identified in the construction documents.

Field Engineer;

A letter listing the qualifications, schools, formal training, and experience of the field engineer.

Site Welding;

A letter listing the welder qualifying procedures for each welder, complete with supporting data such as test procedures used, what was tested to, and a list of the names of all welders and their qualifications symbols.

General Installation; G

A complete copy of the manufacturer's installation procedures. A detailed description of the manufacturer's recommended break-in procedure.

Site Visit;

A site visit letter stating the date the site was visited and listing discrepancies found.

SD-06 Test Reports

Onsite Inspection and Tests; G,

a. A letter giving notice of the proposed dates of all onsite inspections and tests at least 14 days prior to beginning tests.

b. A detailed description of the Contractor's proposed procedures for onsite tests including the test including the test plan and a listing of equipment necessary to perform the tests. Submission shall be at least 7 days prior to beginning tests.

c. Six copies of the onsite test data described below in 216 x 279 mm (8-1/2 x 11 inch) 3-ring binders with a separate section for each test. Sections shall be separated by dividers with tabs. Data plots shall be full size 216 x 279 mm (8-1/2 x 11 inches) minimum), showing all grid lines, with full resolution.

(1) A description of the procedures for onsite tests.

(2) A list of equipment used, with calibration certifications.

(3) A copy of measurements taken, with required plots and graphs.

(4) The date of testing.

(5) The parameters verified.

(6) The condition specified for the parameter.

(7) The test results, signed and dated.

(8) A description of all adjustments made.

#### SD-07 Certificates

##### Vibration Isolation; G

Torsional analysis including prototype testing or calculations, which certify and demonstrate that no damaging or dangerous torsional vibrations will occur when the prime mover is connected to the generator, at synchronous speeds, plus/minus 10%.

##### Prototype Tests;

Manufacturer's standard certification that prototype tests were performed for the generator model proposed.

##### Design Prototype Tests.

- Components of the emergency system, such as the engine/generator set, transfer switch, and accessories, shall not be subjected to prototype tests because the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests:
- Maximum power (kW).
- Maximum motor starting (kVA) at 35% instantaneous voltage dip.
- Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.6.
- Governor speed regulation under steady-state and transient conditions.
- Voltage regulation and generator transient response.
- Harmonic analysis, voltage waveform deviation, and telephone influence factor.
- Three-phase short circuit tests
- Alternator cooling air flow.
- Torsional analysis to verify that the generator set is free of harmful torsional stresses.
- Endurance testing.

##### Final Production Tests

- Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:
- Single-step load pickup
- Transient and steady-state governing
- Safety shutdown device testing
- Voltage regulation
- Rated Power @ 0.8 PF
- Maximum power
- A witness test or a certified test record sent prior to shipment.

#### Reliability and Durability; G

Documentation, which cites engines and generators in similar service to demonstrate compliance with the requirements of this specification. Certification does not exclude annual technological improvements made by a manufacturer in the basic standard model set on which experience was obtained, provided parts interchangeability has not been substantially affected and the current standard model meets all the performance requirements of this specification. For each different set, 2 like sets shall have performed satisfactorily in a stationary power application, independent and separate from the physical location of the manufacturer's and assembler's facilities, for a minimum of 2 consecutive years without any failure to start, including periodic exercise. The certification shall state that for the set proposed to meet this specification, there were no failures resulting in downtime for repairs in excess of 72 hours or any failure due to overheating during 2 consecutive years of service. Like sets are of the same model, speed, bore, stroke, number and configuration of cylinders, an output powers rating. Like generators are of the same model, speed, pitch, cooling, exciter, voltage regulator and output power rating. A list shall be provided with the name of the installations, completion dates, and name and telephone number of a point of contact.

#### Emissions; G

A certification from the engine manufacturer stating that the engine exhaust emissions meet federal, state, and local regulations and restrictions specified. At a minimum, this certification shall include emission factors for criteria pollutants including nitrogen oxides, carbon monoxide, particulate matter, sulfur dioxide, non-methane hydrocarbon, and for hazardous air pollutants (HAPs).

#### Sound limitations; G

A certification from the manufacturer stating that the sound emissions meet the specification.

#### Flywheel Balance; G

Manufacturer's certification that the flywheel has been statically and dynamically balanced and is capable of being rotated at 125% of rated speed without vibration or damage.

#### Materials and Equipment; G

A letter stating that where materials or equipment are specified to comply with requirements of UL, or other standards, written proof of such compliance has been obtained. The label or listing of the specified agency, or a written certificate from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of the specified agency are acceptable as proof.

#### Factory Inspection and Tests; G

A certification that each engine generator set passed the factory tests and inspections and a list of the test and inspections.

#### Inspections; G

A letter certifying that all facilities are complete and functional, that each system is fully functional, and that each item of equipment is complete, free from damage, adjusted, and ready for beneficial use.

#### Cooling System; G

Certification that the engine-generator set and cooling system function properly in the ambient temperatures

### 1.3 SYSTEM DESCRIPTION

Each engine-generator set shall be provided and installed complete and totally functional, with all necessary ancillary equipment to include air filtration; starting system; generator controls, protection, and isolation; instrumentation; lubrication; fuel system; cooling system; and engine exhaust system. Each engine generator set shall satisfy the requirements specified in the Engine Generator Parameter Schedule.

#### 1.3.1 Engine-Generator Parameter Schedule

- The generator set shall be a Kohler model \_\_\_\_\_ or an approved equal with a \_\_\_\_\_ alternator. It shall provide \_\_\_\_ kW/\_\_\_\_ kVA when operating at \_\_\_\_ volts, 60 Hz, .8 power factor. The generator set shall be capable of a Standby 130°C rating while operating in an ambient condition of less than or equal to 77° F and a maximum elevation of 7546 feet above sea level.
- Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying \_\_\_\_\_ LRKVA for starting motor loads with a maximum instantaneous voltage dip of 35%, as measured by a digital RMS transient recorder in accordance

with IEEE standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip i.e. engine, alternator, voltage regulator and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system. Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

- Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

### Engine

- The \_\_\_\_-cubic-inch displacement engine shall deliver a minimum of \_\_\_\_ HP at a governed engine speed of 1800 rpm, and shall be equipped with the following:
  - Electronic isochronous governor capable of 0.25% steady-state frequency regulation.
  - 12-volt positive-engagement solenoid shift-starting motor.
  - 70-ampere automatic battery charging alternator with a solid-state voltage regulation.
  - Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain.
  - Dry-type replaceable air cleaner elements for normal applications.
  - Engine-driven or electric fuel-transfer pump including fuel filter and electric solenoid fuel shutoff valve capable of lifting fuel.
  - The turbocharged engine shall be fueled by diesel.
  - The engine shall have a minimum of \_\_\_\_ cylinders and be liquid-cooled by Unit Mounted Radiator 122°F/50°C.
  - The engine shall be EPA certified from the factory.

### Alternator

- The alternator shall be salient-pole, brushless, 2/3-pitch, 12 lead, self-ventilated with drip-proof construction and amortisseur rotor windings and skewed for smooth voltage waveform. The ratings shall meet the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446 and the varnish shall be a fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to Standby 130°C. The excitation system shall be of brushless construction controlled by a solid-state voltage regulator capable of maintaining voltage within  $\pm 2.0\%$  at any constant load from 0% to 100% of rating. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.
- The alternator shall have a single maintenance-free bearing, designed for 40000 hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.
- The generator shall be inherently capable of sustaining at least 250% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.

#### ENGINE GENERATOR PARAMETER SCHEDULE

Service Load [\_\_\_\_\_] [kVA] [kW]

Power Factor .08

Motor Starting kVA (maximum) [\_\_\_\_\_] kVA

Maximum Speed 1800 rpm

Engine-Generator Application stand-alone

Engine Cooling Type water/ethylene glycol

Heat Exchanger Type fin-tube

Governor Type Isochronous

Frequency Bandwidth + 0.4% (steady state)

Voltage Regulation + 2% (max.) (No load to full load) Voltage Bandwidth + 0.5 (steady state)

Frequency 60 Hz

Voltage [\_\_\_\_\_] volts

Phases [3 Phase, Wye] [3 Phase, Delta] [1 Phase]

Minimum Generator 12% percent Sub transient Reactance

Nonlinear Loads [\_\_\_\_\_] kVA

Max Step Load Increase 100% of Service

Load at 0.8 PF

Max Step Load Decrease 100 % of Service Load at (without shutdown) 0.8 PF

Max Time to Start to 10 seconds to Assume Load

Max Summer Outdoor Temp 49 degrees C (Ambient)

Min Winter Outdoor Temp -30 degrees C (Ambient)

Installation Elevation 150M above sea level

### 1.3.2 Output Capacity

Each generator set shall provide power equal to the sum of service load plus the machine's efficiency loss and associated ancillary equipment loads. Rated output capacity shall also consider engine and/or generator over-sizing required to meet requirements in paragraph Engine-Generator Parameter Schedule.

### 1.3.3 Power Rating

Standby ratings shall be in accordance with EGSA 101P.

## 1.4 GENERAL REQUIREMENTS

### 1.4.1 Engine-Generator Set

Each set shall consist of one engine, one generator, and one exciter, mounted, assembled, and aligned on one base; and all other necessary ancillary equipment, which may be mounted separately. Sets shall be assembled and attached to the base prior to shipping. Set components shall be environmentally suitable for the locations shown and shall be the manufacturer's standard product offered in catalogs for commercial or industrial use. A generator strip heater shall be provided for moisture control when the generator is not operating.

#### 1.4.2 Nameplates

Each major component of this specification shall have the manufacturer's name, type or style, model or serial number, and rating number on a plate secured to the equipment. As a minimum, nameplates shall be provided for: Engines; Relays; Generators; Day tanks; Transformers (CT & PT); Regulators; Pumps and pump motors; Governors; Generator Breaker; Economizers; Heat exchangers (other than base-mounted).

Engines Relays

Generators Day tanks

Transformers (CT & PT) Regulators

Pumps and pump motors Governors

Generator Breaker Economizers

Heat exchangers (other than base-mounted)

Where the following equipment is provided as a standard component by the diesel-engine generator set manufacturer, the nameplate information may be provided in the maintenance manual in lieu of nameplates.

Battery charger Heaters

Exhaust mufflers Exciters

Switchgear Silencers

Battery

#### 1.4.3 Personnel Safety Device

Exposed moving parts, parts that produce high operating temperatures, parts which may be electrically energized, and parts that may be a hazard to operating personnel during normal operation shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. The safety devices shall be installed so that proper operation of the equipment is not impaired.

#### 1.4.4 Verification of Dimensions

Before performing work, the premises shall be visited and details of the work verified. The Contracting Officer shall be advised in writing of any discrepancies before performing any work.

#### 1.4.5 Conformance to Codes and Standards

Where equipment is specified to conform to requirements of any code or standard such as UL, the design, fabrication and installation shall conform to the code.

#### 1.4.6 Site Welding

Structural members shall be welded in accordance with Section 05090 WELDING, STRUCTURAL. For all other welding, procedures and welders shall be qualified in accordance with ASME BPVC SEC IX. Welding procedures qualified by others, and welders and welding operators qualified by a previously qualified employer may be accepted as permitted by ASME B31.1. Welder qualification tests shall be performed for each welder whose qualifications are not in compliance with the referenced standards. The Contracting Officer shall be notified 24 hours in advance of qualification tests. The qualification tests shall be performed at the work site if practical. The welder or welding

operator shall apply the assigned personal symbol near each weld made as a permanent record

#### 1.4.7 Engine Generator Set Enclosure Weather Enclosure

- All enclosures are to be constructed from high strength, low alloy steel, aluminum or galvanized steel.
- The enclosure shall be finish coated with powder baked paint for superior finish, durability, and appearance. Enclosures will be finished in the manufacturer's standard color.
- The enclosures must allow the generator set to operate at full load in an ambient temperature of 40 - 45°C with no additional derating of the electrical output.
- Enclosures must be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirements are two doors per side. When the generator set controller faces the rear of the generator set, an additional rear facing door is required. Access to the controller and main line circuit breaker must meet the requirements of the National Electric Code.
- Doors must be hinged with stainless steel hinges and hardware and be removable.
- Doors must be equipped with lockable latches. Locks must be keyed alike.
- The enclosure roof must be pitched to prevent accumulation of water
- A duct between the radiator and air outlet must be provided to prevent re-circulation of hot air.
- The complete exhaust system shall be internal to the enclosure or optional with external mounted silencer
- The critical silencer shall be insulated with a tailpipe and rain cap

#### SOUND LIMITATIONS.

##### 1.4.8 Vibration Isolation

The maximum engine-generator set vibration in the horizontal, vertical and axial directions shall be limited to 0.15 mm (6 mils) peak-peak RMS with an overall velocity limit of 24 mm/seconds 0.95 inches/seconds RMS, for all speeds through 110% of rated speed. The engine-generator set shall be provided with vibration-isolation in accordance

with the manufacturer's standard recommendation. Where the vibration-isolation system does not secure the base to the structure floor or unit foundation, seismic restraints shall be provided in accordance with the seismic parameters specified.

#### 1.4.9 Experience

Each component manufacturer shall have a minimum of 3 years experience in the manufacture, assembly and sale of components used with stationary diesel engine-generator sets for commercial and industrial use. The engine-generator set manufacturer/assembler shall have a minimum of 3 years experience in the manufacture, assembly and sale of stationary diesel engine-generator sets for commercial and industrial use.

#### 1.4.10 Field Engineer

The engine-generator set manufacturer or assembler shall furnish a qualified field engineer to supervise the complete installation of the engine-generator set, assist in the performance of the onsite tests, and instruct personnel as to the operational and maintenance features of the equipment. The field engineer shall have attended the engine-generator manufacturer's training courses on installation and operation and maintenance for engine generator sets.

#### 1.4.11 Seismic Requirements

Seismic requirements shall be in accordance with Sections 13080 SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT, 15070 SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT and 16070 SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT [as shown on the drawings]. All emergency/standby generators shall be mounted on spring isolators rated for seismic zone "C".

### 1.5 STORAGE AND INSTALLATION

The Contractor shall properly protect material and equipment in procedures, before, during, and after installation. Stored items shall be protected from the weather and contamination. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

### 1.6 OPERATION AND MAINTENANCE MANUALS

The operation and maintenance manuals shall be submitted and approved prior to commencing onsite tests.

#### 1.6.1 Operation Manual

Three copies of the manufacturer's standard maintenance manual. (All available manuals)

a. Procedures for each routine maintenance item. Procedures for troubleshooting. Factory-service, takedown overhaul, and repair service manuals, with parts lists.

b. The manufacturer's recommended maintenance schedule.

c. A component list, which includes the manufacturer's name, address, type or style, model or serial number, rating, and catalog number for the major components, listed in paragraph GENERAL REQUIREMENTS.

d. A list of spare parts for each piece of equipment and a complete list of materials and supplies needed for operation.

e. One hard copy of each manual and 2 complete copies of CD's shall be permitted instead of 3 hard copies.

#### 1.6.1 Deleted

#### 1.6.2 Maintenance Manual

Three copies of the [manufacturers standard maintenance manual] [maintenance manual containing the information described below in 216 x 279 mm (8-1/2 x 11 inch) three-ring binders shall be provided. Each section shall be separated by a heavy plastic divider with tabs. Drawings shall be folded, with the title block visible, and placed in plastic pockets with reinforced holes].

a. Procedures for each routine maintenance item. Procedures for troubleshooting. Factory-service, overhaul, and repair service manuals, with parts lists.

b. The manufacturer's recommended maintenance schedule.

c. A component list, which includes the manufacturer's name, address, type or style, model or serial number, rating, and catalog number for the major components, listed in paragraph GENERAL REQUIREMENTS.

d. A list of spare parts for each piece of equipment and a complete list of materials and supplies needed for operation.

### 1.7 SPECIAL TOOLS AND FILTERS

Two sets of special tools and two sets of filters required for maintenance shall be provided. Special tools are those that only the manufacturer provides, for special purposes, or to reach otherwise inaccessible parts this also includes, software, firmware, hardware, cables and connectors and an electronic device capable of programming, diagnostic trouble shooting, memory of not less than 80gb if required for re-programming of any component. One handset shall be provided for each electronic governor when required to indicate and/or change governor response settings. Two complete sets of filters shall be supplied in a suitable storage box. These filters shall be in addition to filters replaced after testing.

## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall be as specified.

2.1.1 Circuit Breakers, Low Voltage  
NEMA AB 1, UL 489, and NEMA SG 3.

2.1.2 Filter Elements (Fuel-oil, Lubricating-oil, and Combustion-air)  
Manufacturer's standard.

2.1.3 Instrument Transformers  
ANSI C12.11.

2.1.4 Pipe (Sleeves, Fuel/Lube-oil, Compressed-Air, Coolant and Exhaust) ASTM A 53/A 53M, ASTM A 106 or ASTM A 135, steel pipe. Pipe smaller than 50 mm (2 inches) shall be Schedule 80. Pipe 50 mm (2 inches) and larger shall be Schedule 40.

2.1.5 Pipe Flanges and Fittings

a. Pipe Flanges and Flanged Fittings: ASTM A 181/A 181M, Class 60, or ASME B16.5, Grade 1, Class 150.

b. Pipe Welding Fittings: ASTM A 234/A 234M, Grade WPB or WPC, Class 150, or ASME B16.11, 1360.7 kg. (3000 lb.)

c. Threaded Fittings: ASME B16.3, Class 150.

d. Valves: MSS SP-80, Class 150.

e. Gaskets: Manufacturers Standard.

2.1.6 Pipe Hangers  
MSS SP-58 and MSS SP-69.

2.1.7 Electrical Enclosures

2.1.7.1 General  
NEMA ICS 6.

2.1.7.2 Panel-boards  
NEMA PB 1.

2.1.8 Electric Motors

Electric motors shall conform to the requirements of NEMA MG 1. Motors shall have sealed ball bearings, a maximum speed of 1800 rpm and integral automatic or manual reset thermal overload protectors. Motors used indoors shall have drip proof frames; those used outside shall be totally enclosed. AC motors larger than 373 W (1/2 Hp) (1/2 Hp) shall be of the squirrel cage induction type for standard voltage of 460 volts, 60 Hz three phase power. AC motors 373 W (1/2 Hp) (1/2 Hp) or smaller, shall be for standard voltage 115 volts, 60 Hz single-phase power.

2.1.9 Motor Controllers Motor controllers and starters shall conform to the requirements of NFPA 70 and NEMA ICS 2.

## 2.2 ENGINE

Each engine shall operate on No. 2-D diesel conforming to ASTM D 975, shall be designed for stationary applications and shall be complete with ancillaries. The engine shall be a standard production model described in the manufacturer's catalog. The engine shall, supercharged or turbocharged. The engine shall be four-stroke-cycle and compression-ignition type. The engine shall be vertical inline, V-, or opposed-piston type, with a solid cast block or individually cast cylinders. The engine shall have a minimum of two cylinders. Opposed-piston type engines shall have no less than four cylinders. Each block shall have a coolant drain port. Each engine shall be equipped with an over-speed sensor.

## 2.3 FUEL SYSTEM

The fuel system for each engine generator set shall conform to the requirements of NFPA 30 and NFPA 37 and contain the following elements.

### 2.3.1 Pumps

#### 2.3.1.1 Main Pump

Each engine shall be provided with an engine driven pump. The pump shall supply fuel at a minimum rate sufficient to provide the amount of fuel required to meet the performance indicated within the parameter schedule. The fuel flow rate shall be based on meeting the load requirements and all necessary re-circulation.

#### 2.3.1.2 Auxiliary Fuel Pump

Auxiliary fuel pumps shall be provided to maintain the required engine fuel pressure, either required by the installation or indicated on the drawings. The auxiliary pump shall be driven by a dc electric motor powered by the starting/station batteries. The auxiliary pump shall be automatically actuated by a pressure-detecting device.

### 2.3.2 Filter

A minimum of one full flow fuel filter shall be provided for each engine. The filter shall be readily accessible and capable of being changed without disconnecting the piping or disturbing other components. The filter shall have inlet and outlet connections plainly marked.

### 2.3.3 Relief/Bypass Valve

A relief/bypass valve shall be provided to regulate pressure in the fuel supply line, return excess fuel to a return line, and prevent the build-up of excessive pressure in the fuel system.

### 2.3.4 Day Tank

Each engine shall be provided with a separate self-supporting day tank if required. Each day tank shall be provided with connections for fuel supply line, fuel return line, fuel overflow line, local fuel fill port, gauge, vent line, drain line, and float switch assembly for control. A fuel return line cooler shall be provided as recommended by the manufacturer and assembler. The temperature of the fuel returning to the day tank shall be below the flash point of the fuel. A temperature-sensing device shall be installed in the fuel supply line.

#### 2.3.4.1 Capacity

Each tank shall have capacity to supply fuel to the engine for an uninterrupted 2-hour period at 100% rated load without being refilled or 25 gallons, whichever is recommended or specified.

#### 2.3.4.2 Local Fuel Fill

Each local fuel fill port on the day tank shall be provided with a screw-on cap.

#### 2.3.4.3 Fuel Level Controls

a. Each tank shall have a float-switch assembly to perform the following functions:

(1) Activate the "Low Fuel Level" alarm at 70% of the rated tank capacity.

(2) Activate the "Overfill Fuel Level" alarm at 95% of the rated tank capacity.

#### 2.3.4.4 Arrangement

Gravity flow tanks and any tank that allows a fuel level above the fuel injectors shall be provided with an internal or external factory installed valve located as near as possible to the shell of the tank. The valve shall close when the engine is not operating.

#### 2.3.5.1 Capacity, Standby

Each day tank shall have capacity to supply fuel to the engine for an uninterrupted 2-hour period at 100% rated load without being refilled, plus any fuel, which may be returned to the main fuel storage tank. The calculation of the capacity of each day tank shall incorporate the requirement to stop the supply of fuel into the day tank at 90% of the ultimate volume of the tank.

#### 2.3.5.2 Drain Line

Each day tank drain line shall be accessible and equipped with a shutoff valve. Self-supporting day tanks shall be arranged to allow drainage into a 305 mm (12 inch) tall bucket.

#### 2.3.5.3 Local Fuel Fill

Each local fuel fill port on the day tank shall be provided with a screw-on cap.

#### 2.3.5.4 Fuel Level Controls

a. Each day tank shall have a float-switch-assembly to perform the following functions:

(1) Activate the "Overfill Fuel Level" alarm at 95% of the rated tank volume.

(2) Activate the "Low Fuel Level" alarm at 70% of the rated tank Capacity.

### 2.3.5.5 Arrangement

Day tanks may allow gravity flow into the engine. Gravity flow tanks shall be provided with an internal or external valve located as near as possible to the shell of the tank. The valve shall close when the engine is not operating. Day tanks shall be provided with any necessary pumps to supply fuel to the engine as recommended by the generator set manufacturer. The fuel supply line from the day tank to the manufacturer's standard engine connection shall be threaded pipe.

### 2.3.6 Fuel Supply System

The fuel supply from the main storage of fuel to the day tank shall be as specified in Section 13202 FUEL STORAGE SYSTEMS.

#### Double Wall Secondary Containment Sub Base Fuel Tank

- A sub base fuel tank used in conjunction with a diesel powered generator set of \_\_\_kW will contain \_\_\_ gallons of fuel to support the generator set for a period of 48 hours at 100% of rated load and 72 hours at 75% of rated load.
- The sub base fuel system is listed under UL 142, subsection entitled Special Purpose Tanks EFVT category, and will bear their mark of UL Approval according to their particular classification.
- The above ground steel secondary containment rectangular tank for use as a sub base for diesel generators is manufactured and intended to be installed in accordance with the Flammable and Combustible Liquids Code—NFPA 30, the Standard for Installation and Use of Stationary Combustible Engine and Gas Turbines—NFPA 37, and Emergency and Standby Power Systems—NFPA 110.
- Primary Tank. It will be rectangular in shape and constructed in clam shell fashion to ensure maximum structural integrity and allow the use of a full throat fillet weld. The Primary Tank shall not exceed 18 inches in height.
- Steel Channel Support System. Reinforced steel box channel for generator support, with a load rating of 5,000 lbs. per generator mounting hole location. Full height gussets at either end of channel and at generator mounting holes shall be utilized.
- Exterior Finish. The exterior coating has been tested to withstand continuous salt spray testing at 100 percent exposure for 244 hours to a 5 percent salt solution at 92-97° F. The coating has been subjected to full exposure humidity testing to 100 percent humidity at 100° F for 24 hours. Tests are to be conducted in accordance with The American Standard Testing Methods Society.

- Venting. Normal venting shall be sized in accordance with the American Petroleum Institute Standard No 2000, Venting Atmospheric and Low Pressure Storage Tanks not less than 1-1/4" (3 cm.) nominal inside diameter.
- Emergency Venting. The emergency vent opening shall be sized to accommodate the total capacity of both normal and emergency venting and shall be not less than that derived from NFPA 30, table 2-8, and based on the wetted surface area of the tank. The wetted area of the tank shall be calculated on the basis of 100 percent of the primary tank. The vent is spring-pressure operated: opening pressure is 0.5/psig and full opening pressure is 2.5 psig. The emergency relief vent is sized to accommodate the total venting capacity of both normal and emergency vents.
- Fuel Fill. There shall be a 2" NPT opening within the primary tank and lockable manual fill cap.
- Fuel Level. A direct reading, UL listed, magnetic fuel level gauge with a hermetically sealed vacuum tested dial shall be provided to eliminate fogging
- Low Fuel Level Switch. Consists of a 30 watt float switch for remote or local annunciation of a (50% standard) low fuel level condition.

## 2.4 LUBRICATION

Each engine shall have a separate lube-oil system conforming to NFPA 30 and NFPA 37. Each system shall be pressurized by engine-driven oil pumps. Each system shall be furnished with a relief valve for oil pressure regulation (for closed systems) and a dipstick for oil level indications. The crankcase shall be vented in accordance with the manufacturer's recommendation except that it shall not be vented to the engine exhaust system. Crankcase breathers, if provided on engines installed in buildings or enclosures, shall be piped to vent to the outside. The system shall be readily accessible for service such as draining, refilling, etc. Each system shall permit addition of oil and have oil-level indication with the set operating. The system shall utilize an oil cooler as recommended by the engine manufacturer.

### 2.4.1 Filter

One full-flow filter shall be provided for each pump. The filter shall be readily accessible and capable of being changed without disconnecting the piping or disturbing other components. The filter shall have inlet and outlet connections plainly marked.

### 2.4.2 Lube-Oil Sensors

Each engine shall be equipped with lube-oil pressure sensors. Pressure sensors shall be located downstream of the filters and provide signals for required indication and alarms.

## 2.5 COOLING SYSTEM

Each engine cooling system shall operate automatically while the engine is running. Each cooling system shall be sized for the maximum summer outdoor design temperature and site elevation. Water-cooled system coolant shall use a combination of water and ethylene-glycol sufficient for freeze protection at the minimum winter outdoor temperature specified. The maximum temperature rise of the coolant across the engine shall be no more than that recommended and submitted in accordance with paragraph SUBMITTALS.

#### 2.5.1 Coolant Pumps

Coolant pumps shall be the centrifugal type. Each engine shall have an engine-driven primary pump. Secondary pumps shall be electric motor driven and have automatic controllers.

#### 2.5.2 Deleted

##### 2.5.2.1 Fin-Tube-Type Heat Exchanger (Radiator)

Heat exchanger may be factory coated with corrosive resistant film providing that corrosion measures are taken to restore the heat rejection capability of the radiator to the initial design requirement via over-sizing, or other compensating methods. Internal surfaces shall be compatible with liquid fluid coolant used. Materials and coolant are subject to approval by the Contracting Officer. Heat exchangers shall be pressure type incorporating a pressure valve, vacuum valve and a cap. Caps shall be designed for pressure relief prior to removal. Each heat exchanger and the entire cooling system shall be capable of withstanding a minimum pressure of 48-kPa gauge (7 psi). (7 psi.) Each heat exchanger shall be protected with a strong grille or screen guard. Each heat exchanger shall have at least two tapped holes. One tapped hole in the heat exchanger shall be equipped with a drain cock, the rest shall be plugged.

#### 2.5.3 Expansion Tank

The cooling system shall include an air expansion tank, which will accommodate the expanded water of the system generated within the normal operating temperature range, limiting the pressure increase at all components in the system to the maximum allowable pressure at those components. The tank shall be suitable for an operating temperature of 121 degrees C (250 degrees F) and a working pressure of 0.86 MPa (125 psi). (125 psi.) The tank shall be constructed of welded steel, tested and stamped in accordance with ASME BPVC SEC VIII D1 for the stated working pressure. A bladder type tank shall not be used. Steel legs or bases for vertical installation shall support the tank.

#### 2.5.5 Temperature Sensors

Each engine shall be equipped with coolant temperature sensors. Temperature sensors shall provide signals for pre-high and high indication and alarms.

2.6 SOUND LIMITATIONS The noise generated by the diesel generator set operating at 100 percent load shall not exceed the following sound pressure levels in any of the

indicated frequencies when measured in a free field at a radial distance of 7 meters (22.9 feet) at 45 degrees apart in all directions.

Frequency Band Maximum Acceptable

(Hz) Pressure Level

(Decibels)

31 [ 81 ]

63 [ 77 ]

125 [ 71 ]

250 [ 64 ]

500 [ 58 ]

1,000 [ 55 ]

2,000 [ 54 ]

4,000 [ 54 ]

8,000 [ 56 ]

## 2.7 AIR INTAKE EQUIPMENT

Filters and silencers shall be provided in locations that are convenient for servicing. The silencer shall be of the high-frequency filter type, located in the air intake system as recommended by the engine manufacturer. Silencer shall be capable of reducing the noise level at the air intake to a point below the maximum acceptable levels specified in paragraph SOUND LIMITATIONS. A combined filter-silencer unit meeting requirements for the separate filter and silencer items may be provided. Expansion elements in air-intake lines shall be rubber.

## 2.8 EXHAUST SYSTEM

The system shall be separate and complete for each engine. Piping shall be supported so as to minimize vibration. Where a V-type engine is provided, a V-type connector with necessary flexible sections and hardware shall connect the engine exhaust outlets.

### 2.8.1 Flexible Sections and Expansion Joints

A flexible section at each engine and an expansion joint at each muffler shall be provided. Flexible sections and expansion joints shall have flanged connections. Flexible sections shall be made of convoluted seamless tube without joints or packing. Expansion joints shall be the bellows type. Expansion and flexible elements shall be stainless steel suitable for diesel-engine exhaust gas at the maximum exhaust temperature that is specified by the engine manufacturer. Expansion and flexible elements shall be capable of absorbing vibration from the engine and compensation for thermal expansion and contraction.

### 2.8.2 Exhaust Muffler

A chamber type exhaust muffler shall be provided. The muffler shall be constructed of welded steel and designed for [outside] [inside] [vertical] [horizontal] mounting. Eyebolts, lugs, flanges, or other items shall be provided as necessary for support in the location and position indicated. Pressure drop through the muffler shall not exceed the

recommendations of the engine manufacturer. Outside mufflers shall be zinc coated or painted with high temperature 204 degrees C (400 degrees F) resisting paint. The muffler and exhaust piping together shall reduce the noise level to less than the maximum acceptable level listed for sound limitations in paragraph SOUND LIMITATIONS. The muffler shall have a drain valve, nipple, and cap at the low-point of the muffler.

### 2.8.3 Exhaust Piping

Exhaust muffler shall be provided for each engine, size and type as recommended by the generator set manufacturer. A chamber type exhaust muffler shall be provided. The muffler shall be constructed of welded steel and designed for outside horizontal mounting. Eyebolts, lugs, flanges, or other items shall be provided as necessary for support in the location and position indicated. Pressure drop through the muffler shall not exceed the recommendations of the engine manufacturer. Outside mufflers shall be zinc coated or painted with high temperature, 204o C resisting paint. The muffler and exhaust piping together shall reduce the noise level to less than the maximum acceptable level listed for sound limitations. The muffler shall have a drain valve, nipple, and cap at the low-point of the muffler.

A flexible section at each engine and an expansion joint at each muffler shall be provided. Flexible sections and expansion joints shall have flanged connections. Flexible sections shall be made of convoluted seamless tube without joints or packing. Expansion joints shall be the bellows type.

Expansion and flexible elements shall be stainless steel suitable for diesel engine exhaust gas at the maximum exhaust temperature that is specified by the engine manufacturer. Expansion and flexible elements shall be capable of absorbing vibration from the engine and compensation for thermal expansion and contraction.

Exhaust Piping: Horizontal sections of exhaust piping shall be sloped downward away from the engine to a condensate trap and drain valve. Changes in direction shall be long-radius. Exhaust piping shall be provide with a hinged gravity operated, self-closing rain cover.

## 2.9 EMISSIONS

The finished installation shall comply with Federal, state, and local regulations and restrictions regarding the limits of emissions.

## 2.10 STARTING SYSTEM

The starting system for standby engine generator sets used in emergency applications shall be in accordance with NFPA 99 and NFPA 110 and as follows

### 2.10.1 Controls

#### Generator Set Controller:

- The generator set controller shall be a microprocessor based control system that will provide automatic starting, system monitoring and protection. The controller

system shall also provide local monitoring and remote monitoring. The control system shall be capable of PC based updating of all necessary parameters, firmware and software.

- The controller shall be mounted on the generator set and shall have integral vibration isolation. The controller shall be prototype and reliability tested to ensure operation in the conditions encountered.

### Controller Buttons, Display and Components

- The generator set controller shall include the following features and functions:

- Push button Master Control buttons. The buttons shall be tactile-feel membrane with an indicator light to initiate the following functions:

Run Mode: When in the run mode the generator set shall start as directed by the operator.

Off/Reset Mode: When in the Off/Reset mode the generator set shall stop, the reset shall reset all faults, allowing for the restarting of the generator set after a shutdown.

Auto Mode: When in Auto the mode the generator set shall be te device.

- Push button Master Control buttons. The buttons shall be tactile-feel membrane with an indicator light to initiate the following functions:

Run Mode: When in the run mode the generator set shall start as directed by the operator.

Off/Reset Mode: When in the Off/Reset mode the generator set shall stop, the reset shall reset all faults, allowing for the restarting of the generator set after a shutdown.

Auto Mode: When in Auto the mode the generator set shall be ready to accept a signal from a remote device.

- Emergency Stop Switch. The remote stop switch shall be red in color with a "mushroom" type head. Depressing the stop button will immediately stop the generator set and lockout the generator set for any automatic remote starting.

- Push Button/Rotary Selector dial. This dial shall be used for selection of all Menus and sub-menus. Rotating the dial moves you through the menus, pushing the dial selects the menu and function/features in that menu. Pushing the button selects the feature/function and sub-menus.

- Digital Display. The digital display shall be alphanumeric, with 2 lines of data and approximately 24 characters. The display shall have back

lighting for ease of operator use in high and low light conditions. The display shall display status of all faults and warnings. The display shall also display any engine faults. While the generator set is running the display shall scroll all important information across the screen for ease of operator use. The scroll can be stopped by pushing the rotary dial. The display shall fall asleep when the generator set is not running and will wake-up when the generator set starts or the rotary dial is depressed.

- Fault Light. The controller shall have an annunciator fault light that glows red for faults and yellow for warnings. These faults and warnings shall be displayed in the digital display. The fault light will also glow yellow when not in AUTO.
- Alarm Horn. The controller shall provide an alarm horn that sounds when any faults or warnings are present. The horn shall also sound when the controller is not in the AUTO mode.
- Alarm Silence/Lamp Test Button. When this button is depressed it shall test all controller lamps. This button will also silence the alarm horn when the unit is not AUTO.
- USB Connection. The controller shall have a USB connection on the face of the controller. This connection shall allow for updating of all software and firmware. This port shall also allow for all servicing of generator set parameters, fault diagnostics and viewing of all controller information via use a laptop computer.
- Dedicated user inputs. The controller shall have dedicated inputs for remote emergency stop switch, remote 2 wire star for transfer switch and auxiliary shutdown.
- The controller shall have auto resettable circuit protection integral on the circuit board.

#### System Controller Monitoring and Status Features and Functions

- The generator controller shall display and monitor the following engine and alternator functions and allow adjustments of certain parameters at the controller
- Overview menu
  1. Active shutdowns and warnings shall be displayed if present and without the need of operator interface.
  2. Engine runtime with total hours
  3. Average line to line voltage

4. Coolant temperature
5. Fuel level or pressure
6. Oil pressure
7. Battery voltage
8. Software version
9. Frequency
10. Average current

- Engine metering menu

1. Engine speed
2. Oil pressure
3. Coolant temperature
4. Battery voltage

- Generator metering menu

1. Total power in VA
2. Total power in W
3. Rated power % used
4. Voltage L-L and L-N for all phases
5. Current L1, L2, L3
6. Frequency

- Generator set information

1. Generator set model number
2. Generator set serial number
3. Controller set number

- Generator set run time

1. Engine run time total hours
2. Engine loaded total hours
3. Number of engine starts
4. Total energy in kW

- Generator set system

1. System voltage
2. System frequency 50/60Hz
3. System phase, single/three phase

4. Power rating kW
5. Amperage rating
6. Power type standby/prime
7. Measurement units, metric/English units adjustable
8. Alarm silence, always or auto only

- Generator set Calibration; the following are adjustable at the controller

1. Voltage L-L and L-N all phases
2. Current L1, L2, L3
3. Reset all calibrations

- Voltage regulation, +/-0.5% regulation, the following is adjustable at the controller

1. Voltage Adjustable +/- 10%

- Digital and Analog Inputs and outputs

1. Displays settings and status

- Event Log

1. Stores event history, up to 1000 events

#### Controller Engine control features and functions

- Automatic restart - the controller has automatic restart feature which initiates the start routine and re-crank after a failed start attempt.
- Cyclic cranking - the controller shall have programmable cyclic cranking
- Engine starting aid - the controller shall have the capability of providing control for an optional engine starting aid.
- The control system shall include time delays for engine start and cool down.
- The control system shall interface with the engine ECM and display engine fault codes and warnings. The ECM shall also include sender failure monitoring to help distinguish between failed senders and

actual failure conditions.

- The controller shall monitor and display engine governor functions with include steady state and transient frequency monitoring.

#### Controller Alternator control features and functions

- Integrated hybrid voltage regulator. The system shall have integral microprocessor based voltage regulator system that provides +/- 5% voltage regulation, no-load to full load with three phase sensing. The system is prototype tested and control variation of voltage to frequency. The voltage regulator shall be adjustable at the controller with maximum +/- 10% adjustable of nominal voltage.
- AC output voltage regulator adjustment. The system shall allow for adjustment of the integral voltage regulator with maximum of +/- 10% adjustment of the system voltage.
- Alternator thermal overload protection. The system shall have integral alternator overload and short circuit protection matched to each alternator for the particular voltage and phase configuration.
- Power metering. The controller digitally displays power metering of kW and kVA.

#### Other control features and functions

- Event logging. The controller keeps a record of up to 1000 events, for warning and shutdown faults. This fault information becomes a stored record of systems events and can be reset.
- Historical data logging. The controllers' total number of generator set successful start shall be recorded and displayed.
- Programmable access. The control system shall include a USB port that gives service technicians the ability to provide software and firmware upgrades. The system shall also be capable of allowing setting of all critical parameters using the service software and a laptop computer. All parameters and setting should be capable to being stored on a laptop for future upgrades of printing for analysis.

## Generator Set Warning, Shutdown Alarm and Status

- The generator set shall have alarms and status indication lamps that show non-automatic status and warning and shutdown conditions. The controller shall indicate with a warning lamp and or alarm and on the digital display screen any shutdown, warning or engine fault condition that exists in the generator set system. The following alarms and shutdowns must exist as a minimum:

- Engine functions

1. Critical high fuel level (alarm)
2. ECM communication loss (shutdown)
3. ECM diagnostics (alarm & shutdown)
4. Engine over speed (shutdown)
5. Engine start aid active
6. Engine under speed (shutdown)
7. Fuel tank leak (alarm & shutdown)
8. High DC battery voltage (alarm)
9. High coolant temperature (alarm & shutdown)
10. High fuel level (alarm)
11. Low DC battery voltage (alarm)
12. Low coolant level (shutdown)
13. Low coolant temperature (alarm)
14. Low cranking voltage (alarm)
15. Low engine oil level (alarm & shutdown)
16. Low fuel level (alarm & shutdown)
17. Low fuel pressure (alarm)
18. Low oil pressure (alarm & shutdown)
19. No coolant temperature signal (shutdown)
20. No oil pressure signal (shutdown)
21. Over crank (shutdown)
22. Speed sensor fault (alarm)

- Generator functions

1. AC sensing loss over & under current (alarm & shutdown)
2. Alternator protection (shutdown)
3. Ground fault input (alarm)
4. kW overload (shutdown)
5. Locked rotor (shutdown)
6. Over-frequency (shutdown)
7. Over AC voltage (shutdown)
8. Under-frequency (shutdown)
9. Under AC voltage (shutdown)
10. Emergency stop (shutdown)

- Other General functions

1. Battery charger fault (alarm)
2. Common fault (shutdown)
3. Common warning (alarm)
4. Master switch not in auto (alarm)
5. Generator running
6. Input/output fault (alarm)

- The generator set controller shall also be capable of meeting all necessary NFPA 110 level 1 requirements which include several of the above along with; EPS supplying load, Master switch not in auto and contacts for local and remote common alarm.

#### 2.10.2 Capacity

The starting system shall be of sufficient capacity, at the maximum outdoor summer temperature specified to crank the engine without damage or overheating. The system shall be capable of providing a minimum of three cranking periods with 15-second intervals between cranks. Each cranking period shall have a maximum duration of 15 seconds.

#### 2.10.3 Functional Requirements

Starting system shall be manufacturers recommended dc system utilizing a negative circuit ground. Starting motors shall be in accordance with SAE ARP 892.

#### 2.10.4 Battery

A starting battery system shall be provided and shall include the battery, battery rack, inter-cell connectors, and spacers. The battery shall be in accordance with SAE J 537. Critical system components (rack, protection, etc.) shall be sized to withstand the seismic acceleration forces specified. The battery shall be lead-acid non-maintenance type, with sufficient capacity, at the minimum outdoor winter temperature specified to provide the specified cranking periods. Valve-regulated lead-acid batteries are not acceptable.

#### 2.10.5 Battery Charger

A 10-amp voltage regulated battery charger shall be provided for each engine generator set. Charger may be mounted in an automatic transfer switch if desired. Chargers shall not be mounted on the generator set. Charger shall be equipped with float, taper and equalize charge settings. Operations monitors shall provide visual output along with individual from C contacts rated at 4-amps, 120 VAC, 30 VDC from remote indication of:

Loss of AC power - RED Light

Low battery voltage - RED Light

High battery voltage - RED Light

Power ON - GREEN Light (no relay contact)

#### 2.10.6 Starting Aids

The manufacturer shall provide one or more of the following methods to assist engine starting.

##### 2.10.6.1 Deleted

##### 2.10.6.2 Jacket-Coolant Heaters

A thermostatically controlled electric heater shall be mounted in the engine coolant jacketing to automatically maintain the coolant within plus or minus 3 degrees of the control temperature. The heater shall operate independently of engine operation so that starting times are minimized. The control temperature shall be the temperature recommended by the engine manufacturer to meet the starting time specified.

#### 2.11 GOVERNOR

Each engine shall be provided with a governor, which maintains the frequency within a bandwidth of the rated frequency, over a steady-state load range of zero to 100% of rated output capacity. The governor shall be configured for safe manual adjustment of the speed/frequency during operation of the engine generator set, without special tools, from 90 to 110 % of the rated speed/frequency, over a steady state load range of zero to 100% of rated capacity. Isochronous governors shall maintain the midpoint of the frequency bandwidth at the same value for steady-state loads over the range of zero to 100% of rated output capacity

#### 2.12 GENERATOR

Each generator shall be of the synchronous type, one or two bearing, conforming to NEMA MG 1, equipped with winding terminal housings in accordance with NEMA MG 1, equipped with an amortisseur winding, and directly connected to the engine. Insulation shall be Class H standby rating at a minimum of 130 o C temperature rise. Generator design shall protect against mechanical, electrical and thermal damage due to vibration, 25 percent over-speeds, or voltages and temperatures at a rated output capacity of 100 percent. Generator ancillary equipment shall meet the short circuit requirements of NEMA MG 1. Frames shall be the drip-proof type.

##### 2.12.1 Current Balance

At 100 percent rated load, and load impedance equal for each of the three phases, the permissible current difference between any two phases shall not exceed 2 percent of the largest current on either of the two phases.

##### 2.12.2 Voltage Balance

At any balanced load between 75 and 100 percent of rated load, the difference in line-to-neutral voltage among the three phases shall not exceed 1 percent of the average line-to-neutral voltage. For a single-phase load condition, consisting of 25 percent load

at unity power factor placed between any phase and neutral with no load on the other two phases, the maximum simultaneous difference in line-to-neutral voltage between the phases shall not exceed 3 percent of rated line to neutral voltage. The single-phase load requirement shall be valid utilizing normal exciter and regulator control. The interpretation of the 25 percent load for single-phase load conditions means 25 percent of rated current at rated phase voltage and unity power factor.

### 2.12.3 Waveform

The deviation factor of the line-to-line voltage at zero load and at balanced full rated load at 0.8 power factor shall not exceed 10%. The RMS of all harmonics shall be less than 5.0% and that of any one harmonic less than 3.0% at full rated load. Each engine-generator shall be designed and configured to meet the total harmonic distortion limits of IEEE Std 519.

### 2.13 EXCITER

The generator exciter shall be of the brushless type. Semiconductor rectifiers shall have a minimum safety factor of 300% for peak inverse voltage and forward current ratings for all operating conditions, including 110% generator output at 40 degrees C (104 degrees F) ambient. The exciter and regulator in combination shall maintain generator-output voltage within the limits specified.

### 2.14 VOLTAGE REGULATOR

Each generator shall be provided with a solid-state voltage regulator, separate from the exciter. The regulator shall maintain the voltage within a bandwidth of the rated voltage, over a steady-state load range of zero to 100% of rated output capacity. Regulator shall be configured for safe manual adjustment of the engine generator voltage output without special tools, during operation from 90 to 110% of the rated voltage over the steady state load range of zero to 100% of rated output capacity. Regulation drift shall not exceed plus or minus 0.5% for an ambient temperature change of 20 degrees C. (36 degrees F.)

#### 2.14.1 Steady State Performance (Regulation or Voltage Droop).

The voltage regulator shall have a maximum droop of 2% of rated voltage over a load range from 0 to 100% of rated output capacity and automatically maintain the generator output voltage within the specified operational bandwidth.

### 2.15 GENERATOR PROTECTION

Short circuit and overload protection for the generator shall be provided. The generator circuit breaker (IEEE Device 52) ratings shall be consistent with the generator rated voltage and frequency, with continuous, short circuit and interrupting current ratings to match the generator capacity. The manufacturer shall determine the short circuit current interrupting rating of the breaker. The breaker shall be engine generator base mounted by the engine-generator set manufacturer. UL listed molded case thermal magnetic type rated at [\_\_\_\_] amps, [\_\_\_\_] pole, and [\_\_\_\_] volts. Each breaker shall be provided with shunt trip and wired to the engine fault conditions. Field circuit breakers shall not be

acceptable for generator over-current protection. Surge protection shall be provided for each phase of the generator, to be mounted at the generator terminals.

#### 2.15.1 Panel-boards

Panel-boards shall be metal-enclosed, general purpose, [3-phase, 4-wire], [1-phase, 3-wire], [600][\_\_\_\_\_] volt rated, with neutral bus and continuous ground bus, conforming to NEMA PB 1 and UL 891. Neutral bus and ground bus capacity shall be [as shown][full capacity]. Enclosure designs, construction, materials and coatings shall be [as indicated][suitable for the application and environment]. Bus continuous current rating shall be [at least equal to the generator rating and correspond to UL listed current ratings specified for panel boards and switchboards][as indicated]. Current withstand rating (short circuit rating) shall match the generator capacity. Buses shall be copper.

#### 2.15.2 Devices

Switches, circuit breakers, switchgear, fuses, relays, and other protective devices shall be as specified in Section 16475 COORDINATED POWER SYSTEM PROTECTION.

### 2.16 SAFETY SYSTEM

Devices, wiring, remote panels, local panels, etc., shall be provided and installed as a complete system to automatically activate the appropriate signals and initiate the appropriate actions. The safety system shall be provided with a self-test method to verify its operability. Alarm signals shall have manual acknowledgement and reset devices. The alarm signal systems shall reactivate for new signals after acknowledgment is given to any signal. The systems shall be configured so that loss of any monitoring device shall be dealt with as an alarm on that system element.

#### 2.16.1 Audible Signal

The audible alarm signal shall sound at a frequency of 70 Hz at a volume of 75 dB at 3.1 m (10 feet). The sound shall be continuously activated upon alarm and silenced upon acknowledgment. Signal devices shall be located as shown.

#### 2.16.2 Visual Signal - Signal

The visual alarm signal shall be a panel light. The light shall be normally off, activated to be blinking upon alarm. The light shall change to continuously light upon acknowledgment. If automatic shutdown occurs, the display shall maintain activated status to indicate the cause of failure and shall not be reset until cause of alarm has been cleared and/or restored to normal condition. Shutdown alarms shall be red; all other alarms shall be amber.

#### 2.16.3 Alarms and Action Logic

##### 2.16.3.1 Shutdown

Simultaneous activation of the audible signal, activation of the visual signal, stopping the engine, and opening the generator main circuit breakers shall be accomplished.

### 2.16.3.2 Problem

Activation of the visual signal shall be accomplished.

### 2.16.4 Local Alarm Panel

Device/Condition/ Action/Location/ No. of Manufacturers  
Function Offering

Low Coolant Level SD/CP VA 3

Overvoltage Protection SD/CP VA O 3

Shutdown

Under frequency SD/CP VA 1 Under voltage SD/CP VA 1

Magnetic Pickup Failure SD/CP VA 1

Over current SD/CP VA 1

Short Circuit SD/CP VA 1

Auxiliary Fault Alarm CP VA 1

Audible Alarm CP AA 1

Over current CP VA 1

Oil Pressure Sender Fault CP VA 1

Weak Battery CP VA 1

A local alarm panel shall be provided with the following shutdown and alarm functions [as indicated] [in accordance with NFPA [99] [110 level [1] [2]] and including the listed Corps of Engineers requirements, mounted either on or adjacent to the engine generator set.

Device/ What/Where/Size NFPA 99 NFPA 110 NFPA 110 Corps of  
Condition/ Level 1 Level 2 Engrs Function Required

Shutdowns

W/Alarms

High engine Automatic/ SD/CP VA SD/CP VA SD/CP VA SD VA  
temperature jacket water/  
cylinder

Low lube-oil Automatic/ SD/CP VA SD/CP VA SD/CP VA SD VA  
pressure/  
level

Over speed (110% (+ 2%) SD/CP VA SD/CP VA SD/CP VA SD VA  
shutdown \$ of rated  
alarm speed

Over crank Automatic/ SD/CP VA SD/CP VA SD/CP VA  
failure to  
to start to start

Air shutdown When used SD/CP VA SD/CP VA  
damper  
(200-600kW)

Day tank Automatic/Day SD/OPA  
overflow Tank/Level (Pump)  
limit

indication &

transfer pump  
shutdown  
(95% volume)  
Red emergency Manual Switch SD/CP VA SD/CP VA SD VA  
stop switch  
Failure to Corps of Engrs.  
crank Required  
[Day tank] Corps of Engrs.  
[Integral Main Required  
Fuel Tank]  
low fuel  
limit Device/  
Condition/  
indication  
(70% volume  
remaining)  
Alarms  
Low lube-oil Pressure/ CP VA CP VA CP VAO CP VA  
pressure level  
Low fuel Main tank, VA/AA CP VA CP VAO  
level 3 hours  
remaining  
High fuel Integral Main CP VA  
level Fuel Storage  
Tank  
95% Volume  
Low coolant Jacket water CP/VA CP VA CP VA  
Pre-high Jacket water/ CP VA CP VA CP VAO CP VA  
temperature cylinder  
Pre-low CP VA CP VA  
lube-oil  
pressure  
High battery CP VA CP VAO  
voltage  
Low battery CP VA CP VAO  
voltage  
Battery AC supply not CP VA CP VAO  
charger available  
AC failure  
Control CP VA CP VAO  
switch not  
in AUTO  
Low starting CP VA CP VAO  
air pressure  
Low starting CP VA CP VAO  
hydraulic pressure

SD - Shut Down  
 CP - On Control Panel  
 VA - Visual Alarm  
 AA - Audible Alarm  
 O - Optional]

### 2.16.5 Time-Delay on Alarms

For startup of the engine-generator set, time-delay devices shall be installed bypassing the low lubricating oil pressure alarm during cranking, and the coolant-fluid outlet temperature alarm. The lube-oil time-delay device shall return its alarm to normal status after the engine starts. The coolant time-delay device shall return its alarm to normal status 5 minutes after the engine starts.

### 2.16.6 Remote Alarm Panel (If Required)

A remote alarm panel shall be provided as indicated. A remote alarm panel shall be provided in accordance with NFPA 99, NFPA 110 and as follows:

Device/Condition/ What/Where/Size NFPA 99 NFPA 110 NFPA 110

Function Level 1 Level 2

Remote annunciator panel Battery powered Alarms

Loads on genset VA

Battery charger VA

malfunction

Low lube-oil Pressure/level VA/AA AA AAO

Low Temperature Jacket water VA/AA AA AAO

High Temperature Jacket water/ VA/AA AA AAO

cylinder

Low fuel level Main tank, 3 hr VA/AA AA AAO

remaining

Over crank Failure to start VA/AA AA AAO

Over speed VA/AA AA AAO

Pre-high temperature Jacket water/ AA

cylinder

Control switch not in AA

AUTO

Common alarm contacts X X

for local & remote

common alarm

Audible alarm silencing X O

switch

Air shutdown damper When used AA AAO

Common fault alarm AA

X - Required

SD - Shut Down

CP - On Control Panel

VA - Visual Alarm

AA - Audible Alarm

O - Optional]

## 2.17 ENGINE GENERATOR SET CONTROLS AND INSTRUMENTATION

Devices, wiring, remote panels, local panels, etc., shall be provided and installed as a complete system to automatically activate the appropriate signals and initiate the appropriate actions.

### 2.17.1 Controls

A local control panel shall be provided with controls [as indicated] [in accordance with NFPA 110 level [1] [2]] [and as follows] mounted on the engine generator set. A remote control panel shall be provided [with devices as indicated] [fully redundant to the local control panel] as required.

Device/Condition/ Corps Requirement NFPA 110 NFPA 110 MFG

Function Level 1 Level 2 Offering

Controls

Switch: run/start CP CP/STD

- off/set - auto

Emergency stop switch CP CP/STD

& alarm

Lamp test/indicator test CP CP VA CP VA CP/STD

Common alarm contacts/ X X CP/O

fault relay

Panel lighting CP CP/STD

Audible alarm & CP

silencing/reset switch

Voltage adjust for voltage CP/

Regulator

Pyrometer display CP

w/selector switch

Remote emergency stop switch CP VA CP VA

Remote fuel shutoff switch

Remote lube-oil shutoff switch

### 2.17.2 Engine Generator Set Metering and Status Indication

A local panel shall be provided with devices [as indicated] [in accordance with NFPA 110 level [1] [2]] [and as follows] mounted to the engine generator set as indicated. A remote control panel shall be provided [with devices as indicated] [fully redundant to the local control panel] as required.

Device/Condition/Corps Requirement NFPA 110 NFPA 110 MFG

Function Level 1 Level 2 Offering

Genset Status & Metering

Genset supplying load CP VA CP VAO CP VAO

System ready CP/STD

Engine oil pressure CP CP/STD

Engine coolant temperature CP CP/STD

Engine RPM (Tachometer) CP CP/STD

Engine run hours CP CP/STD  
Pyrometer display CP  
w/selector switch  
AC volts (generator), CP CP/STD  
3-phase  
AC amps (generator), CP CP/STD  
3-phase  
Generator frequency CP CP/STD  
Phase selector switches CP CP/STD  
(amps & volts)  
Watts/kW CP/VA-O  
Voltage Regulator  
Adjustment CP  
CP - On Control Panel  
VA - Visual Alarm  
AA - Audible Alarm O - Optional  
STD - Manufacturers Standard Offering

## 2.18 PANELS

Each panel shall be of the type necessary to provide specified functions. Panels shall be mounted on the engine generator set base by vibration/shock absorbing type mountings. Instruments shall be mounted flush or semi flush. Convenient access to the back of instruments shall be provided to facilitate maintenance. Instruments shall be calibrated using recognized industry calibration standards. Each panel shall be provided with a panel identification plate, which clearly identifies the panel function as indicated. Each instrument and device on the panel shall be provided with a plate that clearly identifies the device and its function as indicated. Panels except the remote alarm panel can be combined into a single panel.

### 2.18.1 Enclosures

Enclosures shall be designed for the application and environment, conforming to NEMA ICS 6, and provided with locking mechanisms, which are keyed alike.

### 2.18.2 Analog

Analog electrical indicating instruments shall be in accordance with ANSI C39.1 with semi flush mounting. Switchgear, and control-room panel-mounted instruments shall have 250-degree scales with an accuracy of not less than 1 percent. Unit-mounted instruments shall be the manufacturer's standard with an accuracy of not less than 2 percent. The instrument's operating temperature range shall be minus 20 to plus 65 degrees C. Distorted generator output voltage waveform of a crest factor less than 5 shall not affect metering accuracy for phase voltages, hertz and amps.

### 2.18.3 Electronic

Electronic indicating instruments shall be true RMS indicating, 100 percent solid state, microprocessor controlled to provide all specified functions. Control, logic, and function devices shall be compatible as a system, sealed, dust and water tight, and shall utilize

modular components with metal housings and digital instrumentation. An interface module shall be provided to decode serial link data from the electronic panel and translate alarm, fault and status conditions to set of relay contacts. Instrument accuracy shall be not less than 2 percent for unit-mounted devices and 1 percent for control room, panel mounted devices, throughout a temperature range of minus 20 to plus 65 degrees C. Data display shall utilize LED or back lit LCD. Additionally, the display shall provide indication of cycle programming and diagnostic codes for troubleshooting. Numeral height shall be at the minimum height of ¼ inch or manufacturer specifications whichever is larger.

#### 2.18.4 Parameter Display

Indication or readouts of the lubricating-oil pressure, ac voltmeter, ac ammeter, frequency meter, and coolant temperature.

#### 2.18.5 Exerciser

The exerciser shall be in accordance with Section 16410 AUTOMATIC TRANSFER.

### 2.19 SURGE PROTECTION

Electrical and electronic components shall be protected from, or designed to withstand the effects of surges from switching and lightning.

### 2.20 AUTOMATIC ENGINE-GENERATOR-SET SYSTEM OPERATION

Fully automatic operation shall be provided for the following operations: engine-generator set starting and source transfer upon loss of normal source; retransfer upon restoration of the normal source; sequential starting; and stopping of each engine-generator set after cool down. Devices shall automatically reset after termination of their function.

#### 2.20.1 Automatic Transfer Switch

- Furnish and install automatic transfer switches system(s) with \_\_\_ Pole [T], \_\_\_ Amps, \_\_\_ Volt-60Hz [C]. Each automatic transfer shall consist of an inherently double throw power transfer switch mechanism and a microprocessor controller to provide automatic operation. All transfer switches and controllers shall be the products of the same manufacturer.

Codes and Standards - The automatic transfer switches and controls shall conform to the requirements of:

- UL 1008 - Standard for Transfer Switch Equipment
- IEC 947-6-1 Low-voltage Switchgear and Control gear; Multifunction equipment; Automatic Transfer Switching Equipment
- NFPA 70 - National Electrical Code

- NFPA 99 - Essential Electrical Systems for Health Care Facilities
- NFPA 110 - Emergency and Standby Power Systems
- IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
- NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches
- UL 508 Industrial Control Equipment
- CSA C22.2 No. 178 certification

#### Acceptable Manufacturers

- Automatic transfer switches shall be Kohler Specific Breaker Rated - Standard Transition (KSS)/KSSDCTA0\_\_\_S or an approved equal. Any alternate shall be submitted for approval to the consulting engineer and Local Authority Having Jurisdiction at least 10 days prior to bid date. Alternate bids shall include a line-by-line clarification of the specification marked with "D" for deviation; "E" for exception, and "C" for comply.

#### Mechanically Held Transfer Switch

- The transfer switch shall be electrically operated and mechanically held with double throw construction, and operated by a momentarily energized solenoid-driven mechanism. Main operators shall include over current disconnect devices; linear motors or gears shall not be acceptable.
- All transfer switch sizes shall use only one type of main operator for ease of maintenance and commonality of parts.
- The switch shall be positively locked and unaffected by momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
- All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand and close-on capability and be protected by separate arcing contacts.

- Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. Switches rated 600 amps and higher shall have front removable and replaceable contacts. All stationary and moveable contacts shall be replaceable without removing power conductors and/or bus bars.
- Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources, are not acceptable.
- Where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor plate with fully rated AL-CU pressure connectors shall be provided.

### Enclosure

- The ATS shall be furnished in a NEMA \_\_ (A) enclosure.
- All standard door mounted switches and long life super bright type indicating LEDs described in section 3 shall be integrated into a flush-mounted, interface membrane or equivalent in the enclosure door for easy viewing & replacement. The panel shall be capable of having manual locking feature to allow the user to lockout all membrane mounted control switches to prevent unauthorized tampering. This cover shall be mounted with hinges and have a latch that may be padlocked. The membrane panel shall be suitable for mounting by others when furnished on open type units.

### Controller Display and Keypad

- A four line, 20 character LCD display and dynamic 4 button keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the communications interface port. The following parameters shall only be adjustable via a password protected programming on the controller (dip switches shall not be acceptable):

- Nominal line voltage and frequency
- Single or three phase sensing
- Operating parameter protection
- Transfer operating mode configuration (Open transition, Closed transition, or Delayed transition)

- All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

### Voltage, Frequency and Phase Rotation Sensing

- Voltage (all phases) and frequency on both the normal and emergency sources shall be continuously monitored, with the following pickup, dropout, and trip setting capabilities (values shown as % of nominal unless otherwise specified):

Parameter	Dropout/Trip	Pickup/Reset
Under voltage	75 to 98%	85 to 100%
Over voltage	105 to 135%	95 to 100% of trip
Under frequency	85 to 99%	95 to 99%
Over frequency	105 to 120%	101 to 105%
Voltage unbalance	5 to 20%	3% to 18%

- Repetitive accuracy of all settings shall be within  $\pm 0.5\%$  over an operating temperature range of  $-20^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .
- An adjustable dropout time for transient voltage and frequency excursions shall be provided. The time delays shall be 0.1 to 9.9 seconds for voltage and .1 to 15 seconds for frequency.
- Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via the communications interface port.
- The controller shall be capable of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or BAC). Unacceptable phase rotation shall be indicated on the LCD; the service required LED and the annunciation through communication protocol and dry contacts. In addition, the phase rotation sensing shall be capable of being defeated, if required.
- The controller shall be capable of detecting a single phasing condition of a source, even though a voltage may be regenerated by the load. This condition shall be considered a failed source.

- Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases (phase to phase and phase to neutral), frequency, and phase rotation.

### Time Delays

- An adjustable time delay of 0 to 10 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 12 or 24 VDC power supply.
- A time delay shall be provided on transfer to the emergency source, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.
- A time delay shall be provided on re-transfer to normal. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.
- A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.
- A time delay activated output signal shall also be provided to drive external relay(s) for selective load disconnect control. The controller shall be capable of controlling a maximum of 9 individual output time delays to step loads on after a transfer occurs. Each output may be individually programmed for their own time delay of up to 60 minutes. Each sequence shall be independently programmed for transferring from normal to emergency and transferring from emergency to normal.
- The controller shall also include the following built-in time delays for the following operations:
  1. 0 to 60 minute time delay on failure to acquire the acceptable electrical parameters from the emergency source
  2. 0 to 60 minute time delay for a failure to synchronize on an in-phase operation.
  3. 60 minute time delay for the load disconnect position for delayed transition operation.
- All time delays shall be adjustable in 1 second increments.
- All time delays shall be adjustable by using the display and keypad or with a remote device connected to the communications interface port through a security-password system.

- All time delays shall be adjustable by using the display and keypad or with a remote device connected to the communications interface port through a security-password system.
- Each time delay shall be identified and a dynamic countdown shall be shown on the display.

#### Additional Features

- The controller shall have 3 levels of security. Level 1 shall allow monitoring of settings and parameters only. The Level 1 shall be capable of restricted with the use of a lockable cover. Level 2 shall allow test functions to be performed and Level 3 shall allow setting of all parameters.
- Membrane-type switches shall be provided for the test functions and be maintained until the end test function is activated. The test function shall be allowed through password security. It shall be possible to defeat the password requirement by way of a circuit board mounted dip switch setting. The test function shall be load, no load or auto test. The auto test function shall request an elapsed time for test. At the completion of this time delay the test shall be automatically ended and a retransfer sequence shall commence. All loaded tests shall be immediately ended and retransfer shall occur if the emergency source fails and the normal source is acceptable.
- A SPDT contact, rated 5 amps at 30 VDC, shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
- Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of two contacts, closed when the ATS is connected to the normal source and two contacts closed, when the ATS is connected to the emergency source.
- LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).
- LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal (green) and emergency sources (red), as determined by the voltage, frequency and phase rotation sensing trip and reset settings for each source.

- A membrane switch shall be provided on the membrane panel to test all indicating lights and display when pressed.
- Provide the ability to select "commit/no commit to transfer" to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
- Terminals shall be provided for a remote contact which opens to signal the ATS to transfer to emergency and for remote contacts which closes to inhibit transfer to emergency and/or retransfer to normal. Both of these inhibit signals can be activated through the keypad or the communications interface port. A "not-in-auto" LED shall indicate anytime the controller is inhibiting transfer from occurring.
- An in-phase monitor shall be a standard feature in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The in-phase monitor shall be specifically designed for and be the product of the ATS manufacturer. The in-phase monitor shall be capable of being enabled or disabled for the user interface.
- *Engine Exerciser* - The controller shall provide an internal engine exerciser. The engine exerciser shall allow the user to program up to 21 different exercise routines based on a calendar mode. For each routine, the user shall be able to:
  1. Enable or disable the routine.
  2. Enable or disable transfer of the load during routine.
  3. Set the start time,  
time of day  
day of week  
week of month (1st, 2nd, 3rd, 4th, alternate or every)
  4. Set the duration of the run.
  5. At the end of the specified loaded exercise duration the switch shall transfer the load back to normal and run the generator for the specified cool down period. All loaded exercises shall be immediately ended and retransfer shall occur if the standby source fails. The next exercise period shall be displayed on the main screen with the type of exercise, time and date. The type of exercise and the time remaining shall be display when the exercise is active. It shall be possible of ending the exercise event with a single button push.
- *Date and time* - The date shall automatically adjust for leap year and the time shall have the capability of automatically adjusting for daylight saving and standard times.

- **System Status** - The controller shall have a default display the following on:
  1. System status
  2. Date, time and type of the next exercise event
  3. Average voltage of the preferred and standby sources
- Scrolling through the displays shall indicate the following:
  1. Line to line and line to neutral voltages for both sources
  2. Frequency of each source
  3. Load current for each phase
  4. Single or three phase operation
  5. Type of transition
  6. Preferred source
  7. Commit or no commit modes of operation
  8. Source/source mode (Utility/Gen; Gen/Gen; Utility/Utility)
  9. In phase monitor enable/disable
  10. Phase rotation
  11. Date and time
- Controllers that require multiple screens to determine system status or display "coded" system status messages, which must be explained by references in the operator's manual, are not permissible.
- **Self Diagnostics** - The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.
- **Communications Interface** - The controller shall be capable of interfacing, through a standard communications with a network of transfer switches and generators. It shall be able to be connected via an RS-485 serial communication (up to 4000 ft. direct connect or multi-drop configuration), an Ethernet connectivity (over standard 10baseT Ethernet networks utilizing a RJ-45 port or remotely utilizing a dial-up modem). This module shall allow for seamless integration of existing or new communication transfer devices and generators. Monitoring software shall allow for the viewing, control and setup of parameters of the genset and transfer switch network through a standard personal computer utilizing current Microsoft operating systems. Separate and specific transfer switch software interfaces shall not be acceptable.
- The transfer switch shall also be able to interface to 3rd party applications using Modbus RTU and Modbus TCP/IP open standard protocols utilizing Modbus register maps. Proprietary protocols shall not be acceptable.

- The controller shall contain a USB port for downloading the controller's parameters and settings; exercise event schedules; maintenance records and event history. The file designator shall be the unique serial number of the transfer switch.
  
- *Data Logging* - The controller shall have the ability to log data and to maintain the last 2000 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory. The controller shall be able to display up to the last 99 events. The remaining events shall be downloadable to be displayed on a computer.
  1. Event Logging
    - Data, date and time indication of any event.
  2. Statistical Data
    - Total number of transfers.\*
    - Total number of fail to transfers.\*
    - Total number of transfers due to preferred source failure.\*
    - Total number of minutes of operation.\*
    - Total number of minutes in the standby source.\*
    - Total number of minutes not in the preferred source\*
    - Normal to emergency transfer time
    - Emergency to normal transfer time
    - System start date
    - Last maintenance date

\* The statistical data shall be held in two registers. One register shall contain data since start up and the second register shall contain data from the last maintenance reset.
  
- *External DC Power Supply* - An optional provision shall be available to connect up to two external 12/24 VDC power supply to allow the LCD and the door mounted control indicators to remain functional when both power sources are dead for extended periods of time. This module shall contain reverse battery connection indication and circuit protection.

## Tests and Certification

- Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.
  
- The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality

assurance in design/development, production, and installation and servicing in accordance with ISO 9001.

### Service Representation

- The manufacturer shall maintain a national service organization of employing personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.

The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

Automatic transfer switches shall be in accordance with Section 16410 AUTOMATIC TRANSFER.

#### 2.20.2 Monitoring and Transfer

Devices shall be provided to monitor voltage and frequency for the normal power source and each engine generator set, and control transfer from the normal source and retransfer upon restoration of the normal source. Functions, actuation, and time delays shall be as described in Section 16410 AUTOMATIC TRANSFER.

#### 2.21 MANUAL ENGINE-GENERATOR SET SYSTEM OPERATION

Complete facilities shall be provided for manual starting and testing of each set without load, loading and unloading of each set.

#### 2.22 BASE

The base shall be constructed of steel. The base shall be designed to rigidly support the engine-generator set, ensure permanent alignment of all rotating parts, be arranged to provide easy access to allow changing of lube-oil, and ensure that alignment will be maintained during shipping and normal operation. The base shall permit skidding in any direction during installation and shall be provided with suitable holes for foundation bolts. The base shall also withstand and mitigate the effects of synchronous vibration of the engine and generator, and shall be provided with suitable holes for anchor bolts and jacking screws for leveling. The base shall be mounted on spring isolators rated for Fort Campbell seismic conditions.

#### 2.23 THERMAL INSULATION

Thermal insulation shall be as specified in Section 15080 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

#### 2.24 PAINTING AND FINISHING

The engine-generator set shall be cleaned, primed and painted in accordance with the manufacturer's standard color and practice.

#### 2.25 FACTORY INSPECTION AND TESTS

Factory inspection and tests shall be performed on each engine-generator set proposed to meet this specification section. Inspections shall be completed and necessary repairs made prior to testing. Inspectors shall look for leaks, looseness, defects in components, and proper assembly. Factory tests shall be NEMA MG 1 routine tests and the manufacturer's routine tests.

### PART 3 EXECUTION 3.1 GENERAL INSTALLATION

Installation shall provide clear space for operation and maintenance in accordance with NFPA 70 and IEEE C2. Installation of pipe, duct, conduit, and ancillary equipment shall be configured to facilitate easy removal and replacement of major components and parts of the engine-generator set.

### 3.2 PIPING INSTALLATION

#### 3.2.1 General

Piping shall be non-welded (threaded). Connections at valves shall be threaded. Connections at equipment shall be threaded to the diesel engine may be threaded if the diesel-engine manufacturer's standard connection is threaded. Except as otherwise specified, threaded fittings shall be utilized to allow for complete dismantling and removal of each piping system from the facility without disconnecting or removing any portion of any other system's equipment or piping. Connections to all equipment shall be made with flexible connectors. Pipes extending through the roof shall be properly flashed. Piping shall be installed clear of windows, doors, and openings to permit thermal expansion and contraction without damage to joints or hangers, and with a 15 mm (1/2 inch) drain valve at each low point.

#### 3.2.2 Supports

Hangers, inserts, and supports shall be of sufficient size to accommodate any insulation and shall conform to MSS SP-58 and MSS SP-69. Supports shall be spaced not more than 2.1 m (6 feet) on center for pipes 50 mm (2 inches) in diameter or less, not more than 3.6 m (12 feet) on center for pipes larger than 50 mm (2 inches) (2 inches) but no larger than 100 mm, (4 inches,) and not more than 5.2 m (17 feet) on center for pipes larger than 100 mm (4 inches) in diameter. Supports shall be provided at pipe bends or change of direction.

#### 3.2.3 Deleted

#### 3.2.4 Cleaning

After fabrication and before assembly, piping interiors sh

#### 3.2.5 Pipe Sleeves

Pipes passing through construction such as ceilings, floors, or walls shall be fitted with sleeves. Each sleeve shall extend through and be securely fastened in its respective structure and shall be cut flush with each surface. The structure shall be built tightly to the sleeve. The inside diameter of each sleeve shall be 15 mm, (1/2 inch,) and where

pipes pass through combustible materials, 25 mm (1 inch) larger than the outside diameter of the passing pipe or pipe covering.

### 3.3 ELECTRICAL INSTALLATION

Electrical installation shall comply with NFPA 70, IEEE C2, and Section 16415 ELECTRICAL WORK, INTERIOR.

#### 3.3.1 Vibration Isolation

Flexible fittings shall be provided for all conduit, cable trays, and raceways attached to engine-generator sets. Metallic conductor cables installed on the engine generator set and from the engine generator set to equipment not mounted on the engine generator set shall be flexible stranded conductor. Terminations of conductors on the engine generator set shall be crimp-type terminals or lugs.

### 3.4 FIELD PAINTING

Field painting shall be as specified in Section 09900 PAINTING, GENERAL.

## ONSITE INSPECTION AND TESTS

### NOTE: ALL ONSITE TESTING WILL BE AT NAME PLATE RATING OF THE GENERATOR SET

- Site Tests. The manufacturer's distribution representative shall perform an installation check, startup, and building load test. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:
  - Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.
  - Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery chargers, alternator strip heaters, remote annunciators, etc.
  - Generator set startup under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, and phase rotation.
  - Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.

#### 3.5.1 Test Conditions

#### 3.5.1.1 Data

Measurements shall be made and recorded of parameters necessary to verify that each set meets specified parameters. If the results of any test step are not satisfactory, adjustments or replacements shall be made and the step repeated until satisfactory results are obtained. Unless otherwise indicated, data shall be taken during engine-generator set operation and recorded in 15 minute intervals and shall include: readings of engine-generator set meters and gauges for electrical and power parameters; oil pressure; ambient temperature; and engine temperatures available from meters and gauges supplied as permanent equipment on the engine-generator set. In the following tests where measurements are to be recorded after stabilization of an engine-generator set parameter (voltage, frequency, current, temperature, etc.), stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings. Electrical measurements shall be performed in accordance with IEEE Std 120. Definitions and terms are in accordance with IEEE Std 100. Temperature limits in the rating of electrical equipment and for the evaluation of electrical insulation shall be in accordance with IEEE Std 1.

#### 3.5.1.2 Power Factor

Engine-generator set operating tests shall be made utilizing a load with 0.8-power factor for all 3-phase installations; a unity of 1.0 power factor shall be used on all single-phase installations.

#### 3.5.1.3 Contractor Supplied Items

The Contractor shall provide all equipment and supplies required for inspections and tests including fuel, test instruments, cables, test leads, and load banks at the specified power factors.

#### 3.5.1.4 Instruments

Readings of panel gauges, meters, displays, and instruments, provided under this specification shall be verified during test runs by test instruments of precision and accuracy greater than the tested items. Test instrument accuracy shall be at least as follows: current, 1.5%; voltage, 1.5%; real power, 1.5%; reactive power, 1.5%; power factor, 3%; frequency, 0.5%. Test instruments shall be calibrated by a recognized standards laboratory within 30 days prior to testing.

#### 3.5.1.5 Sequence

The sequence of testing shall be as specified in the approved testing plan unless variance is authorized by the Contracting Officer and Local Authority Having Jurisdiction. Field-testing shall be performed in the presence of the Contracting Officer and Local Authority Having Jurisdiction. Tests may be scheduled and sequenced in order to optimize run-time periods; however the following general order of testing shall be followed: Construction Tests; Inspections; Safety run Tests; and Performance Tests and Final Inspection.

### 3.5.2 Construction Tests

Individual component and equipment functional tests for fuel piping, coolant piping, and lubricating-oil piping, electrical circuit continuity, insulation resistance, circuit protective devices, and equipment not provided by the engine-generator set manufacturer shall be performed prior to connection to the engine-generator set.

#### 3.5.2.1 Piping Test

- a. Lube-oil and fuel-oil piping shall be flushed with the same type of fluid intended to flow through the piping, until the out flowing fluid has no obvious sediment or emulsion.
- b. Fuel piping which is external to the engine-generator set shall be tested in accordance with NFPA 30. All remaining piping, which is external to the engine generator set shall be pressure tested with air pressure at 150% of the maximum anticipated working pressure, but in no case less than 1 MPa, (150 psig,) for a period of 2 hours to prove the piping has no leaks. If piping is to be insulated, the test shall be performed before the insulation is applied.

#### 3.5.2.2 Electrical Equipment Tests

- a. Low-voltage cable insulation integrity tests shall be performed for cables connecting the generator breaker to the [automatic transfer switch] [panel-board] [main disconnect switch] [distribution bus] [\_\_\_\_\_]. Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energizing. The test voltage shall be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or conduit. The minimum value of insulation shall be:

$R$  in megohms = (rated voltage in kV + 1) x 304,800/(length of cable in meters). ( $R$  in megohms = (rated voltage in kV + 1) x 1000/(length of cable in feet))

Each cable failing this test shall be repaired or replaced. The repaired cable shall be retested until failures have been eliminated.

- a. Medium-voltage cable insulation integrity tests shall be performed for cables connecting the generator breaker to the [generator switchgear] [main disconnect switch] [distribution bus]. After insulation and before the operating test or connection to an existing system, the medium-voltage cable system shall be given a high potential test. Direct-current voltage shall be applied on each phase conductor of the system by connecting conductors as one terminal and connecting grounds or metallic shielding or sheaths of the cable as the other terminal for each test. Prior to making the test, the cables shall be isolated by opening applicable protective devices and disconnecting equipment.

- b. The test shall be conducted with all splices, connectors, and terminations in place. The method, voltage, length of time, and other characteristics of the test for initial installation shall be in accordance with NEMA WC 7 or NEMA WC 8 for the particular type of cable installed, except that 28 kV and 35 kV insulation test voltages shall be in accordance with either AEIC CS5 or AEIC CS6 as applicable, and shall not exceed the

recommendations of IEEE Std 404 for cable joints and IEEE Std 48 for cable terminations unless the cable and accessory manufacturers indicate higher voltages are acceptable for testing. Should any cable fail due to a weakness of conductor insulation or due to defects or injuries incidental to the installation or because of improper installation of cable, cable joints, terminations, or other connections, the contractor shall make necessary repairs or replace cables as directed. Repaired or replaced cables shall be retested.

c. Ground-Resistance Tests. The resistance of [each grounding electrode] [each grounding electrode system] [the ground mat] [the ground ring] shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

1) Single rod electrode - [25] [\_\_\_\_\_] ohms.

2) Multiple rod electrodes - [\_\_\_\_\_] ohms.

3) Ground mat - [\_\_\_\_\_] ohms.

d. Circuit breakers and switchgear shall be examined and tested in accordance with manufacturer's published instructions for functional testing.

### 3.5.3 Inspections

The following inspections shall be performed jointly by the Contracting Officer the Contractor and Local Authority Having Jurisdiction, after complete installation of each engine-generator set and its associated equipment, and prior to startup of the engine-generator set. Checks applicable to the installation shall be performed. The results of those which are physical inspections (I) shall be documented by the Contractor and submitted in accordance with paragraph SUBMITTALS. The Contractor shall present manufacturer's data for the inspections designated (D) at the time of inspection. Inspections shall verify that equipment type; features, accessibility, installation and condition are in accordance with the contract specification. Manufacturer's statements shall certify provision of features, which cannot be verified visually.

1. Drive belts. (I)

2. Governor type and features. (I)

3. Engine timing mark. (I)

4. Starting motor. (I)

5. Starting aids. (I)
6. Coolant type and concentration. (D)
7. Radiator drains. (I)
8. Block coolant drains. (I)
9. Coolant fill level. (I)
10. Coolant line connections. (I)
11. Coolant hoses. (I)
12. Combustion air filter. (I)
13. Intake air silencer. (I)
14. Lube oil type. (D)
15. Lube oil drain. (I)
16. Lube-oil filter. (I)
17. Lube-oil-fill level. (I)
18. Lube-oil line connections. (I)
19. Lube-oil lines. (I)
20. Fuel type. (D)
21. Fuel-level. (I)
22. Fuel-line connections. (I)
23. Fuel lines. (I)
24. Fuel filter. (I)
25. Access for maintenance. (I)
26. Voltage regulator. (I)
27. Battery-charger connections. (I)

28. Wiring & terminations. (I)

29. Instrumentation. (I)

30. Hazards to personnel. (I)

31. Base. (I)

32. Nameplates. (I)

33. Paint. (I)

34. Exhaust system. (I)

35. Access provided to controls. (I)

36. Enclosure. (I)

37. Engine & generator mounting bolts (proper

3.5.4 Safety Run Tests

a. Perform and record engine manufacturer's recommended pre-starting checks and inspections.

b. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.

c. Activate the manual emergency stop switch and verify that the engine stops.

d. Remove the high and pre-high lubricating oil temperature sensing elements from the engine and temporarily install temperature gauge in their normal locations on the engine (required for safety, not for recorded data). Where necessary, provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.

e. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set at no load until the output voltage and frequency stabilize. Monitor the temporarily installed temperature gauges. If temperature reading exceeds the value for an alarm condition, activate the manual emergency stop switch.

f. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down. Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.

g. Remove the high and pre-high coolant temperature sensing elements from the engine and temporarily seal their normal location on the engine and temporarily install temperature gauges in their normal locations on the engine (required for safety, not for recorded data). Where necessary provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.

h. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set at no load until the output voltage and frequency stabilize.

i. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down. Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.

j. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.

k. Operate the engine generator-set for at least 30 minutes at 100 percent of service load.

l. Verify proper operation of the governor and voltage regulator.

m. Verify proper operation and set points of gauges and instruments.

n. Verify proper operation of ancillary equipment. o. Manually adjust the governor to increase engine speed past the over-speed limit. Record the RPM at which the engine shuts down.

p. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 75 percent of rated load.

q. Manually fill the day tank to a level above the overfill limit. Record the level at which the overfill alarm sounds. Verify shutdown of the fuel transfer pump. Drain the day tank down below the overfill limit.

r. Shut down the engine. Remove the time-delay low lube oil pressure alarm bypass and try to start the engine. Record the results.

s. Attach a manifold to the engine oil system (at the oil sensor pressure port) that contains a shutoff valve in series with a connection for the engine's oil pressure sensor followed by an oil pressure gauge ending with a bleed valve. The engine's oil pressure sensor shall be moved from the engine to the manifold and its normal location on the

engine temporarily sealed. The manifold shutoff valve shall be open and bleed valve closed.

t. Start the engine, record the starting time, make and record all engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 75 percent of service load.

u. Close the manifold shutoff valve. Slowly allow the pressure in the manifold to bleed off through the bleed valve while watching the pressure gauge. Record the pressure at which the engine shuts down. Catch oil spillage from the bleed valve in a container. Add the oil from the container back to the engine, remove the manifold, and reinstall the engine's oil pressure sensor on the engine.

v. Start the engine, record the starting time, make and record all engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 100% of service load. Record the maximum sound level in each frequency band at a distance of 22.9 m ((75 feet)) from the end of the exhaust and air intake piping directly along the path of intake and discharge horizontal piping; or at a radius of [\_\_\_\_\_] [22.9 m][10.7 m] ((75)[35] feet) from the engine at 45 degrees apart in all directions for vertical piping. The measurements should comply with the paragraph SOUND LIMITATIONS. [If a sound limiting enclosure is provided, the enclosure, the muffler, and intake silencer shall be modified or replaced as required to meet the sound requirements contained within this specification.] [If a sound limiting enclosure is not provided, the muffler and air intake silencer shall be modified or replaced as required to meet the sound limitations of this specification. If the sound limitations cannot be obtained by modifying or replacing the muffler and air intact silencer, the contractor shall notify the Contracting Officer and provide a recommendation for meeting the sound limitations.]

w. Manually drain off fuel slowly from the day tank to empty it to below the low fuel level limit and record the level at which the audible alarm sounds. Add fuel back to the day tank to fill it above low-level alarm limits.

### 3.5.5 Performance Tests

#### 3.5.5.1 Continuous Engine Load Run Test

The engine-generator set and ancillary systems shall be tested at service load to: demonstrate durability; verify that heat of extended operation does not adversely affect or cause failure in any part of the system; and check all parts of the system. If the engine load run test is interrupted for any reason, the entire test shall be repeated. The engine load run test shall be accomplished principally during daylight hours, with an average ambient temperature of 35 degrees C, during the month of July. After each change in load in the following test, measure the vibration at the end bearings (front and back of engine, outboard end of generator) in the horizontal, vertical, and axial directions. Verify that the vibration is within the allowable range. Measurements are to be recorded after stabilization of an engine-generator set parameter (voltage,

frequency, current, temperature, etc.). Stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings. Data taken at 15 minutes intervals shall include the following:

a. Electrical: Output amperes, voltage, real and reactive power, power factor, frequency.

b. Pressure: Lube-oil.

c. Temperature: Coolant.

Lube-oil.

Ambient.

(1) Perform and record engine manufacturer's recommended pre-starting checks and inspections. Include as a minimum checking of coolant fluid, fuel, and lube-oil levels.

(2) Start the engine; make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.

(3) Operate the engine generator-set for at least 2 hours at 75 percent of service load.

(4) Increase load to 100% of service load and operate the engine generator-set for at least 2 hours.

(5) Remove load from the engine-generator set.

#### 3.5.5.2 Load Acceptance Test

Engine manufacturer's recommended pre-starting checks and inspections shall be performed and recorded. The engine shall be started, and engine manufacturer's after-starting checks and inspections made and recorded during a reasonable warm-up period. For the following steps, the output line-line and line-neutral voltages and frequency shall be recorded after performing each step instruction (after stabilization of voltage and frequency). Stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings.

a. Apply load in steps no larger than the Maximum Step Load Increase to load the engine-generator set to 100 of Service Load.

b. Verify that the engine-generator set responds to the load

c. Verify that the engine-generator set responds to the load addition and that the output voltage returns to and stabilizes within the rated bandwidths.

### 3.5.6 Automatic Operation Tests for Stand-Alone Operation

The automatic loading system shall be tested to demonstrate automatic starting, and loading and unloading of each engine-generator set. The loads for this test shall utilize the actual loads to be served, and the loading sequence shall be the indicated sequence. Perform this test for a minimum of two successive, successful tests. This test shall be for a period of 2 hours. Data taken shall include the following:

- a. Ambient temperature (at 15 minute intervals).
  - b. Generator output current (before and after load changes).
  - c. Generator output voltage (before and after load changes).
  - d. Generator output frequency (before and after load changes.)
1. Initiate loss of the primary power source and verify automatic sequence of operation.
  2. Restore the primary power source and verify sequence of operation.
  3. Verify resetting of controls to normal.

### 3.6 FINAL INSPECTION AND TESTING

During final inspection and testing procedures, Fort Campbell Directorate of Public Works , Authority Having Jurisdiction shall be scheduled and in attendance. Approval shall not occur without this observation and participation. Testing procedures shall include the following:

- a. Start the engine, record the starting time, make and record all engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- b. Increase the load in steps no greater than the maximum step load increase to 100% of service load, and operate the engine-generator set for at least 30 minutes. Measure the vibration at the end bearings (front and back of engine, outboard end of generator) in the horizontal, vertical, and axial directions. Verify that the vibration is within the same range as previous measurements and is within the required range.
- c. Remove load and shut down the engine-generator set after the recommended cool down period. Perform the pre-test inspections and take necessary corrective actions.
- d. Remove the lube oil filter and have the oil and filter examined by the engine manufacturer for excessive metal, abrasive foreign particles, etc. Any corrective action shall be verified for effectiveness by running the engine for 4 hours at service load, then re-examining the oil and filter.
- e. Remove the fuel filter and examine the filter for trash, abrasive foreign particles, etc.

f. Visually inspect and check engine and generator mounting bolts for tightness and visible damage.

g. Replace air, oil, and fuel filters with new filters.

### 3.7 MANUFACTURER'S FIELD SERVICE

#### 3.7.1 Onsite Training

The Contractor shall conduct training course for Fort Campbell Authority Having Jurisdiction and operating staff as designated by the Contracting Officer. The training period shall consist of a total 4 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance. The course instructions shall cover pertinent points involved in operating, starting, stopping, programming of all components, servicing the equipment, as well as all major elements of the operation and maintenance manuals. Additionally, the course instructions shall demonstrate all routine maintenance operations such as oil change, oil filter change, and air filter change.

#### 3.7.2 Manufacturer's Representative

The engine generator-set manufacturer shall furnish a factory certified, qualified representative to supervise the installation of the engine generator-set, assist in the performance of the onsite tests, and instruct personnel as to the operational and maintenance features of the equipment.

### Warranty and Maintenance

- The generator set shall include a standard one year warranty to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from date of startup. Optional warranties shall be available upon request.
- The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and functional tests performed on all systems.

### 3.8 INSTRUCTIONS

Two sets of instructions shall be typed and framed under weatherproof laminated plastic, and posted side-by-side where directed before acceptance. First set of instructions shall include a one-line diagram, wiring and control diagrams and a complete layout of the system. Second set of instructions shall include the condensed operating instructions describing manufacturer's pre-start checklist and precautions;

start procedures for test-mode, manual-start mode, and automatic-start mode (as applicable); running checks, procedures, and precautions; and shutdown procedures, checks, and precautions. Instructions shall include procedures for interrelated equipment and automatic transfer switches

### 3.9 ACCEPTANCE

Final acceptance of the engine-generator set will not be given until the Contractor has successfully completed all tests and after all defects in installation material or operation have been corrected.

[Return to Section Instructions](#)

[Return to Division Table of Contents](#)

## **SECTION 16370**

### **Electrical Distribution System, Aerial**

#### **Ft. Campbell Requirements:**

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit (FC Form 4183) from the Fort Campbell Electrical Inspector in accordance with Fort Campbell Directorate of Public Works Standing Operating Procedure (SOP) 308, except as provided within said SOP. Copies of SOP and permits shall be obtained at DPW, Operations and Maintenance Division, Building 867, 16th Street, Fort Campbell, Kentucky.

The distribution level voltage at Fort Campbell is 12.47/7.2 kV.

All new electrical distribution lines shall be installed underground, see Section 16375. If and when overhead service has been approved by the installation, use pinless construction. Should a need for cross arms arise, use fiberglass. Wooden poles with wooden cross arms are NOT to be utilized.

Where distribution lines must be installed overhead:

- \* Use wooden poles with 20 year life span.
- \* Use armless, narrow profile construction where practicable.

- \* Use fiberglass cross arms where cross arms are required.
- \* Overhead lines shall be ACSR (no copper).
- \* All fittings shall be compression type.
- \* All equipment mounts shall be aluminum.
- \* All overhead switches and cut-outs shall be of the load break type.

Minimize distribution lines installed under pavement.

Generally, when underground electric approaches 350-400 feet in length, provide a manhole.

Underground medium voltage lines shall be concrete encased. Underground service entrance conductors shall be copper installed in conduits. Copper conductors are preferred for overhead service drops, but aluminum conductors are acceptable. However provide copper conductors from meter base to service equipment inside. If meter or disconnect mounted on a pole, run copper conductors from transformer down.

Distribution lines shall be designed for maximum system flexibility. Use loop feed where practicable to create redundancy. In housing areas utilizing underground distribution, run separate feeds from transformer to each apartment.

The following guidance applies to all electrical distribution equipment that contains oil. This is for equipment installed permanently as well as temporary installation for contractor's offices at a job site or in contractor's row next to Roads & Grounds.

- Delta banks shall not be provided for transformer stations.
- Provide adjustable taps on transformers.
- Rebuilt or reconditioned transformers will be not installed.
- A nameplate will be provided on all transformers that says "NON-PCB" or "LESS THAN 1 PPM PCB". In addition to the nameplate PCB-free designation, all transformers will have a "No PCB's" per EPA regulations. Stickers shall be visible from the ground. The sticker shall be 2" wide by 1" high, UV fade resistant, pressure sensitive adhesive backing, blue background with white letters, and suitable for all weather conditions. Source of supply is Style PCNL as manufactured by Labelmaster Hazardous Materials Safety Products, 1996 General Catalog G-110.

- The following information will be provided to the construction representative to be forwarded to the Environmental Division point of contact Wally Crow for updating of the Fort Campbell database:

Manufacturer:  
Model Number:  
Serial Number  
Manufacture Date:  
KVA and Phase:  
Primary Voltage:  
Secondary Voltage:  
Installation Date:  
State Installed:  
Location Installed:

Any new oil equipment used shall be non-PCB. All regulated electrical equipment at Fort Campbell should be free of PCB. However, if a contractor should discover a piece of equipment that is not marked, the DPW Environmental Division should be contacted. The POC for PCB is Russ Godsave at (270) 798-9637.

### Instructions to Designers:

1. Include all required features and specific equipment features into project design and contract documents specifications as they apply.

[Return to Division Table of Contents](#)

## **SECTION 16375 Electrical Distribution System, Underground**

### Ft. Campbell Requirements:

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit (FC Form 4183) from the Fort Campbell Electrical Inspector in accordance with Fort Campbell Directorate of Public Works Standing Operating Procedure (SOP) 308, except as provided within said SOP. Copies of SOP and permits shall be obtained at DPW, Operations and Maintenance Division, Building 867, 16th Street, Fort Campbell, Kentucky.

The distribution level voltage at Fort Campbell is 12.47/7.2 kV.

All new electrical distribution lines shall be installed underground. If and when overhead service has been approved by the installation, use pinless construction. Should a need for cross arms arise, use fiberglass. Wooden poles with wooden cross arms are NOT to be utilized.

Minimize distribution lines installed under pavement.

Generally, when underground electric approaches 350-400 feet in length, provide a manhole.

Underground medium voltage lines shall be concrete encased. Underground service entrance conductors shall be copper installed in conduits. Copper conductors are preferred for overhead service drops, but aluminum conductors are acceptable. However provide copper conductors from meter base to service equipment inside. If meter or disconnect mounted on a pole, run copper conductors from transformer down.

Distribution lines shall be designed for maximum system flexibility. Use loop feed where practicable to create redundancy. In housing areas utilizing underground distribution, run separate feeds from transformer to each apartment.

At design meetings, discuss what outages will be needed and for how long. Generally, Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer need and is properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

Fort Campbell has a great deal of underground utility lines (both active and abandoned) that do not show up on Base utility maps. Therefore, any utilities to be installed underground must be coordinated with DPW as soon as possible during the design process.

Utility lines installed underground shall be marked with magnetic tape.

Grounding shall not be accomplished at water lines. Use of ground rods is required.

Provide individual meters on gas, water, and electric service lines for all buildings. Meters shall be capable of receiving a device which will allow remote monitoring in the future.

Trenching through roadways shall be avoided to the maximum extent possible. Whenever possible utilities shall be pressure-pumped below roadways. When underground utilities are sleeved under roadways, conduit sleeves shall be extended a minimum of 10 feet beyond the roadway on both sides to protect conductors from penetration by new road signs, poles, etc.

The following guidance applies to all electrical distribution equipment that contains oil. This is for equipment installed permanently as well as temporary installation for contractor's offices at a job site or in contractor's row next to Roads & Grounds.

- Service transformers, for all 15kV, and below, 3-phase underground fed installations, shall be of the pad-mounted type. The high-voltage compartment shall be dead-front construction. Primary switching and protective devices shall include load break switching, fuse protection, medium-voltage separable load break connectors, universal bushing wells and inserts or integral one piece bushings and surge arresters. The nameplate rating for the transformer shall not be less than 90 percent of the KVA demand load calculated for the transformer. Provide copper windings, not aluminum. Enclosure shall be lockable using a padlock. New single phase transformer installations shall utilize a pad mount transformer. Single phase installations for O&M projects shall be coordinated with user as to whether a pole mount or a pad mount transformer should be used. Designer shall coordinate with the DPW as to whether a new or replacement feed is to be run aerially or underground.
- Delta banks shall not be provided for transformer stations.
- Provide adjustable taps on transformers.
- Rebuilt or reconditioned transformers will be not installed.
- A nameplate will be provided on all transformers that says "NON-PCB" or "LESS THAN 1 PPM PCB". In addition to the nameplate PCB-free designation, all transformers will have a "No PCB's" per EPA regulations. Stickers shall be visible from the ground. The sticker shall be 2" wide by 1" high, UV fade resistant, pressure sensitive adhesive backing, blue background with white letters, and suitable for all weather conditions. Source of supply is Style PCNL as manufactured by Labelmaster Hazardous Materials Safety Products, 1996 General Catalog G-110.
- The following information will be provided to the construction representative to be forwarded to the Environmental Division point of contact Wally Crow for updating of the Fort Campbell database:

Manufacturer:  
Model Number:  
Serial Number  
Manufacture Date:  
KVA and Phase:  
Primary Voltage:  
Secondary Voltage:  
Installation Date:  
State Installed:

Location Installed:

- Any new oil equipment used shall be non-PCB. All regulated electrical equipment at Fort Campbell should be free of PCB. However, if a contractor should discover a piece of equipment that is not marked, the DPW Environmental Division should be contacted. The POC for PCB is Russ Godsave at (270) 798-9637.

**Instructions to Designers:**

1. Include all features into project design and contract documents specifications as they apply.

[Return to Division Table of Contents](#)

## **SECTION 16415**

### **Electrical Work, Interior**

#### **Ft. Campbell Requirements:**

- a. An Electrical Inspection is required for any electrical work, modifications, additions or upgrades to existing electrical systems in any Fort Campbell real property, temporary building or other structures, including mobile homes, temporary office trailers, recreational vehicles, floating buildings; and other premises such as yards, parking, storage, carnival, and other lots and industrial substations.
- b. An Electrical Inspection is required for any electrical work, modifications, additions or upgrades during new construction in any Fort Campbell real property, temporary building or other structures, including mobile homes, temporary office trailers, recreational vehicles, floating buildings; and other premises such as yards, parking, storage, carnival, and other lots and industrial substations.
- c. An Electrical Inspection is required for any electrical service that is to be connected to the Fort Campbell electrical network.
- d. An approved Fort Campbell Electrical Contractor Registration form is required for any person, firm or corporation requiring an Electrical Work Permit. At minimum, but not limited to, a current valid state Electrical Contractors License is required to obtain and maintain approval.

See CAM Reg 420-4, 4 April 2006 for further details [click here](#).

Grounding shall not be accomplished at water lines. Use of ground rods is required.

Provide watt-hour meters and secondary surge arrestors on each new facility. Meters shall be capable of receiving a device to allow future remote monitoring

#### **General:**

There shall be an electrical room separate from the mechanical room to protect electrical communications and fire alarm equipment from temperature and humidity normally encountered in a mechanical room. Access to the electrical room shall be either directly from the outside of the building or through the mechanical room.

Do not use wet cell batteries, particularly for exit lights and emergency lights.

Coordinate with mechanical and plumbing disciplines to ensure that proper NEC clearances are maintained around electrical equipment in electrical and mechanical rooms.

Install surface mounted panel boards in unfinished areas of buildings. Install flush or semi-flush panel boards in other areas. Provide spare 1P circuit breakers and spaces for future expansion.

Coordinate plans so that lighting fixtures, smoke detectors, supply and return grilles, and other ceiling mounted equipment do not overlap or interfere with each other.

Do not install timers to control lighting in latrines and showers.

State in the contract that when systems or equipment require special tools or peripheral equipment to repair, operate, maintain, or program that tool or equipment shall be provided to the DPW. This includes laptop computers and/or software. This applies in particular to fire alarm equipment and fiber optic systems. Also state in the contract that the contractor shall provide and schedule appropriate training for DPW personnel to maintain unusual systems and equipment.

Provide reduced voltage starting where motor starting kVA will result in more than a 30% transient voltage dip per DA technical guidance (Technical Manual 5-811-2).

Use 3 phase motors to the maximum extent possible especially for integral (1/2, 3/4 HP) motors that start and stop frequently. (i.e. pumps and air compressors. General rule is less than 1 HP is single phase but single phase motors that start/stop frequently tend to wear out faster).

Provide single-phase protection on all 3-phase motors.

The following guidance applies to all electrical distribution equipment that contains oil. This is for equipment installed permanently as well as temporary installation for contractor's offices at a job site or in contractor's row next to Roads & Grounds.

- Rebuilt or reconditioned transformers will be not installed.
- Delta banks shall not be provided for transformer stations.
- Provide adjustable taps on transformers.
- A nameplate will be provided on all transformers that says "NON-PCB" or "LESS THAN 1 PPM PCB". In addition to the nameplate PCB-free designation, all transformers will have a "No PCB's" per EPA regulations. Stickers shall be visible from the ground. The sticker shall be 2" wide by 1" high, UV fade resistant, pressure sensitive adhesive backing, blue background with white letters, and suitable for all weather conditions. Source of supply is Style PCNL as manufactured by Labelmaster Hazardous Materials Safety Products, 1996 General Catalog G-110.

- The following information will be provided to the construction representative to be forwarded to the Environmental Division point of contact Wally Crow for updating of the Fort Campbell database:

Manufacturer:  
Model Number:  
Serial Number  
Manufacture Date:  
KVA and Phase:  
Primary Voltage:  
Secondary Voltage:  
Installation Date:  
State Installed:  
Location Installed:

Any new oil equipment used shall be non-PCB. All regulated electrical equipment at Fort Campbell should be free of PCB. However, if a contractor should discover a piece of equipment that is not marked, the DPW Environmental Division should be contacted. The POC for PCB is Russ Godsave at (270) 798-9637.

#### **Instructions to Designers:**

1. Include all features into project design and contract documents specifications as they apply.

[Return to Division Table of Contents](#)

[Return to Table of Contents](#)

## **SECTION 16528 Exterior Lighting Including Security**

### **Ft. Campbell Requirements:**

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit (FC Form 4183) from the Fort Campbell Electrical Inspector in accordance with Fort Campbell Directorate of Public Works Standing Operating Procedure (SOP) 308, except as provided within said SOP. Copies of SOP and permits shall be obtained at DPW, Operations and Maintenance Division, Building 867, 16th Street, Fort Campbell, Kentucky.

**All exterior lighting (parking lot, street, building, etc.) shall be either 120, 208, or 277 Volt. 480-Volt lighting is not permitted. Safety is an issue when working on this high of a voltage, especially in inclement weather.**

Exterior lighting (parking lot, street, building, etc) shall be Metal Halide or 100, 150, or 400 watt Mercury Vapor. Use 1500-watt metal halide on athletic fields. No High-Pressure Sodium lighting will be permitted.

All exterior street, building and flood lights, shall meet the requirements of UFC 3-530-01, Chapter 7 to avoid conflict with night vision goggle use. The intent is to minimize light pollution in the area and to minimize the chances of pilots looking directly into the beams of nearby lights.

Parking lot lighting control shall be by photocell. Timers will not be permitted. This control shall be by means of one photocell per fixture or one photocell per pole. One photocell per pole is acceptable except for sensitive areas like hospitals, PX, and schools (all lights are out if photocell fails). Provide one photocell per fixture in those areas. Direct burial is acceptable for street light circuits.

Parking lot lighting fixtures shall be COE standard type EH1 and as indicated above.

## **Instructions to Designer**

1. Include all features into project design and contract documents specifications as they apply.

[Return to Division Table of Contents](#)

## **SECTION 16700+ Telecommunications Systems**

### **Ft. Campbell Requirements:**

#### **General:**

The Director of the Network Enterprise Center, Fort Campbell (NEC) will enforce the following standards for *Installation Information Infrastructure Policy (I3P)*.

- N.E.C. will review and approve all proposed voice-data communications requirements for fiber, copper, and all requirements for connectivity into Fort Campbell's telecommunications infrastructure.

- N.E.C. requires all contracts performing telecommunications construction or deconstruction by a civilian contractor utilize the I3P standard requirements. Any and all requirements in these standards apply equally to on-site employees and to US Government contractors.
- N.E.C. requires designers to coordinate with tenant organizations and ensure that all communications requirements are being met in accordance with this standard.

#### Contractor Requirements:

- Application to Dig or Connect Buildings: Project plans and specification shall require Contractors to apply to the Director, Network Enterprise Center, Fort Campbell for approval of a digging/excavation permit. The Contractor is required to contact the N.E.C. as required in the I3P prior to connecting any building on Fort Campbell to the infrastructure.
- Plans and specification shall require Contractors to notify the N.E.C. when renovating, modifying, or deconstructing communications materials in any existing structures on Fort Campbell, KY. This also applies to new facilities or any Major Construction Projects (MCA) at Fort Campbell, KY.

#### Other:

- Per DAIM-FD Memorandum dated 3 November 2000, Army-wide policy applies to individual subscriber communications (barracks soldier rooms) infrastructure that supports MILCON barracks construction. Project funds are allowable to install the cabling from the individual soldier room to a central telephone closet. Beyond that point, AAFES through their commercial phone service provider, will make connection.
- All exterior communications infrastructure to the designated central closet is the responsibility of AAFES through their designated service provider. This includes all outside cable plant (cable, duct, manholes), equipment shelters, and switches.

#### Instructions to Designers:

##### **Design Requirements:**

1. All detailed requirements contained in the [Fort Campbell Installation Information Infrastructure Policy \(I3P\) \(Appendix H\)](#) document shall be incorporated into all design and construction documents. Any additional requirements not addressed in the document standards will conform to the ANSI/TIA/EIA Standard.
2. All Designs shall be coordinated with N.E.C. and submitted to N.E.C. for review and approval prior to start of construction to ensure that the requested or designed wiring is available in the existing system infrastructure.
3. All new data and voice communications lines shall be installed underground. If and when overhead service has been approved by the installation, use pinless construction.

Should a need for cross arms arise, use fiberglass. Wooden poles with wooden cross arms are NOT to be utilized.

[Return to Division Table of Contents](#)

[Return to Table of Contents](#)

# Appendix A

## Environmental Requirements

### PARAGRAPH

- A-1 [Occupational Health Considerations](#)
- A-2 [Clean Air Act](#)
- A-3 [Clean Water Act](#)
- A-4 [Safe Drinking Water Act](#)
- A-5 [TSCA](#)
- A-6 [FIFRA](#)
- A-7 [Solid Waste Disposal Practices](#)
- A-8 [Hazardous Waste Disposal Practices](#)
- A-9 [Emergency Planning and Community Right-To-Know Act](#)
- A-10 [National emission standards for hazardous air pollutants \(NESHAP\)](#)

### **A-1. Occupational Health Considerations**

Ft. Campbell has design Standard Operating Procedures for the following items and they shall be used in preparation of a design:

#### **Confined Spaces:**

Contractor shall observe OSHA Regulation 29 CFR Part 1910.146 regarding permitting, entry and working within confined spaces. Contractor is required to submit a work plan to the Contracting Officer's representative prior to entering any confined space.

#### **Hazard Communication Program:**

Contractor shall observe OSHA Regulation 29 CFR Part 1910.1200 regarding a written hazard communication program for describing how requirements for labels and other forms of warning, material safety data sheets, and employee information and training will be met. The program will also include a list of the hazardous chemicals known to be present and the methods used to inform employees of the hazards of non-routine tasks.

#### **Lock Out, Tag Out Procedures:**

Contractor shall observe OSHA Regulation 29 CFR Part 1910.147 regarding the control of hazardous energy (lock-out/tag-out).

Lock-out/Tag-out for Safety: The Contractor shall use a locking device that secures a valve or lever in the "off" position when a repair, inspection, or construction or new installation is required and also to clean or move any equipment. Making any exception to this rule could result in serious injury and death.

Lock-out: Blocking the flow of energy from the power source to the equipment - and keeping it blocked out - is called a lock-out system. A locking device is usually a key or combination lock arrangement.

Tag-out: Tag-out means placing a tag on the power source to warn co-workers or others not to turn the power on. The information on the tag shall include the name of personnel who put it there, the date, time the work begins, and type of work to be performed.

Basic Rules: Before shut down, the Contractor shall ensure that authorized employees know the type, magnitude, and hazards of the energy to be controlled; and shall verify the method or means of the system. He shall inform all affected employees of the lockout. The equipment shall be turned off, and the Contractor shall lockout energy sources and tag-out at the disconnect point. Any stored or residual energy may be released at that time so the equipment can be tested. The Contractor shall restore energy safely.

[Return to Chapter 2](#)

[Return to Appendix A](#)

## **A-2 Clean Air Act:**

A-2.1 Fort Campbell has specific Environmental points of contact, and requirements. These are available at the following Internet site:

[\*\*http://www.campbell.army.mil/envdiv/cleanairact.html\*\*](http://www.campbell.army.mil/envdiv/cleanairact.html)

A-2.2 Ft. Campbell is a major source for criteria air pollutants and has an Operating permit for both Kentucky and Tennessee. Permitted air sources include boilers, spray booths, aggregate storage piles, etc. Air permit information is to be provided by designers to Ft. Campbell Environmental Division, Air Quality, prior to construction start. If required, construction and operating permits will be obtained by the Air Quality office. Construction permits are based on design while Operating permits are based on actual installation. Data needed for the permit application are on the **Control Device/Technique Checklist** and **Vent/Stack Checklist** that are included at the end of this Appendix for designers' use. If required, permits can take 3-6 months to obtain so as much of a lead time will be necessary.

A-2.3 Class 1 ozone depleting substances (CFC's, Halon) shall not be used on any project. Class 2 refrigerants (HCFC's) are close to being phased out of production so Class III refrigerants (HFC's) are preferred.

A-2.4 Emergency generator data must be obtained to determine compliance with new regulations. Please contact the Air Quality office if a new emergency generator is going to be installed.

A-2.5 Ft. Campbell has been designated as an “Attainment - Maintenance” area for ozone. A General Conformity Rule (GCR) analysis will be required for all projects that have the potential to impede the continuation of the attainment status for ozone and to ensure that the action does not hinder air pollution control efforts in the ozone “maintenance” area. The contractor performing the work on a project must provide information as requested on the **General Conformity Rule Checklist** included at the end of this Appendix and turned into the Air Quality office prior to commencement of construction.

A-2.6 Ft. Campbell Air Quality POC is Patty Lockard, 270.798.9603

**FORT CAMPBELL ENVIRONMENTAL DIVISION – AIR QUALITY PROGRAM  
CONTROL DEVICE/TECHNIQUE CHECKLIST**

Date: \_\_\_\_\_

Organizational Owner/Operator: \_\_\_\_\_

Interviewer: \_\_\_\_\_

Facility: \_\_\_\_\_ Contact: \_\_\_\_\_

Phone: \_\_\_\_\_

Bldg. No.: \_\_\_\_\_ Room No.: \_\_\_\_\_

Source No.: \_\_\_\_\_

1. Control(s) for (describe source): \_\_\_\_\_

2. Type of controls (check all that apply):  equipment  technique/strategy  
(If technique only, describe in comments)

3. Control for:  PM  VOC  HAP  Other (describe) \_\_\_\_\_

4. Monitoring for:  PM  VOC  HAP  Other (describe) \_\_\_\_\_

5. Type of controls/monitors:

No.	Description	Pollutant	% Control Equip. Eff	Tested? (y/n)	Test date	Cost Equip.
_____	_____ for _____	_____	_____	_____	_____	_____
_____	_____ for _____	_____	_____	_____	_____	_____
_____	_____ for _____	_____	_____	_____	_____	_____
_____	_____ for _____	_____	_____	_____	_____	_____
_____	_____ for _____	_____	_____	_____	_____	_____

(If necessary, continue on additional sheets and attach.)

6. Control Equipment Information:

No.	Equipment Manufacturer	Model No.	Serial No.
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

7. Obtain copy of technical specifications and attach (includes specifications for panel filter products)

8. Obtain copy of test results and attach

9. Complete applicable control equipment form(s) and attach

10. If answer to No. 9 is "yes", list the control devices for which capture efficiency tests have been completed \_\_\_\_\_



**FORT CAMPBELL ENVIRONMENTAL DIVISION – AIR QUALITY PROGRAM  
VENT/STACK CHECKLIST**

Date: \_\_\_\_\_

Organizational Owner/Operator: \_\_\_\_\_

Interviewer: \_\_\_\_\_

Facility: \_\_\_\_\_ Contact: \_\_\_\_\_

Phone: \_\_\_\_\_

Bldg. No.: \_\_\_\_\_ Room No.: \_\_\_\_\_

Source No.: \_\_\_\_\_

1. Description of emission (particulate matter, gaseous, mix, species name, etc.)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. Identify source(s) served \_\_\_\_\_

\_\_\_\_\_

3. Are criteria air pollutants emitted? (check one) Yes  No

4. Are hazardous air pollutants emitted? (check one)  Yes  No

5. Does the source also have the potential for fugitive emissions? (check one)  
(If yes, describe nature of fugitive emissions in the comment section.)  Yes  No

6. Has there been a stack test for this source? (check one)  
(If yes, attach copy of stack test documents to this form)  Yes  No

7. Has there been a surrogate stack test for this source? (check one)  
(If yes, attach copy of stack test documents to this form)  Yes  No

**Pick-up Duct Data (Not applicable if spray booth exhaust panel(s) are part of design)**

1. Hood Type \_\_\_\_\_

2. Hood Dimensions: Slot Length \_\_\_\_\_

Slot Width \_\_\_\_\_

Distance from Hood Face to Contaminant \_\_\_\_\_

Hood Face Area (Calculated) \_\_\_\_\_

Measured Air Flow at Hood \_\_\_\_\_

Measured Face Velocity \_\_\_\_\_

Hood Static Pressure \_\_\_\_\_

Duct ID \_\_\_\_\_

Duct Length to Bldg. Exit \_\_\_\_\_

Contaminant Capture Temp. \_\_\_\_\_

**Vent Information**

1. Inside diameter (ID) at exit \_\_\_\_\_ (  inches;  ft - check one)

2. Vent height: a. Above ground \_\_\_\_\_ (ft)

b. Above roof level \_\_\_\_\_ (ft)

- 3. Gas stream exhaust exit temp \_\_\_\_\_ (  °F;  °C - check one)
- 4. Exit velocity \_\_\_\_\_ (ft/sec), at \_\_\_\_\_ °F, \_\_\_\_\_ (air pressure - note measurement units) and standard conditions (68 °F and 1 atm) \_\_\_\_\_ (ft/sec)
- 5. Exit flow at exit conditions \_\_\_\_\_ (ft<sup>3</sup>/min)  
Obtained from (check one):  calculations  test data  
Exit flow at standard conditions \_\_\_\_\_ (dscfm)
- 6. Stack gas moisture percent at exit conditions \_\_\_\_\_%  By  Weight  Volume (check one)
- 7. Exit plume direction (check one):  Up  Down  Horizontal
- 8. Exhaust fan data: Horsepower \_\_\_\_\_ RPM \_\_\_\_\_ Volume Rate \_\_\_\_\_ (ft<sup>3</sup>/min)
- 9. Air pollution controls installed? (check one)  yes  no  
(If yes, complete and attach Control Device/Technique Checklist)

If the stack/vent serves more than one piece of equipment, submit diagram and identify the units served. Complete the additional applicable process or non-process checklists.

COMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
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General Conformity Rule Checklist  
General Information

Name of Project: \_\_\_\_\_

Construction Company: \_\_\_\_\_

POC Name: \_\_\_\_\_

Phone Number/Email: \_\_\_\_\_

Anticipated Start Date: \_\_\_\_\_ Anticipated End Date: \_\_\_\_\_

Construction Equipment Listing

Equipment Type	Qty	Hours of Operation	Miles	Fuel Type
<b>Bulldozer</b>				
<b>Grader</b>				
<b>Excavator</b>				
<b>Backhoe</b>				
<b>Dump Truck</b>				
<b>Fuel/Service Trucks</b>				
<b>Tractors</b>				
<b>Pug Mills (on site)</b>				
<b>Concrete Batch Plant (on site)</b>				
<b>Scraper</b>				
<b>Ready-Mix Truck</b>				
<b>Screed, Concrete</b>				
<b>Portable Paint Sprayer</b>				
<b>Air Compressor</b>				
<b>Lay Down Machines</b>				
<b>Rollers</b>				
<b>Compactors</b>				
<b>Water Trucks</b>				
<b>Pavement Stripping Machines</b>				
<b>Traffic Road Striping</b>				
<b>Loaders</b>				

<b>Generators</b>				
<b>Compactors</b>				
<b>Curb and Gutter Pavers</b>				
<b>Other:</b> _____				
<b>Other:</b> _____				

**Emergency Generator Information**

(This information will be needed for all stationary emergency generators associated with the project, attach a sheet if necessary)

**Manufacturer:** \_\_\_\_\_

**Model Number:** \_\_\_\_\_

**Horsepower:** \_\_\_\_\_

**Max. Fuel consumption (gal/hr):** \_\_\_\_\_

**Fuel Type:** \_\_\_\_\_

**Serial number if currently available:** \_\_\_\_\_

**Stationary Fuel Burning Equipment**

(This information will be needed for all stationary sources such as boilers, hot water heaters, etc that will be installed attach a sheet if necessary)

**Type:** \_\_\_\_\_

**Manufacturer:** \_\_\_\_\_

**Model Number:** \_\_\_\_\_

**BTU Value:** \_\_\_\_\_

**Fuel Type:** \_\_\_\_\_

**Serial number if currently available:** \_\_\_\_\_

**Personal Occupancy Vehicle Information**

Vehicle Type	Qty	Miles driven on Post	Fuel Type
<b>Light Duty Truck</b>			
<b>Heavy Duty Truck</b>			
<b>Car/SUV/Van</b>			

**Submitted by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

ISSUE	STATEMENT TO BE INCLUDED
<p style="text-align: center;">GENERAL CONFORMITY RULE (GCR)</p>	<p><b><u>OZONE:</u></b> The current status for Fort Campbell is that the installation has been designated an ozone " maintenance" area in 2005 . The maintenance plan requirements will be designed to maintain the average ozone concentration levels at or below the maximum allowed to sustain compliance with the National Ambient Air Quality Standards. The redesignation as an "attainment maintenance area" will be in effect for 12 years. During this time Fort Campbell Air Quality will have to establish that all construction activities will not impede the continuation of the attainment status and ensure the action does not impede Kentucky or Tennessee air pollution control efforts in ozone "attainment maintenance areas". This is referred to as the General Conformity Rule (GCR). The rule requires that an analysis and other procedures (if required as a result of the analysis) be completed prior to the commencement of any of the project activities. In order to make the determination, the Air Quality Program will need to gather information from the contractor concerning equipment types, hours of operation, number of personnel, etc. and then do calculations for estimated emissions. This process needs to be started as soon as the contractor is known, because it is required to be completed prior to groundbreaking. Once awarded, please have the contractor contact the Air Quality office at (270) 798-9598 or (270) 798-9603.</p> <p><b><u>PM2.5:</u></b> Nonattainment designations for particulate matter (PM) are based on 3- year averages of either each years' annual average concentration (annual average) or on a 24 hour average basis (a rolling 24 hour avg.). Exceeding either standard can result in an area being classified as nonattainment. Trends indicate that within the next few years Fort Campbell has a strong possibility of being designated nonattainment for PM2.5. If that should occur, PM2.5 will be considered and added to the GCR process as stated above.</p>
<p style="text-align: center;">Fuel Burning Equipment (Natural Gas and/or Fuel Oil)</p>	<p>Boilers <math>\geq</math> 10 MBTU or any boiler that uses fuel oil, contact the Air Quality Program with specifications for boilers. Hot Water Heaters <math>\geq</math> 120 gallons, contact the Air Quality Program with specifications for hot water heaters. The Air Quality Program will submit the Boiler NESHAP Notification to EPA.</p>
<p style="text-align: center;">Concrete/ Asphalt</p>	<p>Recommend that document include requirements concerning whether operations of concrete batch plant/asphalt plant (including any use of a pug mill) will be on or off post. If on post, need capacity and other design data to determine if air permits would be required and to determine other CAA related compliance issues. Approximately 120 day lead time to obtain state operating permit.</p>
<p style="text-align: center;">Debris Burning</p>	<p>Recommend inserting the statement "air pollution restrictions applicable to this project do not allow materials to be burned on the Government premises."</p>
<p style="text-align: center;">Debris Disposal</p>	<p>Recommend that document include requirements concerning disposal of debris. If the debris is to be sent to a grinder for recycling, need to know if the grinding equipment will be on or off post and if on-post, will need to obtain grinder capacity (tons/hour) and design in order to determine if air permitting and other CAA related compliance issues apply. Approximately 120 day lead time to obtain state operating permit.</p>
<p style="text-align: center;">Dust</p>	<p>Recommend inserting the statement "maintain all excavations, stockpiles, access roads, waste areas, and all other work areas free from excess dust to such a reasonable degree as to avoid causing a hazard or nuisance".</p>
<p style="text-align: center;">Ozone Depleting Chemicals</p>	<p>Recommend inserting a statement requiring any refrigerants to have an ozone depleting potential (ODP) of 0.05 or less.</p>

[Return to Chapter 2](#)

[Return to Section 15550](#)

[Return to Section 15569](#)

[Return to Appendix A](#)

[Return to Section 15846](#)

### **A-3 Clean Water Act:**

A-3.1 Ft. Campbell POC is Dan Etson at 270-798-9784.

A-3.2 Ft. Campbell averages 3 million gallons per day. The high has been 13 million gallons. The desire is to not exceed this.

A-3.3 Water volume calculations need to be submitted. There is a two to three month review time by State. Can walk permit through. Storm water shall not discharge into sanitary sewer.

A-3.4 When sinkholes are encountered close them, and route water to natural storm drainage patterns. Must have permit from Tennessee to close sinkhole. Double sandbag or hay bales if sinkhole is part of the drainage pattern on a construction site.

A-3.5 If water is discharged into Kentucky, then Kentucky permit will be required.

A-3.6 If oil/water separators are used then design shall be the open top type. Ft. Campbell Environmental Division will provide oil/water separator design.

A-3.7 Specifications and sizing data for construction of the grease interceptor are available to the design team. Designer will contact Gary Sewell for this information. State of Tennessee has sizing criteria. Grease interceptors shall be located for ease of access for cleaning by pumper truck.

A-3.8 Pollution prevention plan must be maintained during construction. Notice-of-intent is required prior to moving any earth.

A-3.9 See Specification [Section 01560, Environment Protection](#). Specifications must address spill containment for contractor and should contain language for servicing of construction vehicles. Five copies of Spill Contingency Plans shall be specified. The Contractor shall be required to mail or submit one copy of a Spill Contingency Plan to:

Wayne Lee  
Environmental Division, DPW  
Building 2186, 13-1/2 Street

And, four copies to the Contacting Officer. The Contractor shall not start work until the Spill Contingency Plan is approved by the Contracting Officer. If the contract does not require any plan for a specific project, he shall apply for an exception to the Contracting Officer with a copy to Mr. Lee, Environmental Division at address indicated above. For further information or guidelines in order to prepare Spill Plan contact Environmental Division, DPW at 270-798-9641.

A-3.10 Dumping of any liquids on the ground will be considered a release.

A-3.11 Floor drains are not to be provided except where required. They will be provided in a judicious manner, only where necessary. Old sewage system cannot take load. Shower drains are okay but wash-down drains are not acceptable. Mud Rooms must go to sanitary sewer. Discharge cannot adversely affect waste treatment. Biggest concern is volume. Ft. Campbell treatment facility almost maxed out. This is the reason shop wash down is not allowed. Must adhere to approved provisions for washing tents or vehicles. Washing must occur on grass areas.

A-3.12 Must pretreat boiler blow down before discharge due to base sewer toxicity levels being a noted problem.

[Return to Chapter 2](#)   [Return to Storm-Drainage System](#)   [Return to Appendix A](#)

#### **A-4 Safe Drinking Water Act:**

A-4.1 Dead end water lines shall not be installed. Lines must be looped and disinfected. POC is Audie Hardin at 270-956-1801.

A-4.2 Backflow prevention is required on domestic water only and must be approved by state of Tennessee.

[Return to Chapter 2](#)   [Return to Appendix A](#)

#### **A-5 Toxic Substances Control Act (TSCA):**

##### **A-5.1 Lead paint:**

A-5.1.1 Lead-based paint and lead containing paint protection required for working personnel in accordance with OSHA requirements. Lead exposure for air quality will be tested by an exposure assessment for the first building demolished; this data can then be used for the remainder of buildings. If test results indicate that airborne lead levels have not exceeded standards as established by the Clean Air Act, additional testing is not required.

A-5.1.2 Lead-Based Paint Notification Requirements for Work in Family Housing:

A-5.1.2.1 There is a new Federal requirement to notify family housing occupants when work in their quarters will disturb known or suspected lead-based paint (LBP). This requirement became effective 1 June 1999 and will affect all Army Family housing built prior to 1978. This final rule is issued under the authority of section 406(b) of the Toxic Substance Control Act (TSCA), 15 U.S.C. 2686(b) as amended by the Residential Lead-Based Paint Hazard Reduction Act of 1992 to add Title IV, entitled Lead Exposure Reduction. The Residential Lead-Based Paint Hazard Reduction Act is also referred to as Title X of the Housing and Community Development Act of 1992, Public Law 102-550. A copy of this requirement can be found in the Federal Register, 1 Jun 98, at <http://www.epa.gov/fedrgstr/EPA-TOX/1998/June/Day-01/t14437.htm>.

A-5.1.2.2 The requirement is that whenever maintenance, repair, or renovation is performed in or on an occupied unit and LBP is disturbed (resulting in flaking or dust) that the worker (both in-house and contractor) must provide the occupant a copy of the pamphlet, "Protect Your Family from Lead in Your Home". The Pamphlet can be obtained at <http://www.hud.gov/lea/leadhelp.html>. This is the same pamphlet that is required to be given to occupants by the housing office when they are assigned to quarters containing lead-based paint (per ACSIM Memo, Subject: Disclosure Requirements for Lead-Based Paint Hazards in Army Family Housing, dated 24 Jul 96). The worker must also attempt to obtain from the occupant a written acknowledgment that the occupant has received the pamphlet (sample language on the above web site). These records must be kept for three years. This requirement also applies when work is done in common areas of occupied multi-unit family housing. The Garrison commander (or designated representative, such as the housing manager), as the owner's representative, must also be notified.

A-5.1.2.3 Contractors working in occupied AFH are also required to issue this pamphlet and this should be verified by the Government inspector. Current contracts should be modified as necessary to comply with this new requirement. Pre-1978 AFH units that are certified as free of lead-based paint and units that are vacant due to major renovation or between occupancy are exempt from this requirement. This requirement does not apply to minor repair and maintenance activities (including minor electrical work and plumbing) that disrupt 2 square feet or less of painted surface per component.

A-5.1.2.4 PAINTER-L is a computerized tool currently available to help manage the presence of LBP and LBP hazards. For more information on this system contact Dr. Ashok Kumar, CERL, at 1-800-USA-CERL.

[Return to Chapter 2](#)   [Return to Section 02090](#)   [Return to Appendix A](#)

## **A-5.2 Radon:**

A-5.1.1 Building design must have Radon protection features. In the specifications, Contractor is to be required to test the building for radon after construction is complete. Also refer to Section 01560, Paragraph 2.1.1g.

Radon mitigation design and testing: All construction performed at Fort Campbell must have passive radon mitigation features implemented into the design. The contractor will install preliminary features as per drawings. The contractor will hire an independent testing company to perform radon monitoring prior to habitation of the building(s). The testing firm must be EPA accredited and approved to perform work in the State of Tennessee (Kentucky). A list of accredited testing firms in the state of TN (KY) can be obtained through the state Radon Program Coordinator (TN 615-532-0733) (KY 502-). In the event radon concentrations greater than 4 pCi/l (pico curies per liter) are revealed, consult Fort Campbell DPW through the Contracting Officer's Representative for guidance pertaining to retesting. If upon further testing unacceptable levels are present, additional mitigation features will be installed followed by more testing. The buildings will not be inhabited until levels of less than 4 pCi/l have been achieved.

[Return to Chapter 2](#)   [Return to Appendix A](#)

## **A-6 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA):**

A-6.1 Fort Campbell has an approved insecticide and pesticide list contained in the Installation Pest Management Plan (IPMP). The current IPMP's approved list of pesticides will be used in the preparation of the appropriate contract documents. All insecticide and pesticide work on Fort Campbell must comply with the IPMP.

A-6.2 Contractors will submit a report of the pesticides used, type and amounts, on Ft Campbell to the FIFRA program manager. Applicators of pesticides on Ft. Campbell must be licensed in Kentucky and Tennessee.

[Return to Chapter 2](#)   [Return to Appendix A](#)

## **A-7 Solid Waste Disposal/Diversion Practices:**

A-7.1 In the interest of reducing waste, Fort Campbell is actively recycling and reducing waste in all operations to meet the installation's 25 year sustainability goals. Contractors are required to participate in on-post programs. They are encouraged to find ways of reducing waste. Recycling shall be practiced to the maximum extent possible. Refuse materials shall be separated in accordance with installation policies and practices.

A-7.2 Dumpster service is not provided by the installation. Contractors shall arrange for dumpster service at their own expense.

A-7.3 Landfill:

A-7.3.1 Contract specifications shall include contract performance requirements for a 50% minimum diversion of construction and demolition (C&D) waste by weight, from

landfill disposal. Contract specifications will include submission of a contractor's C&D Waste Management Plan to be submitted and approved by DPW, preferably prior to the start of a site clearance.

A-7.3.2 Point of contact for landfill issues is DPW Environmental Division at 270-798-9769.

A-7.3.3 Landfill Access:

- Upon award of a contract the name of the contractor, the contract number, project name and the completion date of the contract is furnished to the Directorate of Public Works Environmental Division, which will in turn furnish landfill access passes for the contractor's use in delivering C&D debris materials to the Woodlawn Rd. C&D landfill.
- All loads of debris will be weighed and recorded in the landfill data base. Scales are available at the landfill. Each month, tabulation (by contract number) will be furnished to contracting office indicating the amount of debris generated by that contract, if requested. Trucks and/or trailers shall be weighed coming in and going out of the landfill. The vehicle operator shall have a landfill access pass from the contractor to obtain entrance into the landfill. Other information that will be recorded includes whether the load contained asbestos or any other authorized special waste and whether the load contained recyclable materials.

A-7.4 Materials Handling:

A-7.4.1 Demolition and removal Activities:

- Contract specifications shall require at least a 50% diversion (by weight) of C & D waste materials such as wood, plumbing fixtures, electrical materials (lights and panels), windows, doors, toilet partitions, HVAC equipment, and scrap metals be diverted from the landfill. Diversion can be accomplished by deconstructing the wood buildings and components per instructions below or by moving the structure off-post. Construction specifications shall require a C & D Waste Management Plan to be submitted and approved by DPW.

A-7.4.1 (a) Salvageable materials shall not to be transported off the installation. Government salvage requirements shall be evaluated on a project by project basis and salvage rights automatically apply for the following equipment:

Transformers  
Cut-outs  
Capacitors  
Circuit Breakers  
Voltage Regulators  
Line hardware  
Utility Poles

Salvageable metals that are recovered as a result of grinding shall be separated for sale as scrap metal.

- All salvageable materials removed from the project site shall be delivered to DRMO for selling as scrap metal. The Contractor must properly complete the turn in document, DD Form 1348-1a and ensure Fort Campbell funding code (21F3875 1111 76 C S15056 AC 9921) is utilized when materials are turned into DRMO.

A-7.4.1 (b) Nonsalvageable materials shall not be removed from the installation. They shall be taken to the landfill or diverted for recycle as recovered materials.

- Street surfacing (asphalt/concrete), sidewalks, curbs & gutters, etc., and building related concrete and masonry materials shall be ground up at the construction site and transported to an offsite location designated by the COR. Materials to be ground up shall not have foreign items (doors, windows, piping, PVC items, toilet partitions, plumbing fixtures, etc) included that will render the ground products un-useable.
- These materials may also be transported and stockpiled at the Woodlawn C/D landfill for future grinding. However, Ft. Campbell has placed limits on the size of materials (specifically concrete and asphalt pavement) that can be placed in the landfill. These materials shall not exceed more than 2 feet by 3 feet and shall be no thicker than 18 inches.
- Bricks may be delivered whole and recycled to meet diversion goals.
- **Land clearing waste (trees, stumps, etc.) shall be mulched at the Bi-County Landfill. Logs cannot exceed a maximum length of 12' and 20" in diameter.**

A-7.4.2 New Construction Activities and Contracts:

- It is the contractor's responsibility to insure that all new construction C & D materials disposal meets the 50% diversion criteria. Waste recyclable materials, such as cardboard, paper, scrap metals, pallets, etc., shall be recycled and not landfilled. Evidence that this diversion criteria is met shall be maintained in a data log for the duration of the project by the contractor and provided to the project COR or the project engineer. Assistance in identifying recycler outlets can be obtained from DPW Environmental Division.

A-7.5 Construction projects requiring soil borrow material should be coordinated with DPW Engineering Division at 270-798-3113.

[Return to Chapter 2](#)

[Return to Appendix A](#)

## **A-8 Hazardous Waste Disposal Practices:**

A-8.1 Mercury containing light bulbs such as fluorescent tubes, mercury vapor, metallic halide, and high-pressure sodium lamps shall be considered hazardous wastes and require special handling. Fluorescent, mercury vapor, metallic halide, and high pressure sodium light bulbs, while not a listed hazardous waste, may be a characteristic hazardous waste and therefore subject to testing and proper disposal as per RCRA. These lamps are a concern at Fort Campbell in regard to their disposal. Disposal of these materials resulting from demolition or other DPW related activities, shall be coordinated with the DPW Environmental Quality Officer for the policy contained in Section 11 of the EQP Handbook.

A-8.2 Low-pressure sodium lamps are not listed hazardous wastes but require special handling.

A-8.3 Refrigerant in air conditioning equipment being demolished must be recovered and transported to the Environmental Division Pollution Prevention Operations Center for reclaiming.

A-8.4 PCB's is a concern for HVAC/Electrical and capacitors. Capacitors in existing air conditioning equipment may contain polychlorinated biphenyl's (PCB's).

A-8.5 Fluorescent ballast in buildings to be demolished may contain PCB's.

A-8.6 Transformers as well as all fluorescent ballasts and HVAC/Electrical capacitors to be removed may contain PCB's. Transformers shall be turned over to DRMO.

A-8.7 Lighting ballast and capacitors are to be placed in 55-gallon drum and delivered to the Environmental Division Pollution Prevention Operations Center..

[Return to Chapter 2](#)   [Return to Appendix A](#)

## **A-9 Emergency Planning and Community Right-To-Know Act (EPCRA):**

A-9.1 Ft. Campbell is required by Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements", to comply with the requirements of the Emergency Planning and Community Right-to-Know Act (EPCRA). EPCRA requires Ft. Campbell to identify the amounts of chemicals present on, or released from its facilities, understand the potential problems that hazardous materials pose to the surrounding communities and environment, and provide information to the public and local emergency planning organizations. To comply with EPCRA requirements, Ft. Campbell must track and be accountable for hazardous materials (HM) used throughout the installation. The Contractor must submit information describing hazardous materials (paint, solvents, adhesives, treated lumber, etc) on

**FTCKY HAZMAT INVENTORY FORM** to the Environmental Division Pollution Prevention Branch. The Contractor will account for the quantity of HM brought to the post, the quantity used or expended during the job, and the leftover quantity to be removed from the installation. This information will be provided on a calendar year basis and must be submitted by the end of January following the year reported. Tracking of hazardous materials used by the Contractor shall be required by the contract.

[Return to Chapter 2](#)

[Return to Appendix A](#)

**CHECKLIST FOR NON-PROCESS SOURCE**

Organizational Owner/Operator: \_\_\_\_\_  
 Date: \_\_\_\_\_ Interviewer: \_\_\_\_\_  
 Facility: \_\_\_\_\_ Contact: \_\_\_\_\_ Phone: \_\_\_\_\_  
 Bldg. No.: \_\_\_\_\_ Room No.: \_\_\_\_\_ Source No.: \_\_\_\_\_

<b>FOR DPW-E USE ONLY</b>				
Permit Status:	<input type="checkbox"/> Required	<input type="checkbox"/> Not Required		
Permit Type:	<input type="checkbox"/> Operating	<input type="checkbox"/> Construction	<input type="checkbox"/> Relocation	<input type="checkbox"/> Modification

General

1. Description and designation of source (Boiler #1, Hot Water Heater #1, etc.)  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
2. Construction date (manufactured) \_\_\_\_\_ Date commenced operations \_\_\_\_\_  
 Installation date (at site) \_\_\_\_\_
3. Manufacturer \_\_\_\_\_  
 Model No. \_\_\_\_\_ Serial No. \_\_\_\_\_
4. Normal operating hours \_\_\_\_\_ hrs/day, \_\_\_\_\_ days/week, \_\_\_\_\_ weeks/yr.
5. % operating (time) by calendar year per quarter  
 \_\_\_\_\_ 1st \_\_\_\_\_ 2nd \_\_\_\_\_ 3rd \_\_\_\_\_ 4th.
6. Maximum (potential) operating hours  
 \_\_\_\_\_ hrs/day, \_\_\_\_\_ days/week, \_\_\_\_\_ weeks/yr.
7. Fuel type: Primary fuel \_\_\_\_\_ Standby fuel (if any) \_\_\_\_\_  
 BTU values of fuels: Primary fuel \_\_\_\_\_ Standby fuel (if any) \_\_\_\_\_
8. Primary use of heat source \_\_\_\_\_  
 Secondary use of heat source (if any) \_\_\_\_\_
9. If coal burner, type of firing? \_\_\_\_\_
10. Maximum rated boiler horsepower (BHP) \_\_\_\_\_  
 Heat input capacity (MMBtu/hr) \_\_\_\_\_  
 Maximum rated electrical Output (kw) \_\_\_\_\_ (if applicable)
11. Average % load \_\_\_\_\_ or actual maximum heat input value used \_\_\_\_\_ MMBtu/hr
12. For fuels other than natural or liquified gases:

**CHECKLIST FOR NON-PROCESS SOURCE (continued)**

% Sulfur content \_\_\_\_\_  
% Ash \_\_\_\_\_ (if solid fossil fuel)

13. Average annual fuel consumption: Primary \_\_\_\_\_ ( ft<sup>3</sup>  gal - check one)  
Secondary \_\_\_\_\_ ( ft<sup>3</sup>  gal - check one)

14. Emissions monitoring equipment installed?  Yes  No

---

(If yes, describe above)

**[ATTACH COMPLETED CONTROL DEVICE(S)/TECHNIQUE(S) CHECKLIST(S)]**

15. Is the source operated under a current operating or construction permit?  Yes  No  
(If yes, obtain copy of permit and attach to this checklist)
16. If fuel oil is used, is the unit served by a fuel storage tank? (check one)  Yes  No  
(If yes, complete and attach Storage Tank Checklist)
17. Is a fuel flow meter installed for
- a. Natural gas (check one):  Yes  No
  - b. Other fuel (check one):  Yes  No

**[ATTACH COMPLETED STACK/VENT CHECKLIST FOR NON-PROCESS OPERATION]**

Comments

2 of 2

[Return to Section](#)

**VENT/STACK CHECKLIST**

Organizational Owner/Operator: \_\_\_\_\_  
 Date: \_\_\_\_\_ Interviewer: \_\_\_\_\_ Initials: \_\_\_\_\_  
 Facility: \_\_\_\_\_ Contact: \_\_\_\_\_ Phone: \_\_\_\_\_  
 Bldg. No.: \_\_\_\_\_ Address: \_\_\_\_\_ Permit No.: \_\_\_\_\_

General

1. Description of emission (particulate matter, gaseous, mix, species name, etc.)  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
2. Identify source(s) served \_\_\_\_\_  
 \_\_\_\_\_
3. Are the emissions air contaminants? (check one)  Yes  No
4. Does the source also have the potential for fugitive emissions? (check one)  Yes  No  
 (If yes, describe nature of fugitive emissions in the comment section.)
5. Has there been a stack test for this source? (check one)  Yes  No  
 (If yes, attach copy of stack test documents to this form)
6. Has there been a surrogate stack test for this source? (check one)  Yes  No  
 (If yes, attach copy of stack test documents to this form)

Pick-up Duct Data

1. Hood Type \_\_\_\_\_
2. Hood Dimensions Slot Length \_\_\_\_\_ Slot Width \_\_\_\_\_  
 Distance from Hood Face to Contaminant \_\_\_\_\_  
 Hood Face Area \_\_\_\_\_  
 Measured Air Flow at Hood \_\_\_\_\_  
 Measured Face Velocity \_\_\_\_\_  
 Hood Static Pressure \_\_\_\_\_  
 Duct ID \_\_\_\_\_  
 Duct Length to Bldg. Exit \_\_\_\_\_  
 Contaminant Capture Temp. \_\_\_\_\_
3. Contaminant Data  

Name	Constituency Portion (list measurement units)
_____	_____

## VENT/STACK CHECKLIST (continued)

### Vent Information

1. Inside diameter (ID) at exit \_\_\_\_\_ (ft)
2. Vent height:
  - a. Above ground \_\_\_\_\_ (ft)
  - b. Above roof level \_\_\_\_\_ (ft)
3. Gas stream exhaust exit temp \_\_\_\_\_ (°F)
4. Exit velocity \_\_\_\_\_ (ft/sec), at \_\_\_\_\_ °F, \_\_\_\_\_ (air pressure - note measurement units) and standard conditions (68 °F and 1 atm) \_\_\_\_\_ (ft/sec)
5. Exit flow at exit conditions \_\_\_\_\_ (ft<sup>3</sup>/min)  
Obtained from (check one):  calculations  test data  
Exit flow at standard conditions \_\_\_\_\_ (dscfm)
6. Stack gas moisture percent at exit conditions \_\_\_\_\_ %  By Weight  Grains Per Dry Standard Cubic Foot (gr/dscf)
7. Exit plume direction (check one):  Up  Down  Horizontal
8. Exhaust fan data: horsepower \_\_\_\_\_ RPM \_\_\_\_\_ volume rate \_\_\_\_\_ (ft<sup>3</sup>/min)
9. Air pollution controls installed? (check one)  yes  no  
(If yes, complete and attach Control Device/Technique Checklist)
10. Is there a Bypass Stack? Y or N  
If so, describe and complete vent/stack form for the Bypass Stack.
11. Is this stack equipped with continuous Pollutant Monitoring equipment? Y or N  
If yes, what Pollutants are monitored.

Attach drawing of emission source showing air contaminant flow from process to atmosphere.  
Complete the additional applicable process or non-process checklists.

### Comments

[Return to Section](#)

## **A-10. National emission standards for hazardous air pollutants (NESHAP)**

Ft. Campbell has design Standard Operating Procedures for the NESHAP items and they shall be used in preparation of a design:

State of Kentucky and Tennessee NESHAP Reporting Requirements for Demolition (Defined as the demolition of a building or demolition of a load supporting structure such as a load-bearing wall) shall be followed:

1. In the case of demolition only, the contractor will mail and be postmarked, fax and follow-up with a mailing, or deliver the NESHAP notice 10 working days before demolition begins even if the operation involves removal of “non-regulated” ACM only in any amount, OR even if the operation involves no ACM removal whatsoever!
2. In the case of demolition where asbestos abatement is also involved, the contractor will send in a separate notice for the abatement as required in paragraphs 2.a. through 2.d. below. The abatement notice may also be included on the demolition notice, so that only one notice may be sent. In this case, include the additional notice lead times as identified in paragraphs 2.a. through 2.d.
  - a. The Contractor is requested by the state to telephone at least 24 hours beforehand if the operation involves RACM that is below 260 LF, 160 SF, or 35 CF. This only applies in the contractor has sent a long-term NESHAP notification to the State.
  - b. The Contractor will mail and be postmarked, fax and follow-up with a mailing, or deliver the NESHAP notice 10 working days beforehand if the operation involves RACM that is below 260 LF, 160 SF, or 35 CF (and if the contractor has not sent a long-term NESHAP notification to the State).
  - c. The Contractor is requested (not a regulatory requirement) by the State to mail, fax, deliver a notice, or phone in the notice so that it is received at least 24 hours beforehand if the operation involves non-regulated ACM in any amount. (In any case, the government “project designer” may still specify that the contractor does a NESHAP notice for any asbestos removal actions. This would be advantages to the government.)
  - d. The Contractor will mail and be postmarked, fax and follow-up with a mailing, or deliver the NESHAP notice at least 10 working days before abatement begins if the operation involves RACM that is at least 260 LF, 160 SF, or 35 CF.

3. All Kentucky notifications are sent to:

Rebecca Bohannon  
Kentucky Division for Air Quality  
Asbestos Branch, Paducah Region  
4500 Clarks River Road  
Paducah, Kentucky 42003  
(270) 898-8468 Office  
(270) 898-8640 Fax

All Tennessee notifications are sent to:

Mr. Randal Harrison  
Tennessee Division Air Pollution Control  
9th Floor, L & C Annex, 401 Church St.  
Nashville, Tennessee 37243-1531  
(615) 532-0554 Office  
(615) 532-0614 Fax

[Return to Appendix A](#)

[Return to Section](#)

**APPENDIX B**  
**State Water/Sewer Submittals**

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## APPENDIX C

### Digging / Excavation Permits

See [CAM Regulation 420-3](#). This regulation establishes policies, procedures, and guidance for requesting utility locates associated with digging activities and excavation of soil to ensure protection of underground utilities (water/sewer, electric, gas, phone, steam/chill water, control cables, petroleum/POL, cable TV) and environmental/historical sensitive areas (archeological sites, former solid waste disposal sites).

Fort Campbell has stopped using dig permits. Currently, Tennessee One Call is being used to notify utility providers of the need to locate buried utilities prior to digging/excavation. One week prior to beginning digging/excavation, call 800-351-1111 with the following information:

- a. Address
- b. Phone number
- c. Start date – when digging/excavation to begin
- d. Start time – time digging/excavation to begin
- e. Town – Fort Campbell
- f. Dig Street & Number
- g. Nearest Intersecting Road

The proposed area of excavation shall be designated by the person responsible for the excavation by marking such area with safety white color coded stakes or white paint.

The underground utilities will be marked within 3 days as follows:

- a. Safety Red – electric power distribution and transmission facilities
- b. High Visibility Safety Yellow – gas and oil distribution and transmission facilities
- c. Safety Alert Orange – telephone, telegraph, cable, television, video and other telecommunications facilities
- d. Safety Precaution Blue – water system facilities
- e. Safety Green – sewer system facilities
- f. Safety Purple – reclaimed water, irrigation and slurry lines

If the start date and time arrives and one or more members has failed to mark the facilities, and there is clear evidence of the presence of an unmarked utility, you MUST call Tennessee One-Call with a Second Request.

If, during the course of excavation an underground facility has been damaged, notify the facility owner immediately of the location and nature of the damage. Do not try to repair the facility yourself or to cover up the damage.

A locate request has an expiration date. It is 15 calendar days from the date and time specified the dig is to begin.

The above information was taken from the "Tennessee Excavation Guide, April 2007" available from Tennessee One-Call System, Inc. (phone: 615-367-1110, email: [tnocs@tncall.com](mailto:tnocs@tncall.com))

**[Return to Chapter 2](#)**

## **APPENDIX D**

### **Finishes, Exterior and Interior**

The following are Ft. Campbell's standard color schedule for **Exterior Finishes** and special items:

#### STANDING SEAM METAL ROOF AND FASCIA

Manufacturer: Varies

Color: Butler, Kyner 500, color "Terra Brown" or approved equal

#### METAL SIDING (When approved)

Manufacturer: Varies

Color: Butler, Kyner 500, color "Country Wheat" or approved equal

#### EXTERIOR DOORS, FRAMES, TRIM AND ANODIZED ALUMINUM WINDOWS

Manufacturer: Varies

Color: Match standing seam metal roof color

#### BRICK

Manufacturer: Palmetto Brick Company

Color: ".75 Greystone"

Manufacturer: Acme Brick

Color: "Ko-Ko Brown"

Manufacturer: Sioux City Brick

Color: Beige Grey Velour

#### ACCENT BRICK

Manufacturer: Acme Brick

Color: "Ko-Ko Plus Chocolate"

Manufacturer: Palmetto Brick Company

Color: "1.25 Greystone"

Manufacturer: Sioux City Brick

Color: Charcoal Grey Velour

#### SPLIT-FACE CONCRETE MASONRY UNITS

Manufacturer: Southland Supply style

Color: Goldenrod, 24H

## MORTAR

Manufacturer: Quickrete

Color: Ochre 2

Manufacturer: Holcim Cement

Color: PCL S Buff

## ROOF FIXTURES

Manufacturer: Varies

Color: Match standing seam metal roof

## DOWNSPOUTS, GUTTERS, LOUVERS, FLASHING

Manufacturer: Varies

Color: Match standing seam metal roof

## EXTERIOR SOFFITS AND CEILING

Manufacturer: Varies

Color: White (factory finish)

[The following are Ft. Campbell's standard color schedule for Interior Finishes and special items:](#)

Plastic Laminate, Vertical: **Wilsonart, "1500N-60, Grey"**  
**Wilsonart, "D432-60, Cashmere"**

Plastic Laminate, Horizontal: **Wilsonart "4640-60, Dove Moraine"**  
**Wilsonart "4608-60, Caldera Beige"**

Solid Surface Material: **Wilsonart "1521-MG, Light Beige Mirage"**  
**Wilsonart "D431-MG, Alabaster Mirage"**

Vinyl Base: **Azrock, 4" Vinyl Base, "CB-66"**  
**Flexco, 4" Vinyl Base, "VCB-031 Zephyr"**

VCT: **Azrock, 12"x12"x1/8" "V869, Tundra, Cortina Colors"**  
**Azrock, 12"x12"x1/8" "V787, Stratus"**

Sheet Flooring: **Tarket, "18319"**

ACT: **USG "2110, 2'x2'x5/8" White, Radar"**

ACT Grid: **USG "Donn DX, 15/16", White"**

Window Blinds: **Valencia Deluxe, "0285, 1" Metal**  
**Valencia Deluxe, "0023, 1" Metal**

Carpet: **Lees, 115 Mauve, Pebble Weave II**  
**Lees, 305 Cloisonne, Pebble Weave II**  
**Lees, 204 Vienna Woods, Pebble Weave II**

[Return to Finishes](#)  
[Return to Table of contents](#)

# APPENDIX E

## Fort Campbell Landscape Plant List

### Native Plant Material

#### (Native) Conifers/Evergreens:

Botanical Name	Common Name
<b>(Native) Tall Trees – (trees over 50 ft. at maturity)</b>	
<i>Pinus echinata</i>	Shortleaf Pine
<i>Tsuga canadensis</i>	Eastern Hemlock
<i>Taxodium distichum</i>	Bald Cypress
<b>(Native) Medium Trees – (trees 25 to 50 ft. at maturity)</b>	
<i>Pinus virginiana</i>	Virginia Pine
<i>Juniperus virginiana</i>	Eastern Red Cedar
<b>(Native) Small Trees/Large Shrubs – (10 to 25 ft. at maturity)</b>	
<i>Juniperus virginiana</i>	Eastern Red Cedar

[Return to Exterior Planting Section](#)

#### (Native) Deciduous:

Botanical Name	Common Name
<b>(Native) Tall Trees– (trees over 50 ft. at maturity)</b>	
<i>Liriodendron tulipifera</i>	Yellow or Tulip Poplar
<i>Sassafras albidum</i>	Sassafras
<i>Liquidambar styraciflua</i>	Sweetgum
<i>Ulmus thomasii</i>	Rock Elm
<i>Celtis occidentalis</i>	Hackberry
<i>Celtis laevigata</i>	Sugarberry
<i>Morus rubra</i>	Red Mulberry
<i>Juglans nigra</i>	Black Walnut
<i>Carya illinoensis</i>	Pecan
<i>Carya cordiformis</i>	Bitternut Hickory
<i>Carya tomentosa</i>	Mockernut Hickory
<i>Carya ovata</i>	Shagbark Hickory
<i>Carya glabra</i>	Pignut Hickory
<i>Fagus grandifolia</i>	American Beech

Botanical Name	Common Name
<b>(Native) Tall Trees– (trees over 50 ft. at maturity) continued</b>	
<i>Quercus alba</i>	White Oak
<i>Quercus stellata</i>	Post Oak

<b>Botanical Name</b>	<b>Common Name</b>
<i>Quercus bicolor</i>	Swamp White Oak
<i>Quercus michauxii</i>	Swamp Chestnut Oak
<i>Quercus prinus</i>	Chestnut Oak
<i>Quercus muehlenbergii</i>	Chinkapin Oak
<i>Quercus rubra</i>	Northern Red Oak
<i>Quercus palustris</i>	Pin Oak
<i>Quercus falcata</i>	Southern Red Oak
<i>Quercus velutina</i>	Black Oak
<i>Quercus shumardii</i>	Shumard Oak
<i>Quercus coccinia</i>	Scarlet Oak
<i>Quercus phellos</i>	Willow Oak
<i>Tilia americana</i>	American Basswood
<i>Populus deltoides</i>	Eastern Cottonwood
<i>Salix nigra</i>	Black Willow
<i>Diospyros virginiana</i>	Common Persimmon
<i>Prunus serotina</i>	Black Cherry
<i>Gleditsia tracanthos</i>	Honeylocust
<i>Gymnocladus dioica</i>	Kentucky Coffeetree
<i>Nyssa aquatica</i>	Water Tupelo
<i>Nyssa sylvatica</i>	Black Tupelo
<i>Aesculus octandra</i>	Yellow Buckeye
<i>Acer rubrum</i>	Red Maple
<i>Acer saccharinum</i>	Silver Maple
<i>Acer negundo</i>	Box Elder
<i>Fraxinus pennsylvanica</i>	Green Ash
<i>Fraxinus americana</i>	White Ash
<b>(Native) Medium Trees – (trees 25 to 50 ft. at maturity)</b>	
<i>Magnolia tripetala</i>	Umbrella Magnolia
<i>Magnolia macrophylla</i>	Bigleaf Magnolia
<i>Asimina triloba</i>	Pawpaw
<i>Ulmus alata</i>	Winged Elm
<i>Celtis occidentalis</i>	Hackberry
<i>Quercus stellata</i>	Post Oak
<i>Quercus marilandica</i>	Blackjack Oak
<i>Ostrya virginiana</i>	Eastern Hop Hornbeam
<i>Carpinus carolinia</i>	American Hornbeam
<i>Betula lenta</i>	Sweet Birch
<i>Betula nigra</i>	River Birch
<i>Salix nigra</i>	Black Willow
<i>Oxydendron arboreum</i>	Sourwood
<i>Diospyros virginiana</i>	Common Persimmon
<i>Halesia carolina</i>	Carolina Silverbell

<b>Botanical Name</b>	<b>Common Name</b>
<b>(Native) Medium Trees – (trees 25 to 50 ft. at maturity) continued</b>	
<i>Amelanchier arborea</i>	Downey Serviceberry
<i>Ilex opaca</i>	American Holly
<i>Rhamnus caroliniana</i>	Carolina Buckthorn
<i>Aesculus glabra</i>	Ohio Buckeye
<i>Acer negundo</i>	Box Elder
<b>(Native) Small Trees/Large Shrubs – (10 to 25 ft. at maturity)</b>	

Botanical Name	Common Name
<i>Hamamelis virginiana</i>	Witch Hazel
<i>Carpinus carolinia</i>	American Hornbeam
<i>Kalmia latifolia</i>	Mountain Laurel
<i>Prunus americana</i>	American Plum
<i>Crataegus spp.</i>	Hawthorn
<i>Cercis canadensis</i>	Eastern Redbud
<i>Cornus florida</i>	Flowering Dogwood
<i>Euonymus atropurpurens</i>	Eastern Wahoo
<i>Cephalanthus occidentalis</i>	Buttonbush
<i>Sambucus canadensis</i>	American Elder

[Return to Exterior Planting Section](#)

### Introduced Species (Kentucky Extension Service List)

#### (Introduced) Evergreen:

Botanical Name	Common Name
<b>(Introduced) Tall Trees– (trees over 50 ft. at maturity)</b>	
<i>Abies nordmanniana</i>	Nordmann Fir
<i>Cedrus libani</i> var. <i>stenocoma</i>	Hardy Cedar of Lebanon
<i>Picea abies</i>	Norway Spruce
<i>Picea glauca</i> ‘Densata’	Black Hills Spruce
<i>Picea omorika</i>	Serbian Spruce
<i>Picea orientalis</i>	Oriental Spruce
<i>Picea pungens</i>	Colorado Spruce
<i>Pinus densiflora</i>	Japanese Red Pine
<i>Pinus flexilis</i>	Limber Pine
<i>Pinus resinosa</i>	Red Pine
<i>Pseudotsuga menziesii</i>	Douglas Fir
<i>Thuja occidentalis</i>	American Arborvitae
<b>(Introduced) Medium Trees – (trees 25 to 50 ft. at maturity)</b>	
<i>Abies concolor</i>	White Fir
<i>Chamaecyparis obtusa</i>	Hinoki Cypress
<i>Chamaecyparis pisifera</i>	Thread Cypress
<i>Ilex attenuata</i> ‘Fosteri’	Foster No. 2 Holly
<i>Juniperus chinensis</i>	Chinese Juniper
<i>Osmanthus americanus</i>	Devil Wood

Botanical Name	Common Name
<b>(Introduced) Medium Trees – (trees 25 to 50 ft. at maturity)</b>	
<b>continued</b>	
<i>Pinus bungeana</i>	Lacebark Pine
<i>Pinus cembra</i>	Swiss Stone Pine
<i>Pinus densiflora</i> ‘Oculus-draconis’	Japanese Red Pine
<i>Pinus strobus</i> ‘Fastigiata’	Columnar White Pine
<i>Pinus strobus</i> ‘Pendula’	Weeping White Pine
<i>Pinus sylvestris</i>	Scotch Pine
<i>Platycladus orientalis</i>	Oriental Arborvitae
<i>Taxus baccata</i>	English Yew
<i>Taxus cuspidata</i> ‘Capitata’	Upright Japanese Yew

Botanical Name	Common Name
<b>(Introduced) Small Trees/Large Shrubs – (10 to 25 ft. at maturity)</b>	
<i>Abies koreana</i> 'Prostrate Beauty'	Prostrate Korean Fir
<i>Chamaecyparis obtusa</i> 'Torulosa'	Contorted Hinoki Cypress
<i>Ilex aquifolium</i>	English Holly
<i>Ilex crenata</i> 'Noble's Upright'	Noble's Upright Japanese Holly
<i>Ilex pedunculosa</i>	Longstock Holly
<i>Juniperus chinensis</i>	Chinese Juniper
<i>Juniperus scopulorum</i>	Rocky Mountain Juniper
<i>Picea glauca</i> 'Conica'	Dwarf Albert Spruce
<i>Pinus densiflora</i> 'Umbraculifera'	Tanyosho Pine
<i>Pinus mugo</i>	Mugho Pine
<i>Pinus strobus</i> 'Contorta'	Curly White Pine
<i>Pinus sylvestris</i> 'Wateri'	Waterer's Scotch Pine
<i>Rhododendron catawbiense</i>	Rhododendron
<i>Rhododendron azalea</i>	Azalea
<i>Rhododendron maximum</i>	Rosebay Rhododendron
<i>Sciadopitys verticillata</i>	Umbrella Pine
<i>Taxus cuspidata</i>	Japanese Yew
<i>Viburnum pragense</i>	Fragrant Viburnum
<b>(Introduced) Medium Shrubs – (6 to 8 ft. at maturity)</b>	
<i>Chamaecyparis obtusa</i> 'Sanderi'	Sanderi Hinoki False Cypress
<i>Chamaecyparis pisifera</i>	Sawara Cypress
<i>Ilex meserveae</i>	Blue Holly
<i>Juniperus chinensis</i> 'Sea Green'	Sea Green Chinese Juniper
<i>Mahonia aquifolium</i>	Oregon Holly Grape
<i>Pieris japonica</i>	Japanese Pieris
<i>Taxus cuspidata</i>	Japanese Yew
<i>Taxus media</i>	Spreading Yew
<b>(Introduced) Small Shrubs – (4 to 5 ft. at maturity)</b>	
<i>Buxus microphylla</i>	Boxwood
<i>Chamaecyparis pisifera</i>	Gold Thread Cypress
<i>Ilex glabra</i> 'Compacta'	Compact Inkberry
<i>Ilex opaca</i> 'Maryland Dwarf'	Maryland Dwarf American Holly
<i>Juniperus chinensis</i>	Chinese Juniper

Botanical Name	Common Name
<b>(Introduced) Small Shrubs – (4 to 5 ft. at maturity) continued</b>	
<i>Leucothoe fontanesiana</i>	Drooping Leucothoe
<i>Mahonia aquifolium</i>	Oregon Holly Grape
<i>Picea abies</i>	Norway Spruce
<i>Picea pungens</i>	Colorado Spruce
<i>Pinus mugo</i>	Mugho Pine
<i>Pinus strobus</i> 'Nana'	Dwarf White Pine
<i>Pinus sylvestris</i> 'Beuvronensis'	Dwarf Scotch Pine
<i>Rhododendron</i> 'Starry Night'	Starry Night Rhododendron
<i>Taxus baccata</i> 'Repandens'	Spreading English Yew
<i>Tsuga canadensis</i> 'Gentsch'	Gentsch White Canadian Hemlock
<b>(Introduced) Low Shrubs – (2 to 3 ft. at maturity)</b>	
<i>Abies balsamea</i> 'Nana'	Dwarf Balsam Fir

Botanical Name	Common Name
<i>Chamaecyparis obtusa</i> 'Pygmae Aurescens'	Dwarf Hinoki False Cypress
<i>Chamaecyparis pisifera</i>	Moss Cypress
<i>Juniperus horizontalis</i>	Compact Juniper
<i>Juniperus sabina</i>	Savin Juniper
<i>Juniperus squamata</i> 'Blue Star'	Blue Star Juniper
<i>Leucothoe fontanesiana</i>	Drooping Leucothoe
<i>Mahonia aquifolium</i> 'Compactum'	Compact Oregon Holly Grape
<i>Picea abies</i>	Dwarf Norway Spruce
<i>Pieris japonica</i> 'Pygmaea'	Pygmy Andromeda
<i>Pinus sylvestris</i> 'Riverside Gem'	Riverside Gem Scotch Pine
<i>Rhododendron obtusum</i>	Azalea (several varieties)

[Return to Exterior Planting Section](#)

**(Introduced)  
Deciduous:**

Botanical Name	Common Name
<b>(Introduced) Tall Trees– (trees over 50 ft. at maturity)</b>	
<i>Acer platanoides</i>	Norway Maple
<i>Alnus glutinosa</i>	European Alder
<i>Cercidiphyllum japonicum</i>	Katusra Tree
<i>Eucommia ulmoides</i>	Hardy Rubber Tree
<i>Fagus sylvatica</i>	European Beech
<i>Ginkgo biloba</i>	Ginkgo or Maidenhair Tree
<i>Larix kaempferi</i>	Japanese Larch
<i>Metasequoia glyptostroboides</i>	Dawn Redwood
<i>Platanus x acerfolia</i>	London Planetree
<i>Quercus acutissima</i>	Sawtooth Oak
<i>Quercus robur</i>	English Oak
<i>Tilia cordata</i>	European Linden

Botanical Name	Common Name
<b>(Introduced) Tall Trees– (trees over 50 ft. at maturity) continued</b>	
<i>Tilia tomentosa</i>	Silver Linden
<i>Ulmus parvifolia</i>	Chinese Elm
<i>Ulmus x</i>	Hybrid Elms
<i>Zelkova serrata</i>	Japanese Zelkova
<b>(Introduced) Medium Trees – (trees 25 to 50 ft. at maturity)</b>	
<i>Acer campestre</i>	Hedge Maple
<i>Acer griseum</i>	Paperbark Maple
<i>Aesculus x carnea</i>	Red Horsechestnut
<i>Aesculus pavia</i>	Red Buckeye
<i>Amelanchier grandiflora</i>	Apple Serviceberry
<i>Amelanchier laevis</i>	Alleghany Serviceberry
<i>Betula populifolia</i>	Gray Birch
<i>Betula maximowicziana</i>	Monarch Birch
<i>Carpinus betulus</i>	European Hornbeam
<i>Castanea mollissima</i>	Chinese Chestnut
<i>Corylus colurna</i>	Turkish Filbert

<b>Botanical Name</b>	<b>Common Name</b>
<i>Franklinia alatamaha</i>	Franklin Tree
<i>Ilex decidua</i>	Possum Haw
<i>Koeireuteria paniculata</i>	Golden Raintree
<i>Larix decidua</i> 'Pendula'	Weeping European Larch
<i>Maackia amurensis</i>	Amur Maackia
<i>Magnolia virginiana</i>	Sweet Bay Magnolia
<i>Phellodendron amurense</i>	Cork Tree
<i>Prunus sargentii</i>	Sargent Cherry
<i>Prunus serrulata</i> 'Kwanzan'	Kwanzan Japanese Cherry
<i>Pyrus fauriei</i>	Korean Pear
<i>Stewartia pseudocamellia</i>	Japanese Stewartia
<i>Syringa pekinensis</i>	Pekin Lilac
<i>Syringa reticulata</i>	Japanese Tree Lilac
<i>Prunus x yedoensis</i>	Yoshino Cherry
<i>Pyrus calleryana</i>	Callery Pear
<b>(Introduced) Small Trees/Large Shrubs – (10 to 25 ft. at maturity)</b>	
<i>Acer buergeranum</i>	Trident Maple
<i>Acer ginnala</i>	Amur Maple
<i>Acer japonicum</i>	Fullmoon Maple
<i>Acer maximowiczianum</i>	Nikko Maple
<i>Acer palmatum</i>	Japanese Maple
<i>Acer tegmentosum</i>	Manchu Striped Maple
<i>Aesculus parviflora</i>	Bottlebrush Buckeye
<i>Buddleia alternifolia</i>	Fountain buddleia
<i>Cercidiphyllum japonicum</i>	Weeping Katsura Tree
<i>Chionanthus retusus</i>	Chinese Fringe Tree
<i>Chionanthus virginicus</i>	Fringe Tree
<i>Cornus alternifolia</i>	Pagoda Dogwood

<b>Botanical Name</b>	<b>Common Name</b>
<b>(Introduced) Small Trees/Large Shrubs – (10 to 25 ft. at maturity) continued</b>	
<i>Cornus kousa</i>	Kousa Dogwood
<i>Cornus mas</i>	Cornelian Cherry Dogwood
<i>Cornus officinalis</i>	Japanese Cornel Dogwood
<i>Cornus racemosa</i>	Gray Dogwood
<i>Corylus avellana</i> 'Cortorta'	Curly European Filbert
<i>Corylus maxima</i> 'Purpurea'	Purple Giant Filbert
<i>Cotoneaster multiflorus</i>	Many-flowered Cotoneaster
<i>Crataegus crus-galli</i>	Cockspur Hawthorn
<i>Crataegus lavalleyi</i>	Lavalle Hawthorn
<i>Crataegus phaenopyrum</i>	Washington Hawthorn
<i>Crataegus viridis</i> 'Winter King'	Winter King Hawthorn
<i>Deutzia scabra</i> 'Pride of Rochester'	Pride of Rochester Deutzia
<i>Enkianthus campanulatus</i>	Redvein Enkianthus
<i>Euonymus alata</i>	Burning Bush
<i>Forsythia intermedia</i>	Border Forsythia
<i>Fothergilla major</i>	Large Fothergilla
<i>Ilex verticillata</i>	Winterberry
<i>Kolkwitzia amabilis</i>	Beauty Bush
<i>Ligustrum ibolium</i>	Ibolium Privet

<b>Botanical Name</b>	<b>Common Name</b>
<i>Ligustrum ovalifolium</i>	California Privet
<i>Ligustrum vicaryl</i>	Vicary Golden Privet
<i>Lindera benzoin</i>	Spicebush
<i>Lonicera morrowii</i>	Fragrant Honeysuckle
<i>Lonicera tatarica</i>	Tatarian Honeysuckle
<i>Magnolia x</i>	Hybrid Magnolia (several varieties)
<i>Magnolia loebneri</i> 'Merrill'	Dr. Merrill Magnolia
<i>Magnolia soulangiana</i>	Saucer Magnolia
<i>Magnolia stellata</i>	Star Magnolia
<i>Malus x spp.</i>	Crabapple
<i>Malus floribunda</i>	Flowering Crabapple
<i>Malus sieboldii</i> var. Zumi	Calocarpa Crabapple
<i>Philadelphus virginialis</i>	Mockorange
<i>Physocarpus opulifolius</i>	Eastern Ninebark
<i>Prunus x</i> 'Hally Jolivette'	Hally Jolivette Cherry
<i>Prunus subhirtella</i>	Higan Cherry
<i>Rhamnus fragula</i> 'Asplenifolia'	Cutleaf Buckthorn
<i>Syringa vulgaris</i>	Common Lilac
<i>Ulmus glabra</i> 'Camperdownii'	Camperdown Elm
<i>Viburnum burkwoodii</i>	Burkwood Viburnum
<i>Viburnum carlcephalum</i>	Fragrant Viburnum
<i>Viburnum dentatum</i>	Arrowwood Viburnum
<i>Viburnum dilatatum</i> 'Iroquois'	Iroquois Linden Viburnum
<i>Viburnum lantana</i>	Wayfaring Tree
<i>Viburnum lentago</i>	Nannyberry Viburnum
<i>Viburnum macrocephalum</i>	Chinese Snowball Viburnum
<b>(Introduced) Small Trees/Large Shrubs – (10 to 25 ft. at maturity) continued</b>	
<i>Viburnum opulus</i>	Cranberry Bush Viburnum
<i>Viburnum plicatum</i> var. <i>tomentosum</i> '	Doublefile Viburnum
<i>Viburnum prunifolium</i>	Blackhaw
<i>Viburnum rhytidophyloides</i>	Lantanaphyllum Viburnum
<i>Viburnum sargentii</i> 'Onondaga'	Onondaga Viburnum
<i>Viburnum sieboldii</i> 'Seneca'	Seneca Viburnum
<i>Viburnum setigerum</i>	Tea Viburnum
<i>Viburnum</i> 'Sesquehana'	Sesquehanna Viburnum
<b>(Introduced) Medium Shrubs – (6 to 8 ft. at maturity)</b>	
<i>Acanthopanax sieboldianus</i>	Five-leaved Aralia
<i>Acer palmatum</i>	Japanese Maple
<i>Aronia arbutifolia</i> 'Brilliantissima'	Brilliant Red Chokeberry
<i>Berberis mentorensis</i>	Mentor Barberry
<i>Berberis thunbergii</i>	Japanese Barberry
<i>Buddleia davidii</i>	Orange-eyed Butterfly Bush
<i>Clianthus floridus</i>	Carolina Allspice
<i>Cercis chinensis</i>	Chinese Redbud
<i>Chaenomeles speciosa</i>	Flowering Quince
<i>Clethra alnifolia</i>	Summer Sweet
<i>Cornus alba</i>	Tatarian Dogwood
<i>Cornus baileyi</i>	Bailey's Dogwood
<i>Cornus florida</i> 'Pygmaea'	Pygmy Dogwood
<i>Cornus sericea</i> 'Flaviramea'	Yellow-twig Dogwood

<b>Botanical Name</b>	<b>Common Name</b>
<i>Cotoneaster divaricata</i>	Spreading Cotoneaster
<i>Deutzia lemoinei</i>	Slender Deutzia
<i>Forsythia intermedia</i> 'Sunrise'	Border Forsythia
<i>Hamamelis vernalis</i>	Vernal Witchhazel
<i>Hibiscus syriacus</i>	Rose of Sharon
<i>Hydrangea quercifolia</i>	Oakleaf Hydrangea
<i>Ilex verticillata</i>	Winterberry
<i>Kerria japonica</i>	Japanese Kerria
<i>Ligustrum vulgare</i> 'Lodense'	Lodense Privet
<i>Lonicera xyldosteum</i> 'Claveyl'	Clavey's Honeysuckle
<i>Malus sargentii</i>	Sargent Crabapple
<i>Morus alba</i> 'Pendula'	Weeping Mulberry
<i>Myrica pensylvanica</i>	Northern Bayberry
<i>Prunus x cistena</i>	Purpleleaf Sand Cherry
<i>Pyracantha coccinea</i>	Scarlet Firethorn
<i>Rhus aromatica</i>	Fragrant Summac
<i>Ribes alpinum</i>	Alpine Currant
<i>Spiraea nipponica</i> 'Snowmound'	Snowmound Spirea
<i>Spiraea x vanhouttei</i>	Vanhoutte Spirea
<i>Viburnum acerfolium</i>	Mapleleaf Viburnum
<i>Viburnum carlesli</i>	Koreanspice
<i>Viburnum juddii</i>	Judd Viburnum
<b>(Introduced) Medium Shrubs – (6 to 8 ft. at maturity) continued</b>	
<i>Viburnum x 'Mohawk'</i>	Mohawk Viburnum
<i>Viburnum x pragense</i>	Prague Viburnum
<i>Weigela florida</i>	Weigela
<b>(Introduced) Small Shrubs – (4 to 5 ft. at maturity)</b>	
<i>Abelia grandiflora</i>	Glossy Abelia
<i>Berberis thunbergii</i> 'Aurea'	Golden Japanese Barberry
<i>Cotoneaster horizontalis</i>	Rockspray Cotoneaster
<i>Deutzia gracilis</i>	Slender Deutzia
<i>Divervilla sessilifolia</i>	Southern Bush Honeysuckle
<i>Hydrangea arborescens</i>	Hills-of-Snow
<i>Hypericum kalm</i>	Kalm St. Johnswort
<i>Ilex verticillata</i>	Winterberry
<i>Itea japonica</i> 'Beppu'	Beppu Sweetspire
<i>Malus sargentii</i> 'Tina'	Tina Crabapple
<i>Physocarpus opulifolius</i>	Eastern Ninebark
<i>Potentilla fruticosa</i>	Bush Cinquefoil
<i>Pyracantha coccinea</i>	Scarlet Firethorn
<i>Syringa meyeri</i> 'Palibin'	Meyer's Lilac
<i>Syringa patula</i> 'Miss Kim'	Littleleaf Lilac
<i>Viburnum opulus</i> 'Nana'	Dwarf Cranberrybush Viburnum
<i>Viburnum trilobum</i> 'Compactum'	Compact American Cranberry Bush
<i>Viburnum utile</i> 'Eskimo'	Eskimo Viburnum
<b>(Introduced) Low Shrubs – (2 to 3 ft. at maturity)</b>	
<i>Berberis thunbergii</i>	Japanese Barberry
<i>Caryopteris clandonensis</i> 'Blue	Blue Mist Bluebeard
<i>Cornus sericea</i> 'Kelseyi'	Kelsey's Dwarf Dogwood
<i>Cotoneaster apiculatus</i>	Cranberry Cotoneaster
<i>Cotoneaster dammeri</i>	Bearberry Cotoneaster
<i>Cotoneaster horizontalis</i> 'Perpusilla'	Perpusilla Rock Cotoneaster
<i>Cotoneaster microphylla</i>	Small Leaf Cotoneaster
<i>Forsythia viridissima</i> 'Bronxensis'	Bronx Forsythia

<b>Botanical Name</b>	<b>Common Name</b>
<i>Forsythia</i> 'Arnold's Dwarf'	Arnold's Dwarf Forsythia
<i>Fothergilla gardenii</i>	Dwarf Fothergilla
<i>Hypericum</i> 'Hidcote'	Hidcote St. Johnswort
<i>Jasminum nudiflorum</i>	Winter Jasmine
<i>Kalmia cuseata</i> 'White Wicky'	White Wicky Mountain Laurel
<i>Kerria japonica</i> 'Picta'	Variegated Japanese Kerria
<i>Physocarpus opulifolius</i> 'Nana'	Dwarf Eastern Ninebark
<i>Rhus aromatica</i> 'Gro-low'	Gro-low Fragrant Summac
<i>Ribes alpinum</i> 'Greenmound'	Greenmound Alpine Currant
<i>Rosa wichuriana</i>	Memorial Rose
<i>Spiraea x bumalda</i>	Bumald Spirea
<i>Spiraea japonica</i> 'Little Princess'	Little Princess Japanese Spirea
<i>Symphoricarpos albus</i> <i>var. laevigatus</i>	Snowberry

[Return to Exterior Planting Section](#)

[Return to Table of Contents](#)

# Appendix F

## Utility Procedures

### PARAGRAPH

- F-1 [Introduction](#)
- F-2 [Record Drawings](#)
- F-3 [Metering](#)
- F-4 [Distribution Lines](#)
- F-5 [Existing Lines to be Removed](#)
- F-6 [New Service Lines](#)
- F-7 [Plans and Specifications](#)
- F-8 [Utility Cost Estimate](#)
- F-9 [Utility Company Contracts](#)

[Return to Table of Contents](#)

[Return to Section 02510](#)

[Return to Sanitary Sewers](#)

[Return to Section 02556](#)



The natural gas distribution system, the water distribution system for domestic and fire, and the sewer systems at Fort Campbell are now privately owned and operated by utility companies.

This is an outline of the recommended procedures for dealing with the utility aspects of facility design projects. Variation from this procedure is expected, depending upon the project. However, revised procedures should be agreed upon during the early design stages of a project. Unless noted otherwise in the design scope of work, the utility companies will install new service lines to buildings.

The utility companies are active players in the planning, design, and construction process of each building project.

Utility company contacts are provided below.

## **F-2 RECORD DRAWINGS:**

The utility companies maintain as-built record utility drawings for the installation. To obtain utility drawings, refer to UTILITY COMPANY CONTACTS below.

## **F-3 METERING:**

Metering of gas, steam, heating hot water, electricity, fuel oil, etc. is required by UFC 3-400-01 Energy Conservation.

Metering of water is required for all buildings where potable water demand is estimated to exceed 100,000 gallons per year.

Connection of the meters to the Energy Monitoring and Control System (EMCS) is required.

The gas utility company will install a regulator, an emergency gas connection, a seismic shutoff valve, and a meter with a pulse initiator for EMCS. [A typical gas service meter assembly at the building is attached for information.](#) Coordinate the location of this assembly with the utility company and show the location on the drawings and indicate that the installation is by the gas utility company.

Where required, a building domestic water meter will be provided inside the building mechanical room by the water company. Coordinate the location of this meter with the utility company and show the location on the drawings and indicate that the installation is by the water utility company.

The fire sprinkler water will not be metered.

## **F-4 DISTRIBUTION LINES:**

The utility company will determine whether changes to the utility distribution systems will be required. The cost, schedule, and execution of the upgrade to the distribution system will be handled by Fort Campbell and the utility company as a contract action separate from the building project.

## **F-5 EXISTING LINES TO BE REMOVED:**

Unused lines will be removed by the utility company.

## **F-6 NEW SERVICE LINES:**

The building designer determines the required capacity of each service line and the preferred location of the building service entrance.

The building designer determines the required gas pressure into the building (typically 14 inches water column).

The building designer obtains the installation utility record drawings (maps) from the utility company.

The building designer coordinates with the utility companies to determine and share the following information concerning the service lines:

- Flow
- Estimated consumption
- Line size
- Routing
- Tie-in points to the main distribution system
- Location of the utility service entrance to the building
- Location of the gas regulator / meter / emergency connection / seismic shutoff valve assembly
- Location of valves including the post indicator valve for the fire sprinkler system
- Location of the water meter
- The type of backflow preventer on the incoming domestic water service lines, usually a reduced pressure type
- The type of backflow preventer on the incoming fire sprinkler line, usually a double check type. However if there are additives such as antifreeze or foam in the system or if there is a second non-potable water source connected to the sprinkler system, a reduced pressure type is required.
- Location of existing utility lines to be removed

## **F-7 PLANS AND SPECIFICATIONS:**

On the design drawings, the building designer shows:

- The routing of the new utility service lines, noted to be installed by others
- The location of building meters and regulator assemblies, noted to be installed by others
- The location of fire hydrants, noted to be installed by others
- The location of water line valves in the service lines, noted to be installed by others
- The location of post indicator valves, noted to be installed by others
- The location of utility lines to be removed, noted to be removed by others
- The main gas pressure
- The required building gas pressure
- The available static and residual water pressure and associated flow

Utility installation details are not shown.

Fire department connections are included in the contract as part of the sprinkler work.

The backflow preventers for domestic water and for fire sprinkler service are to be located inside the building and will be included in the building construction contract.

The building designer sends the design drawings to the utility companies. This should be done during concept design and during final design.

The utility company reviews the drawings and coordinates any required changes with the building designer.

The building designer includes a provision in the specifications that the building construction contractor must coordinate with the utility companies on the timing and sequence of work for the installation of the utilities. The utility contacts for utility work during construction below are to be included in the design documents.

The design documents must indicate that the utility company applies for all permits from the appropriate state authorities.

## **F-8            UTILITY COST ESTIMATE:**

The building designer has no involvement in the gas and water utility cost estimate.

## **F-9            UTILITY COMPANY CONTACTS:**

### **NATURAL GAS:**

To obtain record drawings, to discuss gas service line capacity, size, routing, and tie-in points to the main distribution system, and for coordination of gas utility work during construction or for inspection of contractor installed lines:

Randall Lewis  
Clarksville Gas and Water Co.  
Phone: 931-542-9600  
Fax: 931-542-9601

**WATER AND SEWER:**

To obtain water and sewer record drawings, to discuss water and sewer service line capacity, size, routing, and tie-in points to the main distribution system, and for coordination of water and sewer utility work during construction or for inspection of contractor installed lines:

Chris Semler  
CH2M Hill Co.  
Phone: 931-431-2015  
Fax: 931-431-0952

[Return to Appendix B](#)

[Return to Plumbing Section](#)

[Return to Table of Contents](#)

# APPENDIX G

## Mold and Humidity Control

### PARAGRAPH

- G-1 [Introduction](#)
- G-2 [Building Envelope](#)
- G-3 [Tight Buildings](#)
- G-4 [Air Infiltration and Vapor Barriers](#)
- G-5 [Gypsum Board and Wall Finishes](#)
- G-6 [Attics](#)
- G-7 [Crawl Spaces](#)
- G-8 [System Selection / Space Humidity Considerations](#)
- G-9 [Condensate Leaks](#)
- G-10 [Barracks](#)

### **G-1 INTRODUCTION:**

Mold grows where mold spores, nutrients, correct temperature, and ample moisture are combined. Controlling moisture is the best approach to avoiding mold. Eliminating mold spores is impractical, the organic materials in buildings offer potential mold nutrients, and the temperature in buildings is conducive to mold growth. Thus minimizing moisture by eliminating leaks, drips, and condensation in the wrong places must be addressed. Undesired water and moisture usually comes from problems in either the building envelope or the building mechanical systems or both. Wet materials and surfaces are not always required for mold to grow. Even high humidity conditions contribute to mold growth. Air conditioning systems must be designed to keep space humidity at reasonable levels.

### **G-2 BUILDING ENVELOPE**

The design of the building envelope must consider removal of all air entry points, cold bridges, multiple vapor barriers and gaps in the insulation system. Attics (with exceptions) and crawl spaces should no longer be ventilated. Interior floor slabs should be separated from foundations by insulated expansion joint materials. Cavity wall insulation should extend down to the footings. Insulated windows should be aligned with cavity wall insulation to remove gaps in the insulation system. Window sills, foundation sills and other veneer wall features should be isolated from the structural backup wall allowing cavity wall insulation to run continuously. Use only thermally broken windows. When designing with metal stud backup wall, apply minimum 1' rigid

insulation over exterior sheathing to improve thermal performance. Consider the use of new insulation products such as Polycynene which effectively eliminates air infiltration and vapor transmission.

### **G-3 TIGHT BUILDINGS:**

Leaks of unconditioned outdoor bring moisture into the building and lead to condensation on cold surfaces with subsequent wetting of building materials followed by deterioration of the materials and mold growth. Therefore, buildings that are relatively air tight must be the goal. A ventilated attic directly over an insulated lay-in ceiling, for example, does not represent tight building construction. Keep in mind that a slight pressure difference usually exists between inside and outside the building. Insulation batts alone will not stop air flow through the batt if a pressure difference exists from one side of the batt to the other and should therefore not be the only barrier to outdoor air. Mechanical air handling and exhaust systems are typically designed to bring in more air than they exhaust in an attempt to pressurize the building to prevent infiltration of outdoor air. This pressurization however is impossible if the building is full of holes. Pay close attention to the details of construction where walls meet roof to eliminate sources of air leaks. Note that building air tightness is not the same as vapor tightness. Buildings may be designed with or without vapor barriers depending on the indoor and outdoor conditions; however, air tightness must always be the goal.

### **G-4 AIR INFILTRATION AND VAPOR BARRIERS:**

Recent studies have shown that air infiltration/exfiltration is a more significant source of moisture accumulation in walls than water vapor diffusion. Air infiltration barriers (such as Tyvek) resist entry of air in walls that can transport moisture and create condensation problems while allowing water vapor to escape. These barriers also resist wind blown rain and water while protecting wall sheathing.

The use of vapor barriers, vapor retarders, and perm ratings for construction materials in the building envelope must be carefully considered for use by the designer. Vinyl wall coverings, bituminous damproofing, certain paint systems all have properties which may create vapor retarders. If used, vapor barriers must be placed at a location where the temperature is above the dew point temperature in both the heating and the cooling seasons. It is critical to eliminate multiple vapor retarders in wall systems which can trap moisture and create potential mold conditions.

### **G-5 GYPSUM BOARD AND WALL FINISHES:**

Do not place paper covered gypsum board or other surfaces that may provide nutrients for mold behind wall mounted fan coil units. Condensate drips from the valves and cold piping inside the fan coil cabinet and a small splash occurs with each drip. Because manufacturers provide no rear panel to the fan coil cabinet, the splashed

droplets dampen the wall surface behind the fan coil unit. Conventional gypsum board material at this location insures mold growth. Provide a wall liner made of plastic, metal, or other material that will not be a nutrient source for mold behind wall mounted fan coil units.

Do not use vinyl wall coverings on the interior surfaces of exterior walls or wall surfaces opposite kitchens or shower rooms. Moisture from these high humidity spaces will be trapped and condense behind the vinyl. Use of vinyl wall covering is not permitted in locations with predominant air conditioning loads rather than heating loads.

## **G-6 ATTICS:**

Because mold is becoming more associated with the entry of moisture laden air in the building envelop, it is strongly recommended that ventilated attics be used only in limited applications. However, if an attic is ventilated, do not use a vapor barrier under the insulation installed on top of the ceiling. This is because in the cooling season, this puts the vapor barrier in a location made cold by air discharging from supply air diffusers.

[Return to Appendix G](#)

## **G-7 CRAWL SPACES:**

Do not ventilate crawl spaces. Doing so introduces moisture to the crawl space which will migrate through floors and condense on the underside of floor coverings. The moisture can also condense on cold pipe surfaces within the crawl space; even the outer surface of the insulation on a chilled water line can easily reach temperatures below the dew point of a ventilated crawl space.

Use a 10 mil vapor barrier on the ground surface to prevent moisture migration from the ground. Cover the vapor barrier with gravel.

## **G-8 SYSTEM SELECTION / SPACE HUMIDITY CONSIDERATIONS:**

Direct humidity control using reheat is rarely necessary except in the most demanding climate control situations such as libraries or museums. Indirect humidity control can reasonably be achieved through thoughtful system design.

The paragraphs below are not meant to dictate equipment or system types. Rather, the goal is to point out the advantages and disadvantages of various systems with regard to space humidity for designer consideration.

Most systems are designed to do a good job of limiting humidity at full cooling load. The problem with high space humidity usually occurs at part load.

Oversized equipment essentially runs at part load all the time, so over sizing must be avoided.

Make sure the occupant's needs for temperature and humidity are known.

Design systems to limit space relative humidity to 45% instead of the usual 50% at full load. Use an indoor design condition of 78 deg F / 45% RH.

Design systems to limit space relative humidity to 60% at part load conditions.

Size cooling coils handling outdoor air for the design dry bulb temperature day, or the design humidity day which ever gives the greater coil capacity.

#### Single Zone Systems:

These systems modulate the supply air temperature in response to the space temperature.

Avoid adding safety factor to the cooling loads. Doing so increases the supply airflow, and with excess airflow comes high supply air temperature which leads to high space humidity.

A typical single zone air handling system serving a small office area is an example. Assess the cooling loads carefully and do not arbitrarily increase airflow or oversize the equipment.

Simple single zone systems serving a theater, an auditorium, or a gymnasium can be a problem, particularly if one air handler is used for the entire area. The wide fluctuation in load caused by the wide variation in the occupancy of these facilities leads to problems at part load conditions. In many cases, a single air handling unit sized for full occupancy can maintain space temperature setpoint with a supply air temperature that is within a degree or two of the space temperature when the facility is at minimal occupancy. This insures part load humidity problems.

Get the airflow right and full load humidity problems are less likely. Always consider what will happen to the supply air temperature and the resulting space humidity at part load conditions. Consider the following possible solutions to part load humidity problems when using single zone equipment:

Colder Supply Air – Design for colder supply air. Then at part load the air will be colder than it would otherwise be, more moisture will be removed from the air stream, space humidity at part load will be lower. (Designing for lower space relative humidity will require colder supply air.)

Variable Air Volume Single Zone System – The single zone cooling coil provides constant discharge air temperature while the fan speed is modulated based on space temperature. After the fan reaches minimum speed the supply air temperature is modulated by decreasing.

Return Air Bypass Single Zone System – Using face and bypass dampers, bypass return air (not mixed air) around the cooling coil as the space cooling load is satisfied while the cooling coil operates with full flow.

Multiple Single Zone Systems – Use more than one air handling system. As the cooling load falls shut down one or more units. This causes the remaining units to supply colder air to maintain the space temperature setpoint.

#### Multizone Systems:

As with single zone, accurate determination of the cooling loads and zone airflow leads to good humidity control at full load conditions.

During warm weather, many multizone systems are operated without heating water to the heating coil because the boiler is turned off. Then at part load, mixed air is essentially bypassed around the cooling coil through the hot deck. The moisture laden mixed air is then delivered to the space causing a rise in the space humidity.

Improved part load performance space humidity performance can be achieved by resetting the hot deck temperature upward during periods of high humidity. (Of course this requires operating the boiler during the warm weather months.)

A Texas multizone with individual heating coils in the individual zone ducts also offers a possible solution to the part load humidity problem by providing a means of reheat.

Carefully consider the part load space humidity before using a multizone system.

#### Dual Duct Systems:

These systems typically have a hot and a cold deck and are similar to multizone systems. Instead of zone dampers, modulating dual duct mixing boxes mounted near the space combine the hot and cold air streams from separate ducts then deliver the mixture to the space. The part load humidity problems are the same as with a multizone.

Improved part load space humidity performance can be achieved by resetting the hot deck temperature upward during periods of high humidity. Of course this requires operating the boiler during the warm weather months.

A modified arrangement known as a Dew Point Dual Duct system could be employed for good humidity control. All of the mixed air in the air handler passes through the cooling coil. Then a portion of this air is split off and passes through the hot coil then to the hot duct. Both hot and cold air streams have the same low dew point temperature giving this arrangement its name.

Carefully consider the part load space humidity before using a dual duct system. The system may be more expensive than other alternatives due to the requirement for two supply main ducts. As with a variable air volume system, terminal boxes are required, and these create additional maintenance.

#### Variable Air Volume Systems:

Because a VAV air handler maintains cold discharge air, it automatically maintains reasonable space humidity and should be considered where applicable and when budget permits.

However, VAV systems are not a panacea. The valve, heating coil, controls, and often filter and fan inside every VAV box represent additional maintenance. The maintenance aggravation is amplified when the VAV boxes are not easily accessible.

#### Computer Room Units:

Oversized computer room units are common. Determining the cooling load by summing all the nameplate amp ratings of all the computer equipment will surely result in an oversized unit and cause inefficient operation. Space humidity may not be a problem only because the computer room unit has reheat capability. The unit adds enough heat to make up for the excess in airflow. Size computer room units to accommodate the estimated heat release from the computer equipment; airflows will be decreased, the supply temperatures will be lower for a longer period of time, and the reheat will operate far less frequently. Always consider multiple computer room units to split the cooling load.

#### Fan Coil Systems:

Fan coils usually handle sensible loads but often fall short on the latent load.

Do not design fan coil units to handle outdoor air because the cooling coils are usually not deep enough, because cycling the coil flow insures periods when no moisture removal occurs, and because local exhaust systems can cause bypass of outdoor air around the cooling coil directly into the space.

In lieu of specifying the total coil load for fan coil units, specify the entering and leaving air conditions, and specify that these conditions must be met at all fan speeds. Where multi-speed fan coil units are used, schedule the maximum airflow at the high fan speed setting.

Fan coil units represent a great maintenance burden. The multiple cooling coils with multiple filters, multiple condensate pans, multiple potential leak sources, and multiple potential locations for mold growth must be considered.

Fan coils shall be installed in a manner that will prevent water from dripping or splashing outside the drain pans. Require back splash panels to contain the splashing cause by drips from coil valves and uninsulated piping within the cabinet enclosure.

#### Direct Expansion (DX) Equipment

Avoid the use of DX coils in air handlers with constant running fans that handle outdoor air. When the sensible load is satisfied and the compressor turns off, unconditioned outdoor air is then delivered to the space and any water on the wet cooling coil is evaporated into the supply air and also delivered to the space. The result is poor part load humidity control.

## **G-9 CONDENSATE LEAKS:**

Condensate drain pans and drain lines from air conditioning equipment must be designed to allow access for cleaning and flushing. Blockages in fan coil condensate

lines are notorious for causing overflowing drain pans and wet floors, walls, and ceilings.

Improper trapping of condensate discharge in air handling units leads to water hold-up and overflow at the condensate drain pan.

Provide details of the condensate traps on the design drawings. Require adequate slope in two directions on condensate drain pans and drain lines (1/4 inch per foot). Make certain that the equipment curb or equipment frame affords ample elevation of the pan outlet connection above the floor or roof to accommodate the required trap dimensions and drain line slope.

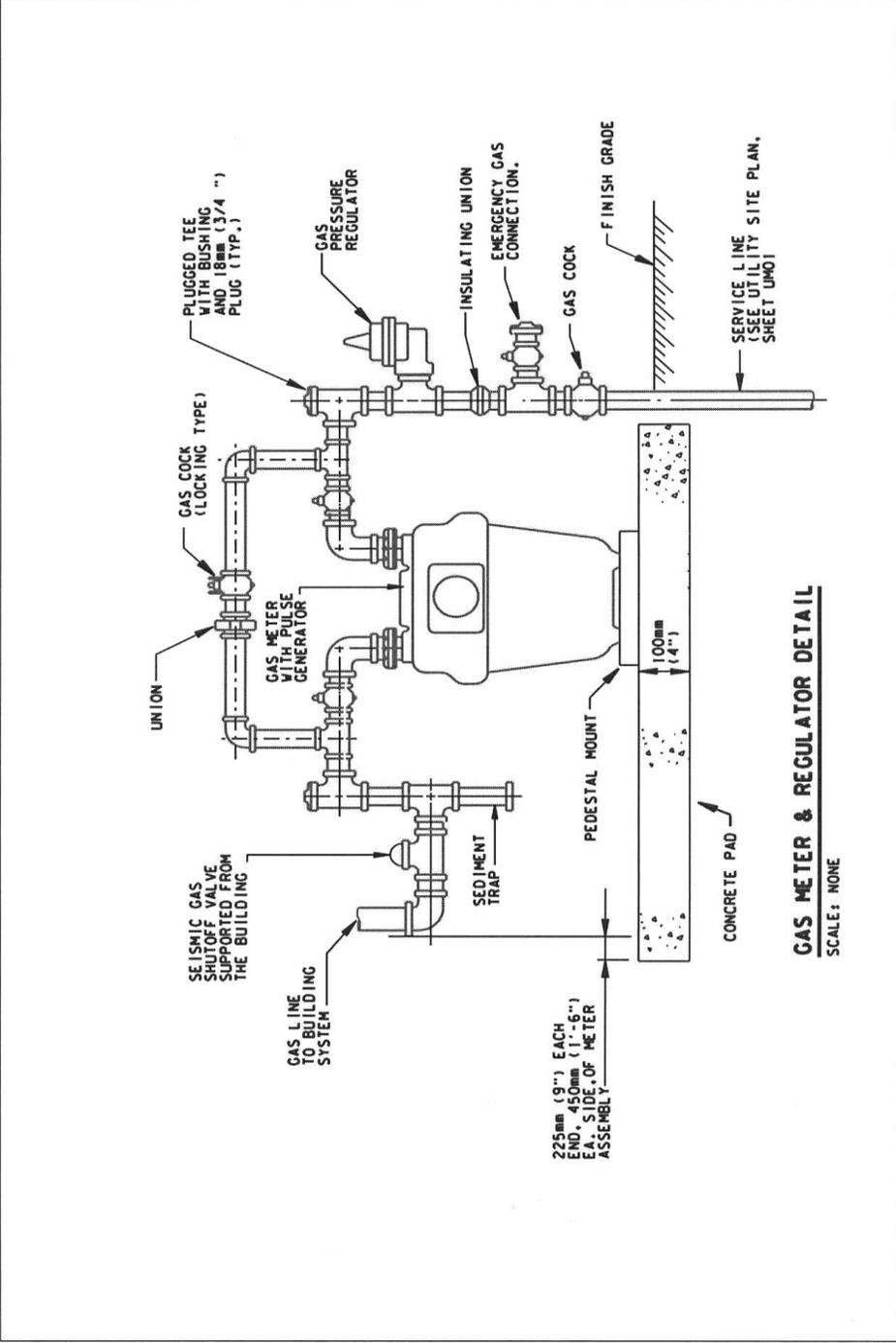
[Return to Appendix G](#)

## **G-10      BARRACKS:**

Barracks have historically had high humidity problems leading to mold growth in the living space.

In barracks, follow the technical design guidance found in TI 800-01 Appendix B Unaccompanied Personnel Housing for the mechanical systems in barracks. This guidance requires that outside air be treated (heated / cooled) by a separate dedicated air handling unit to a neutral temperature, or as necessary to handle the latent load, and ducted to each living / sleeping room (Dedicated Outside Air System, DOAS).

[Return to Table of Contents](#)



**GAS METER & REGULATOR DETAIL**

SCALE: NONE

# APPENDIX H

## Network Enterprise Center, Fort Campbell Requirements

Prepared By:  
N.E.C.  
907 Bastogne Ave  
Fort Campbell, KY 42223

Revised  
5 Jan 2010

MEMORANDUM FOR Directorate of Contracting

**SUBJECT: Fort Campbell Information Technology (IT) Technical Design Guide**

**1. Purpose.** To outline the associated reference documents and identify local enhancements/clarification for all IT-related construction services provided on Fort Campbell, Kentucky.

**2. References.** Below are the IT regulations/standards used by the Fort Campbell NEC to ensure compliance for all unclassified (NIPRnet) and classified (SIPRnet) and IT-related voice and data equipment/services and associated construction efforts:

a. "Technical Guide for Installation Information Infrastructure Architecture (I3A), Department of the Army, U.S. Army Information Systems Engineering Command, Fort Huachuca, AZ", dated Jul 2008.

b. "Technical Guide for the Integration of Secret Internet Protocol Router Network (SIPRNET), Version 5.0", dated August 2008.

c. National Security Telecommunications and Information Systems Security (NSTISSI) No. 7003, "Protective Distribution Systems (PDS)", dated 13 December 1996.

d. NSTISSAM TEMPEST/2-95, "Red/Black Installation Guidance", dated 12 December 1995.

e. Army Regulation 380-5, "Department of the Army Information Security Program", Chapter 7, Section III, dated 29 September 2000.

Based on varying environmental, infrastructure density and construction considerations unique to Fort Campbell, the NEC has identified the need to implement certain deviations from the above listed references as they pertain to IT construction efforts on the installation. These deviations are found at the enclosure and are listed by reference. Each deviation consists of: the Item (paragraph number, page number, Item Name), and verbiage as it appears in the reference; the deviation imposed by the NEC; followed by a justification for implementing that specific deviation.

**3. Applicability:** This policy applies to all persons who provide IT construction services to any facility located on Ft. Campbell, Kentucky.

**NEC-SFB-DS**

**SUBJECT: Fort Campbell Information Technology (IT) Technical Design Guide**

**4. This memorandum supersedes "Information Technology (IT) Technical Design Guide, dated 23 Oct 08.**

**5. Point of contact for this document is the, NEC Plans/Architecture Branch located at Building 6905, 30<sup>th</sup> Street and A Shau Valley Road, 270.798.6238.**

**Encl**

**// Original Signed//  
TIMOTHY E. EAYRE  
Deputy NEC**

**TABLE OF CONTENTS**

Tech Guide for Installation Information Infrastructure Architecture (I3A), dated Mar 2006

	1	
Item: 2.3.1, Outlet Box.....	1	
Item: 2.3.5, Outlet Types and Density.....	2	
2.3.5.1 Family Housing Units .....	2	
2.3.5.2 BOQ .....	3	
2.3.5.3 Systems Furniture Wiring.....	3	
2.3.5.4 Wireless Access Point (WAP) Cabling.....	4	
Item: 2.4.1.1, Copper, Voice and Data .....	5	
Item: 2.4.2.2, Copper Termination.....	6	
Item: 2.4.4.6, Optical Customer Premise Items.....	6	
Item: 2.5.2, Room Door.....	6	
Item: 2.5.10, Fiber Optic Patch Panels (FOPP).....	7	
Item: 2.5.15, Electrical Power.....	8	
Item: 3.3.2.1, Copper.....	8	
Item: 3.6.2, Utility Location.....	8	
Item: 3.6.9.2, Grass.....	9	
Item: 3.7.2, Direct Buried.....	9	
Item: 3.7.3, Aerial.....	9	
Item: 3.8.1.3(c), Accessories (locking covers).....	1	
Item: 3.8.1.5, Stencil (HH).....	0	
Item: 3.8.2, Hand holes.....	1	
Item: 3.8.2.2, Stencil (MH).....	0	
Item: 3.8.4.5(e), Maximum Duct Bank Sizing.....	1	
Item: 3.8.4.6(a), Fiber Optic Termination.....	1	
Item: 3.9.3, Warning Signs.....	1	
Item: 3.9.4, Plowing.....	1	
Item: 3.9.5, Trenching .....	1	
3.9.5.1 Backhoe Trenching.. .....	1	
3.9.5.2 Trencher Trenching.....	1	
Item: 3.9.6 Depth of Placement.....	1	
3.9.6.1 Copper Cable .....	1	
3.9.6.2 FOC.....	2	
3.9.6.3 Frost Considerations .....	1	
3.9.6.4 Other Considerations.....	2	
Item: 3.9.7, DB Cable Splicing .....	1	
Item: 3.12, Free Space Optics .....	2	
Item: 3.15.2, Cable ID/Cable Tags.....	1	
Item: 3.15.3.3, Splices .....	2	
Item: 3.17.3.1, Duct Installations Depth of Cover.....	1	
Item: 3.17.3.2, Fiber Terminations.....	2	

Army Reg 380-5, "Dept of the Army Information Security Program", dated 29 Sep 2000.....	17
<b>Item: 7-3 Standards for Storage Equipment.....</b>	<b>17</b>
Tech Guide for the Integration of Secure Internet Protocol Router Network (SIPRNET), Ver. 5.0, dated Aug 2008.....	18
National Security Telecommunications and Information Systems Security (NSTISSI) No. 7003, "Protective Distribution Systems (PDS)", dated 13 December 1996 .....	19
NSTISSI TEMPEST/2-95, "Red/Black Installation Guidance", dated 12 December 1995 .....	20
<b>Figure A, Equipment Rack.....</b>	<b>356</b>
<b>Figure B, Manhole.....</b>	<b>357</b>
<b>Figure C, Steel Cage.....</b>	<b>358</b>

## Clarifications/Enhancements

- a. “Technical Guide for Installation Information Infrastructure Architecture (I3A), Department of the Army, U.S. Army Information Systems Engineering Command, Fort Huachuca, AZ”, dated Mar 2006.

### ITEM: 2.3.1, page 3 - Outlet Box

**Specify double gang electrical boxes of at least 2-1/8 inches (in) (54 millimeters (mm) depth to provide dedicated space for current and possible future FO cable (FOC) installation.**

**For single connector outlets, such as voice-only, cable television (community antenna television (CATV)) or closed circuit television (CCTV), use a single gang 2 in by 4 in by 2-**

**1/4 in (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 millimeters (mm)**

**of the CATV or CCTV outlet. Designers should specify 4-11/16-in (119 mm) square by 2-1/4 (57 mm) boxes for 1-in (27 mm) conduit installations and outlet boxes that have or may require FO cabling.**

**CLARIFICATION/ENHANCEMENT: Dual jacks will be used instead of a single jack use. Dual jack will be one voice and one data. NO single jacks will be installed without NEC approval in writing.**

**JUSTIFICATION: All jacks will contain a voice and data, cat 6, so that each desk location will have both. If an office needs more data than voice, jack usage can be adjusted without a lot of additional cost.**

### ITEM: 2.3.5, page 4 - Outlet Types and Density

**Table 1 shows outlet types that are commonly used in military construction projects. Sketches of these outlets are included in Figure B-7 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 TG, 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.).**

Table 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	See below
Non-admin spaces (CDCs, chapels, Recreation 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/bachelor officer's quarters (BOQ)	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 telephone 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
Wireless access points	One 8-pin modular (RJ45 type) connectors in a single gang outlet box labeled for data.	See below

#### 2.3.5.1 Family Housing Units.

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: kitchen, living room, dining room, family room/area, each bedroom, and any other logical location deemed appropriate. Copper outlet/connector must be TIA/EIA Cat 6 for U.S. Army and U.S. Air Force projects.

#### 2.3.5.2 BOQ.

For U.S. Army barracks projects, provide one 8-pin modular (RJ45 type) connector in a single gang outlet faceplate, labeled voice use. In Bachelor Enlisted Quarters (BEQ), BOQ, Senior Enlisted Bachelor Quarters (SEBQ) etc., provide one single RJ-45 outlet in each room of the suite; i.e., bedroom and living room, configured per TIA/EIA-570.

#### 2.3.5.3 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 facsimile (FAX) machines. When systems furniture is installed as part of the construction contract, ensure that systems furniture specifications include EIA American National Standards Institute (ANSI)/TIA/EIA-568-B and EIA ANSI/TIA/EIA-569-B cabling and raceway standards.

#### 2.3.5.4 Wireless Access Point (WAP) Cabling.

Wireless access points may be required in some situations. If the project management for IT has approved the inclusion of wireless in the design, the recommendations here should be followed. The designer should specify one-Cat 6, unshielded twisted pair (UTP) cable, each to a standard 8-pin modular connector for each wireless AP outlet. The Cat 6 cable can be used in conjunction with Power over Ethernet (PoE) to provide both power and data to the AP. The TIA/EIA technical committee TR-42 is currently working on a Technical Service Bulletin (TSB- 162) *Telecommunications Cabling Guidelines for Wireless Access Points*. The intent of this TSB is to provide a pre-cabled grid to support 802.11 wireless local area networks (LAN). The current guidance is to place one WAP at the center of each 55 by 55 foot (ft) square grid, for up to 20 users. For grid locations with over 20 users, provide two UTP cables. The TSB is based upon International Standards Organization (ISO)/International Engineering Consortium (IEC) TR 24704 *Information Technology Customer Premises Cabling for Wireless*

**Access Points.** Both TIA and ISO utilize a 39-ft (12 meters (m)) diameter circle for WAP coverage. The designer should note that a wireless survey will be required after the completion of construction to ensure proper wireless coverage. The WAP grid provides a foundation for implementing wireless, but does not eliminate final wireless design.

**CLARIFICATION/ENHANCEMENT:**

<b>Facility Space Category</b>	<b>(Area) Sq Ft per Outlet</b>
Classroom XXI	50
Administrative/Clerical	50
Technical	50
Warehouse/Motor Pools	200
Hangars	500

**JUSTIFICATION:** Because of the lack of work area and the number of personnel occupying that space, the increase in the amount of jacks per area help alleviate the connection to voice/data requirements that exist for activities/units.

**Item: 2.4.1.1, page 8 – Copper Voice and Data**

One Cat 6, for general projects, 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 IAW National Fire Protection Association, Inc. (NFPA) 70, or when directed by the facility safety officer or local building code. Provide terminations IAW the paragraph entitled “Copper Termination” in this TG. The designer must not use 150 ohm shielded twisted pair for new construction. The Cat 5, Cat 5e, and Cat 3 rated cable must not be used in new construction or rehabilitation projects.

**a. 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 Cat 6 for general projects. Very small projects (i.e., less than 10 user telephones) may use an EIA/TIA 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.

**b. Copper Patch Cables.**

Copper patch cables must be 4-pair, 24 American Wire Gauge (AWG) stranded UTP cable, rated for Cat 6, with 8-pin modular connectors at each end. Provide sufficient copper patch cables, of various appropriate lengths, to terminate all copper patch panel appearances.

**c. Category 6 Augmented and Category 7.**

The TIA/EIA is the United States trade organization and standards body that specifies structured cabling systems. The ISO/IEC is a network of the national standards institutes of 151 countries and international standards body responsible for specifying structured cabling systems. The TIA committee TR-42 has a task group working on standards for 10GBase-T cabling, or augmented Cat 6, as does ISO/IEC. Neither group is scheduled to have a standard ratified before mid-2006. The ISO/IEC currently has a standard for a shielded twisted pair (STP) cabling system, designated as Class F. The TIA/EIA has approved for publication, the standard for 10GBase-T cabling, or augmented Cat 6 (Cat 6A), ANSI/TIA/EIA-568-B.2-10. ISO/IEC currently has ISO/IEC 11801 Addendum 1 Draft Class EA.

not yet formed a task group to explore the standardization of ISO/IEC 11801 Class F as Category 7. As of the publication of this TG, implementation of an augmented Cat 6 runs the risk of being non-standards compliant, and obsolete upon ratification of the standard. Implementation of Class F cabling within the United States also runs the risk of utilizing a non-standard termination connector.

**CLARIFICATION/ENHANCEMENT:** Copper distribution cables (voice and data) will be terminated at the TR in rack-mounted patch panel, compliant with Cat 6. Cables from the same outlet must be terminated on the same patch panel and individually identified with voice cables being terminated on the odd number ports and the data on the even number ports.

Copper jacks will be EIA/TIA Category 6, 9-pin/8 position insulation displacement terminations wired to match existing system (T568A or T568B). If there is no existing wire, they will be wired per T568A (normal). All drops will conform to the following wire color scheme. Beige or White – Voice and Unclassified data (NIPRnet); Red – Classified data (SIPRnet); and Orange JWICS (Top Secret) (Appendix A)

**JUSTIFICATION:** It saves space in the TRs, allows NEC to maintain a more efficient area. Some of the older facilities at Ft. Campbell have a termination of T568B instead of T568A. If adding additional drops in those areas, continuing with matching termination. Any NEW infrastructure with no present wiring will be T568A.

**ITEM: 2.4.2.2, page 10 - Copper Termination**

Termination shall be performed using 110-type connectors, rated for the installed cable. All terminations must be wired IAW TIA/EIA T568A. Twisted pair outside plant (OSP) cable is terminated on the Protected Entrance Terminal (PET), see paragraph 3. See figures B-5 and B-6 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 main TRs that contain a telephone distribution frame, the horizontal main distribution frame (MDF) blocks must serve as the main cross connects. Refer to MDF description in the section on Dial Central Offices (DCO) in the *USAISEC TG for Circuit Switching*. 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 second floor TR; and one backbone cable should be terminated on 110-type blocks in the third 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 Cat 6 outlet wiring. Cross-connects can be done by the Director of Information Management (NEC)/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.

CLARIFICATION/ENHANCEMENT: Copper distribution cables (voice and data) will be terminated at the TR in rack-mounted patch panel, compliant with Cat 6. Cables from the same outlet must be terminated on the same patch panel and individually identified with voice cables being terminated on the odd number ports and the data on the even number ports.

JUSTIFICATION: It saves space in the TRs, allows NEC to maintain a more efficient area.

**Item: 2.4.4.6, page 13 - Optical 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, flexible cable tray, and alternative support systems specifically certified for Cat 6, 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.

CLARIFICATION/ENHANCEMENT: “J” hooks will not be used.

JUSTIFICATION: These hooks do not supply enough support and cause points of stress on the cable.

**ITEM: 2.5.4, page 16 - Room Door**

The TR doors must be a minimum of 36 in (1 m) wide, 86 in (2 m) tall, without doorsill,

hinged to open outward, and be fitted with a lock to control access to the room.

**CLARIFICATION/ENHANCEMENT:** Present buildings will have closet door(s) in Telecommunications room keyed separate from other locks in the building IAW DPW standards, with two copies of the key provided to the Supply Section of the NEC. On new construction or triaged buildings, closet doors will have a swipe card system installed.

**JUSTIFICATION:** Having a separate lock from others in the building provides for additional security and accountability of the expensive IT equipment. Swipe card access is the new standard for TRs as per ISEC.

**Item: 2.5.10, page 16 - Fiber Optic Patch Panels (FOPP)**

Fiber optic patch panels 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 in (300x250 mm) wall mounted enclosures may be utilized when necessary, such as at small facilities in U.S. Army projects. A 3-ft (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 percent in the installed patch panels.

**CLARIFICATION/ENHANCEMENT:** Fiber Optic patch panels WILL be installed in cabinets or racks that house the LAN equipment. No fiber optic patch panels will be installed on backboards unless specified by the NEC.

**JUSTIFICATION:** Patch panels need to be within a close proximity of the LAN equipment to make patching cables convenient and neat.

**ITEM: 2.5.15, page 17 – Electrical Power**

Provide a minimum of two dedicated 120 volt, 20-ampere duplex receptacles in each TR. Each receptacle must be on a separate 20-ampere branch circuit serving only that receptacle. Additional convenience receptacles must be provided at 6 feet (1800 mm) intervals around the perimeter walls. For all projects, provide a dedicated 20-ampere circuit and a quadraplex receptacle for each 19 inches (480 mm) rack or cabinet. The designer must consult with the electrical designer or facilities engineer if the TR is to house blade servers, PoE switches, PoE mid-span hubs, or large numbers of network switches. The designer should determine estimated power draw of these devices. The electrical designer may have to compensate for the considerable current draw amount of these devices.

**Design note for renovations: The designer must specify a disconnecting means as defined in the NEC, Article 645.10, if the existing panel is not collocated or in close proximity of the branch-circuit power panel.**

**CLARIFICATION/ENHANCEMENT: A minimum of four dedicated 20 ampere, 110 volt AC outlets will be installed with each equipment rack or cabinet to provide power for installed equipment. Each communication rack will have a 1000 CA UPS installed. Electrician will coordinate with appropriate contractor for location and type of outlet.**

**JUSTIFICATION: Having the outlets on the communication racks allows for ease of use, prevents the use of extension cords to connect switches and UPS and also keeps cords from trailing on the ground causing safety issues.**

**ITEM: 3.3.2.1, page 23 – Copper**

**The number of OSP copper pairs is calculated by multiplying the number of users or jumpers in the building times 1.5 pairs. This factor will add in some additional pairs for faxes, modems, and special circuits. The cable is then sized to the nearest logical standard cable size. For example, a building with 85 users would require a 200-pair cable ( $85 \times 1.5 = 128 \rightarrow 200$  pair).**

**CLARIFICATION/ENHANCEMENT: A minimum of 25 pair copper is required.**

**JUSTIFICATION: No less than 25 pair copper will be run to any building. It allows for future growth without expending additional dollars for additions.**

**Item: 3.6.2, page 24 – Utility Location**

**The NEC or DPW must be responsible for the location and marking of the utilities, unless otherwise stated in the design package. The installer must furnish a schedule of proposed excavation involving utility locations to the NEC/DPW in sufficient time to allow marking. Since each NEC/DPW has different operating requirements, the location lead-time must be stated in the design package. An acceptable utility mark must be within 24 inches (600 mm) of the edge of the utility. After the utilities are located and marked, the installer is responsible for maintaining the marks until they are no longer required. The intent is that the utilities must be located and marked only once and not after each rainfall.**

**CLARIFICATION/ENHANCEMENT: Cables for the NEC will be remarked upon justifiable request by the contractor. Contractor is not responsible to maintain the locates. The Contractor will place a call to Tennessee1 and locates will be done.**

**JUSTIFICATION: This practice is being done to cut down on the amount of cables and other utilities cut during the project.**

**ITEM 3.6.9.2, page 27 - Grass.**

All grass surfaces must be leveled and reseeded, unless otherwise directed (such as the placement of sod) in the design package. For grassy areas where the installer must have to bring heavy equipment back onto the construction site, the areas must be rough graded and covered with protective matting to prevent erosion. For durations longer than two weeks between construction and final disturbance, the installer must rough seed the area to provide cover until final grading and seeding are accomplished.

CLARIFICATION/ENHANCEMENT: ALL grass areas will be leveled and either place new sod, use of a mesh ground cover or hydraspray will be used to prevent erosion of soil.

JUSTIFICATION: Due to the number of construction projects and the rainy weather in the area, this form of restoration will help keep erosion to a minimum.

**ITEM: 3.7.3, page 31 – Direct Buried**

The DB cable plant system is the preferred method for placement in less congested areas.

Supporting documentation for buried cable installation is available in RUS Bulletins 1751F-640 (<http://www.usda.gov/rus/telecom/publications/1751f640.pdf>), 641 (<http://www.usda.gov/rus/telecom/publications/1751f641.pdf>), and 642 (<http://www.usda.gov/rus/telecom/publications/1751f642.pdf>) and TIA/EIA-758, Customer Owned Outside Plant Telecommunications Cabling Standard.

Note: Above sites are located at the following URL under the BULLETINS Table (<http://www.usda.gov/rus/telecom/publications/publications.htm>)

CLARIFICATION/ENHANCEMENT: All cable splicing will be done either in manholes, hand holes, or pedestals. NO buried splices will be performed unless stated in writing by the NEC.

JUSTIFICATION: Buried splices do not protect the cable sufficiently, and are subject to freezing and thawing causing excessive unstable environmental conditions to the cable. This will allow ease of access for future maintenance requirements.

**ITEM 3.7.4, page 31 – Aerial**

Aerial cable plant systems must not be used except as specified in the design package. Exceptions may include range cables or other long runs through undeveloped areas, in cases where underground systems cannot be installed, or in conformance to local mandates. Aerial pathways and spaces may consist of poles, messenger wire, anchoring guy wires, splice closures, and terminals.

CLARIFICATION/ENHANCEMENT: Aerial cable will not be engineered.

JUSTIFICATION: Aerial cable is subject to thermal in the air and also has been torn down by heavy equipment and large vehicles.

**Item: 3.8.1.3(c), page 30 – Accessories (locking covers)**

Each new MH must be equipped with a lid, sump, pulling-in irons, ground rod, bonding ribbon, cable racks, and hooks. Accessories must be designed for use in a telecommunications MH. Cable hooks must be placed JAW RUS Bulletin 175 1F-643, RUS Bulletin 1753F-151, and the *AT&T Outside Plant Engineering Handbook*, August 1994, Practices 632-305-2 15 and 9 19-240-300 to support the weight of the cable and splice case.

**Locking Covers** – The first MH outside a DCO or wire node, MHs at critical junctions, or MHs equipped with carrier equipment will have lockable cover. Additional MHs may be identified as requiring lockable covers in the Statement of Work (SOW)/Engineering Design Plan (EDP). The preferred lockable lid cover is one that utilizes a lever and clamp mechanism placed into a receiver that is installed into the cover. The mechanism will allow the cover to be replaced without indexing the cover to the frame. When locked, the mechanism will be flush with the frame surface minimizing the potential for the cover to be dislodged. The bolt used to secure the cover is available in many configurations and can only be turned with a socket provided by the manufacturer. The U.S. Government will select the bolt configuration. A disposable tamper evident plastic cap snaps into the lock body covering the recessed bolt head keeping dirt and debris out of the bolt area. An alternative means of securing the MH utilizes an inner, water resistant cover that can be locked by a General Services Administration (GSA)-approved, changeable combination lock. The U.S. Government will provide the locks.

**CLARIFICATION/ENHANCEMENT:** Manhole lids will be centered and locking. The manhole will include a ladder from collar to floor of same. Three keys will be turned into NEC supply for one manhole installation. An additional three keys will be required for every 10 manholes set. (APPENDIX B)

**JUSTIFICATION:** The centered manhole lid provides for easier access to the cable inside and also lockable to prevent access by unauthorized personnel.

**ITEM: 3.8.1.5, page 32 – Stencil**

All new MHs must be stenciled with a number designated by the NEC.

**CLARIFICATION/ENHANCEMENT:** Manhole name will be stenciled on the north side of the collar inside and also on the top of the lid.

**JUSTIFICATION:** This allows for ease of recognizing manholes and also the inside marking provides for recognition if the stenciling on the top of the lid wears off.

**Item: 3.8.2, page 32 – Hand holes**

Hand holes are reinforced concrete units provided with a lid that permits internal access to the housed components. Hand holes are typically used as pull points for small diameter cables for building access. A hand hole must not be used in place of a MH or in a main conduit system. Hand holes must not be used for splicing cables without prior U.S. Government approval. Telecommunications hand holes must not be shared with

electrical installations. The minimum hand hole size is 4 ft x 4 ft x 4 ft (1.2 m x 1.2 m x 1.2m). Larger hand holes (i.e., 1.2 m x 1.8 m x 1.2 m) are acceptable. Hand holes installed where vehicle traffic may be present must be load rated as H-20 and must be equipped with round MH lids.

CLARIFICATION/ENHANCEMENT: Hand holes will be no less than 4 x 6 x 6 unless otherwise stated in writing by the NEC. Hand hole lids must also be locking and three keys furnished to the NEC.

JUSTIFICATION: The larger hand hole allows more room for splice cases and ease of splicing. It also provides additional space for dark cable to be coiled up.

ITEM: 3.8.2.2, page 32 – Stencil

All new Hand holes must be stenciled with a number designated by the NEC.

CLARIFICATION/ENHANCEMENT: Hand hole name will be stenciled on the north side of the inside of the hole and also on the top of the lid.

JUSTIFICATION: This allows for ease of recognizing hand holes and also the inside marking provides for recognition if the stenciling on the top of the lid wears off.

Item: 3.8.4.5(e), page 35 – Minimum Duct Bank Sizing

e. Entrance conduits in minor buildings, as listed in the design package, must be a minimum of one-way, 4 inch (100-mm) ducts if the entrance cables are less than 1-inch (25-mm) diameter and if less than 40 percent of the duct area must be used.

CLARIFICATION/ENHANCEMENT: Entrance conduits in ALL buildings must be a minimum of two- 4 inch ducts.

JUSTIFICATION: Due to the number of buildings that are being used in a capacity different than purpose intended we require two ducts so no additional digging would be required for additional infrastructure installation.

ITEM: 3.8.4.6 (a), page 40 – Duct Installation Guidelines Depth of Cover.

At least 24 inches (600 mm) of cover is required above the top of the duct bank. At least 18 inches (457 mm) of cover is required under roads or sidewalks (if duct is concrete-encased). For ducts installed in solid rock, the cover shall consist of at least 150mm (6 inches) of concrete. If rock is encountered below grade, the minimum cover above the concrete-encased duct shall be 12 inches (300mm). See Figure C-3 (Figure C-10 for Europe) – Conduit Placement/Cut and Resurface for details. The cover or fill shall be compacted IAW UFGS-02300, Earthwork.

**CLARIFICATION/ENHANCEMENT: There will be 48" of cover required above the top of the duct or duct encasement.**

**JUSTIFICATION: Due to congestion of existing underground utilities.**

**ITEM: 3.9.3, page 42 – Warning Signs**

**Buried cable warning signs or route markers must be provided no less than every 250 feet (76 m) or at each change in route direction, on both sides of street crossings, on pipelines, and on buried power cables. Color-coded warning signs or markers must be orange in color.**

**CLARIFICATION/ENHANCEMENT: Wording:**

<p style="text-align: center;"><b>Underground Cable Communications Contact NEC at 798-9650 prior to</b></p>
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**In addition, the signs should be installed as follows:**

- **Sign mounted to steel PSP stake; orange in color preferred**
- **4' below ground in concrete; rising 5' above ground**
- **No more than 1' off the ditch line; perpendicular to the trench line**
- **If there is a change in direction, a sign should be positioned immediately at the turn showing the line**
- **Although I3A states every 250' for those areas that end up being less than 250' we request they be positioned accordingly, even if an additional sign needs to be added**

**JUSTIFICATION: Orange PSP stake and height/depth is due to the height of the grass, especially in rear areas, and the bush hogs used to cut the grass. It will hopefully give us a fighting chance of not being hit/damaged or mowed over.**

**ITEM: 3.9.4, page 42 – Plowing**

**Plowing must be used in range environments or other areas where there are no significant obstacles and where cable runs typically exceed 1,000 feet (305 m) between splices. The design package must identify areas in which plowing is deemed feasible.**

**CLARIFICATION/ENHANCEMENT: When trenching or excavating in the cantonment area, under no circumstances will rotary trenchers or plowing be allowed. The NEC prefers the method of open trenching, using bucket type equipment, i.e., backhoe and track hoe. It is however, acceptable to use plowing and rotary trenching equipment in the rear areas. The maximum width of the trench is in accordance with the type of equipment used to dig.**

**JUSTIFICATION: Due to congestion of existing underground utilities.**

**ITEM: 3.9.5, page 42 - Trenching**

**3.9.5.1 Backhoe Trenching.**

**Trenching with a backhoe must be done only for short distances (i.e., MH to building). The installer must hand dig at all existing MH locations, building entrance points, utility crossings, through tree roots, under curbs, etc.**

**3.9.5.2 Trencher Trenching.**

**A maximum trench width of 12 inches (300 mm) must be used in DB applications done by a trencher. The installer must hand dig at all existing MH locations, building entrance points, utility crossings, through tree roots, under curbs, etc.**

**CLARIFICATION/ENHANCEMENT: When trenching or excavating in the cantonment area, under no circumstances will rotary trenchers or plowing be allowed. The NEC prefers the method of open trenching, using bucket type equipment, i.e., backhoe and track hoe. It is however, acceptable to use plowing and rotary trenching equipment in the rear areas. The maximum width of the trench is in accordance with the type of equipment used to dig.**

**JUSTIFICATION: Due to congestion of existing underground utilities.**

**ITEM: 3.9.6, page 42 – Depth of Placement**

**3.9.6.1 Copper Cable.**

**The depth of placement for a DB copper cable must provide a minimum top cover of 24 inches (600 mm) in soil, 36 inches (900 mm) at ditch crossings, and 6 inches (150 mm) in solid rock (RUS Bulletin 345-150/RUS Form 515A).**

**3.9.6.2 FOC.**

**Direct buried FOC must be placed at a depth providing a minimum top cover of 42 inches (1070 mm). In solid rock, the minimum top cover must be 6 inches (150 mm).**

**3.9.6.3 Frost Considerations**

**In areas where frost heaving can be expected, the cable or wire should be buried below the frost line. Movement of OSP housings due to frost heaving can cause damage to the insulated copper conductors, optical fibers, or loss of shield and/or armor continuity. In areas where movement of OSP housings by frost heaving is encountered, the OSP housings should be installed on stub poles. The stub poles should be set below the frost line and IAW the requirements of RUS Form 515.**

**3.9.6.4 Other Considerations**

**The NEC/DPW may have special depth requirements for certain areas (i.e., tank tracks, ranges, etc.), which must be provided in the design package.**

**CLARIFICATION/ENHANCEMENT: Depth of cover for all communication cables is 48" of cover. There will be NO new Direct Buried FOC.**

**JUSTIFICATION: Due to congestion of existing underground utilities.**

**Item: 3.9.7, page 43 - DB Cable Splicing**

**Buried splices must be engineered and installed as identified in the design package. For example, a buried splice may be used for the following conditions with U.S. Government approval:**

- **Electrical or explosion hazard (i.e., ammunition areas)**
- **Vehicular hazard (i.e., motor pool areas)**
- **Security hazard (i.e., within a high security compound)**

**Only splice cases specifically designed for a buried application must be used. All buried splices must be encapsulated. All other splices in a DB run must be placed in pedestals or MHs. Encapsulation is not required in a pedestal.**

**CLARIFICATION/ENHANCEMENT: All cable splicing will be done either in manholes, hand holes, or pedestals. NO buried splices will be performed unless stated in writing by the NEC.**

**JUSTIFICATION: Buried splices do not protect the cable sufficiently, and the cables are subject to freezing and thawing causing excessive unstable environmental conditions to the cable. This will allow ease of access for future maintenance requirements.**

**Item: 3.12, page 45 – Free Space Optics**

**The FSO can provide an alternative to FO connectivity, for the “last mile,” to EUBs and small enclaves. Typical FSO implementations arise from one of the following factors that prohibit traditional infrastructure– rapid deployment, right of way permit issues, water, railroads, and rough terrain. The FSO is a line-of-sight (LOS), point-to-point, wireless optic technology that uses the transmission of modulated infrared beams through the atmosphere to obtain broadband communications. The FSO operates in the unlicensed near-infrared spectrum 750 nanometer (nm) to 1550 nm wavelength range. The FSO systems can function over distances of several kilometers (km), as long as there is a clear LOS between the source and the destination.**

**Design Note: For systems operating at 1.25 gigabits per second (Gbps) the link distance should be kept around 1000 meters. If the FSO system is to operate in an environment of low visibility (fog) a backup system (e.g., MMW, SHDSL, 802.11a) should be used.**

**There are a number of manufacturers producing FSO equipment. The designer should utilize an FSO device that was tested, approved, and recommended by the USAISEC TIC. The FSO equipment must be designed to prevent data loss due to temporary blockages, such as birds, smoke, dust, rain, and light fog. The FSO devices must be FDA and IEC 60825-1 Class 1M approved to ensure safety. Operational test reports on individual**

equipment are available from USAISEC TIC, such as TR No. AMSEL-IE-TI 04-009 November 2003 *Free Space Optics (FSO) Comparison Report* and TR No. AMSEL-IE-TI, 05-066, June 2005 *Grafenwoehr Free Space Optics (FSO) Demonstration Report*. transport the data stream.

CLARIFICATION/ENHANCEMENT: FSO will not be implemented unless approved in writing by the NEC.

JUSTIFICATION: All non-wired transmission falls under Spectrum Management. This type of equipment operates on an unlicensed frequency.

#### Item 3.15.2, Page 55 - Cable ID/Cable Tags.

Cable tags must be installed at all termination points (terminals) and splices, including house cables. In MHs, all new and existing cables that are part of the project must be tagged/retagged between the splice and the wall and on both sides of a splice loop or maintenance loop. One tag is required for a copper cable pull-through, and two tags are required for a FOC pull-through.

CLARIFICATION/ENHANCEMENT: NEC will provide necessary cable tags for all TRs, Manholes, Pedestals, and Hand holes; labeled with cable names and counts.

JUSTIFICATION: This allows the NEC to standardize cable tags and make sure exact verbiage, counts, and names are correct. It prevents errors made due to poor handwriting or incorrect tag types.

#### ITEM: 3.15.3.3, page 52 – Splices

- a. Copper and FOC splicing must be performed IAW RUS Bulletin 1735F-401, *Standards for Splicing Copper and Fiber Optic Cable*, February 1995.
- b. Cable must be spliced into one continuous length. All copper splices must be of the fold-back type to facilitate future work in the splice. Fiber cable must contain splice loops in trays IAW manufacturer's recommendations.
- c. Completed splices must meet similar performance and mechanical specifications of a single cable of the same overall length.
- d. Self-piercing electrical filled connectors must be used when splicing plastic-insulated conductors. The installer must place and install connectors using a tool specifically designed to place those connectors. In North America, a 25-pair splicing module, 3M-type MS2 or equal must be used. The same modules must be used throughout the project and must be consistent with previously installed connectors to preclude a requirement for a variety of installation tools. B-wire connectors must not be used. In Europe, a 10-pair splicing module system is used.
- e. Binder group integrity must be maintained.

f. All dead pairs in a copper cable must be spliced through if the size of the continuing cable must allow a clear and cap at the end. Only UL listed material must be used when capping cable pairs.

g. All underground and buried splice cases must use encapsulant-fillable closures and must be filled with encapsulant upon completion of the splice IAW RUS Bulletin 345-72 (PE-74). Cable sheaths must be bonded at all cable splices with bonding harnesses to assure sheath continuity.

CLARIFICATION/ENHANCEMENT: “Preform” stainless steel splice cases are Fort Campbell’s preferred standard for all copper cable splices, or an equivalent which will be approved by the lead planner or the Service Management Division Chief. NEC requires submittals for splice cases and splice modules prior to work beginning.

All splice cases shall be specified for the particular environment in which they will be placed and shall be sized to accommodate the cable count spliced. End plates shall be designed for the number and size of the cables served by the splice and shall be designed to seal around each cable individually. All splice cases shall be re-enterable and shall contain all necessary equipment to be installed properly, adhering to all appropriate electrical codes. Splices will be done in 710 instead of MS2.

JUSTIFICATION: Specific splice cases are required in order to protect the cable infrastructure. They have been used on the installation for a number of years with no problems or unsolvable issues. Their durability and reliability has been proven over many years of use. Using 710 splicing is more compact and ease of troubleshooting.

**ITEM: 3.17.3.1, page 58 – Fiber Termination Device.**

All strands of FOCs, both OSP and inside plant will be properly terminated on FOPPs. The OSP plant FOC will be extended IAW the NEC standards into the main data closet/location of the building and terminated there. If the main data closet/location cannot be determined, the OSP FOC will be terminated on a lockable patch panel collocated with the copper PET. Inside plant FO riser cables between the main data closet/location and any satellite data closet(s)/location(s) will be terminated at both locations on the FOPPs. All FOPPs will be stenciled with the panel number and the cable count.

CLARIFICATION/ENHANCEMENT: Fiber optic cable (FOC) entering a facility will be terminated in a rack mounted Fiber Optic Patch Panel (FOPP). If lack of space for sufficient rack; FOPP will be mounted on backboard in coordination with written NEC approval.

JUSTIFICATION: Some of the older facilities at Ft. Campbell do not have sufficient space to provide a telecommunications room. In those instances a backboard mount is required.

**Item: 3.17.3.2, page 58 – Fiber Terminations**

**All terminations will be made using ST or SC connectors.**

**CLARIFICATION/ENHANCEMENT: All NEW terminations will be made using LC connectors. Any connectors already in place in triaged buildings or additional fiber connections in old buildings will be terminated with already present technology.**

**JUSTIFICATION: We are trying to standardize the connectors with the newest technology.**

#### Clarifications/Enhancements

**b. Army Regulation 380-5, "Department of the Army Information Security Program", Chapter 5, Section I, 5-101, dated 29 September 2000.**

#### **ITEM: Standards for Storage Equipment**

The GSA establishes and publishes minimum standards, specifications, and supply schedules for containers, vault doors, alarm systems, and associated security devices suitable for the storage and protection of classified information. Heads of DoD Components may establish additional controls to prevent unauthorized access. Security filing cabinets conforming to federal specifications bear a Test Certification Label on the locking drawer, attesting to the security capabilities of the container and lock. (On some older cabinets the label was affixed on the inside of the locked drawer compartment) Cabinets manufactured after February 1962, indicate "General Services Administration Approved Security Container" on the outside of the top drawer. The GSA-approved changeable combination padlock built to Federal Specification FF-P110 (Sergeant and Greenleaf Model 8077A), is intended for use only as an indoor or sheltered area reusable seal.

**CLARIFICATION/ENHANCEMENT: All taclanes will be installed in a steel cage or safe shown at APPENDIX C. SIPR drops will be located at least 39 inches from any other type of media.**

**JUSTIFICATION: It protects the equipment physically and provides assurance for accountability of the NEC hand receipt. If room needing the SIPR has modular furniture, the SIPR drops will either be put in the floor in floor boxes according to standard or above the furniture.**

**c. "Technical Guide for the Integration of Secret Internet Protocol Router Network (SIPRNET), Version 5.0", dated August 2008.**

**There are currently no deviations to this reference.**

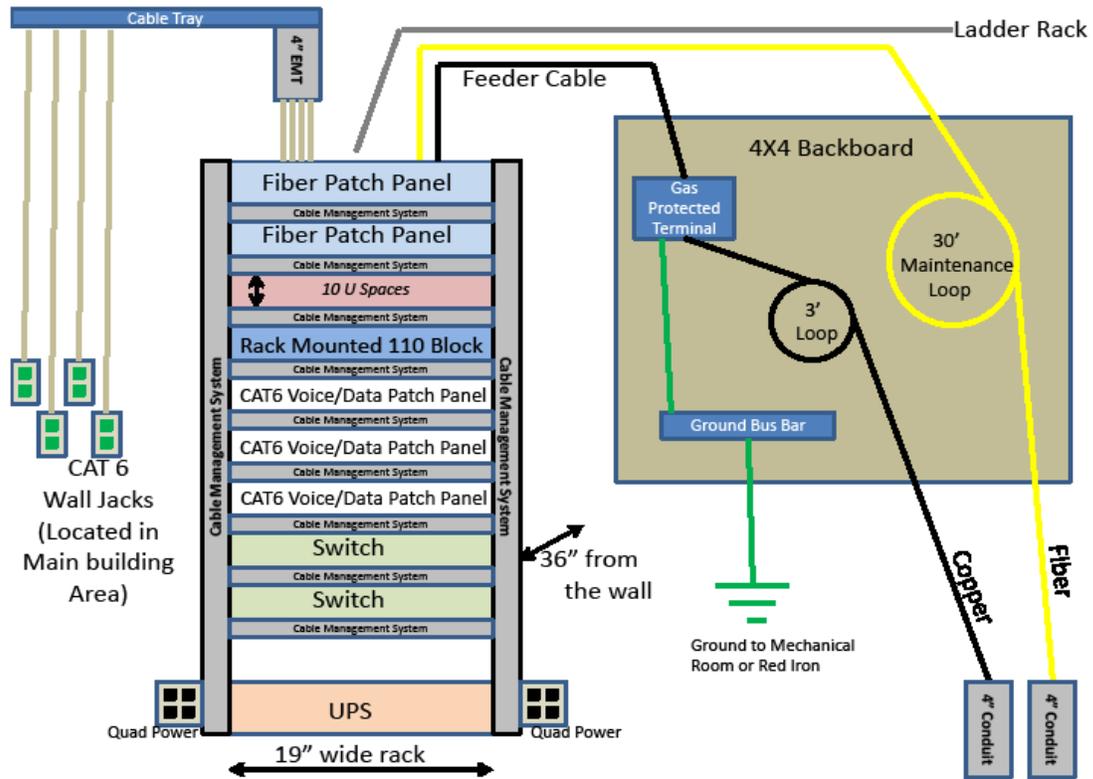
**d. National Security Telecommunications and Information Systems Security (NSTISSI) No. 7003, "Protective Distribution Systems (PDS)", dated 13 December 1996.**

**There are currently no deviations to this reference.**

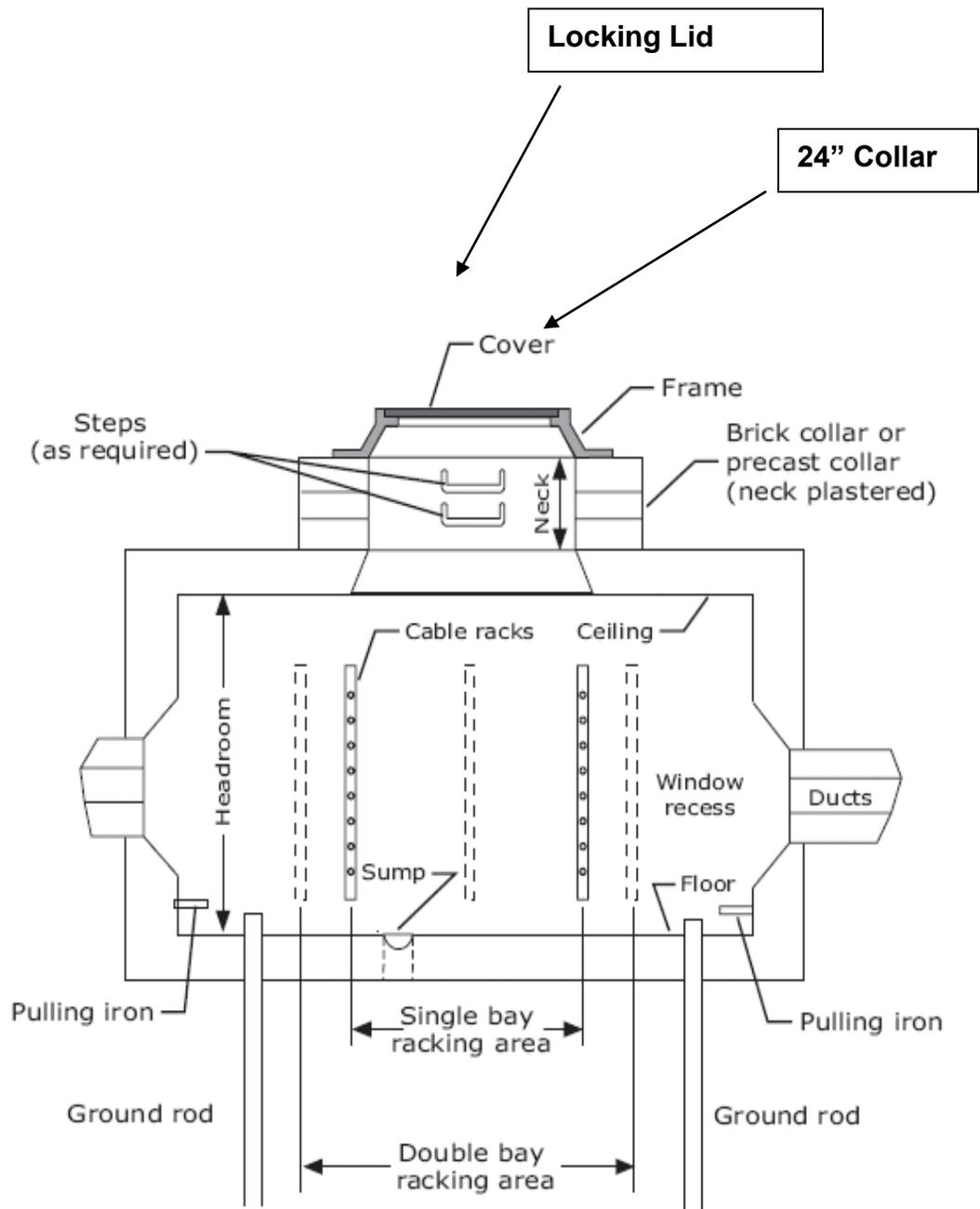
e. NSTISSI TEMPEST/2-95, "Red/Black Installation Guidance", dated 12 December 1995.

There are currently no deviations to this reference.

**Figure A**

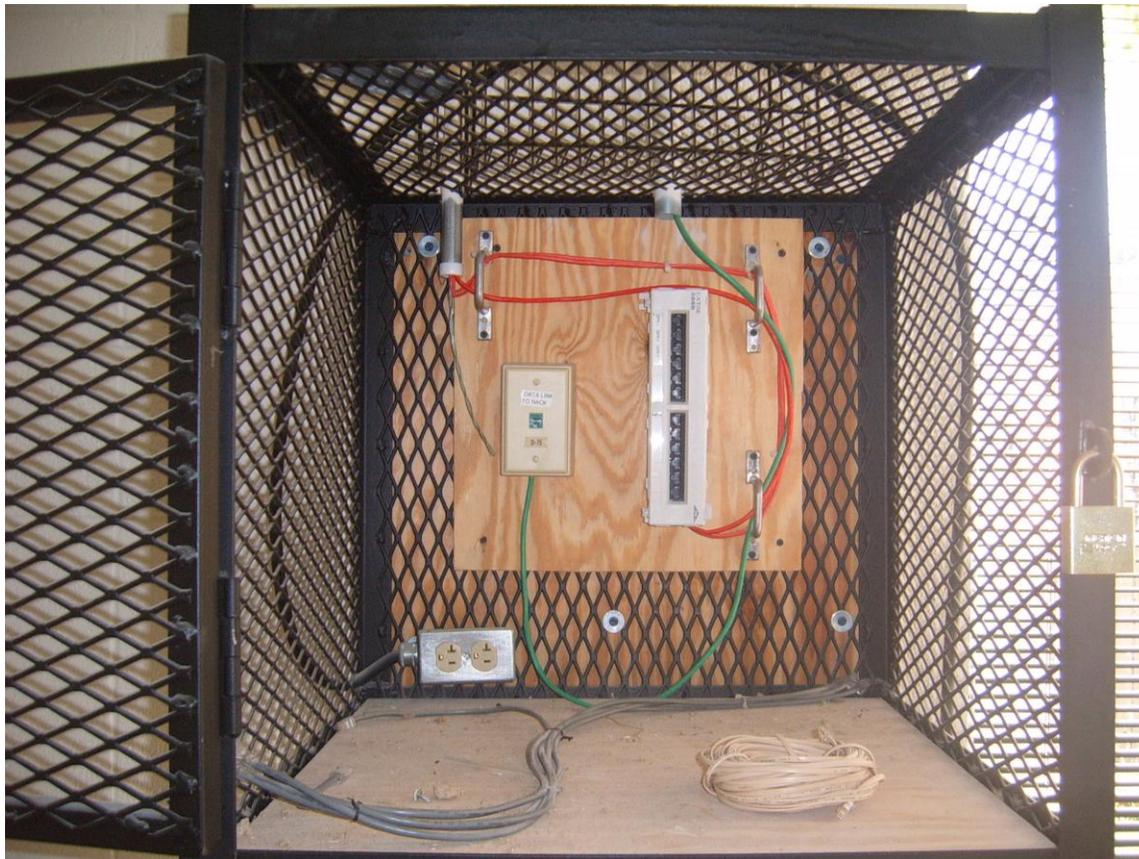


**Figure B**



**Figure C**

**TACLANE CAGE**



**Size - 2'x2'x2'**

**Frame - 1 1/2"x1 1/2"x1/8" Angle**

**Wire - 3/4" #9 Flat Mesh Wire**

**Door Frame - 1"x1" Sq Box tube**

**Hinge - 1 1/4"x4" 11 gauge hinge (2 ea)**

**Hasp - 3"x3"x1/4" plate for hasp**

**Lock - 1"x2"x1/4" flange for lock**

**Bottom of cage - 12 gauge solid metal bottom**

**NOTE**

- All joints must be welded - wire mesh welded to angle frame and door frame.

- Hinge PMS tack welded

- Latch plate and flange fabricated and continuous welded

- 2 coats of flat black paint.

-Power and NIPR drop must be placed inside the cage.

# **Erosion and Sedimentation Control**

## **TABLE OF CONTENTS**

[CHAPTER 1I- INTRODUCTION](#)

[CHAPTER 2I- BORROW SITE PROCEDURES](#)

[CHAPTER 3I- EROSION AND SEDIMENTATION CONTROL](#)

[CHAPTER 4I- RECLAMATION](#)

[REFERENCES](#)

[PERMIT FORM](#)

## **LIST OF TABLES**

- Table 1. Fort Campbell Borrow Pit Locations
- Table 2. Guidelines for selecting vegetative cover
- Table 3. Size of riprap stones
- Table 4. Guidelines for selecting permanent seeding

## **APPENDICES**

- |            |                                     |
|------------|-------------------------------------|
| APPENDIX a | Borrow Pit Location Maps            |
| APPENDIX b | Tennessee NPDES Permit Requirements |
| APPENDIX c | Kentucky NPDES Permit Requirements  |

[Return to Table of Contents](#)

## EXECUTIVE SUMMARY

This plan provides information on erosion control for activities that result from opening, operating, and closing borrow pits on the Fort Campbell Military Reservation. This material is intended for use at Fort Campbell, KY by its military units and all authorized subcontractors. It provides step-by-step procedures to help plan, design, and install soil and water Best Management Practices (BMP). It does not override any local, city, county, state, or federal rule, regulation, or law, including job safety and utility safety laws. Where there is a difference between this plan and any language contained in any contractual document, the contractual document must be followed.

The standards and specifications listed in this manual provide criteria for the design, installation, and maintenance of water management and sediment control practices to abate nonpoint source (NPS) Pollution. Those responsible for design of these practices should evaluate the conditions existing on a particular site and determine if the minimum criteria contained in these standards are adequate or if more stringent criteria should be used.

Properly applied, this information will provide an efficient plan to operate the borrow pit site(s) while ensuring maximum safety and minimizing adverse impact to the environment. By following these guidelines, it is the intent of this management tool to furnish a uniform plan that will provide continuity throughout the life of the borrow pit.

## CHAPTER 1—INTRODUCTION

### General

It is the intent of this manual to help authorized borrow pit operators understand soil and water management practices. These Best Management Practices (BMP) recommendations are somewhat generalized because of wide variations in topography, geology, soils and plant requirements. Feasible ways to handle water management and to minimize erosion and sedimentation at the site are complex and vary according to each borrow pit location.

These guidelines will address borrow pit operations from site identification through final reclamation. The site manager as well as engineers and contractors must be fully cognizant of the environmental impact and strive to lessen the effect throughout the life of the project. This will also ensure minimal cost at the time of site closure.

### Site Selection

After establishing a need for borrow or topsoil, borrow areas shall be coordinated with program manager. A site should be reasonably close to construction areas, yet remote enough not to hinder future development. Access to the site should not create any undue safety problems. The site should be of sufficient size to provide safe operations and years of acceptable material. No previously used impact areas will be considered, due to the threat of unexploded ordnance.

The topography of the area should allow for excavation throughout the construction season. Wetlands shall be avoided, since altering or affecting them is subject to state or federal regulatory oversight and may require mitigation.

The material at the site must be acceptable to provide the fill requirements for projected construction. The initial determinations can be made with the use of soil surveys and the cooperation of the local county U.S. Natural Resource Conservation Service (NRCS). When fill materials appear to be acceptable, core drilling should be done to verify soil profiles. Laboratory testing is necessary to determine the natural moisture content, Atterberg limits, and compaction information.

### **Site Development**

Safety and environmental considerations are paramount in site development. All haul roads should be designed to ensure smooth traffic flow and they should have ample traffic width as well as full shoulders. Grades into and out of the pit area will not exceed safe slope percent of grade or length of slope. Main access roads will require a construction that will allow trafficability in most weather conditions. During dusty conditions, provisions will be made for dust control.

It is necessary to protect the environment throughout the life of the site and restore vegetation as soon as possible after material excavation. Off-site sediment migration must be kept to a minimum. The best way to protect from off-site sediment migration is to protect exposed soil and use sediment and runoff control measures.

The best way to minimize exposed soil is to prevent the pit operations from becoming larger than required for safe and efficient operations. As soon as the excavation of an area is complete, that portion shall be reclaimed and stabilized. If the active excavation area is kept below ten (10) acres then costly control measures such as sedimentation basins do not have to be designed, built, and maintained. However, it is not practical to mulch any of the active areas where borrow still remains because this would hamper fill compaction at the construction site. There are three active borrow pits on Fort Campbell; Patton Road, Angels Road and On-The-Line Road.

Sediment control measures will be constructed to prevent off-site sedimentation. The design size of these structures will be of sufficient size to prevent exposed soil from being transported off-site. Periodic maintenance and evaluation of these controls will be required.

A system of runoff control measures should be used to direct water away from the active borrow area. By diverting surface water from the active pit area, work may continue during rainy periods. These diversions can be constructed when removing vegetation and/or topsoil.

### **Site Operations**

To maintain the continuity of the operation, the Engineer Design Branch of the Directorate of Public Works, will oversee the operation of the borrow pit. This is imperative to control users operating in the pit, coupled with the longevity of the site.

Prior to any borrow excavation, sediment control measures should be designed and constructed. Runoff control measures necessary to ensure that water passes through the basin should also be constructed. An adequate network of roads should be

designed and constructed, keeping in mind that they will be used for the life of the borrow area. One-way roads are preferable for safety and ease of operations.

The pit will be opened at its lowest elevation to ensure positive drainage control. Any marketable timber should be harvested. All forest debris, brush and shrubs must be piled and disposed of in accordance with the procedures described in Chapter 2. Topsoil should be stripped and stockpiled. If there is no pending requirement for topsoil, the topsoil stockpile will be protected from erosion by seeding and mulch. The area of topsoil removal should expose enough borrow material for the projected year's construction. Borrow in the pit must be excavated to a controlled elevation. Reclamation design contours must maximize borrow removal while maintaining positive drainage.

As soon as practical after borrow removal, the area will be stabilized and revegetated. Reclamation should be close behind the pit operations and completed contemporaneously with borrow excavation. Topsoil replacement will expedite revegetation and cover acid forming subsoil. Prior to preparing the soil for seeding, soil tests should be taken and soil amendments applied according to recommendations. If no topsoil is replaced, then the acid forming potential of the subsoil should be considered in lime recommendations. The prepared area will be seeded with a mixture of legumes and warm season grasses. The seeded area will be mulched at the rate of three tons of straw or hay per acre. The mulch will be crimped (or otherwise stabilized) into the soil.

### **Responsibilities**

SITE MANAGER. The site manager is Joseph D. Whitfill, Engineer Design Branch, 798-3113. It is his responsibility to ensure safe and continuous operations of the site. The site manager will direct the general operations of the contractors and other users operating in the pit area. The site manager will direct all maintenance of roads and control measures. The site manager shall issue a permit to operate in the borrow pit.

CONTRACTOR/USER. The contractor and other users will meet with the site manager prior to operating in the pit. It will be the responsibility of the contractor/user to maintain pit roads and adhere to safe operating procedure.

PROVOST MARSHALL. The Provost Marshall will periodically patrol the area to inspect for unauthorized use of the area.

### **Storm water Permitting**

Storm water runoff from construction activities is one facet of water quality and quantity management that is being regulated on construction sites of a certain size through the U.S. Environmental Protection Agency (EPA). The storm water permit program was enacted by Congress in 1987 in the amendment to The Water Pollution Control Act. This program falls under the National Pollution Discharge Elimination System (NPDES).

The program presently applies only to those construction sites that will disturb five or more acres. The area of disturbance is defined as that portion of the site where ground cover and/or topsoil is removed, as contrasted with areas where tree or shrub clearing is the only activity.

Programs vary from state to state and appropriate state agencies should be consulted before borrow pit activities begin to determine applicability.

The Fort Campbell representative can be contacted at:

[Directorate of](#) Directorate of Public Works  
Compliance Branch  
Storm Water Program Manager  
(502) 798-9784

[Return to Table of Contents](#)

## CHAPTER 21—BORROW SITE PROCEDURES

### Clearing and Grubbing

#### Description

This work is associated with the clearing, grubbing, removing and disposing of all vegetation and debris. This work shall also include the preservation from injury or defacement of all vegetation and objects designated to remain.

The work under this section shall also consist of removing and disposing of dead, diseased, poorly formed or other trees designated by the site manager to be undesirable and shall include removal and disposal of undergrowth, stumps of uprooted trees, logs, vines, other undesirable vegetation, and all debris designated by the site manager.

#### Specifications

##### a) General

1. The site manager will establish borrow pit boundary lines, construction lines and designate all trees, shrubs, plants and other items to remain. Any damage to natural terrain or to vegetation or objects designated to remain shall be repaired, replaced, or otherwise compensated for, as determined by the site manager, at the expense of the Contractor. All cut or scarred surfaces of trees or shrubs shall be treated with an asphaltum base paint especially prepared for tree surgery.
2. All marketable timber within the construction and easement limits which have not been removed prior to the beginning of borrow operations, along with other timber within the right of way designated by the site manager for removal, shall remain the property of the US Government, unless otherwise specified by the plans or proposal.

## B) Clearing

1. The area within the construction lines shall be cleared of all surface objects and all trees, stumps, roots and other objectionable obstructions resting on or protruding through the surface of the original ground not designated to be retained.
2. Areas outside the borrow lines shall be selectively cleared of designated dead wood, undergrowth, rubbish and other objectionable matter, designated trees and stumps. This includes trimming and treatment of damaged trees (in accordance with good tree surgery practice). Natural ground cover shall be protected insofar as practical.

## c) Grubbing

All areas within the construction lines shall be grubbed of all objectionable matter on or projecting through the ground surface. All fill areas shall be grubbed to a depth at least one foot below the natural ground.

## d) Disposal of Materials

1. The Contractor shall submit prior to beginning work, a plan for the satisfactory disposal of material and debris from the clearing and grubbing operations for approval by the site manager.
2. The plan shall provide for the satisfactory disposal of perishable materials and rubbish within 30 days after accumulation, unless a longer period is authorized in writing by the site manager, to prevent infestation of pests. No material may be buried on the Fort Campbell installation.
3. Some acceptable methods of disposal may include:

### a) LANDFILLING

All materials designated for landfill disposal may be deposited in the nearest permitted off-post landfill.

### b) RECYCLING

The use of mechanical brush clippers or other recycling methods for vegetation will be considered for approval.

### c) WINDROW

Biodegradable materials may be windrowed on site.

## **Topsoil Removal**

### **Description**

Topsoil is defined as a natural, workable, friable, loamy soil without a mixture of subsoil, refuse, or foreign materials, reasonably free from hard lumps, stiff clay, hardpan, gravel, noxious weeds, brush, or other undesirable material, and suitable for growing grasses, legumes, or other vegetative ground cover.

Acceptable topsoil shall be well drained and has a healthy vegetative growth, and does not contain toxic amounts of either acid, alkaline, or other phytotoxic elements. The areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage and other characteristics as to offer assurance that, when removed in quantity, the product will be homogeneous in nature and of acceptable quality.

## **Specifications**

### **a) General**

All areas from which topsoil is to be stripped shall be cleaned of all refuse which will hinder or prevent seedbed preparation or growth. When securing topsoil from approved areas, should unforeseen strata or seams of material occur which do not meet the requirements for topsoil, such material shall be removed from the topsoil and disposed of as directed or if directed, the area shall be abandoned.

### **b) Hauling Topsoil**

Topsoil shall be hauled in vehicles suitable for the purpose. Scrapers of reasonable capacity will be considered as acceptable; however, excessive spillage will not be tolerated and loads shall be controlled to prevent such spillage. Topsoil spilled on subgrade or other base or pavement structure layers shall be removed immediately.

### **c) Maintenance**

The topsoil that has been set aside shall be maintained through seeding, sodding, planting, or other work, until final completion of the project. Maintenance shall consist of preserving, protecting, and such other work as may be necessary to keep the work in a satisfactory condition.

d) Topsoil may only be placed in the borrow pit area with the approval of the site manager. All topsoil must be free of any foreign debris. No topsoil will be accepted which has large rock, asphalt, metal or other materials.

## **Access Roads**

### **Description**

Access road design and development shall consider the longevity of the borrow pit operation. Since the entire area is projected for borrow removal, a main access road will be constructed around the perimeter of the site. The road will be designed with drainage and a graveled treadway to serve as an all weather road.

Temporary pit roads from the main access road can be constructed with borrow material. At no time will any road prevent the active borrow site drainage from passing through the sediment basin.

## Specifications

### a) General

1. Temporary roads shall follow the contour of the natural terrain to the extent possible. Slopes should not exceed 10 percent.
2. Temporary parking areas should be located on naturally flat areas to minimize grading. Grades should be sufficient to provide drainage but should not exceed four (4) percent.
3. Roadbeds should be at least 14 feet wide for one-way traffic and 20 feet wide for two-way traffic.
4. Drainage ditches shall be provided as needed and shall be designed and constructed to carry anticipated storm flows.
5. The roadbed or parking surface shall be cleared of all vegetation, roots and other objectionable material.
6. A 6-inch course of clean aggregate shall be applied immediately after grading. Filter fabric may be applied to the roadbed for additional stability in accordance with fabric manufacturer's specifications.

### b) Construction Entrance

1. A gravel construction entrance is a pad of crushed stone that reduces the tracking of mud onto the adjacent road. To construct the pad, place a layer of 2- to 3-inch stone across the full width of the vehicle ingress and egress area. The stone pad should be at least 50 feet long and at least 6 inches thick. Additional stone may have to be added periodically to maintain the proper functioning of the pad.
2. There will be no washing of wheels in the borrow site.

### c) Maintenance

**Both temporary and permanent roads and parking area may require periodic top dressing with new gravel. Seeded areas adjacent to the roads and parking areas should be checked periodically to insure that a vigorous stand of vegetation is maintained. Roadside ditches and other drainage structures should be checked regularly to ensure that they do not become clogged with silt or other debris. The paved roads in the area will be inspected daily by the contractor/user and all mud/dirt deposits removed. The site manager along with authorized contractors shall maintain all access and pit roads.**

## Dust and Pollutant Control

## Description

Dust and pollutant control measures are implemented to reduce surface and air movement of dust and other pollutants during land disturbing, demolition, and other construction activities. The purpose of these controls is to prevent surface and groundwater contamination and air transport of dust and other pollutants from exposed surfaces and to reduce the presence of airborne substances that may be harmful or injurious to human health, welfare, and safety, or to animals and plant life. This practice is applicable to heavy use areas on the borrow site and to areas subject to surface and air movement of dust where, without treatment, on-site and off-site damage may occur.

Earth moving activities cause the largest amount of construction dust emissions. The less soil exposed at one time, the less potential there is for dust generation. Therefore, dust control should involve phasing of borrow pit activities and utilizing temporary stabilization measures upon completion of grading.

Oil, gasoline, grease, solvents and other pollutants are associated with equipment used on construction sites. The level of equipment maintenance and repair will, of course, depend upon the size and complexity of the project. Whenever equipment must be serviced, special precautions should be taken.

## Specifications

### a) General

Blowing dust may be controlled permanently or temporarily, depending on the needs of the site. The following summarizes available temporary dust control methods:

### b) Temporary Practices

- Mulching: Chemical mulch binders may be used instead of asphalt to bind mulch materials. Binders such as Curasol or Tenatack should be used according to manufacturer's recommendations.
- Vegetative Cover: Refer to Temporary Seeding measures in Chapter 3.
- Spray-on-Adhesives: These are used on mineral soils (not effective on muck soils); traffic should be kept off the area. Apply under proper weather conditions according to manufacturer's directions.
- Wetting: Water can be sprayed by truck or by hand, along the access roads and in the work area to hold down the dust.

### c) Permanent Practices

- Permanent Vegetation: Existing trees and large shrubs may afford valuable protection if left in place. Also refer to Permanent Seeding section of this manual (see Chapter 4, B).
- Top soil: This entails covering the surface with less erosive soil material. Refer to section in this manual on Topsoil (see Chapter 4, A).
- Stone: Cover surface with crushed stone or coarse gravel.

Maintenance and repair of equipment should be confined to areas specifically designed for that purpose. These areas should have adequate waste disposal receptacles for liquid as well as solid waste. Take waste oil to designated waste oil collection areas for recycling. On sites where designed areas for equipment servicing is not feasible, special care should be taken to assure that potential pollutants cannot be washed into nearby receiving streams.

Adequate sanitary facilities, such as chemical toilets, should be placed near maintenance areas or other convenient sites on the construction area.

Scrap from maintenance and other construction litter should be placed in containers or otherwise disposed of properly.

Maintenance areas should be inspected and cleaned daily.

### **Oil and Grease**

To eliminate the potential of large spills, no stationary fuel tanks are permitted at the site. Refueling and lubrication of equipment can only be performed at the site by a portable fueling/servicing truck. Unserviceable equipment must be evacuated from the site for repairs.

### **Spoil from Construction Sites**

Spoil from construction sites on Fort Campbell will be accepted into the open borrow pit or closed pit located on On the Line Road or recycled per project manager. Spoil must be separated as to topsoil or subsoil. It will contain no asphalt or large rocks, metal or other construction debris. All soil will be placed at a site designated by the site manager, deposited in lifts, capped and temporarily seeded. It is the contractor's responsibility to ensure compliance with this requirement.

### **Permit to use Borrow Pits.**

Any contractor wishing to either excavate soil or dispose of spoil must obtain a permit from the site manager prior to operations. The permit must be maintained by all trucks and equipment operating within the borrow pit. Failure to keep proper documentation within the vehicles could result in fines imposed for improper access and dumping. The contractor must provide at a minimum the contract number, quantity of soil to be moved, type of soil, and the dates of operation. The form is located at App C.

[Return to Table of Contents](#)

## **CHAPTER 31—EROSION AND SEDIMENTATION CONTROL**

### **Sediment Control Measures**

## **Sedimentation Basin**

### **Description**

A sedimentation basin is a temporary barrier or dam constructed across a watercourse or at other suitable locations to retain sediment and other waterborne debris. They are required by the EPA

Temporary sediment basins are used as a means of trapping and storing sediment from eroding areas in order to protect downstream areas from damage resulting from sedimentation and waterborne debris.

Sedimentation basins should be used at sites where:

1. Failure of the structure would not result in loss of life; damage to homes; commercial, or industrial buildings; damage to highways or railroads, or interruption of use or service or private utilities.
2. The height of dam is 25 feet or less, as measured from the natural streambed at the downstream toe of dam to the top of dam.
3. The product of the total volume of storage (acre-feet) and the height of dam (feet) is not greater than 3,000.
4. The drainage area is 100 acres or less.
5. The basin will be removed within a three-year period after construction.

Temporary sediment basins apply where physical site conditions or other restrictions preclude the installation of erosion control measures to adequately control erosion and sedimentation. It may be used downslope from borrow operations that expose areas to erosion. Temporary sediment basins will be removed after the exposed areas are adequately protected against erosion by vegetative or mechanical means.

### **Regulation**

Unless otherwise excepted, all dams with a height of 25 feet or more, or storage of 50 acre-feet or more, require detailed construction plans prior to the start of construction. The height of the dam is measured from the natural streambed at the downstream toe of dam to the top of dam.

Design and construction shall comply with all federal, state and local laws, ordinances, rules and regulations.

### **Planning Considerations**

Sediment basins are typically only 70-80 percent effective in trapping sediment that flows into them. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

To improve the effectiveness of the basin, it should be located so as to intercept the largest possible amount of runoff from the disturbed area. The best locations are

generally low areas and natural drainage ways below disturbed areas. Drainage into the basin can be improved by the use of stabilized diversion dikes and ditches. The basin must not be located in a live stream but should be located to trap sediment-laden runoff before it enters the stream. The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

Sediment basins may be designed as permanent structures to remain in place after construction is completed. Site conditions may make the use of these structures desirable for storm water detention purposes. Wherever these structures are to become permanent, or if they exceed the size limitations of the design criteria, they must be approved by the DPW and designed as permanent ponds by a qualified Professional Engineer.

## **Specifications**

### **(a) Embankment Basin**

1. The foundation area shall be cleared of all trees, stumps, roots, and brush boulders, sod, and debris. All channel banks and sharp breaks shall be sloped to no steeper than 1:1. All topsoil containing excessive amounts of organic matter shall be removed. The surface of the foundation area will be thoroughly scarified before placement of the embankment material.
2. The cutoff trench shall be excavated to the lines and grades shown on the plans or as changed during construction because of site conditions, and shall be backfilled with suitable material in the same manner as specified for earth embankment. The trench shall be kept free of standing water during backfill operations.
3. Existing stream channels crossing the foundation area shall be sloped no steeper than 1:1 and deepened and widened as necessary to remove all stones, gravel, sand, roots, and other objectionable material and to accommodate compacting equipment. Such channels shall then be backfilled with suitable material as specified for each embankment.
4. The pipe conduit barrel shall be placed on a firm foundation to the lines and grades shown on the plans. Selected backfill material shall be placed around the conduit in layers, and each layer shall be compacted to at least the same density as the adjacent embankment. All compaction within 2 feet of the pipe spillway will be accomplished with hand-operated tamping equipment.
5. The material placed in the fill shall be free of all sod, roots, frozen soil, stones more than 6 inches in diameter, and other objectionable material. The placing and spreading of the fill material shall be brought up in approximately 6-inch horizontal layers or of such thickness that the required compaction can be obtained with the equipment used. Construction equipment shall be operated over the area of each layer in a way that will result in the required compaction.
6. Special equipment shall be used when the required compaction cannot be obtained without it.

7. The distribution and gradation of materials throughout the fill shall be such that there will be no lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. Where it is necessary to use materials of varying texture and gradation, the more impervious material shall be placed in the upstream and center portions of the fill.
8. The moisture content of fill material shall be such that the required degree of compaction can be obtained with the equipment used.
9. Fill shall not be placed on frozen, slick or saturated soil.

The topsoil material saved in the site preparation shall be placed as a top dressing on the surface of the emergency spillways, embankments, and borrow areas. It shall be evenly spread to a thickness as specified on the plans.

A protective cover of herbaceous vegetation shall be established on all exposed surfaces of the embankment and spillway to the extent practical under prevailing soil and climatic conditions.

### **Excavated Basins**

The completed excavation shall conform to the lines, grades and elevation shown on the plans.

The material excavated from the basin shall be placed in one of the following ways so that its weight will not endanger the stability of the side slopes and where it will not be washed back into the basin by rainfall:

1. Uniformly spread to a height not exceeding 3 feet with the top graded to a continuous slope away from the basins.
2. Uniformly place or shape with side slopes assuming the natural angle of repose for the excavated material behind a berm width equal to the depth of the basin, but not less than 12 feet.
1. .

### **Planning Considerations**

1. Straw bale barriers that are used in streams and drainage ways with high water velocities and volumes will be destroyed or have diminished effectiveness.
2. Improper placement and installation of the barriers, such as staking the bales directly to the ground with no soil seal or entrenchment, will allow undercutting and end flow. This will result in additions of, rather than removal of, sediment from runoff waters. Inadequate maintenance lowers the effectiveness of these barriers. Trapping efficiencies of carefully installed straw bale barriers can drop from 57 percent to 16 percent in one month due to lack of maintenance.

## **Specifications**

### a) Sheet Flow Applications

1. Bales shall be placed in a single row, lengthwise on the contour, with both ends of adjacent bales tightly abutting one another.
2. All bales shall be either wire-bound or string-tied. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales (in order to prevent deterioration of the bindings).
3. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked, the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier.
4. Each bale shall be securely anchored by at least two stakes or rebars driven through the bale. The first stake in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or rebars shall be driven deep enough into the ground to securely anchor the bales.
5. The gaps between bales shall be chinked (filled by wedging) with straw to prevent water from escaping between the bales. (Loose straw scattered over the area immediately uphill around a straw bale barrier tends to increase barrier efficiency.)
6. Inspection shall be frequent, and repair or replacement shall be made promptly as needed.
7. Straw bale barriers shall be removed when they have served their usefulness, but not before the upslope areas have been permanently stabilized.

### b) Channel Flow Applications

1. Bales shall be placed in a single row, lengthwise, oriented perpendicular to the contour, with ends of adjacent bales tightly abutting one another.
2. The remaining steps for installing a straw bale barrier for sheet flow applications apply here, with the following addition:
3. The barrier shall be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment laden runoff will flow either through or over the barrier, but not around it.

## **Maintenance**

1. Straw bale barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall.
2. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales.
3. Necessary repairs to barriers to replace bales shall be accomplished promptly.

4. Sediment deposits should be removed after each rainfall. They must be removed when the level of deposition reaches approximately one-half the height of the barrier.
5. Any sediment deposit remaining in place after the straw bale barrier is no longer required shall be dressed to conform to the existing grade, prepared and seeded.

## **Silt Fence**

### **Description**

A silt fence is a temporary barrier to trap sediment that consists of a filter fabric stretched between supporting posts, with the bottom entrenched in the soil. The Silt Fence is a temporary linear filter barrier constructed of synthetic filter fabric, posts, and, depending upon the strength of the fabric used, wire fence for support. The purpose of a silt fence is to intercept and detain small amounts of sediment from disturbed areas during construction operations in order to prevent sediment from leaving the site and damaging streams or entering sinkholes.

Silt fences should be used under the following conditions:

1. Below disturbed areas where erosion would occur in the form of sheet and rill erosion and
2. Where the size of the drainage area is no more than 1/4 acre per 100 feet of silt fence length; the maximum slope length behind the barrier is 100 feet; and the maximum gradient behind the barrier is 50 percent (2:1) and
3. In minor swales or ditch lines where the maximum contributing drainage area is no greater than 2 acres and
4. Under no circumstances should silt fences be constructed in live streams or in swales or ditch lines where flows are likely to exceed 1 cubic foot per second (cfs).

### **Specifications**

#### **a) General**

1. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester or ethylene yarn and shall be certified by the manufacturer or supplier.
2. Burlap shall be 10-ounce per square yard fabric.
3. Posts for Silt Fences shall be either 2-inch diameter wood or 1.33 pounds per linear foot steel with a minimum length of 5 feet. Steel posts shall have projections for fastening wire to them. They should be installed 10 feet on center.
4. Wire fence reinforcement for silt fences using standard strength filter cloth shall be a minimum of 42 inches in height, a minimum of 14 gauge and shall have a maximum mesh spacing of 6 inches.
5. A trench shall be excavated approximately 4 inches wide and 4 inches deep along the line of stake and upslope from the barrier.

6. The filter material shall be attached to the stakes, and 8 inches of fabric shall be extended into the trench. Filter material shall not be stapled to existing trees.
7. The trench shall be backfilled and the soil compacted over the filter material.

### **Maintenance**

1. Silt fences shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
2. Should the fabric on a silt fence decompose or become ineffective prior to the end of the expected usable life and the barrier is still necessary, the fabric shall be replaced promptly.
3. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
4. Any sediment deposit remaining in place after the silt fence is no longer required shall be dressed to conform with the existing grade, prepared and seeded.

### **Runoff Control Measures**

#### **Diversion**

##### **Description**

A diversion is a channel constructed across a slope with a supporting ridge on the lower side. The purpose of the structure is to reduce slope length and to intercept and divert storm water runoff to stabilized outlets at non-erosive velocities.

Diversions should be used under the following conditions:

1. Where runoff from higher areas may damage property, cause erosion, or interfere with the establishment of vegetation on lower areas.
2. Where the slope length needs to be reduced to minimize soil loss.

##### **Planning Considerations**

Diversions can be useful tools for managing surface water flows and preventing soil erosion. On moderately sloping areas, they may be placed at intervals to trap and divert sheet flow before it has a chance to concentrate and cause rill and gully erosion. They may be placed at the top of cut or fill slopes to keep runoff from upland drainage areas off the slope. They can also be used to protect structures, parking lots, adjacent properties, and other special areas from flooding.

Diversions are preferable to other types of man-made storm water conveyance systems because they more closely simulate natural flow patterns and characteristics. Flow velocities are generally kept to a minimum. When properly coordinated into the landscape design of a site, diversions can be visually pleasing as well as functional.

As with any earthen structure, it is very important to establish adequate vegetation as soon as possible after installation. It is equally important to stabilize the drainage area

above the diversion so that sediment will not enter and accumulate in the diversion channel.

A diversion channel must have a minimum capacity to carry the runoff expected from a 10-year frequency storm with a freeboard of at least 0.3 foot.

### **Specifications**

1. All dead furrows, ditches or other depressions to be crossed shall be filled before construction begins or as part of construction, and the earthfill used to fill the depressions will be compacted using the treads of the construction equipment. All old terraces, fence rows, or other obstructions that will interfere with the successful operation of the diversion will be removed.
2. The base for the diversion ridge is to be prepared so that a good bond is obtained between the original ground and the place filled. Vegetation is to be removed and the base thoroughly disked prior to placement of fill.
3. The earth materials used to construct the earth fill portions of the diversions shall be obtained from the diversion channel or other approved source.
4. The earthfill materials used to construct diversions shall be compacted by routing the construction equipment over the fill in such a manner that the entire surface of the fill will be traversed by not less than one tread track of the equipment.
5. The completed diversion shall conform to the cross section and grade shown on the design.
6. Fertilizing, seeding, and mulching shall conform to the recommendations in the applicable vegetative standard and specification.
7. If there is no sediment protection provided on temporary diversion, it should be anticipated that periodic cleanout may be required.
8. Construction operations shall be carried out in such a manner that erosion and air and water pollution will be minimized. State and local laws concerning pollution abatement shall be followed.

### **Maintenance**

Before final stabilization, the diversion should be inspected after every rainfall. Sediment shall be removed from the ditchline and repairs made as necessary. Seeded areas that fail to establish a vegetative cover shall be reseeded as necessary.

### **Waterway**

#### **Description**

A waterway is a natural or constructed waterway or outlet shaped or graded and established in suitable vegetation as needed for safe disposal of runoff water. The

purpose of a waterway is to provide for the disposal of excess surface water from construction sites without causing erosion.

Supplemental measures may be required with this practice. These may include such things as (1) grade control structures, (2) subsurface drainage to permit growing suitable vegetation and to eliminate wet spots that may be a nuisance, (3) a paved channel bottom or buried storm drain to handle storm runoff, base flow or snowmelt.

The location of waterway channels is of considerable importance to a good program of erosion and sedimentation control. Wherever possible, the site manager should preserve the natural drainage system. Waterways should generally be located in natural drainageways where water can drain in from all sides. When the establishment of vegetation is required, moisture conditions and soil fertility are usually best in such areas. Waterway channels should be located so that they do not make sharp, unnatural changes in direction of flow.

All waterway channels should have stable outlets with adequate capacity for the designed flow. The outlet may be another vegetated channel, an earth ditch, a structure, or other suitable outlet. In all cases, the outlet must discharge in such a manner as not to cause erosion. Outlets should be constructed and stabilized prior to the operation of the waterway channel. Applicable drainage laws, traditional case law precedent and local ordinances and regulations must be observed in locating waterway channels and outlets.

### **Specifications**

1. All trees, brush, stumps, and other objectionable material shall be removed and disposed of in a manner so that they will not interfere with construction or the proper functioning of the waterway or outlet.
2. The waterway or outlet shall be constructed to the dimensions specified on the design, and the cross section shall be free from bank projections or other irregularities.
3. All ditches or other depressions below the designed grade will be back filled with fill material that is free from brush, roots, sod or other perishable material, and rocks in excess of 6 inches in diameter. Backfill will be placed in approximately uniform horizontal layers of not more than 9 inches in thickness and each layer will be compacted using the treads or tracks of the construction equipment.
4. After the waterway has been constructed to proper grades and cross section with proper allowance for topsoil, the topsoil will be uniformly spread over the area to a minimum depth of 4 inches.
5. Waterways or outlets shall be protected against erosion by vegetative means as soon after construction as practical and before diversions or other channels are released into them. Consideration should be given to sodding channels to provide erosion protection immediately after construction.

### **Soil Stabilization Measures**

The following soil stabilization techniques should be implemented if borrow pit sections are not closed as soon as excavation is complete.

## **Temporary seeding**

### **Description**

Temporary seeding is used to establish a temporary vegetative cover on disturbed areas by seeding with appropriate rapidly growing annual plants. The purpose of temporary seeding is to reduce erosion and sedimentation by stabilizing disturbed areas that will not be brought to final grade for a year or less and to reduce problems associated with mud and dust production from bare soil surfaces during construction.

Temporary seeding is necessary where exposed soil surfaces are not to be fine-graded for periods from 30 days to one year. Such areas include denuded areas, soil stockpiles, sides of sediment basins, temporary roadbanks, etc.

### **Planning Considerations**

Sheet erosion, caused by the impact of rain on bare soil, is the source of most fine particles in sediment. To reduce this sediment load in runoff, the soil surface itself should be protected. The most efficient and economical means of controlling sheet and rill erosion is to establish vegetative cover. Annual plants that sprout rapidly and survive for only one growing season are suitable for establishing temporary vegetative cover.

Temporary seeding may prevent costly maintenance operations on other erosion control systems. For example, sediment basin clean-outs will be reduced if the drainage area of the basin is seeded where excavation is not taking place.

Temporary seeding is essential to preserve the integrity of earthen structures used to control sediment, such as diversions, and the banks and dams of sediment basins.

### **Specifications**

#### **a) General**

Prior to seeding, install necessary erosion control practices such as waterways and basins.

#### **b) Plant Selection**

Select plants appropriate to the season and site conditions. The local Natural Resource Conservation Service may supply more specific information upon request.

#### **c) Seedbed Preparation**

To control erosion on bare soil surfaces, plants must be able to germinate and grow. Seedbed preparation is essential. The following must be considered prior to seeding:

Plant or Plant Mixture	Application Rate per Acre	Plant Dates
Rye	3 bushels	Aug. 15 - Nov. 1
Wheat	2-3 bushels	Sept. 1 - Nov. 1
Annual Ryegrass	30 pounds	Aug. 15 - Nov. 1
Browntop or Pearl Millet	20 pounds	Apr. 1 - July 15
Fescue	10 pounds	Mar 1- May 30
Clover/Red or White	5 pounds	28 Feb -15 Apr 15 Sep - 1 Nov
Warm Season Grasses	3-7 pounds	Apr 1 – Sep 30

1. Liming: Where soils are known to be highly acidic (pH 5.5 and lower), lime should be applied at the rate of two tons of pulverized agricultural limestone per acre, or in accordance with local extension office recommendations.
2. Fertilizer: Shall be applied as 500 pounds/acre of 6-12-12 (10 pounds/1,000 ft<sup>2</sup>) or equivalent. Lime and fertilizer shall be incorporated into the top 2 to 4 inches of the soil.
3. Surface Roughening: If the area has been recently loosened or disturbed, no further roughening is required. When the area is compacted, crusted, or hardened, the soil surface shall be loosened by disking, raking, harrowing, or other acceptable means.
4. Tracking: Tracking with bulldozer cleats is most effective on sandy soils.

#### c) Seeding

Table 1. Guidelines for selecting vegetative cover

Seed shall be evenly applied with a cyclone seeder, drill, cultipacker seeder or hydroseeder. Small grains shall be planted no more than one-inch deep. Grasses and legumes shall be planted no more than 1/4-inch deep.

#### d) Mulching

1. Seedings made in fall for winter cover shall be mulched.
2. At other times of the year, seedings made on slopes in excess of 4:1, or on adverse soil conditions, or during excessively hot or dry weather, shall be mulched.
3. Seedings made during optimum spring and summer seeding dates, with favorable soil and site conditions, will not require mulch.

## Ground Cover

### Description

Ground covers are plants that naturally grow very close together, causing severe competition for space, nutrients, and water. They are used to stabilize disturbed areas by establishing vegetative cover with trees, shrubs, or vines. The purpose of ground cover is to aid in stabilizing soil in areas where vegetation other than turf is preferred and provides food and shelter for wildlife where wildlife habitat is desirable.

Ground cover should be used under the following conditions:

1. On steep or rocky slopes, where mowing is not feasible.
2. In shady areas where turf maintenance is difficult.
3. Where woody plants are desirable for soil conservation and the establishment of wildlife habitat.

### Planning Considerations

1. Protect the area from excess runoff as necessary with diversions, grass waterways or sediment basins.
2. Evaluate the capabilities and limitations of the soil to be planted. Special attention should be placed on soil pH, texture, internal water movement, steepness, and stability in order to plan the appropriate treatment.
3. The species and type of plant selected should be based on soil type, planned use of the area, and the amount of maintenance that can be devoted to the area in the future.
4. Fertilizer, lime, seedbed preparation, and irrigation should be used as necessary to promote quick establishment.
5. Plantings cannot be expected to provide erosion control and prevent soil slippage on a soil that is not stable due to its structure, water movement, or excessive slope.

### Specifications

#### a) Planting Time:

Planting should be done in early spring if possible, but no later than May 1, for bare root stock. This allows for the maximum root and top development to reduce soil erosion and allow the plant to become established before winter.

#### (b) Soil Preparation

1. For short slopes, small areas, and mass plantings of close spacing apply a commercial granular fertilizer, such as 6-12-12, and organic supplement, such as composted cow manure, peat, or well-rotted sawdust, and work into the soil prior to planting. Fertilize with 500 pounds per acre. The organic material needed will

depend upon the soil and plant being used. Plants such as pachysandras require a high rate of organic material, about a 2-inch layer worked into the root zone. Depending on the type and steepness of slope, the depth of soil preparation will vary from 4 to 6 inches.

2. For steep slopes and large area plantings, working up the entire planting area would be impractical and would probably induce erosion. Center hole planting, a hole dug for each plant, would be more desirable. If the soil on the slope is poorly suited to the species being planted, incorporate organic material into the slanting hole. Whether organic material is needed or not, fertilize each plant at the rate of one ounce per plant of a complete fertilizer such as 6-12-12. Mix fertilizer with soil below the roots of the plants or place a slow-release pellet or packet in bottom of planting hole.

#### c) Planting

1. Select the desired type and species of plants based on the suitability of the soil, the planned use, and the characteristics of the site.
2. Soil for ground covers should be well prepared. A well-drained soil high in organic matter is best. If the area to be planted is so large that adding amendments to the soil as a whole would be impractical, organic matter may be added only to each planting hole.
3. Plants such as ivy, pachysandra, and periwinkle should be planted on one-foot centers; large plants such as juniper can be spaced on three-foot centers.
4. The soil between trees and shrubs must be planted with cover vegetation or must be mulched. When establishing ground covers, it is not desirable to plant species that will make maintenance difficult. A thick durable mulch such as shredded bark or wood chips is recommended to prevent erosion and reduce weed problems. Pre-emergent herbicides may be necessary where weeding is not practical.
5. On slopes where erosion may be a problem, jute net or excelsior blankets may be installed prior to planting, and plants tucked into the soil through slits in the net. Such plants should be put in a staggered pattern to minimize erosion.

#### d) Establishment

1. Some watering, weeding, remulching, and fertilizing may be required of a new planting during the period of establishment. Soil movement is not recommended. This could cause soil erosion and/or root injury. Competing weeds should be controlled.
2. If a controlled-release fertilizer was used at the time of planting, additional fertilizing will not be necessary for several years. Otherwise, fertilize plantings in the spring of the second growing season and thereafter as needed, using 2 to 3 pounds per 100 square feet of a granulated commercial fertilizer such as 6-12-12.

3. Trim old growth as needed to improve the appearance of ground covers. Most covers need once-a-year trimming to promote growth. Maintain mulch cover with additions of mulch where needed.

## Riprap

### Description

Riprap is a permanent, erosion-resistant ground cover of large, loose, angular stone (see Figures 3 and 4).

The purpose of riprap is:

1. To protect the soil surface from the erosive forces of concentrated runoff.
2. To slow the velocity of concentrated runoff while enhancing the potential for infiltration.
3. To stabilize slopes with seepage problems and/or non-cohesive soils.
4. Riprap shall have geotextile fabric under the stone.

Riprap may be used, as appropriate, at stormdrain outlets, on channel banks and/or bottoms, roadside ditches, drop structures, at the toe of slopes, etc.

### Planning Considerations

Riprap is classified as either graded or uniform. A sample of graded riprap would contain a mixture of stones that vary in size from small to large. A sample of uniform riprap would contain stones that are all fairly close in size. For most applications, graded riprap is preferred to uniform riprap. Graded riprap forms a flexible self-healing cover, while uniform riprap is more rigid and cannot withstand movement of the stones. Graded riprap is cheaper to install, requiring only that the stones be dumped so that they remain in a well-graded mass. Hand or mechanical placement of individual stones is limited to that necessary to achieve the proper thickness and line.

Uniform riprap requires placement in a more or less uniform pattern, requiring more hand or mechanical labor. Riprap sizes can be designated by either the diameter or the weight of the stones. It is often misleading to think of riprap in terms of diameter, since the stones should be rectangular instead of spherical. However, it is simpler to specify the diameter of an equivalent size of spherical stone. Table 2 list some typical stones by weight, spherical diameter and the corresponding rectangular dimensions. These stone sizes are based upon an assumed specific weight of 165 pounds/ft<sup>3</sup>.

Since graded riprap consists of a variety of stone sizes, a method is needed to specify the size range of the mixture of stone. This is done by specifying a diameter of stone in the mixture for which some percentage, by weight, will be smaller. For example,  $d_{85}$  refers to a mixture of stones in which 85 percent of the stone by weight would be smaller than the diameter specified. Most designs are based on  $d_{50}$ . In other words, the design is based on the median size of stone in the mixture.

Table 2. Size of riprap stones

Weight (pounds)	Diameter (feet)	Length (feet)	Width, Height (feet)
50	0.8	1.4	0.5
100	1.1	1.75	0.6
150	1.3	2.0	0.67
300	1.6	2.6	0.9
500	1.9	3.0	1.0
1000	2.2	3.7	1.25

Since riprap is used where erosion potential is high, construction must be sequenced so that the riprap is put in place with the minimum possible delay. Disturbance of areas where riprap is to be placed should be undertaken only when final preparation and placement of the riprap can follow immediately behind the initial disturbance. Where riprap is used for outlet protection, the riprap should be placed before or in conjunction with the construction of the pipe or channel so that it is in place when the pipe or channel begins to operate.

### Specifications

1. The riprap shall be composed of a well-graded mixture down to the one-inch size particle such that 50 percent of the mixture by weight shall be larger than the  $d_{50}$  size as determined from the design procedure. A well-graded mixture as used herein is defined as a mixture composed primarily of the larger stone size with a sufficient mixture of other sizes to fill the progressively smaller voids between the stones. The diameter of the largest stone size in such a mixture shall be 1.5 times the  $d_{50}$  size.
2. The site manager, after determining the riprap size that will be stable under the flow conditions shall consider that size to be a minimum size and then, based on riprap gradations actually available in the area, selects the size or sizes that equal or exceed the minimum size.
3. The minimum thickness of the riprap layer shall be 1.5 times the maximum stone diameter but not less than 6 inches.
4. Stone for riprap shall consist of clean or washed field stone or rough unhewn quarry stone of approximately rectangular shape. The stone shall be hard and angular and of such quality that it will not disintegrate on exposure to water or weathering. The specific gravity of the individual stones shall be at least 2.5.
5. Riprap for channel stabilization shall be designed to be stable for the condition of bank-full flow in the reach of channel being stabilized. Riprap shall extend up the

banks of the channel to a height equal to the maximum depth of flow or to a point where vegetation can be established to adequately protect the channel.

## **Maintenance**

Once a riprap installation has been completed, it should require very little maintenance. It should, however, be inspected periodically to determine if high flows have caused scour beneath the riprap or dislodged any of the stone. If repairs are needed, they should be accomplished immediately.

[Return to Table of Contents](#)

## **CHAPTER 4I-RECLAMATION**

Upon completion of borrow activities, the site should be brought to the desired final grade and stockpiled topsoil should be applied. Final contours should resemble original contours as closely as possible with slopes not to exceed 2:1. Measures should be taken to provide permanent ground cover through seeding or sprigging. Temporary erosion controls should be removed after establishment of permanent ground cover.

### **Topsoil Application**

After the application of the topsoil to such a depth as needed, the area shall be harrowed and disked entirely through the layer of topsoil and into the subsoil to a depth of at least 2 inches in order to secure proper bond of the topsoil with the subsoil. At this stage all large lumps, large rocks, roots, or other objectionable matter shall be gathered up and disposed. On such areas where the application of topsoil involves primarily the backfilling of rills or small washes, ground preparation may be delayed until just before the application of fertilizer and grassing operations.

### **Permanent Seeding**

#### **Description**

Permanent seeding is the establishment of permanent vegetation on disturbed areas by planting seed. The purpose of permanent seeding is to reduce erosion and decrease sediment yield from disturbed areas and stabilize disturbed areas in a manner that is economical, adaptable to site conditions, and allows selection of the most appropriate plant materials.

Permanent seeding should be applied to disturbed areas where permanent, long-lived vegetative cover is needed to stabilize the soil and rough graded areas that will not be brought to final grade for several months or more.

### **Planning Considerations**

1. Protect the area from excess runoff as necessary with diversions, waterways, or sediment basins.
2. Evaluate the capabilities and limitations of the soil to be seeded. Special attention needs to be given to soil pH, texture, internal water movement, steepness, and stability in order to plan the appropriate treatment.
3. Plant species should be selected on the basis of timing of establishment, planned use of the area, and the amount or degree of maintenance that can be devoted to the area in the future.
4. Fertilizer, lime, seedbed preparation, seed coverage, mulch, and irrigation should be used as necessary to promote quick plant growth.

### **Specifications**

#### **a) Site Preparation**

1. Soil materials should be capable of supporting permanent vegetation and have at least 25 percent silt and clay to provide an adequate amount of moisture holding capacity. An excessive amount of porous sand will not consistently provide sufficient moisture for good growth regardless of other soil factors.
2. Where compacted soils occur, they should be broken up sufficiently to create a favorable rooting depth of 6-8 inches.
3. Stockpile topsoil to apply to sites that are otherwise unsuited for establishing vegetation.
4. Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application and anchoring, and maintenance. After the grading operation, spread topsoil where needed.
5. Install the needed erosion control practices such as diversions, waterways, and sediment basins.

#### **b) Seedbed Preparation**

The seedbed is prepared using the same guidelines detailed in Chapter 3, C (Soil Stabilization Measures).

#### **c) Seed Application**

After seedbed preparation, seed may be applied by drilling, broadcasting or hand application. All broadcast seed shall have straw mulch placed over the area to promote

water retention, soil stabilization and seed germination. All seeding on slopes will be covered with straw mulch and crimped in use dozer track or disk harrow running cross slope. This will provide adequate stabilization to the slopes until seed germination can occur.

### Maintenance

Maintenance is a vital factor in maintaining an adequate vegetative erosion control cover.

- Irrigation - If soil moisture is deficient, supply new seedings with adequate water for plant growth until they are firmly established. This is especially true when seedings are made late in the planting season, in abnormally dry and hot season, or on adverse sites.
- Repairs - Inspect all seeded areas for failures and make necessary repairs, replacements, reseeding, and remulching within the planting season.
  1. If stand is inadequate, (less than 85 percent groundcover) overseed, fertilize, using half of rates originally applied, and mulch.
  2. If stand is more than 60 percent damaged, reestablish following original seedbed preparation methods, seeding and mulching recommendations and apply lime and fertilizer as needed according to a soil test.

**Table 3.** Guidelines for selecting permanent seeding

Permanent Plant Mixtures	Application Rate Per Acre	Plant Dates
Tall Fescue	45 Pounds	Feb. 15 - Apr. 15
White Clover	3 Pounds	Sep. 15 - Oct. 15
Crownvetch	20 Pounds	Feb. 15 - Apr. 15
Tall Fescue	30 Pounds	Aug. 15 - Oct. 15
Korean or Kobe Lespedeza	8 Pounds	Mar. 1 - May 15 Aug 15 – Oct 15
Warm Season Grasses	3 – 7 pounds	May 1 – Sep 30

### Hydroseeding

#### Description

Hydroseeding is the application of seed, fertilizer, necessary organic soil amendments, fibrous mulch, and a tachifier. The products are applied as a single, uniformly applied, sprayed slurry under pressure over the entire area.

## Specifications

### a) Seed Classification.

State approved seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with AMS-01 and applicable state seed laws.

### b) Seed Mixtures.

Seed will be applied at a rate of 45 lbs per acre and shall be proportioned by weight as follows:

<u>Name</u>	<u>Mixture Percent by Weight</u>
Korean Lespedeza	10%
White Clover	8%
KY31 Fescue, Fungus Free	82%

### c) Fertilizer.

Fertilizer shall be commercial grade, free flowing, uniform in composition and conforming to CID A-A-1909. Granular Fertilizer shall be applied at a rate of 500 lbs per acre with a guaranteed analysis of 6-12-12.

### d) Wood Cellulose Fiber Mulch.

Wood cellulose fiber shall not contain any growth or germination-inhibiting factors and shall be dyed an appropriate color to facilitate visual metering during application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 4.5 to 6.0.

### e) Tachifier.

A biodegradable tachifier shall be applied at a rate of 100 lbs per acre.

### f) Seeding Time.

The hydroseeding operation should be conducted from 15 February to 1 May to obtain the best results.

### G) Tillage.

Soil on slopes gentler than 3-horizontal-to-1-vertical shall be tilled to a minimum depth of four inches. On slopes between 3-horizontal-to-1-vertical and 1-horizontal-to-1 vertical, the soil shall be tilled to a minimum depth of 2 inches by scarifying with heavy rakes, or other method. Rototillers shall be used where soil conditions and length of slope permit. On slopes 1-horizontal-to-1 vertical and steeper, no tillage is required.

### h) Final Grade Preparation.

Turf areas shall be filled as needed or have surplus soil removed to attain the finished grade. Drainage patterns shall be maintained as indicated on drawings. Turf areas compacted by construction operations shall be completely pulverized by tillage. Soil

used for repair of erosion or grade deficiencies shall conform to topsoil requirements specified by the grading requirements. Finished grade shall be 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas.

i) Satisfactory Stand of Turf.

A satisfactory stand of turf from the seeding operation is defined as a minimum of 10 grass plants per square foot. The total bare spots shall not exceed 2 percent of the total seeded area.

**Maintenance During Establishment Period**

Maintenance of the turfed areas shall include eradicating weeds, eradicating insects and diseases, protecting embankments and ditches from erosion, maintaining erosion control materials and mulch, protecting turfed areas from traffic, mowing, watering, and post-fertilization.

[Return to Table of Contents](#)

**REFERENCES**

Kentucky Division of Conservation and Division of Water. August 1994. Kentucky Best Management Practices for Construction Activities. Kentucky Division of Conservation and Division of Water.

Tennessee Department of Environment and Conservation. July 1992. Tennessee Erosion & Sediment Control Handbook: A Guide for Protection of State Waters through Effective Management Practices during Construction Activities. Tennessee Department of Environment and Conservation.

[Return to Table of Contents](#)

# IMSE-CAM-DPW-E-R

Contract# \_\_\_\_\_

Contractor: \_\_\_\_\_

Vehicle Tag # \_\_\_\_\_

Material: Excavation  
Disposition

Material Type: Topsoil  
Fill

Dates of Excavation: \_\_\_\_\_

Quantity to be moved: \_\_\_\_\_

Authorized by Joseph D. Whitfill

Date: \_\_\_\_\_

Signature \_\_\_\_\_

[Return to Table of Contents](#)

# APPENDIX J

## Installation of ICIDS Equipment in Arms Rooms

First Priority in ICIDS installation is the contractor scheduling a meeting with the ICIDS Administrator, Mr. Anthony Saylor, and Senior Technician Mr. Bennie Robinson prior to commencement of work.

Second Priority in ICIDS installation is the contractor scheduling an inspection of the conduit and wire prior to closing up the walls/ceiling.

NOTE: Type and placement of ICIDS sensors will be discussed at the meeting.

Contact information is: Office: (270) 412-5864 or (270) 798-1225, Cell Phone: (931) 624-1783, or email at: [anthony.saylor@us.army.mil](mailto:anthony.saylor@us.army.mil)

- Contractor will run and tag all wire and provide all materials except as noted.

- Contractor will provide the ICIDS Administrator the As-builts to the ICIDS protected area(s) during the inspection of the conduit and wiring.

1. Mount the Remote Area Data Collector (RADC) to the same side as the interior door opens, approximately two feet to the left or right of the door and five feet up from the floor.

(RADC provided by ICIDS Administrator.)

2. Mount a four square box to the Center of the door left or right of door as in step one approximately one foot from the doorframe and five feet up from the floor. Half inch EMT must be run from the four square box to the bottom of the RADC can. This is for the Keypad mounting.

(Keypad provided by ICIDS Administrator.)

3. A foursquare must be mounted to the ceiling (center) of the arms room or 3 foursquares must be mounted in the following locations, rear wall facing the door, on the walls to the opposite of the doors as seen in diagram, depending on the type of motion sensor to be used and size of Vault. Half inch EMT must be run from the foursquares to the RADC can (top). Note: placement of sensors will be noted at time of meeting. See arms room type drawings 1, 2, or 3 (depending on the size of the room) attached. The four squares for the ceiling sensors must be flushed with the dropped ceiling. If Sharpshooters are utilized in the plan, the foursquares must be flushed against a flat wall just above the drop ceiling.

4. Drill half inch hole approximately eighteen inches above and centered on the arms room door to outside for mounting of the LED indicator lamp. Mount a foursquare box over drill hole and run half inch EMT from box to RADC can (top).  
(LED provided by ICIDS Administrator.)
5. Dedicated 120 Volt AC power with minimum of a 20 AMP (30 AMP preferred) Breaker must be run to RADC can through ½” or ¾” EMT. The Line must be tagged.
6. A four conductor 22 awg wire must be run from motion sensor to RADC. The wire must be tagged. (Motion sensors provided by ICIDS Administrator.)
7. A two conductor 22 awg wire must be run from foursquare above arms room door to RADC. This is for the Balance Magnetic Switch (BMS) for the door. The wire must be tagged.  
(BMS provided by ICIDS Administrator.)
8. A two conductor 22 awg wire must be run from the foursquare above door through the foursquare for the BMS to the RADC can for installation of a LED light to be mounted on the outside of the arms room. The wire must be tagged. (LED provided by ICIDS Administrator.)
9. A four conductor 22 awg wire must be run from the foursquare for the keypad to RADC. The wire must be tagged.

NOTE #1: Leave approximately four feet of wire at both ends. All Wire must be Single Stranded solid copper.

Type wire used (manufacture can be substituted)

West Penn 220 = 2 conductor 22 awg

West Penn 240 = 4 conductor 22 awg

Power: Black, Red, Green 12 awg stranded to RADC

All four Square Boxes must have covers.

## Measurements

RADC: Approximately 5 to 5 ½ feet above floor and two feet left of door.

Keypad: Approximately 4 ½ to 5 feet above floor and one foot left of door.

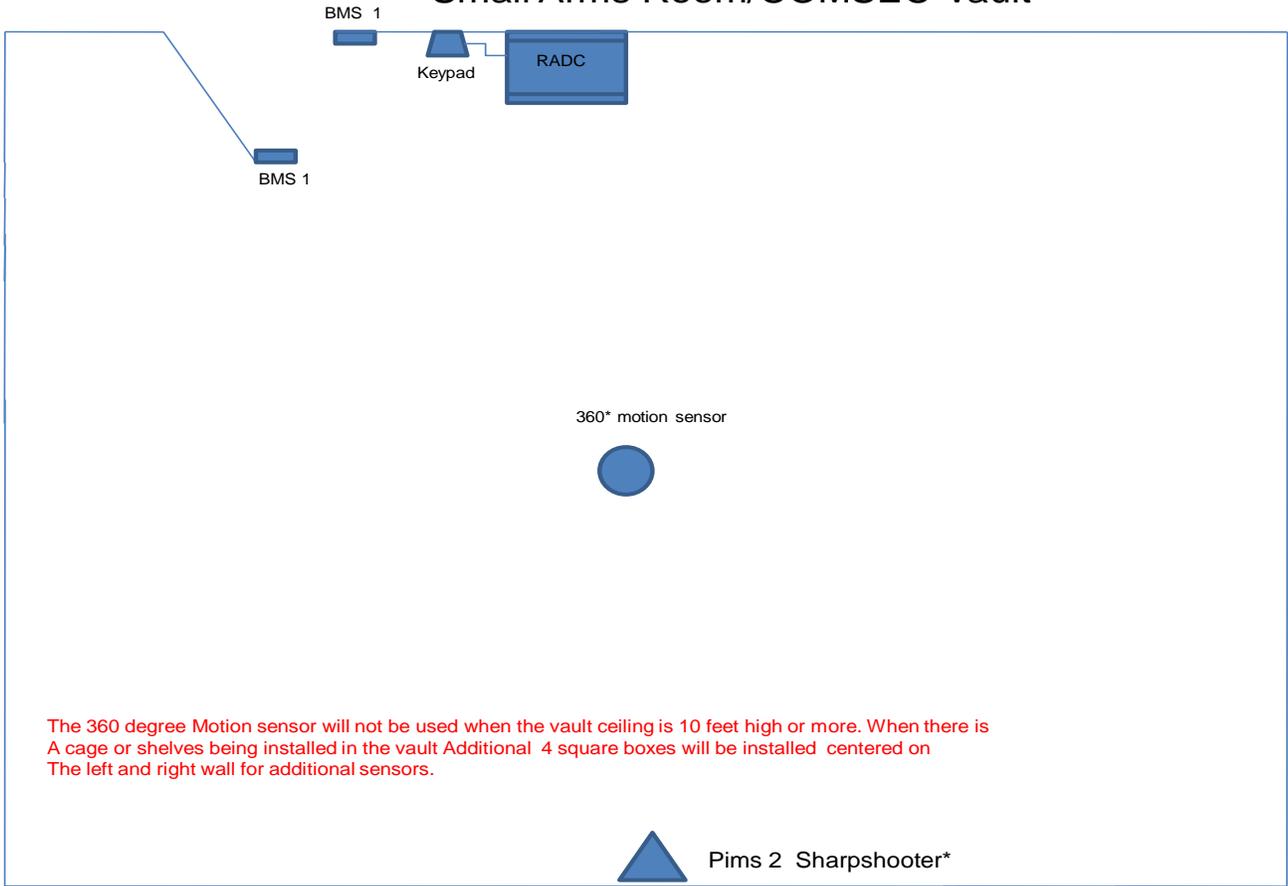
Note: All holes drilled in RADC can to run wires must be sealed off with no metal showing. There are marked areas in the RADC can that can be used, if new holes are drilled they must be drilled in such a way that the insides Part of the RADC must be attached unhindered.

NOTE for Unit: A work order will be submitted, by ICIDS Administrator from a dedicated dry ICIDS line at the unit's expense. This line will be run from the alarmed area to the communications room.

NOTE: For new buildings with ICIDS requirements and rooms other than arms room, the ICIDS Administrator and/or Senior technician will instruct the electrician where to run the wires and mount the four square box.

LED centered above door (outside)

## Small Arms Room/COMSEC Vault

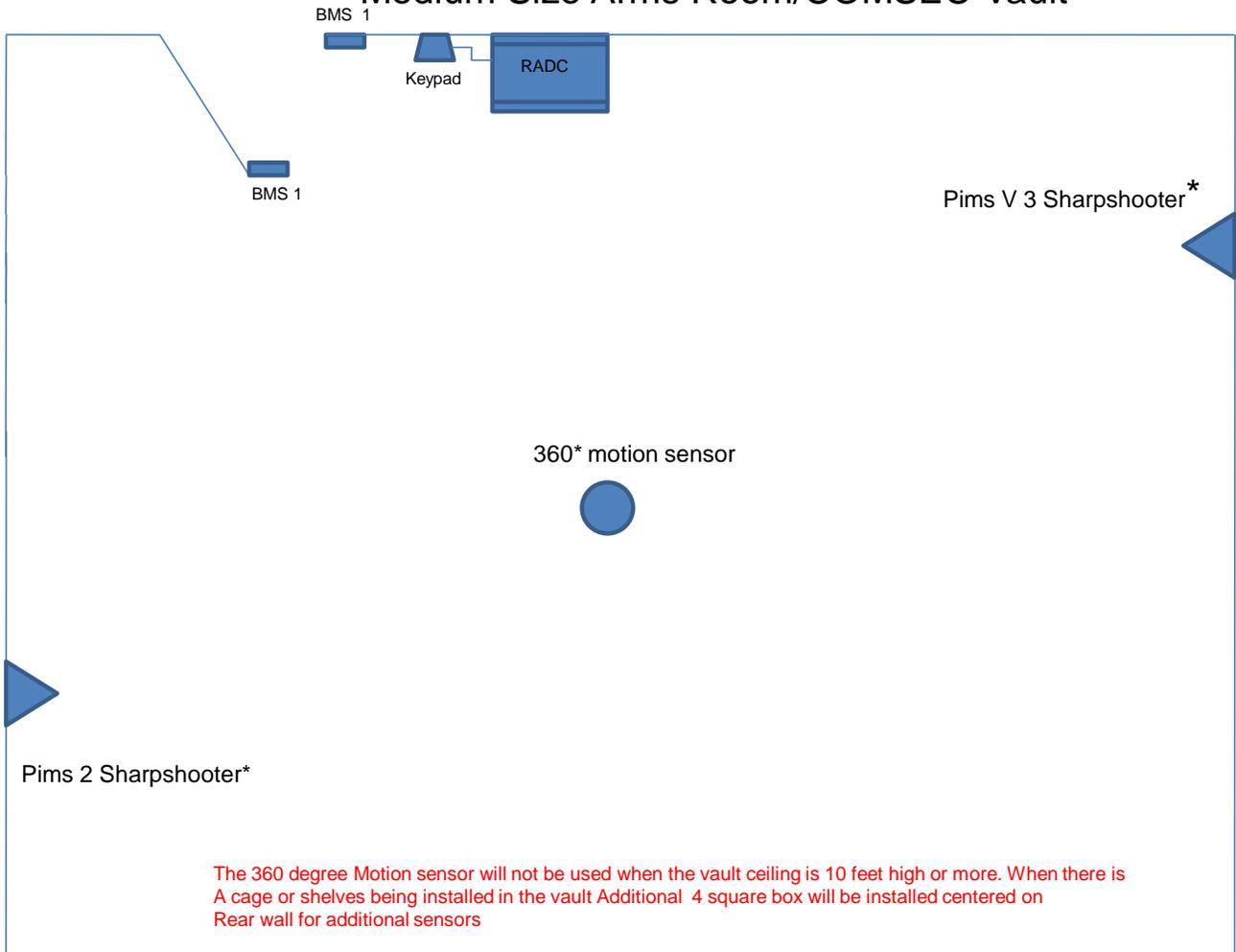


The 360 degree Motion sensor will not be used when the vault ceiling is 10 feet high or more. When there is A cage or shelves being installed in the vault Additional 4 square boxes will be installed centered on The left and right wall for additional sensors.

Small Arms Room 1

10/14/2010

LED centered above door (outside) **Medium Size Arms Room/COMSEC Vault**

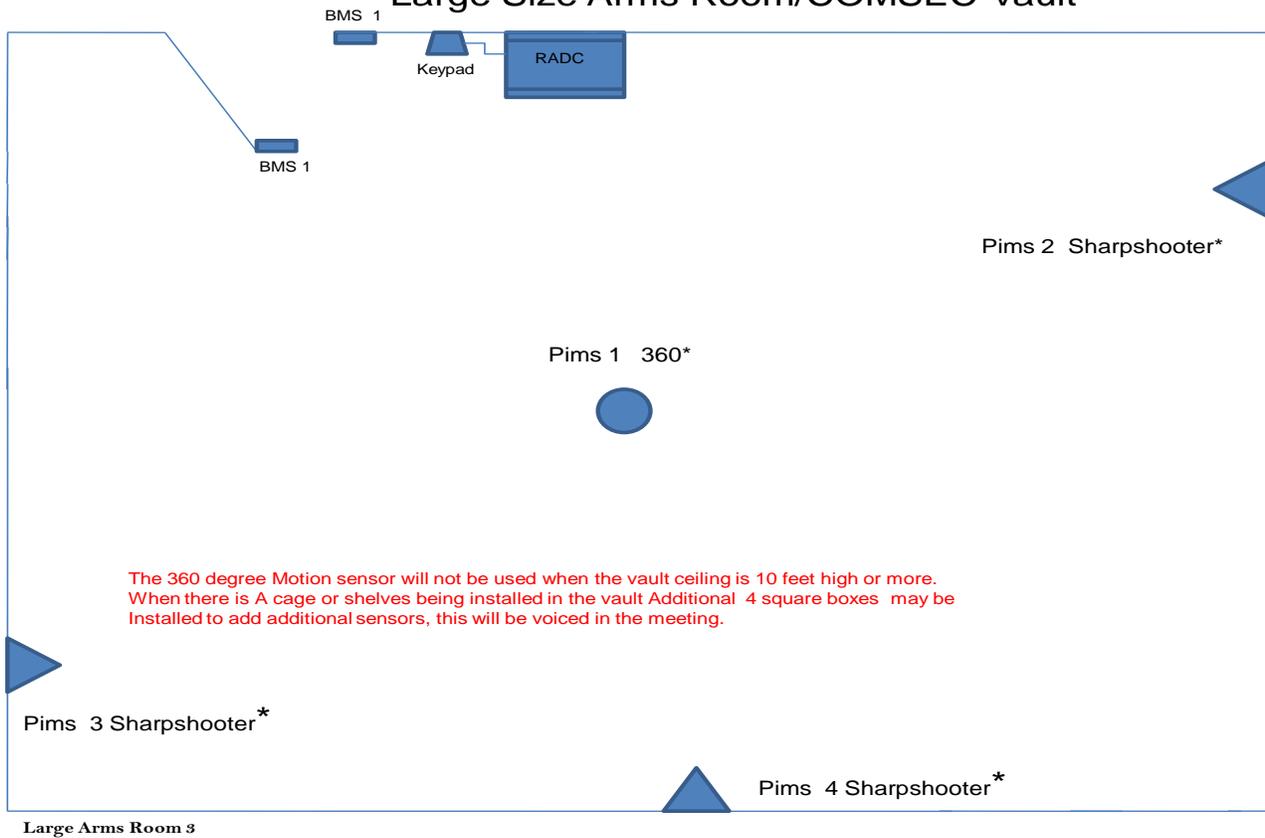


**Medium Arms Room 2**

10/14/2010

LED centered above door (outside)

## Large Size Arms Room/COMSEC Vault



10/14/2010