US Army Corps
of Engineers
Tulsa District

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**Task Order No.: TBD**

# PHYSICAL FITNESS FACILITY
# FORT SILL, OKLAHOMA

**PN: 01235 FY:12**

**DESIGN/BUILD REQUEST FOR PROPOSAL**

**DECEMBER 2011**

# SECTION 01 10 00.T.O. TBD
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## 1.0 PROJECT OBJECTIVES

1.0.1 The project objective is to design and construct facilities for the military that are consistent with the design and construction practices used for civilian sector projects that perform similar functions to the military projects. For example, a Company Operations Facility has the similar function as an office/warehouse in the civilian sector; therefore the design and construction practices for a company operations facility should be consistent with the design and construction of an office/warehouse building.

**Comparison of Military Facilities to Civilian Facilities**

| Military Facility | Civilian Facility |
|---|---|
| Physical Fitness Facility (PFF) | Fitness Center, Gym or Health Club |

1.0.2 It is the Army's objective that these buildings will have a 50 year useful life. The design and construction should provide an appropriate level of quality to ensure the continued use of the facility over that time period with the application of reasonable preventive maintenance and repairs that would be industry-acceptable to a major civilian sector project OWNER. The facility design should consider that the Army may repurpose the use of the facility over the 50 year life. The Army's intent is to install products and materials of good quality that meet industry standard average life that corresponds with the period of performance expected before a major renovation or repurpose. The design should be flexible and adaptable to possible future uses different than the current to the extent practical while still meeting the operational and functional requirements defined within. Flexibility is achieved through design of more flexible structural load-bearing wall and column system arrangements. The site infrastructure will have at least a 50-year life expectancy with industry-accepted maintenance and repair cycles. Develop the project site for efficiency and to convey a sense of unity or connectivity with the adjacent buildings and with the Installation as a whole.

1.0.3 Requirements stated in this contract are minimums. Innovative, creative, and life cycle cost effective solutions, which meet or exceed these requirements are encouraged. Further, the OFFEROR is encouraged to seek solutions that will expedite construction (panelization, pre-engineered, etc.) and shorten the schedule. **The intent of the Government is to emphasize the placement of funds into functional/operational requirements. Materials and methods should reflect this by choosing the most economical Type of Construction allowed by code for this occupancy/project allowing the funding to be reflected in the quality of interior/exterior finishes and systems selected.**

### 1.1. SECTION ORGANIZATION

This Section is organized under 6 major “paragraphs”.

(1) Paragraph 1 is intended to define the project objectives and to provide a comparison between the military facility(ies) and comparable “civilian” type buildings.

(2) Paragraph 2 describes the scope of the project.

(3) Paragraph 3 provides the functional, operational and facility specific design criteria for the specific facility type(s) included in this contract or task order.

(4) Paragraph 4 lists applicable industry and government design criteria, generally applicable to all facility types, unless otherwise indicated in the Section. It is not intended to be all-inclusive. Other industry and government standards may also be used, where necessary to produce professional designs, unless they conflict with those listed.

(5) Paragraph 5 contains Army Standard Design Criteria, generally applicable to all facility types, unless otherwise indicated in the Section.

(6) Paragraph 6 contains installation and project specific criteria supplementing the other 5 paragraphs.

## 2.0 SCOPE

### 2.1. PHYSICAL FITNESS FACILITY

Provide a(n) Large (89,448 SF) Physical Fitness Facility. The overall goal is to provide a functional, secure, visually appealing facility that is a source of pride for the installation. The desire is to provide "State-of-the-Art" facilities that rival similar use facilities found in local communities and on college campuses.

Refer to the PHYSICAL FITNESS FACILITY PROGRAM AREAS table below for the configuration of the facility.

**Physical Fitness Facility Size** (Small, Medium, etc.)**:** Large (89,448 SF)
**Total Gross Building Area:**
**Subtotal, Physical Fitness Facility:** 89,448 **SF**
**Subtotal, Indoor Jogging Track:** 5,300 **SF**

**Modules**:

Fitness Module

Exercise Module

Gymnasium Module

| (Indicate required elements by "X") | |
|---|---|
| | 1 Court w/ Track |
| | 1 Court no Track |
| | 2 Courts w/ Track and Tournament Court |
| | 2 Courts w/ Track |
| | 2 Courts w/ Tournament Court |
| | 2 Courts no Track, no Tournament Court |
| | 3 Courts w/ Track and Tournament Court |
| X | 3 Courts w/ Track |
| | 3 Courts w/ Tournament Court |
| | 3 Courts no Track, no Tournament Court |
| | 4 Courts w/ Track and Tournament Court-Option A |
| | 4 Courts w/ Track-Option A |
| | 4 Courts w/ Tournament Court-Option A |
| | 4 Courts w/ Track and Tournament Court-Option B |

| | |
|---|---|
| | 4 Courts w/ Track-Option B |
| | 4 Courts w/ Tournament Court-Option B |
| | 4 Courts no Track, no Tournament Court-Option A |
| | 4 Courts no Track, no Tournament Court-Option B |

Structured Activity Module

| (Indicate required elements by “X” and by providing information requested) | | |
|---|---|---|
| **X** | Racquetball Courts | 2 |
| **X** | Small Group Fitness (Area desired) | 2,500 |
| **X** | Climbing Wall | |
| **X** | 1 Mat Combatives | |
| | 2 Mat Combatives | |
| **X** | Spinning Room (Area desired) | 1,200 |
| **X** | Concessions (Area desired) | 261 |
| **X** | Small Child Care | |
| | Large Child Care | |
| **X** | Other #1 | Storage: 250 sq ft for Small Group Fitness storage<br>244 sq ft for general storage |
| | Other #2 | |
| | Other #3 | |
| | Other #4 | |
| **X** | Storage | |

**Additional Module Details:**

Fitness Module non-standard Project requirements:
- Cardiovascular - 4750 sq ft
- Circuit Area - 3300 sq ft
- Free Weight Area - 6695 sq ft

2.2. SITE:

Provide all site improvements necessary to support the new building facilities. Refer to Paragraph 6.

Approximate area available 14.40 acres

2.3. GOVERNMENT-FURNISHED GOVERNMENT-INSTALLED EQUIPMENT (GFGI)

Coordinate with Government on GFGI item requirements and provide suitable structural support, brackets for projectors/VCRs/TVs, all utility connections and space with required clearances for all GFGI items. Fire extinguishers are GF/GI personal property, while fire extinguisher brackets and cabinets are Contractor furnished and installed CF/CI. Local Area Network and personal Computers along with related hardware, copiers, faxes, printers, video projectors, VCRs and TVs are GFGI.

The following are also GFGI items: No additional requirements.

2.4. FURNITURE REQUIREMENTS

Provide furniture design for all administrative and lobby spaces listed in Chapter 3 and including any existing furniture and equipment to be re-used. Coordinate with the user to define requirements for furniture systems, movable furniture, storage systems, equipment, any existing items to be reused, etc. Early coordination of furniture design is required for a complete and usable facility.

The procurement and installation of furniture is NOT included in this contract. Furniture will be provided and installed under a separate furniture vendor/installer contract. The general contractor shall accommodate that effort with allowance for entry of the furniture vendor/installer onto this project site at the appropriate time to permit completion of the furniture installation for a complete and usable facility to coincide with the Beneficial Occupancy Date (BOD) of this project. The furniture vendor/installer contract will include all electrical pre-wiring and the whips for final connection to the building electrical systems however; the general contractor shall make the final connections to the building electrical systems under this contract. Furthermore, the general contractor shall provide all Information/Technology (IT) wiring (i.e. LAN, phone, etc.) up to and including the face plate of all freestanding and/or systems furniture desk tops as applicable, the services to install the cable and face plates in the furniture, the coordination with the furniture vendor/installer to accomplish the installation at the appropriate time, and all the final IT connections to the building systems under this contract.

The Government reserves the right to change the method for procurement of and installation of furniture to Contractor Furnished/Contractor Installed (CF/CI). CF/CI furniture will require competitive open market procurement by the Contractor using the Furniture, Fixtures and Equipment (FF&E) package. Reference applicable appendix for Preliminary FF&E Information including furniture dimensions sizes as shown in the Standard Design.

2.5. NOT USED

## 3.0 PHYSICAL FITNESS FACILTIY (PFF)

### 3.1. FUNCTIONAL/OPERATIONAL REQUIREMENTS

Comply with the American College of Sports Medicine (ACSM) Health/Fitness Facility Standards and Guidelines and the Technical Criteria – U.S. Army Physical Fitness Facilities (no older than the October 2003 edition), except where modified by this document..

(a) Additional reference material for comparable private sector facilities is accessible from the American College of Sports Medicine website: http://www.acsm.org/AM/Template.cfm?Section=Home_Page

(b) Examples of private sector State-of-the-Art athletic facilities may be found at the Athletic Business websites: http://www.architecturalshowcase.com/galleries/ArchitecturalShowcase.aspx

#### 3.1.1. ACCESSIBILITY REQUIREMENTS

All aquatic facility functional areas shall be barrier-free and accessible to people with disabilities as required by the Architectural Barriers Act (ABA). Site, sidewalks, building, and pool designs shall enable people with disabilities to act independently and enjoy the full range of programs provided. Level changes may be included, but must be accommodated by ramps suitable for wheelchair access, both indoors and outdoors. Accessible entry to pools may be accomplished by utilizing zero entry depth ramps with ABA compliant handrails or by lift and assistance equipment designed specifically for people with disabilities. Utilize lifts that do not require assistance by another person, and that are operated by rechargeable batteries. The need for special equipment, such as transfer benches, crane lifts, or ramps into the pool shall be considered during the design process.

#### 3.1.2. FUNCTIONAL SPACE REQUIREMENTS

The functional space and design must comply with the Army Standards for the facility type, along with the PFF functional criteria. The Technical Criteria for U.S. Army Physical Fitness Facilities is provided in Attachment B. The Army Standard for Physical Fitness Facilities is provided in Attachment A.

#### 3.1.3. Facility Betterments: DELETED

#### 3.1.4. Pool and Spa Safety

In accordance with VIRGINIA GRAEME BAKER POOL AND SPA SAFETY ACT, PUBLIC LAW 110-140, each public pool and spa in the United States shall be equipped with anti-entrapment devices or systems that comply with the ASME/ANSI A112.19.8 performance standard, or any successor standard; and each public pool and spa in the United States with a single main drain other than an unblockable drain shall be equipped, at a minimum, with one or more of the following devices or systems designed to prevent entrapment by pool or spa drains:

(a) Safety vacuum release system.--A safety vacuum release system which ceases operation of the pump, reverses the circulation flow, or otherwise provides a vacuum release at a suction outlet when a blockage is detected, that has been tested by an independent third party and found to conform to ASME/ANSI standard A112.19.17 or ASTM standard F2387.

(b) Suction-limiting vent system.--A suction-limiting vent system with a tamper-resistant atmospheric opening.

(c) Gravity drainage system.--A gravity drainage system that utilizes a collector tank.

(d) Automatic pump shut-off system.--An automatic pump shut-off system.

(e) Drain disablement.--A device or system that disables the drain.

(f) Other systems.--Any other system determined by the Commission to be equally effective as, or better than, the systems described in (I) through (V) of this paragraph at preventing or eliminating the risk of injury or death associated with pool drainage systems.

(g) Outlet covers located in less than 6 feet of water shall be unblockable covers, flush with the floor rather than domed, to avoid trip hazards.

3.2. SITE PLANNING AND DESIGN

Organize the site to be compatible with the site planning and style of adjacent existing structures. Locate the building to reflect local climatic conditions. For example, provide protection from prevailing winds and glare . Locate the building to take advantage of passive solar heating and day lighting.

3.2.1. Landscaping

Choose a plant selection that is easy to maintain and enhances the visual quality of the facility in all seasons. Indigenous species are preferred. Assess the growth characteristics of selected plant material when considering line of sight requirements to either flight pavements or facilities. Comply with the local Installation landscape standards.

Take into consideration sustainable design issues when designing the landscape. Select plants that require little to no additional water beyond normal rainfall. Avoid plants that require an irrigation system or, if irrigation is required, consider a gray water or storm water irrigation system.

3.3. ARCHITECTURAL REQUIREMENTS

3.3.1. Building Exterior

Design the facility to enhance or compliment the visual environment of the Installation. The building entrance shall be architecturally defined and easily seen. When practical, exterior materials, roof forms, and detailing shall be compatible with the surrounding development and adjacent buildings on the Installation and follow locally established architectural themes. Use durable materials that are easy to maintain. Provide large glass areas where fitness equipment is located to provide visual interest from the outside, and views from the inside. Use glass in other areas as appropriate, taking into consideration glare, direct solar heat gain, and other functional requirements. Design the building exterior using energy efficient strategies and technologies to meet overall energy performance requirements. Exterior colors shall conform to the Area Design Guide.

3.3.1.1. Trim and Flashing: All exterior metals including gutters, downspouts, and fascias shall be factory pre-finished metal, aluminum, or galvanized steel base metal with baked-on or bonded high-performance fluoropolymer coating, fabricated and installed in compliance with SMACNA Architectural Sheet Metal Manual.

3.3.1.2. Bird Habitat Mitigation: Provide details necessary to eliminate the congregating and/or nesting of birds at, on, or in the facility.

3.3.1.3. Exterior Doors and Frames

(a) Main Entrance Doors: Provide aluminum storefront doors and frames with Architectural Class 1 anodized finish (color selected by the Contracting Officer from the manufacturer's full line of standard colors), fully glazed, and with medium or wide stile are preferred for entry lobbies or corridors. Storefront systems shall comply with wind load requirements of applicable codes and UFC 4-010-01 requirements. Framing systems shall have thermal-break design.

(b) Side Entrance/Exit Doors: Exterior doors and frames opening to spaces other than corridors or lobbies shall be insulated hollow metal and comply with SDI/DOOR A250.8 Recommended Specification for Standard Steel Doors and Frames. Fire-rated openings shall comply with NFPA 80 Standard for Fire

Doors and Other Opening Protectives, and the requirements of the labeling authority. Door and frame installation shall comply with applicable codes and UFC 4-010-01 requirements. Provide a local alarm as part of the hardware on all doors other than the main entrance door. This alarm shall sound at the door and shall notify the control desk if the door is opened. This alarm requirement is separate from the security forces requirements in paragraph 6.

(c) Exterior Door Finish Hardware: All hardware and accessories in the facility shall be consistent and shall conform to BMHA A156 Series Standards, Grade 1. Coordinate door hardware and security requirements with the functional requirements, the Technical Criteria for U.S. Army Physical Fitness Facilities, and the electrical security/fire alarm system requirements of this document. Provide bored Locks in accordance with BHMA A156.2 Bored and Preassembled Locks and Latches. Provide all hardware necessary to meet the requirements of NFPA 80 for fire doors and NFPA 101 for all exit doors and BHMA A156.3 Exit Devices. Provide closers on all exterior doors, fire-rated doors, and restroom doors. The Main Entrance door is considered a high traffic door that requires a high quality door closing mechanism complying with BHMA A156.4 Door Controls - Closers with adequate strength to ensure safe and easy operation in a high wind environment. Hardware finish shall be US 26D/652 Satin Chrome over Nickel, steel base metal. Doors leading directly outside from functional areas (such as gymnasium, locker rooms, etc.) do not require any hardware on the exterior side of the door.

3.3.1.4. Exterior Windows: Provide non-operable windows.

3.3.1.5. Exterior Glass and Glazing: Provide the thickness required to provide necessary sound deadening properties for the exterior walls. The rating of the exterior glass shall be within 5 decibels of the wall to which it is installed. In addition, glazing must comply with ATFP and Energy requirements.

3.3.1.6. Thermal Insulation: Provide exterior wall, floor, and roof/ceiling assemblies with thermal transmittance (U-values) required to comply with the proposed energy calculations for the facility. Do no install insulation directly on top of suspended acoustical panel ceilings.

3.3.1.7. Exterior Louvers: Design exterior louvers to exclude wind-driven rain, with bird screens and made to withstand a wind loads in accordance with the applicable codes. Wall louvers shall bear the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500-D Laboratory Methods of Testing Dampers for Rating and AMCA 511 Certified Ratings Program for Air Control Devices.

3.3.1.8. Exterior Paint Systems: Exterior Paint Systems shall be based on and comply with the recommendations of the Master Painters Institute (MPI) for the substrate to be painted and the environmental conditions existing at the project site. Exterior surfaces, except those from factory pre-finished material, shall be painted with a minimum one prime coat and two finish coats. No lead paints are acceptable. For exterior applications provide an MPI gloss Level 5 finish (semi-gloss), unless otherwise specified. Apply all paints in accordance with the manufacturer's specifications.

3.3.2. Building Interior

3.3.2.1. Space Configuration: Arrange spaces in an efficient and functional manner. Structure interior spaces to allow maximum flexibility for future modifications. Provide glass panels between functions when appropriate to enhance the open concept of the PFF. Maximize use of natural lighting and daylighting within the constraints of the applicable codes and UFC 4-010-01. Arrange active spaces visible from the lobby to provide a high energy feel when entering the facility. Per the requirements of the Technical Criteria, locate the Control Counter with direct visual and physical access to the Lobby and the Free Weight Area.

3.3.2.2. Locate electrical distribution equipment installed within the facility, including dry-type transformers and electrical panels, within dedicated electrical rooms/closets.

3.3.2.3. Concepts such as exposed structure in lieu of acoustical tile ceilings may be utilized in many different areas. Spaces shall be as open as possible to provide flexibility to accommodate shifts in trends in fitness and recreation.

3.3.2.4. Circulation schemes must support easy way-finding within the building. Consider locating the control desk on the right side as you enter the facility to avoid cross traffic conflicts when entering the facility. Ensure wet circulation is kept separate from dry circulation.

3.3.2.5. Appearance retention is the top priority for building related finishes. Provide low maintenance, easily cleaned room finishes that are commercially standard for the facility occupancy specified, unless noted otherwise.

3.3.2.6. In general, use neutral tones with contrasts. Bright color accents or schemes may be considered for areas where appropriate. Facility should have a bright and energetic feel.

3.3.2.7. Interior Doors and Frames

(a) Wood Doors: Provide flush wood solid core doors complying with National Wood Window and Door Association (NWWDA) I.S.-1A. Stile edges shall be non-finger jointed hardwood compatible with face veneer. Provide Architectural Woodwork Institute (AWI) Grade-A hardwood face veneer for transparent finished doors; provide AWI Sound Grade hardwood face veneer for painted doors. Transparent finished doors are preferred.

(b) Hollow Metal Doors: Comply with SDI/DOOR A250.8. Doors shall be minimum Level 2, physical performance Level B, Model 2; factory primed. Hollow metal doors shall be mounted in hollow metal frames.

(c) Hollow Metal Frames: Comply with SDI/DOOR A250.8. Frames shall be minimum Level 2, 16 gauge, with continuously welded corners and seamless face joints; factory primed.

(d) Side Lites: Provide ¼” clear tempered glass at all door lites.

(e) Interior Door Finish Hardware: Door hardware and security requirements must be coordinated with the functional requirements, the room-by-room criteria, and the electrical security/fire alarm requirements. Hardware finish shall be US 26D/652 Satin Chrome over Nickel, steel base metal.

(f) Programmable Electronic Key Card Access Systems: Provide Key Card System on all doors to rooms from corridors other than service doors such as: Janitor’s closets, communication rooms, electrical rooms, mechanical rooms.

3.3.2.8. Interior Doors and Frames, Natatorium

(a) Hollow Metal Doors: Comply with SDI/DOOR A250.8. Doors shall be minimum Level 2, physical performance Level B, Model 2; factory primed. Hollow metal doors shall be mounted in hollow metal frames. Doors shall be 316L stainless steel, painted with high performance coating (to avoid corrosion).

(b) Hollow Metal Frames: Comply with SDI/DOOR A250.8. Frames shall be minimum Level 2, 16 gauge, with continuously welded corners and seamless face joints; factory primed. Frames shall be 316L stainless steel, painted with high performance coating (to avoid corrosion).

(c) Side Lites: Provide ¼ inch clear tempered glass at all door lites.

(d) Interior Door Hardware: Door hardware and security requirements must be coordinated with the functional requirements, the room-by-room criteria, and the electrical security/fire alarm requirements. At a minimum, provide closers on all fire-rated doors, locker room doors, and restroom doors. If possible, utilize “airport” entrances to locker rooms and other applicable areas to minimize wear on finishes and hardware. Hardware finish shall be type 316L stainless steel.

(e) NOTE: As an alternative to stainless steel door and frames, FIB-R-DORS could be utilized. These would be the best doors and frames for doors leading directly to the pools.

(f) Interior doors shall be rated the same as the wall in which they are installed.

3.3.2.9. Casework: Provide casework complying with AWI Section 400, Custom Grade flush overlay cabinets with stained wood. Work surfaces and counters shall be solid surfacing material or a material with at least the same durability qualities. Laminate countertops are not allowed. Install casework complying with AWI Section 1700.

3.3.2.10. Comply with the recommendations of the Master Painters Institute (MPI) on interior paint systems for the substrate to be painted and the interior environmental conditions existing at the project site. Apply a minimum of one prime coat and two finish coats on iInterior surfaces, except factory pre-finished material or interior surfaces receiving other finishes. Lead paints are acceptable. In wet areas, provide an MPI Gloss Level 5 (semi-gloss) finish. Apply all paints in accordance with manufacturer's instructions.

3.3.2.11. Gypsum Board: Comply with ASTM C 36 Gypsum Wallboard. Minimum panel thickness shall be 5/8 inch. Provide moisture resistant panels (glass–mat panels are preferred) at locations subject to moisture. Consider use of impact resistant gypsum board.

3.3.2.12. Interior Windows: Provide minimum ¼" clear tempered glass. Provide STC rated windows that meet required STC rating of the wall it is located.

3.3.2.13. Signage: Provide interior signage for overall way finding and life safety requirements. The comprehensive interior plan shall be from one manufacturer and shall include the following sign types: (1) Lobby Directory; (2) Directional Signs; (3) Room Identifications signs; (4) Building Service signs; (5) Regulatory signs; (6) Official and Unofficial Signs; (7) Visual Communication Boards.

3.3.2.14. Window Treatments: Provide window blinds or an appropriate type of window treatment on all exterior windows in administrative spaces. Provide permanent shading devices and other measures to reduce glare in activity spaces while still allowing for natural daylighting and views into and out of the facility.

3.3.2.15. Provide bulletin boards in the lobby and main corridors. Bulletin boards shall fit into an overall architectural theme. The intent is to avoid randomly placed bulletin boards that are not coordinated with the interior finishes, colors, and/or theme. Coordinate placement of bulletin boards with the user.

3.3.2.16. Corner Guards: On gypsum board walls, provide surface-mounted, high impact integral color rigid vinyl corner guards where necessary to reduce the potential for damage (i.e. in areas subject to high traffic and where carts or other mobile pieces may be used.). Provide stainless steel corner guards at all outside corners of ceramic tile walls where necessary to reduce the potential for damage (i.e. in areas subject to high traffic and where carts or other mobile pieces may be used.).

3.3.2.17. Mold Prevention: Design and construct buildings to maintain space humidity at reasonable levels. Building construction shall be relatively air tight. Locate vapor barriers, if used, where temperature is above dewpoint in both heating and cooling seasons, and not under insulation installed on top of a ceiling at a ventilated attic. Do not ventilate crawl spaces. Install a vapor barrier on ground surfaces of crawl spaces. Acoustical ceiling tiles shall have factory applied mold preventive and sag resistant physical properties.

3.3.3. Special Acoustical Requirements

Design and construct exterior walls and roof/ceiling assemblies, doors, windows and interior partitions to provide for attenuation of external noise sources such as airfields in accordance with applicable criteria. Provide additional acoustical control for reverberation in gymnasiums and natatoriums.

3.4. STRUCTURAL REQUIREMENTS

3.4.1. General

Design and construct as a complete system in accordance with APPLICABLE CRITERIA.

3.4.2. Running Track

Structural design shall account for a suspended running track. Attach the track to the roof system structural framing. Design suspended running track to dampen all vibrations from users.

3.5. MECHANICAL REQUIREMENTS

3.5.1. Fire Protection

Provide facilities with automatic sprinklers that provide 100 percent coverage of the facility. in accordance with UFC 3-600-01

3.5.1.1. Racquetball Courts - Any fire suppression or detection equipment must be protected and flush with the wall or ceiling surface.

3.5.1.2. Gymnasium/Basketball/Volleyball Courts - Provide protection for sprinkler heads, exit signs, manual pull stations, and other exposed components. Minimize equipment that protrudes into activity space or raise it above 6 feet for safety considerations.

3.5.2. Plumbing

Provide facilities with a fully functional plumbing system that complies with the International Plumbing Code (IPC).

3.5.3. Heating, Ventilating and Air-Conditioning (HVAC)

3.5.3.1. Provide facilities with a fully functional HVAC system that is automatically controlled by a Building Automation System (BAS). Do not locate HVAC equipment above the gymnasium or inside the gymnasium due to any possible risk of a leak causing water damage. Provide for air flow from the dry side of the Men’s And Women’s Locker/Dressing/Shower/Toilet space to the exhaust intakes in the wet area.

3.5.3.2. Provide for connection to energy monitoring and control system (EMCS) for monitoring purposes.

3.5.3.3. Steam Room – Maintain space temperature at 100 F minimum, 110 F maximum. Humidity 100% relative.

3.5.3.4. Sauna - Provide a separate dry heat system with individual temperature controls and a timer . Provide secure controls. Provide passive ventilation.

3.5.3.5. Gymnasium/Basketball/Volleyball Courts - Provide durable air grill covers and do not place air grills in line with basketball nets.

3.5.3.6. Racquetball Courts - Ventilating ducts must be installed flush with the ceiling or wall surfaces. Locate supply and return vents in the rear one-third of the ceiling and/or the upper one-third of the back wall.

## 3.6. ELECTRICAL REQUIREMENTS

Electrical power, lighting and telecommunications shall be provided to the facility as specified below, in accordance with APPLICABLE CRITERIA, GENERAL TECHNICAL REQUIREMENTS, all IEEE Standards (including Recommended Practice) where the scope is applicable to this design effort, all UL Standards where the UL scope is applicable to this design effort, and where itemized in the combined interdisciplinary areas cited.

Perform a short circuit study as an integral part of selecting and sizing electrical distribution components (all equipment shall be fully rated; that is, do not use series-combination rated equipment). Perform a coordination study to ensure that protective device settings are appropriate for the expected range of conditions (depending on the design and construction schedule, it is acceptable to design adequate protective devices with adjustable features, followed by a coordination study required during construction to specify the correct settings.) Circuit breakers, disconnect switches, and other devices that meet the OSHA definition of energy-isolating device must be lockable. Do not exceed 5 percent combined voltage drop on feeders and branch circuits if the transformer providing service is located within the facility. If the transformer is located exterior to the facility, limit the combined voltage drop for service conductors, feeders, and branch circuits to 5 percent. Individual voltage drop on branch circuits should not exceed 3 percent. Branch circuits supplying sensitive circuits shall be limited to 1 percent voltage drop.

### 3.6.1. Interior Power

Provide interior power per the general electrical requirements and per the Technical Criteria – U.S. Army Physical Fitness Facilities unless revised by the requirements of this RFP. When facility electrical design includes a 480/277V power distribution system, mechanical systems and lighting systems shall generally be fed from the available 480/277V power distribution system.

3.6.1.1. Lobby. Power to circuits as needed to Control Desk, for computer terminals (2 minimum in the X-small and Small, 3 minimum in the medium, 4 minimum in the large and X-large), counter mounted video monitors, multiplex video receiver, tape backup, sound processor for multiple paging sources, music source (such as a CD player) and sound amplifier.

3.6.1.2. Gymnasium/Suspended Running Track. Scorer's table is generally located for one designated court, at mid court, and requires one (1) 4-outlet, 20 amp power outlet and two (2) Cat5 or better data connections, both in recessed floor boxes, centered under the anticipated table location, but outside the court boundaries. Solid brass cover plates shall be provided for these outlets for when scoreboard equipment is not in use to provide good ball return value and skid resistance.-

3.6.1.3. Fitness Module (Cardio, Circuit, Free Weight). 20A dedicated circuits (one outlet per piece of equipment is acceptable) unless equipment manufacturer’s data indicates a larger circuit is required for the equipment.

3.6.1.4. Miscellaneous Areas – Offices. In copy/file/work/break room, provide outlets at built-in counter area for microwave, coffee pot, refrigerator, and other cooking devices. Provide ground fault protection of outlets within 6 feet of any water source.

### 3.6.2. Interior Lighting

Provide interior lighting and control per the Technical Criteria – U.S. Army Physical Fitness Facilities unless revised by the requirements of this RFP. When “PL Lamp” is indicated by Technical Criteria – U.S. Army Physical Fitness Facilities, provide multi-tube, 4-pin, compact fluorescent lamp. When building

electrical design includes 480/277V power distribution system, interior lighting will generally be fed from the 480/277V power distribution system. Pay particular attention to issues such as glare, heat generation, and impact protection for the fixtures in Fitness Facility activity spaces. Provide fluorescent luminaires with electronic programmed start fluorescent ballasts. Provide daylighting dimming systems where dimming is controlled by a photosensor to save energy in interior spaces where on a clear summer day a minimum interior illumination of 50% is expected in the majority of the space and where there is a life cycle cost benefit.

3.6.2.1. Lobby. Low profile LED lighting is acceptable under cabinet lighting.

3.6.2.2. Gymnasium/Suspended Running Track. High Intensity Discharge (HID) fixtures are not required. Lighting selected shall be identified as suitable for the intended use and lighting design shall meet IESNA recommendations for Basketball Sports-Lighting, Class III (Class of Play). Fixtures shall be mounted not less than 25' above the finished floor. Fixtures with 80% direct and 20% indirect lighting are preferred. For overhead locations, protect luminaires with wire cages and/or provide appropriate shatterproof enclosed luminaires. Switching for lighting control shall provide different lighting options to take into account natural lighting and different activities (such as boxing matches, etc.). Lighting control shall be located in a controlled area to avoid accidental and unauthorized switching.

3.6.2.3. Fitness Module (Cardio, Circuit, Free Weight). When ceilings heights do not allow pendant mounted or suspended lighting, 2 x 2 or 2 x 4 lay-in indirect fluorescent fixtures may be used. Independent slide or toggle controls may be used to control fixtures by groups. Grouping needs and/or preferences will be determined by circuit capacity and by location and amount of natural daylighting. If fixtures requiring remote ballasts are used, where possible install the remote ballasts above ceiling and provide with above ceiling access adequate to service the remote ballasts . It is recommended that ballast be located above accessible ceilings. Plan to provide ceiling access to service ballasts. Additional contribution of natural light via windows and/or skylighting is highly recommended.

3.6.2.4. Exercise Module. When ceilings heights do not allow pendant mounted or suspended lighting, direct 2 x 2 or 2 x 4 lay-in fluorescent fixtures may be used but are not recommended due to lower light quality (excessive glare and static light distribution; e.g. causes greater eye fatigue over long periods of time). Natural light via windows may be provided, but direct sun-light and glare must be avoided. Windows providing internal views to other spaces is desirable.

3.6.2.5. Miscellaneous Areas – Offices. Flush edge lens frames are minimum; chamfered lens frames preferred. Indirect lighting, to reduce computer glare, would be preferred. Provide recessed wall wash downlight accent lighting to improve wall surface brightness and illuminate architectural features to assist visitor wayfinding in the main lobby, to functional areas, and in the waiting spaces for office suites. Lay-in lighting fixtures with integral HVAC diffusers in a slot arrangement on the fixture frame do not provide a good distribution of air and tend to increase air noise; therefore, these are not recommended.

3.6.3. General Site Lighting

Ensure that parking areas and the facility have adequate lighting for safety, evacuation, and security measures. Lighting for all exterior applications shall be controlled by a photosensor and astronomical time switch that is capable of automatically turning off the exterior lighting when sufficient daylight is available or the lighting is not required.

3.6.4. Cathodic Protection System

Corrosion protection for the facility shall be provided by coordinated material specification and/or provision of a cathodic protection system to assure corrosion will not compromise system operation for the 50 year infrastructure design lifetime of the facility. Provide an appropriate Cathodic Protection System when the design analysis of a corrosion engineer indicates cathodic protection is recommended

to assure corrosion will not compromise system operation for the 50 year infrastructure design lifetime of the facility.

3.6.5. Mass Notification

A Mass Notification System (MNS) shall be integral to the fire alarm system and shall be connected to the base MNS. Speakers shall be located throughout the facility, providing total coverage. Announcements or music shall be by all-call or by room. If speakers are mounted on/in a wall, ensure they are mounted at least 8' above the floor.

3.7. TELECOMMUNICATIONS REQUIREMENTS

3.7.1. Design telecommunications design in accordance with the Technical Guide for Installation Information Infrastructure Architecture (I3A). In the I3A Technical Guide, substitute the word “shall” for the word “should” throughout the document.Service

3.7.2. Coordinate service with local DOIM personnel.System

Provide a fully operational system from the demarcation point to each outlet.

3.8. PUBLIC ADDRESS SYSTEM

System may be integrated into Fire Alarm/MNS. Locate the master station at the Control Desk with input for music source. Locate the PA speakers in all hallways, restrooms, locker rooms, gymnasium and exterior areas. If speakers are mounted on/in a wall, ensure they are mounted at least 8' above the floor. Provide announcement configuration capability by room, zone or all-call. Provide commercial grade audio system for each group exercise room with recessed A/V rack and ceiling mounted speakers.

3.9. CABLE TV (CATV) REQUIREMENTS

3.9.1. Service

Cable Television service will be by the Installation provider. The D/B contractor shall provide a two inch conduit with nylon pull cord from the communications room to the designated interface point.

3.9.2. System

Provide a CATV system to distribute incoming television signals and user supplied. Distribution point shall be the communications room. Outlets shall be in the lobby, all exercise modules, break rooms and activity rooms. Coordinate the number of outlets in exercise rooms with the user. Run cables in conduit and install a nylon pull cord in each conduit.

3.10. FIRE ALARM REQUIREMENTS

The fire alarm system shall consist of a fire alarm panel integrated with the MNS, transceiver, initiating devices, and notification devices. The fire alarm system shall be compatible with existing Installation fire alarm system and base MNS, and shall be coordinated with Base Fire Chief and\ or AHJ. The system shall be a Class A, addressable system, Style Z. All audible alarm appliances shall be voice type with a selection of prerecorded announcements.

3.11. Attachments

Attachment A - The Army Standard for Physical Fitness Facilities

Attachment B – Technical Criteria for U.S. Army Physical Fitness Facilities

**DEPARTMENT OF THE ARMY**
**ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT**
**600 ARMY PENTAGON**
**WASHINGTON, DC 20310-0600**

DAIM-ZA

OCT 16 2009

MEMORANDUM FOR

Commander, US Army Corps of Engineers (CEMP), 441 G St NW, Washington, DC 20314
Installation Management Command (IMCOM), 2511 Jefferson-Davis Highway, Arlington, VA 22202

SUBJECT: Army Standard for Physical Fitness Facility (PFF)

1. The enclosed Army Standard for the Physical Fitness Facility is approved for implementation. The standards apply only to the Active Component and not the Reserve Component. Only the Assistant Chief of Staff for Installation Management has authority to approve exceptions to this standard. Waivers from the Army Standard must be approved in accordance with AR 420-1.

2. These standards are mandatory for Military Construction, Army (MCA) projects in the FY2012 program and beyond. Designs based on these Army Standards, Standard Design, and Standard Criteria will be developed consistent with MILCON Transformation methodologies.

3. The points of contact (POC) for the Facilities Design Team are Mr. Jay Clark, USAESCH, james.t.clark@usace.army.mil, 256-895-1673; Ms. Janet MacKinnon, IMWR-CR, janet.mackinnon@us.army.mil, 703-681-1544; Mr. Hyuk Pak, DAIM-ODF, hyuk.pak@us.army.mil; and Mr. David Marquardt, HQ USACE, David.D.Marquardt@usace.army.mil, 202-761-7419.

Encl
as

ROBERT WILSON
Lieutenant General, GS
Assistant Chief of Staff
for Installation Management

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# THE ARMY STANDARD FOR PHYSICAL FITNESS FACILITIES

## Description:

Physical fitness is the cornerstone of readiness. It is an essential and critical element of Soldiering. The Army emphasizes the importance of a high level of physical capability for the occupational tasks that Soldiers are required to perform. Staying fit is enhanced today with the growing popularity and use of cardiovascular and strength equipment among Soldiers. Physical Fitness Facilities are required by the Army to promote the strength and fitness of the soldiers. Physical fitness and sports support Army Core values. In addition, Physical Fitness Facilities provide one of the most popular sources of recreation for the soldiers and their families. Sample Surveys of Military Personnel (SSMP) consistently show fitness/sports facilities as first in use and importance to soldiers and family members.

## Applicability:

- This Army Standard applies immediately to all new permanent Physical Fitness Facilities.
- The Army Standard applies to Army facilities worldwide.
- The Army Standards for Physical Fitness Facilities are derived from the American College of Sports Medicine (ACSM) (as directed by DoD Memorandum), Unified Facilities Criteria UFC 4-740-02, TI 800-01 - Appendix H, and the Technical Criteria for U.S. Army Physical Fitness Facilities dated October, 2003.
- All geographic districts shall incorporate the mandatory design criteria described herein in close coordination with the USACE designated Center of Standardization (COS) for Physical Fitness Facilities.

## Waivers:

- Only the Assistant Chief of Staff for Installation Management has authority to approve exceptions to the Army Standards.
- Waivers from the Army Standard must be requested in accordance with (IAW) AR 420-1 and the Army Facilities Standardization Program Charter, latest edition.
- All waiver requests to this Army Standard require COS conflict resolution prior to submission by the Garrison Commander.
- Garrison Army Standard waiver request submissions must be received in sufficient time to allow completion of Facility Design Team review and development of recommendations or course of action for the Army Facilities Standardization Committee (AFSC) to consider prior to implementation into project design.
- Late submissions and/or project delays are NOT sufficient stand-alone justification for accelerated review or other dispensation for not meeting the Army Standard contained herein.
- All waiver requests shall include compelling rationale of functional and operational deviations to include substantiating documentation in sufficient detail for the Army to assess implications of approving the waiver.
- All HQDA approved waivers shall be documented in installation mater plans thereby serving as the installation’s modified standards.

**THE ARMY STANDARD FOR PHYSICAL FITNESS FACILITIES**

| Item | Mandatory Criteria |
|---|---|
| Facility Size | Physical Fitness Facility (PFF) facility sizes will be determined based on the following installation population table. The "PFF population" includes 100% full-time soldiers (Active, Reserve Component, including other military services), 25% of family members, and 10% of DoD civilians in CONUS (when the civilian workforce is more than 60% of the total work force). At OCONUS locations include 100% of the full-time DoD civilians.<br><br>Size / Population / Total Gross Square Feet<br>X-small 251 – 1000 27,771<br>Small 1001 – 3000 44,347<br>Medium 3001 – 6000 64,799<br>Large 6001 – 10,000 89,448<br>X-large 10,001 – 15,000 120,125<br>For every 5000 in population over 15,000, add increments of 30,677 square feet. These gross building areas are exact. |
| Facility Consolidation | A PFF may be combined with other facility types of a recreational or support nature, with the approval of FMWRC. Examples of facilities that could be combined are Natatoriums, Outdoor Pools, Outdoor Sport Facilities, Recreation Centers, etc. |
| Energy and Sustainability | Facilities shall be designed to meet energy and sustainable design and development requirements as established by Federal Law and Department of the Army policy. |
| Accessibility | All portions of the PFF shall comply with the Architectural Barriers Act (ABA). |
| Control Desk | Must be located directly inside the main entrance in order to control who enters the facility. Must be located adjacent to, and with direct, unobstructed, visual and physical access to, the free weight area for safety concerns. Shall also be located adjacent to the lobby seating area. Must be able to monitor either visually, or with video-surveillance, the following areas:<br>• Cardio and Circuit areas<br>• Gymnasium<br>• Group Exercise Rooms<br>• Entrance to Locker Rooms<br>• Entrance to Racquetball Courts<br>Counter heights shall be provided for standing height along with a lower area to meet ABA requirements. Lockable storage space must be provided for towels, balls, and other required equipment that will be issued from this desk. |

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| Fitness Module - Cardiovascular Area | Floor mounted electrical outlets in a grid or linear configuration, with circuits sized for the load from fitness equipment, are required to allow flexibility in equipment arrangement and to avoid cord tripping hazards. Cardiovascular area shall be designed to provide a minimum of 2 different "environments". These environments include Cardio Theater, external views, internal views, large group interaction, and small intimate groupings. Some portion of the Cardiovascular area must be contiguous with the Circuit and Free Weight Areas. Ceiling heights and flooring material must be as specified in the Technical Criteria for U.S. Army Physical Fitness Facilities. |
| Fitness Module - Circuit Area | Must be designed so that the entire circuit area is contiguous and that circuit equipment space is not dispersed into the Cardiovascular and/or Free Weight areas. In addition, the Circuit Area must be contiguous with the Free Weight Area and a portion of the Cardiovascular Area. Ceiling heights and flooring material must be as specified in the Technical Criteria for U.S. Army Physical Fitness Facilities. |
| Fitness Module - Free Weight Area | Must be directly accessible, visually and physically, to the Control Desk so that staff may see and respond to any emergency immediately. Mirrors must be provided on at least half of 2 perpendicular walls. Mirrors must extend from 18 inches above the floor to a height that provides full body visibility. For safety reasons for the weight lifters, all lighting fixtures in this area must be primarily indirect (>75% up-lighting). The Free Weight Area must be contiguous with the Circuit Area and a portion of the Cardiovascular Area. Ceiling heights and flooring material must be as specified in the Technical Criteria for U.S. Army Physical Fitness Facilities. |
| Fitness Module - Receiving/Equipment Repair/Storage | This room must be located on an exterior wall with vehicular access and oversized double doors (8 foot wide minimum) or roll-up doors for delivery of fitness equipment. Doors into the fitness module must also be able to accommodate movement of equipment. |
| Fitness Module - Fitness Assessment and Stretching | The Fitness Assessment area must be located within the Fitness Module to provide space for fitness testing and consultation. The Fitness Assessment shall provide privacy for talking about sensitive health issues and for testing such as Body Fat Composition and other health tests. The stretching area shall be located near the entrance to the Fitness Module and shall be an open area to allow for stretching prior to working out. |

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| Exercise Module | Shall be 1 room that can be divided into 2 smaller rooms by use of a movable wall. When the area for this function exceeds 5000 square feet, the function may be divided into 2 or 3 smaller rooms. All sections of the room must be accessible from the main circulation path. Dimensions of the room shall ensure that it is a usable space when opened for 1 large class or divided for smaller classes. Mirrors must be provided on the wall behind the instructor and either one perpendicular wall or the back wall, and must extend from no more than 1 foot above the floor to a height that provides full body visibility. Open storage cubbies must be provided for user's personal items. Flooring must be solid maple strip flooring that meets or exceeds the Maple Flooring Manufacturers Association (MFMA) specifications for a "second or better" grade, with an appropriate substrate that eliminates dead spots and provides for adequate impact absorption. Synthetic flooring, designated for aerobic classes, may be provided only if the general population served by this facility is primarily active-duty military, these areas will not be used primarily for standard aerobic classes, and are approved by FMWRC. A waiver will be required for any other type of flooring proposed. Ceiling heights must be as specified in the Technical Criteria for U.S. Army Physical Fitness Facilities. Enclosed, lockable storage rooms, configured for one-way patron flow, must be provided for each room, or section of a room, to provide space for storage of items such as mats, fit balls, medicine balls, bands, steps, dumb bells, etc. |
| Gymnasium | In facilities with more than 2 basketball courts authorized, courts may be provided in 1 large gymnasium or in a primary and secondary gymnasium. Minimum of 10 foot safety zone required between courts and walls or other surfaces (such as bleachers). Minimum of 15 foot safety zone required between courts. Flooring in the gymnasium shall be appropriate for basketball and volleyball, and shall comply with the appropriate Deutsches Institut für Normung (DIN) standards for gymnasium flooring. Court markings and function fixtures (such as backboards) must comply with the requirements of the Governing body of the sport (such as National Collegiate Athletic Association (NCAA)). The secondary gymnasium will be designed to meet the programming requirements of the installation and shall consider more non-traditional sports such as indoor soccer, in-line hockey, etc. Clear heights must be as specified in the Technical Criteria for U.S. Army Physical Fitness Facilities to accommodate both Basketball and Volleyball. An enclosed, lockable storage room must be provided for each gymnasium for equipment. Doors must be sized to allow for movement of large items such as rolls of floor mats, volleyball standards, portable basketball goals, etc. |

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| Indoor Jogging Track | A 3-lane indoor jogging track with banked corners is required in at least 1 PFF on an installation. For a specific project, this must be programmed as an additional line item in the 1391, as it is in addition to the building areas provided in “Facility Size” above. |
| Structured Activity Module | The Structured Activity Module provides flexible space that can be used to meet the installation’s requirements along with the latest in fitness trends. Must be designed in accordance with the use that the user intends. Structured activities include, but are not limited to, Combatives Room, Racquetball Court(s), Spinning Studio, Climbing Wall, Health and Wellness offices, concessions area (such as a “smoothie bar” or mini-mart), and Child Care. Or, the space for Structured Activity may be used as additional space for one of the other functional modules, to include spectator space for racquetball courts, an additional exercise room, or to provide both saunas and steam rooms. If the user has selected a Climbing Wall for their facility, it must be located so as to be under constant staff supervision. Racquetball courts must be designed in accordance with the rules of the United States Racquetball Association, to include exact court size. Combatives Room shall be designed to accommodate mats on walls and floor, and shall minimize inside corners for safety. Child Care room shall be designed to FMWRC-CYS standards. Enclosed, lockable storage is required for each structured activity other than Racquetball. |
| Locker Rooms | The following functions are mandatory in the general area referred to as “Locker Room”.<br>• Locker/Dressing Area<br>• Grooming Area<br>• Shower Area with private shower stalls and drying booths. Gang showers are NOT allowed.<br>• Restroom facilities<br>• Sauna or Steam Room<br>A separate men’s and women’s locker room shall be provided. All locker room functions, listed above, must be provided for each gender. Locker Rooms must be arranged so that the restroom functions are close to the entrance of the locker room, and do not require that people needing to use the restroom must pass through the locker and/or shower area. Separate saunas, steam rooms, etc. will be provided for men and women. Lockers must be a minimum of 15 inches wide and 18 inches deep. Minimum height is 30 inches per half locker. Use of “Z” lockers to provide additional height is required. There will be a combination of full-height and half-height lockers, the ratio of which is determined by the installation based on climatic concerns. |

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| Sauna/Steam Room | A sauna or a steam room must be provided in the Physical Fitness Facility. The installation will determine their preference. Separate saunas/steam rooms must be provided for each gender. Shared saunas or steam rooms are NOT allowed. Controls shall be accessible to staff only. Access to the saunas/steam rooms shall be through the locker rooms only. |
| Laundry | Shall provide adequate area and mechanical/electrical support for industrial style washers (extractors) and dryers (tumblers) with additional space for utility sink, folding table, and storage for a minimum of 2 laundry carts if not located adjacent to control desk. |
| Administration | An administration area must be provided that includes office space for the facility manager along with other program staff in accordance with the table below. It is not required that the administration area be adjacent to the control desk. |
| Lobby | Shall be adjacent to the main entrance and control desk. Must be visible from the control desk so staff can monitor the area. Must provide area for seating for approximately 5% of the total number of participants. Must also provide direct access to public toilets. |
| Public Toilets | Must be accessible from the lobby and gymnasium. Primary users of these restrooms will be spectators. |
| Elevator | In multi-story applications, an elevator to comply with ABA and to provide a means to move fitness equipment to the upper level(s) is required. |
| Location | PFF shall be located close to barracks and/or other MWR type facilities to allow users to walk and/or minimize the need to drive. |
| Private Operated Vehicle (POV) Parking / Service Deliveries | • Minimum of 1 parking space per every 300 square feet of gross building area. A portion of this parking may be in adjacent underutilized parking areas. Additional parking will be required if the gymnasium is used to hold large tournaments. In addition, additional parking will be required if a parking needs survey indicates a lack of parking.<br>• Provide signage and pavement markings per the ABA.<br>• Provide sufficient access for turnaround/backing space for tractor trailer deliveries of equipment to the Fitness Storage/Equipment Repair Room. |
| HVAC | Physical Fitness Facilities must be conditioned (air conditioned and heated) and must comply with the Technical Criteria Document for Army Physical Fitness Facilities, which is based on the American College of Sports Medicine (ACSM). A waiver is required to deviate from the requirements specified in the Technical Criteria document |

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| Telecommunications | • Telecommunications infrastructure will meet the USAISEC Technical Guide for Installation Information Infrastructure Architecture (I3A) and ANSI/TIA/EIA 568 and 569 requirements.<br>• The facility must connect to the Installation telecommunications (voice and data) system through the outside plant (OSP) underground infrastructure per I3A guidance. Connections to the OSP cabling system shall be from each facility main cross connect located in the main telecommunications room or telecommunications equipment room to the closest OSP access point.<br>• Telecommunications outlets will be provided IAW the Technical Guide for Installation Information Infrastructure Architecture (I3A Guide). Telecommunications outlets will be provided per the I3A technical guide based on functional purpose of the various spaces with the facility as modified by user special operational requirements.<br>• Telecommunications Room. A Telecommunications Room (TR) shall be provided for the voice and data network. There shall be a minimum of one TR on each floor, designed in accordance with the I3A Guide and ANSI/EIA/TIA-569-B. |
| Drinking fountains | Drinking fountains shall be directly adjacent to, or within, each functional module. Determination of whether the drinking fountain is placed within the module is dependent upon the flooring material and potential for damage or injury. Drinking fountains shall NOT be located on wood floors. |

## THE ARMY STANDARD FOR PHYSICAL FITNESS FACILITIES

GENERAL DESIGN PHILOSOPHY:

The Army currently has 244 facilities at 110 installations world-wide. The majority of these facilities are in adequate condition, but almost all installations currently have a deficit in the amount of Physical Fitness Facility (PFF) space based on their population. The new standard reflects a modular approach which takes into account the current trends in training, fitness, and recreation, and uses the current PFF inventory at the installation to maximize efficiencies and to provide uniform opportunities across the Army.

The PFF Standard Criteria was developed around standardized modules for various physical fitness activities. The concept was that the Army would look at all of the PFF assets at a given installation and compare what was existing against what is authorized through the use of a Quantity Questionnaire (QQ). The QQ is part of the PFF Standard criteria, and was developed to allow the sports and fitness personnel to determine their existing assets. Once the existing assets have been entered, the form automatically determines deficits. This would then enable Installation master planners to determine whether the addition of some modules to an existing PFF would help alleviate major deficiencies. In addition, these authorized areas could be used to custom design a facility to address major deficiencies in certain modules across the installation. In effect, an installation could choose to build just an aerobics center if there were no exercise module existing in any of the PFF.

GUIDANCE:

Facility Category Code: The Category Code does not automatically imply a specific GSF limit.

| **CATEGORY CODE** | **DESCRIPTION** |
|---|---|
| 74028 | Physical Fitness Facility |

U.S. Army Physical Fitness Facilities must comply with the latest version of the Technical Criteria for U.S. Army Physical Fitness Facilities (dated no earlier than October, 2003), to include any amendments issued after the date of the latest publication, except as modified by the Army Standard above.

Reference Criteria: The designs should use latest editions of the following design criteria:
• Architectural Barriers Act (ABA)
• American College of Sports Medicine’s Health/Fitness Facility Standards and Guidelines
• IBC – International Building Code
• NFPA 101, Life Safety Code
• AR 405-70, Utilization of Real Property
• AR 420-1, Army Facilities Management
• DA PAM 415-28, Facility Guide To Army Real Property Category Codes
• UFC 3-600-01, Design: Fire Protection Engineering for Facilities
• UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings
• UFC 4-023-03, Security Engineering: Design to Resist Progressive Collapse

• ETL 1110-3-491, Sustainable Design for Military Facilities
• USAISEC Technical Guide for Installation Information Infrastructure Architecture (I3A)
• ANSI/TIA/EIA-568-B Commercial Building Telecommunications Cabling Standard
• ANSI/TIA/EIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces

The Corps of Engineers Center of Standardization (COS) provides the first line technical compliance review. The Facilities Design Team in conjunction with the COS will resolve any issues where there may be conflicting, unclear or no compliance measurement threshold. Resolution may require senior leadership guidance or amendment of the Army Standard. Only the ACSIM can approve adjustments or changes to the requirements in an Army Standard. The Army Standard is not intended to provide compliance criteria detailed in references, regulations, industry standards, or standard design.

Physical Fitness Facilities must be designed to allow natural day lighting while controlling glare and heat gain. Spaces should be provided with large windows, translucent panels, clerestory windows and other techniques to maximize day lighting and improve the quality of life in these facilities.

Army PFF in the past have been a series of dark concrete block rooms with different functions placed inside. The intent of the new standard is to provide open areas appropriately designed for their function. Concepts such as exposed structure in lieu of acoustical tile ceilings may be utilized in many different areas. Also, spaces shall be as open as possible to provide flexibility to accommodate shifts in trends in fitness and recreation. Designers are strongly encouraged to review the State of the Art facilities published each June in the Athletic Business magazine.

Extremely large installations will consider providing mega facilities (larger than the “large” size indicated in the attached Authorized PFF Space Allowance chart), sized by using the increments, to minimize the total number of facilities on the installation to maximize staffing and other efficiencies.

In the attached Authorized PFF Space Allowance chart, all areas provided are the ideal net area based on equipment sizes and other functions. Actual net areas may vary +/- 5% from what is shown unless noted otherwise in this standard.

Traffic patterns must be considered when laying out the lobby and control desk to minimize potential conflicts with cross traffic for people signing in. It is preferable that the control desk be located on the right side when you enter the facility.

Deutsches Institut für Normung (DIN) standards referenced above in the Gymnasium may be found in the American College of Sports Medicine (ACSM) book, “Health/Fitness Facility Standards and Guidelines”.

The preference for flooring in the Gymnasium is an appropriately designed solid maple floor. Where 2 Gymnasiums are provided in a facility, it is recommended that the second Gymnasium be designed to be more multi-purpose oriented. Synthetic athletic

flooring may be used in the primary Gymnasium when requested by the installation and approved by the COS and FMWRC.

It is preferred that the climbing wall be located off of the lobby, under supervision of the control desk, as a design feature of the facility. However, another option would be to locate the climbing wall in a lockable room.

The chart on the following page lists the total area for each functional area that should be provided for an entire installation based on their authorized population. The PFF buildings are allocated on the basis of authorized population (AP) which includes 100% of active duty military and 25% of their dependents. Retirees are not counted in the AP at this time. DoD civilians are included at 10% only if they exceed 60% of the total workforce for CONUS installations. OCONUS installations are authorized at 100% of the civilian population in their AP.

It is difficult to determine the number of parking spaces required for a PFF. Based on the American College of Sports Medicine's "Health/Fitness Facility Standards and Guidelines", for initial parking calculations, assume 1 parking space for every 300 gross square feet of facility. This will provide adequate parking for all staff and approximately 60% of the maximum facility participants. However, many factors may result in the adjustment of this number of parking spaces, either up or down. A parking needs survey needs to be conducted to determine a more accurate need for parking, and the number of parking spaces provided adjusted accordingly. This survey needs to consider the following aspects at a minimum:

1. Current parking available in close proximity to the PFF.
2. The number of spectators that can be accommodated in the gymnasium.
3. Proximity of the PFF to troop housing.
4. Availability and use of public transportation.
5. The type of unit (administrative vs. training, etc.)
6. The amount of shift work.

# THE ARMY STANDARD FOR PHYSICAL FITNESS FACILITIES

## AUTHORIZED PFF SPACE ALLOWANCE

| CRITICAL FUNCTIONAL AREAS & TOTAL PFC BUILDING AREA (Areas in square feet) | | X-SMALL (Facility or Post) | SMALL (Facility or Post) | MEDIUM (Facility or Post) | LARGE (Facility or Post) | X-LARGE (Facility or Post) | INCREMENT (each 5000 over 10,000) |
|---|---|---|---|---|---|---|---|
| | **Minimum Population:** | 251 | 1001 | 3001 | 6001 | 10001 | 1 |
| | **Maximum Popultion:** | 1000 | 3000 | 6000 | 10,000 | 15000 | 5000 |
| **Fitness Module** | Cardiovascular Area | 550 | 1,350 | 2,550 | 4,000 | 6,000 | 2,000 |
| | Circuit Area | 800 | 1,350 | 1,650 | 2,300 | 3,300 | 1,000 |
| | Free Weight Area | 975 | 1,885 | 3,055 | 5,200 | 7,995 | 2,795 |
| | subtotal | 2,325 | 4,585 | 7,255 | 11,500 | 17,295 | 5,795 |
| | Storage - 10% of Cardio/Circuit/Free | 233 | 459 | 726 | 1,150 | 1,730 | 580 |
| | Stretching/Fitness Assessment | 225 | 400 | 575 | 750 | 925 | 175 |
| **Exercise Module** | Large Group Exercise | 1,200 | 1,650 | 2,800 | 4,500 | 6,750 | 2,250 |
| | subtotal | 1,200 | 1,650 | 2,800 | 4,500 | 6,750 | 2,250 |
| | Storage - 10% | 120 | 165 | 280 | 450 | 675 | 225 |
| **Structured Activities** | Racquetball Court(s) | | | | | | |
| | Combatives Room | | | | | | |
| | Climbing Wall | | | | | | |
| | Spinning Classroom | | | | | | |
| | Small Group Exercise Room | | | | | | |
| | Concessions Area | | | | | | |
| | Child Care | | | | | | |
| | Other: | | | | | | |
| | Other: | | | | | | |
| | subtotal | 4,740 | 5,183 | 6,310 | 8,002 | 12,104 | 4,102 |
| **Gym Module** | Basketball Courts (Gymnasium) | 9,775 | 17,400 | 25,200 | 33,000 | 41,400 | 8,400 |
| | Storage | 700 | 1,050 | 1,400 | 1,750 | 2,100 | 350 |
| | subtotal | 10,475 | 18,450 | 26,600 | 34,750 | 43,500 | 8,750 |
| **TOTAL NET OF MODULES** | | 19,318 | 30,892 | 44,546 | 61,102 | 82,979 | 21,877 |
| **SUPPORT AREA ALLOWANCES:** | | | | | | | |
| **Sauna, Lockers, Showers, Toilets** | | 2,400 | 3,800 | 5,850 | 8,800 | 11,800 | 3,000 |
| **Admin** (Including internal circulation) | | 514 | 741 | 1,377 | 1,471 | 1,589 | 120 |
| **Lobby** (Including control desk & public toilets) | | 817 | 1,467 | 2,226 | 3,098 | 3,617 | 519 |
| **Misc.** (M/E, Circ., Struct., other functions not listed) | | 4,722 | 7,447 | 10,800 | 14,978 | 20,141 | 5,161 |
| **TOTAL GROSS AREAS:** | | 27,771 | 44,347 | 64,799 | 89,449 | 120,125 | 30,677 |

Note: Areas are not provided for the individual functions within the Structured Activity Module as these are determined in conjunction with the Installation during the Design Charrette. The spaces selected must total no more than the Structured Activities subtotals shown above.

# Technical Criteria

# Technical Criteria for U.S. Army Physical Fitness Facilities

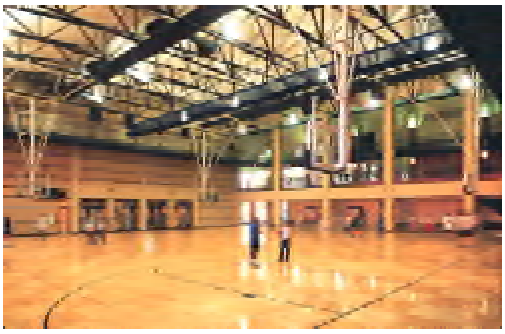
Standard Criteria

**Updated June, 2010**

**Originally developed for the Corps of Engineers**
**by**
**Hastings & Chivetta Architects** in association with **Construction Engineering & Management**

***Updated by the US Army Engineering and Support Center, Huntsville***

# Technical Criteria for U.S. Army Physical Fitness Facilities



**Developed for the Corps of Engineers**

Updated April, 2010

U.S. Army Engineering and Support Center, Huntsville

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## V Appendix

A. *Utilization Study*

# I Executive Summary

## A. Summary of Findings

***Facility Allocation***

Four Physical Fitness Facility (PFF) building programs are developed and presented herein. The PFF buildings are allocated on the basis of authorized population (AP) which includes 100% of active duty military and 25% of their dependents. Retirees are not counted in the AP at this time. DoD civilians are included at 10% only if they exceed 60% of the total workforce for CONUS installations. OCONUS installations are authorized at 100% of the civilian population in theirAP. The four PFF total building program areas include the following:

| | | |
|---|---|---|
| **X-Small** | 251 to 1,000 AP | 27,771GSF (Gross Square Feet) |
| **Small** | 1,001 to 3,000 AP | 44,347GSF |
| **Medium** | 3,001 to 6,000 AP | 64,799GSF |
| **Large** | 6,001 to 10,000 AP | 89,448GSF |

To calculate PFF building program forAPs that exceed 10,000, an "Increment" building program is provided to increase the Large building program. The Increment program is intended to serve each additional 5,000 persons over 10,000 and includes 30,677SF. Thus, a total AP of 20,000 would require a Large PFF of 89,448SF + two 30,677SF Increments for a total of 150,802SF.

***Facility Evaluation - Program Area***

A breakdown of the Critical Function Modules (CFM) or components in the PFF is provided on page 5. Existing and new facilities should be inventoried and measured to assess compliance with these program areas. A PFF is considered to be in compliance with the PFF requirements when the following occurs:

- *If Fitness, Exercise and Shower/Locker/Toilet CFM components and their subcomponents individually meet a minimum of 95% of the net square foot required space, the CFM are considered in compliance.*

- *If the number of Racquetball or Squash Courts required in the Structured Activity Component is met, even if the courts are smaller than the required area, the component is considered to be in compliance. If compliance is not met, the required courts should be added by using a net increase of 850SF per court.*

- *If the Gymnasium component has the required number of courts sized at 50'x94' regardless of whether the required bleacher and storage areas are met, the Gym Component is considered to be in compliance. If this requirement is not met, new Gymnasium modules should provided per the PFF Space Allowance Table shown on page 5.*

- *If there is one track, and the gross area of the PFF meets area required to serve the AP, regardless of whether the track meets the required CFM area, this component is considered to be in compliance.*

- *If PFF components are brought into compliance with the above standards and the facility is a maximum of 10% over the allowed gross square foot area, the facility is considered to be in compliance. If the component sizes cannot be sized to meet the space standards defined above without exceeding a 10% overage, the PFF should be renovated or replaced to achieve a more efficient building design.*

***Facility Evaluation - Quality Standards***
Standards for new construction should meet the quality standards described in Section IV - Building Design Criteria. Renovation of existing facilities should be evaluated on a case by case basis.

# II Design Concepts

## A. Background

***History of Development***

Headquarters, Family, Morale, Welfare, and Recreation Command (FMWRC), with the Corps of Engineers, have developed new design standards for Physical Fitness Facilities (PFF) for military bases in and out of CONUS. This report presents four PFF buildings to serve authorized populations ranging from 250 to 10,000. The facilities are categorized as X-Small, Small, Medium and Large. Standard increments have also been developed to accommodate populations over 10,000.

In order to function as a PFF, a facility must, at a minimum, include the following Critical Function Modules (CFM):

- Fitness Module (cardiovascular, circuit and free weight areas)
- Exercise Module (exercise rooms for instruction i.e. aerobics)
- Structured Activity Module (racquetball and other activities)
- Gymnasium Module (suitable for basketball and volleyball)
- Locker / Shower / Sauna Module

To test the adequacy of the indoor spaces for each PFF, national participation statistics were used to predict the recreational interests of active duty personnel. The national participation statistics, from a civilian survey of approximately 50% men - 50% women, were adjusted to fit a military base demographic of 80% men - 20% women. National survey responses were narrowed to the 18-44 year age group which represents 96.9% of the active duty army personnel.

Each module was tested and adjusted to verify its ability to accommodate the recreation, fitness and health interests of Active Duty (AD) personnel during peak times. Peak use varies from activity to activity. For activities requiring instruction or teams, peak use fluctuates between 50-60% of the hours of operation. For walk-in and individual activities such as fitness or running peak use varies between 80-90% of operating hours. The total hours of operation are 100 per week and reasonable attendance is assumed. Utilization worksheets for all four facilities are provided in the Appendix.

***Findings***

Utilization testing of Fitness, Exercise and Non-Structured Modules confirms that program areas are adequately sized to meet demand even when civilian statistics for fitness are nearly tripled. Module areas that fall short of meeting peak demand are Gymnasium (Medium and Large), Racquetball (Medium and Large) and Jogging Track (Large)

***Recommendations***

Gymnasium Module

a) Constructing additional courts is not recommended to meet the short fall. A 50' x 94' court is a large area relative to the number of participants that can be accommodated for a basketball or volleyball game. Constructing and maintaining new courts is not an economically feasible solution to providing more game time. Programming half-court games, extending program hours, and providing outdoor courts are all viable alternatives.

b) Recreation trends over the past ten years show steady interest in basketball but a downward trend in volleyball. Overall, national participation for volleyball for all age groups dropped from 25.1% in 1989 to 11.7% in 1999. This trend may result in a lower demand for volleyball court time.

Racquetball Court

a) Recreation trends over the past ten years show a steady decline in racquetball of 8.2% in 1989 to 3.2% in 1999. Meeting the shortage in peak demand can be satisfied by using the Structured Activity Space for an additional court. The contingency space for every building size easily accommodates an additional racquetball or squash court.

Jogging Track

a) Exercise walking, jogging and running are popular activities. Walking has grown 20% over the past ten years and is becoming a staple of recreational activity for all age groups. National statistics do not separate survey responses by indoor track, treadmill or outdoor participation. Notwithstanding, each facility will provide a minimum of one suspended track surrounding the gymnasium. Facilities in extreme climates can expand track areas by looping the track around other indoor components. Need should be reviewed on a case by case basis.

## B. Physical Fitness Facility (PFF) Space Allowance Table

Net and gross areas PFFs are itemized below. These spaces have been sized and tested for ability to meet peak demand based on a recommended square foot per person area published by the National Intramural-Recreation Sports Association (NIRSA) Space Standard for Indoor Facilities.

| CFM Component | NIRSA Recommended Area |
|---|---|
| Exercise Module - Aerobics | 50SF per participant |
| Exercise Module - Non-Structured | 125SF per participant |
| Gymnasium Court - Basketball | 14 participants + 4 rotating in |
| Gymnasium Court - Volleyball | 16 participants + 4 rotating in |
| Fitness Module | 50SF per equipment station |
| | 65SF per free weight station |
| Structured Activity - Racquetball | 4 participants per 800SF Court |
| Indoor Track | 1 runner/ 20 lineal feet |

An "Increment" program area is provided to increase the X-Large facility to serve authorized populations that exceed 15,000. The Increment area will serve 5,000 persons. Thus, a population of 19,000 requires an X-Large PFF plus one Increment.

**AUTHORIZED PFF SPACE ALLOWANCE**

| CRITICAL FUNCTIONAL AREAS & TOTAL PFF BUILDING AREA (Areas in square feet) | | X-SMALL | SMALL | MEDIUM | LARGE | X-LARGE | INCREMENT |
|---|---|---|---|---|---|---|---|
| | Minimum Population: | 251 | 1,001 | 3,001 | 6,001 | 10,001 | 1 |
| | Maximum Popultion: | 1,000 | 3,000 | 6,000 | 10,000 | 15,000 | 5,000 |
| Fitness Module | Cardiovascular Area | 550 | 1,350 | 2,550 | 4,000 | 6,000 | 2,000 |
| | Circuit Area | 800 | 1,350 | 1,650 | 2,300 | 3,300 | 1,000 |
| | Free Weight Area | 975 | 1,885 | 3,055 | 5,200 | 7,995 | 2,795 |
| | Stretching/Fitness Assessment | 225 | 400 | 575 | 750 | 925 | 175 |
| | Storage | 233 | 459 | 726 | 1,150 | 1,730 | 580 |
| Exercise Module | Large Group Exercise | 1,200 | 1,650 | 2,800 | 4,500 | 6,750 | 2,250 |
| | Storage | 120 | 165 | 280 | 450 | 675 | 225 |
| Structured Activities | Racquetball Courts, Climbing Wall, Spinning Classroom, Combatives, Concesssions, Child Care, etc. | 4,740 | 5,183 | 6,310 | 8,002 | 12,104 | 4,102 |
| Gym Module | Basketball Courts (Gym) | 9775 | 17,400 | 25,200 | 33,000 | 41,400 | 8,400 |
| | Storage | 700 | 1,050 | 1,400 | 1,750 | 2,100 | 350 |
| **TOTAL NET OF MODULES:** | | **19,318** | **30,892** | **44,546** | **61,102** | **82,979** | **21,877** |
| SUPPORT AREA ALLOWANCES: | | | | | | | |
| Sauna, Lockers, Showers, Toilets | | 2,400 | 3,800 | 5,850 | 8,800 | 11,800 | 3,000 |
| Admin | Director's Office | 120 | 120 | 120 | 120 | 130 | 10 |
| | Program Mgr's Office | 0 | 100 | 100 | 100 | 110 | 10 |
| | Support Staff Workstations | 128 | 128 | 256 | 320 | 384 | 64 |
| | Copy/file/work/break Room | 160 | 240 | 160 | 170 | 180 | 10 |
| | Storage | 20 | 29 | 32 | 36 | 40 | 5 |
| | Classroom/Training Room | 0 | 0 | 420 | 420 | 420 | 0 |
| | Classroom/Training Storage | 0 | 0 | 60 | 60 | 60 | 0 |
| | Internal Circulation (20%) | 86 | 123 | 230 | 245 | 265 | 21 |
| Lobby | Estimated Lobby | 230 | 440 | 650 | 880 | 1,090 | 210 |
| | Est. Control Counter/Storage | 300 | 512 | 725 | 938 | 1,151 | 213 |
| | Estimated Public Restrooms | 287 | 515 | 851 | 1,280 | 1,376 | 96 |
| Miscellaneous (M/E, Circ., Struct., and other functions not listed – janitor, laundry, etc.) | | 4,722 | 7,447 | 10,800 | 14,978 | 20,141 | 5,161 |
| **TOTAL GROSS AREAS:** | | **27,771** | **44,347** | **64,799** | **89,448** | **120,125** | **30,677** |

## C. Allocation of Facilities – Programming

***Method of Allocation***
Physical Fitness Facilities are allocated on the basis of Authorized Population (AP). Authorized population is counted as follows:

100% of Active Duty personnel (AD)
25% of AD Dependents
10% of Civilians (in CONUS) if they are 60% of the total workforce
100% of Civilians (OCONUS) regardless of percentage of workforce

***New Construction***
If no PFF exists on post, the procedure for allocating facility size is to calculate AP and reference the Authorized PFF Space Allowance Table on Page 5. Recommendations are presented in Section III of this manual to establish criteria for designing, constructing and equipping a new facility.

***Existing Facilities***
If there is an existing PFF on the installation, the procedure for assessment is:

- Calculate total AP
- Determine the Authorized PFF Space Allowance (see below)
- Measure PFF from outside wall to outside wall (gross square feet)
- Inventory and measure interior spaces (net square feet)
- Compare actual net and gross areas to Authorized PFF Allowances
- Identify deficits
- Identify surplus
- Analyze the facility for conformity to minimum ISR quality standards
- Record inadequacies or inefficiencies (surplus areas)

Since facilities are allocated solely on the basis of authorized population, it is important to accurately calculate the total authorized population. Army guidelines provide for only 25% of dependents to be counted in the AP. DoD statistics report that Fifty-percent of active duty personnel are married with an average of 2.83 dependents. Failure to accurately count the total Authorized Population may result in a facility that is undersized. Some of the consequences of an under-programmed PFF will be overcrowding and shortened life-span of building resources and equipment.

***Assumption***
A chart illustrating a prototypical demographic breakdown of an Authorized Population of 1,000 persons is shown on the next page. Studies to test module sizes assume the peak user group for this prototype is AD personnel that makes up 74% of the total AP. The current DoD demographic profile for activity duty personnel in the DA is 85% Men and 15% Women. The DoD projects that within ten years the demographic split will be 80% Men and 20% Women. An overall male/female demographic for a total installation with an AD split of 80/20 Men/Women is estimated to be 60% Men and 40% Women.

| | Estimated Authorized Population | | | 1000 | total |
|---|---|---|---|---|---|
| | **Active Duty** | | | **739.0** | **74%** |
| A | Married | | | 369.5 | |
| B | Unmarried | | | 369.5 | |
| C | Ratio of Dependents/Married (based on DOD statistics) | 2.83 x | 369.5 | 1045.7 | |
| D | **Actual Base Population** | | | **1784.7** | |
| E | Married | 100% x | A | 369.5 | |
| F | Unmarried | 100% x | B | 369.5 | |
| G | Dependents | 25% x | C | 261.4 | |
| | **Total Authorized Users** | | | **1000.4** | |

**10-Year Projected AD Breakdown = 80% Men, 20% Women**

| | Demographic Profile of Adult Population | | | |
|---|---|---|---|---|
| H | 100% of AD Unmarried Men | 80% x | B | 295.6 |
| I | 100% of AD Unmarried Women | 20% x | B | 73.9 |
| J | 100% of AD Married Men | 80% x | A | 295.6 |
| K | 100% of AD Married Women | 20% x | A | 73.9 |
| L | Female Spouses | 100% x | J | 295.6 |
| M | Male Spouses | 100% x | K | 73.9 |
| | **Adult Population** | | | **1108.5** |

| | | | |
|---|---|---|---|
| **Projected Males on Base** | **60%** | H+J+M | **665.1** |
| **Projected Females on Base** | **40%** | I+K+L | **443.4** |
| | | | **1108.5** |

The two charts above illustrate the demographic profile of a CONUS installation with a civilian workforce of less than 60%. This installation qualifies for an X-Small PFF. The AP of 1,000 is comprised of 50% unmarried AD and 50% married AD with 2.83 dependents. This emulates the 2001 DoD statistic for the DA overall. The chart demonstrates that a PFF designed to accommodate an AP of 1,000 may have an actual installation population of 1,784.

The total Dependents (G) are assumed to be spouses and children. Children are expected to visit the PFF during off-peak times. The peak user group, creating demand in early morning and after-work hours, is expected to be adults. The lower chart illustrates that the actual adult population is 1,108 with a projected demographic of 60% Male and 40% Female.

It is unlikely that all 1,108 adults will visit the PFF at peak times. Some AD will be on-duty and spouses may be at home with children. For purpose of this study, the peak user group for all facilities is assumed to be 74% of the AP which equates to almost 100% of the AD personnel. The demographic profile of 80/20 Men/Women is used, even though 60/40 represents the overall base demographic. Depending on the MACOM and installation mission, the AD demographic may change, affecting participation statistics and utilization. Adjustments should be made to PFF Space allowances if the Male/Female population shifts more than 10% in either direction. See Section IV - Appendix for guidance in making adjustments.

***Programming***

Programming a Physical Fitness Facility (PFF) requires several steps to accommodate the Army's goals to provide adequate PFF facilities at every installation.

1. Determine if there are any PFF(s) existing on the installation already. If a PFF(s) already exists on the installation, determine whether the existing PFF(s) will be demolished or converted to some other use as part of this project, or shortly after the new facility is constructed, such that this new facility will be the only PFF on the installation. If no PFF exists, or the existing one will be removed from the inventory once the new one is built, use the gross areas provided in the PFF Space Allowance Table on Page 5 which is based on the authorized population of the installation. This includes instances where a entirely new community is being developed away from the main installation.

2. If there are PFF facilities that will remain after the new facility has been constructed, determine if a Quantity Worksheet has been completed for the installation, which shows the total gross area of the facility as well as the net areas of all the functional modules.

   a. If the Quantity Worksheet has been completed, use the results from the worksheet to program the new facility. If the result indicates that you must build more than authorized in order to meet C1 status, please obtain MACOM approval as required. Also, evaluate the space in your existing PFF(s) to determine if the space could be utilized more efficiently, or if it would be wise to remove some of the facilities from your inventory. Utilize the Quality Worksheets from the ISR to help determine if a facility should be removed or renovated.

   b. If a Quantity Worksheet cannot be completed before programming the new facility, use the Standard Criteria to determine the allowed area for the authorized population of the installation. Subtract from that number the total gross building area of any PFF that will remain. The result is the amount that may be programmed for a new PFF. Realize that without the Quantity Worksheet, this new building may not meet the requirements for C1, and another construction or renovation project may be required in the out years.

3. In the overall gross areas for PFF, a "Miscellaneous Area" has been provided to accommodate circulation, wall thickness, and mechanical/ electrical spaces, and other required spaces not identified elsewhere. This area is calculated at 20% of the total net area of the functional modules. If there are larger mechanical and/or electrical requirements, this additional space must be added during the programming phase. FUNCTIONAL MODULES MAY NOT BE REDUCED IN AREA TO ACCOMMODATE MECHANICAL AND/OR ELECTRICAL REQUIREMENTS. Areas provided for each functional module are directly related to the requirements in the Installation Status Report (ISR). Reduction of these areas will result in a lower "C" rating for the installation, even after the construction of a brand new facility.

4. Computation of Gross Areas. The gross area of facilities will be computed according to the definition in Chapter 5 of TI 800-01.

5. New PFF(s) will be designed in accordance with this document, the approved Army Standard, the UFC 4-740-02, and other criteria maintained by the US Army Corps of Engineers Center of Standardization.

III Functional Relationships & Module Design Criteria

## A. Component Descriptions

***Lobby***

A well-designed lobby serves to not only welcome visitors to the fitness facility, but also to motivate them. Functionally, the lobby provides a passageway to organize the building. Referred to as "public space" the lobby physically leads visitors from the exterior to the control point. The control desk should be adjacent to the entry for check-in/out and equipment issue. This facilitates monitoring and restricting access to the building and gives all visitors an arrival destination. From the control point, users can be easily directed to major activity areas and support spaces. Open views into the gymnasium, fitness facility and other activity modules instantly define building function and capture user attention. These views also enable supervision of activities from the control desk.

Features that make the lobby an inviting space include lounges to provide refuge for anyone waiting for a friend or for court time. However, recreation facility lounge areas should not resemble airport waiting areas with tandem seating. Instead, seating should be placed to invite socialization and relaxation with features that include an oversized television, comfortable seating and kiosk or message center. Small cafe-style tables and chairs may be provided if vending machines are available.

The shape of the lobby can either be classically geometric or a lineal concourse. The mall concept is newer and integrates retail thinking. A long passageway increases visual connection to fitness elements, thereby advertising activities. Lobby orientation is influenced by other factors including sun angles, tree coverage and pedestrian /vehicular circulation. Site context, massing and material selection also impact lobby design.

The aesthetic impact of the lobby relies on the placement and quality of finish materials. Durability and maintainability play a significant role in the selection of finishes for high-traffic areas. In general, warm colors and soft textures are most successful at creating an ambiance that invites users to linger in the transitory space. Terrazzo or porcelain tile floors add durability and quality. Suitable wall materials include burnished or split-face block, masonry or epoxy-painted concrete masonry units. Lobby lighting should allow for natural light through large windows and clerestories and should be provided with a combination of natural and artificial light sources to utilize daylighting and daylight harvesting within the space. Various ceiling heights and drywall bulkheads help to define lobby functions.

More than any other space in the facility, the lobby furnishings and fixtures contribute to forming the user's impression of the building. Furniture, display cases, refuse containers, plants, graphics and signage should all be carefully coordinated.

***Gymnasiums***

Large volume gyms are often neglected by designers because function overwhelms creative possibilities. However, with careful planning, these "big-box" spaces will respond to a wide variety of program needs.

No other space can accommodate multiple activities as well as the gymnasium. Through the use of simple devices like divider curtains, concurrent basketball, volleyball, and even tennis is possible. Suspend the running track above the floor and runners or walkers can overlook floor activities. Such a large volume can incorporate interior views at many levels to look across to racquetball courts, high ceiling lobbies, or climbing walls. Views to the exterior offer visual variety from the inside and add interest in the facility to passersby. Windows have the added benefit of bringing in natural light in what traditionally has been an artificially lit and harsh environment. In short, careful planning of even the most utilitarian elements can make the gymnasium the visual and functional hub of the facility.

High performance materials, color, lighting, and ventilation are key elements that make gymnasiums attractive spaces. Ventilation systems should be designed with adequate air changes to maintain a suitable activity environment. Recommendations are provided in Section IV of this report. Color and lighting impact overall design. Neutral colors for walls and white ceilings can be easily combined with accent colors. Light colors are also reflective, making a large-volume space easier to illuminate. Darker colors hide marks on the walls, but absorb light requiring greater levels of artificial illumination. Selection and placement of light fixtures is crucial to achieving even but not harsh illumination. Downlighting alone may cause hot spots and glare on the playing surface. Indirect lighting alone may not provide sufficient light for competitive play. The preferred solution is a combination of indirect and direct lighting that illuminates the entire space with a minimum amount of glare. Recommendations for light level are provided in Section IV.

Suspending the running track helps to reduce the apparent volume of the gym module, as well as provide an opportunity to introduce accent colors and decorative elements via the railings and structural supports for the track. Accenting selected elements within the entire space can create a sense of energy and excitement, or in softer tones create a more relaxed atmosphere. Every element within the volume must be considered for its functional and visual impact on the whole.

Bleacher seating, basketball backstops, and divider curtains are other elements that provide opportunities for accenting and highlighting the space. Not only used for activity control, divider curtains form one of the strongest visual elements in the space. Careful consideration of mounting height and the proportion of solid versus open mesh material can prevent divider curtains from blocking views, lowering light levels, and constricting an otherwise light and open volume.

Flooring materials have the greatest impact on user satisfaction. Select high performance wood floors that utilize neoprene shock pads for impact absorption to reduce injuries while maintaining near perfect ball return characteristics. Maple floors are the industry standard, but a wide variety of appearance grades are possible. Lower grades may reduce cost for the same performance, but allow undesirable visual variation in the boards. Synthetic sports floors also offer competitive cost and performance characteristics while allowing the introduction of colors and durability. To repeat, careful planning and a reasonable understanding of how each element affects the visual quality of the space are key to creating a superior gymnasium. Technical guidelines for track and flooring elements are in Section IV.

The layouts follow regulations from nationally recognized sports associations like the United States Volleyball Association (USAV) and the National Collegiate Athletics Association (NCAA). It is required that new courts conform to competitive standards nationwide. The correct volume for the gymnasium module starts with the proper court dimensions, clear heights, and sideline allowances. Minimum clear height of the gymnasium is 28’ from floor to lowest element.

As of October, 2003, the governing bodies for Volleyball and Basketball, along with some of the facility requirements, are listed below. Current regulations shall be followed. Actually Army requirements are defined further in this document.

**Regulation Information from the USA Volleyball Rule Book**
USA Volleyball (USAV) is the national governing body for the sport of volleyball in the United States and is recognized by the Federation International de Volleyball (FIVB) and the United States Olympic Committee (USOC).

**Ceiling Height**
The playing space is free from any obstructions to a height of 7 m (23') from the playing surface.

**Playing Court**
The playing court measures 18 m x 9 m (59' x 29’6").

**Center Line**
The axis of the center line divides the court into two team courts measuring 9m x 9 m (29’6" x 29’6") each.

**Lines**
All lines on the court are 5 cm (2") wide.

**Boundary Lines**
Boundary lines: Two sidelines and two end lines mark the playing court. All boundary lines are drawn inside the dimensions of the playing court.

**Attack Lines**
Attack lines are drawn in each team court so that the edge of the attack line farthest from the center line is 3 m (9’10") from the axis of the center line. Extensions of the attack lines outside the court shall be marked with five 6" lines spaced 8" apart to a total length of 70" (for national competition).

**Area Around the Court (Free Zone)**
The free zone surrounds the court with a recommended minimum width of 2 m (6’6").

**Net Height** FIVB, USAV, California Beach Volleyball Association (CBVA), Women’s Professional Beach Volleyball Association WPVA

Net height for men, cooed mixed 6, & outdoor is 2.43 meters or 7’11-5/8".
Net height for women, boy’s 14-and-under & reversed mixed 6 is 2.24 meters or 7’4-1/8".
Net height for 12-and-under is 2.13m or 7’0".
Net height for girl’s 10-and-under is 1.98m or 6’6".

**Information from the NCAA for Basketball Court Dimensions and Markings**
The ideal playing area is 50 feet wide by 94 feet long with at least 3 feet (preferably 10 feet) of open area outside the boundaries.

In addition to sidelines and end lines, markings include a center circle; a division line through the center circle from sideline to sideline, dividing the court into two equal parts; a free-throw lane (12 feet wide) and free-throw line (15 feet from the backboard) at each end of the court and a broken restraining line outside the court 6 feet from, and parallel to, the end lines. The center circle has a 6-foot radius. The area inside the circle may not be occupied by the eight nonjumpers until one of the two jumpers has tapped the ball.

The three-point arc, measured 19 feet 9 inches from the center of the basket, serves as the boundary line to let the referee know that three points shall be awarded for a successful field-goal attempt from beyond the line.

***Fitness Module***

Strength, cardiovascular and free-weight areas have moved from the dark recesses of gymnasium basements to become the most sought after and visible components of fitness facilities. High schools have incorporated fitness training into standard curriculum. Colleges now recognize that students come to their campus with a well-founded interest in fitness and wellness pursuits. Most young recruits will also be familiar with an array of workout equipment. Since military readiness is inextricably connected with fitness, this component should offer a stimulating environment that promotes an ongoing interest in physical proficiency.

Because of this enhanced purpose, army fitness modules should be designed for function and aesthetics. Many private sector facilities are used as much for socialization as fitness. Aesthetics in these private niche facilities is largely market-driven with interiors that sometimes resemble a nightspot. Community and collegiate recreation centers must appeal to a wider group satisfying more diverse expectations. These facilities generally benefit from a timeless design approach. Army fitness facilities should adopt a similar tactic. Newer thinking in fitness design integrates all equipment into one area, but creates separations in function by using halfwalls, dropped ceilings, and changes in flooring materials. Free weight equipment must be directly visible and directly accessible to the reception (control) desk. Recommended free weight flooring is rubber or synthetic flooring material. Dispersing cardiovascular equipment within lobbies or overlooks helps to bring movement throughout the facility and addresses differing individual workout needs. Army fitness facilities shall have cardiovascular equipment located in at least 2 areas of the facility. Cardiovascular “theaters” include overhead mounted television monitors. In all, electrical considerations must be taken into account to power not just existing equipment, but future equipment as well. In addition, future needs and flexibility must be considered.

Lighting is crucial to providing a stimulating fitness environment. Indirect lighting and a visual connection to indoor and outdoor vistas will have a positive influence on the users’ frame of mind. For safety reasons, primarily indirect lighting must be used in the free-weight area. An exposed, painted ceiling can contribute a high-tech look, providing some other acoustical elements are incorporated to offset the hard-surface. Wall materials should be durable but not institutional. Mirrors, graphics, soft textures and wallcarpeting will help to soften the entire fitness environment. Recommendations for finishes are provided in Section IV of this report.

Regardless of the finishes and other design features, inadequate ventilation and temperature control will result in an undesirable workout experience. Mechanical systems should be capable of adjusting to different internal loads and occupancies at different times of the day. Recommendations for temperature and humidity levels are provided in Section IV of this report.

***Exercise Module***

Over the past 30 years, group fitness activities have maintained steady growth and progression. Aerobic classes of the seventies were characterized by strained muscles and high impact movement in bare feet. Frequent injuries quickly taught instructors serious lessons about exercise safety. Since that time, improvements in flooring, footwear, equipment and instruction technique have helped to generate safer, low impact movements that prevent injury.

Today, the list of popular classroom activities continues to grow including step aerobics, conditioning, yoga, martial arts, kick-boxing, dance, urban rebounding, etc. All of these activities provide aerobic or "cardio" conditioning. Some programs incorporate strength training by using steps, handheld weights, elastic bands and stability balls.

Fitness programs that support military readiness may include many of the above activities combined with individualized workouts in the fitness module. Providing adequate programming will be the greatest challenge for PFF facility operators. In addition, young recruits may have a desire for activities that imitate extreme sports. Flexibility in classroom design will be essential to accommodate a variety of programs.

The staff for each PFF should monitor the popularity of programs and equip the exercise modules accordingly. The desire to participate in group exercise will be influenced not only by trend, but also by the quality of the space. In addition, the quality of the instructors will play a significant role in the participation in exercise programs. A skilled and enthusiastic instructor will quickly create demand. Hiring and retaining proficient instructors is key to filling group programs.

Each PFF is programmed with a minimum of 1 large group exercise studio, which is provided with a movable wall to allow for dividing the space into 2 separate spaces. Storage is provided for both sides of the room and is designed for flow-through circulation to minimize down time during the class. Design criteria for the exercise module is provided in Section IV and includes data for flooring, lighting and environmental conditions.

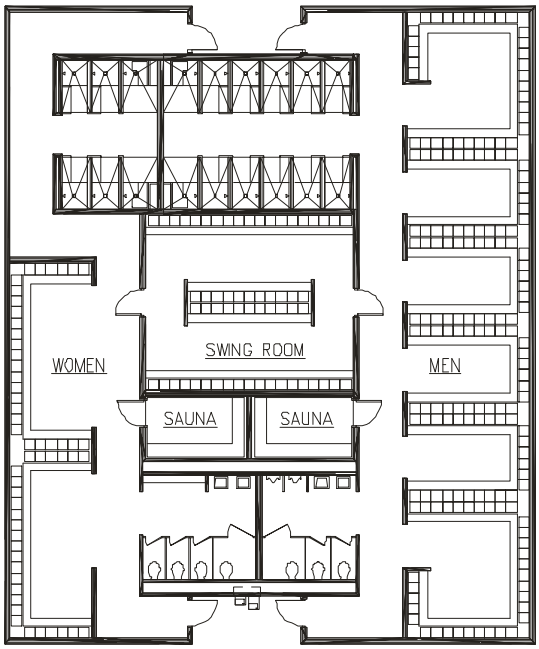
***Structured Activity Module***

Structured activity areas have very specific design requirements. However, the orientation of these components is subjective.

Racquetball courts can be provided with this allocation, or other elements that could include a spinning studio, climbing wall, squash court, etc.

Racquetball participation is on the decline in the United States decreasing from 8.2% in 1989 to 3.2% in 1999. These spaces are expensive to construct and are not easily adapted to other use. A careful review of the need for racquetball courts should be reviewed by each installation before constructing new or additional courts. That said, court play is exciting to watch. A highly competitive game will draw spectators who may be on the way to or from their own activities. Views into racquetball from the lobby or main corridor system add vitality to the building.

The United States Racquetball Association (USRA) and International Racquetball Federation (IRF) provide specification criteria for court design and construction. Courts shall be built to USRA/IRF standards to ensure they are suitable for all types of play, including international matches. Design criteria for racquetball courts is provided in Section IV of this report.




***Sauna, Lockers, Showers, Toilet***

Important locker room design elements include aesthetics, environment, layout and location. Every effort should be made to provide a direct connection between locker facilities and major activity spaces. Design options for consideration include family change rooms or satellite uni-sex change rooms for after-hour use. Convertible locker room space that is accessible from both male or female locker rooms will provide a "swing" space to increase locker room capacity for special events. An example of a locker room design incorporating swing space is shown in the left margin.

Other key objectives in locker room design include selecting eye catching colors, using maintenance-free materials and providing an adequate ventilation system. Every material used in the shower, toilet, locker and sauna area has color. Coordinating these color finishes, as well as other building materials, should be done in consultation with design professions. In general, multicolored schemes are more appealing than pallets that are limited to shades of gray or neutrals. Manufacturers have broadened color options over the last decade and simplified the specification process. Most tile manufacturers provide preset tile patterns in sheets. Standard patterns are cost effective and require minimal color selection. These floor patterns are an excellent method of adding design quality for very little money. Coordinating wall tile patterns, wall graphics, paint, toilet and shower partitions, and locker room flooring will tie these elements together and unify the entire locker room space.

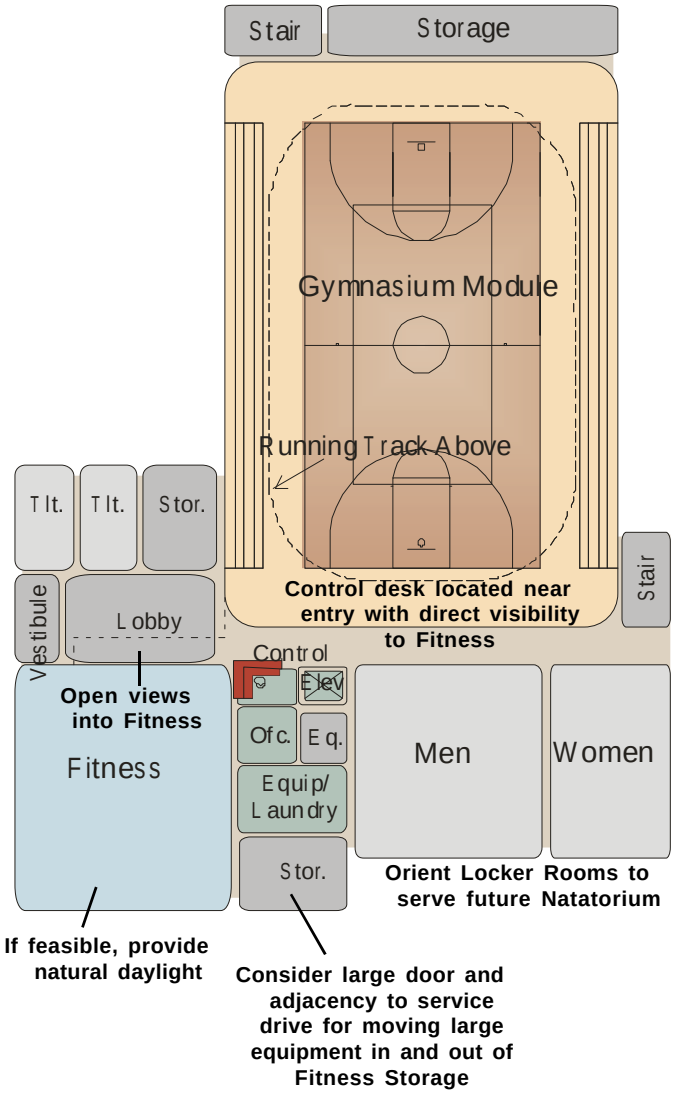
Concrete masonry unit (CMU) wall construction is recommended for locker room areas. Wall finishes in wet areas should be nonporous materials such as glazed ceramic wall tile, glazed CMU, or unglazed porcelain tile. Wall tile can be carried throughout non-wet areas or CMU can be filled and painted with an epoxy coating. Slip resistant materials or unglazed porcelain tile should be used for floors in all wet areas. Epoxy grouts for floor tile should be darker to offset the discoloration that will come with time. Antimicrobial, pvc-backed carpet with welded seams is an ideal finish for locker areas. The carpet provides an acoustical element to help muffle the sound of metal locker doors.

Recommended ceiling materials include plaster ceilings in wet areas and a moisture-resistant suspended ceiling in locker room areas.

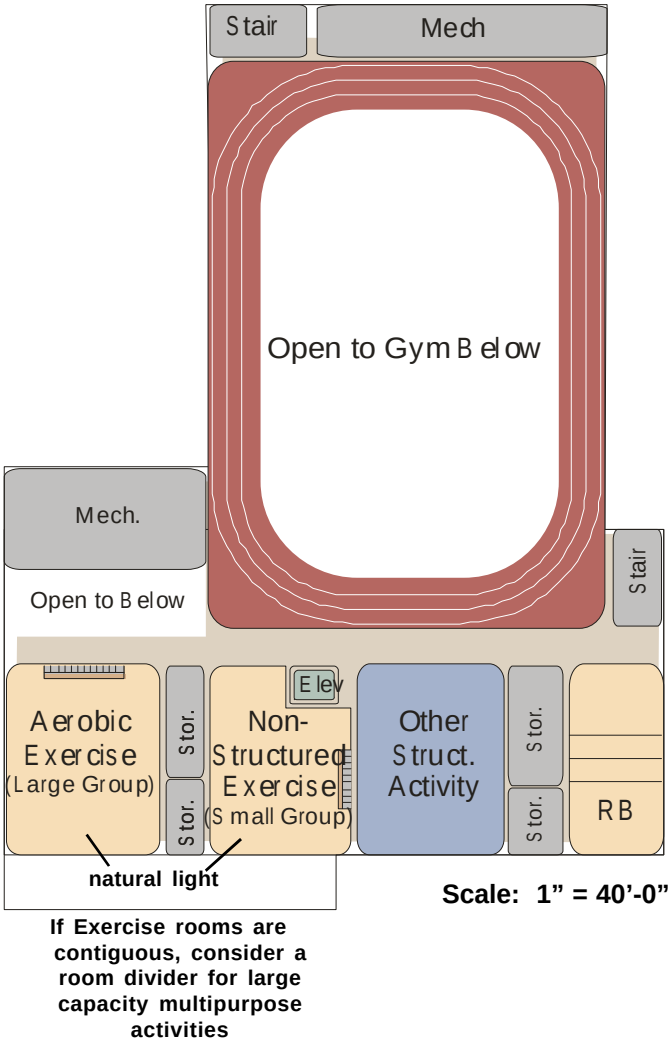
Maintenance of wet areas and locker rooms is the final, and most important, component in providing an appealing recreational experience. Even though most users may change and shower in a short period of time before departing, every user in the facility will take notice of neglected locker room areas. Instituting adequate procedures and daily inspection will go a long way to extending the life-span of finishes.

Specific recommendations for materials and finishes can be found in Section IV of this report.

## Adjacency Diagram - X-Small Facility **



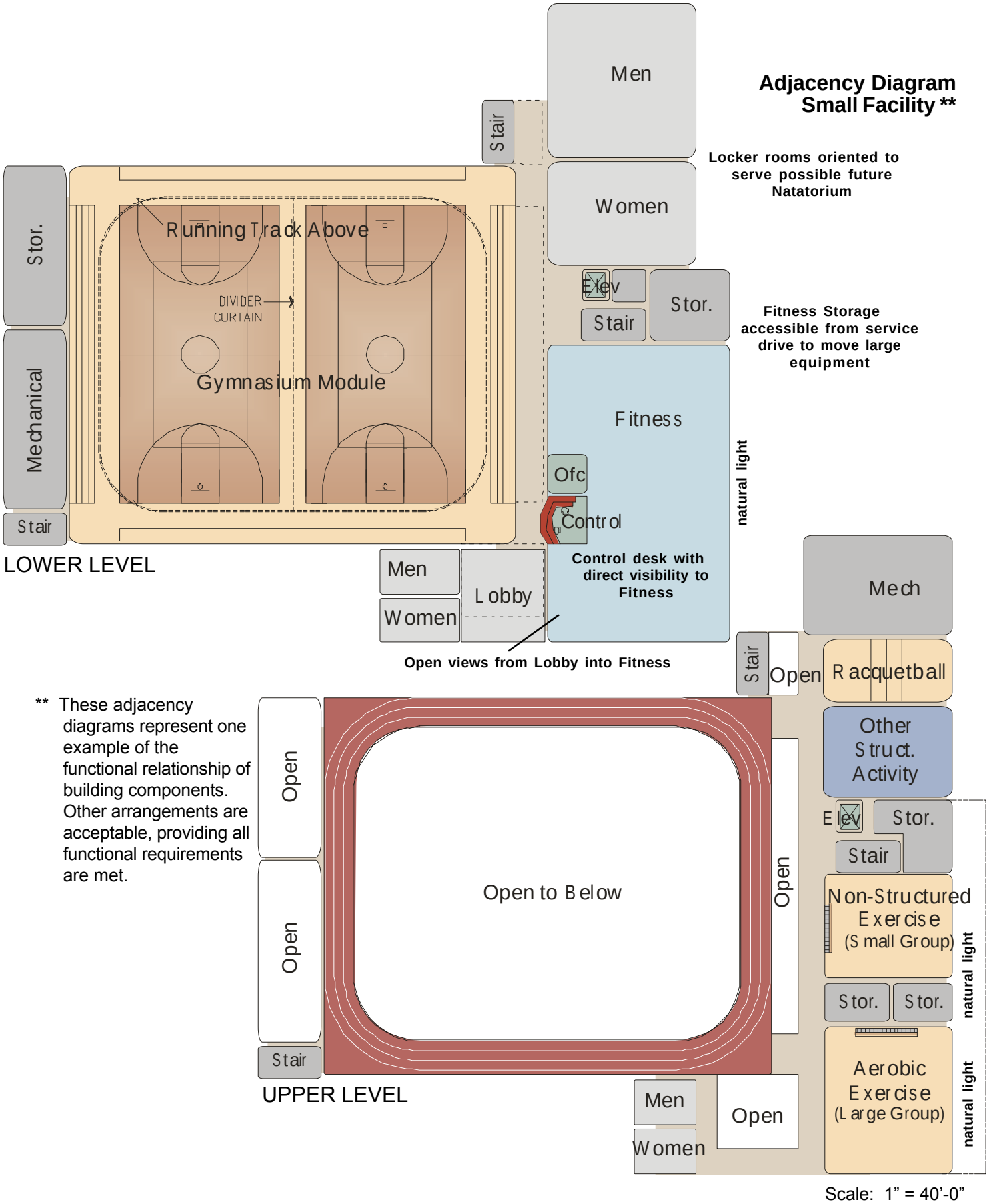

LOWER LEVEL




UPPER LEVEL

** These adjacency diagrams represent one example of the functional relationship of building components. Other arrangements are acceptable, providing all functional requirements are met.

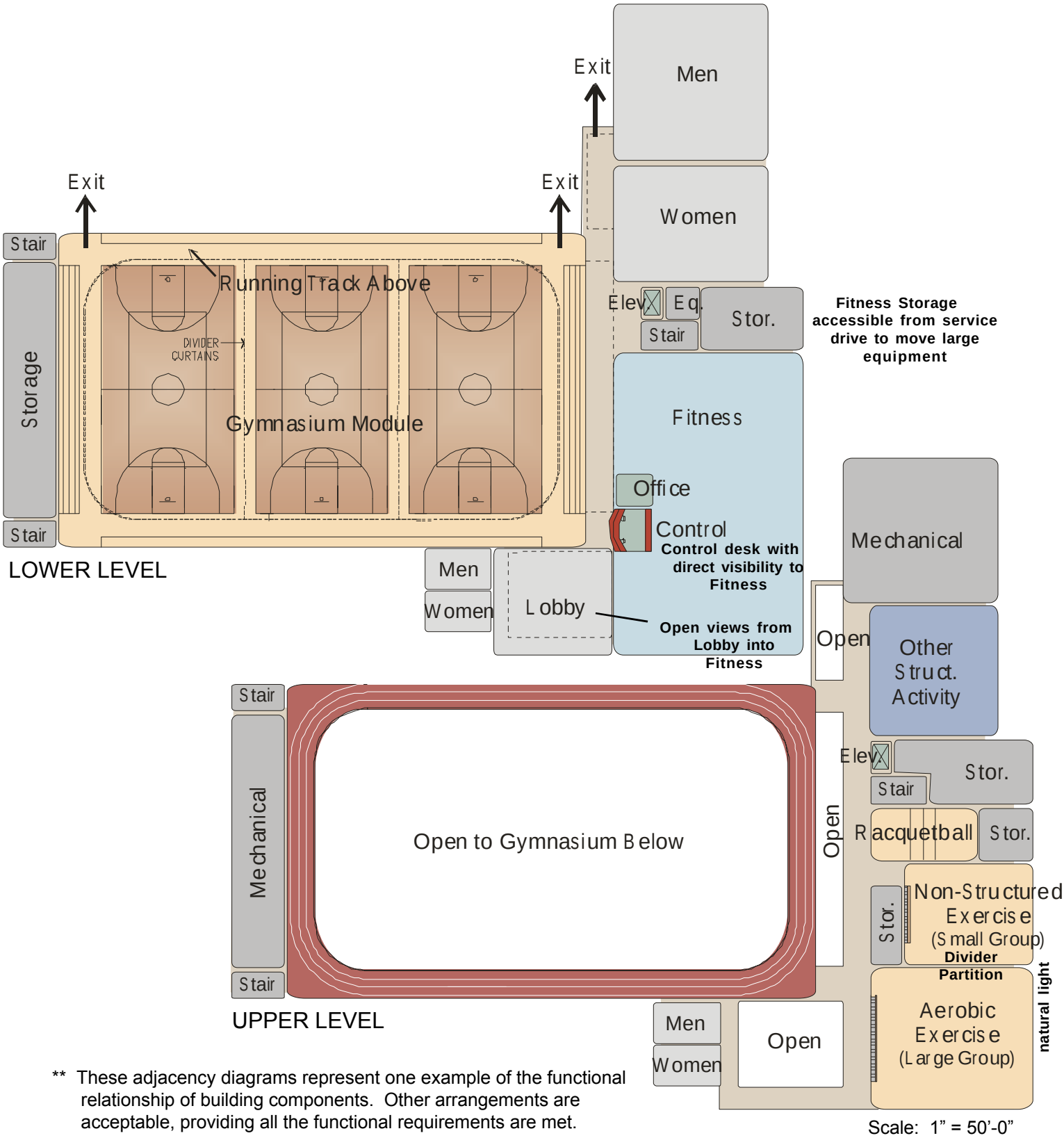
## Adjacency Diagram
## Small Facility **




** These adjacency diagrams represent one example of the functional relationship of building components. Other arrangements are acceptable, providing all functional requirements are met.

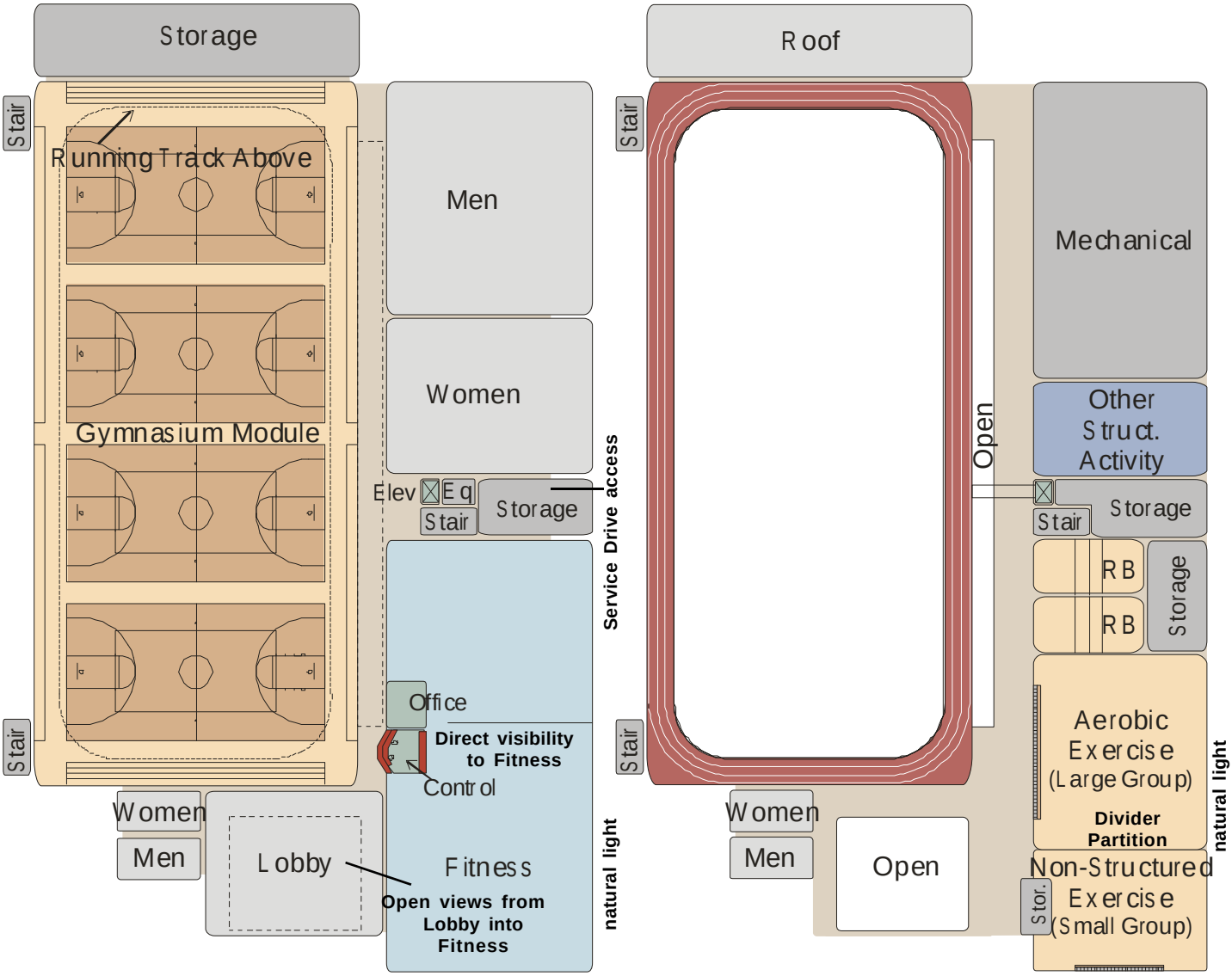
Scale: 1" = 40'-0"

## Adjacency Diagram - Medium Facility**




** These adjacency diagrams represent one example of the functional relationship of building components. Other arrangements are acceptable, providing all the functional requirements are met.

## Adjacency Diagram - Large Facility**



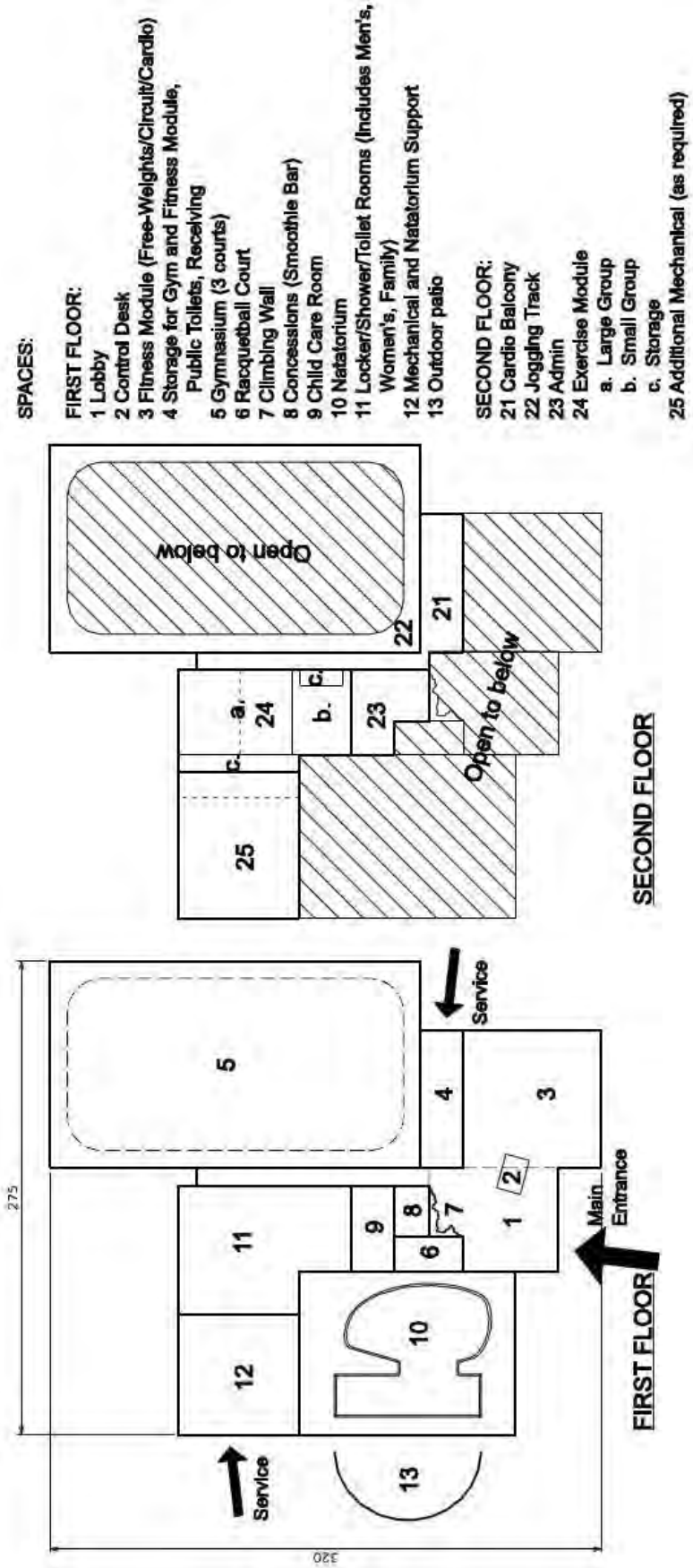

LOWER LEVEL

UPPER LEVEL

Scale: 1” = 60’-0”

** These adjacency diagrams represent one example of the functional relationship of building components. Other arrangements are acceptable, providing all the functional requirements are met.

The diagrams on pages 22 and 23 indicate other possible arrangements for a Medium PFF. Both of these illustrate an attached natatorium.

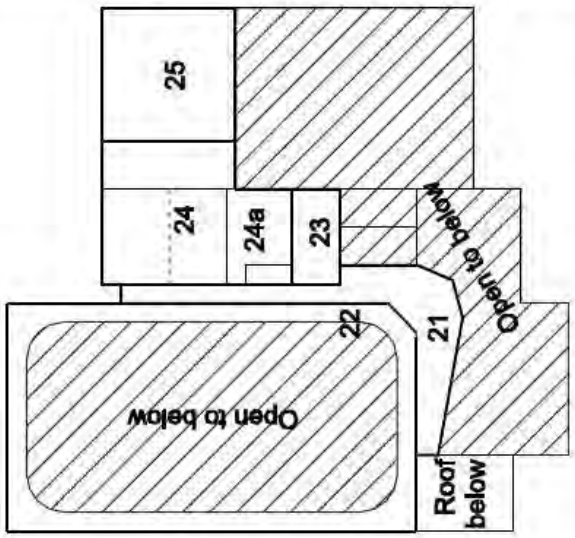


SPACES:

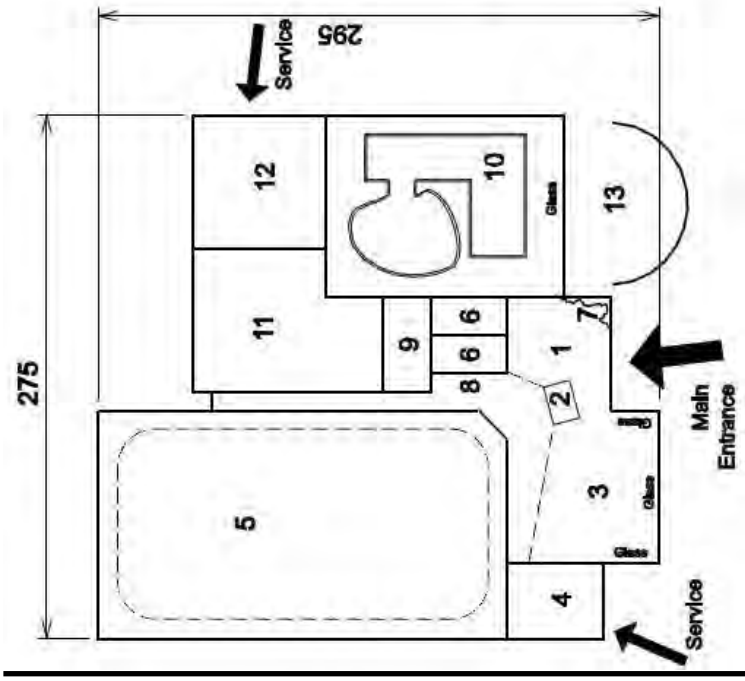
FIRST FLOOR:
1 Lobby
2 Control Desk
3 Fitness Module (Free-Weights/Circuit/Cardio)
4 Storage for Gym and Fitness Module, and Receiving
5 Gymnasium (3 courts)
6 Racquetball Court
7 Climbing Wall
8 Area for Juice/Smoothie Bar, public toilets, and vertical circulation
9 Spinning Classroom
10 Natatorium
11 Locker/Shower/Toilet Rooms (Includes Men's, Women's, Family)
12 Mechanical and Natatorium Support
13 Outdoor patio

SECOND FLOOR:
21 Cardio Balcony
22 Jogging Track
23 Admin
24 Exercise Module - Large Group Exercise Room
24a Exercise Module - Small Group Exercise Room
25 Additional Mechanical (as required)

Not shown:
Public restrooms




SECOND FLOOR




FIRST FLOOR

IV Building Design Criteria

## A. Component Descriptions

## A. Site Criteria

Site considerations for recreation facilities are generally no more restricting to placement and orientation than general construction of any large facility. The few exceptions are critical for proper performance of the most common site failures; water transmission and uneven settling under the 35K/ square foot or greater loads typical to recreation facility foundations. If feasible, building siting should be close to outdoor sports fields.

**Soils testing:** Retain a qualified geo-technical engineer to take borings on site and recommend foundation systems and pavement designs. Update existing soils testing older than 5 years, with new borings intermediate to the old locations. With new, undeveloped sites, it is recommended to increase the number of test borings beyond the four corners and one to two intermediate borings typical to a soils report of minimum scope. Maintaining floor flatness for slabs on grade and minimizing cracking requires an understanding of soils conditions across a 170' x 170 to 285' proposed footprint. To avoid being over-conservative in foundation sizing, in soils replacement, or groundwater protections allow the geo-tech to take ample borings to allow for a firm judgment. A 40 to 60 foot boring grid across the site, in variable soils conditions, is considered minimum. Expect a minimum 100 foot grid in historically stable soils.

Soils analysis will reveal most potential problems with situating a recreation facility on a particular site. Typical recreation facility foundations require a drilled or driven pier and grade beam application. Spread footings have a limited application to resist recreation facility loading, and would be confined to smaller one-story projections off the larger two story, open volumes.

Electrical system grounding and lightening protection grounding should be coordinated with the project geotechnical engineer.

**Groundwater and runoff:** The control of water flow around the site, site runoff and below grade ground water is critical to ensuring the long term viability of activity spaces that utilize special sports flooring. The technical guidelines point out that sports floor products are susceptible to failure in the presence of below grade moisture. Moisture contribution to concrete slabs on grade will warp wood floors and delaminate the adhesives in synthetic flooring. Properly installed vapor barriers beneath slabs can resolve most problems.

Caution: the presence of ground water within the frost depth of the foundation system typically warrants the use of a complete subsurface drainage system and/or the use of perimeter foundation drains. Loose or clayey soils will argue for piping all roof and site runoff into a controlled storm drainage system. Water flow across the recreation facility site from other properties will argue for foundation drains for the entire facility perimeter. Minimum recommendation for any soils conditions are: 1) foundation drain, and 2) minimize roof runoff onto grade. Pipe water away whenever possible.

Site drainage design must meet local agency requirements.

**Substandard soils:** It is not uncommon for recreation facility slab-on-grade tolerances to require the removal and replacement of subsurface soils unable to reach proper compaction, offer the engineer reasonable confidence that compaction will be consistent, or provide adequate resistance to overall loads. One element often overlooked in judging the adequacy of soils is the ability of the construction crew to use heavy crane equipment, without risk to the stability of a prepared subbase. Soils must be capable of resisting rutting and pumping while maintaining an optimum moisture content. All other elements being equal, the stability of the subbase to an adequate depth, and the consistency of the same over the whole area of the proposed slabs prevent the most common slab failure problems. Explain floor tolerance and moisture content requirements to the geo-technical engineer at the time of testing.

Potential actions to be taken to meet these criteria are, from least to most expensive:
1) straight compaction of existing soils, 2) amendment and "churning" of soils to a recommended depth followed by compaction of existing soils, 3) removal and replacement of defective soils to recommended depths.
Project engineer should reserve a contingency budget amount to anticipate some replacement of deficient soils. If soils are deficient throughout the site, drilled piers may extend further into the ground than anticipated. It is recommended that a reserve of an additional 20% of the estimated cost of drilled piers, be held against the cost of correcting unexpected soils conditions. If not used, the amount can revert to a general building contingency.

Rocky conditions are another category of deficiency in that drilled piers must find stable stone to rest upon if piers are not designed to resist loads via the friction of the entire surface area of the pier. Stone layers of uncertain thickness must be removed. A unit price per cubic yard for stone removal should be set at the beginning of the project. Soils testing cannot pinpoint all areas of unacceptable stone that would impede drilled piers. Rock removal is therefore by nature an unknown quantity. The best the engineer can do is anticipate the potential expense based on soils testing report and size the contingency fund accordingly. For any project of large scale, "getting out of the ground" is the most potentially trying part of the process. Awareness of the problems involved in any project, will help reduce after the fact finger-pointing.

**Parking:** It is difficult to determine the number of parking spaces required for a PFF. Based on the American College of Sports Medicine's "Health/Fitness Facility Standards and Guidelines", for initial parking calculations, assume 1 parking space for every 300 gross square feet of facility. This will provide adequate parking for all staff and approximately 60% of the maximum facility participants. However, many factors may result in the adjustment of this number of parking spaces, either up or down. A parking needs survey needs to be conducted to determine a more accurate need for parking, and the number of parking spaces provided adjusted accordingly. This survey needs to consider the following aspects at a minimum:

1. Current parking available in close proximity to the PFF.
2. The number of spectators that can be accommodated in the gymnasium.
3. Proximity of the PFF to troop housing.

4. Availability and use of public transportation.
5. The type of unit (administrative vs. training, etc.)
6. The amount of shift work.

Parking shall comply with ABA and Installation requirements. Vehicular access is required to the Mechanical Room and the Storage Room serving the Fitness Module at a minimum.

**B. General Systems Criteria**

**HVAC**: Outside mechanical heating and cooling is not recommended. Air movement should be controlled with use of a vestibule / airlock with two sets of entry doors

**Mechanical System Noise Control:** Noise from the building services should not interfere with the usage of the space. Noise criteria (NC) are a generally accepted, single number standard to determine what amount of sound can exist in a space and still allow full usage. The NC standards are subjective criteria but derived from multiple signal curves calculated along the entire audible range. The NC measure mechanical noise, and more specialized criteria for dampening specific sound frequencies require further engineering. NC standards simply establish how much sound can be contributed to a space before it becomes annoying and no longer falls within the accepted NC class for that usage.

To achieve the criteria at any level, follow these general guidelines: Provide mass in the walls around mechanical equipment spaces. Recommend concrete block masonry be used, whenever possible.

All ductwork shall sheet metal and be constructed for laminar airflow, in accordance with SMACNA guidelines. Minimum 2” thick insulation in all large ductwork, plenums, and fan casings. 1” minimum thickness elsewhere. Liner shall be an erosion resistant glass fiber duct lining. Minimum density should be 2.0 pcf.

Large ducts over 60” shall be subdivided into chambers with metal septums to avoid rumbling (oil canning) of the duct.

Flex duct is suitable for branch ductwork only. Flex duct leading to diffusers or grilles should be at least 5 feet in length and have one 90 degree bend before reaching the diffuser.

Select air handling units to minimize noise generation. Acoustically isolated enclosures and floor supports are common. (Even a lined fan housing can achieve significant reductions of 8 to 10 db in noise level over the system.) Manufacturers of sound isolated pre-engineered housings must provide guarantees that the internal isolation is free from short circuiting.

Avoid locating roof top units RTU’s directly overhead or horizontally adjacent to noise sensitive spaces. Recommend locating RTU’s only over support spaces such as storage rooms or rest rooms. When located on roofs, provide concrete curbs and sound isolating spring cushions. Roof structure shall be designed to resist static deflection below .025” under dead load and dynamic deflection under unit operation.

Avoid direct metal to metal contact between RTU and ducts by utilizing neoprene or canvas duct connectors.

Rotating variable speed drives must be designed to prohibit sustained rotating speeds of less than 400 rpm.

All pumps require flexible connections for all attached piping and conduit.

Airflow velocity shall be held to the criteria established for the particular NC standards. Refer to NC criteria set for each module. (Assumes 1" duct liner and ducted return) All values in feet per minute (FPM)

| | | | |
|---|---|---|---|
| Lobby: | NC 30 to 35 | 840 to 1020 | Main Supply 460 to 540<br>Branch w/ 5' runout |
| Gyms: | NC 30 to 35 | 1020 to 1200 | 540 to 640 |
| Fitness: | NC 30 to 35 | 1020 to 1200 | 540 to 640 |

Utilize low velocity and pressure air distribution system to prevent airflow noise at diffusers. Generally the closer the diffuser to the occupants, the greater the NC reduction *at the diffuser* below the ambient noise level expected for the usage. NC reductions of 8 NC (where diffusers are 12' or less away) to only 3 NC (where diffusers are 20' or more away) are recommended.

Initial duct system design shall plan for medium pressure drop silencers. Silencers shall be located about 3 duct diameters from fan housings.

Fan powered terminals or variable air volume (VAV) boxes shall not be located directly over noise sensitive spaces (NC 35 or less). Volume dampers shall not be located at the diffusers but back at the takeoff point of the branch duct. Recommend locating no closer than 10' from discharge point, with one 90 degree bend between dampers and diffusers.

Avoid using perforated face diffusers, double vane grilles and registers of any kind.

[ Each value to be inserted under Acoustical Performance for their respective modules]

| | |
|---|---|
| Lobbies: | NC-30-35 |
| Gymnasium: | NC-30 to 35 |
| Fitness: | NC-30 to 35 |
| Racquetball | NC-40 |
| Sauna | NC-30 |

**C. General Construction and Design Criteria**

Data and design information for each module follows.

## General

**In addition to this document, compliance with UFC 4-740-02, Fitness Centers, is required. Where the information in this document conflicts with the UFC, this document takes precedence.**

**PROGRAM AREAS:**

Refer to the table at the end of the Army Standard for Physical Fitness Facilities for the square footage for each of the functional areas of a Physical Fitness Facility (PFF).

**RESTROOMS:**

Restrooms shall be provided on each level of the PFF to accommodate staff and users.

**CEILING REQUIREMENTS:**

Where acoustical lay-in ceilings are provided, the following recommendations apply:

**Surface light reflectance**: No less than 0.80. Lighting placement and lamping types shall be considered when designing the ceiling. Increase lighting output with off-white colors and/or panels with not less than 0.80 light reflectance.

**Sound absorption for acoustical panels**: No less than .55NRC

**Overstock**: Provide 2% for future replacement.

**WALL MATERIALS:**

Walls through out the Physical Fitness Facility shall be extremely durable and impact resistant. Use bullnose CMU corner units at all outside corners. On gypsum board walls, use corner protectors on outside corners in high traffic areas, or where the potential for impact is significant.

**WALL FINISHES:**

Where paint is used, paint shall be water based epoxy, semi-gloss finish. Apply one coat compatible primer with two finish coats of 5 to 6 mils DFT.

**Surface light reflectance**: No less than 0.50. Lighting placement and lamping types shall be considered when designing the walls. Increase lighting output with light colors and/or panels with not less than 0.50 light reflectance.

**Ferrous metals** (window and door frames): water based epoxy. Apply one coat primer compatible with finish coat, and as barrier coat to factory primer. Two finish coats of 5 to 6 mils DFT.

**FLOOR FINISHES:**

VCT is not allowed in the PFF unless specifically allowed in this document.

**Surface light reflectance**: No less than 0.20. Lighting placement and lamping types shall be considered when designing the floor. Increase lighting output with off-white colors and/or textures with not less than 0.20 light reflectance.

**OPTIONS:**

Consider using electronic locks, with codes established by the patron, on lockers.

In addition, consider providing lockable cubbies, similar to those shown below, where cubbies are required. Coordinate with the users for their preference.

# FITNESS MODULE (Cardio, Circuit, and Free Weights)

## FUNCTION/DESCRIPTION:

Dedicated area providing space for three separate functions within the Fitness Module (Cardiovascular (Cardio), Circuit (Selectorized), and Free Weights). Cardiovascular: training equipment such as treadmills, stationary bicycles, stair climbers, ellipticals, etc. Free Weight: free weight and plate loaded equipment, benches, and storage racks. Circuit: equipment with pin selected weights.

Because participants have different personal requirements for the environment in which they work out, the cardiovascular area shall be divided into at least 2 different areas to provide different opportunities.

The circuit area and free weights must be collocated in the same area. In addition, at least 50% of the cardio area shall be collocated with the circuit and free-weights. The rest of the cardio area shall be in a different area(s) of the facility. Options for the rest of the cardio requirement include a balcony overlooking other activity areas, nooks with views to the outside or other activity areas, an area close to the entrance to the jogging track, etc. A cardio theater shall be provided in at least one of the cardio areas. Cardio theaters, open ceilings, color and lighting will all help to draw users into the space.

Also within this area shall be an open space for stretching, along with an enclosed office type area for fitness assessments.

## ESSENTIAL DESIGN REQUIREMENTS:

- Free weight area must be visually and directly physically accessible from the control desk to ensure staff can monitor the activity in the free weight area. There are no exceptions to this requirement.
- For safety reasons, primarily indirect lighting (minimum 70% indirect) is required in the free weight area, as a minimum, so that users are not looking directly into overhead lighting while lifting weights.
- Approximately 50% of the Cardiovascular area must be contiguous with the Circuit Area and the Free Weight area. The installation may desire a visual/acoustical separation between the free weights and the other functions. The remaining portion of the Cardiovascular area shall be located elsewhere throughout the facility.
- Mirrors are required in the free weight and circuit areas as a minimum.

## DIRECT ADJACENCIES:

- For safety reasons, the free weight area must be visually and directly physically accessible from the control desk. The free weight area has the highest potential for injury, and staff at the control desk must be able to see and to respond to any incident or unsafe activity within the space. Separation between the free weight area and the control desk by walls, other equipment, or major circulation is detrimental to complying with this requirement.
- A direct adjacency to the lobby and open circulation will accommodate supervision from the control area, and allow this space to become a major focal point.

- The Fitness Module Storage/Equipment Repair area shall be adjacent to and directly accessible to the Fitness Module. This storage/repair area must also have exterior access for transfer of fitness equipment. Doors shall be minimum of 8' wide to facilitate the moving of equipment.
- Other key adjacencies for this function include Control Area and Locker Rooms.

**CEILING HEIGHT:**

Minimum of 12'-0" ceiling height with 14'-0" preferred. This clear height is to the lowest element. This becomes especially important where the structure is left exposed, thereby exposing pipes, ducts, conduit, structure, etc. It is also strongly recommended that at least a portion of this space be two-story in height.

**CEILING FINISHES:**

In lower spaces, provide ceilings of highly light reflective and sound absorbent materials. Consider 2'x 2' lay-in, wet-formed mineral fiber acoustical panels, on standard "T" shaped pre-finished metallic grid system. 15/16" or 9/16" wide "T" grids are preferred. Non-directional fissured face designs are preferred to reduce installation cost and waste. Tegular (routed edges) tiles are preferred. In taller spaces, exposed structure is acceptable provided acoustical treatment is provided in the space.

**WALLS:**

Provide ¼" tempered mirror glass with 15 year warranty silver coating on at least half of two perpendicular walls in free weight and circuit area. Mount bottom of mirrors at 18" above the finish floor, to a height that provides full body visibility or align with door head height. Provide a solid molding (solid rubber, wood, metal) at the bottom of the mirrors to help ensure weight plates leaned up against the wall will not come in contact with the mirror. Molding shall extend ¾" – 1 ½" from wall at a distance of no more than ¾" below the mirror (1 ½" half-round mounted at the bottom of the mirrors would work, as would a piece of 1x or 2x wood mounted at the bottom of the mirrors).

**Wall Base**: Extend the flooring material (see below) up the face of wall to approximately 18" a.f.f. and cap with a finished hardwood wainscot trim or other molding as defined in "Walls" paragraph above. Above average physical abuse to the lower half of walls is typical to Fitness modules. Rubber wainscot resists foot scuffs, "tipping" of free weights against walls, and impact from equipment. To optimize adhesion, the paint finish must be deleted directly behind rubber wainscots. Utilize the molding to conceal and secure the top edge of this material. Other materials may be used between the floor and the molding as long as equal or better protection is provided to the wall to greatly reduce the damage caused by free weights, shoes, etc.

Some portion of the wall must also be glazing to the exterior. Around the cardio and circuit there must be clear glazing. Translucent glazing may be used in all areas and may supplement the clear glazing mentioned above.

**FLOORING:**

**Rubberized flooring:**

Recommended for use throughout the Fitness Module, to include Free-weights, Circuit, and Cardio.

Critical item: It is recommended to perform a moisture test in order to measure retained and film forming moisture at the surface of the slab. The directly adhered rubber products recommended herein have maximum moisture content standards that cannot be exceeded prior to application of the flooring and over the entire warranty period of the floor. In deficient substrates, additional floor treatment may be necessary to meet these moisture constraints. It is recommended that the selected flooring manufacturer make recommendations suitable to their products and warranty requirements.

**Type**: Granulized new rubber, granulized EPDM, or both used in combination with polyurethane binders. Directly adhered. Recycled rubber not acceptable due to potential of off-gassing. Tiles are not recommended due to difficulty of cleaning joints. Surface shall be non-porous with as few joints as possible, and all joints shall be tight, and preferably sealed, such that no liquid may enter into the joint.

**Finish**: Due to color variations inherent to the products, single, solid color floors are not recommended, instead a speckled finish is preferred. Material shall be a minimum of 3/8" thick. Greater thicknesses are available and may be used when above peak-time activity is typical to the facility. Note: Flooring in excess of 3/8" may require special transitions to avoid access conflicts with the Americans with Disabilities Act.

**Material Weight**: Density no less than 65 lbs./cu.ft.

**Durability**: Shore A hardness of no less than 60.

**Transitions**: If required, use solid rubber transition strips sized to match the heights of the dissimilar materials.

**PLUMBING:**

**Water fountains:** Required within this module. Provide one unit minimum in the Fitness Module of the X-Small, Small, and Medium PFF. Provide a minimum of two units in facilities larger than a Medium. A unit consists of either two water fountains in a single unit combination, or two separate units side by side to allow for one unit to be mounted at ADA height. Electrically cooled unit required. Water fountains shall be fed from dedicated 120V, 20A circuits. It is recommended that water fountains be placed outside normal traffic paths and recessed into the wall plane if possible.

**MECHANICAL (HVAC):**

Mechanical heating, ventilation, and humidity control of the module is mandatory. Shall exceed the current ASHRAE requirements.

**Operating range**: System able to maintain 68 - 74 degrees (F) year-round at 50% relative humidity or less. Shall meet or exceed ASHRAE 62 for the ventilation rate.

**Air movement / control**: Fully ducted supply. Natural (non-mechanically driven) ventilation is not allowed. Ceiling fans shall be provided throughout. Maximum 144 sq. ft. floor area served per fan. Independent wall mounted or infrared remote controls. It is not recommended that fans be controlled in groups.

**Temperature controls**: Independent to room, solid state and programmable. Ability to control peak and off-peak temperatures with 24 hour or one-touch setback programming recommended.

## LIGHTING

Indirect (80% minimum) direct (20% maximum) lighting is required in the free weight area. If necessary, supplement with other lighting to overcome shadows from obstructions or to highlight certain areas. However, no direct down lighting is to be provided where the free-weight area is located.

**Lighting control:** Use of occupancy sensors to activate lighting by motion detection, is recommended. In addition, grouping of lights so that a portion of the lights may be turned off, especially if natural daylighting is provided, is required. Independent slide or toggle controls may also be used to control fixtures by groups. Grouping needs and/or preferences will be determined by circuit capacity.

**Light level:** 40 footcandles at the floor, minimum.

Additional contribution of natural light via windows, clerestories, and/or skylights to utilize daylighting and daylight harvesting within the space is highly recommended. Again, care must be taken to avoid glare and direct illumination over the free weight area.

## POWER

Convenience and specialized outlets required.

**Convenience power (general cleaning and service)**: Provide receptacles rated 125V AC, 20A. Space receptacles at 10'-0" o.c. minimum around the perimeter of the room and at freestanding columns located more than 10'-0" from the walls or the nearest outlet.

**Specialized (equipment) power**: 120V, 20A dedicated circuits, unless equipment manufacturer's data indicates a larger circuit is required for the treadmills. Provide one per piece of equipment, minimum. In addition, convenience outlets must be provided for all of the cardio equipment to support built-in cardio theaters and other personal electrical requirements. In addition, additional electrical power may be required to support the fitness data systems, such as FitLinxx. Use floor mounted, dual or quad outlet, recessed boxes as required to meet equipment count. Solid brass cover plates, flush mounted. Power requirements in this Technical Criteria manual are for CONUS installations. OCONUS power requirements should be addressed on a location by location basis.

**Critical item**: Floor boxes must be mounted above the substrate at a height equal to the thickness of the finish floor system. (i.e. 3/8" for rubber), including the thickness of the box cover plate. Cover plates with flip-up or hinged lids are not recommended. Where outlets are in use, cover plates should be removable or lay flush so as to not contribute to a tripping hazard.

**Critical item**: Early determination of equipment purchase and a preliminary equipment layout is highly recommended in order to determine in-floor power needs and box locations. The fitness module should be designed to the equipment whenever possible.

Spacing (preliminary): 8'-0" on center, each way.

**TECHNOLOGY/AV:**

Data, sound and video required. Provide as required for Cardio Theater and personal fitness tracking systems. Cardio Theater may be mounted to a wall, suspended from ceiling, or supported by posts from the floor. Consult with the user when determining cardio theater requirements.

**Data outlets**: Dedicated and located at points to be determined by project engineer as follows: Data outlets at cardiovascular equipment floor boxes to accommodate computerized equipment input / outputs, as occurs. 1 data port per each power outlet provided. In addition, data outlets are required in the cardio and circuit areas to support the fitness data systems, such as FitLinxx.

**Data ports:** required for workstations used to track and/or monitor fitness performance. 1 workstations minimum per 100 patrons / hourly at peak time. Centralized location. Data port required for card access device to monitor access security and peak occupancy. Data ports as required around the perimeter of room for mobile monitoring workstations. 1 data port per convenience outlet location.

**SOUND:**

**Sound system**: Flush recessed ceiling speakers, 25 watt minimum output rating, capable of reproducing the entire audible range for (CD quality) music, minimum.

**Sound sources**: Commercial amplifier, filtered for EM interference.

- Public Address / microphone station
- Cassette / CD combination unit
- Television monitors.
- Optional: VHS or DVD playback device.

Locate sound equipment in a centralized control location. Typically provide a lockable, glass door vertical rack for mounting the A/V equipment. Sound amplification requirements are determined by the combined sound source output and the desired reproduction sound level minus the acoustical performance rating of the space. See "acoustical performance" guidelines below.

**ACOUSTICAL PERFORMANCE:**

**Acoustic performance**: No extraordinary sound reduction treatments are required. In order to analyze the potential need for additional sound reduction, the following criteria apply: Optimum peak sound level is 40 to 50 db constant (at 1000hz minimum), during peak operation times. - PNC (Preferred Noise Criteria) Curve 55 to 60. Recommended average

coefficient of sound absorption of all materials in combination is no less than .50. ("Live" acoustics are desirable). Acoustical ceilings that follow these guidelines are mandatory. Sound absorption via ceiling materials shall be no more than 5db of the total desired reduction. Provide acoustic wall panel material where needed to bring noise levels and reverberation down to acceptable levels.

**WINDOWS AND DOORS:**

Provide views into adjacent spaces and/or public ways. Aluminum or hollow metal frames are recommended. Tempered glass should be typical to the module.

**FIXED EQUIPMENT:**

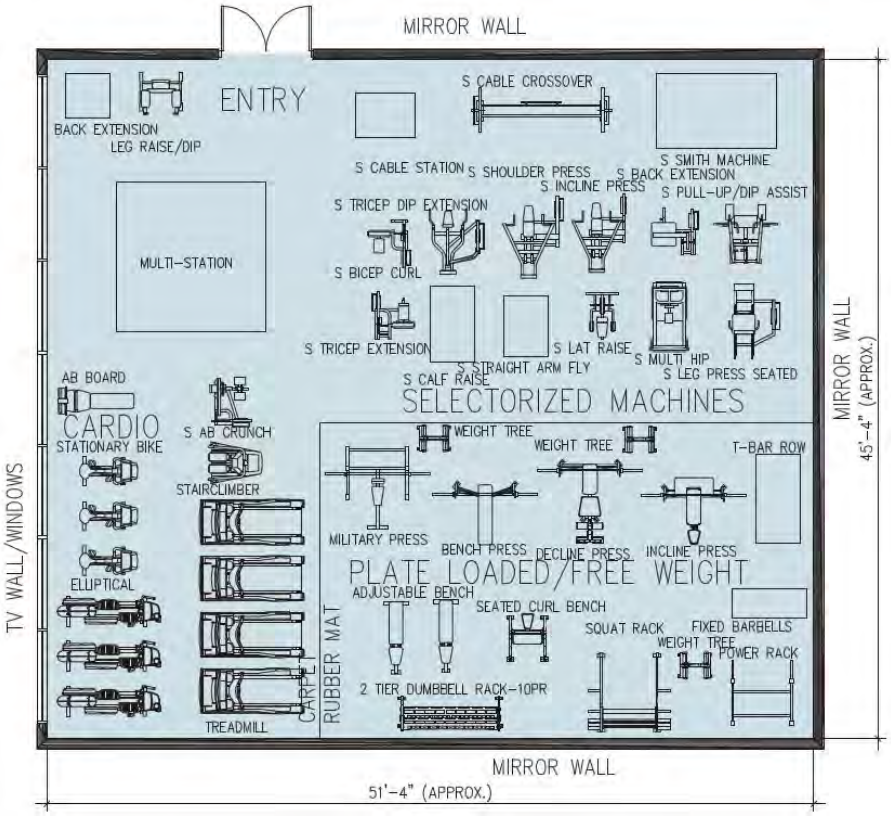
**Cubbies**: Provide storage cubicles (minimum quantity based on ½ of the number of pieces of equipment) within the room for personal items. These may either be open, or may be provided with a lockable door. If doors are provided, provide an electronic combination locking mechanism for each door that allows the user to set their own combination. See “Architectural Casework” in the Exercise Module for more details.

**ARRANGEMENT:**

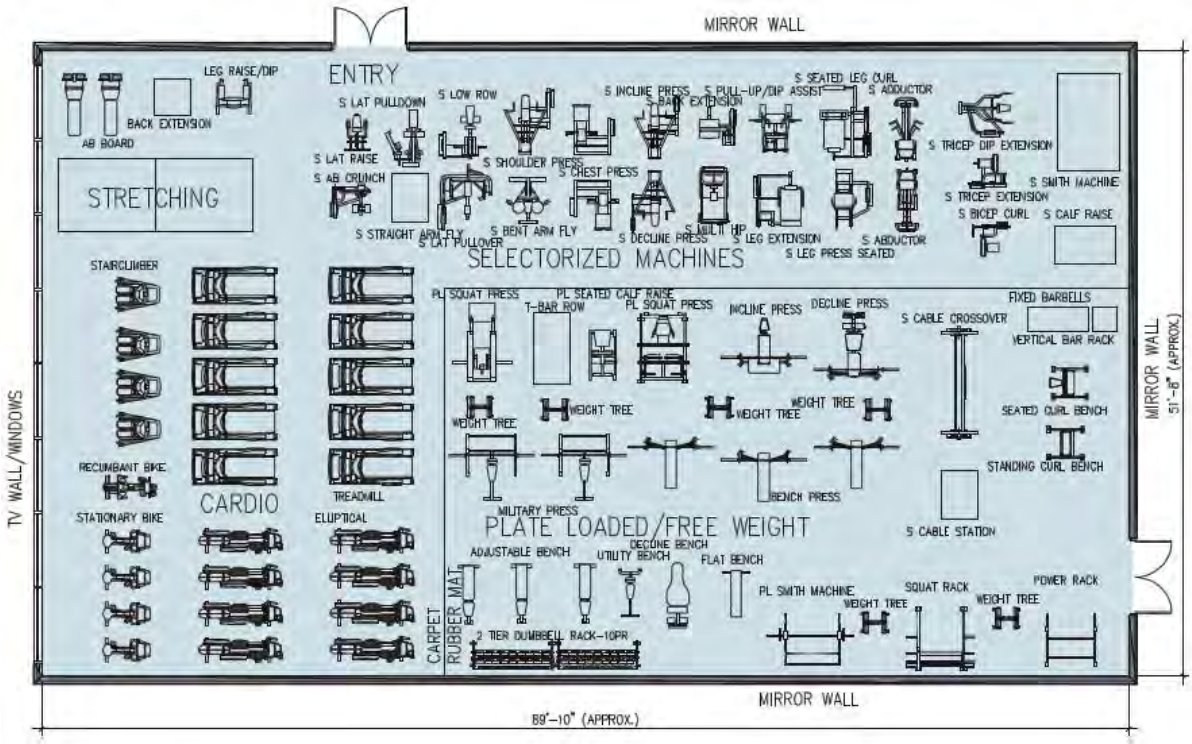
Provided below are diagrams for different sizes of the PFF that illustrate all of the equipment provided within the required space. As mentioned earlier in this document, a portion of the Cardio will be located elsewhere throughout the building. The equipment and space shown is the minimum to be provided. Other arrangements are allowed as long as all criteria is met. The diagrams do NOT indicate the relationship to the Control Desk, which MUST be physically and visually accessible to the Free Weight area.

Following the diagrams is the listing of equipment that will be provided as the standard for each size of facility.

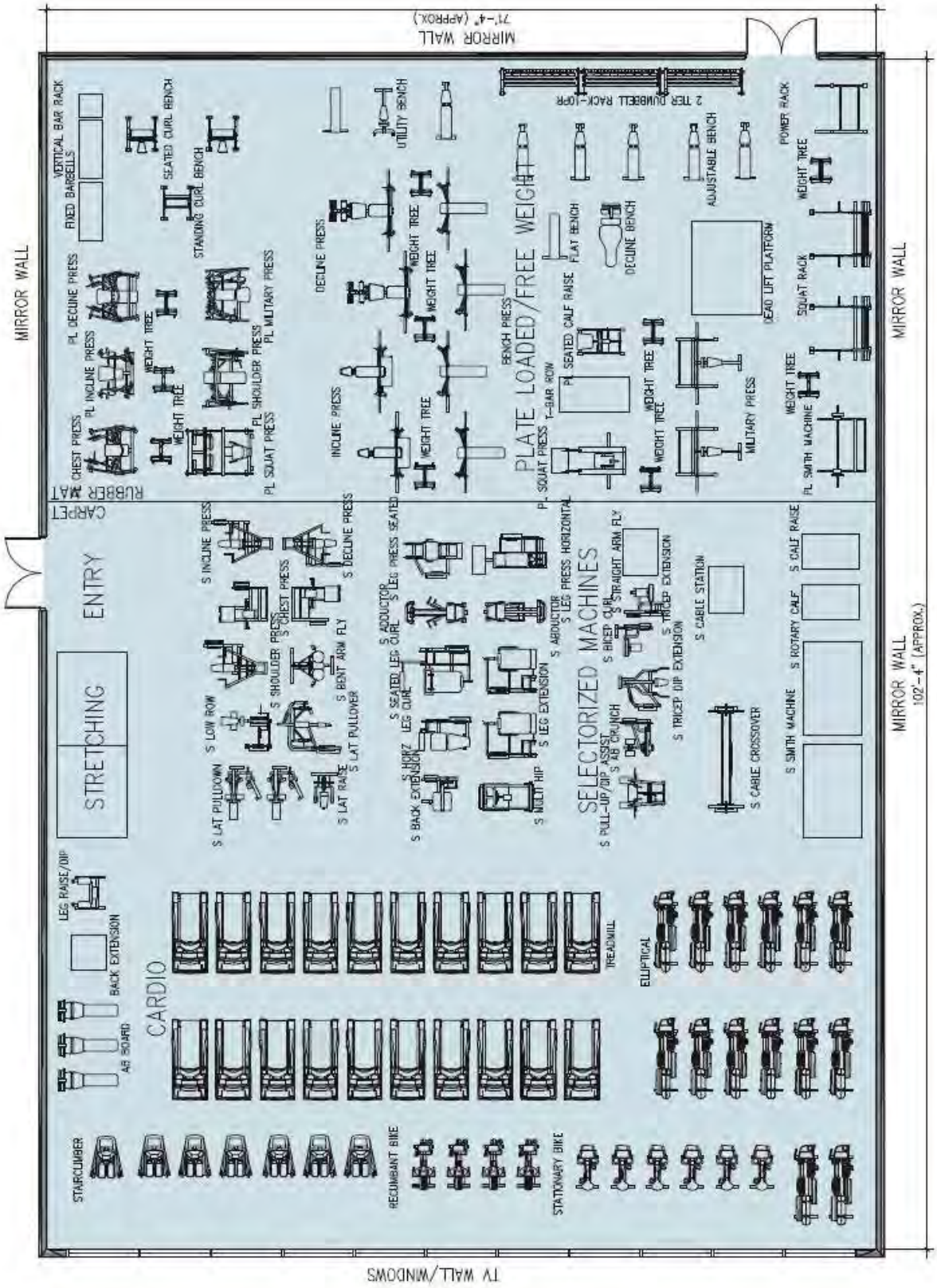
**X-Small:**



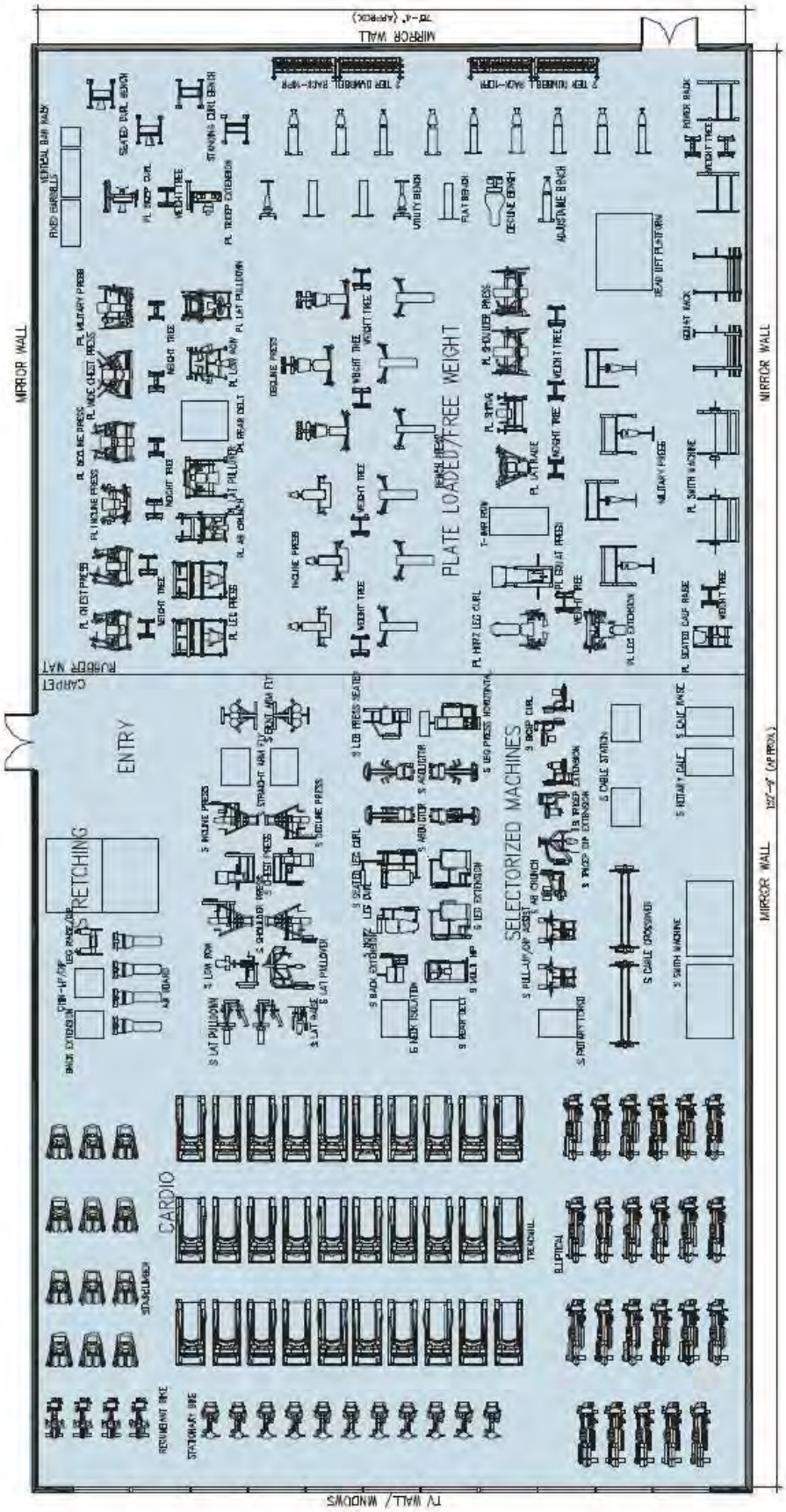

**Small:**



**Medium:**


MIRROR WALL
71'-4" (APPROX.)
MIRROR WALL
MIRROR WALL
102'-4" (APPROX.)
TV WALL/WINDOWS
ENTRY
STRETCHING
CARPET
RUBBER MAT
PLATE LOADED/FREE WEIGHT
SELECTORIZED MACHINES
CARDIO
VERTICAL BAR RACK
FIXED BARBELLS
SEATED CURL BENCH
STANDING CURL BENCH
UTILITY BENCH
2 TIER DUMBELL RACK-LOWR
ADJUSTABLE BENCH
POWER RACK
WEIGHT TREE
PL DECLINE PRESS
PL INCLINE PRESS
PL SHOULDER PRESS
PL MILITARY PRESS
DECLINE PRESS
INCLINE PRESS
BENCH PRESS
FLAT BENCH
DECLINE BENCH
DEAD LIFT PLATFORM
SQUAT RACK
PL CHEST PRESS
PL SQUAT PRESS
PL SEATED CALF RAISE
T-BAR ROW
MILITARY PRESS
PL SMITH MACHINE
S INCLINE PRESS
S DECLINE PRESS
S CHEST PRESS
S SHOULDER PRESS
S BENT ARM FLY
S LAT PULLOVER
S LAT RAISE
S LOW ROW
S LAT PULLDOWN
S ADDUCTOR
S LEG PRESS SEATED
S SEATED LEG CURL
S HORIZ LEG CURL
S BACK EXTENSION
S LEG EXTENSION
S ABDUCTOR
S LEG PRESS HORIZONTAL
S MULTI HIP
S STRAIGHT ARM FLY
S BICEP CURL
S TRICEP EXTENSION
S TRICEP DIP EXTENSION
S PULL-UP/DIP ASSIST
S AB CRUNCH
S CABLE STATION
S CABLE CROSSOVER
S CALF RAISE
S ROTARY CALF
S SMITH MACHINE
LEG RAISE/DIP
BACK EXTENSION
AB BOARD
TREADMILL
ELLIPTICAL
STAIRCLIMBER
RECUMBANT BIKE
STATIONARY BIKE

**Large:**


MIRROR WALL
MIRROR WALL
MIRROR WALL
TV WALL/ WINDOWS
PLATE LOADED/FREE WEIGHT
ENTRY
STRETCHING
SELECTORIZED MACHINES
CARDIO
CARPET
RUBBER MAT

## Cardiovascular Equipment

| Commercial Grade Electronically Controlled | X-SMALL | SMALL | MEDIUM | LARGE | INCREMENT |
|---|---|---|---|---|---|
| | MODULE SIZE | | | | |
| Treadmill | 4 | 10 | 20 | 30 | 16 |
| Elliptical Trainer | 3 | 8 | 14 | 23 | 10 |
| Cross Trainer/Hiker | A | A | A | A | A |
| Stationary Bike (Upright) | 3 | 5 | 10 | 15 | 8 |
| Stationary Bike (Recumbent) | B | B | B | B | B |
| Stairclimber/Stepper | 1 | 4 | 7 | 12 | 6 |
| Rowing Machine | 0 | 0 | 0 | 0 | 0 |
| Skier | 0 | 0 | 0 | 0 | 0 |
| Kayak Machine | 0 | 0 | 0 | 0 | 0 |
| Skate Machine | 0 | 0 | 0 | 0 | 0 |
| **Subtotal** | **11** | **27** | **51** | **80** | **40** |

## Strength Equipment

### Commercial Grade Selectorized/Stack Weight Machines

| MODULE SIZE | X-SMALL | SMALL | MEDIUM | LARGE | INCREMENT |
|---|---|---|---|---|---|
| Multi-Station (Ex. 6 stations) | 1 | 0 | 0 | 0 | 0 |
| Leg Extension | C | 1 | 2 | 2 | 1 |
| Leg Curl (Seated) | C | 1 | 1 | 1 | 1 |
| Leg Curl (Horizontal/Prone) | D | D | 1 | 1 | D |
| Leg Curl (Standing/Kneeling) | D | D | D | D | D |
| Leg Press (Seated/45deg) | 1 | 1 | 1 | 1 | 1 |
| Leg Press (Horizontal/Supine) | D | D | 1 | 1 | D |
| Leg Press (Lunge) | 0 | 0 | D | D | D |
| Calf Raise (Seated) | 1 | 1 | 1 | 1 | 1 |
| Calf Raise (Standing/Donkey) | D | D | D | D | D |
| Calf Raise (45deg) | D | D | D | D | D |
| Rotary Calf | D | D | 1 | 1 | D |
| Abductor | 0 | 1 | 1 | 2 | 0.5 K |
| Adductor | 0 | 1 | 1 | 2 | 0.5 K |
| Multi-Hip Machine (Rotary Hip) | 1 | 1 | 1 | 1 | 0.5 K |
| Hip Extension | 0 | 0 | 0 | 0 | D |
| Glute Isolation | 0 | 0 | 0 | 0 | D |
| Bent Arm/Pectoral Fly | C | 1 | 1 | 2 | 0.5 K |
| Straight Arm Fly/Rear Delt | 1 | 1 | 1 | 2 | 0.5 K |
| Chest Press (Seated) | C | 2 | 2 | 2 | 1 |
| Chest Press (Horizontal/Supine) | D | D | D | D | D |
| Incline Press | 1 | 1 | 1 | 1 | 0.5 K |
| Decline Press | 0 | 1 | 1 | 1 | 0.5 K |
| Lat Pulldown | C | 1 | 2 | 2 | 0.5 K |
| Lat Pullover | 0 | 1 | 1 | 1 | 0.5 K |
| Low Row | C | 1 | 1 | 1 | 0.5 K |
| High Row | 0 | 0 | 0 | 0 | D |
| Rear Deltoid (Seated) | 0 | 0 | 0 | 1 | 0.5 K |
| Rear Deltoid (Horizontal/Prone) | 0 | 0 | 0 | D | 0 |
| Back Extension | 1 | 1 | 1 | 1 | 1 |
| Lateral/Deltoid Raise | 1 | 1 | 1 | 1 | 1 |
| Shoulder/Overhead Press | C | 1 | 1 | 2 | 1 |
| Bicep Curl | 1 | 1 | 1 | 2 | 1 |
| Tricep Extension | 1 | 1 | 1 | 2 | 1 |
| Tricep Dip Extension (Press) | 1 | 1 | 1 | 1 | 0.5 K |
| Wrist Curl | 0 | 0 | 0 | 0 | 0 |
| Neck Isolation | 0 | 0 | 0 | 1 | 0 |
| Smith Machine (H) | 1 | 1 | 2 | 2 | 1 |
| Cable Crossover w/ Chin-up Bar | 1 | 1 | 1 | 2 | 1 |
| Cable Station (2 sided) | 1 | 1 | 1 | 2 | 0.5 K |
| Ab Crunch | 1 | 1 | 1 | 1 | 0.5 K |
| Rotary Torso | 0 | 0 | 0 | 1 | 0.5 K |
| Pull-up/Dip Assist | 1 | 1 | 1 | 2 | 0.5 K |
| **Subtotal** | **16** | **27** | **33** | **46** | **20** |

## Strength Equipment

### Commercial Grade Plate Loaded Machines

| | X-SMALL | SMALL | MEDIUM | LARGE | INCREMENT |
|---|---|---|---|---|---|
| | MODULE SIZE | | | | |
| Leg Extension | 0 | 0 | 0 | 1 | 0.5 K |
| Leg Curl (Seated) | 0 | 0 | 0 | 1 | 0.5 K |
| Leg Curl (Horizontal/Prone) (F) | 0 | 0 | 0 | D | D |
| Leg Curl (Standing/Kneeling) | 0 | 0 | 0 | D | D |
| Squat Press (Seated/45deg/Hip) (F) | 0 | 1 | 1 | 2 | 1 |
| Squat Press (Vertical/Hack) (F) | 0 | 1 | 1 | 1 | 1 |
| Squat Press (Horizontal/Supine) (F) | 0 | D | D | D | D |
| Squat Press (Jammer/Ground Based) (F) | 0 | 0 | 0 | D | D |
| Calf Raise (Seated) | 0 | 1 | 1 | 1 | 1 |
| Calf Raise (Standing) | 0 | D | D | D | D |
| Calf Raise (45deg) | 0 | D | D | D | D |
| Rotary Calf (F) | 0 | D | D | D | D |
| Tibia Dorsi Flexion | 0 | 0 | 0 | 0 | D |
| Abduction (F) | 0 | 0 | 0 | 0 | 0 |
| Adduction (F) | 0 | 0 | 0 | 0 | 0 |
| Glute Isolation | 0 | 0 | 0 | 0 | 0 |
| Chest Press (Seated) (F) | 0 | 0 | 1 | 2 | 1 |
| Chest Press (Horizontal/Supine) (F) | 0 | 0 | D | D | D |
| Wide Chest Press (F) | 0 | 0 | 0 | 1 | 0.5 K |
| Incline Press (F) | 0 | 0 | 1 | 1 | 1 |
| Decline Press (F) | 0 | 0 | 1 | 1 | 1 |
| Military/Shoulder Press (F) | 0 | 0 | 1 | 1 | 0.5 K |
| Lat Pulldown (F) | 0 | 0 | 0 | 1 | 1 |
| Lat Pullover (F) | 0 | 0 | 0 | 1 | 0.5 K |
| Low Row (F) | 0 | 0 | 0 | 1 | 0.5 K |
| High Row (F) | 0 | 0 | 0 | 0 | D |
| Rear Deltoid (Seated) (F) | 0 | 0 | 0 | 1 | 0.5 K |
| Rear Deltoid (Horizontal/Prone) (F) | 0 | 0 | 0 | D | D |
| Back Extension | 0 | 0 | 0 | 0 | 0 |
| T-Bar/Lever Row (J) | 1 | 1 | 1 | 1 | 0.5 K |
| Lateral/Deltoid Raise (F) | 0 | 0 | 0 | 1 | 0.5 K |
| Shoulder Press (F) | 0 | 0 | 1 | 2 | 0.5 K |
| Shrug (F) | 0 | 0 | 0 | 1 | 0.5 K |
| Bicep Curl | 0 | 0 | 0 | 1 | 1 |
| Tricep Extension | 0 | 0 | 0 | 1 | 1 |
| Tricep Dip Extension (F) | 0 | 0 | 0 | 0 | D |
| Wrist Curl | 0 | 0 | 0 | 0 | 0.5 K |
| Hand Grip Isolation | 0 | 0 | 0 | 0 | 0.5 K |
| Neck Isolation (F) | 0 | 0 | 0 | 0 | 0 |
| Smith Machine (F) | 0 | 1 | 1 | 2 | 0 |
| Ab Crunch | 0 | 0 | 0 | 1 | 0.5 K |
| Rotary Torso | 0 | 0 | 0 | 0 | 0 |
| **Subtotal** | **1** | **5** | **10** | **26** | **16** |

| | X-SMALL | SMALL | MEDIUM | LARGE | INCREMENT |
|---|---|---|---|---|---|
| | MODULE SIZE | | | | |
| **Strength Equipment** | | | | | |
| **Commercial Grade Free Weight Equipment/Benches** | | | | | |
| Dumbbell Sets (10pr) | G | G | G | G | G |
| Dumbbell Rack-1 Tier/5pr | 0 | 0 | 0 | 0 | 0 |
| Dumbbell Rack-2 Tier/10pr | 1 | 2 | 3 | 4 | 2 |
| Fixed Barbell Set (10 Assorted) | 1 | 1 | 2 | 2 | 1 |
| Fixed Barbell Rack | G | G | G | G | G |
| Weights (Assorted 2.5#-45#) | G | G | G | G | G |
| Weight Tree/Rack | G | G | G | G | G |
| Bars (Assorted/Loose) | G | G | G | G | G |
| Bar Rack | G | G | G | G | G |
| Benches (Assorted) | 2 | 6 | 10 | 16 | 9 |
| Squat Rack (F) & Bar | 1 | 1 | 2 | 2 | 1 |
| Bench Press (F) & Bar | 1 | 3 | 4 | 6 | 4 |
| Incline Press (F) & Bar | 1 | 1 | 2 | 3 | 1 |
| Decline Press (F) & Bar | 1 | 1 | 2 | 3 | 1 |
| Military/Shoulder Press (F) & Bar | 1 | 2 | 2 | 4 | 1 |
| Dead Lift Platform/Rack (F) & Bar | 0 | 0 | 1 | 1 | 0.5 K |
| Power Cage/Rack (F) w/ Bar | 1 | 1 | 1 | 2 | 1 |
| Curl Bench (Seated) | 1 | 1 | 2 | 2 | 1 |
| Curl Bench (Standing) | 0 | 1 | 1 | 2 | D |
| Leg Raise/Dip | 1 | 1 | 1 | 1 | 1 |
| Chin-Up/Dip | 0 | 0 | 0 | 1 | 0.5 K |
| Back Extension | 1 | 1 | 1 | 1 | 1 |
| Abdominal Board | 1 | 2 | 3 | 4 | 2 |
| **Subtotal** | **14** | **24** | **37** | **54** | **27** |

## Equipment Summary

| | | | | | |
|---|---|---|---|---|---|
| **Cardiovascular Equipment** | | | | | |
| Electronically Controlled | 11 | 27 | 51 | 80 | 40 |
| Subtotal | 11 | 27 | 51 | 80 | 40 |
| **Strength Equipment** | | | | | |
| Selectorized/Stack Weight Equipment | 16 | 27 | 33 | 46 | 20 |
| Plate Loaded Equipment | 1 | 5 | 10 | 26 | 16 |
| Free Weight Equipment/Benches | 14 | 24 | 37 | 54 | 27 |
| Subtotal | 31 | 56 | 80 | 126 | 63 |
| **TOTAL** | **42** | **83** | **131** | **206** | **103** |

**Notes:**

**(A) Cross Trainer may be substituted for Elliptical Trainer.**

**(B) Recumbent may be substituted for upright configuration.**

**(C) Inclusive in Multi-Station machine as an example.**

**(D) Alternate configurations may be substituted for typical exercise configuration (Ex. Horizontal, Standing, Kneeling, etc.).**

**(E) Dip extension may be substituted for extension configuration.**

**(F) Integral weight storage consideration to reduce Weight Tree & space requirements.**

**(G) Actual count dependant on station count & requirements.**

**(H) Plate Loaded Smith Machine may be substituted for Selectorized/ Stack Weight Smith Machine**

**(J) Rear Deltoid may be substituted for T-Bar Row**

**(K) For ".5" Equipment quantity for "Incremental" Module Size, select a total quantity of pieces that does not exceed the allowance shown in the Subtotal.**

# EXERCISE MODULE (Large Group Exercise)

## FUNCTION/DESCRIPTION:

Classroom(s) to accommodate instructional fitness programs that may include aerobics, martial arts, yoga, step-conditioning, kick boxing, etc. The exercise module shall be one large room that can be divided, through use of a movable wall (not accordion fold partition), into 2 separate group exercise areas. Consider use of an electrically operated wall system. Rooms shall facilitate flexible arrangements for a variety of setups. Equipment setup and tear down time will affect the rollover of exercise modules.

## ESSENTIAL DESIGN REQUIREMENTS:

- Storage rooms for convenient access to exercise equipment. The storage room shall be a flow-through design. In other words, the storage room shall be a linear arrangement with adjustable shelves/bins on both sides with a door at each end, so that patrons may enter one end of the room, pick up their equipment, and leave from the other end, without causing a traffic flow problem.

## DIRECT ADJACENCIES:

- Storage rooms shall be provided for each side of the group exercise room it the room can be divided.
- Drinking fountain shall be located directly outside of this space if a wood floor is provided. Otherwise, the drinking fountain may be located within the space.

## CEILING HEIGHT:

10'-0" minimum.

## CEILING FINISHES:

Provide ceilings of highly light reflective and sound absorbent materials. Consider 2'x 2' lay-in, wet-formed mineral fiber acoustical panels, on standard "T" shaped pre-finished metallic grid system. Tegular (routed edges) tiles are preferred.

Accent functional areas or improve aesthetics by the addition of single layer, gypsum board "dropped" soffits or bulkheads on metal studs. Use of dropped soffits allows concealment of lower items (i.e. ceiling fans, structure, or utilities) while allowing the majority of ceiling to be increased in height. Install around perimeters of rooms, or across ceilings in an arrangement of "false beams." Area of solid, sound reflective surfaces should not exceed 15% of the total ceiling area. "Modular" soffit arrangement: Where possible, design and size soffits and bulkheads to allow the use of full acoustical panels in each direction. For non-modular areas, center ceilings by using balanced border widths where panels are cut to fit. Coordinate lighting: With direct lighting (recessed in ceiling) locate bulkheads and acoustical panel arrangements with the optimum lighting locations first, then consider the pattern of the panels and placement of bulkheads. Where soffits exceed 36" in width and/or 12" in depth, consider supplemental lighting in the bottom of the soffit to avoid shadowed areas across the ceiling plane or at upper portions of wall planes.

An open ceiling, exposed to the structure, is also acceptable as long as acoustic panels and/or banners are provided to provide the same level, or better, of acoustical treatment as an acoustical tile ceiling would.

**WALLS:**

**Mirrors**: Provide ¼" tempered mirror glass with 15 year warranty silver coating on 50% of at least two perpendicular walls. Mount mirrors with the bottom no more than 12" (8" preferred) above the finish floor to a height that provides full body visibility or align with door head height.

**FLOORING:**

**Aerobic floor**: Machine milled and formed solid maple strip flooring that meets or exceeds MFMA (Maple Flooring Manufacturers Association) specification for a "second or better" grade.

**Size and construction**: 25/32" thick x 2 ¼" width minimum. Provide a floating system with two bonded bi directional plywood backing layers, supported on neoprene cushion pads (3/4" high) and continuous 7/16" to ¾" thick EPDM cushion pad or other approved flooring system which is DIN certified for aerobic use. Floor will have noticeable flex but with firm feel during aerobic activities.

**Alternate floor:** Synthetic flooring, designated for aerobic classes, may be provided only if the general population served by this facility is primarily active-duty military, and these areas will be used more for martial arts, boxing, etc., with very limited aerobic classes with repetitive impact on the legs and joints.

**PLUMBING:**

**Water fountains:** Required within or adjacent to this module, as described above. Provide one unit minimum with any size module. A unit consists of either two water fountains in a single unit combination, or two separate units side by side to allow for one unit to be mounted at ADA height. Electrically cooled unit required. Water fountains shall be fed from dedicated 120V, 20A circuits. It is recommended that water fountains be placed outside normal traffic paths and recessed into the wall plane if possible. Do not install water fountains where wood flooring is located.

**MECHANICAL (HVAC):**

Mechanical heating, ventilation, and humidity control of the module is mandatory. Shall exceed the current ASHRAE requirements.

**Operating range**: System able to maintain 66 - 72 degrees (F) year-round at 60% relative humidity or less. Shall meet or exceed ASHRAE 62 for the ventilation rate.

**Temperature controls**: Independent to room, solid state and programmable. Ability to control peak and off-peak temperatures with 24 hour or one-touch setback programming recommended.

**Air movement / control**: Fully ducted supply and return. Use spiral duct if existing ceiling is exposed structure. Directional diffusers mounted to spiral duct system shall be engineered for maximum throw and even distribution. Ceiling-mounted diffusers will be standard 2x2 units with directional vanes. Return air may be centralized. Natural (non-mechanically driven) ventilation is not allowed. Provide ceiling fans.

**LIGHTING:**

When ceilings heights do not allow pendant mounted or suspended lighting, indirect 2 x 2 or 2 x 4 lay-in fluorescent fixtures may be used. Direct 2 x 2 or 2 x 4 lay-in fluorescent fixtures may also be used, but are not recommended due to lower light quality (excessive glare and static light distribution; e.g. causes greater eye fatigue over long periods of time). Lighting shall be switched to allow for different levels of lighting. Natural light via windows may be provided, but direct sun-light and glare must be avoided. Windows providing internal views to other spaces is desirable.

**Lighting control:** Use of occupancy sensors to activate lighting by motion detection, is recommended. In addition, grouping of lights so that a portion of the lights may be turned off, especially if natural daylighting is provided, is required. Independent slide or toggle controls may also be used to control fixtures by groups. Grouping needs and/or preferences will be determined by circuit capacity. Lighting on each side of the movable wall shall be controlled separately so each side of the room can function independently.

**Light level:** 40 footcandles at the floor, minimum.

**POWER**

Convenience outlets required.

**TECHNOLOGY/AV:**

Provide recessed A/V rack with commercial grade amplifier, or amplifier and input/output control device, with minimum 2 microphone inputs. 400 watt minimum continuous output rating. CD/DVD/MP3 player with remote control. Provide two microphone outlets wired to locations remote from one another within the module for directed activities.

**SOUND:**

Ceiling mounted speaker for music reproduction. Sound system: Recessed ceiling speakers, 50 watt minimum output rating, capable of reproducing CD quality sound.

**ACOUSTICAL PERFORMANCE:**

Aerobic activity will require partitions to be sound rated to 53 STC minimum. Where glass walls are used to enhance interior views, front these walls to interior circulation and not into other activity spaces. One exception is the gymnasium. All other sound performance characteristics are comparable to the Fitness Module.

**WINDOWS AND DOORS:**

Hollow metal interior windows from traffic or lobby areas are recommended. Tempered safety glass is typical where glazing is 18" or closer to the floor. Tempered or laminated

safety glass above that point depends on the potential for impact from adjoining activities. It is recommended tempered glass be used when precise potential cannot be determined. Adding horizontal mullions at 32-36" A.F.F. also reduces risks from casual contact with glazing. Aluminum frames should be used when consistent with the interior design of adjacent spaces.

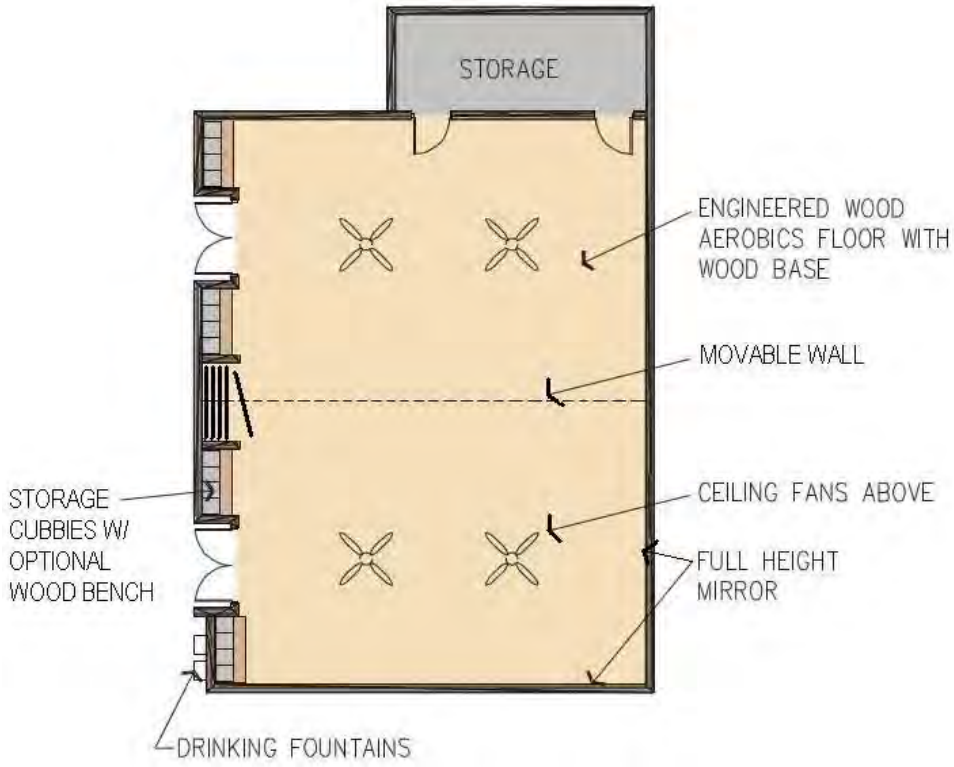
**FIXED EQUIPMENT:**

**Architectural Casework**: Provide storage cubicles along one wall of the module for incidental storage during activities: Provide minimum of one cubicle foe 75% of the total number of participants at room's maximum occupant load (based on 50 sq. ft. per person). Cubicle design is generally an open face cube in modular "banks" aligned on one wall to counter top height or vertically with the tallest cubicle 5'-0" above finish floor. Cubicles shall be minimum 14" x 14" (18" x 18" preferred) face opening x minimum 15" deep. Construct cubicles of ½" minimum particle board shell with ½ plywood horizontal shelves. Entire construction veneered with .048 horizontal grade, high pressure plastic laminate. As an alternative, if solid wood or hardwood veneer-core plywood is used throughout, the surfaces may be finished and sealed with a polyurethane, or equal, coating. The coating must be cleanable and able to withstand moisture without degrading. Edge trim of cubicle frames shall be solid hardwood (bonded) or 3 mil PVC edging routed into panel edge. Use of plastic laminate edges is not allowed. If counter height, provide solid surfacing counter top with eased edge front and minimum 1" tall lip where the counter abuts the wall.

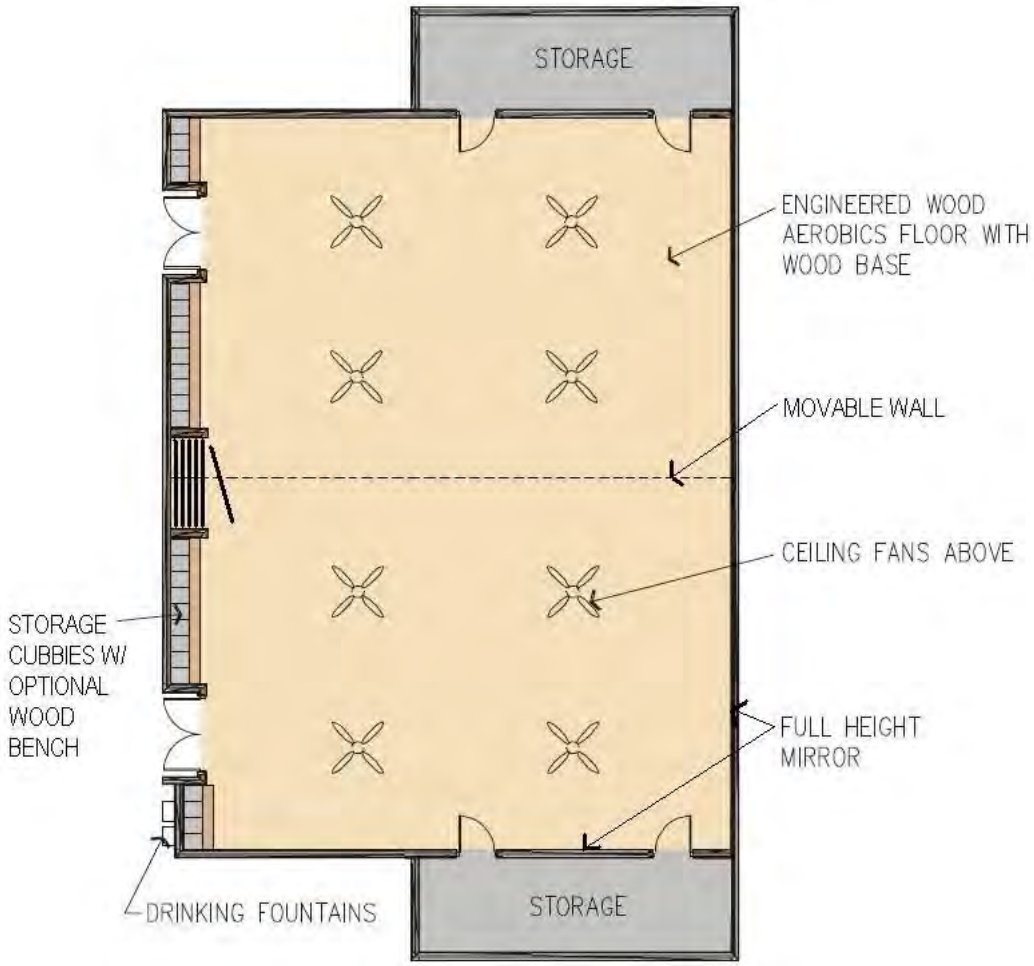
**ARRANGEMENT:**

Provided below are recommended arrangements for a X-Small and Small facility and for a Medium and Large facility. It is desirable for storage to be provided for both halves of the X-Small and Small facilities provided the space provided in each storage room is adequate to be functional and meet the needs of the user.

**X-Small/Small:**



**Medium/Large:**



# STRUCTURED ACTIVITY MODULE

## FUNCTION/DESCRIPTION:

The Structured Activity Module is discretional space allocated for each facility size to allow the installation to determine what other activities are required at their installation. This space must be designed to accommodate the unique requirements of each activity. Some uses of this space may include a climbing wall, spinning studio, racquetball or squash court(s), permanent combatives room, small group exercise room, increased fitness areas, etc. Other uses could include a Health Assessment area, child care, and concessions area. The installation will determine the required areas during the design process.

# RACQUETBALL

## ESSENTIAL DESIGN REQUIREMENTS:

- It is preferred that these are located in a visible area, such as off the lobby. Courts shall be provided with full-height glass back walls for spectators. An area shall be provided for spectators. Seating may be accomplished by movable or built-in seating.
- Inside dimensions of Racquetball courts are 20' x 40' x 20' high. Finished assembly size of courts, including wall thicknesses, are approximately 1'-2" larger than interior dimensions.
- Strongly recommend use of panelized racquetball court construction, as opposed to plaster on concrete.
- Racquetball facilities are essentially rooms within a room. Exterior envelope, floor and roof system are assumed to be existing. With regard to special treatment of the building envelope: the floor substrate should follow the same guidelines for the Fitness module whether wood floors for courts or synthetic floors in the adjacent seating / waiting area are under consideration. Floor tolerances and wall tolerances require precise construction in court systems. If space is tight, the exterior walls or interior partitions must be plumb to within ¼" in 10'-0" in the vertical and horizontal planes prior to starting the walls for the courts. Courts construction must also wait until environmental conditions within the building envelope meet recommended minimums and can be maintained during and after construction.

## FINISHES:

**General**: The necessary clear space above the inside height of the Racquetball court must take into account the thickness of the court roof, the height of lighting housings, clearance for ductwork overhead, and the depth of structural elements that are part of the floor/roof assembly above. As a preliminary guideline, allow 2'-0" plus the depth of the structure system above 20'-0" to accommodate these elements.

**Material:** Pre-formed high density (62 lbs / cu.ft.) resin core racquetball court panels on concealed T- spline system. Prefinished systems are preferred for their reduced life-cycle maintenance. Face design: Smooth. Recommend use of the same panels for the entire ceiling.

**Panel Edge design**: Flush butt joints with no more than a 3/32" gap between panels. Impact resistance: high impact and 80 shore A durability rating.

**Metal wall studs**: 33ksi yield strength, load bearing studs, 18 gauge minimum. Typically 4" studs for 20' height, spaced at 16" o.c. Six inch (6") studs are preferred.

**Face finish:** Smooth and flush. Surface variations equal to or less than 3/32" gaps or variations in plane at panel joints. System walls "float" in relation to one another. Inside corners are kept loose with 1/16"- 1/8" gap at the vertical corners.

Critical item: Wall finish panels do not extend to the floor. End of panels are held off the substrate ½" minimum to allow walls to contract and expand without warping the surface. See floor guidelines below.

**Back wall**: Glass wall. Competition courts generally prefer that the back wall run full height, but can use an 8'- 12' high glass partition at the floor line and use a solid wall panel system for the remaining height. Glass wall system: ½" thick tempered glass walls and doors. Tall vertical walls (above 8'-0" a.f.f.) will require use of vertical glass stiffeners. Glass is structural and utilizes upper and lower channels only to retain 8' - 10'-0" high glass systems, with added edge panel hardware for tall glass systems.

Caution: Review glass panel attachments to floor line with supplier to provide proper support and understanding of the floor to floor transition between spectator floor and the court floor. If both systems are not wood systems, court substrate will be recessed approximately 2 ½" in relation to the spectator area. Back wall doors shall be frameless glass doors with face finish to match wall system. In resin core applications, manufacturers of panels offer face panels for door applications. Door frames, where used, shall be heavy gauge aluminum with adjustable stops to provide a flush installation within regulation tolerances for court wall faces.

Critical Item: No surface fasteners or projecting hardware shall be used on the interior court face for any components. Accessory items, including doors and frames shall all use concealed fasteners. Door hardware shall be flush and recessed in the face of the door on the court side. Door width shall be no less than 34" clear for ADA use.

**Sound absorption for panels**: Fiberboard may be mounted directly behind resin core panels to reduce "drum" effect of hard panels systems. Sound batts are also provided to reduce transfer noise to other spaces or in multi-court applications.

**Surface light reflectance**: No less than .80.

**Humidity resistance**: No special protection.

**Fire resistance**: Use only Class A rated materials as determined by Underwriters Laboratories (UL) Fire resistive gypsum board mandatory when used as part of the ceiling system.

**RACQUETBALL COURT FLOORING:**

**Floor tolerances**: No more than ¼" in 10'-0" each direction, non-averaged for the full length of the floor. Follow wood flooring supplier's recommendations for leveling uneven substrates.

**Materials**: Machine milled and formed solid maple strip flooring that meets or exceeds MFMA (Maple Flooring Manufacturers Association) specification for a "second or better" grade.

**Size and construction**: 33/32" thick x 2 ¼" width minimum, bonded to 2 layer bi-directional ½" thick plywood panels. Provide a system with ¾" thick wood or metal and wood composite support sleepers mechanically fastened to floor panels or equal system. Cushion pads on the underside of the sleepers is optional. Expansion control is critical to floor system. DIN certified system for court use.

**Floor Edge treatments**: Racquet ball court floors do not extend to the wall surfaces. Floor edge is held back from wall a maximum of 3/16" at head walls and ½" maximum at side walls, to allow for expansion and contraction of floor system.

**Floor finish**: Catalyzed polyurethane finish system requiring multiple sanding and application steps for a sanding sealer / primer base coat and two finish coats of gloss urethane. Floor striping is accomplished between the first and second finish coats.

**Court striping**: Flooring striping is handled by the flooring manufacturer. Front and side wall striping is prefinished with resin core laminate panels. Consult with a national racquetball association like USRA (United States Racquetball Association) for standards particular to competition in the project region.

**PLUMBING:**

**Water fountains**: 1 per 150 patrons at peak time use. Provide one drinking fountain near spectator area, but not necessarily directly adjacent to courts. It is undesirable for water to be available where it could be carried onto courts. Electrically cooled unit required. Water fountains shall be fed from dedicated 120V, 20A circuits.

**MECHANICAL (HVAC):**

Mechanical heating, ventilation, and humidity control of the module is mandatory. Shall exceed the current ASHRAE requirements.

**Operating range**: For racquetball courts, system shall be able to maintain 60 - 68 degrees (F) year-round at 50% or less relative humidity.

**Air movement / control:** Fully ducted supply and return. Passive or plenum return not recommended. Supply diffusers are to be heavy gauge fixed metal grilles with four-way air movement and blade-type vanes. Return air grilles may be perforated plate or blade type. All diffusers to be prefinished, designed to be impact resistant. Preferred location is back wall supply and return. Natural (non-mechanically driven) ventilation is not allowed.

**Temperature controls**: Independent to courts, with all controls centrally located, solid state and programmable. Ability to control peak and off-peak temperatures with 24 hour or one-touch setback programming recommended. Ductwork shall be insulated sheet metal rectangular or circular duct routed adjacent to diffuser locations. Use flexible duct drops to diffusers. Natural (non-mechanically driven) ventilation is not allowed.

**TECHNOLOGY/AV:**

No technology requirements.

**SOUND:**

**Sound system**: Flush recessed speakers, 25 watt minimum output rating, capable of reproducing the entire audible range for human speech. Link speakers to paging system with input / output modes for single court or all court paging. Provide at least one speaker location in spectator / waiting area with court speaker at back upper wall.

**WINDOWS AND DOORS:**

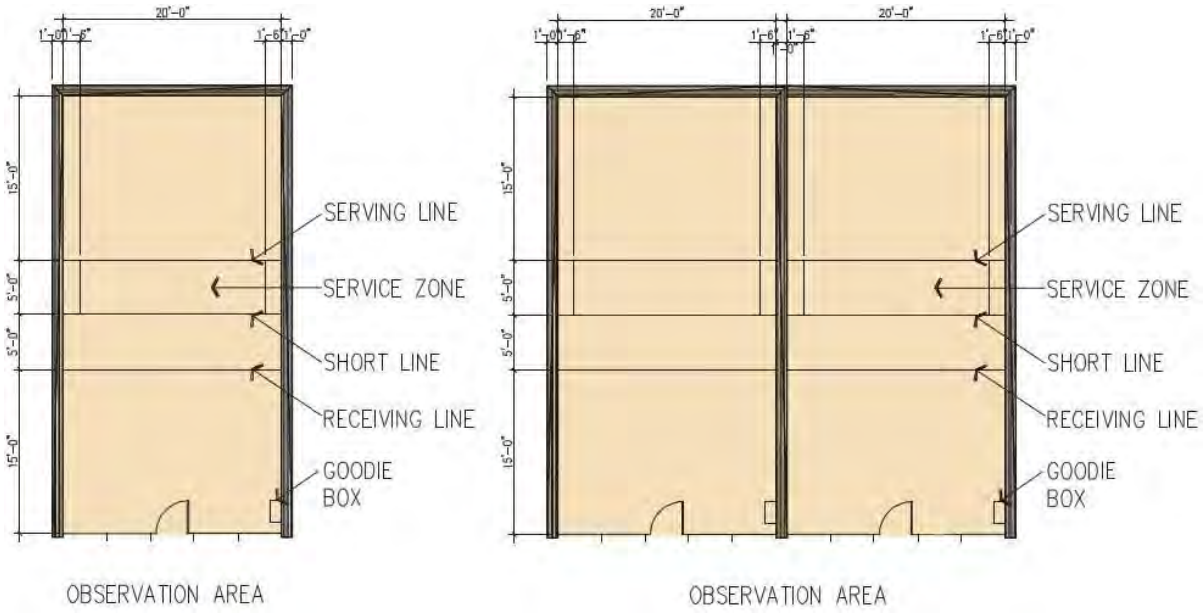
Glass doors integral to the glass wall system shall be provided.

**FIXED EQUIPMENT;**

**"Goody box:"** A “goody box” shall be provided in each court as a place for the storage of small valuables during play be provided for each court. Court manufacturers offer a recessed metal box with flush cover and concealed fasteners, accessible from the interior side of the court only.

**ARRANGEMENT:**

Provided below are arrangements for 1 and 2 racquetball courts. Markings must meet the current guidelines of the governing organization. Based on user preferences, more than 2 courts may be provided.



# SMALL GROUP FITNESS

## ESSENTIAL DESIGN REQUIREMENTS:

- Small Group Exercise Room: follow the requirements for the Exercise Module (Large Group Fitness) above.
- Must have one-way flow-through storage room directly accessible to the space.
- Cubbies shall be provided based on 75% maximum occupancy based on 125 square feet per person.
- Mirrors and flooring shall be coordinated with the users prior to design to determine anticipated usage of the room.

# CLIMBING WALL

## ESSENTIAL DESIGN REQUIREMENTS:

- Climbing wall must be controlled for safety concerns.
- Appropriate and adequate flooring and safety zone is required. Assume a depressed slab in this area.
- Consider a bouldering area in this area as well.

## DIRECT ADJACENCIES:

- The climbing wall must be visually and physically accessible from the Control Desk or a fully staffed area for control and safety. The climbing wall should be located in an open area, preferably off of the lobby and in direct view of the Control Desk. Locating it in a separate locked room is acceptable, but not desirable.

## CEILING HEIGHTS:

25'-0" minimum. Heights up to 40' are ideal.

## MECHANICAL (HVAC):

Mechanical heating, ventilation, and humidity control of the module is mandatory. Shall exceed the current ASHRAE requirements.

**Operating range**: If located in the open lobby area, temperatures should be appropriate for a combination of all of the functions. In a separate room, the system must be able to maintain 66 - 72 degrees (F) year-round at 60% relative humidity or less. Shall meet or exceed ASHRAE 62 for the ventilation rate.

**Temperature controls**: Independent to room, solid state and programmable. Ability to control peak and off-peak temperatures with 24 hour or one-touch setback programming recommended.

**Air movement / control**: Fully ducted supply and return. Use spiral duct if existing ceiling is exposed structure. Directional diffusers mounted to spiral duct system shall be engineered for maximum throw and even distribution. Ceiling-mounted diffusers will be standard 2x2 units with directional vanes. Return air may be centralized. Natural (non-mechanically driven) ventilation is not allowed.

## TECHNOLOGY/AV:

No technology requirements.

## SOUND:

**Sound system**: Flush recessed speakers, 25 watt minimum output rating, capable of reproducing the entire audible range for human speech. Link speakers to paging system.

# COMBATIVES

## ESSENTIAL DESIGN REQUIREMENTS:

- Room shall not have any external corners within the room. Columns, if required, must be fully buried within the wall, so the wall surface is perfectly flat. The room shall be sized to accommodate 1 or 2 mats as required by the installation. Floors and walls shall be provided with padding. Padding on walls shall be provided to 8' above the floor.
- A storage room must be provided. Unlike the group exercise rooms, this storage room does not have to be a one-way flow-through configuration.
- Space is required for hanging bags.
- Provide cubbies (minimum of 12 for 1 mat, 24 for 2 mats) for storage of small items inside the room.
- The following drawings indicate the preferred arrangement for this space.

## DIRECT ADJACENCIES:

- No special requirements.

## CEILING HEIGHTS:

10'-0" minimum

## CEILING FINISHES:

Provide ceilings of highly light reflective and sound absorbent materials. Consider 2'x 2' lay-in, wet-formed mineral fiber acoustical panels, on standard "T" shaped pre-finished metallic grid system. Tegular (routed edges) tiles are preferred. Hold down clips may be desirable.

## PLUMBING:

**Water fountains**: 1 per 150 patrons at peak time use. Provide one drinking fountain near this function. Electrically cooled unit required. Water fountains shall be fed from dedicated 120V, 20A circuit(s).

## MECHANICAL (HVAC):

Mechanical heating, ventilation, and humidity control of the module is mandatory. Shall exceed the current ASHRAE requirements.

**Operating range**: System able to maintain 66 - 72 degrees (F) year-round at 60% relative humidity or less. Shall meet or exceed ASHRAE 62 for the ventilation rate.

**Temperature controls**: Independent to room, solid state and programmable. Ability to control peak and off-peak temperatures with 24 hour or one-touch setback programming recommended.

**Air movement / control**: Fully ducted supply and return. Use spiral duct if existing ceiling is exposed structure. Directional diffusers mounted to spiral duct system shall be engineered

for maximum throw and even distribution. Ceiling-mounted diffusers will be standard 2x2 units with directional vanes. Return air may be centralized. Natural (non-mechanically driven) ventilation is not allowed.

**LIGHTING:**

Provide indirect 2 x 2 or 2 x 4 lay-in fluorescent fixtures may be used. Direct 2 x 2 or 2 x 4 lay-in fluorescent fixtures may also be used, but are not recommended due to lower light quality (excessive glare and static light distribution; e.g. causes greater eye fatigue over long periods of time). Lighting shall be switched to allow for different levels of lighting.

**Lighting control:** Use of occupancy sensors to activate lighting by motion detection, is recommended.

**Light level:** 40 footcandles at the floor, minimum.

**POWER**

Locate convenience outlets to avoid safety concerns with cut outs in the wall padding. Best locations would be where no padding is required, and at a corner of the floor mat.

**TECHNOLOGY/AV:**

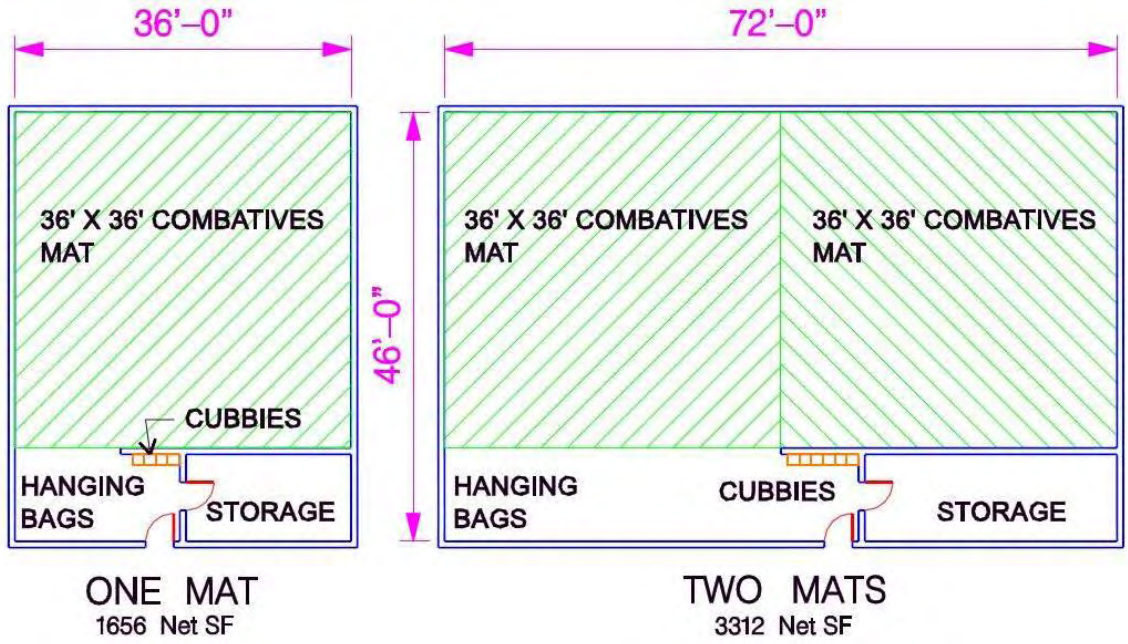
No technology requirements.

**SOUND:**

**Sound system**: Flush recessed speakers, 25 watt minimum output rating, capable of reproducing the entire audible range for human speech. Link speakers to paging system.

**ARRANGEMENT:**

Provided below are recommended arrangements for 1-mat and 2-mat Combatives Rooms.



# CONCESSIONS

## ESSENTIAL DESIGN REQUIREMENTS:

- This describes the optional food and beverage sales or expanded retail functions that will be provided in a separate area that is highly visible and accessible to patrons to encourage business. Vending can also be provided at a self-service standalone space with vending machines. The vending area, if a standalone space, should be identifiable, visually screened but not totally enclosed, and visually accessible from the control desk.
- Coordinate with the user to determine level of service desired along with the proposed operators. Different operators may have different requirements for security, equipment, layout, etc.

## DIRECT ADJACENCIES:

- Should be located adjacent to the lobby to serve spectators, visitors, and users upon entering or leaving the facility.

## CEILING HEIGHTS:

9’-0” Minimum

# CHILD CARE

## ESSENTIAL DESIGN REQUIREMENTS:

- Must comply with all Child and Youth Services (CYS) requirements. Please refer to the Army Standard and the Standard Design for Child Development Centers. These documents may be downloaded from https://eportal.usace.army.mil/sites/COS/CDCIT/default.aspx

## DIRECT ADJACENCIES:

- The Child Care area shall be located close to the main entrance/lobby so that patrons may drop off their children shortly after arriving at the facility.
- It may be desirable to provide cardio equipment in an arrangement such that the users can watch their children in the child care area. In this instance, the cubbies and shelves in the attached drawings may be relocated to other walls, and a glass wall provided.
- The layouts shown in the attached drawings are mandatory unless otherwise modified by this section.
- Child Care shall NOT be located on any floor other than the ground floor.
- The Child Care Room must also have direct access to the exterior. It is ideal if this door leads to a playground area.

## CEILING HEIGHTS:

8’-0”

## CEILING FINISHES:

Salient characteristics include ease of accessibility to mechanical system above ceiling, durable, and shall provide an aesthetically pleasing surface, free of sags or other defects.

## WALL FINISHES:

Salient characteristics include easy to clean, repairable, easy to maintain, and durable. Wall material shall have the ability to absorb pushpins. Wall surface shall be able to withstand tape peeling. Where drinking fountains and/or lavatories are provided, a minimum 48” tall wainscot that is impervious to water and able to withstand daily sanitizing is required. This material shall extend to the floor and at least 18” horizontally in both directions from the centerline of the equipment.

## FLOOR AND BASE:

Salient characteristics include seamless, easy to clean and maintain. A base material, appropriate for the flooring material used, is required. Base shall be seamless except at inside corners. Base shall be sealed to floor with USDA or NSF approved caulking.

## PLUMBING:

A drinking fountain (non-refrigerated, similar to Halsey Taylor model HRFGE) is required on the wall near the toilet area as shown, mounted so that top of drinking fountain is 17” above

finished floor. Plumbing for toilet/lavatory area, diaper changing table, and food preparation snk area is also required.

**MECHANICAL (HVAC):**

One exhaust fan providing 100 to 150 cubic feet per minute shall be provided directly over the diaper changing station. Room temperature shall be measured and maintained at 1 foot above finished floor. Temperature will be designed for 68 °F in the winter and for 78 °F in the summer.

Humidity Control. A relative humidity of between 35 and 50 percent will be maintained to prevent drying of mucous membranes, to control the spread of diseases, and to prevent mold growth.

**POWER:**

All electrical outlets, except for those mounted above countertops, shall be mounted 54" above the finish floor, and shall be Hospital grade, tamper resistant safety type. Outlets provided above countertops shall be located no less than 18" from the edge of the countertop. Two electrical outlets to be provided above the backsplash (food preparation counter/sink). Electrical outlet to be provided for under the counter refrigerator. Electrical outlet, data port and intercom phone connection at sign in desk to be provided. Provide task lighting at sign in desk, installed on underside of upper cabinets. A minimum of 1 (one) outlet will be provided above the cubbies in the program area and will be mounted horizontally.

**TECHNOLOGY/AV:**

No technology requirements.

**SOUND:**

**Sound system**: Flush recessed speakers, 25 watt minimum output rating, capable of reproducing the entire audible range for human speech. Link speakers to paging system.

**WINDOWS AND DOORS:**

Doors, frames, and hardware shall be able to withstand constant opening and closing. Doors shall be provided with finger guards at the hinges, on the Activity Room side, up to a minimum height of 48". Finger guard shall be roll type. On exterior doors, finger guards shall not conflict with weather stripping. Interior doors shall be a minimum of half-height glass, with a clear width opening of 34 inches and shall be provided with a 12-inch wide side lite on the latch side of the door. Exterior door shall be provided with flush panic hardware, shall have a clear width opening of 34 inches, open at least 110 degrees to ensure ease of crib emergency evacuation, and direct exiting onto the outdoor play space. Interior and exterior doors shall swing in the direction of exit travel. Door thresholds and hardware will be designed to facilitate the exit of a crib containing five infants by a single adult. The thresholds will have a low profile. Doors shall be provided with self-closing device.

**FIXED EQUIPMENT;**

- **CABINETRY:** Salient characteristics include easy to clean, maintain, and repair. Cabinets shall be durable and be able to withstand impacts (examples: food carts, push toys, etc.), without showing damage. Cabinets shall be a minimum of Architectural

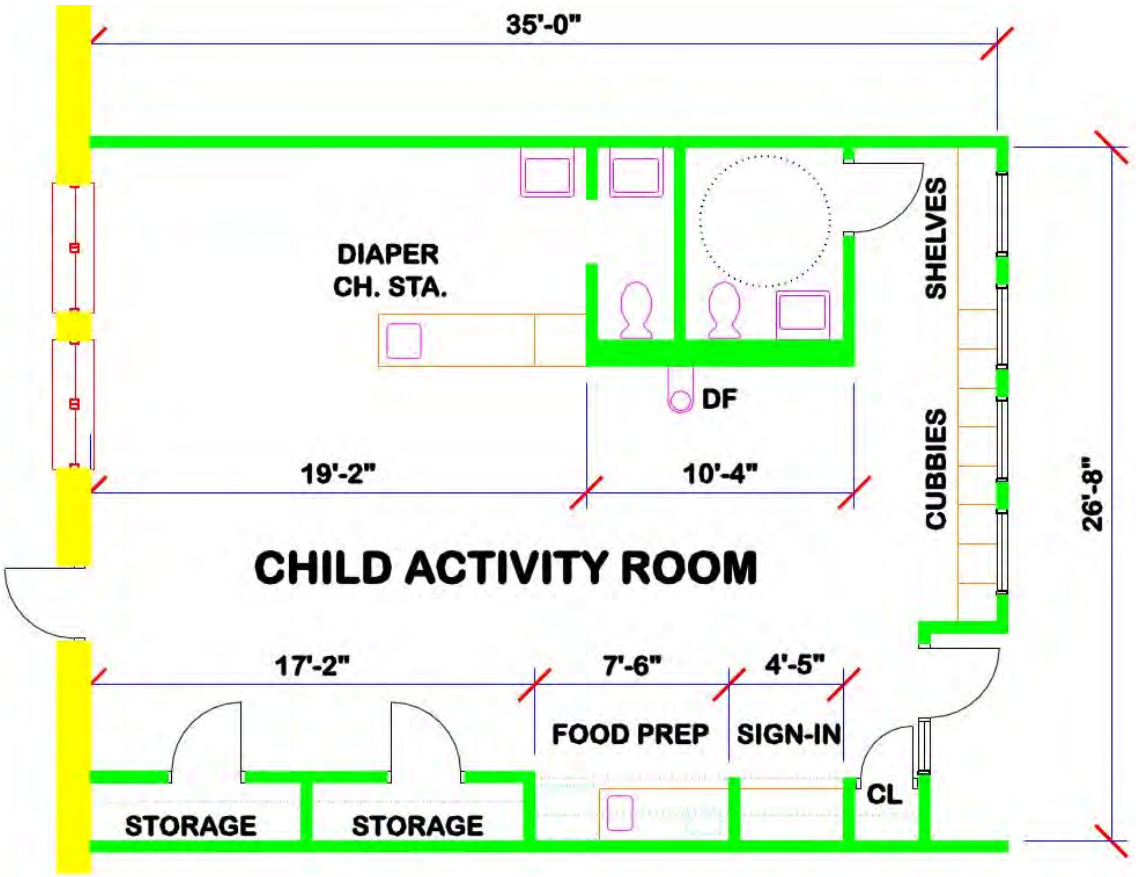
Woodworking Institute (AWI) 400B, Custom Grade, High Pressure Laminate clad. Counter top shall have integral back splash, and shall be solid surfacing, solid phenolic, or better. Counter tops of cabinets will have rounded/radius corners and edges.

**(a)** A 3'-6" wide sign-in desk with 6 lockable storage units in an overhead cabinet, and an adjacent 18 inch wide coat closet.

**(b)** 8 foot wide base and wall cabinets with stainless steel sink. Sink shall be provided with gooseneck faucet. Sink bowl shall be a minimum of 21" W x 15-3/4" D x 8" H. Space shall be provided for an undercounter refrigerator. Base cabinets shall be lockable, and may not have a protruding handle. All base cabinets in the facility shall be keyed alike.

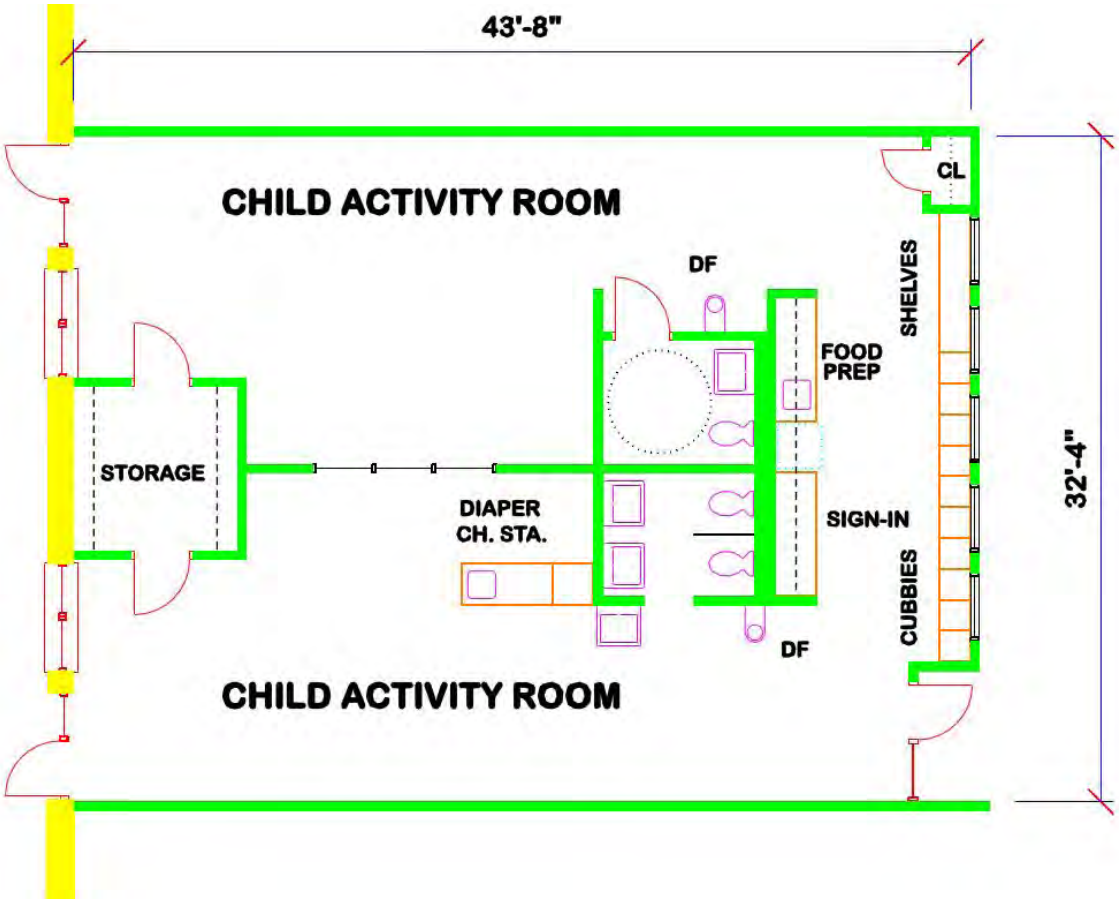
**(c)** 14-15 pre-school cubbies, 8"-12" wide x 15" deep x 46"-49" tall permanently attached to walls (pre-manufactured). Provided by Building Contractor.

**(d)** One diaper changing station approximately 2 foot wide by 5 foot long cabinet with sink integral to diaper changing surface, and retractable stairs. Refer to illustrations in the Army Standard Design.




## Small Child Care

933 Square Feet




## Large Child Care

1412 Square Feet

# GYMNASIUM

## FUNCTION/DESCRIPTION:

The gymnasium is a dedicated space for team activities and competitive play, which includes basketball and volleyball. Multiple court gymnasiums with divider curtains will accommodate simultaneous activities. In facilities with 3 or more courts, the option exists to provide two separate gymnasiums. One of the gymnasiums shall be provided with the wood floor. The second gymnasium may be more of a multi-purpose space, if desired by the installation. If programmed, a suspended indoor jogging/walking track shall be provided, typically around the perimeter of the gymnasium.

## ESSENTIAL DESIGN REQUIREMENTS:

- Minimum clear heights must be maintained.
- Safety padding must be provided on the wall behind backstops. Doors, windows, electrical panels, etc. shall not be located in this area for safety reasons. This will require careful planning of door locations, as well as any other item that may be on or in the wall that would result in no padding.
- Floor must be striped for basketball and volleyball, with a tournament basketball court located perpendicular and centered within 2 regular basketball courts. All basketball courts shall be to NCAA standards.
- Gymnasium storage must be provided that opens directly into the gymnasium.
- If a tournament court is provided, it must be perpendicular, and superimposed over the normal courts. Retractable bleachers must be provided to provide spectator space for the tournament court. It is recommended in gymnasiums with 3 courts, that the tournament court is superimposed over 2 courts. However, if the installation prefers, the tournament court may be centered within the gymnasium.

## DIRECT ADJACENCIES:

- Restroom facilities, other than those in the locker rooms, will be provided to support the gymnasium spectators.
- Team Locker Rooms can be provided adjacent to the Gymnasium for game use, but the area for these elements must be deducted from the structured activity module.
- Adjacency to the Control Desk is required for check-in and equipment issue.
- Drinking fountains. Drinking fountains are not to be provided where there is a wood floor.

## INDIRECT ADJACENCIES:

- Activity Components
- Locker Rooms

## CEILING HEIGHT:

Minimum unobstructed height is 28'-0". Lights, speakers, structure, etc., must be above the 28’ height.

**CEILING FINISHES:**

**General provisions**: Exposed structural and mechanical systems are typical.

**Structural Considerations**: Roof trusses are typically designed to minimum load values for the spans involved resulting in the most economical truss (by weight) that can be provided. Gymnasiums have additional truss mounted loads that must be taken into account:

- Suspension of basketball backstops
- Divider Curtains and drapes for temporary backdrops
- Ductwork
- Lighting, Temporary Theater Lighting and Sound Equipment
- Company or squad decorative banners
- Suspended jogging track

The Engineer also has the responsibility of reviewing the pattern of the truss webs to coordinate passage of HVAC ductwork and installation of the correct lighting pattern. This should be done in consultation with the structural engineer at the earliest possible date.

**Acoustical Decking**: Provide a flat panel, or exposed cell perforated metal deck with cell depth as required. Minimum sound absorption factor shall be 0.47, with a NRC of 1.00. Absorption values of 0.68 to 0.83 are easily reached for long span acoustical decks. Obtain highest level possible in new construction. Design sound quality should be "lively" with no reverberation.

Critical item: Applied acoustical treatments are not recommended.

**Ceiling Finish**: "Dry-fall" or "wet-fall" paint system for decking and trusses. Deck painted in white or off white preferred for maximum lighting distribution. Contrasting color of trusses and ductwork offer an opportunity for accent colors.

**WALL MATERIALS:**

Recommended wall construction for gymnasiums is an interior wythe of 8 inches thick to 12 inches thick concrete block, with 2 inches of rigid insulation in the wall cavity and a veneer system suitable to the context of surrounding buildings. The two most common structural systems for tall multi-wythe masonry walls are 1) load bearing masonry, or 2) steel frame with non-load bearing in-fill partitions. Concrete masonry units (CMU) recommended to be moisture controlled Type 1, normal weight, hollow core.

**Safety:** Minimum safety requirements provide for wall-mounted padding, meeting all applicable safety requirements, to be permanently affixed to the walls behind each backboard.

**WALL FINISHES:**

Standard block with water based epoxy coating, semi-gloss. Apply a heavy acrylic block filler spray applied and backrolled to a pinhole free surface, and two epoxy finish coats of 5 to 6 mil Dry Film Thickness (DFT). Ferrous metals (doors and frames): water based epoxy.

Apply one coat primer compatible with finish coat, and as barrier coat to factory primer. Two finish coats of 5 to 6 mils DFT.

**FLOORING:**

**BALLCOURTS:**

**Substrates**: Where possible, provide a min. 4 inch thick, level concrete slab on grade over properly graded crushed stone sub-base, with a 10 mil polyethylene sheet vapor barrier located directly between the slab and the subbase. Where continuous water is anticipated beneath floors due to local conditions, a subsurface drainage system is recommended.

**Ballcourt floors**: Machine milled and formed solid maple strip flooring that meets or exceeds MFMA (Maple Flooring Manufacturers Association) specification for a "second or better" grade. Expect some visual variation in color in the wood, but otherwise free from defects. Flooring materials to meet DIN Standards. Provide all lines for basketball (per NCAA specifications) and volleyball. In gymnasiums with 2 or more courts, there will be a tournament cross-court as well. Synthetic flooring may only be provided with approval from the Installation and the Center of Standardization (COS).

**Size and construction**: 25/32 inches thick x 2 ¼ inches width minimum. It is extremely desirable to provide 25/32” thick flooring with the same wear depth as 33/32” thick flooring for extended longevity through multiple sandings. Provide a floating system with two bonded bi directional plywood backing layers, supported on solid neoprene cushion pads (3/4 inch high) for an overall performance of 90% or better ball rebound with 53% or better force reduction, or other approved gymnasium flooring system which meets these DIN standards. Floor will be rigid but with minor "give" during normal play.

**Flooring accessories:**

Holes for volleyball support posts shall be drilled through the wood floor. Inserts are cast in place with the formation of the slab on grade, or post drilled. Coverplates are used to conceal holes through wood floors when netting equipment is not in use.

**Court overruns:** Provide 10’-0” of unobstructed space around the perimeter of each regulation-size basketball court. Provide 15’-0” minimum between courts.

**NATURAL LIGHTING:**

It is recommended that natural light be allowed into gymnasium spaces through the use of windows and / or overhead skylights. Wall construction will control the ease and relative cost of creating such openings. Avoid glare in window placement, and consider use of translucent wall panels to avoid glare and control heat gain. Linear skylights may be used to enhance natural lighting and enhance visual appeal of the module. Recommend an aluminum framed, gable type skylight with laminated safety glass. Glass should have visible light transmittance of no less than 56% to provide significant light to the floor. Again, pay close attention to direct sunlight and glare.

**PLUMBING:**

**Water fountains**: 1 unit per two courts. A unit consists of either two water fountains in a single unit combination, or two separate units side by side to allow for one unit to be mounted at ADA height. Electrically cooled unit required. One cuspidor minimum adjacent to fountains. Water fountains shall be fed from dedicated 120V, 20A circuit(s). Water fountains shall be located outside of the gymnasium, in close proximity to an entrance to the gymnasium, to avoid damage to the wood flooring. It is recommended that water fountains be placed outside normal traffic paths and recessed into the wall plane if possible.

**MECHANICAL (HVAC):**

Mechanical heating, ventilation, and humidity control of the module is mandatory. Shall exceed the current ASHRAE requirements.

**Operating range**: System able to maintain 68 - 74 degrees (F) year-round at 50% relative humidity or less. Shall meet or exceed ASHRAE 62 for the ventilation rate.

**Temperature controls**: Independent to room, solid state and programmable. Ability to control peak and off-peak temperatures with 24 hour or one-touch setback programming recommended.

**Air movement / control**: Fully ducted supply and return. Spiral duct for exposed use within gym module. Main supply with one branch duct per court, minimum. Directional diffusers mounted to spiral duct system shall be engineered for maximum throw and even distribution over courts areas. Return air may be centralized but locate low to floor. No through-wall relief dampers. Natural (non-mechanically driven) ventilation is not allowed. Smoke and combustion duct detectors will be required.

**Acoustical performance:** Insulate all supply ducts and moderate air flow to reduce noise. Isolate all air handling equipment in a separate mechanical space dedicated for that use. Provide sound dampening for all equipment.

**LIGHTING:**

High Intensity Discharge (HID) fixtures are not required. Lighting selected shall be identified as suitable for the intended use and lighting design shall meet IESNA recommendations for Basketball Sports-Lighting, Class III (Class of Play). In general, lighting levels shall be a minimum of 50 foot candles at floor level, adjustable up to 80 foot candles. Fixtures shall be mounted not less than 28' above the finished floor. For overhead locations, protect luminaires with wire cages and/or provide appropriate shatterproof enclosed luminaires. Switching for lighting control shall provide different lighting options to take into account natural lighting and different activities (such as boxing matches, etc.). Do not locate fixtures directly above basketball backboards. Lighting control shall be located in a controlled area to avoid accidental and unauthorized switching.

**POWER:**

Scorer's table is generally located for one designated court, at mid court, and requires one (1) 4-outlet, 20 amp power outlet and two (2) Cat5 or better data connections, both in recessed floor boxes, centered under the anticipated table location, but outside the court

boundaries. Solid brass cover plates shall be provided for these outlets for when scoreboard equipment is not in use to provide good ball return value and skid resistance.

**TECHNOLOGY/AV:**

At a minimum, all facilities shall provide electronic scoreboards. Scoreboards to be visible to officials and players and be appropriate for programmed sports. If consistent with the mission of the facility, consider providing video connections, wall mounted in gymnasium for portable video camera use, with outlet linked via cable, to monitoring equipment (i.e. video recording, multiplex video control /output, TV monitors, or base wide cable system). Provide one recessed floor box mounted (1) 4-outlet, 20 amp duplex power outlet centered under the anticipated scorer's table location, but outside the court boundaries. Provide two directly interconnected communications outlets in gymnasiums for time clock and scoreboard connections. One outlet shall be recessed floor mounted with cover at the scorer's table location and one shall be wall mounted at the scoreboard location. Each outlet shall consist of one Cat 6 communications jack and one coaxial TV connector.

**SOUND:**

Wall mounted speakers for public announcements.

Sound system: Built-in system for announcing events in the Gymnasium. Wall mounted speakers, 50 watt minimum output rating, capable of reproducing human speech, minimum. If multipurpose functions are considered, provide speakers capable of CD quality sound reproduction of music.

**WINDOWS AND DOORS:**

Views into the space from the lobby/control counter are required to the greatest extent possible. Views to other spaces and admittance of natural light are also recommended. Non-operable windows are mandatory for temperature / humidity control. Aluminum or hollow metal frames are recommended. Aluminum only for exterior openings. Tempered safety glass should be typical to the module. The potential for injury does not warrant selective location of safety glass. Avoid locating doors directly behind backstops for safety reasons.

**Sun Shading devices**: If natural lighting through windows is anticipated, shading devices may be necessary to avoid glare across courts at certain times of the day. Permanently mounted shading elements limit design flexibility and are unnecessary for a majority of module use time. A more cost effective solution to glare is a reduction in visible light transmittance of 38% to 18% in exterior insulated glazing, when floor level or tall windows are desired, without cost of shade devices. It is recommended to minimize east and west facing glazing, and provide adequate exterior shading on south facing glass.

**Storage:** A storage room is required per the standard. The storage room shall be provided with a minimum of one pair of 4'-0" W x 8'-0" H doors with no center mullion (opening size 8'-0" x 8'-0"). Consider a roll-up door as an option.

**FIXED EQUIPMENT:**

**Basketball backstops**: Two per court, overhead mounted and electrically operated forward folding type. Mounted to trusses with provided pipe support frame.

**Rectangular glass backboard**: NCAA official size (3'-6" x 6'-0") fabricated from ½ tempered glass with continuous edge gasket mounted with aluminum flange and breakaway rims.

**Goals**: Safety reflex type, with 5/8" steel rod ring and "no-tie" steel attachments. 120 thread, retarding type netting.

**Divider Curtains**: For multi court gyms, divider curtains shall be provided between each standard basketball court. Curtains to be electrically operated vertical-folding/rolling mesh fabric with solid vinyl bottom panels. Curtain shall be fully retractable to the bottom of the structure. Curtains are mounted to bottom of trusses on steel subframes. Lower panels are of solid polyester reinforced vinyl fabric, 18 oz./ sq. yd. min weight, to a height of 2'-8" above the finished floor. Middle Mesh is vinyl coated polyester mesh weighing not less than 6 oz. / sq. yd.- from 2'-8" to 18' above the finished floor. Upper curtain portion is generally open to structure above.

**Volleyball**: Steel posts of hollow tubes 3 ½" diameter with powder coated or zinc plate finish. Nets are tensioned to the posts by use of a ratchet winches with removable handles.

**Floor plates and sleeves**: Galvanized steel tubing, mated to the post diameter, is cast into the floor and the hole is covered with a solid brass plate with removable lid. Solid brass floor covers required to provide good ball return value and skid resistance. Use of flip up cover plates is not allowed. Plate lid must be removed from the area of play to prevent injury.

**Nets**: Specifically designed for volleyball use, black, with heavy web sides and bottom. Double sewn vinyl top binding with rope cable and antenna (for out of bounds markers).

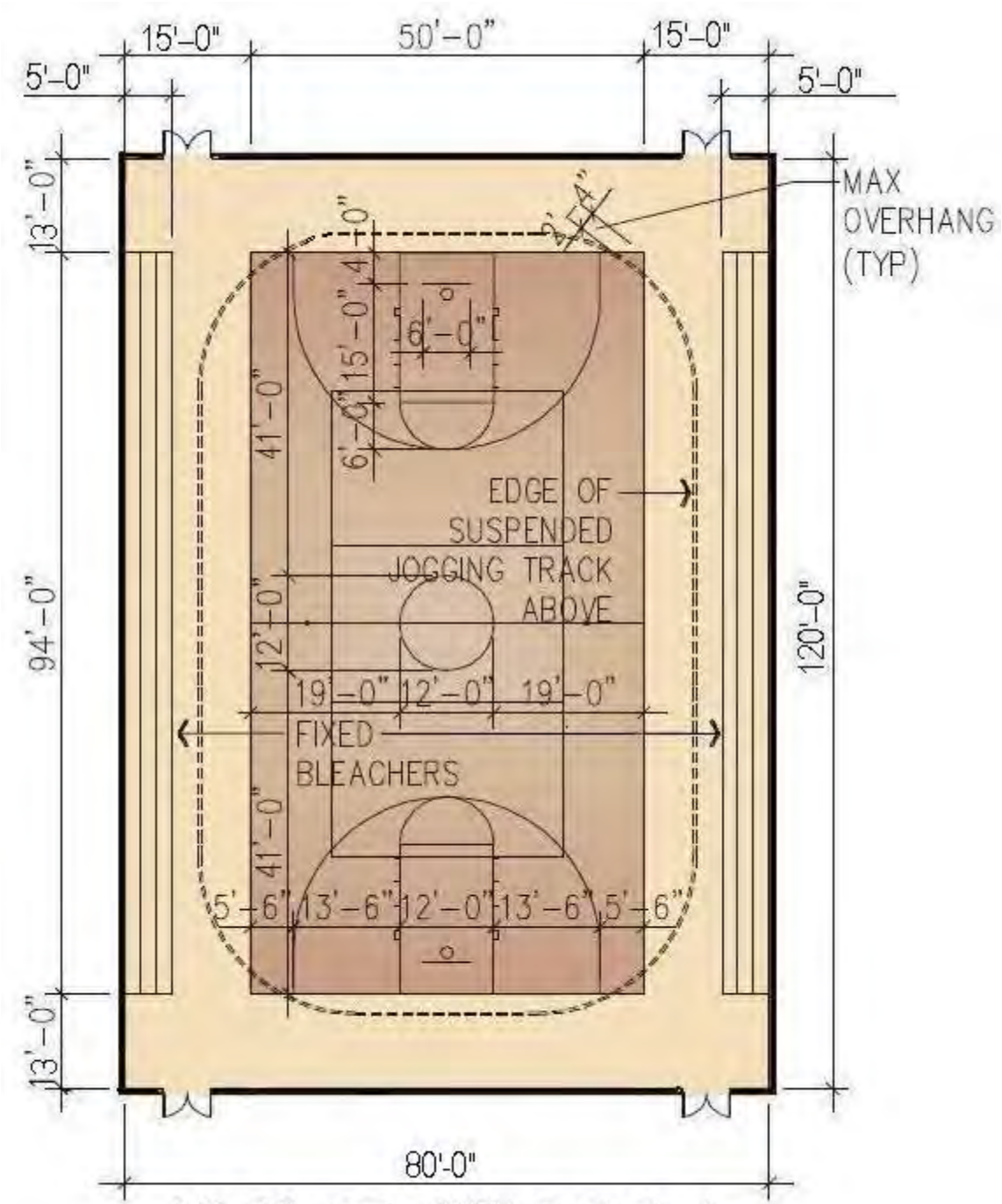
**Post padding**: All posts must be padded during use. Provide a 6'-0" high, 1" polyurethane foam core, vinyl covered pad. Designed to wrap the pipe with Velcro closures.

**Bleachers:** If a tournament court is provided (which is typically the case), retractable, wall-mounted bleachers shall be provided on both sides of the tournament court, the full length of the court. These bleachers shall be electrically operable with manual override, and shall be sized to accommodate normal spectator requirements, as allowed to provide the adequate safety zone around the basketball court, and to ensure adequate headroom under the track. Bleachers on the side wall(s) of the standard basketball courts shall be 3 row, tip and roll, aluminum bleachers (purchased by others). In the diagram below, these are referred to as “fixed bleachers” in that the rows are fixed. These fixed bleachers shall be provided for as many courts as possible.

**Miscellaneous:** Two shot clocks shall be provided for each court (assume 1 shot clock for each backboard). For intramural courts, a minimum of 1 score board is required for each court. Two score boards may be required if a single board can not be viewed by spectators. For tournament courts, either 2 score boards or a center hung 4-sided score board shall be provided.

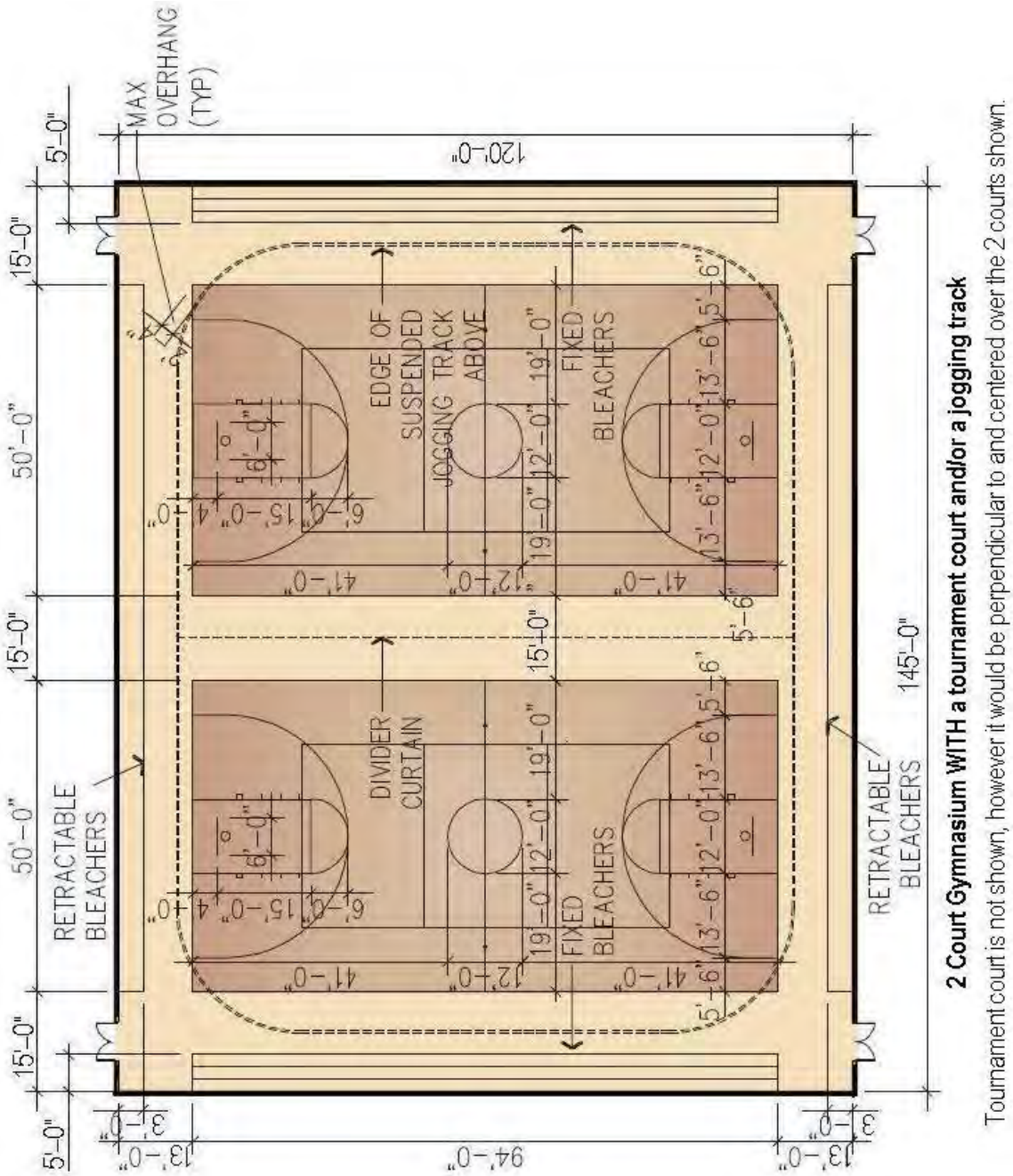
**ARRANGEMENT:**

Provided below is the recommended layout for a 1-court gymnasium with a jogging track. It is slightly less than the area shown in the Army Standard, however it complies with all safety requirements. If no jogging track is to be provided, the length of the gymnasium may be reduced from 120'-0" to 114'-0", with the extra space added to the Structured Activity Module for use in functional areas elsewhere in the facility.



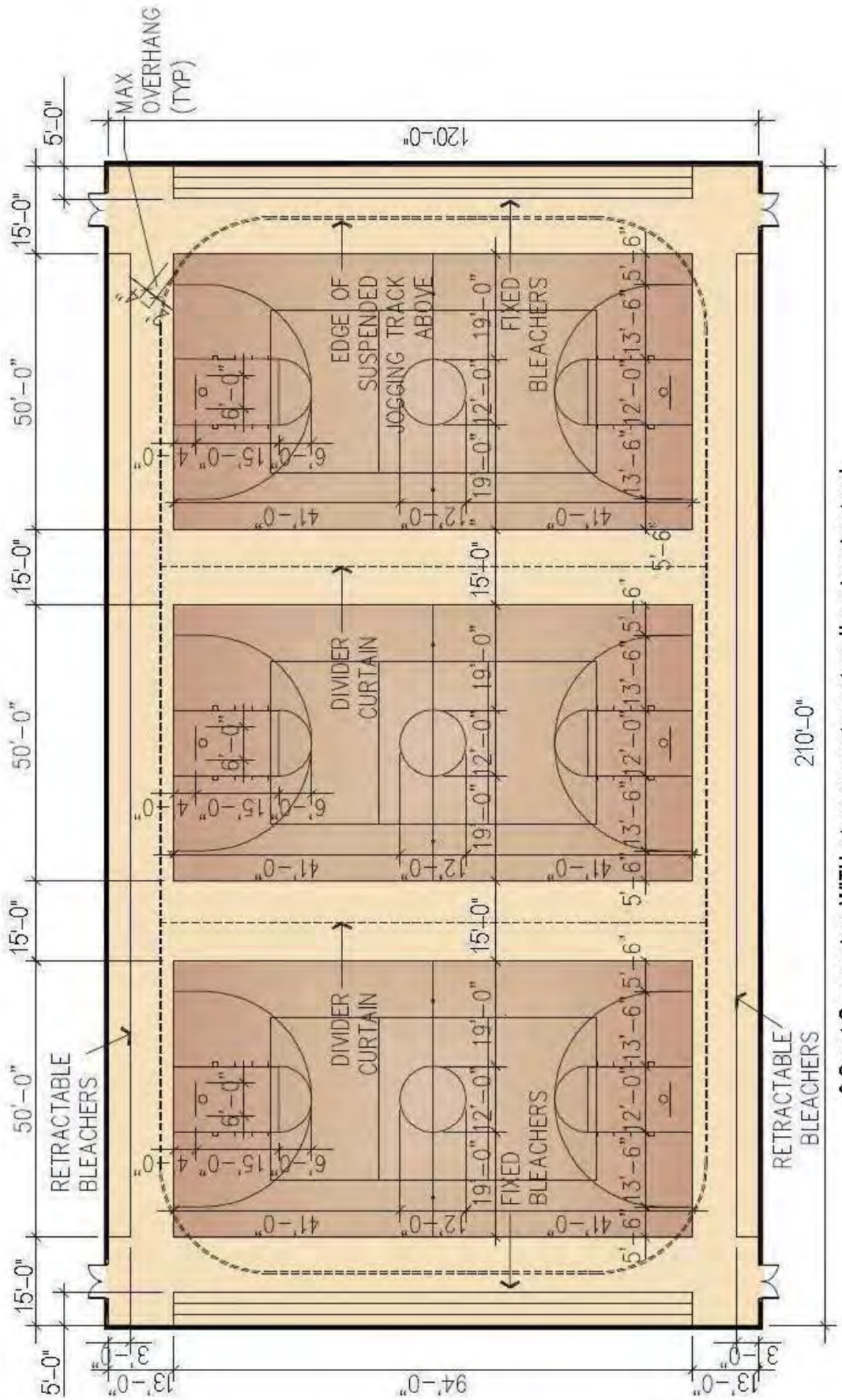

1 Court Gymnasium WITH a jogging track

Provided below are the recommended layouts for a 2-court and a 3-court gymnasium. In most cases a jogging track and/or a tournament court will be provided, which will result in the larger layouts shown below. If a jogging track is provided, but no tournament court, the retractable bleachers shown will not be provided. There will be no reduction in the dimensions. If neither a tournament court nor a jogging track is included in the project, the gymnasium will be reduced to the dimensions as shown in the smaller diagrams on page 37, with the building area saved added to the Structured Activity Module for use in functional areas elsewhere in the facility.

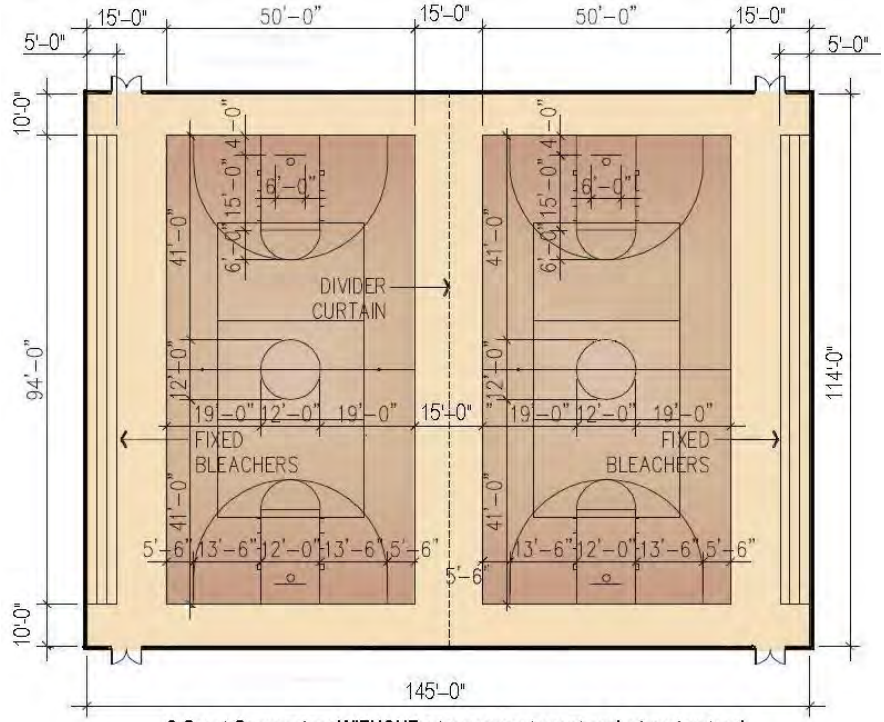



**2 Court Gymnasium WITH a tournament court and/or a jogging track**

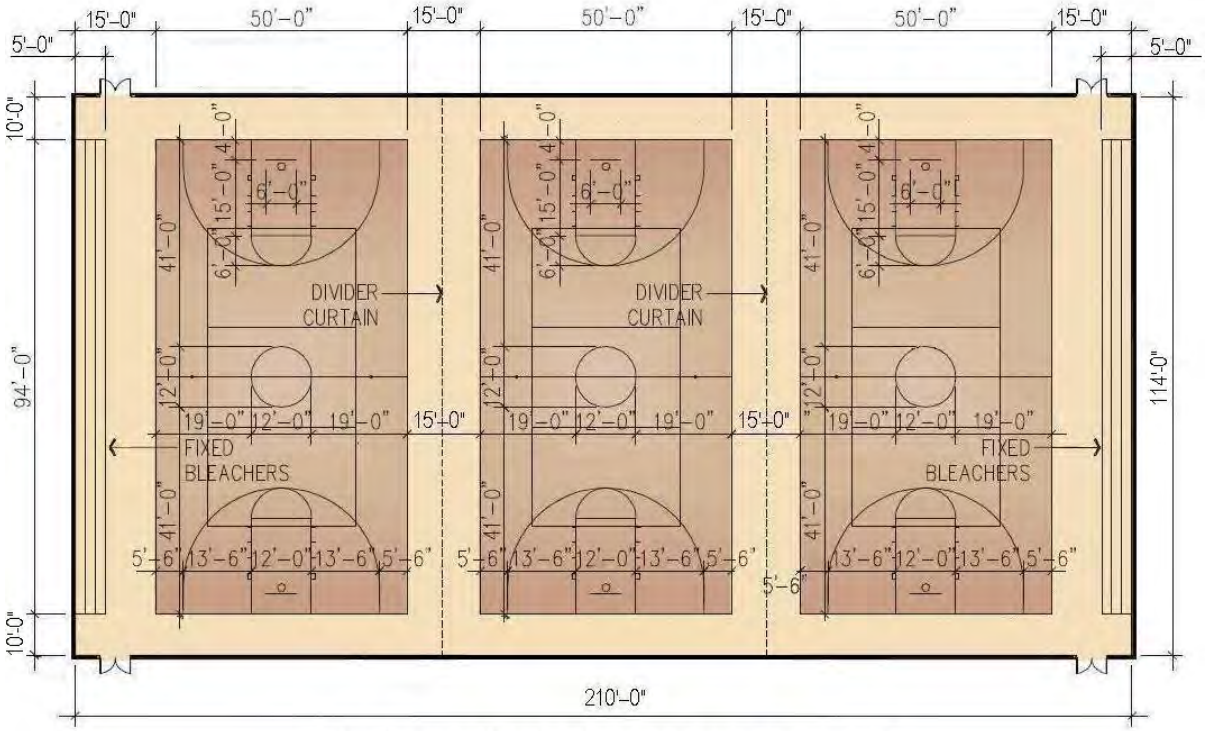
Tournament court is not shown, however it would be perpendicular to and centered over the 2 courts shown.




**3 Court Gymnasium WITH a tournament court and/or a jogging track.**
Tournament court not shown, however it can be perpendicular to and centered over 2 courts, or over all 3 courts.

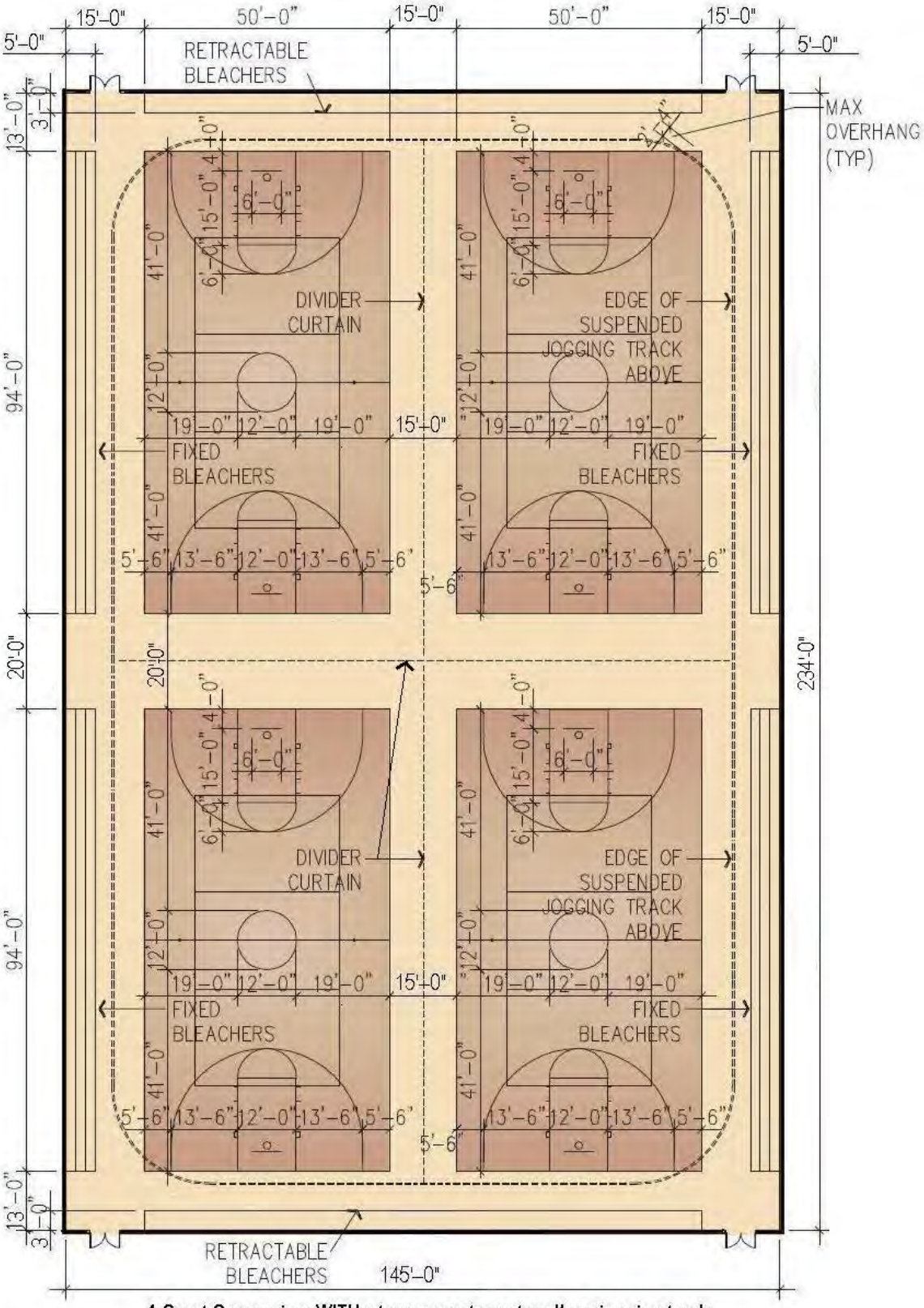



2 Court Gymnasium WITHOUT a tournament court and a jogging track.




3 Court Gymnasium WITHOUT a tournament court and jogging track

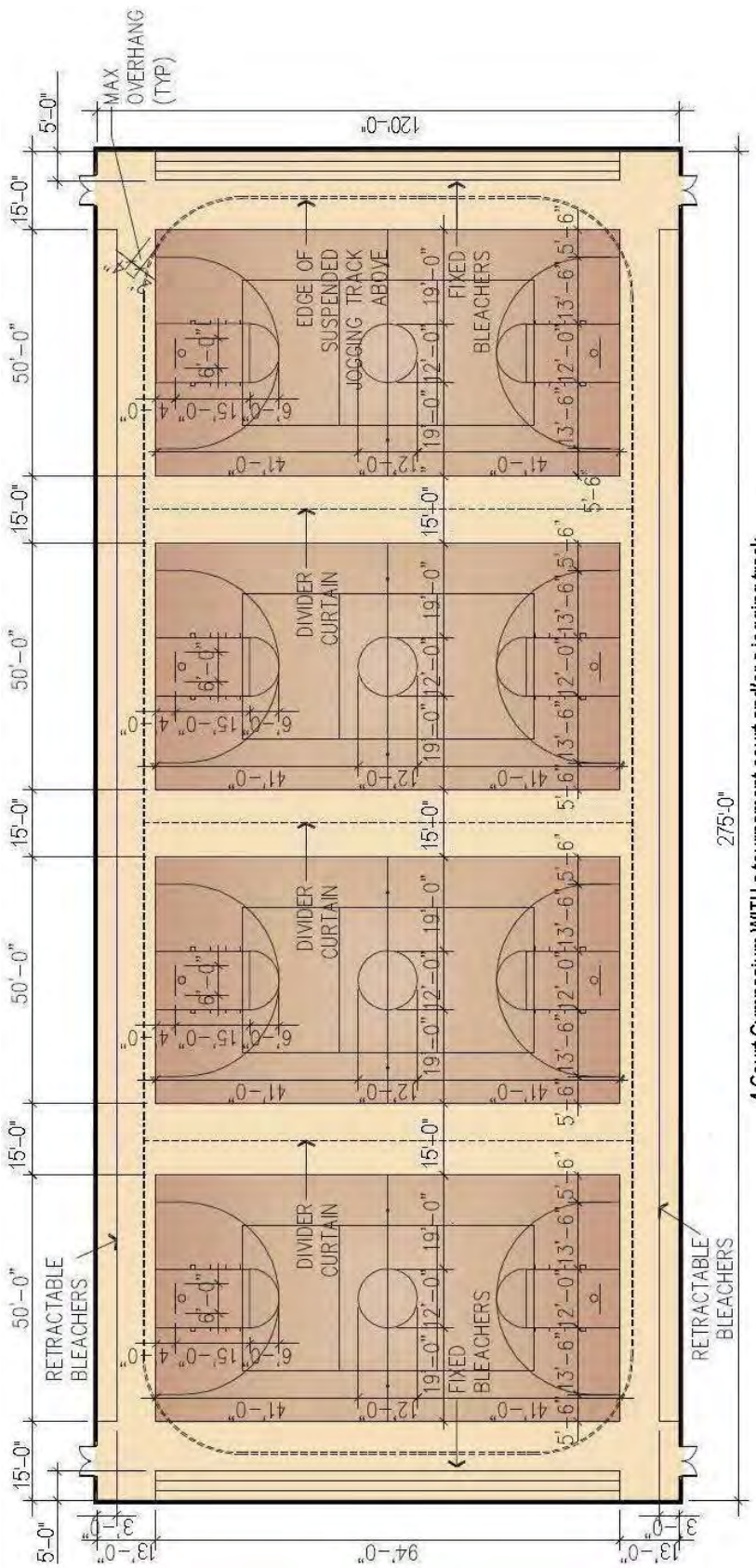
Provided below are recommended layouts for a 4-court gymnasium. Often times, a 4-court gymnasium will be broken into 2 separate gymnasiums. Coordinate with the user to determine their needs. In most cases a jogging track and/or a tournament court will be provided, which will result in the layouts shown below. If all 4 courts are to be in one gymnasium, option A is better for intramural play as fixed bleachers are provided for each court. Option B is better if a tournament court is required, and less emphasis on intramural play since it will allow for the retractable bleachers on both sides. Option A, as shown, is slightly larger than Option B. If a tournament court is not provided, the retractable bleachers will not be provided, however there is no reduction in the dimensions. If neither a tournament court nor a jogging track is included in the project, the gymnasium will be reduced by the 6’ retractable bleachers (2 sets of 3’ deep), and the space savings added to the Structured Activity Module for use in other functional areas.




**4 Court Gymnasium WITH a tournament court and/or a jogging track**

Tournament court is not shown, however it would be perpendicular to and centered over 2 courts

**OPTION A**




**4 Court Gymnasium WITH a tournament court and/or a jogging track.**
Tournament court not shown, however it will be perpendicular to and centered over 2 courts.

**OPTION B**

# INDOOR JOGGING TRACK

## FUNCTION/DESCRIPTION:

The indoor track provides space for running, jogging, and walking. It is expected that the track will be suspended above the gym area as shown in the previous diagrams.

## ESSENTIAL DESIGN REQUIREMENTS:

- Track shall have 3 lanes.
- The inner-most lane of the track shall NOT have banked corners to accommodate ADA requirements. The other lanes shall have banked corners
- The lobby, and track entrance, shall be located as close to the middle of a straight-a-way as possible.
- Lane width shall be 42”.
- The minimum radius of the inside corners is 20’

## DIRECT ADJACENCIES:

- The jogging track shall be directly adjacent to a lobby area with space for stretching. In addition, some pieces of cardiovascular equipment may be located in this lobby area. The lobby area will open directly on to the track without a door to avoid potential conflicts of opening the door while standing on the track. The larger the opening between lobby and track, the better.

## CEILING HEIGHTS:

Minimum 10’

## FLOORING:

Resilient, cushioned running surface, such as rubber or urethane, with permanent lane lines.

## PLUMBING:

Water fountains: An electrically cooled water cooler must be provided in or adjacent to the track lobby area.

## MECHANICAL (HVAC):

Mechanical heating, ventilation, and humidity control of the module is mandatory. The requirements are the same as the space in which the track is located.

## WINDOWS AND DOORS:

It is ideal to provide views to the outside along the track. However, it is important to avoid glare and direct sunlight.

## FIXED EQUIPMENT;

Provide cubbies in the lobby area for storage of smaller personal items.

# LOCKERS, SHOWERS, TOILET, SAUNA

## FUNCTION/DESCRIPTION:

Support space to facilitate showering and changing before and after physical activities. Half and full lockers are provided in each locker room. Showers are programmed to provide individual cubicles with dressing compartments.

## ESSENTIAL DESIGN REQUIREMENTS:

- Individual shower stalls and drying booths for both the men's and women's locker rooms are required.
- If a whirlpool is provided within a locker/shower area, ensure that maintenance can be performed outside of the locker/shower area.

## DIRECT ADJACENCIES:

- Main corridor system
- Major activity components such as Fitness and Gymnasium
- If a natatorium is included as part of the project, or anticipated as an addition in the future, the locker rooms shall be designed to provide an entrance to the natatorium in the wet portion of the locker/shower/toilet area.

## CEILING HEIGHT:

10'-0" minimum in locker area except where furred down. 9'-0" minimum in shower and toilet areas.

## MATERIAL DEFINITION:

"Wet areas" are defined as rooms where direct contact at walls and floors with water is expected. This includes showers, drying areas, and toilet / grooming areas directly adjacent to the showers. Wet areas may be considered "humid" space.

"Humid" is defined as above 60% relative humidity during typical room function over the entire period of normal hours of operation. Humid areas include locker rooms adjacent to showers and toilet rooms open to shower areas. Humidity varies by degree with "high" humidity occurring only in areas with continuous open water sources such as whirlpools, steam rooms, and swimming pool areas.

## CEILING FINISHES:

**General provisions**: Highly light reflective and sound absorbent materials for locker areas. Provide 2'x 4' or 2'x 2' lay-in, wet-formed mineral fiber acoustical panels, on "humid" rated "T" shaped pre-finished metallic grid system. 15/16" or 9/16" wide "T" grids are preferred. Non-directional fissured face designs are preferred to reduce installation cost and waste. Provide "Flush" (Square edge) edge design.

**Sound absorption for acoustical panels**: No less than .55NRC for standard tiles, .70 for film or ceramic faced units.

**Locker Room - Humidity and mold resistance**: Manufacturers offer "plastic" film faced units, ceramic, and painted finishes for humidity and mold control. Most standard tiles are "non-sag" but not mold resistant. Units should be treated for low moisture absorption and mold formation. The most expensive (high humidity resistant) to least expensive (adequate humidity resistance) ceiling tile options are: 1) Aluminum grid with ceramic faced tiles, rated for wet (pools) conditions. Use with extreme peak load activities and constant humidity (100%) produced by existing, deficient air handling systems or constant shower activity. 2) Factory applied paint finish for steel grids rated for "humid" conditions with ceramic faced "high humidity" tiles or "high humidity," unfaced tiles. Recommended as best cost to benefit ratio. 3) Factory applied paint finish for steel grid with "humid" rated tiles. Lower initial cost offset by higher maintenance costs.

**Toilet and Shower - Humidity and mold resistance:** Provide veneer plaster finish on gypsum board or true plaster on mesh lath or plaster base (board) ceilings in shower rooms. Toilet rooms can use painted, suspended gypsum board ceilings. Where shower / toilet room combinations exist, use plaster finished ceilings of either type. Epoxy paint system typical throughout. Use dropped soffits or false gypsum board beams between toilet / shower areas and locker rooms. This will divide ceiling systems and provide a barrier, at the ceiling line, for odor and moisture confinement to the higher humidity areas.

**WALL MATERIALS:**

Provide ceramic tile, full height in showers, behind toilets and urinals (as per most health codes), and as a 4' high wainscot throughout the room(s). Minimum acceptable is "full" height ceramic tile defined as 6' - 8' above the finished floor at toilets, full height at showers and deleted elsewhere. Use gloss finish tiles. Consider creating a pattern of accent tiles or trims in complimentary colors to improve visual appearance. Avoid using darker colors as the main background color. Partial height ceramic tile or fiberglass panels in shower units are not allowed. Use bullnose edge tiles at all outside corners. Use coved base tiles to match wall or floor system. Do not use wood base. Do not use rubber or vinyl base in wet areas.

Where ceramic tile is not used, epoxy paint system is required for optimum moisture and stain resistance.

**FLOORING:**

**Locker rooms:** Slip-resistant quarry/porcelain tile floor to match shower and toilet rooms. As an alternative, only when approved by the user, solution dyed, level loop nylon carpet, with microbial treatment for resistance to mold and mildew can be used. Carpet to be 26 oz yarn weight, 45-60 oz finished weight with woven polypropylene backing. 5/64 gauge minimum. 10 year wear / abrasion warranty. Minimum pile height .166" to .1875".

**Shower and toilet rooms:** Ceramic mosaic tile. 2" x 2" preferred. Mud set with floors sloped to drain. Slope to drain in showers (located one per cubicle), keep flat in toilet rooms with slight depression around floor drains. Overall floor slope should not exceed 1/2" in 10'-0". Wet and dry skid resistance is the priority. Non-glazed mosaic tiles for floor use are typically provided with a roughened face texture. Natural (flat) finish tile may also be satisfactory.

**PLUMBING:**

Plan on grouping toilets and urinals. Whenever possible, provide back to back plumbing for efficiency. Locker rooms and wet areas should be separated by a full-height barrier. Provide automatic sensors for faucets and toilets/urinals. One, electrically cooled, two station unit, designed for ADA use, shall be provided in each locker room or one unit shall be located directly outside the main entrance to the locker rooms.

**Floor drains**: Provide one drain per shower, and one floor drain per 250 square feet of floor area. Typically, one drain centered near toilet / urinal wall is adequate for unexpected overflows.

**MECHANICAL (HVAC):**

Mechanical heating, ventilation, and humidity control of the module is mandatory. Shall exceed the current ASHRAE requirements.

Operating range: System able to maintain 70 - 78 degrees (F) year-round at 50% relative humidity or less. Shall meet or exceed ASHRAE 62 for the ventilation rate.

**Temperature controls**: Independent to room, solid state and programmable. Ability to control peak and off-peak temperatures with 24 hour or one-touch setback programming recommended.

**Air movement / control**: Fully ducted supply and return. Dedicated supplemental exhaust for toilets. Passive or plenum return not recommended. Supply diffusers are to be adjustable metal grilles with four-way air movement and blade-type vanes. Return air grilles may be perforated plate or blade type. All diffusers to be pre-finished.

Ductwork shall be insulated sheet metal rectangular or circular duct routed adjacent to diffuser locations. Use flexible duct drops to diffusers. Natural (non-mechanically driven) ventilation is not allowed.

**TECHNOLOGY/AV:**

Ceiling mounted speaker for public announcements.

Sound system: Flush recessed ceiling speakers, 10 watt minimum output rating, capable of reproducing human speech, minimum. Speakers shall be weatherproof in wet areas.

Provide for wall-mounted flat-screen televisions throughout the locker rooms.

**WINDOWS AND DOORS:**

Views into the space are prohibited. Aluminum or hollow metal frames are recommended. Natural light can still be provided by use of translucent glazing panels.

**FIXED EQUIPMENT:**

Lockers, benches, wall mounted hair/hand dryers. Lockers must be a minimum of 15” wide and 18” deep. Minimum height is 30” per half locker. Use of “Z” lockers to provide additional height is required. There will be a combination of full-height and half-height lockers, the ratio of which is determined by the installation based on climatic concerns. Lockers shall not be metal or plastic laminate faced, and shall be durable. Solid plastic or color through phenolic is preferred. Lockers will allow for user supplied locks or be electronically locking, based on installation requirements.

## SAUNA

**FUNCTION/DESCRIPTION:**

**General provisions**: A sauna is a supplemental space within the locker area. Guidelines for this module assume the presence of changing rooms and construction quality similar to the gymnasium module. Sauna rooms can take the form of:

1) a custom built space of any size with heating equipment and finishes designed specifically for that space,

2) a prefabricated assembly shipped broken down to the site and reassembled in place with all heating, lighting, controls, and accessories provided, or

3) a hybrid of a field constructed enclosure, utilities and controls, and specialized room finishes, purchased separately and installed on site. The guidelines provided herein are suitable for building any of the three types listed above.

**ESSENTIAL DESIGN REQUIREMENTS:**

- Separate saunas must be provided for men and women. Saunas shared by both genders are not allowed.
- Sauna controls are to be accessible to staff only.
- Provide a panic button in sauna, which is connected to the control desk.

**DIRECT ADJACENCIES:**

Locker Room, Shower, Toilet, Cool-down area

**CEILING HEIGHT:**

8'-0" minimum.

**CEILING FINISHES:**

Plaster veneer over gypsum / cement composition board. Moderately light reflective, smooth trowel finish.

**WALLS:**

Sauna interior finish: ½" thick x nominal 4" wide natural finish redwood tongue and groove boards.

The veneer wall system should be placed over a 3 mil continuous sheet of polyethylene film to act as a vapor barrier and seal the room. The vapor barrier is attached to 1 ½" thick treated wood furring strips at 24"o.c. To insulate the sauna partition and reduce heat loss, in-fill the space between the furring strips with 1 ½" thick extruded polystyrene rigid insulation.

Ferrous metals: Do not use any ferrous metal products within the sauna interior. It is recommended that all fasteners and hardware are stainless steel. Exceptions are noted below.

**FLOORING:**

Machine milled and formed ¾" thick minimum, solid redwood strip flooring mounted on cross aligned ¾" thick redwood sleepers. (Overall floor thickness of 1 ½."). Floor boards are visually run in a single direction in an open slat design with ¼" gaps between boards. Floor loose laid in 2' x 2' modules for easy removal for periodic maintenance / cleaning of the concrete substrate. Recess slab as required.

**PLUMBING:**

No plumbing provisions for this module.

**MECHANICAL (HVAC):**

Outside mechanical heating and cooling is not applicable. Air movement is accomplished via passive ceiling and floor mounted vents, typically 24 square inches total for every 100 plan square feet, assuming 8'-0" ceiling height.

4 air changes per hour.

Temperature controls: Independent to room - Range 170 to l80 degrees F.

Relative humidity 5%.

**WINDOWS AND DOORS:**

Door must open outwards.

**EQUIPMENT CRITERIA:**

**Seating benches**: Expect to provide continuous 24" deep x 18" high, two tier bench seating constructed from 2 x 4 solid redwood boards. Benches are generally arranged along two walls contiguous with one another. Redwood grade for benches is premium grade. Fully sanded and sealed. All edges of every board in the bench construction shall be eased and sanded smooth.

**Sauna dry heat system**: Estimate 1.7 KW per 100 square feet of sauna. Coordinate power with electrical provisions for the space. Factory wired timer for the heating unit is typically provided. Thermostatic and / or heat setting control is usually an option purchased with the

equipment. Controls remote from heating unit housing will need to be coordinated in advance and wired by others during construction.

Provide a unit with a grated 30# or 60# (greater heat storage capacity) lava rock compartment.

Sauna accessories: Room temperature and humidity gauge, wall mounted. Optional towel or robe pegs, wall mounted.

**ARRANGEMENT:**

Provided below are illustrations of locker/shower/toilet/sauna rooms for different sizes of PFF. Another consideration, which is not shown in the diagrams below is the inclusion of a "convertible" locker room. The convertible locker room is a smaller room with lockable access from both the men's side and the women's side. When needs shift, one of the doors can be locked to provide a larger ratio of lockers to a specific gender.

**X-Small:**

**X-Small - Sauna, Lockers, Toilet Module**

**Sauna, Lockers, Toilet**
**Total Square Feet = 2,550 (288 total lockers )**
**Men - 144 Lockers - 48 full, 96 double tier**
**Women - 84 Lockers - 28 full, 56 double tier**

**Small:**

**Small - Sauna, Lockers, Toilet Module**

**Sauna, Lockers, Toilet**
**Total Square Feet = 3,630 (354 total lockers)**
**Men - 231 Lockers - 77 full, 154 double-tier**
**Women - 123 Lockers - 41 full, 41 double tier**

**Medium:**

**Medium - Sauna, Lockers, Toilet Module**

**Sauna, Lockers, Toilet**
**Total Square Feet = 5,887 (573 total lockers)**
**Men - 372 Lockers - 124 full, 248 double tier**
**Women - 201 Lockers - 67 full, 134 double tier**

**Large:**

**Large - Sauna, Lockers, Toilet Module**

**Sauna, Lockers, Toilet**
**Total Square Feet = 9,022 (855 total lockers)**
**Men - 557 Lockers - 185 full, 372 double tier**
**Women - 298 Lockers - 100 full, 198 double tier**

# LOBBY AREA

## FUNCTION/DESCRIPTION:

A transitional space used for visitors and users to check-in upon entry and orient themselves to various activities. Also provides a waiting area. A control counter is required within the lobby to facilitate security procedures and to issue and collect equipment such as basketballs, volleyballs, towels, etc. The Lobby area consists of the Entry Lobby, Waiting/Display area, Control Counter, Equipment Storage, and Vending. The breakdown of individual spaces in the Lobby Area is provided in the chart at the end of the Administrative section.

## ESSENTIAL DESIGN REQUIREMENTS:

Control Counter Requirements:

- Staff MUST have direct visual and physical access to free-weight area. The free-weight area is the location with the largest potential for injury. The staff at the desk must be able to see and respond to any unsafe behavior or incidents immediately. Providing elements that obstruct or impede this are not acceptable.
- Staff must be able to control who enters the building, and be able to provide a convenient check-in arrangement.
- Staff must have visual access or total coverage video-surveillance of cardiovascular area, circuit area, gymnasium and exercise areas.
- Staff must have visual access or video-surveillance of the entrances to the locker room and the general area of the racquetball courts.
- Storage must be provided behind the counter or in an adjacent room for issue items such as balls, towels, racquetball goggles, etc.

## DIRECT ADJACENCIES:

- Entry Vestibule and vertical circulation to upper level areas.
- Control Counter must be adjacent to the free weight area, and must have direct access to this area, for safety reasons.
- The preferred adjacency for the lobby is as a link between the gymnasium and the rest of the facility so that the gym can function independently during off hours when the remainder of the building is shut down.

## INDIRECT ADJACENCIES:

- Corridor system to activity areas.
- Restrooms.
- Laundry.

## CEILING HEIGHT:

10'-0" and above preferred with 9'-0" min. to lowest ceiling element over control desk.

The intent for lobby ceiling design is to encourage interest and traffic into the facility. Bright, open volumes with views into the facility provide that impression. Though higher ceilings will

require an increase in heat / cooling input, it is recommended that the facility utilize the largest volume possible within the space criteria guidelines.

**CEILING FINISHES:**

Highly reflective and sound absorbent materials. If an acoustical lay-in ceiling system is used, consider options for face design that introduce a distinctive element to the lobby space. Recommend use of tegular tiles if a lay-in system is used. Consider lighting placement and lamping types while considering ceiling design. The lobby is the primary area to consider decorative fixtures which may require areas of the ceiling reserved for pendant hung fixtures and/or up-lighting of ceiling features. See lighting guidelines below.

**Additional Considerations**: Other ceiling treatments are acceptable, as described below.

Accent functional areas, "mirror" floor patterns, or improve aesthetics by the addition of single layer, gypsum board "dropped" soffits or bulkheads on metal studs. Use of dropped soffits allows concealment of lower items (i.e. ceiling fans, structure, or utilities) while allowing the majority of ceiling to be increased in height. Install around perimeters of rooms, or across ceilings in an arrangement of "false beams." Area of solid, sound reflective surfaces should not exceed 15% of the total ceiling area. "Modular" soffit arrangement: Where possible, design and size soffits and bulkheads to allow the use of full acoustical panels in each direction. For non-modular areas, center ceilings by using balanced border widths where panels are cut to fit.

If the lobby is a part of an overall large volume area, it is also appropriate to not provide a ceiling. Provide sound absorption through either suspended or wall-mounted acoustical panels or baffles. Consider use of a lower element over the control desk to provide a visual focal point and to bring the scale down to a more human scale.

**Coordinate lighting**: With direct lighting (recessed in ceiling) locate bulkheads and acoustical panel arrangements with the optimum lighting locations first, then consider the pattern of the panels and placement of bulkheads. Consider pendant hung decorative lighting. Where soffits exceed 36 inches in width and/or 12 inches in depth, consider supplemental lighting in the bottom of the soffit to avoid shadowed areas across the ceiling plane or at upper portions of wall planes.

**WALL MATERIALS:**

Consider use of accent materials or textures.

**FLOORING:**

Selection criteria are based on appearance, durability, and yearly maintenance.

Recommendations include terrazzo, porcelain tile, and ceramic tile. Each material has certain advantages / disadvantages. Sealed colored and patterned concrete may be considered as an option for lobby and circulation areas. Plain sealed concrete is not acceptable.

Resilient Tile is not allowed for lobby due to aesthetics and durability. Carpet is not allowed due to high frequency traffic and direct adjacency to the outside.

Each entry shall have a recessed mat, constructed of pre-finished metal retaining strips with nylon fiber, or shredded rubber inserts. Semi-open design. Floor mat recesses shall span the width of the entry opening or vestibule and be 4'-6' long in the direction of travel. Mats are intended to be removable to facilitate periodic cleaning of the mat and the floor recess. Floor drains under the mats are optional but recommended for heavy rainfall or snowfall locations.

**NATURAL LIGHTING:**

Lobby appeal is enhanced by a combination of natural and artificial light. Centrally located skylight or clerestory window for hub type lobby or several smaller skylights/clerestories for linear spaces is highly recommended. Attempt to position natural light to accent control area. The Army prefers the use of clerestory windows over the use of skylights.

**PLUMBING:**

One, electrically cooled, two station unit, designed for ADA use, linked to the public restroom function in or adjacent to the lobby. The drinking fountain count throughout the facility must meet code for peak occupancy levels.

**MECHANICAL (HVAC):**

Outside air infiltration should be controlled with use of a vestibule / airlock with two sets of entry doors.

**Operating range**: System able to maintain 68 to 76 degrees (F) year round at 50% relative humidity or less. Shall meet or exceed ASHRAE 62 for the ventilation rate.

**Temperature controls**: Independent to zone.

**LIGHTING:**

Main module lighting to be a combination of 1) recessed fluorescent down lighting (PL lamps) with pendant hung decorative lighting or 2) pendant hung direct / indirect fluorescent fixtures. Decorative wall sconces or other decorative fixtures are recommended to accent functions or highlight focal points.

Provide lobby lighting control center at control desk. Dimming function is not required but should be considered as an option.

Provide down lighting directly over all control desk counters.

Provide display lighting within casework for merchandising or issue functions at Control desk.

Provide under cabinet lighting of counters where wall cabinets are used. Low profile LED lighting is acceptable under cabinet lighting. In addition, linear low profile fluorescent or "puck" style metal halide is acceptable. Metal halide system requires concealed low voltage power supply.

**POWER:**

Power to circuits as needed to Control Desk, for computer terminals (2 minimum in the X-small and Small, 3 minimum in the medium, 4 minimum in the large and X-large), counter mounted video monitors, multiplex video receiver, tape backup, sound processor for multiple paging sources, music source (such as a CD player) and sound amplifier.

Utilize custom raceway in casework. See Architectural Woodworking guidelines above.

**TECHNOLOGY/AV:**

Main power and communications needs are at the Control Desk.

Empty conduit routing, (recommend 2" min. diameter) for present or future video cabling from security camera sources around facility. Stub up into base cabinets and continue up into ceiling cavity above control desk.

**SOUND:**

PA system shall be provided, and shall be controlled from the Control area. PA system shall be able to broadcast through the entire facility at once, or multiple rooms, or a single room. Shall be able to broadcast voice and music.

**WINDOWS AND DOORS:**

Window and Door requirements shall meet the Force Protection / Anti Terrorism requirements.

Aluminum framing preferred, with hollow metal frames acceptable.

Provide aluminum entrance frames with an insulated aluminum door (i.e. as if for exterior use) with an insulated glass insert for all exterior frames. Option exists to continue use of aluminum framing and aluminum / glass doors within the lobby for openings visible from within the lobby area. Aluminum finishes may then match in color / sheen and durability.

Utilizing aluminum window system framing to create large open views into adjacent activity spaces and /or to the exterior is highly recommended. Window shading devices may become necessary for tall glass with south to southwest exposures. Consider afternoon sun angles and control desk locations to avoid glare conflicting with the control desk monitoring functions.

Tempered glass is typical to the module.

Door hardware: Satin stainless steel or satin finish chrome preferred. High frequency ball bearing butt hinges are an acceptable minimum. Continuous gear-operated hinges preferred. Concealed or surface applied pivot hinges are not recommended. Continuous hinges will require custom color coordination with the door frames.

**FIXED EQUIPMENT:**

**Architectural Woodwork:** For the control counter, provide a visually attractive focal point for 1) entering patrons, 2) control and security functions, and 3) information. The control area shall be contiguous with both the Lobby and Fitness modules. Expect to provide counters and casework for a minimum of two stations / control personnel within a desk area in a small facility. Add 1 person for each size larger than a small. Make provisions for lower counter for ADA access. Provide two tier counter system, more to block view of countertop clutter and controls, than as a privacy barrier. Direct visual control of lobby and fitness areas is critical. "Back wall" (if available) counters may be standard seating height for more extended paperwork functions. A minimum of 50% of the counter shall be standing height.

**Casework: Premium grade**. Recommend all wood construction for flexibility in configuration. Solid wood fronts, veneer plywood exposed sides and knee spaces. Interior dividers may be fused and bonded vinyl or plastic laminate particle board. Recommend only 3/8 inch thick min. plywood for shelving 3'-0" wide and under (1/2 inch thick otherwise), with wood veneer or fused and bonded vinyl finish. Solid wood face edging for shelving and door edges recommended. PVC edging is an alternative.

**Counters**: Solid ½ to ¾ inch thick polymer resin counters. Provide 1 ½ inch dia. half round edges. Avoid square edges toward patrons. Provide stone or solid surface counters for durability (Plastic laminate is not acceptable). Drawer and door hardware: to be commercial grade. Drawer glides to be side mounted, and use ball bearings and/or nylon wheels with minimum 75 lb. capacity for drawers less than 2.0 cu. ft, minimum 100 lb. capacity for drawers between 2.0 and 4.0 cu. ft., and minimum 150 lb. capacity for drawers larger than 4.0 cu. ft. Guides shall be provided with positive out and in stops. Use concealed door hinges and an integral pull or any metal cabinet pull style. Plastic or nylon pulls are not allowed. Provide through the counter grommets for covering holes needed for computer and device wiring from counter mounted devices.

# ADMINISTRATIVE

## FUNCTION/DESCRIPTION:

Administration space (offices, work/break room, meeting space) for facility director and staff.

The breakdown of individual spaces in the Administrative Area is provided in the chart at the end of this section.

## DIRECT ADJACENCIES:

Typically, offices are centralized with individual offices connected to an open office core for shared administrative services. The office suite does not have to be adjacent to the control desk. It is preferred that this area be away from the main entry, as it is desired that the facility portrays an active facility upon entering, as opposed to an administrative facility. If a large Training/Conference Room is provided, it is strongly desired that this room be accessible from the corridor as well as the admin office area. The door into the admin office area should be lockable to avoid access during after hour meetings or training.

## CEILING HEIGHT:

9'-0" minimum.

## CEILING FINISHES:

Highly reflective and sound absorbent materials. Provide 2'x2' lay-in, wet formed mineral fiber acoustical panels, on standard "T" shaped pre-finished metallic grid system. 15/16" or 9/16" wide "T" grids are base selection criteria. Tegular (routed edges) tiles are preferred. Random fissured, non-directional face design preferred. Main offices or conference / office space may benefit from continuing a textured or decorative face tile from centralized office entry points in an office suite. Avoid solid gypsum board ceilings. Perimeter soffits are acceptable. Maintain access above ceilings for HVAC maintenance and future data network upgrades.

## WALLS:

Acrylic latex paint with "eggshell" finish is minimum. Vinyl Wall Covering may also be considered.

## FLOORING:

Carpet is principle material for centralized office suites. Carpet tiles are preferred, the minimum is commercial, solution dyed nylon in 26 oz yarn weight, 45 oz total finished weight. Provide carpet with static control. Increasing total finished weight closer to 60oz is preferred. Carpet should be darker tones and patterned to hide stains. Provide vinyl or rubber base. VCT is allowed in the Administrative areas where carpet is not desired or appropriate.

## PLUMBING:

In the copy/file/work/break room, provide a minimum 1 compartment kitchen-style sink, plus water hook-up for icemaker in refrigerator.

**MECHANICAL (HVAC):**

Outside air is not recommended. Air movement should be controlled with ducted supply to each office. Variable air volume (VAV) devices are recommended for thermostatically controlling individual offices. Office temperature controls may be centralized as a minimum, with individual controls preferred.

Utilize main corridors as ducted or plenum return air paths for office suites.

Provide acoustically lined ducts when routing ducts across several grouped offices.

For sound transfer control between offices, always maintain at least two elbow turns in hard ductwork prior to connecting the main duct run to a flex duct to ceiling diffusers.

**Operating range:** System able to maintain 68 to 76 degrees (F) year round at 50% relative humidity.

**LIGHTING:**

Flush edge lens frames are minimum; chamfered lens frames preferred. Indirect lighting, to reduce computer glare, would be preferred. Add recessed fluorescent downlighting for accent effects in main office or waiting spaces to office suites. Lay-in lighting fixtures with integral HVAC diffusers in a slot arrangement on the fixture frame do not provide a good distribution of air and tend to increase air noise; therefore, these are not recommended.

**POWER:**

In copy/file/work/break room, provide outlets at built-in counter area for microwave, coffee pot, refrigerator, and other cooking devices. Provide ground fault protection of outlets within 6 feet of any water source.

**TECHNOLOGY/AV:**

Data and telephone cable routed to adjacent to convenience outlets, on desk wall if identifiable at time of design. See furniture considerations below.

Competitive sports or training may require the use of video taping to gauge performance. Offices for fitness directors may benefit from a TV and VCR bracket mounted 72' a.f.f. for the purpose of reviewing video tapes.

**SOUND:**

None. Avoid extending paging systems into offices or office suites.

**ACOUSTICAL PERFORMANCE:**

Office walls should maintain an STC (sound transmission class) rating of 45 or better to ensure a minimum level of privacy. This can be achieved typically with a single layer of gypsum board on each side of a metal stud wall extended fully to floor-roof deck above.

If less sound transfer is of primary concern, add 2" thick sound batting to dividing walls in sensitive offices. One additional layer of gypsum board on the room side one is seeking to protect will increase the STC rating to 50-53. Monitor and seal all tops of walls, duct, and pipe penetrations through walls. Sound insulate toilet and roof drain piping in walls shared with offices.

**FIXED EQUIPMENT:**

**Kitchenette Cabinets: Premium grade**. Solid wood fronts. Solid wood face edging for shelving and door edges recommended.

**Counters**: Solid ¾" thick polymer resin counters. Plastic laminate counters not allowed. Drawer glides to use nylon wheels or ball-bearing drawer guides, rated for 50 lbs. minimum.

**MISCELLANEOUS:**

**Furniture Considerations:** It is preferred that offices are designed in anticipation of a particular grouping of furniture. It is anticipated that private offices will be outfitted with a modular U-shaped workstation with a conferencing peninsula with 2 guest chairs. Provide adequate shelves and file storage along with a vertical unit to provide space for coat storage. Open offices will typically be a modular 8' x 8' U-arrangement with a guest chair at the end of one leg of the "U". A vertical unit with file drawers and hanging space should be provided at the other end of the "U". Each office will have an ergonomic desk chair. Once satisfied with a basic arrangement, then power and data ports can be located with greater confidence.

Provide space in kitchenette area for a minimum 18 cu. ft. refrigerator at the end of the counter

**AUTHORIZED PFF SPACE ALLOWANCE**

| ADMIN & LOBBY DETAILED AREAS (Areas in square feet) 2/11/10 | | X-SMALL (251-1000) | SMALL (1001-3000) | MEDIUM (3001-6000) | LARGE (6001-10,000) | X-LARGE (10,001-15,000) | INCREMENT (each 5000 over 15,000) |
|---|---|---|---|---|---|---|---|
| Admin | Director's Office | 120 | 120 | 120 | 120 | 130 | 10 |
| | Program Mgr's Office | 0 | 100 | 100 | 100 | 110 | 10 |
| | Support Staff Workstations | 128 | 128 | 256 | 320 | 384 | 64 |
| | Copy/file/work/break Room | 160 | 240 | 160 | 170 | 180 | 10 |
| | Storage | 20 | 29 | 32 | 36 | 40 | 5 |
| | Classroom/Training Room | 0 | 0 | 420 | 420 | 420 | 0 |
| | Classroom/Training Storage | 0 | 0 | 60 | 60 | 60 | 0 |
| | Internal Circulation, (20%) | 86 | 123 | 230 | 245 | 265 | 21 |
| | **subtotal** | **514** | **741** | **1,377** | **1,471** | **1,589** | **120** |
| Lobby | Estimated Lobby | 230 | 440 | 650 | 880 | 1,090 | 210 |
| | Est. Control Counter/Storage | 300 | 512 | 725 | 938 | 1,151 | 213 |
| | Estimated Public Restrooms | 287 | 515 | 851 | 1,280 | 1,376 | 96 |
| | **subtotal** | **817** | **1,467** | **2,226** | **3,098** | **3,617** | **519** |

# LAUNDRY

## FUNCTION/DESCRIPTION:

Laundry for cleaning and distribution of towels and/or sports gear, and includes extractor(s), tumbler(s), laundry sink, folding table, storage cabinet, and space for laundry carts.

## DIRECT ADJACENCIES:

- Laundry may need to be in close proximity to the Control Area depending upon staffing levels and anticipated usage.
- A connection to a service corridor and one outside wall is also preferred.

## CEILING HEIGHT:

9'-0" minimum.

## CEILING FINISHES:

Highly reflective and moisture resistant materials. Provide 2'x2' or 2'x4' lay-in, wet formed mineral fiber acoustical panels, on phosphatized or otherwise humidity controlled "T" shaped pre-finished metallic grid system. 15/16" or 9/16" wide "T" grids are base selection criteria.

**Face design:** Random fissured, non-directional face ceramic frit (film faced tile) is minimum and preferred.

**Edge design:** "Flush" (square) edge. Avoid textured surface tiles or expending resources on decorative tiles. Laundry issue rooms will require flat, cleanable tiles to maintain their appearance.

**Impact resistance:** Standard durability rating. High impact resistance preferred.

**Humidity:** Non-sag, humidity controlled tiles.

**Material specifications and lighting:** 2’ x 2’ or 2' x 4' lay-in recessed fluorescent fixtures with prismatic lenses, mounted in the ceiling grid are minimum. Fixtures to be rated for damp conditions.

## WALLS:

Must be appropriate for damp/humid location.

## FLOORING:

Sealed concrete floors preferred. Provide 4" raised concrete platforms for washers and dryers.

## PLUMBING:

Provide one exposed hot and cold water manifold with taps at each machine, to serve washing machines. Provide one individual floor drain for each machine, located to the back right corner. Manifold and drains should fall within a 2'0" alleyway created behind any bank of machines. Pipe manifold shall be 36" high at individual taps. Insulate all cold and hot water lines. Provide a laundry sink.

**MECHANICAL (HVAC):**

Outside air is not recommended. Air movement should be controlled with ducted supply and make up air balanced against dryer exhaust. Variable air volume (VAV) devices are recommended for thermostatic control. Ducted return air.

Dryer exhaust ducts will impact headroom clearances if dryers are not located directly on an outside wall. Size dryer equipment as early in the design process as possible. Locate or group dryer ducting and plan for an exhaust route to the outside when locating space.

If gas operated dryers are used, path for vertical flues shall be provided.

Operating range: System able to maintain 68 to 76 degrees (F) year round at 50% relative humidity. Shall meet or exceed ASHRAE 62 for the ventilation rate.

**TECHNOLOGY/AV:**

One data and telephone port.

**SOUND:**

None. Avoid extending paging systems into Laundry rooms.

**ACOUSTICAL PERFORMANCE:**

Guard against sound transfer to adjacent modules with full height walls minimum.

**EQUIPMENT CRITERIA:**

The following is provided as a planning guideline. Commercial washer extractors and dryer tumblers shall be used.

X-Small: Provide one 25 lb minimum commercial washer extractor and two 25 lb minimum dryer tumblers.

Small: Provide one 35 lb minimum commercial washer extractor and two 35 lb minimum dryer tumblers.

Medium: Provide two 30 lb minimum commercial washer extractors and three 30 lb minimum dryer tumblers.

Large: Provide two 50 lb minimum commercial washer extractors and three 50 lb minimum dryer tumblers.

For facilities larger than a large: Provide three 50 lb minimum commercial washer extractors and four 50 lb minimum dryer tumblers.

# CORRIDORS

## FUNCTION/DESCRIPTION:

General building circulation serves to connect spaces visually as well as physically. Corridors should be broken into two main functions, central public axis and service corridors. Service corridors are isolated by doors for security and privacy when possible, and connect loading and off-loading entries to mechanical rooms and main corridors, when required.

## CEILING HEIGHT:

Public corridors: 10'-0" and above with minimum 9'-0" to lowest ceiling element.

Service corridors: No less than 9-'0"

Ceiling heights serve to identify main public corridors and may vary based on the width and visual axis desired within the facility. Gymnasium and Fitness modules utilize high ceilings and connecting corridors should take advantage of vertical views by use of tall interior window systems when possible. Generally, lobby and main corridor ceiling heights should match, with lower ceilings reserved for service corridors and corridors leading to auxiliary spaces serving the main module. If the corridor ceiling must be lower than the Lobby, then the transition between the lobby and corridor needs to be designed so that it is apparent that the corridor is the primary circulation path.

## CEILING FINISHES:

Highly reflective and sound absorbent materials. Provide 2'x2' or 2'x4' lay-in, wet formed mineral fiber acoustical panels, on standard "T" shaped pre-finished metallic grid system. 15/16" or 9/16" wide "T" grids are base selection criteria. See optional considerations below.

**Ceiling design:** Public corridors are to follow level of finish and design utilized in the Lobby module. This includes continuation of dropped soffits or false beam patterns utilized in the Lobby module. Refer to design considerations in that module for more details. Service corridors out of public view and secondary corridors not visually connected to main corridor ceilings may reduce finishes to minimums.

**Material Specification & Lighting:** Refer to Lobby module guidelines.

**Special considerations:** Main corridors will serve as routes for hidden utilities. Use accessible ceilings as much as possible. Avoid large areas of dropped gypsum ceilings as accents in corridors unless dedicated accessible paths for utility routing can be accommodated. Use of gypsum board decorative ceilings should take into account HVAC and plumbing valves, damper and control locations above hard ceilings. These will require access doors to service these devices that will detract from the visual impact of the space.

Where service corridors will be opened to the outside air on a regular basis, use high humidity rated acoustical tiles.

**FLOORING:**

Public corridors can extend the Lobby module finishes. Hard durable surfaces are required. Resilient (VCT) tile is not allowed.

Service corridors: resilient tile preferred with clear or tinted sealed concrete as a minimum.

**PLUMBING:**

A drinking fountain may be required along main corridors. When required, provide one electrically cooled two station unit, designed for ADA use.

**TECHNOLOGY/AV:**

Expect main conduit routing and data cable routing to take place in corridor ceilings.

**SOUND:**

Ceiling mounted voice quality only speakers every 24'-0" o.c. in Main Corridors for paging system. Option to upgrade to music quality speakers if broadcasting of CD quality source is expected. Provide speakers with wide dispersion, 120 degrees or more, for ceilings 12 feet and lower.

# V Appendix

## DEMAND-BASED STUDY OF CRITICAL FUNCTION MODULES

A study of utilization for each CFM in the Physical Fitness Facility was conducted using National Sporting Goods Association (NSGA) statistics for indoor activities. The NSGA surveys sports participation annually for 64 indoor and outdoor activities. The results are published as Series I and Series II. For purpose of this study, data for activities deemed to be appropriate for programming in a typical PFC were extrapolated from both Series I and II Publications and include:

| CFM Component | NSGA Activity | NIRSA Recommended Area |
|---|---|---|
| Exercise Module | Aerobic Exercising | 50SF per participant |
| Exercise Module | Calisthenics | 50SF per participant |
| Exercise Module | Step Aerobics | 50SF per participant |
| Exercise Module | Martial Arts | 125SF per participant |
| Exercise Module | Kick Boxing | 125SF per participant |
| Gymnasium Module | Basketball | 14 participants (10 + 4 rotating) |
| Gymnasium Module | Volleyball | 16 participants (12 + 4 rotating) |
| Fitness Module | Exercising w. Equipment | 50SF per equipment station<br>65SF per free weight station |
| Structured Activity | Racquetball | 4 participants per 800SF Court |
| Indoor Track | Exercise Walking | 1 runner per 20 lineal feet |
| Indoor Track | Running / Jogging | 1 runner 20 lineal feet |

Assuming that the recreational interests of the AD population are similar to civilians, NSGA participation data is utilized to test each building component for meeting peak demand. Peak contact times vary from activity to activity. For instance, classroom activities require an instructor and participants meeting at a specific time. In a typical day with 16 hours of operation, it is feasible to program classes for two hours in the morning, two hours over lunch, and four hours in the evening. On weekends peak times are expected to be mid morning to late afternoon. Thus, the analysis tests a projected group of participants against a peak window of time that is approximately 55% of the total hours of operation per week.

Individual activities, such as exercising with equipment, have longer peak times (90% of hours of operation). While busiest peak times are anticipated to be early morning, users will access Fitness at all times of the day and evening.

The Gymnasium component is anticipated to have the greatest difficulty meeting peak demand because this activity requires a large number of users coming together simultaneously. Team activities are usually scheduled at lunchtime and evening. The number of players is small relative to the amount of space required for court play. Some court activities will have to be conducted in later hours of daily operation or throughout the weekend. Peak gymnasium hours are anticipated to be approximately 60% of the total hours of operation.

The Indoor Track is expected to have a shortfall of peak time. However, many participants will satisfy their needs by running or walking outdoors. Peak time for the indoor track is projected to be 80% of operating hours. As with fitness, individual participants can access the track at all hours of the day or evening.

The tables on the following pages show a total of available ***contact hours*** for each activity. A contact hour is defined as one user occupying one station for one hour. For example, if an Aerobics Room is 1,200 SF and NIRSA safety standards require 50SF of space for each occupant, than there are 24 ***stations*** in the room. For each one hour class there are 24 available contact hours. If the facility is operational for 100 hours a week, there are 2,400 available contact hours per week. The objective of this study is to compare the total peak contact hours for each CFM to a reasonable projection of participants to determine if each CFM is sized sufficiently to meet peak demand. Standard hours of operation are estimated to be 100 per week based on the following schedule:

| PFC TYPE: (250-1000 Pop.) | X-SMALL | | | | ASSUMED MILITARY PERSONNEL: | | 73.9% | x 1,000 | = | 739 |
|---|---|---|---|---|---|---|---|---|---|---|
| WEEKDAY HOURS (M-F) | 6:00 | to | 22:00 | = | 16 hrs. | 5days/wk | = | 80 hrs. | | |
| WEEKEND HOURS (SA) | 8:00 | to | 19:00 | = | 11 hrs. | 1days/wk | = | 11 hrs. | | |
| WEEKEND HOURS (SU) | 8:00 | to | 17:00 | = | 9 hrs. | 1days/wk | = | 9 hrs. | | |
| | | | | | | | | 100 hrs. | | |

One-hundred hours is used as a baseline for the study and does not affect an installation's plans for staffing and operation under the Army baseline operating standards.

## X-Small Facility - maximum population of 1,000 persons - approx. 74% peak users- 100 hours of operation per week

| Aerobic Exercise 1,200 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 84 | x | 3 hrs/wk | 252 hrs/wk | 50 SF/user | 24 stas. | | |
| Step Aerobics | 3.0% | 22 | x | 3 hrs/wk | 67 hrs/wk | 50 SF/user | 24 stas. | | |
| Calisthenics | 5.7% | 42 | x | 3 hrs/wk | 126 hrs/wk | 50 SF/user | 24 stas. | | |
| **TOTALS** | | **148** | | | **445 hrs/wk** | **50 SF/user** | **24 stas.** | | **2400hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **22 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | = | **55 hrs/wk** | **x** | **22 stas.** | = | **1188hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **1188hrs/wk** | **minus** | **445.16 hrs/wk** | = | **743hrs/wk** |

| Non-Structured Exercise 1,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 22 | x | 2 hrs/wk | 44 hrs/wk | 125 SF/user | 8 stas. | | |
| Kick Boxing | 2.2% | 16 | x | 2 hrs/wk | 32 hrs/wk | 125 SF/user | 8 stas. | | |
| **TOTALS** | | **38** | | | **76 hrs.** | **125 SF/user** | **8 stas.** | | **800hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **7 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | = | **55 hrs/wk** | **x** | **7 stas.** | = | **396hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **396hrs/wk** | **minus** | **76 hrs.** | = | **320hrs/wk** |

| Fitness Module (Weight/Cardio) 2,325 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 181 | x | 3 hrs/wk | 544 hrs/wk | 55.4 SF/user | 42 stas. | | |
| **TOTALS** | | **181** | | | **544 hrs/wk** | **55.36 SF/user** | **42 stas.** | | **4200hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **34 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | = | **90 hrs/wk** | **x** | **34 stas.** | = | **3024hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **3024hrs/wk** | **minus** | **544 hrs/wk** | = | **2480hrs/wk** |

| Fitness Module (Weight/Cardio) 2,325 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 480 | x | 3 hrs/wk | 1440 hrs/wk | 55.4 SF/user | 42 stas. | | |
| **TOTALS** | | **480** | | | **1440 hrs/wk** | **55.36 SF/user** | **42 stas.** | | **907hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **34 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | = | **90 hrs/wk** | **x** | **34 stas.** | = | **3024hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **3024hrs/wk** | **minus** | **1440 hrs/wk** | = | **1584hrs/wk** |

| Gymnasium Module 10,200 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 4,700 SF | 1 court/s | | |
| Volleyball | 6.4% | 48 | x | 3 hrs/wk | 143 hrs/wk | 392 SF/user | 16 players | | |
| Basketball | 18.3% | 135 | x | 3 hrs/wk | 406 hrs/wk | 470 SF/user | 14 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **183** | | | **549 hrs/wk** | **430.8 SF/user** | **15 players** | | **1500hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **15 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | = | **60 hrs/wk** | **x** | **15 players** | = | **900hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **900hrs/wk** | **minus** | **549 hrs/wk** | = | **351hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Court 850 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 23 | x | 2 hrs/wk | 46 hrs/wk | 213 SF/user | 4 occup. | | |
| **TOTALS** | | **23** | | | **46 hrs/wk** | **212.5 SF/user** | **4 occup.** | | **400hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **4 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | = | **50 hrs/wk** | **x** | **4 occup.** | = | **200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **200hrs/wk** | **minus** | **46 hrs/wk** | = | **154hrs/wk** |

| Jogging Track 3,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 108 | x | 2 hrs/wk | 216 hrs/wk | | 48 occup. | | |
| Exercise Walking | 28.8% | 213 | x | 2 hrs/wk | 425 hrs/wk | | 48 occup. | | |
| **TOTALS** | | **321** | | | **641 hrs/wk** | | **48 occup.** | | **4800hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **29 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | = | **80 hrs/wk** | **x** | **29 occup.** | = | **2304hrs/wk** |
| **AVAILABLE PEAK HOURS FOR ADDITIONAL PROGRAMMING** | | | | | **2304hrs/wk** | **minus** | **641 hrs/wk** | = | **1663hrs/wk** |

## Small Facility - maximum population of 3,000 persons - approx. 74% peak users- 100 hours of operation per week

| Aerobic Exercise 1,650 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 252 | x | 3 hrs/wk | 757 hrs/wk | 50 SF/user | 33 stas. | | |
| Step Aerobics | 3.0% | 67 | x | 3 hrs/wk | 201 hrs/wk | 50 SF/user | 33 stas. | | |
| Calisthenics | 5.7% | 126 | x | 3 hrs/wk | 378 hrs/wk | 50 SF/user | 33 stas. | | |
| **TOTALS** | | **445** | | | **1335 hrs/wk** | **50 SF/user** | **33 stas.** | | **3300hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **30 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **30 stas.** | **=** | **1634hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **1634hrs/wk** | **minus** | **1335.5 hrs/wk** | **=** | **298hrs/wk** |

| Non-Structured Exercise 1,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 66 | x | 2 hrs/wk | 131 hrs/wk | 125 SF/user | 8 stas. | | |
| Kick Boxing | 2.2% | 48 | x | 2 hrs/wk | 95 hrs/wk | 125 SF/user | 8 stas. | | |
| **TOTALS** | | **113** | | | **226.707 hrs/wk** | **125 SF/user** | **8 stas.** | | **800hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **7 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **7 stas.** | **=** | **396hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **396hrs/wk** | **minus** | **226.71 hrs/wk** | **=** | **169hrs/wk** |

| Fitness Module (Weight/Cardio) 4645 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 544 | x | 3 hrs/wk | 1632 hrs/wk | 56 SF/user | 83 stas. | | |
| **TOTALS** | | **544** | | | **1632 hrs/wk** | **55.96 SF/user** | **83 stas.** | | **8300hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **66 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **66 stas.** | **=** | **5976hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **5976hrs/wk** | **minus** | **1632 hrs/wk** | **=** | **4344hrs/wk** |

| Fitness Module (Weight/Cardio) 4,645 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 1440 | x | 3 hrs/wk | 4321 hrs/wk | 56 SF/user | 83 stas. | | |
| **TOTALS** | | **1440** | | | **4321 hrs/wk** | **55.96 SF/user** | **83 stas.** | | **8300hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **66 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **66 stas.** | **=** | **5976hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **5976hrs/wk** | **minus** | **4321 hrs/wk** | **=** | **1655hrs/wk** |

| Gymnasium Module 17,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 9,400 SF | 2 court/s | | |
| Volleyball | 6.4% | 143 | x | 3 hrs/wk | 428 hrs/wk | 392 SF/user | 32 players | | |
| Basketball | 18.3% | 406 | x | 3 hrs/wk | 1219 hrs/wk | 470 SF/user | 28 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **549** | | | **1647 hrs/wk** | **430.8 SF/user** | **30 players** | | **3000hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **30 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | **=** | **60 hrs/wk** | **x** | **30 players** | **=** | **1800hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **1800hrs/wk** | **minus** | **1647 hrs/wk** | **=** | **153hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Court 850 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 69 | x | 2 hrs/wk | 138 hrs/wk | 213 SF/user | 4 occup. | | |
| **TOTALS** | | **69** | | | **138 hrs/wk** | **212.5 SF/user** | **4 occup.** | | **400hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **4 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **4 occup.** | **=** | **200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **200hrs/wk** | **minus** | **138 hrs/wk** | **=** | **62hrs/wk** |

| Jogging Track 4,200 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 325 | x | 2 hrs/wk | 649 hrs/wk | | 66 occup. | | |
| Exercise Walking | 28.8% | 638 | x | 2 hrs/wk | 1275 hrs/wk | | 66 occup. | | |
| **TOTALS** | | **962** | | | **1924 hrs/wk** | | **66 occup.** | | **6600hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **40 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | **=** | **80 hrs/wk** | **x** | **40 occup.** | **=** | **3168hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **3168hrs/wk** | **minus** | **1924 hrs/wk** | **=** | **1244hrs/wk** |

## Medium Facility - maximum population of 6,000 persons - approx. 74% peak users- 100 hours of operation per week

| Aerobic Exercise 2,800 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 504 | x | 3 hrs/wk | 1513 hrs/wk | 50 SF/user | 56 stas. | | |
| Step Aerobics | 3.0% | 134 | x | 3 hrs/wk | 402 hrs/wk | 50 SF/user | 56 stas. | | |
| Calisthenics | 5.7% | 252 | x | 3 hrs/wk | 756 hrs/wk | 50 SF/user | 56 stas. | | |
| **TOTALS** | | **890** | | | **2671 hrs/wk** | **50 SF/user** | **56 stas.** | | **5600hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **50 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **50 stas.** | **=** | **2772hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **2772hrs/wk** | **minus** | **2671 hrs/wk** | **=** | **101hrs/wk** |

| Non-Structured Exercise 2,150 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 131 | x | 2 hrs/wk | 262 hrs/wk | 125 SF/user | 17 stas. | | |
| Kick Boxing | 2.2% | 95 | x | 2 hrs/wk | 191 hrs/wk | 125 SF/user | 17 stas. | | |
| **TOTALS** | | **227** | | | **453.414 hrs/wk** | **125 SF/user** | **17 stas.** | | **1720hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **15 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **15 stas.** | **=** | **851hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **851hrs/wk** | **minus** | **453.41 hrs/wk** | **=** | **398hrs/wk** |

| Fitness Module (Weight/Cardio) 7,300 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 1088 | x | 3 hrs/wk | 3263 hrs/wk | 55.7 SF/user | 131 stas. | | |
| **TOTALS** | | **1088** | | | **3263 hrs/wk** | **55.73 SF/user** | **131 stas.** | | **13100hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **105 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **105 stas.** | **=** | **9432hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **9432hrs/wk** | **minus** | **3263 hrs/wk** | **=** | **6169hrs/wk** |

| Fitness Module (Weight/Cardio) 7,300 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 2881 | x | 3 hrs/wk | 8643 hrs/wk | 55.7 SF/user | 131 stas. | | |
| **TOTALS** | | **2881** | | | **8643 hrs/wk** | **55.73 SF/user** | **131 stas.** | | **13100hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **105 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **105 stas.** | **=** | **9432hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **9432hrs/wk** | **minus** | **8643 hrs/wk** | **=** | **789hrs/wk** |

| Gymnasium Module 24,600 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 14,100 SF | 3 court/s | | |
| Volleyball | 6.4% | 286 | x | 3 hrs/wk | 857 hrs/wk | 392 SF/user | 48 players | | |
| Basketball | 18.3% | 813 | x | 3 hrs/wk | 2438 hrs/wk | 470 SF/user | 42 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **1098** | | | **3295 hrs/wk** | **430.8 SF/user** | **45 players** | | **4500hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **45 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | **=** | **60 hrs/wk** | **x** | **45 players** | **=** | **2700hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **2700hrs/wk** | **minus** | **3295 hrs/wk** | **=** | **-595hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Court 850 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 138 | x | 2 hrs/wk | 276 hrs/wk | 213 SF/user | 4 occup. | | |
| **TOTALS** | | **138** | | | **276 hrs/wk** | **212.5 SF/user** | **4 occup.** | | **400hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **4 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **4 occup.** | **=** | **200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **200hrs/wk** | **minus** | **276 hrs/wk** | **=** | **-76hrs/wk** |

| Jogging Track 5,300 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 649 | x | 2 hrs/wk | 1298 hrs/wk | | 84 occup. | | |
| Exercise Walking | 28.8% | 1275 | x | 2 hrs/wk | 2550 hrs/wk | | 84 occup. | | |
| **TOTALS** | | **1924** | | | **3849 hrs/wk** | | **84 occup.** | | **8400hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **50 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | **=** | **80 hrs/wk** | **x** | **50 occup.** | **=** | **4032hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **4032hrs/wk** | **minus** | **3849 hrs/wk** | **=** | **183hrs/wk** |

## Large Facility - maximum population of 10,000 persons - approx. 74% peak users- 100 hours of operation per week

| Aerobic Exercise 4,500 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 841 | x | 3 hrs/wk | 2522 hrs/wk | 50 SF/user | 90 stas. | | |
| Step Aerobics | 3.0% | 223 | x | 3 hrs/wk | 670 hrs/wk | 50 SF/user | 90 stas. | | |
| Calisthenics | 5.7% | 420 | x | 3 hrs/wk | 1259 hrs/wk | 50 SF/user | 90 stas. | | |
| **TOTALS** | | **1484** | | | **4452 hrs/wk** | **50 SF/user** | **90 stas.** | | **9000hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **81 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **81 stas.** | **=** | **4455hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **4455hrs/wk** | **minus** | **4451.6 hrs/wk** | **=** | **3hrs/wk** |

| Non-Structured Exercise 2,500 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 219 | x | 2 hrs/wk | 437 hrs/wk | 125 SF/user | 20 stas. | | |
| Kick Boxing | 2.2% | 159 | x | 2 hrs/wk | 318 hrs/wk | 125 SF/user | 20 stas. | | |
| **TOTALS** | | **378** | | | **755.689 hrs/wk** | **125 SF/user** | **20 stas.** | | **2000hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **16 stas.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **16 stas.** | **=** | **800hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **800hrs/wk** | **minus** | **756 hrs/wk** | **=** | **44hrs/wk** |

| Fitness Module (Weight/Cardio) 11,500 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 1813 | x | 3 hrs/wk | 5438 hrs/wk | 55.8 SF/user | 206 stas. | | |
| **TOTALS** | | **1813** | | | **5438 hrs/wk** | **55.83 SF/user** | **206 stas.** | | **20600hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **165 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **165 stas.** | **=** | **14832hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **14832hrs/wk** | **minus** | **5438 hrs/wk** | **=** | **9394hrs/wk** |

| Fitness Module (Weight/Cardio) 11,500 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 4801 | x | 3 hrs/wk | 14404 hrs/wk | 55.8 SF/user | 206 stas. | | |
| **TOTALS** | | **4801** | | | **14404 hrs/wk** | **55.83 SF/user** | **206 stas.** | | **20600hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **165 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **165 stas.** | **=** | **14832hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **14832hrs/wk** | **minus** | **14404 hrs/wk** | **=** | **428hrs/wk** |

| Gymnasium Module 31,800 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 18,800 SF | 4 court/s | | |
| Volleyball | 6.4% | 476 | x | 3 hrs/wk | 1428 hrs/wk | 392 SF/user | 64 players | | |
| Basketball | 18.3% | 1354 | x | 3 hrs/wk | 4063 hrs/wk | 470 SF/user | 56 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **1830** | | | **5491 hrs/wk** | **430.8 SF/user** | **60 players** | | **6000hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **60 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | **=** | **60 hrs/wk** | **x** | **60 players** | **=** | **3600hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **3600hrs/wk** | **minus** | **5491 hrs/wk** | **=** | **-1891hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Courts 1,700 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 230 | x | 2 hrs/wk | 461 hrs/wk | 213 SF/user | 8 occup. | | |
| **TOTALS** | | **230** | | | **461 hrs/wk** | **212.5 SF/user** | **8 occup.** | | **800hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **8 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **8 occup.** | **=** | **400hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **400hrs/wk** | **minus** | **461 hrs/wk** | **=** | **-61hrs/wk** |

| Jogging Track 6400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 1082 | x | 2 hrs/wk | 2164 hrs/wk | | 102 occup. | | |
| Exercise Walking | 28.8% | 2125 | x | 2 hrs/wk | 4250 hrs/wk | | 102 occup. | | |
| **TOTALS** | | **3207** | | | **6414 hrs/wk** | | **102 occup.** | | **10200hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **61 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | **=** | **80 hrs/wk** | **x** | **61 occup.** | **=** | **4896hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **4896hrs/wk** | **minus** | **6414 hrs/wk** | **=** | **-1518hrs/wk** |

# Maximum authorized population of 20,000 - 100 hours of operation per week:

## Base Population: (15,001-20,000)

| Aerobic Exercise 9,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 1681 | x | 3 hrs/wk | 5044 hrs/wk | 50 SF/user | 180 stas. | | |
| Step Aerobics | 3.0% | 447 | x | 3 hrs/wk | 1340 hrs/wk | 50 SF/user | 180 stas. | | |
| Calisthenics | 5.7% | 840 | x | 3 hrs/wk | 2519 hrs/wk | 50 SF/user | 180 stas. | | |
| **TOTALS** | | **2968** | | | **8903 hrs/wk** | **50 SF/user** | **180 stas.** | | **18000hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **162 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **162 stas.** | **=** | **8910hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **8910hrs/wk** | **minus** | **8903.2 hrs/wk** | **=** | **7hrs/wk** |

| Non-Structured Exercise 5,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 437 | x | 2 hrs/wk | 875 hrs/wk | 125 SF/user | 40 stas. | | |
| Kick Boxing | 2.2% | 318 | x | 2 hrs/wk | 636 hrs/wk | 125 SF/user | 40 stas. | | |
| **TOTALS** | | **756** | | | **1511.38 hrs/wk** | **125 SF/user** | **40 stas.** | | **4000hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **32 stas.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **32 stas.** | **=** | **1600hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **1600hrs/wk** | **minus** | **1511.4 hrs/wk** | **=** | **89hrs/wk** |

| Fitness Module (Weight/Cardio) 23,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 3626 | x | 3 hrs/wk | 10877 hrs/wk | 55.8 SF/user | 412 stas. | | |
| **TOTALS** | | **3626** | | | **10877 hrs/wk** | **55.83 SF/user** | **412 stas.** | | **41200hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **330 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **330 stas.** | **=** | **29664hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **29664hrs/wk** | **minus** | **10877 hrs/wk** | **=** | **18787hrs/wk** |

| Fitness Module (Weight/Cardio) 23,000 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 9603 | x | 3 hrs/wk | 28809 hrs/wk | 55.8 SF/user | 412 stas. | | |
| **TOTALS** | | **9603** | | | **28809 hrs/wk** | **55.83 SF/user** | **412 stas.** | | **41200hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **330 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **330 stas.** | **=** | **29664hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **29664hrs/wk** | **minus** | **28809 hrs/wk** | **=** | **855hrs/wk** |

| Gymnasium Module 48,600 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 28,200 SF | 6 court/s | | |
| Volleyball | 6.4% | 952 | x | 3 hrs/wk | 2856 hrs/wk | 392 SF/user | 96 players | | |
| Basketball | 18.3% | 2709 | x | 3 hrs/wk | 8127 hrs/wk | 470 SF/user | 84 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **3661** | | | **10983 hrs/wk** | **430.8 SF/user** | **90 players** | | **9000hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **90 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | **=** | **60 hrs/wk** | **x** | **90 players** | **=** | **5400hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **5400hrs/wk** | **minus** | **10983 hrs/wk** | **=** | **-5583hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Courts 3,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 461 | x | 2 hrs/wk | 921 hrs/wk | 213 SF/user | 16 occup. | | |
| **TOTALS** | | **461** | | | **921 hrs/wk** | **212.5 SF/user** | **16 occup.** | | **1600hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **16 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **16 occup.** | **=** | **800hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **800hrs/wk** | **minus** | **921 hrs/wk** | **=** | **-121hrs/wk** |

| Jogging Track 6,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 2164 | x | 2 hrs/wk | 4328 hrs/wk | | 150 occup. | | |
| Exercise Walking | 28.8% | 4250 | x | 2 hrs/wk | 8501 hrs/wk | | 150 occup. | | |
| **TOTALS** | | **6414** | | | **12828 hrs/wk** | | **150 occup.** | | **15000hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **90 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | **=** | **80 hrs/wk** | **x** | **90 occup.** | **=** | **7200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **7200hrs/wk** | **minus** | **12828 hrs/wk** | **=** | **-5628hrs/wk** |

## Maximum authorized population of 25,000 - 100 hours of operation per week:

**Base Population:** (20,001-25,000)

| Aerobic Exercise 11,250 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 2102 | x | 3 hrs/wk | 6306 hrs/wk | 50 SF/user | 225 stas. | | |
| Step Aerobics | 3.0% | 558 | x | 3 hrs/wk | 1675 hrs/wk | 50 SF/user | 225 stas. | | |
| Calisthenics | 5.7% | 1049 | x | 3 hrs/wk | 3148 hrs/wk | 50 SF/user | 225 stas. | | |
| **TOTALS** | | **3710** | | | **11129 hrs/wk** | **50 SF/user** | **225 stas.** | | **22500hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **203 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **203 stas.** | **=** | **11138hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **11138hrs/wk** | **minus** | **11129 hrs/wk** | **=** | **8hrs/wk** |

| Non-Structured Exercise 6,250 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 547 | x | 2 hrs/wk | 1094 hrs/wk | 125 SF/user | 50 stas. | | |
| Kick Boxing | 2.2% | 398 | x | 2 hrs/wk | 796 hrs/wk | 125 SF/user | 50 stas. | | |
| **TOTALS** | | **945** | | | **1889.22 hrs/wk** | **125 SF/user** | **50 stas.** | | **5000hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **40 stas.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **40 stas.** | **=** | **2000hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **2000hrs/wk** | **minus** | **1889.2 hrs/wk** | **=** | **111hrs/wk** |

| Fitness Module (Weight/Cardio) 28,750 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 4532 | x | 3 hrs/wk | 13596 hrs/wk | 55.8 SF/user | 515 stas. | | |
| **TOTALS** | | **4532** | | | **13596 hrs/wk** | **55.83 SF/user** | **515 stas.** | | **51500hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **412 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **412 stas.** | **=** | **37080hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **37080hrs/wk** | **minus** | **13596 hrs/wk** | **=** | **23484hrs/wk** |

| Fitness Module (Weight/Cardio) 28,750 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 12004 | x | 3 hrs/wk | 36011 hrs/wk | 55.8 SF/user | 515 stas. | | |
| **TOTALS** | | **12004** | | | **36011 hrs/wk** | **55.83 SF/user** | **515 stas.** | | **51500hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **412 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **412 stas.** | **=** | **37080hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **37080hrs/wk** | **minus** | **36011 hrs/wk** | **=** | **1069hrs/wk** |

| Gymnasium Module 57,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 32,900 SF | 7 court/s | | |
| Volleyball | 6.4% | 1190 | x | 3 hrs/wk | 3570 hrs/wk | 392 SF/user | 112 players | | |
| Basketball | 18.3% | 3386 | x | 3 hrs/wk | 10158 hrs/wk | 470 SF/user | 98 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **4576** | | | **13728 hrs/wk** | **430.8 SF/user** | **105 players** | | **10500hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **105 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | **=** | **60 hrs/wk** | **x** | **105 players** | **=** | **6300hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **6300hrs/wk** | **minus** | **13728 hrs/wk** | **=** | **-7428hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Courts 4,250 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 576 | x | 2 hrs/wk | 1152 hrs/wk | 213 SF/user | 20 occup. | | |
| **TOTALS** | | **576** | | | **1152 hrs/wk** | **212.5 SF/user** | **20 occup.** | | **2000hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **20 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **20 occup.** | **=** | **1000hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **1000hrs/wk** | **minus** | **1152 hrs/wk** | **=** | **-152hrs/wk** |

| Jogging Track 6,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 2705 | x | 2 hrs/wk | 5410 hrs/wk | | 150 occup. | | |
| Exercise Walking | 28.8% | 5313 | x | 2 hrs/wk | 10626 hrs/wk | | 150 occup. | | |
| **TOTALS** | | **8018** | | | **16036 hrs/wk** | | **150 occup.** | | **15000hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **90 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | **=** | **80 hrs/wk** | **x** | **90 occup.** | **=** | **7200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **7200hrs/wk** | **minus** | **16036 hrs/wk** | **=** | **-8836hrs/wk** |

## Maximum authorized population of 30,000 - 100 hours of operation per week:

**Base Population:** (25,001-30,000)

| Aerobic Exercise 13,500 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 2522 | x | 3 hrs/wk | 7567 hrs/wk | 50 SF/user | 270 stas. | | |
| Step Aerobics | 3.0% | 670 | x | 3 hrs/wk | 2010 hrs/wk | 50 SF/user | 270 stas. | | |
| Calisthenics | 5.7% | 1259 | x | 3 hrs/wk | 3778 hrs/wk | 50 SF/user | 270 stas. | | |
| **TOTALS** | | **4452** | | | **13355 hrs/wk** | **50 SF/user** | **270 stas.** | | **27000hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **243 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **243 stas.** | **=** | **13365hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **13365hrs/wk** | **minus** | **13355 hrs/wk** | **=** | **10hrs/wk** |

| Non-Structured Exercise 7,500 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 656 | x | 2 hrs/wk | 1312 hrs/wk | 125 SF/user | 60 stas. | | |
| Kick Boxing | 2.2% | 477 | x | 2 hrs/wk | 955 hrs/wk | 125 SF/user | 60 stas. | | |
| **TOTALS** | | **1134** | | | **2267.07 hrs/wk** | **125 SF/user** | **60 stas.** | | **6000hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **48 stas.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **48 stas.** | **=** | **2400hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **2400hrs/wk** | **minus** | **2267.1 hrs/wk** | **=** | **133hrs/wk** |

| Fitness Module (Weight/Cardio) 34,500 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 5438 | x | 3 hrs/wk | 16315 hrs/wk | 55.8 SF/user | 618 stas. | | |
| **TOTALS** | | **5438** | | | **16315 hrs/wk** | **55.83 SF/user** | **618 stas.** | | **61800hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **494 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **494 stas.** | **=** | **44496hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **44496hrs/wk** | **minus** | **16315 hrs/wk** | **=** | **28181hrs/wk** |

| Fitness Module (Weight/Cardio) 34,500 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 14404 | x | 3 hrs/wk | 43213 hrs/wk | 55.8 SF/user | 618 stas. | | |
| **TOTALS** | | **14404** | | | **43213 hrs/wk** | **55.83 SF/user** | **618 stas.** | | **61800hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **494 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **494 stas.** | **=** | **44496hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **44496hrs/wk** | **minus** | **43213 hrs/wk** | **=** | **1283hrs/wk** |

| Gymnasium Module 65,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 37,600 SF | 8 court/s | | |
| Volleyball | 6.4% | 1428 | x | 3 hrs/wk | 4284 hrs/wk | 392 SF/user | 128 players | | |
| Basketball | 18.3% | 4063 | x | 3 hrs/wk | 12190 hrs/wk | 470 SF/user | 112 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **5491** | | | **16474 hrs/wk** | **430.8 SF/user** | **120 players** | | **12000hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **120 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | **=** | **60 hrs/wk** | **x** | **120 players** | **=** | **7200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **7200hrs/wk** | **minus** | **16474 hrs/wk** | **=** | **-9274hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Courts 5,100 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 691 | x | 2 hrs/wk | 1382 hrs/wk | 213 SF/user | 24 occup. | | |
| **TOTALS** | | **691** | | | **1382 hrs/wk** | **212.5 SF/user** | **24 occup.** | | **2400hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **24 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **24 occup.** | **=** | **1200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **1200hrs/wk** | **minus** | **1382 hrs/wk** | **=** | **-182hrs/wk** |

| Jogging Track 6,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 3246 | x | 2 hrs/wk | 6492 hrs/wk | | 150 occup. | | |
| Exercise Walking | 28.8% | 6376 | x | 2 hrs/wk | 12751 hrs/wk | | 150 occup. | | |
| **TOTALS** | | **9621** | | | **19243 hrs/wk** | | **150 occup.** | | **15000hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **90 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | **=** | **80 hrs/wk** | **x** | **90 occup.** | **=** | **7200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **7200hrs/wk** | **minus** | **19243 hrs/wk** | **=** | **-12043hrs/wk** |

## Maximum authorized population of 35,000 - 100 hours of operation per week:

**Base Population:** (30,001-35,000)

| Aerobic Exercise 15,750 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 2943 | x | 3 hrs/wk | 8828 hrs/wk | 50 SF/user | 315 stas. | | |
| Step Aerobics | 3.0% | 782 | x | 3 hrs/wk | 2346 hrs/wk | 50 SF/user | 315 stas. | | |
| Calisthenics | 5.7% | 1469 | x | 3 hrs/wk | 4407 hrs/wk | 50 SF/user | 315 stas. | | |
| **TOTALS** | | **5194** | | | **15581 hrs/wk** | **50 SF/user** | **315 stas.** | | **31500hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **284 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **284 stas.** | **=** | **15593hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **15593hrs/wk** | **minus** | **15581 hrs/wk** | **=** | **12hrs/wk** |

| Non-Structured Exercise 8,750 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 766 | x | 2 hrs/wk | 1531 hrs/wk | 125 SF/user | 70 stas. | | |
| Kick Boxing | 2.2% | 557 | x | 2 hrs/wk | 1114 hrs/wk | 125 SF/user | 70 stas. | | |
| **TOTALS** | | **1322** | | | **2644.91 hrs/wk** | **125 SF/user** | **70 stas.** | | **7000hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **56 stas.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **56 stas.** | **=** | **2800hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **2800hrs/wk** | **minus** | **2644.9 hrs/wk** | **=** | **155hrs/wk** |

| Fitness Module (Weight/Cardio) 40,250 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 6345 | x | 3 hrs/wk | 19034 hrs/wk | 56 SF/user | 721 stas. | | |
| **TOTALS** | | **6345** | | | **19034 hrs/wk** | **56 SF/user** | **721 stas.** | | **72100hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **577 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **577 stas.** | **=** | **51912hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **51912hrs/wk** | **minus** | **19034 hrs/wk** | **=** | **32878hrs/wk** |

| Fitness Module (Weight/Cardio) 40,250 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 16805 | x | 3 hrs/wk | 50416 hrs/wk | 56 SF/user | 721 stas. | | |
| **TOTALS** | | **16805** | | | **50416 hrs/wk** | **56 SF/user** | **721 stas.** | | **72100hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **577 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **577 stas.** | **=** | **51912hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **51912hrs/wk** | **minus** | **50416 hrs/wk** | **=** | **1496hrs/wk** |

| Gymnasium Module 73,800 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 42,300 SF | 9 court/s | | |
| Volleyball | 6.4% | 1666 | x | 3 hrs/wk | 4998 hrs/wk | 392 SF/user | 144 players | | |
| Basketball | 18.3% | 4741 | x | 3 hrs/wk | 14222 hrs/wk | 470 SF/user | 126 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **6407** | | | **19220 hrs/wk** | **431 SF/user** | **135 players** | | **13500hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **135 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | **=** | **60 hrs/wk** | **x** | **135 players** | **=** | **8100hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **8100hrs/wk** | **minus** | **19220 hrs/wk** | **=** | **-11120hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Courts 5,950 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 806 | x | 2 hrs/wk | 1612 hrs/wk | 212.5 SF/user | 28 occup. | | |
| **TOTALS** | | **806** | | | **1612 hrs/wk** | **212.5 SF/user** | **28 occup.** | | **2800hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **28 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **28 occup.** | **=** | **1400hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **1400hrs/wk** | **minus** | **1612 hrs/wk** | **=** | **-212hrs/wk** |

| Jogging Track 6,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 3787 | x | 2 hrs/wk | 7574 hrs/wk | | 150 occup. | | |
| Exercise Walking | 28.8% | 7438 | x | 2 hrs/wk | 14876 hrs/wk | | 150 occup. | | |
| **TOTALS** | | **11225** | | | **22450 hrs/wk** | | **150 occup.** | | **15000hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **90 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | **=** | **80 hrs/wk** | **x** | **90 occup.** | **=** | **7200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **7200hrs/wk** | **minus** | **22450 hrs/wk** | **=** | **-15250hrs/wk** |

# Maximum authorized population of 40,000 - 100 hours of operation per week:

## Base Population: (35,001-40,000)

| Aerobic Exercise 18,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 3363 | x | 3 hrs/wk | 10089 hrs/wk | 50 SF/user | 360 stas. | | |
| Step Aerobics | 3.0% | 894 | x | 3 hrs/wk | 2681 hrs/wk | 50 SF/user | 360 stas. | | |
| Calisthenics | 5.7% | 1679 | x | 3 hrs/wk | 5037 hrs/wk | 50 SF/user | 360 stas. | | |
| **TOTALS** | | **5935** | | | **17806 hrs/wk** | **50 SF/user** | **360 stas.** | | **36000hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **324 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **324 stas.** | **=** | **17820hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **17820hrs/wk** | **minus** | **17806 hrs/wk** | **=** | **14hrs/wk** |

| Non-Structured Exercise 10,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 875 | x | 2 hrs/wk | 1750 hrs/wk | 125 SF/user | 80 stas. | | |
| Kick Boxing | 2.2% | 636 | x | 2 hrs/wk | 1273 hrs/wk | 125 SF/user | 80 stas. | | |
| **TOTALS** | | **1511** | | | **3022.76 hrs/wk** | **125 SF/user** | **80 stas.** | | **8000hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **64 stas.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **64 stas.** | **=** | **3200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **3200hrs/wk** | **minus** | **3022.8 hrs/wk** | **=** | **177hrs/wk** |

| Fitness Module (Weight/Cardio) 46,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 7251 | x | 3 hrs/wk | 21753 hrs/wk | 56 SF/user | 824 stas. | | |
| **TOTALS** | | **7251** | | | **21753 hrs/wk** | **56 SF/user** | **824 stas.** | | **82400hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **659 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **659 stas.** | **=** | **59328hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **59328hrs/wk** | **minus** | **21753 hrs/wk** | **=** | **37575hrs/wk** |

| Fitness Module (Weight/Cardio) 46,000 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 19206 | x | 3 hrs/wk | 57618 hrs/wk | 56 SF/user | 824 stas. | | |
| **TOTALS** | | **19206** | | | **57618 hrs/wk** | **56 SF/user** | **824 stas.** | | **82400hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **659 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **659 stas.** | **=** | **59328hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **59328hrs/wk** | **minus** | **57618 hrs/wk** | **=** | **1710hrs/wk** |

| Gymnasium Module 82,200 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 47,000 SF | 10 court/s | | |
| Volleyball | 6.4% | 1904 | x | 3 hrs/wk | 5712 hrs/wk | 392 SF/user | 160 players | | |
| Basketball | 18.3% | 5418 | x | 3 hrs/wk | 16253 hrs/wk | 470 SF/user | 140 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **7322** | | | **21966 hrs/wk** | **431 SF/user** | **150 players** | | **15000hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **150 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | **=** | **60 hrs/wk** | **x** | **150 players** | **=** | **9000hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **9000hrs/wk** | **minus** | **21966 hrs/wk** | **=** | **-12966hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Courts 6,800 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 921 | x | 2 hrs/wk | 1843 hrs/wk | 212.5 SF/user | 32 occup. | | |
| **TOTALS** | | **921** | | | **1843 hrs/wk** | **212.5 SF/user** | **32 occup.** | | **3200hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **32 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **32 occup.** | **=** | **1600hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **1600hrs/wk** | **minus** | **1843 hrs/wk** | **=** | **-243hrs/wk** |

| Jogging Track 6,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 4328 | x | 2 hrs/wk | 8656 hrs/wk | | 150 occup. | | |
| Exercise Walking | 28.8% | 8501 | x | 2 hrs/wk | 17001 hrs/wk | | 150 occup. | | |
| **TOTALS** | | **12828** | | | **25657 hrs/wk** | | **150 occup.** | | **15000hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **90 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | **=** | **80 hrs/wk** | **x** | **90 occup.** | **=** | **7200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **7200hrs/wk** | **minus** | **25657 hrs/wk** | **=** | **-18457hrs/wk** |

# Maximum authorized population of 45,000 - 100 hours of operation per week:

**Base Population:** (40,001-45,000)

| Aerobic Exercise 20,250 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 3783 | x | 3 hrs/wk | 11350 hrs/wk | 50 SF/user | 405 stas. | | |
| Step Aerobics | 3.0% | 1005 | x | 3 hrs/wk | 3016 hrs/wk | 50 SF/user | 405 stas. | | |
| Calisthenics | 5.7% | 1889 | x | 3 hrs/wk | 5667 hrs/wk | 50 SF/user | 405 stas. | | |
| **TOTALS** | | **6677** | | | **20032 hrs/wk** | **50 SF/user** | **405 stas.** | | **40500hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **365 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **365 stas.** | **=** | **20048hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **20048hrs/wk** | **minus** | **20032 hrs/wk** | **=** | **15hrs/wk** |

| Non-Structured Exercise 11,250 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 984 | x | 2 hrs/wk | 1969 hrs/wk | 125 SF/user | 90 stas. | | |
| Kick Boxing | 2.2% | 716 | x | 2 hrs/wk | 1432 hrs/wk | 125 SF/user | 90 stas. | | |
| **TOTALS** | | **1700** | | | **3400.6 hrs/wk** | **125 SF/user** | **90 stas.** | | **9000hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **72 stas.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **72 stas.** | **=** | **3600hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **3600hrs/wk** | **minus** | **3400.6 hrs/wk** | **=** | **199hrs/wk** |

| Fitness Module (Weight/Cardio) 51,750 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 8158 | x | 3 hrs/wk | 24473 hrs/wk | 56 SF/user | 927 stas. | | |
| **TOTALS** | | **8158** | | | **24473 hrs/wk** | **56 SF/user** | **927 stas.** | | **92700hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **742 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **742 stas.** | **=** | **66744hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **66744hrs/wk** | **minus** | **24473 hrs/wk** | **=** | **42271hrs/wk** |

| Fitness Module (Weight/Cardio) 51,750 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 21607 | x | 3 hrs/wk | 64820 hrs/wk | 56 SF/user | 927 stas. | | |
| **TOTALS** | | **21607** | | | **64820 hrs/wk** | **56 SF/user** | **927 stas.** | | **92700hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **742 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **742 stas.** | **=** | **66744hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **66744hrs/wk** | **minus** | **64820 hrs/wk** | **=** | **1924hrs/wk** |

| Gymnasium Module 90,600 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 51,700 SF | 11 court/s | | |
| Volleyball | 6.4% | 2142 | x | 3 hrs/wk | 6426 hrs/wk | 392 SF/user | 176 players | | |
| Basketball | 18.3% | 6095 | x | 3 hrs/wk | 18285 hrs/wk | 470 SF/user | 154 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **8237** | | | **24711 hrs/wk** | **431 SF/user** | **165 players** | | **16500hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **165 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | **=** | **60 hrs/wk** | **x** | **165 players** | **=** | **9900hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **9900hrs/wk** | **minus** | **24711 hrs/wk** | **=** | **-14811hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Courts 7,650 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 1036 | x | 2 hrs/wk | 2073 hrs/wk | 212.5 SF/user | 36 occup. | | |
| **TOTALS** | | **1036** | | | **2073 hrs/wk** | **212.5 SF/user** | **36 occup.** | | **3600hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **36 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **36 occup.** | **=** | **1800hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **1800hrs/wk** | **minus** | **2073 hrs/wk** | **=** | **-273hrs/wk** |

| Jogging Track 6,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 4869 | x | 2 hrs/wk | 9737 hrs/wk | | 150 occup. | | |
| Exercise Walking | 28.8% | 9563 | x | 2 hrs/wk | 19127 hrs/wk | | 150 occup. | | |
| **TOTALS** | | **14432** | | | **28864 hrs/wk** | | **150 occup.** | | **15000hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **90 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | **=** | **80 hrs/wk** | **x** | **90 occup.** | **=** | **7200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **7200hrs/wk** | **minus** | **28864 hrs/wk** | **=** | **-21664hrs/wk** |

## Maximum authorized population of 50,000 - 100 hours of operation per week:

**Base Population:** (45,001-50,000)

| Aerobic Exercise 22,500 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 4204 | x | 3 hrs/wk | 12611 hrs/wk | 50 SF/user | 450 stas. | | |
| Step Aerobics | 3.0% | 1117 | x | 3 hrs/wk | 3351 hrs/wk | 50 SF/user | 450 stas. | | |
| Calisthenics | 5.7% | 2099 | x | 3 hrs/wk | 6296 hrs/wk | 50 SF/user | 450 stas. | | |
| **TOTALS** | | **7419** | | | **22258 hrs/wk** | **50 SF/user** | **450 stas.** | | **45000hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **405 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **405 stas.** | **=** | **22275hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **22275hrs/wk** | **minus** | **22258 hrs/wk** | **=** | **17hrs/wk** |

| Non-Structured Exercise 12500 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 1094 | x | 2 hrs/wk | 2187 hrs/wk | 125 SF/user | 100 stas. | | |
| Kick Boxing | 2.2% | 796 | x | 2 hrs/wk | 1591 hrs/wk | 125 SF/user | 100 stas. | | |
| **TOTALS** | | **1889** | | | **3778.45 hrs/wk** | **125 SF/user** | **100 stas.** | | **10000hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **80 stas.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **80 stas.** | **=** | **4000hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **4000hrs/wk** | **minus** | **3778.4 hrs/wk** | **=** | **222hrs/wk** |

| Fitness Module (Weight/Cardio) 57,500 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 9064 | x | 3 hrs/wk | 27192 hrs/wk | 56 SF/user | 1030 stas. | | |
| **TOTALS** | | **9064** | | | **27192 hrs/wk** | **56 SF/user** | **1030 stas.** | | **103000hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **824 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **824 stas.** | **=** | **74160hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **74160hrs/wk** | **minus** | **27192 hrs/wk** | **=** | **46968hrs/wk** |

| Fitness Module (Weight/Cardio) 57,500 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 24007 | x | 3 hrs/wk | 72022 hrs/wk | 56 SF/user | 1030 stas. | | |
| **TOTALS** | | **24007** | | | **72022 hrs/wk** | **56 SF/user** | **1030 stas.** | | **103000hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **824 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **824 stas.** | **=** | **74160hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **74160hrs/wk** | **minus** | **72022 hrs/wk** | **=** | **2138hrs/wk** |

| Gymnasium Module 99,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 56,400 SF | 12 court/s | | |
| Volleyball | 6.4% | 2380 | x | 3 hrs/wk | 7140 hrs/wk | 392 SF/user | 192 players | | |
| Basketball | 18.3% | 6772 | x | 3 hrs/wk | 20317 hrs/wk | 470 SF/user | 168 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **9152** | | | **27457 hrs/wk** | **431 SF/user** | **180 players** | | **18000hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **180 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | **=** | **60 hrs/wk** | **x** | **180 players** | **=** | **10800hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **10800hrs/wk** | **minus** | **27457 hrs/wk** | **=** | **-16657hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Courts 8,500 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 1152 | x | 2 hrs/wk | 2303 hrs/wk | 212.5 SF/user | 40 occup. | | |
| **TOTALS** | | **1152** | | | **2303 hrs/wk** | **212.5 SF/user** | **40 occup.** | | **4000hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **40 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **40 occup.** | **=** | **2000hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **2000hrs/wk** | **minus** | **2303 hrs/wk** | **=** | **-303hrs/wk** |

| Jogging Track 6,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 5410 | x | 2 hrs/wk | 10819 hrs/wk | | 150 occup. | | |
| Exercise Walking | 28.8% | 10626 | x | 2 hrs/wk | 21252 hrs/wk | | 150 occup. | | |
| **TOTALS** | | **16036** | | | **32071 hrs/wk** | | **150 occup.** | | **15000hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **90 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | **=** | **80 hrs/wk** | **x** | **90 occup.** | **=** | **7200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **7200hrs/wk** | **minus** | **32071 hrs/wk** | **=** | **-24871hrs/wk** |

## Maximum authorized population of 55,000 - 100 hours of operation per week:

**Base Population:** (50,001-55,000)

| Aerobic Exercise 24,750 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 4624 | x | 3 hrs/wk | 13872 hrs/wk | 50 SF/user | 495 stas. | | |
| Step Aerobics | 3.0% | 1229 | x | 3 hrs/wk | 3686 hrs/wk | 50 SF/user | 495 stas. | | |
| Calisthenics | 5.7% | 2309 | x | 3 hrs/wk | 6926 hrs/wk | 50 SF/user | 495 stas. | | |
| **TOTALS** | | **8161** | | | **24484 hrs/wk** | **50 SF/user** | **495 stas.** | | **49500hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **446 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **446 stas.** | **=** | **24503hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **24503hrs/wk** | **minus** | **24484 hrs/wk** | **=** | **19hrs/wk** |

| Non-Structured Exercise 13,750 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 1203 | x | 2 hrs/wk | 2406 hrs/wk | 125 SF/user | 110 stas. | | |
| Kick Boxing | 2.2% | 875 | x | 2 hrs/wk | 1750 hrs/wk | 125 SF/user | 110 stas. | | |
| **TOTALS** | | **2078** | | | **4156.29 hrs/wk** | **125 SF/user** | **110 stas.** | | **11000hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **88 stas.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **88 stas.** | **=** | **4400hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **4400hrs/wk** | **minus** | **4156.3 hrs/wk** | **=** | **244hrs/wk** |

| Fitness Module (Weight/Cardio) 63,250 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 9970 | x | 3 hrs/wk | 29911 hrs/wk | 56 SF/user | 1133 stas. | | |
| **TOTALS** | | **9970** | | | **29911 hrs/wk** | **56 SF/user** | **1133 stas.** | | **113300hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **906 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **906 stas.** | **=** | **81576hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **81576hrs/wk** | **minus** | **29911 hrs/wk** | **=** | **51665hrs/wk** |

| Fitness Module (Weight/Cardio) 63,250 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 26408 | x | 3 hrs/wk | 79224 hrs/wk | 56 SF/user | 1133 stas. | | |
| **TOTALS** | | **26408** | | | **79224 hrs/wk** | **56 SF/user** | **1133 stas.** | | **113300hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **906 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **906 stas.** | **=** | **81576hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **81576hrs/wk** | **minus** | **79224 hrs/wk** | **=** | **2352hrs/wk** |

| Gymnasium Module 107,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 61,100 SF | 13 court/s | | |
| Volleyball | 6.4% | 2618 | x | 3 hrs/wk | 7854 hrs/wk | 392 SF/user | 208 players | | |
| Basketball | 18.3% | 7449 | x | 3 hrs/wk | 22348 hrs/wk | 470 SF/user | 182 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **10068** | | | **30203 hrs/wk** | **431 SF/user** | **195 players** | | **19500hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **195 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | **=** | **60 hrs/wk** | **x** | **195 players** | **=** | **11700hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **11700hrs/wk** | **minus** | **30203 hrs/wk** | **=** | **-18503hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Courts 9,350 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 1267 | x | 2 hrs/wk | 2534 hrs/wk | 212.5 SF/user | 44 occup. | | |
| **TOTALS** | | **1267** | | | **2534 hrs/wk** | **212.5 SF/user** | **44 occup.** | | **4400hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **44 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **44 occup.** | **=** | **2200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **2200hrs/wk** | **minus** | **2534 hrs/wk** | **=** | **-334hrs/wk** |

| Jogging Track 6,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 5951 | x | 2 hrs/wk | 11901 hrs/wk | | 150 occup. | | |
| Exercise Walking | 28.8% | 11689 | x | 2 hrs/wk | 23377 hrs/wk | | 150 occup. | | |
| **TOTALS** | | **17639** | | | **35278 hrs/wk** | | **150 occup.** | | **15000hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **90 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | **=** | **80 hrs/wk** | **x** | **90 occup.** | **=** | **7200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **7200hrs/wk** | **minus** | **35278 hrs/wk** | **=** | **-28078hrs/wk** |

# Maximum authorized population of 60,000 - 100 hours of operation per week:

## Base Population: (55,001-60,000)

| Aerobic Exercise 27,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 5044 | x | 3 hrs/wk | 15133 hrs/wk | 50 SF/user | 540 stas. | | |
| Step Aerobics | 3.0% | 1340 | x | 3 hrs/wk | 4021 hrs/wk | 50 SF/user | 540 stas. | | |
| Calisthenics | 5.7% | 2519 | x | 3 hrs/wk | 7556 hrs/wk | 50 SF/user | 540 stas. | | |
| **TOTALS** | | **8903** | | | **26710 hrs/wk** | **50 SF/user** | **540 stas.** | | **54000hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **486 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **486 stas.** | **=** | **26730hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **26730hrs/wk** | **minus** | **26709.74 hrs/wk** | **=** | **20hrs/wk** |

| Non-Structured Exercise 15,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 1312 | x | 2 hrs/wk | 2625 hrs/wk | 125 SF/user | 120 stas. | | |
| Kick Boxing | 2.2% | 955 | x | 2 hrs/wk | 1909 hrs/wk | 125 SF/user | 120 stas. | | |
| **TOTALS** | | **2267** | | | **4534.135 hrs/wk** | **125 SF/user** | **120 stas.** | | **12000hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **96 stas.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **96 stas.** | **=** | **4800hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **4800hrs/wk** | **minus** | **4534.135 hrs/wk** | **=** | **266hrs/wk** |

| Fitness Module (Weight/Cardio) 69,000 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 10877 | x | 3 hrs/wk | 32630 hrs/wk | 56 SF/user | 1236 stas. | | |
| **TOTALS** | | **10877** | | | **32630 hrs/wk** | **56 SF/user** | **1236 stas.** | | **123600hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **989 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **989 stas.** | **=** | **88992hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **88992hrs/wk** | **minus** | **32630 hrs/wk** | **=** | **56362hrs/wk** |

| Fitness Module (Weight/Cardio) 69,000 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 28809 | x | 3 hrs/wk | 86427 hrs/wk | 56 SF/user | 1236 stas. | | |
| **TOTALS** | | **28809** | | | **86427 hrs/wk** | **56 SF/user** | **1236 stas.** | | **123600hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **989 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **989 stas.** | **=** | **88992hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **88992hrs/wk** | **minus** | **86427 hrs/wk** | **=** | **2565hrs/wk** |

| Gymnasium Module 115,800 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 65,800 SF | 14 court/s | | |
| Volleyball | 6.4% | 2856 | x | 3 hrs/wk | 8568 hrs/wk | 392 SF/user | 224 players | | |
| Basketball | 18.3% | 8127 | x | 3 hrs/wk | 24380 hrs/wk | 470 SF/user | 196 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **10983** | | | **32948 hrs/wk** | **431 SF/user** | **210 players** | | **21000hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **210 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | **=** | **60 hrs/wk** | **x** | **210 players** | **=** | **12600hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **12600hrs/wk** | **minus** | **32948 hrs/wk** | **=** | **-20348hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Courts 10,200 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 1382 | x | 2 hrs/wk | 2764 hrs/wk | 212.5 SF/user | 48 occup. | | |
| **TOTALS** | | **1382** | | | **2764 hrs/wk** | **212.5 SF/user** | **48 occup.** | | **4800hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **48 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **48 occup.** | **=** | **2400hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **2400hrs/wk** | **minus** | **2764 hrs/wk** | **=** | **-364hrs/wk** |

| Jogging Track 6,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 6492 | x | 2 hrs/wk | 12983 hrs/wk | | 150 occup. | | |
| Exercise Walking | 28.8% | 12751 | x | 2 hrs/wk | 25502 hrs/wk | | 150 occup. | | |
| **TOTALS** | | **19243** | | | **38485 hrs/wk** | | **150 occup.** | | **15000hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **90 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | **=** | **80 hrs/wk** | **x** | **90 occup.** | **=** | **7200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **7200hrs/wk** | **minus** | **38485 hrs/wk** | **=** | **-31285hrs/wk** |

## Maximum authorized population of 65,000 - 100 hours of operation per week:

**Base Population:** (60,001-65,000)

| Aerobic Exercise 29,250 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Aerobic Exercising | 11.4% | 5465 | x | 3 hrs/wk | 16394 hrs/wk | 50 SF/user | 585 stas. | | |
| Step Aerobics | 3.0% | 1452 | x | 3 hrs/wk | 4356 hrs/wk | 50 SF/user | 585 stas. | | |
| Calisthenics | 5.7% | 2728 | x | 3 hrs/wk | 8185 hrs/wk | 50 SF/user | 585 stas. | | |
| **TOTALS** | | **9645** | | | **28936 hrs/wk** | **50 SF/user** | **585 stas.** | | **58500hrs/wk** |
| **PEAK ATTENDANCE** | **90%** | **of Stations in Use** | | | | | **527 stas.** | | |
| **PEAK UTILIZATION RATE** | **55%** | **of Hours of Operation** | | **=** | **55 hrs/wk** | **x** | **527 stas.** | **=** | **28958hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **28958hrs/wk** | **minus** | **28935.5 hrs/wk** | **=** | **22hrs/wk** |

| Non-Structured Exercise 16,250 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Martial Arts | 3.0% | 1422 | x | 2 hrs/wk | 2843 hrs/wk | 125 SF/user | 130 stas. | | |
| Kick Boxing | 2.2% | 1034 | x | 2 hrs/wk | 2068 hrs/wk | 125 SF/user | 130 stas. | | |
| **TOTALS** | | **2456** | | | **4911.98 hrs/wk** | **125 SF/user** | **130 stas.** | | **13000hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **104 stas.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **104 stas.** | **=** | **5200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **5200hrs/wk** | **minus** | **4911.98 hrs/wk** | **=** | **288hrs/wk** |

| Fitness Module (Weight/Cardio) 74,750 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 24.5% | 11783 | x | 3 hrs/wk | 35349 hrs/wk | 56 SF/user | 1339 stas. | | |
| **TOTALS** | | **11783** | | | **35349 hrs/wk** | **56 SF/user** | **1339 stas.** | | **133900hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **1071 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **1071 stas.** | **=** | **96408hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **96408hrs/wk** | **minus** | **35349 hrs/wk** | **=** | **61059hrs/wk** |

| Fitness Module (Weight/Cardio) 74,750 SF | LNS Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Exercising with Equipment | 65.0% | 31210 | x | 3 hrs/wk | 93629 hrs/wk | 56 SF/user | 1339 stas. | | |
| **TOTALS** | | **31210** | | | **93629 hrs/wk** | **56 SF/user** | **1339 stas.** | | **133900hrs/wk** |
| **PEAK ATTENDANCE** | **80%** | **of Stations in Use** | | | | | **1071 stas.** | | |
| **PEAK UTILIZATION RATE** | **90%** | **of Hours of Operation** | | **=** | **90 hrs/wk** | **x** | **1071 stas.** | **=** | **96408hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **96408hrs/wk** | **minus** | **93629 hrs/wk** | **=** | **2779hrs/wk** |

| Gymnasium Module 124,200 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Court Size is 50 x 94 for a total playing area of: | | | | | | 70,500 SF | 15 court/s | | |
| Volleyball | 6.4% | 3094 | x | 3 hrs/wk | 9282 hrs/wk | 392 SF/user | 240 players | | |
| Basketball | 18.3% | 8804 | x | 3 hrs/wk | 26412 hrs/wk | 470 SF/user | 210 players | | |
| **TOTALS (Average for SF/Per and Stations)** | | **11898** | | | **35694 hrs/wk** | **431 SF/user** | **225 players** | | **22500hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **225 players** | | |
| **PEAK UTILIZATION RATE** | **60%** | **of Hours of Operation** | | **=** | **60 hrs/wk** | **x** | **225 players** | **=** | **13500hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **13500hrs/wk** | **minus** | **35694 hrs/wk** | **=** | **-22194hrs/wk** |

**Note: VB assumes 12 players + 4 rotating players for each court. BB assumes 10 players + 4 waiting to rotate in for each court.**

| Racquetball Courts 11,050 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Racquetball | 3.1% | 1497 | x | 2 hrs/wk | 2994 hrs/wk | 212.5 SF/user | 52 occup. | | |
| **TOTALS** | | **1497** | | | **2994 hrs/wk** | **212.5 SF/user** | **52 occup.** | | **5200hrs/wk** |
| **PEAK ATTENDANCE** | **100%** | **of Stations in Use** | | | | | **52 occup.** | | |
| **PEAK UTILIZATION RATE** | **50%** | **of Hours of Operation** | | **=** | **50 hrs/wk** | **x** | **52 occup.** | **=** | **2600hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **2600hrs/wk** | **minus** | **2994 hrs/wk** | **=** | **-394hrs/wk** |

| Jogging Track 6,400 SF | Average Particip. | Projected Participants | | Desired Times / Wk. | Desired Contact Hrs. | Max. SF/Person | Stations in Module | | Available Contact Hrs. |
|---|---|---|---|---|---|---|---|---|---|
| Running / Jogging | 14.6% | 7033 | x | 2 hrs/wk | 14065 hrs/wk | | 150 occup. | | |
| Exercise Walking | 28.8% | 13814 | x | 2 hrs/wk | 27627 hrs/wk | | 150 occup. | | |
| **TOTALS** | | **20846** | | | **41693 hrs/wk** | | **150 occup.** | | **15000hrs/wk** |
| **PEAK ATTENDANCE** | **60%** | **of Stations in Use** | | | | | **90 occup.** | | |
| **PEAK UTILIZATION RATE** | **80%** | **of Hours of Operation** | | **=** | **80 hrs/wk** | **x** | **90 occup.** | **=** | **7200hrs/wk** |
| **AVAILABLE PEAK CONTACT HOURS FOR PROGRAMMING** | | | | | **7200hrs/wk** | **minus** | **41693 hrs/wk** | **=** | **-34493hrs/wk** |

## 4.0 APPLICABLE CRITERIA

Unless a specific document version or date is indicated, use criteria from the most current references, including any applicable addenda, unless otherwise stated in the contract or task order, as of the date of the Contractor's latest accepted proposal or date of issue of the contract or task order solicitation, whichever is later. In the event of conflict between References and/or Applicable Military Criteria, apply the most stringent requirement, unless otherwise specifically noted in the contract or task order.

### 4.1. INDUSTRY CRITERIA

Applicable design and construction criteria references are listed in Table 1 below. This list is not intended to include all criteria that may apply or to restrict design and construction to only those references listed. See also Paragraph 3 for additional facility-specific applicable criteria.

### Table 1: Industry Criteria

| | |
|---|---|
| **Air Conditioning and Refrigeration Institute (ARI)** | |
| ARI 310/380 | Packaged Terminal Air-Conditioners and Heat Pumps |
| ARI 440 | Room Fan-Coil and Unit Ventilator |
| ANSI/ARI 430-99 | Central Station Air Handling Units |
| ARI 445 | Room Air-Induction Units |
| ARI 880 | Air Terminals |
| **Air Movement and Control Association (AMCA)** | |
| AMCA 210 | Laboratory Methods of Testing Fans for Rating |
| **American Architectural Manufacturers Association (AAMA)** | |
| AAMA 605 | Voluntary Specification Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels |
| AAMA 607.1 | Voluntary Guide Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum |
| AAMA 1503 | Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections |
| **American Association of State Highway and Transportation Officials (AASHTO)** | |

| | |
|---|---|
| | Roadside Design Guide [guardrails, roadside safety devices] |
| | Standard Specifications for Transportation Materials and Methods of Sampling and Testing [Road Construction Materials] |
| | Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals |
| | Guide for Design of Pavement Structures, Volumes 1 and 2 [pavement design guide] |
| | A Policy of Geometric Design of Highways and Streets |
| **American Bearing Manufacturers Association (AFBMA)** | |
| AFBMA Std. 9 | Load Ratings and Fatigue Life for Ball Bearings |
| AFBMA Std. 11 | Load Ratings and Fatigue Life for Roller Bearings |
| **American Boiler Manufacturers Association (ABMA)** | |
| ABMA ISEI | Industry Standards and Engineering Information |
| **American Concrete Institute** | |
| ACI 302.2R | Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials |
| ACI 318 | Building Code Requirements for Structural Concrete |
| ACI SP-66 | ACI Detailing Manual |
| ACI 530 | Building Code Requirements for Masonry Structures |
| **ADA Standards for Accessible Design** | |
| See US Access Board | ADA and ABA Accessibility Guidelines for Buildings and Facilities, Chapters 3-10. |
| **American Institute of Steel Construction (AISC)** | |
| | Manual of Steel Construction – 13th Edition (or latest version) |

| | |
|---|---|
| **American Iron and Steel Institute** | |
| AISI S100 | North American Specification for the Design of Cold-Formed Steel Structural Members |
| **American National Standards Institute 11 (ANSI)** | |
| ANSI Z21.10.1 | Gas Water Heaters Vol. 1, Storage water Heaters with Input Ratings of 75,000 Btu per Hour or less |
| ANSI Z124.3 | American National Standard for Plastic Lavatories |
| ANSI Z124.6 | Plastic Sinks |
| ANSI Z21.45 | Flexible Connectors of Other Than All-Metal Construction for Gas Appliances |
| ANSI/IEEE C2 | National Electrical Safety Code |
| ANSI/AF&PA NDS | National Design Specification for Wood Construction |
| **American Society of Civil Engineers (ASCE)** | |
| ASCE 7 | Minimum Design Loads for Buildings and Other Structures |
| ASCE 37 | Design and Construction of Sanitary and Storm Sewers, Manuals and Reports on Engineering Practice [sanitary sewer and storm drain design criteria] |
| ASCE/SEI 31-03 | Seismic Evaluation of Existing Buildings [Existing Building Alteration/Renovation] |
| ASCE/SEI 41-06 | Seismic Rehabilitation of Existing Buildings [Existing Building Alteration/Renovation] |
| **American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)** | |
| ASHRAE 90.1 | ANSI/ASHRAE/IESNA 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings |
| ASHRAE Guideline 0 | The Commissioning Process |
| ASHRAE Guideline 1.1 | The HVAC Commissioning Process |

| | |
|---|---|
| ASHRAE Handbooks | Fundamentals, HVAC Applications, Systems and Equipment, Refrigeration (Applicable, except as otherwise specified) |
| ASHRAE Standard 15 | Safety Standard for Refrigeration Systems |
| ASHRAE Standard 62.1 | Ventilation for Acceptable Indoor Air Quality |
| ASHRAE Standard 55 | Thermal Environmental Conditions for Human Occupancy (Design portion is applicable, except where precluded by other project requirements.) |
| ASHRAE Standard 189.1 | Standard for the Design of High-Performance Green Buildings (ANSI Approved; USGBC and IES Co-sponsored), - (APPLICABLE TO THE EXTENT SPECIFICALLY CALLED OUT IN THE CONTRACT) |
| **American Society of Mechanical Engineers International (ASME)** | |
| ASME BPVC SEC VII | Boiler and Pressure Vessel Code: Section VII Recommended Guidelines for the Care of Power Boilers |
| ASME A17.1 | Safety Code for Elevators and Escalators |
| ASME B 31 (Series) | Piping Codes |
| **American Water Works Association (AWWA)** | |
| | Standards [standards for water line materials and construction] |
| **American Welding Society** | |
| | Welding Handbook |
| | Welding Codes and Specifications (as applicable to application, see International Building Code for example) |
| **Architectural Woodwork Institute (AWI)** | |
| Latest Version | AWI Quality Standards |
| **Associated Air Balance Council (AABC)** | |
| AABC MN-1 | National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems |

| | |
|---|---|
| | AABC Associated Air Balance Council Testing and Balance Procedures |
| **ASTM International** | |
| ASTM C1060-90( | Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings |
| ASTM E 779 | Standard Test Method for Determining Air Leakage Rate by Fan Pressurization |
| ASTM E1827-96 | Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door |
| **Builders Hardware Manufacturers Association (BHMA)** | |
| ANSI/BHMA | The Various BHMA American National Standards |
| **Building Industry Consulting Service International** | |
| | Telecommunications Distribution Methods Manual (TDMM) |
| | Customer-Owned Outside Plant Design Manual (CO-OSP) |
| **Code of Federal Regulations (CFR)** | |
| 49 CFR 192 | Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards |
| 10 CFR 430 | Energy Conservation Program for Consumer Products |
| **Consumer Electronics Association** | |
| CEA 709.1B | Control Network Protocol Specification |
| CEA 709.3 | Free-Topology Twisted-Pair Channel Specification |
| CEA 852 | Tunneling Component Network Protocols Over Internet Protocol Channels |
| **Electronic Industries Association (EIA)** | |
| ANSI/EIA/TIA 568 | Structured Cabling Series |

| | |
|---|---|
| ANSI/EIA/TIA 569 | Commercial Building Standard for Telecommunications Pathways and Spaces (includes ADDENDA) |
| ANSI/TIA/EIA-606 | Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings |
| J-STD EIA/TIA 607 | Commercial Building Grounding and Bonding Requirements for Telecommunications |
| **Federal Highway Administration (FHWA)** | |
| | Manual on Uniform Traffic Control Devices for Streets and Highways [signage and pavement markings for streets and highways] |
| FHWA-NHI-01-021 | Hydraulic Engineering Circular No. 22, Second Edition, URBAN DRAINAGE DESIGN MANUAL |
| **Illuminating Engineering Society of North America (IESNA)** | |
| IESNA RP-1 | Office Lighting |
| IESNA RP-8 | Roadway Lighting |
| IESNA Lighting Handbook | Reference and Application |
| **Institute of Electrical and Electronics Engineers Inc. (IEEE)** | |
| | Standard for Use of the International System of Units (SI): the Modern Metric System |
| Standard 1100 | Recommended Practice for Powering and Grounding Sensitive Electronic Equipment |
| **International Code Council (ICC)** | |
| IBC | International Building Code<br><br>Note: All references in the International Building Code to the International Electrical Code shall be considered to be references to NFPA 70.<br><br>All references in the International Building Code to the International Fuel Gas Code shall be considered to be references to NFPA 54 and NFPA 58.<br><br>All references in the International Building Code to the International Fire |

| | |
|---|---|
| | Code and Chapter 9 shall be considered to be references to Unified Facilities Criteria (UFC) 3-600-01. |
| IMC | International Mechanical Code –<br><br>Note: For all references to “HEATING AND COOLING LOAD CALCULATIONS”, follow ASHRAE 90.1<br><br>Note: For all references to “VENTILATION”, follow ASHRAE 62.1 |
| IRC | International Residential Code |
| IPC | International Plumbing Code |
| IEC | Energy Conservation Code (IEC) –Applicable only to the extent specifically referenced herein. Refer to Paragraph 5, ENERGY CONSERVATION requirements. |
| IGC | International Gas Code - not applicable. Follow NFPA 54, National Fuel Gas Code and NFPA 58, Liquified Petroleum Gas Code. |
| **International Organization for Standardization (ISO)** | |
| ISO 6781:1983 | Qualitative detection of thermal irregularities in building envelopes – infrared method |
| **LonMark International (LonMark)** | |
| LonMark Interoperability Guidelines | (available at www.lonmark.org), including: Application Layer Guidelines, Layer 1-6 Guidelines, and External Interface File (XIF) Reference Guide |
| LonMark Resource Files | (available at www.lonmark.org), including Standard Network Variable Type (SNVT) definitions |
| **Metal Building Manufacturers Association (MBMA)** | |
| | Metal Building Systems Manual |
| **Midwest Insulation Contractors Association (MICA)** | |
| | National Commercial and Industrial Insulation Standards Manual |
| **National Association of Corrosion Engineers International (NACE)** | |

| | |
|---|---|
| NACE RP0169 | Control of External Corrosion on Underground or Submerged Metallic Piping Systems |
| NACE RP0185 | Extruded, Polyolefin Resin Coating Systems with Adhesives for Underground or Submerged Pipe |
| NACE RP0285 | Corrosion Control of Underground Storage Tank Systems by Cathodic Protection |
| NACE RP0286 | Electrical Isolation of Cathodically Protected Pipelines |
| **National Electrical Manufacturers Association (NEMA)** | |
| **National Environmental Balancing Bureau (NEBB)** | |
| | Procedural Standards Procedural Standards for Testing Adjusting Balancing of Environmental Systems |
| **National Fire Protection Association (NFPA)** | |
| NFPA 10 | Standard for Portable Fire Extinguishers |
| NFPA 13 | Installation of Sprinkler Systems |
| NFPA 13R | Residential Occupancies up to and Including Four Stories in Height Sprinkler Systems |
| NFPA 14 | Standard for the Installation of Standpipes and Hose Systems |
| NFPA 20 | Installation of Centrifugal Fire Pumps |
| NFPA 24<br><br>NFPA 25 | Standard for the Installation of Private Fire Service Mains and Their Appurtenances [underground fire protection system design]<br><br>Inspection, Testing And Maintenance Of Water-Based Fire Protection Systems |
| NFPA 30 | Flammable and Combustible Liquids Code |
| NFPA 30A | Motor Fuel Dispensing Facilities and Repair Garages |
| NFPA 31 | Installation of Oil Burning Equipment |
| NFPA 54 | National Fuel Gas Code |

| | |
|---|---|
| NFPA 58 | Liquefied Petroleum Gas Code |
| NFPA 70 | National Electrical Code |
| NFPA 70E | Standard for Electrical Safety in the Workplace |
| NFPA 72 | National Fire Alarm Code |
| NFPA 76 | Fire Protection of Telecommunications Facilities |
| NFPA 80 | Standard for Fire Doors and Fire Windows |
| NFPA 90a | Installation of Air Conditioning and Ventilating Systems |
| NFPA 96 | Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations |
| NFPA 101 | Life Safety Code |
| NFPA 780 | Standard for the Installation of Lightning Protection Systems |
| **National Roofing Contractor's Association (NRCA)** | |
| | Roofing and Waterproofing Manual |
| **National Sanitation Foundation, International** | |
| NSF/ANSI Std. 2, 3, 4, 5, 6, 7, 8, 12, 13, 18, 20, 21, 25, 29, 35, 36, 37, 51, 52, 59, 169 | Food Equipment Standards |
| ANSI/UL Std. 73, 197, 471, 621, 763 | Food Equipment Standards |
| CSA Std. C22.2 No. 109, 120, 195 | Food Equipment Standards |
| **Occupational Safety and Health Administration (OSHA)** | |
| Title 29, Part 1926 | OSHA Construction Industry Standards, Title 29, Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction |

| | |
|---|---|
| **Plumbing and Drainage Institute (PDI)** | |
| PDI G 101 | Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data |
| PDI WH201 | Water Hammer Arrestors |
| **Precast Concrete Institute** | |
| PCI Design Handbook | Precast and Prestressed Concrete |
| **Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)** | |
| SMACNA HVAC Duct Construction Standards | HVAC Duct Construction Standards - Metal and Flexible |
| SMACNA Architectural Manual | Architectural Sheet Metal Manual |
| SMACNA HVAC TAB | HVAC Systems - Testing, Adjusting and Balancing |
| **State/Local Regulations** | |
| | State Department of Transportation Standard Specifications for Highway and Bridge Construction |
| | Sedimentation and Erosion Control Design Requirements |
| | Environmental Control Requirements |
| | Storm Water Management Requirements |
| **Steel Door Institute (SDI)** | |
| ANSI A250.8/SDI 100 | Standard Steel Doors and Frames |
| **Steel Deck Institute** | |
| | SDI Diaphragm Design Manual |
| **Steel Joist Institute** | |
| | Catalog of Standard Specifications and Load Tables for Steel Joists and |

| | |
|---|---|
| | Joist Girders |
| **Underwriters Laboratories (UL)** | |
| UL 96A | Installation Requirements for Lightning Protection Systems |
| UL 300 | Standard for Safety for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas |
| **UNITED STATES ACCESS BOARD: U.S. ARCHITECTURAL AND TRANSPORTATION BARRIERS COMPLIANCE BOARD** | |
| ADA and ABA Accessibility Guidelines for Buildings and Facilities | ABA Accessibility Standard for DoD Facilities<br><br>Derived from the ADA and ABA Accessibility Guidelines: Specifically includes: ABA Chapters 1 and 2 and Chapters 3 through 10.<br><br>Use this reference in lieu of IBC Chapter 11.<br><br>Excluded are:<br><br>(a) Facilities, or portions of facilities, on a military installation that are designed and constructed for use exclusively by able-bodied military personnel (See Paragraph 3 for any reference to this exclusion).<br><br>(b) Reserve and National Guard facilities, or portions of such facilities, owned by or under the control of the Department of Defense, that are designed and constructed for use exclusively by able-bodied military personnel. (See paragraph 3 for any reference to this exclusion). |
| **U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES** | |
| | FDA National Food Code |
| **U.S. GREEN BUILDING COUNCIL (USGBC)** | |
| LEED-NC | Green Building Rating System for New Construction & Major Renovations |
| | Application Guide for Multiple Buildings and On-Campus Building Projects |

4.2. MILITARY CRITERIA

The project shall conform to the following criteria. Certain design impacts and features due to these criteria are noted for the benefit of the offeror. However, all requirements of the referenced criteria will be applicable, whether noted or not, unless otherwise specified herein.

4.2.1. Energy Policy Act of 2005 (Public Law 109-58) (applies only to the extent specifically implemented in the contract, which may or may not directly cite or reference EPACT)

4.2.2. Executive Order 12770: Metric Usage In Federal Government

(a) Metric design and construction is required except when it increases construction cost. Offeror to determine most cost efficient system of measurement to be used for the project.

4.2.3. TB MED 530: Occupational and Environmental Health Food Sanitation

4.2.4. Unified Facilities Criteria (UFC) 3-410-01FA: Heating, Ventilating, and Air Conditioning - applicable only to the extent specified in paragraph 5, herein.

4.2.5. Deleted.

4.2.6. UFC 3-600-01 Design: Fire Protection Engineering for Facilities. Use the latest edition of the IBC in coordination with this UFC. Use Chapters 3, 6, 7, 33 and UFC 3-600-01. If any conflict occurs between these Chapters and UFC 3-600-01, the requirements of UFC 3-600-01 take precedence. Use UFC 3-600-01 in lieu of IBC Chapters 4, 8,9,10.

4.2.7. UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings

4.2.8. UFC 4-023-03 Design of Buildings to Resist Progressive Collapse (Use most recent version, regardless of references thereto in other publications)

(a) Note the option to use tie force method or alternate path design for Occupancy Category II.

4.2.9. UFC 4-021-01 Design and O&M: Mass Notification Systems

4.2.10. Technical Criteria for Installation Information Infrastructure Architecture (I3A)

(a) Email: DetrickISECI3Aguide@conus.army.mil

4.2.11. U.S. Army Information Systems Engineering Command (USAISEC) SECRET Internet Protocol (IP) Router Network (SIPRNET) Technical Implementation Criteria (STIC).. See Paragraph 3 for applicability to specific facility type. May not apply to every facility. This is mandatory criteria for those facilities with SIPRNET.

4.2.11.1. Draft Guide Specification for Section 27 05 28 PROTECTIVE DISTRIBUTION SYSTEM (PDS) FOR SIPRNET COMMUNICATIONS SYSTEMS, found at http://mrsi.usace.army.mil/rfp/Shared%20Documents/SECTION_270528-v3.pdf

## 5.0 GENERAL TECHNICAL REQUIREMENTS

This paragraph contains technical requirements with general applicability to Army facilities. See also Paragraph 3 for facility type-specific operational, functional and technical requirements. Residential or similar grade finishes and materials are not acceptable for inclusion in these buildings, unless otherwise specifically allowed.

5.1. SITE PLANNING AND DESIGN

5.1.1. STANDARDS AND CODES: The site planning and design shall conform to APPLICABLE CRITERIA and to paragraph 6, PROJECT SPECIFIC REQUIREMENTS.

5.1.2. SITE PLANNING OBJECTIVES: Group buildings in configurations that create a sense of community and promote pedestrian use. See paragraph 3 for additional site planning requirements relating to building functions.

5.1.2.1. Provide enclosures and or visual screening devices for Outdoor Utility such as dumpsters, emergency generators, transformers, heating, ventilation, and air conditioning units from streetscape and courtyard views to limit visual impact. Enclosures shall be compatible with the building they serve and accessible by vehicle. The location of dumpsters can have a significant visual impact and should be addressed as part of an overall building design and incorporated in site planning.

5.1.2.2. Where included in the project, dumpster pads shall be concrete (minimum of 8 inches thick on 4 inch base course, unless site conditions dictate more conservative requirements) and directly accessible by way of a paved service drive or parking lot with adequate overhead clearance for collection vehicles. Provide space at dumpster areas for recycling receptacles. Coordinate with Installation on recycling receptacle types, sizes and access requirements and provide space at dumpster areas to accommodate them.

5.1.2.3. Vehicular Circulation. Apply design vehicle templates provided by the American Association of State Highway and Transportation Officials (AASHTO) to the site design. The passenger car class includes passenger cars and light trucks, such as vans and pick-ups. The passenger car template is equivalent to the non-organizational – privately owned vehicle (POV). The truck class template includes single-unit trucks, recreation vehicles, buses, truck tractor-semi-trailer combinations, and trucks or truck tractors with semi-trailers in combination with full trailers. Provide vehicle clearances required to meet traffic safety for emergency vehicles, service vehicles, and moving vans. Provide required traffic control signage Site entrances and site drive aisles shall maximize spacing between drives, incorporate right-angle turns, and limit points of conflict between traffic. Design Services Drives to restrict access to unauthorized vehicles by removable bollards, gates, or other barriers to meet Anti-Terrorism/Force Protection (ATFP) requirements. Orient service drives to building entrances other than the primary pedestrian entry at the front of the building.

5.1.2.4. Provide Emergency Vehicle Access around the facility and shall be in accordance with AT/FP requirements. Maintain a 33-foot clear zone buffer for emergency vehicles, designed to prevent other vehicles from entering the AT/FP standoff to the building.

5.1.2.5. Clear and grub all trees and vegetation necessary for construction; but, save as many trees as possible. Protect trees to be saved during the construction process from equipment.

5.1.2.6. Stormwater Management. Employ design and construction strategies (Best Management Practices) that reduce stormwater runoff, reduce discharges of polluted water offsite and maintain or restore predevelopment hydrology with respect to temperature, rate, volume and duration of flow to the maximum extent practicable. See paragraph 6, PROJECT SPECIFIC requirements for additional information.

5.1.3. EXTERIOR SIGNAGE: Provide exterior signage in accordance with Appendix H, Exterior Signage. Provide exterior NO SMOKING signage that conveys building and grounds smoking policy.

5.1.4. EXISTING UTILITIES: Base utilities maps and capacities for this site are included as part of this RFP. See paragraph 6 for more detailed information.

5.2. SITE ENGINEERING

5.2.1. STANDARDS AND CODES: The site engineering shall conform to APPLICABLE CRITERIA.

5.2.2. SOILS:

5.2.2.1. A report has been prepared to characterize the subsurface conditions at the project site and is **appended to these specifications.** The report provides a general overview of the soil and geologic conditions with detailed descriptions at discrete boring locations. The Contractor's team shall include a licensed geotechnical engineer to interpret the report and develop earthwork and foundation recommendations and design parameters in which to base the contractor's design. If any additional subsurface investigation or laboratory analysis is required to better characterize the site or develop the final design, the Contractor shall perform it under the direction of a licensed geotechnical engineer. There will be no separate payment for the cost of additional tests. If differences between the Contractor's additional subsurface investigation and the government provided soils report or the reasonably expected conditions require material revisions in the design, an equitable adjustment may be made, in accordance with the provisions of the Differing Site Conditions clause. The basis for the adjustment would be the design and construction appropriate for the conditions described in the Government furnished report or the reasonably expected conditions, in comparison with any changes required by material differences in the actual conditions encountered, in accordance with the terms of contract clause Differing Site Conditions.

5.2.2.2. The contractor's licensed geotechnical engineer shall prepare a final geotechnical evaluation report, to be submitted along with the first foundation design submittal, as described in Section 01 33 16, *Design After Award*.

5.2.3. VEHICLE PAVEMENTS: (as applicable to the project)

5.2.3.1. Design procedures and materials shall conform to one of the following: 1) the USACE Pavement Transportation Computer Assisted Structural Engineering (PCASE) program, 2) American Association of State Highway and Transportation Officials (AASHTO) or, 3) the applicable state Department of Transportation standards in which the project is located. See paragraph 5.2.2.2 and Section 01 33 16 for required information for the Contractor's geotechnical evaluation report. The minimum flexible pavement section shall consist of 2 inches of asphalt and 6 inches of base or as required by the pavement design, whichever is greater, unless specifically identified by the Government to be a gravel road. Design roads and parking areas for a life expectance of 25 years with normal maintenance. Parking area for tactical vehicles (as applicable to the project) shall be Portland Cement Concrete (PCC) rigid pavement design. For concrete pavements, submit joint layout plan for review and concurrence. Design pavements for military tracked vehicles (as applicable to the project) IAW USACE PCASE. Traffic estimates for each roadway area will be as shown on the drawings or listed in Section 01 10 00 Paragraph 6.4.4. Pavement markings and traffic signage shall comply with the Installation requirements and with the Manual on Uniform Traffic Control Devices.

5.2.3.2. Parking Requirements.

(a) All handicap POV parking lots (where applicable in the facility specific requirements) shall meet the ADA and ABA Accessibility Guidelines for accessible parking spaces.

(b) Design POV parking spaces for the type of vehicles anticipated, but shall be a minimum of 9 ft by 18 ft for POVs, except for two wheel vehicles.

5.2.3.3. Sidewalks. Design the network of walks throughout the complex (where applicable) to facilitate pedestrian traffic among facilities, and minimize the need to use vehicles. Incorporate sidewalks to enhance the appearance of the site development, while creating a sense of entry at the primary patron entrances to the buildings. Minimum sidewalk requirements are in Paragraph 3, where applicable and/or paragraph 6 and/or site plans, where applicable..

5.2.4. CATHODIC PROTECTION: Provide cathodic protection systems for all underground metallic systems and metallic fittings/portions of non-metallic, underground systems, both inside and outside the building 5 foot line that are subject to corrosion. Coordinate final solutions with the installation to insure an approach that is consistent with installation cathodic protection programs.

5.2.5. UTILITIES: See paragraph 6.4.6 for specific information on ownership of utilities and utility requirements. Meter all utilities (gas, water, and electric, as applicable) to each facility. For Government owned utilities, install meters that are wireless data transmission capable as well as have a continuous manual reading option. All meters will be capable of at least hourly data logging and transmission and provide consumption data for gas, water, and electricity. Gas and electric meters will also provide demand readings based on consumption over a maximum of any 15 minute period. Configure all meters to transmit at least daily even if no receiver for the data is currently available at the time of project acceptance. For privatized utilities, coordinate with the privatization utility(ies) for the proper meter base and meter installation.

5.2.6. PERMITS: The CONTRACTOR shall be responsible for obtaining all permits (local, state and federal) required for design and construction of all site features and utilities.

5.2.7. IRRIGATION. Landscape irrigation systems, if provided, shall comply with the following:

5.2.7.1. Irrigation Potable Water Use Reduction. Reduce irrigation potable water use by 100 percent using LEED credit WE1.1 baseline (no potable water used for irrigation), except where precluded by other project requirements.

5.2.8. EPA WATERSENSE PRODUCTS AND CONTRACTORS. Except where precluded by other project requirements, use EPA WaterSense labeled products and irrigation contractors that are certified through a WaterSense labeled program where available.

5.3. ARCHITECTURE AND INTERIOR DESIGN:

This element will be evaluated per APPLICABLE CRITERIA under the quality focus.

5.3.1. STANDARDS AND CODES: The architecture and interior design shall conform to APPLICABLE CRITERIA.

5.3.2. GENERAL: Overall architectural goal is to provide a functional, quality, visually appealing facility that is a source of pride for the installation and delivered within the available budget and schedule.

5.3.3. COMPUTATION OF AREAS: See APPENDIX Q for how to compute gross and net areas of the facility(ies).

5.3.4. BUILDING EXTERIOR: Design buildings to enhance or compliment the visual environment of the Installation. Where appropriate, reflect a human scale to the facility. Building entrance should be architecturally defined and easily seen. When practical, exterior materials, roof forms, and detailing shall be compatible with the surrounding development and adjacent buildings on the Installation and follow locally established architectural themes. Use durable materials that are easy to maintain. Exterior colors shall conform to the Installation requirements. See paragraph 6.

5.3.4.1. Building Numbers: Permanently attach exterior signage on two faces of each building indicating the assigned building number or address. Building number signage details and locations shall conform to Appendix H, Exterior Signage.

5.3.5. BUILDING INTERIOR

5.3.5.1. Space Configuration: Arrange spaces in an efficient and functional manner in accordance with area adjacency matrices.

5.3.5.2. Surfaces: Appearance retention is the top priority for building and furniture related finishes. Provide low maintenance, easily cleaned room finishes that are commercially standard for the facility occupancy specified, unless noted otherwise.

5.3.5.3. Color: The color, texture and pattern selections for the finishes of the building shall provide an aesthetically pleasing, comfortable, easily maintainable and functional environment for the occupants. Coordinate the building colors and finishes for a cohesive design. Select colors appropriate for the building type. Use color, texture and pattern to path or way find through the building. Trendy colors that will become dated shall be limited to non-permanent finishes such as carpet and paint. Select finisheswith regards to aesthetics, maintenance, durability, life safety and image. Limit the number of similar colors for each material. Use medium range colors for ceramic and porcelain tile groutto help hide soiling. Plastic laminate and solid surface materials shall have patterns that are mottled, flecked or speckled. Coordinate finish colors of fire extinguisher cabinets, receptacle bodies and plates, fire alarms / warning lights, emergency lighting, and other miscellaneous items with the building interior. Match color of equipment items on ceilings (speakers, smoke detectors, grills, etc.) the ceiling color.

5.3.5.4. Circulation: Circulation schemes must support easy way finding within the building.

5.3.5.5. Signage: Provide interior signage for overall way finding and life safety requirements. A comprehensive interior plan shall be from one manufacturer. Include the following sign types: (1) Lobby Directory, (2) Directional Signs; (3) Room Identification Signs; (4) Building Service Signs; (5) Regulatory Signs; (6) Official and Unofficial Signs (7) Visual Communication Boards (8) NO SMOKING signage that conveys building smoking policy. Use of emblems or logos may also be incorporated into the signage plan.

5.3.5.6. Window Treatment: Provide interior window treatments with adjustable control in all exterior window locations for control of day light coming in windows or privacy at night. Maintain uniformity of treatment color and material to the maximum extent possible within a building.

5.3.5.7. Casework: Unless, otherwise specified, all casework for Cabinetry and cases shall be “custom grade”, as described in the AWI Quality Standards.

5.3.6. COMPREHENSIVE INTERIOR DESIGN

5.3.6.1. Comprehensive Interior Design includes the integration of a Structural Interior Design (SID) and a Furniture, Fixtures and Equipment (FF&E) design and package. SID requires the design, selection and coordination of interior finish materials that are integral to or attached to the building structure. Completion of a SID involves the selection and specification of applied finishes for the building’s interior features including, but not limited to, walls, floors, ceilings, trims, doors, windows, window treatments, built-in furnishings and installed equipment, lighting, and signage. The SID package includes finish schedules, finish samples and any supporting interior elevations, details or plans necessary to communicate the building finish design and build out. The SID also provides basic space planning for the anticipated FF&E requirements in conjunction with the functional layout of the building and design issues such as life safety, privacy, acoustics, lighting, ventilation, and accessibility. See Section 01 33 16 for SID design procedures.

5.3.6.2. The FF&E design and package includes the design, selection, color coordination and of the required furnishing items necessary to meet the functional, operational, sustainability, and aesthetic needs of the facility coordinated with the interior finish materials in the SID. The FF&E package includes the specification, procurement documentation, placement plans, ordering and finish information on all freestanding furnishings and accessories, and a cost estimate. Coordinate the selection of furniture style, function and configuration with the defined requirements. Examples of FF&E items include, but are not limited to workstations, seating, files, tables, beds, wardrobes, draperies and accessories as well as marker boards, tack boards, and presentation screens. Criteria for furniture selection include function and ergonomics, maintenance, durability, sustainability, comfort and cost. See Section 01 33 16 for FFE design procedures.

5.4. STRUCTURAL DESIGN

5.4.1. STANDARDS AND CODES: The structural design shall conform to APPLICABLE CRITERIA.

5.4.2. GENERAL: The structural system must be compatible with the intended functions and components that allows for future flexibility and reconfigurations of the interior space. Do not locate columns, for instance, in rooms requiring visibility, circulation or open space, including, but not limited to entries, hallways, common areas, classrooms, etc. Select an economical structural system based upon facility size, projected load requirements and local availability of materials and labor. Base the structural design on accurate, site specific geotechnical information and anticipated loads for the building types and geographical location. Consider climate conditions, high humidity, industrial atmosphere, saltwater exposure, or other adverse conditions when selecting the type of cement and admixtures used in concrete, the concrete cover on reinforcing steel, the coatings on structural members, expansion joints, the level of corrosion protection, and the structural systems. Analyze, design and detail each building as a complete structural system. Design structural elements to preclude damage to finishes, partitions and other frangible, non-structural elements to prevent impaired operability of moveable components; and to prevent cladding leakage and roof ponding. Limit deflections of structural members to the allowable of the applicable material standard, e.g., ACI, AISC, Brick Industry Association, etc. When modular units or other pre-fabricated construction is used or combined with stick-built construction, fully coordinate and integrate the overall structural design between the two different or interfacing construction types. If the state that the project is located in requires separate, specific licensing for structural engineers (for instance, such as in Florida, California and others), then the structural engineer designer of record must be registered in that state.

5.4.3. LOADS: See paragraph 3 for facility specific (if applicable) and paragraph 6 for site and project specific structural loading criteria. Unless otherwise specified in paragraph 6, use Exposure Category C for wind. If not specified, use Category C unless the Designer of Record can satisfactorily justify another Exposure Category in its design analysis based on the facility Master Plan. Submit such exceptions for approval as early as possible and prior to the Interim Design Submittal in Section “Design After Award”. Design the ancillary building items, e.g. doors, window jambs and connections, overhead architectural features, systems and equipment bracing, ducting, piping, etc. for gravity, seismic, lateral loads and for the requirements of UFC 4-010-01, DOD Minimum Antiterrorism Standards for Buildings. Ensure and document that the design of glazed items includes, but is not limited to, the following items under the design loads prescribed in UFC 4-010-01:

(a) Supporting members of glazed elements, e.g. window jamb, sill, header

(b) Connections of glazed element to supporting members, e.g. window to header

(c) Connections of supporting members to each other, e.g. header to jamb

(d) Connections of supporting members to structural system, e.g. jamb to foundation.

5.4.4. TERMITE TREATMENT: (Except Alaska) Provide termite prevention treatment in accordance with Installation and local building code requirements, using licensed chemicals and licensed applicator firm.

5.5. THERMAL PERFORMANCE

5.5.1. STANDARDS AND CODES: Building construction and thermal insulation for mechanical systems shall conform to APPLICABLE CRITERIA.

5.5.2. BUILDING ENVELOPE SEALING PERFORMANCE REQUIREMENT. Design and construct the building envelope for office buildings, office portions of mixed office and open space (e.g., company operations facilities), dining, barracks and instructional/training facilities with a continuous air barrier to control air leakage into, or out of, the conditioned space. Clearly identify all air barrier components of each envelope assembly on construction documents and detail the joints, interconnections and penetrations of the air barrier components. Clearly identify the boundary limits of the building air barriers, and of the zone or zones to be tested for building air tightness on the drawings. The use of painted interior walls is not an acceptable air barrier method.

5.5.2.1. Trace a continuous plane of air-tightness throughout the building envelope and make flexible and seal all moving joints.

5.5.2.2. The air barrier material(s) must have an air permeance not to exceed 0.004 cfm / sf at 0.3” wg (0.02 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 2178

5.5.2.3. Join and seal the air barrier material of each assembly in a flexible manner to the air barrier material of adjacent assemblies, allowing for the relative movement of these assemblies and components.

5.5.2.4. Support the air barrier so as to withstand the maximum positive and negative air pressure to be placed on the building without displacement, or damage, and transfer the load to the structure.

5.5.2.5. Seal all penetrations of the air barrier. If any unavoidable penetrations of the air barrier by electrical boxes, plumbing fixture boxes, and other assemblies are not airtight, make them airtight by sealing the assembly and the interface between the assembly and the air barrier or by extending the air barrier over the assembly.

5.5.2.6. The air barrier must be durable to last the anticipated service life of the assembly.

5.5.2.7. Do not install lighting fixtures with ventilation holes through the air barrier

5.5.2.8. Provide a motorized damper in the closed position and connected to the fire alarm system to open on call and fail in the open position for any fixed open louvers at elevator shafts. Coordinate the motorized elevator hoistway vent damper(s) with the Fire Protection System design in paragraph 5.10. Ensure that the damper(s) is accessible to facilitate regular inspection and maintenance.

5.5.2.9. Damper and control to close all ventilation or make-up air intakes and exhausts, , etc., when leakage can occur during inactive periods. Atrium smoke exhaust and intakes shall only open when activated per IBC and other applicable Fire Code requirements.

5.5.2.10. If garages under buildings are applicable, compartmentalize garages by providing air-tight vestibules at building access points.

5.5.2.11. Compartmentalize spaces under negative pressure such as boiler rooms and provide make-up air for combustion.

5.5.2.12. Performance Criteria and Substantiation: Submit the qualifications and experience of the testing entity for approval. Demonstrate performance of the continuous air barrier for the opaque building envelope by the following tests:

(a) Develop an Air Barrier Quality Control plan to assure that a competent air barrier inspector/specialist inspects the critical components prior to them being concealed. At a minimum, three onsite inspections are required during construction to assure the completeness of the construction and design.

(b) Test the completed building and demonstrate that the air leakage rate of the building envelope does not exceed 0.25cfm/ft2 at a pressure differential of 0.3" w.g.(75 Pa) in accordance with ASTM's E 779 (2003) or E-1827-96 (2002). Accomplish tests using both pressurization and depressurization.. Divide the volume of air leakage in cfm @ 0.3" w.g. (L/s @ 75 Pa) by the area of the pressure boundary of the building, including roof or ceiling, walls and floor to produce the air leakage rate in cfm/ft2 @ 0.3" w.g. (L/s.m2 @ 75 Pa). Do not test the building until verifying that the continuous air barrier is in place and installed without failures in accordance with installation instructions so that repairs to the continuous air barrier, if needed to comply with the required air leakage rate, can be done in a timely manner.

(c) Test the completed building using Infrared Thermography testing. Use infrared cameras with a resolution of 0.1deg C or better. Perform testing on the building envelope in accordance with ISO 6781:1983 and ASTM C1060-90(1997). Determine air leakage pathways using ASTM E 1186-03 Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems, and perform corrective work as necessary to achieve the whole building air leakage rate specified in (a) above.

(d) Notify the Government at least three working days prior to the tests to provide the Government the opportunity to witness the tests. Provide the Government written test results confirming the results of all tests.

5.6. PLUMBING

5.6.1. STANDARDS AND CODES: The plumbing system shall conform to APPLICABLE CRITERIA.

5.6.2. PRECAUTIONS FOR EXPANSIVE SOILS: Where expansive soils are present, include design features for underslab piping systems and underground piping serving chillers, cooling towers, etc, to control forces resulting from soil heave. Some possible solutions include, but are not necessarily limited to, features such as flexible expansion joints, slip joints, horizontal offsets with ball joints, or multiple bell and spigot gasketed fittings. For structurally supported slabs, suspend piping from the structure with adequate space provided below the pipe for the anticipated soil movement.

5.6.3. HOT WATER SYSTEMS: For Hot Water heating and supply, provide a minimum temp of 140 Deg F in the storage tank and a maximum of 110 Deg F at the fixture, unless specific appliances or equipment specifically require higher temperature water supply.

5.6.4. SIZING HOT WATER SYSTEMS: Unless otherwise specified or directed in paragraph 3, design in accordance with ASHRAE Handbook Series (appropriate Chapters), ASHRAE Standard 90.1, and the energy conservation requirements of the contract. Size and place equipment so that it is easily accessible and removable for repair or replacement.

5.6.5. JANITOR CLOSETS: In janitor spaces/room/closets, provide at minimum, a service sink with heavy duty shelf and wall hung mop and broom rack(s).

5.6.6. FLOOR DRAINS: As a minimum, provide floor drains in mechanical rooms and areas, janitor spaces/rooms/closets and any other area that requires drainage from fixtures or equipment, drain downs, condensate, as necessary.

5.6.7. URINALS: Urinals shall be water-use type, conforming to ASHRAE Standard 189.1 (0.5 gpf/1.9 lpf).

5.6.8. BUILDING WATER USE REDUCTION. Reduce building potable water use in each building 30 percent from the Baseline, using the Manufacturing Performance Requirements for .Plumbing Fixtures

from the Energy Policy Act of 1992 (Public Law 102-486), except as modified by LEED. See Appendix S. Public lavatory faucets shall deliver a maximum flow rate of 0.5 gallons per minute, when tested in accordance with ASME A 112.18/CSA B125 and use that flowrate as the Baseline figure for calculating the 30 percent reduction requirement from the Baseline.

5.6.9. Do not use engineered vent or Sovent® type drainage systems.

5.6.10. Where the seasonal design temperature of the cold water entering a building is below the seasonal design dew point of the indoor ambient air, and where condensate drip will cause damage or create a hazard, insulate plumbing piping with a vapor barrier type of insulation to prevent condensation. Do not locate water or drainage piping over electrical wiring or equipment unless adequate protection against water (including condensation) damage is provided. Insulation alone is not adequate protection against condensation. Follow ASHRAE Fundamentals Chapter 23, Insulation for Mechanical Systems, IMC paragraph 1107 and International Energy Conservation Code for pipe insulation requirements.

5.6.11. Cover all drain, waste and vent piping to prevent mortar or other debris from being flushed down and blocking pipes during such construction activities.

5.7. ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

5.7.1. STANDARDS AND CODES: The electrical systems for all facilities shall conform to APPLICABLE CRITERIA.

5.7.2. MATERIALS AND EQUIPMENT: Materials, equipment and devices shall, as a minimum, meet the requirements of Underwriters Laboratories (UL) where UL standards are established for those items. Wiring for branch circuits shall be copper. Motors larger than one-half horsepower shall be three phase. All electrical systems shall be pre-wired and fully operational unless otherwise indicated. Wall mounted electrical devices (power receptacles, communication outlets and CATV outlets) shall have matching colors, mounting heights and faceplates.

5.7.3. POWER SERVICE: Primary service from the base electrical distribution system to the pad-mounted transformer and secondary service from the transformer to the building service electrical equipment room shall be underground. See paragraph 6 for additional site electrical requirements.

5.7.3.1. Spare Capacity: Provide 10% space for future circuit breakers in all panelboards serving residential areas of buildings and 15% spaces in all other panelboards.

5.7.4. TELECOMMUNICATION SERVICE: Connect the project's facilities to the Installation telecommunications (voice and data) system through the outside plant (OSP) telecommunications underground infrastructure cabling system per the I3A Criteria. Connect to the OSP cabling system from each facility main cross connect located in the telecommunications room.

5.7.5. LIGHTING: Comply with the recommendations of the Illumination Engineering Society of North America (IESNA), the National Energy Policy Act and Energy Star requirements for lighting products..

5.7.5.1. Interior Lighting:

(a) Reflective Surfaces: Coordinate interior architectural space surfaces and colors with the lighting systems to provide the most energy-efficient workable combinations.

(b) High Efficiency Fluorescent Lighting: Utilize NEMA premium electronic ballasts and energy efficient fluorescent lamps with a Correlated Color Temperature (CCT) of 4100K. Linear fluorescent and compact fluorescent fixtures shall have a Color Rendering Index of (CRI) of 87 or higher. Fluorescent lamps shall be the low mercury type qualifying as non-hazardous waste upon disposal. Do not use surface mounted fixtures on acoustical tile ceilings. Provide an un-switched fixture with emergency ballast at each entrance to the building.

(c) Solid State Lighting: Fixtures shall provide lighting with a minimum Correlated Color Temperature (CCT) of 4100K and shall have a Color Rendering Index of (CRI) of 75 or higher. Verify performance of the light producing solid state components by a test report in compliance with the requirements of IESNA LM 80. Verify performance of the solid state light fixtures by a test report in compliance with the requirements of IESNA LM 79. Provide lab results by a NVLAP certified laboratory. The light producing solid state components and drivers shall have a life expectancy of 50,000 operating hours while maintaining at least 70% of original illumination level. Provide a complete five year warranty for fixtures.

(d) Metal Halide Lighting (where applicable): Metal Halide lamp fixtures in the range of 150-500 Watts shall be pulse start type and have a minimum efficiency rating of 88%.

(e) Lighting Controls: ANSI/ASHRAE/IESNA 90.1 has specific lighting controls requirements. See Also Appendix T, ***Functional Area Lighting Control Strategy.***

(f) Exterior Lighting: See paragraph 6.9 for site specific information, if any, on exterior lighting systems. Minimize light pollution and light trespass by not over lighting and use cut-off type exterior luminaries.

5.7.6. TELECOMMUNICATION SYSTEM: Building telecommunications cabling systems (BCS) and OSP telecommunications cabling system shall conform to APPLICABLE CRITERIA, including but not limited to I3A Technical Criteria. An acceptable BCS encompasses, but is not limited to, copper and fiber optic (FO) entrance cable, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, workstation outlets, racks, cable management, patch panels, cable tray, cable ladder, conduits, grounding, and labeling.. Items included under OSP infrastructure encompass, but are not limited to, manhole and duct infrastructure, copper cable, fiber optic cable, cross connects, terminations, cable vaults, and copper and FO entrance cable.

5.7.6.1. Design, install, label and test all telecommunications systems in accordance with the I3A Criteria and ANSI/TIA/EIA 568, 569, and 606 standards. A Building Industry Consulting Services International (BICSI) Registered Communications Distribution Designer (RCDD) with at least 2 yrs related experience shall develop and stamp telecommunications design, and prepare the test plan. See paragraph 5.8.2.5 for design of environmental systems for Telecommunications Rooms.

5.7.6.2. The installers assigned to the installation of the telecommunications system or any of its components shall be regularly and professionally engaged in the business of the application, installation and testing of the specified telecommunications systems and equipment. Key personnel; i.e., supervisors and lead installers assigned to the installation of this system or any of its components shall be BICSI Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification for each of the key personnel. In lieu of BICSI certification, supervisors and installers shall have a minimum of 5 years experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products.

5.7.6.3. Perform a comprehensive end to end test of all circuits to include all copper and fiber optic cables upon completion of the BCS and prior to acceptance of the facility. Provide adequate advanced notification to the COR to allow COR and Installation personnel attendance The BCS circuits include but are not limited to all copper and fiber optic(FO) entrance cables, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, and workstation outlets. Test in accordance with ANSI/EIA/TIA 568 standards. Use test instrumentation that meets or exceeds the standard. Submit the official test report to include test procedures, parameters tested, values, discrepancies and corrective actions in electronic format. Test and accomplish all necessary corrective actions to ensure that the government receives a fully operational, standards based, code compliant telecommunications system.

5.7.7. LIGHTNING PROTECTION SYSTEM: Provide a lightning protection system where recommended by the Lightning Risk Assessment of NFPA 780, Annex L.

5.8. HEATING, VENTILATING, AND AIR CONDITIONING

5.8.1. STANDARDS AND CODES: The HVAC system shall conform to APPLICABLE CRITERIA.

5.8.2. DESIGN CONDITIONS.

5.8.2.1. Outdoor and indoor design conditions shall be in accordance with UFC 3-410-01FA. Outdoor air and exhaust ventilation requirements for indoor air quality shall be in accordance with ASHRAE 62.1. All Buildings with minimum LEED Silver requirement (or better) will earn LEED Credit EQ 7.1, Thermal Comfort-Design., except where precluded by other project requirements. Where the contract specifies indoor design temperature , airflow, humidity conditions, etc., use those parameters.

5.8.2.2. High Humidity Areas: Design HVAC systems in geographical areas meeting the definition for high humidity in UFC 3-410-01FA to comply with the special criteria therein for humid areas.

5.8.2.3. Cooling equipment may be oversized by up to 15 percent to account for recovery from night setforward. Heating equipment may be oversized by up to 30 percent to account for recovery from night setback. Design single zone systems and multi-zone systems to maintain an indoor design condition of 50% relative humidity for cooling only. For heating only where the indoor relative humidity is expected to fall below 20% for extended periods, add humidification to increase the indoor relative humidity to 30%. Provide ventilation air from a separate dedicated air handling unit (DOAU) for facilities using multiple single zone fan-coil type HVAC systems. Do not condition outside air through fan coil units. In Air handlers that handle outdoor air and have fans that run continuously during the occupied mode, direct expansion cooling coils may be used only if the controls and compressor technology is provided that allows the compressor to operate down to 10% of full load without utilizing hot gas bypass to minimize the potential of delivering unconditioned outdoor air to the space.

5.8.2.4. Locate all equipment so that service, adjustment and replacement of controls or internal components are readily accessible for easy maintenance.

5.8.2.5. Environmental Requirements for Telecommunications Rooms and Telecommunications Equipment Rooms, (including SIPRNET ROOMS, where applicable for specific facility type). Comply with ANSI/EIA/TIA 569 (including applicable Addenda**)**. Maintain environmental conditions at the Class 1 and 2 Recommended Operating Environment. Before being introduced into the room, filter and pre-condition outside air to remove particles with the minimum MERV filtration quality shown in the ASHRAE HVAC Applications, Chapter 17. Maintain rooms under positive pressure relative to surrounding spaces. Design computer room air conditioning units specifically for telecommunications room applications. Build and test units in accordance with the requirements of ANSI/ASHRAE Standard 127. A complete air handling system shall provide ventilation, air filtration, cooling and dehumidification, humidification (as determined during the design phase), and heating. The system shall be independent of other facility HVAC systems and shall be required year round.

5.8.2.6. Fire dampers: dynamic type with a dynamic rating suitable for the maximum air velocity and pressure differential to which the damper is subjected. Test each fire damper with the air handling and distribution system running.

5.8.3. BUILDING AUTOMATION SYSTEM. Provide a Building Automation System (BAS), consisting of a building control network , and integrate the building control network into the UMCS as specified.

The building control networkshall be a single complete non-proprietary Direct Digital Control (DDC) system for control of all the heating, ventilating and air conditioning (HVAC) systems and for control of other building systems. The building control network shall be an Open implementation of LONWORKS® technology using ANSI/EIA 709.1B as the only communications protocol and use only LonMark Standard Network Variable Types (SNVTs), as defined in the LonMark® Resource Files, for communication between DDC Hardware devices to allow multi-vendor interoperability.

5.8.3.1. The building automation system shall be open in that it is designed and installed such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without further dependence on the original Contractor. This includes, but is not limited to the following:

(a) Install hardware such that individual control equipment can be replaced by similar control equipment from other equipment manufacturers with no loss of system functionality.

(b) Necessary documentation (including rights to documentation and data), configuration information, configuration tools, programs, drivers, and other software shall be licensed to and otherwise remain with the Government such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without subsequent or future dependence on the Contractor.

5.8.3.2. All DDC Hardware shall:

(a) Be connected to a TP/FT-10 ANSI/EIA 709.3 control network.

(b) Communicate over the control network via ANSI/EIA 709.1B exclusively.

(c) Communicate with other DDC hardware using only SNVTs

(d) Conform to the LonMark® Interoperability Guidelines.

(e) Be locally powered; link power (over the control network) is not acceptable.

(f) Be fully configurable via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (*nci*), or hardware settings on the controller itself to support the application. All settings and parameters used by the application shall be configurable via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (*nci*), or hardware settings on the controller itself

(g) Provide input and output SNVTs required to support monitoring and control (including but not limited to scheduling, alarming, trending and overrides) of the application. Required SNVTs include but are not limited to: SNVT outputs for all hardware I/O, SNVT outputs for all setpoints and SNVT inputs for override of setpoints.

(h) To the greatest extent practical, not rely on the control network to perform the application.

(i) Provide on board nonvolatile memory for devices accumulating energy consumption.

5.8.3.3. Controllers shall be Application Specific Controllers whenever an ASC suitable for the application exists. When an ASC suitable for the application does not exist use programmable controllers or multiple application specific controllers.

5.8.3.4. Application Specific Controllers shall be LonMark Certified whenever a LonMark Certified ASC suitable for the application exists. For example, VAV controllers must be LonMark certified.

5.8.3.5. Application Specific Controllers (ASCs) shall be configurable via an LNS plug-in whenever t an ASC with an LNS plug-in suitable for the application exists.

5.8.3.6. Each scheduled system shall accept a network variable of type SNVT_occupancy and shall use this network variable to determine the occupancy mode. If the system has not received a value to this network variable for more than 60 minutes it shall default to a configured occupancy schedule.

5.8.3.7. Gateways may be used provided that each gateway communicates with and performs protocol translation for control hardware controlling one and only one package unit.

5.8.3.8. Not Used

5.8.3.9. Perform all necessary actions needed to fully integrate the building control system. These actions include but are not limited to:

- Configure M&C Software functionality including: graphical pages for System Graphic Displays including overrides, alarm handling, scheduling, trends for critical values needing long-term or permanent monitoring via trends, and demand limiting.
- Install IP routers or ANSI/CEA-852 routers as needed to connect the building control network to the UMCS IP network. Routers shall be capable of configuration via DHCP and use of an ANSI/CEA-852 configuration server but shall not rely on these services for configuration. All communication between the UMCS and building networks shall be via the ANSI/CEA-709.1B protocol over the IP network in accordance with ANSI/CEA-852.

5.8.3.10. Provide the following to the Government for review prior to acceptance of the system:

- The latest version of all software and user manuals required to program, configure and operate the system.
- Points Schedule drawing that shows every DDC Hardware device. The Points Schedule shall contain the following information as a minimum:
    - Device address and NodeID.
    - Input and Output SNVTs including SNVT Name, Type and Description.
    - Hardware I/O, including Type (AI, AO, BI, BO) and Description.
    - Alarm information including alarm limits and SNVT information.
    - Supervisory control information including SNVTs for trending and overrides.
    - Configuration parameters (for devices without LNS plug-ins) Example Points Schedules are available at https://eko.usace.army.mil/fa/besc/
- Riser diagram of the network showing all network cabling and hardware. Label hardware with ANSI.CEA-709.1 addresses, IP addresses, and network names.
- Control System Schematic diagram and Sequence of Operation for each HVAC system.
- Operation and Maintenance Instructions including procedures for system start-up, operation and shut-down, a routine maintenance checklist, and a qualified service organization list.
- LONWORKS® Network Services (LNS®) database for the completed system.
- Quality Control (QC) checklist (below) completed by the Contractor's Chief Quality Control (QC) Representative

**Table 5-1: QC Checklist**

| Instructions: Initial each item, sign and date verifying that the requirements have been met. | | |
|---|---|---|
| # | Description | Initials |
| | | |
| 1 | All DDC Hardware is installed on a TP/FT-10 local control bus. | |
| 2 | Communication between DDC Hardware is only via EIA 709.1B using SNVTs. Other protocols and network variables other than SNVTs have not been used. | |
| 3 | All sequences are performed using DDC Hardware. | |
| 4 | LNS Database is up-to-date and accurately represents the final installed system | |
| 5 | All software has been licensed to the Government | |
| 6 | M&C software monitoring displays have been created for all building systems, including all override and display points indicated on Points Schedule drawings. | |
| 7 | Final As-built Drawings accurately represent the final installed system. | |
| 8 | O&M Instructions have been completed and submitted. | |
| 9 | Connections between the UMCS IP network and ANSI/CEA-709.1B building networks are through ANSI/CEA-852 Routers. | |
| | | |
| By signing below I verify that all requirements of the contract, including but not limited to the above, been met. | | |
| Signature:_____ Date:_____ | | |

5.8.3.11. Perform a Performance Verification Test (PVT) under Government supervision prior to system acceptance. During the PVT demonstrate that the system performs as specified, including but not limited to demonstrating that the system is Open and correctly performs the Sequences of Operation.

5.8.3.12. Provide a 1 year unconditional warranty on the installed system and on all service call work. The warranty shall include labor and material necessary to restore the equipment involved in the initial service call to a fully operable condition.

5.8.3.13. Provide training at the project site on the installed building system Upon completion of this training each student, using appropriate documentation, should be able to start the system, operate the system, recover the system after a failure, perform routine maintenance and describe the specific hardware, architecture and operation of the system.

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5.8.4. TESTING, ADJUSTING AND BALANCING. Test and balance air and hydronic systems, using a firm certified for testing and balancing by the Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), or the Testing Adjusting, and Balancing Bureau (TABB). The prime contractor shall hire the TAB firm directly, not through a subcontractor. Perform TAB in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved, i.e., AABC MN-1, NEBB TABES, or SMACNA HVACTAB unless otherwise specified herein. All recommendations and suggested practices contained in the TAB Standard shall be considered mandatory. Use the provisions of the TAB Standard, including checklists, report forms, etc., as nearly as practicable to satisfy the Contract requirements. Use the TAB Standard for all aspects of TAB, including qualifications for the TAB Firm and Specialist and calibration of TAB instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB Standard, adhere to the manufacturer's recommendations. All quality assurance provisions of the TAB Standard such as performance guarantees shall be part of this contract. For systems or system components not covered in the TAB Standard, the TAB Specialist shall develop TAB procedures. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by the body responsible for the TAB Standard used (AABC, NEBB, or TABB), the requirements and recommendations contained in these procedures and requirements are mandatory.

5.8.5. COMMISSIONING: Commission all HVAC systems and equipment, including controls, and all systems requiring commissioning for LEED Enhanced commissioning, in accordance with ASHRAE Guideline 1.1, ASHRAE Guideline 0 and LEED. Do not use the sampling techniques discussed in ASHRAE Guideline 1.1 and in ASHRAE Guideline 0. Commission 100% of the HVAC controls and equipment. Hire the Commissioning Authority (CxA), certified as a CxA by AABC, NEBB, or TABB, as described in Guideline 1.1 to perform the ASHRAE Commissioning activities. The CxA will be an independent subcontractor and not an employee of the Contractor nor an employee or subcontractor of any other subcontractor on this project, including the design professionals (i.e., the DOR or their firm(s)). The CxA will communicate and report directly to the Government in execution of commissioning activities. The Government will provide the Commissioning Authority for LEED Enhanced Commissioning. Cooperate and communicate with, fully coordinate with and provide the,LEED CxA access to all necessary information and attendance in all necessary meetings and activities related to execution of enhanced commissioning. The Contracting Officer's Representative will act as the Owner's representative in performance of duties spelled out under OWNER in Annex F of ASHRAE Guideline 0. All buildings with Minimum LEED Silver (or better) requirement will earn LEED Credit EA3 Enhanced Commissioning.

5.9. ENERGY CONSERVATION

5.9.1. The building including the building envelope, HVAC systems, service water heating, power, and lighting systems shall meet the Mandatory Provisions and the Prescriptive Path requirements of ASHRAE 90.1. Substantiation requirements are defined in Section 01 33 16, Design After Award.

5.9.2. Design all building systems and elements to meet the minimum requirements of ANSI/ASHRAE/IESNA 90.1. Design the buildings, including the building envelope, HVAC systems, service water heating, power, and lighting systems to achieve an energy consumption that is at least 40% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1. Energy calculation methodologies and substantiation requirements are defined in Section 01 33 16, Design After Award.

5.9.3. Purchase Energy Star products, except use FEMP designated products where FEMP is applicable to the type product. The term "Energy Star product" means a product that is rated for energy efficiency under an Energy Star program. The term "FEMP designated product" means a product that is designated under the Federal Energy Management Program of the Department of Energy as being among the highest 25 percent of equivalent products for energy efficiency. When selecting integral sized electric motors, choose NEMA PREMIUM type motors that conform to NEMA MG 1, minimum Class F insulation system. Motors with efficiencies lower than the NEMA PREMIUM standard may only be used in unique applications that require a high constant torque speed ratio (e.g., inverter duty or vector duty type motors that conform to NEMA MG 1, Part 30 or Part 31).

5.9.4. Solar Hot Water Heating. Provide at least 30% of the domestic hot water requirements through solar heating methodologies, unless the results of a Life Cycle Cost Analysis (LCCA) developed utilizing the Building Life Cycle Cost Program (BLCC) which demonstrates that the solar hot water system is not life cycle cost effective in comparison with other hot water heating systems. The type of system will be established during the contract or task order competition and award phase, including submission of an LCCA for government evaluation to justify non-selection of solar hot water heating. The LCCA uses a study period of 25 years and the Appendix K utility cost information. The LCCA shall include life cycle cost comparisons to a baseline system to provide domestic hot water without solar components, analyzing at least two different methodologies for providing solar hot water to compare against the baseline system.

5.9.5. Process Water Conservation. When potable water is used to improve a building's energy efficiency, employ lifecycle cost effective water conservation measures, except where precluded by other project requirements.

5.9.6. Renewable Energy Features. The Government's goal is to implement on-site renewable energy generation for Government use when lifecycle cost effective. See Paragraph 6, PROJECT SPECIFIC REQUIREMENTS for renewable energy requirements for this project.

5.10. FIRE PROTECTION

5.10.1. STANDARDS AND CODES Provide the fire protection system conforming to APPLICABLE CRITERIA.

5.10.2. Inspect and test all fire suppression equipment and systems, fire pumps, fire alarm and detection systems and mass notification systems in accordance with the applicable NFPA standards. The fire protection engineer of record shall witness final tests. The fire protection engineer of record shall certify that the equipment and systems are fully operational and meet the contract requirements. Two weeks prior to each final test, the contractor shall notify, in writing, the installation fire department and the installation public work representative of the test and invite them to witness the test.

5.10.3. Fire Extinguisher Cabinets: Provide fire extinguisher cabinets and locations for hanging portable fire extinguishers in accordance with NFPA 10 Standard for Portable Fire Extinguishers. The Government will furnish and install portable fire extinguishers, which are personal property, not real property installed equipment.

5.10.4. Fire alarm and detection system: Required fire alarm and detection systems shall be the addressable type. Fire alarm initiating devices, such as smoke detectors, heat detectors and manual pull stations shall be addressable. When the system is in alarm condition, the system shall annunciate the type and location of each alarm initiating device. Sprinkler water flow alarms shall be zoned by building and by floor. Supervisory alarm initiating devices, such as valve supervisory switches, fire pump running alarm, low-air pressure on dry sprinkler system, etc. shall be zoned by type and by room location.

5.10.5. Roof Access: Paragraph 2-9 of UFC 3-600-01 Fire Protection for Facilities will be modified in the next update to that UFC. Pending revision, comply with roof access and stairway requirements in accordance with the International Building Code. Where roof access is required by the IBC or other criteria, comply with UFC 4-010-01, Anti-Terrorist Force Protection, Standard 14. "Roof Access".

5.10.6. Fire Protection Engineer Qualifications: In accordance with UFC 3-600-01, FIRE PROTECTION ENGINEERING FOR FACILITIES**,** the fire protection engineer of record shall be a registered professional engineer (P.E.) who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveys (NCEES), or a registered P.E. in a related engineering discipline with a minimum of 5 years experience, dedicated to fire protection engineering that can be verified with documentation.

5.11. SUSTAINABLE DESIGN

5.11.1. STANDARDS AND CODES: Sustainable design shall conform to APPLICABLE CRITERIA. See paragraph 6, PROJECT-SPECIFIC REQUIREMENTS for which version of LEED applies to this project. The LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects (AGMBC) applies to all projects. Averaging may be used for LEED compliance as permitted by the AGMBC but is restricted to only those buildings included in this project. Each building must individually comply with the requirements of paragraphs ENERGY CONSERVATION and BUILDING WATER USE REDUCTION.

5.11.2. LEED RATING, REGISTRATION, VALIDATION AND CERTIFICATION: See Paragraph PROJECT-SPECIFIC REQUIREMENTS for project minimum LEED rating/achievement level, for facilities that are exempt from the minimum LEED rating, for LEED registration and LEED certification requirements and for other project-specific information and requirements.

5.11.2.1. Innovation and Design Credits. LEED Innovation and Design (ID) credits are acceptable only if they are supported by formal written approval by GBCI (either published in USGBC Innovation and Design Credit Catalog or accompanied by a formal ruling from GBCI). LEED ID credits that require any Owner actions or commitments are acceptable only when Owner commitment is indicated in paragraph PROJECT-SPECIFIC REQUIREMENTS or Appendix LEED Project Credit Guidance

5.11.3. OPTIMIZE ENERGY PERFORMANCE. : Project must earn, as a minimum, the points associated with compliance with paragraph ENERGY CONSERVATION. LEED documentation differs from documentation requirements for paragraph ENERGY CONSERVATION and both must be provided. For LEED-NC v2.2 projects you may substitute ASHRAE 90.1 2007 Appendix G in its entirety for ASHRAE 90.1 2004 in accordance with USGBC Credit Interpretation Ruling dated 4/23/2008.

5.11.4. COMMISSIONING. See paragraph 5.8.5 COMMISSIONING for commissioning requirements. USACE templates for the required Basis of Design document and Commissioning Plan documents are available at http://en.sas.usace.army.mil (click on USACE LEED Commissioning Plan Template) and may be used at Contractor's option.

5.11.5. DAYLIGHTING. Except where precluded by other project requirements, do the following in at least 75 percent of all spaces occupied for critical visual tasks: achieve a 2 percent glazing factor (calculated in accordance with LEED credit EQ8.1) OR earn LEED Daylighting credit, provide appropriate glare control and provide either automatic dimming controls or occupant-accessible manual lighting controls.

5.11.6. LOW-EMITTING MATERIALS. Except where precluded by other project requirements, use materials with low pollutant emissions, including but not limited to composite wood products, adhesives, sealants, interior paints and finishes, carpet systems and furnishings,

5.11.7. CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT. Except where precluded by other project requirements, earn LEED credit EQ 3.1 Construction IAQ Management Plan, During Construction and credit EQ 3.2 Construction IAQ Management Plan, Before Occupancy.

5.11.8. RECYCLED CONTENT. In addition to complying with section RECYCLED/RECOVERED MATERIALS, earn LEED credit MR4.1, Recycled Content, 10 percent except where precluded by other project requirements.

5.11.9. BIOBASED AND ENVIRONMENTALLY PREFERABLE PRODUCTS. Except where precluded by other project requirements, use materials with biobased content, materials with rapidly renewable content, FSC certified wood products and products that have a lesser or reduced effect on human health and the environment over their lifecycle to the maximum extent practicable.

5.11.10. FEDERAL BIOBASED PRODUCTS PREFERRED PROCUREMENT PROGRAM (FB4P). The Farm Security and Rural Investment Act (FSRIA) of 2002 required the U.S. Department of Agriculture (USDA) to create procurement preferences for biobased products that are applicable to all federal procurement (to designate products for biobased content). For all designated products that are used in this project, meet USDA biobased content rules for them except use of a designated product with USDA biobased content is not required if the biobased product (a) is not available within a reasonable time, (b) fails to meet performance standard or (c) is available only at an unreasonable price. For biobased content product designations, see http://www.biopreferred.gov/ProposedAndFinalItemDesignations.aspx.

5.12. CONSTRUCTION AND DEMOLITION (C&D) WASTE MANAGEMENT: Achievement of 50% diversion, by weight, of all non-hazardous C&D waste debris is required. Reuse of excess soils, recycling of vegetation, alternative daily cover, and wood to energy are not considered diversion in this context, however the Contractor must tracked and report it. A waste management plan and waste diversion reports are required, as detailed in Section 01 57 20.00 10, ENVIRONMENTAL PROTECTION.

5.13. SECURITY (ANTI-TERRORISM STANDARDS): Unless otherwise specified in Project Specific Requirements, only the minimum protective measures as specified by the current Department of Defense Minimum Antiterrorism Standards for Buildings, UFC 4-010-01, are required for this project. The element of those standards that has the most significant impact on project planning is providing protection against explosives effects. That protection can either be achieved using conventional construction (including specific window requirements) in conjunction with establishing relatively large standoff distances to parking, roadways, and installation perimeters or through building hardening, which will allow lesser standoff distances. Even with the latter, the minimum standoff distances cannot be encroached upon. These setbacks will establish the maximum buildable area. All standards in Appendix B of UFC 4-010-01 must be followed and as many of the recommendations in Appendix C that can reasonably be accommodated should be included. The facility requirements listed in these specifications assume that the minimum standoff distances can be met, permitting conventional construction. Lesser standoff distances (with specific minimums) are not desired, however can be provided, but will require structural hardening for the building. See Project Specific Requirements for project specific siting constraints. The following list highlights the major points but the detailed requirements as presented in Appendix B of UFC 4-010-01 must be followed.

(a) Standoff distance from roads, parking and installation perimeter; and/or structural blast mitigation

(b) Blast resistant windows and skylights, including glazing, frames, anchors, and supports

(c) Progressive collapse resistance for all facilities 3 stories or higher. Unless determined otherwise by the Installation and noted in paragraphs 3 or 6, the building shall be considered to have areas of uncontrolled public access when designing for progressive collapse.

(d) Mass notification system (shall also conform to UFC 4-021-01, Mass Notification Systems)

(e) For facilities with mailrooms (see paragraph 3 for applicability) – mailrooms have separate HVAC systems and are sealed from rest of building

## 6.0 PROJECT SPECIFIC REQUIREMENTS FORT SILL, OK

6.1. GENERAL

The requirements of this paragraph augment the requirements indicated in Paragraphs 3 through 5.

6.2. APPROVED DEVIATIONS

The following are approved deviations from the requirements stated in Paragraphs 3 through 5 that only apply to this project.

6.2.1. Foundations: Due to expansive soil conditions at Ft. Sill, slabs on grade are not permitted. See paragraph 6.6.1.3.

6.2.2. Pressure piping. No Type M for underground pressure pipe will be allowed. See paragraph 6.8.2.

6.3. SITE PLANNING AND DESIGN

6.3.1. General:

6.3.1.1. The Government will designate approximate building site locations and related site features within the drawing included in Appendix J. Since finish grades are not specifically established for specific site responsibility areas, establish finish grades.

6.3.1.2. Site Design. The Contractor is responsible for the shape of the footprint and the building orientation of the proposed facility or facilities on the designated parcel of land (designated as building envelope on the drawings) with respect to adjacent and future facilities shown on the drawings. Locate the facility on the respective parcel of land. The Government must approve any proposed changes from the layout identified in the RFP. Connect all utilities from the building to the service connection point, with the exception of natural gas. Coordinate between the drawings and other contractors relating to site, facility design and functionality and utility connections and outages. Coordinate specific utility outages a minimum of 48 hours in advance through the CO.

6.3.1.3. Upon finalizing the building footprint, provide proposed building footprint, site orientation and requests for deviations from the drawings for Government concurrence and coordination, as applicable, with other product lines. The Government will enforce coordination of proposed buildings and finalize the placement of the buildings within the drawings boundaries and finalize associated site grading around the proposed facilities; however, the Contractor shall be responsible for coordination efforts with work by others on adjacent sites. The Government may modify desired building placement within the building envelope , if deemed necessary. The Government will provide survey control benchmarks and monuments within the specific site area. Set finish floor as indicated in the RFP Drawings and at least a minimum of 8-inches higher than predominant exterior grade. Slope exterior finish grade down and away from each building at a minimum of 5% slope for the first 10 feet. Under no circumstances shall any slope exceed 20% unless retaining structures are not feasible.

6.3.1.4. Privately Owned Vehicle (POV) Parking.

The Contractor shall provide POV parking.

Provide 339 parking spaces and 8 ADA compliant parking spaces. The parking lot shall be asphalt with concrete curb and gutter. ***AM3 ~~Curb and gutter islands separating the rows of parking are encouraged at Ft. Sill.~~*** All parking spaces shall be 9-feet wide and 18-feet long with vehicle overhang or 20-feet long with no vehicle overhang. Parking aisles for emergency vehicle access shall be a minimum of 26-feet wide. All other parking aisles shall be a minimum

of 24-feet wide. Contractor shall be responsible for removing curb and gutter where parking lot entrance drives connect to Crane Avenue. Curb islands are not to be used in the parking lot.

Provide 10 additional parking spaces for motorcycles. Motorcycle parking shall be concrete. Motorcycle spaces shall be 4.5-feet wide and a minimum of 18-feet long.

See Appendix J.

6.3.1.5. Additional Information

Not used.

6.3.2. Site Structures and Amenities

Provide one dumpster pad and enclosure per facility. Locate dumpster enclosure per UFC 4-010-01. Dumpster screening, if required, shall be compatible with the building(s) they serve and shall incorporate the concepts of the architectural theme defined in Appendix F. Locate, design and construct dumpster enclosure(s) as directed within the drawings.

The dumpster pad location and screen to provide full access for front-load refuse trucks. Dumpster will be supplied by others.

Sidewalks. Provide sidewalks on the building-side of the parking lot and from the parking lot to the main entrance of the building. All sidewalks shall be 4-inch concrete and 6-feet wide, except that the main entrance sidewalk shall be 10-feet wide.

6.3.3. Site Functional Requirements:

6.3.3.1. Stormwater Management (SWM) Systems. Storm drainage system design is shown within the drawings at Appendix J. Design any additional storm drain system required by the project. If the Contractor chooses to connect roof drain leaders to the storm water systems, coordinate the location and size for connection of roof drain leaders to the site storm water system with other contractors, as applicable, through the Contracting Officer prior to finalizing building design a minimum of 45 days prior to beginning building construction. The Contractor is responsible for the Storm Water Pollution Prevention Plan (SWPPP) of the entire construction site. Submit site specific SWPPP in accordance with requirements contained in Section 01 57 23 TEMPORARY STORM WATER POLLUTION CONTROL. Make any piping connection from the building to the connection point.

Include all information in the Storm Water Pollution Prevention Plan (SWPPP) required by the Oklahoma Department of Environmental Quality (ODEQ) General Permit OKR10 for storm water discharges from construction activities within the State of Oklahoma. A copy of the OKR10 permit may be found at the following web page:
http://www.deq.state.ok.us/WQDnew/stormwater/construction/okr10_final_permit_13_sep_2007

6.3.3.2. Erosion and Sediment Control. The Fort Sill Environmental Division of Public Works oversees the Stormwater Sediment and Erosion Control Management Plan for the Post.

6.3.3.3. Vehicular Circulation.

(a) Design and construct site pavement to provide access for Ft Sill's fire trucks. The turning radius of the ladder truck is 75-feet 6-inches and weight is 30 tons.

(b) ***AM2 See Appendix J.***

6.4. SITE ENGINEERING

6.4.1. Existing Topographical Conditions. The Government has provided a three dimensional digital topographic and utility survey. Bring any discrepancies which are found in the Government furnished survey to the immediate attention of the Government for clarification. Drawings showing existing conditions are included within Appendix J.

A drainage channel flows through the site from the northwest corner to the southeast. See Appendix KK for additional information.

6.4.2. Existing Geotechnical conditions: See Appendix A for a preliminary geotechnical report.

Geotechnical borings, a boring location map, and raw data on the subsurface conditions described in 5.2.2 are furnished as part of the RFP (Appendix A). After contract award, the successful contractor shall perform additional subsurface investigations and laboratory analysis to better characterize the site and develop the final design. Investigations and laboratory analysis shall be performed under the direction of a licensed geotechnical engineer and shall be the full responsibility of the contractor. Changes from the information presented in Appendix A will be handled in accordance with Clause 52.236-2 DIFFERING SITE CONDITIONS. Refer to Section 01 33 16 DESIGN AFTER AWARD for additional requirements.

The following supersedes the 1st sentence of paragraph 5.2.2.1: A report that contains raw data for the project site is contained in Appendix A. Borings, a boring location map, and the raw data on the subsurface conditions are included in the referenced appendix.

6.4.2.1. The following supersedes the 4th sentence of paragraph 5.2.2.1: Additional subsurface investigations and laboratory analysis are required to better characterize the site and develop the final design. Perform the investigation and analysis subsequent to award under the direction of a licensed geotechnical engineer.

6.4.3. Fire Flow Tests See Appendix D for results of fire flow tests to use for basis of design for fire flow and domestic water supply requirements.

See Appendix D.

6.4.4. Pavement Engineering and Traffic Estimates:

6.4.4.1 In addition to the requirements listed in paragraph 5.2.3 VEHICLE PAVEMENTS, the contractor shall provide a pavement design life IAW requirements shown in paragraph 2.

6.4.4.2 Pavement design shall conform to one of the following: 1) USACE Pavement Transporation Computer Assisted Structural Engineering (PCASE) software program; 2) American Association of State Highway and Transporation Officials (AASHTO), or 3) Oklahoma Department of Transporation (ODOT) State standare pavement design procedures. Pavements required to support passenger automobile traffic shall be asphalt concrete or Portland cement concrete, except as otherwise specified.

6.4.4.3 Roadways bounding this site are adequat to support traffic flow. No traffic study is required. The Contractor is responsible for determining the specific traffic requirements for parking lots, service drives, and other areas required to support vehicle traffic within the site.

6.4.5. Traffic Signage and Pavement Markings

Adhere to all local, state, and federal guidelines (including, but not limited to) the Manual on Uniform Traffic Control Devices (MUTCD) for traffic signage.

6.4.6. Base Utility Information

6.4.6.1. Utilities: The Installation's DPW supervises infrastructure and utilities. Most utilities are privatized. Points of contact for utilities and rates are shown in Section 00 73 00 SPECIAL CONTRACT REQUIREMENTS or 00 73 10 TASK ORDER SUPPLEMENTAL CONTRACT REQUIREMENTS, as applicable to this contract or task order. Existing utility services such as potable water, sanitary sewer, electric, natural gas, and COMM are all located near the site such that lengthy utility extensions are not anticipated for this building. Coordinate and plan utilities with the A/E Integrator through the Contracting Officer. The site plan contained in Appendix J provides utility main routing and general orientation for points of connection for each facility. Prior to final design, Verify the locations and sizes of utility services with the A/E Integrator.

(a) Storm Drainage System tie-in points are shown in the drawings at Appendix J. Tie into these systems as appropriate.

(b) Natural Gas distribution lines are shown on drawings at Appendix J. Coordinate point of connection to the facility with the service provider, Oklahoma Natural Gas (ONG), through the CO. The private utility contractor will run Natural gas service, including meter and regulator, to the face of the building.. Connect to the meter and all piping past the meter outlet. The D/B Contractor is not responsible for costs incurred for services provided by the service provider (ONG). Coordinate and provide gas flow and pressure (if different from the standard pressure) requirements with ONG. Coordinate the location of the facility gas connection with the A/E Integrator and ONG and follow ONG's written and diagrammed location requirements, see Appendix . Design and construct the required building service lines and modifications to any distribution lines in accordance with the requirements of ONG. Also see paragraph entitled "Metering Utilities" in this section.

(c) Water mains are shown on the drawings at Appendix J. Coordinate points of connection through the A/E Integrator with the service provider, American Water Enterprises (AWE). The Infrastructure Contractor will provide the potable water service between the main line to the 5-foot line of the building. Provide potable water service from the 5-foot line to the facility and within the building, through a backflow preventer (generally located in the mechanical room). Coordinate with the service provider, AWE through the CO. The Government will provide primary or main water pipe distribution, including the water meter and vault.. Design and construct water service lines from the 5-foot line to the building to meet the utility provider's installation details and specifications. The Government will provide the Post Indicator Valve (PIV) and any bollards required for protection and route the fire water line (separate from the domestic supply) to 5 feet from the building. See Appendix for AWE requirements.

(d) Sanitary Sewer: The Infrastructure Contractor will design and construct the sanitary sewer service line between the sanitary sewer main to 5 feet from the building, including cleanout or manhole. Sanitary sewer mains are shown on the drawings in Appendix J. Coordinate points of connection through the CO with the service provider (AWE).

(e) Electricity: Others will provide the electrical distribution system , including the primary feed from the distribution line to the pad-mounted transformer. See Appendix J for drawings. Complete the design and construct the work from the pad-mounted transformer. Provide underground secondary service from the pad-mounted transformer to the building electrical equipment room. Power for buildings will be provided from pad-mounted distribution transformers. Locate electric meters in service entrance electrical equipment/switchgear located in the main electrical room. Coordinate with the Infrastructure Contractor for installation of the primary underground feeder to the service entrance transformer.

(f) Communications. See Appendix J for Communications service plans and capacities. Coordinate through the CO with the Fort Sill Directorate of Information Management (DOIM). Determine requirements and capacity for each facility and verify with the DOIM, through the CO, that the infrastructure supports the requirements and capacity of the facility..

(g) Cable TV is privatized. The privatized utility (Sudden Link) will provide service to the building. Provide outlet locations in the building(s), including backbox, mud ring and raceway and vertical/horizontal coaxial cable wire management including, but not limited to, labeling and identification. Provide faceplates for coaxial terminator to be installed by Sudden Link. Sudden Link will terminate all Contractor provided coaxial CATV cables. Provide a pre-wired CATV system throughout designated spaces. CATV system includes, but is not limited to, cables, conduits, pull boxes and CATV jacks. Route all CATV signal conduits and cables back to the communications room or other designated room/closet.

(h) Others will provide telephone system distribution design. Local Telephone Service tie-in points are shown on the drawings at Appendix J. The Infrastructure Contractor will provide telephone conduit duct bank from the primary distribution manhole to 5 feet outside the building. Design and install the telephone conduit duct bank from the[5 foot line of the building to the communications room. Share the telephone duct bank with the communication duct bank. DOIM will provide telephone cabling.

6.4.6.1.1. Metering Utilities.

(a) Provide water meters Prepare meters for EMCS connection The gas utility provider will provide and install gas meters.. Provide connection from the gas and water meters to the EMCS system.

(b) Provide an electronic meter with equivalent capabilities to a Square D Power Logic Monitor Series 4000. Electric meter shall communicate with the EMCS. Connect to the EMCS.. Locate electric meters in the service entrance electrical equipment/switchgear located in the main electrical room.

6.4.7. Cut and Fill

6.4.8. Borrow Material

No borrow material is available on the Installation.

6.4.9. Haul Routes and Staging Areas

6.4.9.1. Use the Haul Route(s) shown in Appendix J.

6.4.9.2. The Contractor will be allotted an area as shown in the attached Access and Haul Route Plan for the placement of a construction trailer complex, if required, and storage See Appendix J for additional information.

6.4.9.3. For proposal purposes, the D/B Contractor may assume utilities will not be provided during construction at the project site.

6.4.10. Clearing and Grubbing:

The Contractor shall clear and grub the site within the project limits as required for construction. Any trees removed by the Contractor shall be replaced in kind on the site.

6.4.11. Landscaping:

Coordinate landscaping scheme with the Acceptable Plant List (Appendix I). Slopes shall not exceed 10:1 unless otherwise noted or shown on the rough grading plan as shown in Appendix J. Use a drip system for all irrigation for plantings. Rip-rap isn't permitted for erosion control. Use stone or brick for edging for planting beds. Steel or plastic edging isn't permitted. Plant trees such that the grade around the tree is recessed 2-inches. Place mulch up to grade. Do not berm around trees. Make minimal use of Pine trees and evergreens. Coordinate landscaping scheme with the Contracting Officer and the ADP.

6.5. ARCHITECTURE

6.5.1. General: To the maximum extent possible within the contract cost limitation, the buildings shall conform to the look and feel of the architectural style and shall use the same colors as adjacent facilities as expressed herein . The Government will evaluate the extent to which the proposal is compatible with the architectural theme expressed in the RFP during the contract or task order competition. The first priority in order of importance is that the design provides comparable building mass, size, height, and configuration compared to the architectural theme expressed herein. The second priority is that design is providing compatible exterior skin appearance based upon façade, architectural character (period or style), exterior detailing, matching nearby and installation material/color pallets, as described herein.

6.5.2. **Design**

6.5.2.1. Appendix F is provided “For Information Only”, to establish the desired site and architectural themes for the area. Appendix F identifies the desired project look and feel based on Fort Sill’s Installation Architectural Theme from existing and proposed adjacent building forms; i.e. building exterior skin, roof lines, delineation of entrances, proportions of fenestration in relation to elevations, shade and shadow effects, materials, textures, exterior color schemes, and organizational layout.

6.5.2.2. The design should address Fort Sill’s identified preferences. Implement these preferences considering the following:

(c) Achievable within the Construction Contract Cost Limitation (CCL)

(d) Meets Milestones within Maximum Performance Duration.

(e) Achieves Full Scope indentified in this Solicitation

(f) Best Life-Cycle Cost Design

(g) Meets the Specified Sustainable Design and LEED requirements

(h) Complies with Energy Conservation Requirements Specified in this RFP.

6.5.2.3. Priority #1. Visual Compatibility: Facility Massing (Size, Height, Spacing, Architectural Theme, etc.) Exterior Aesthetic Considerations: The buildings massing, exterior functional aesthetics, and character shall create a comprehensive and harmonious blend of design features that are sympathetic to the style and context of the Installation. The Installation’s intent for this area is:

Refer to Appendix F for the architectural theme and photos of surrounding buildings.

***AM7 No feature of the building or site shall exceed the height of 44'-11".***

6.5.2.4. Priority #2. Architectural Compatibility: Exterior Design Elements (Materials, Style, Construction Details, etc.) Roofs, Exterior Skin, and Windows & Door Fenestrations should promote a visually appealing compatibility with the desired character while not sacrificing the integrity and technical competency of building systems.

6.5.2.5. See Appendix F for exterior colors that apply to Architectural character at Fort Sill. The manufacturers and materials referenced are intended to establish color only, and are not intended to limit manufacturers and material selections.

6.5.2.6. Additional architectural requirements:

(a) Install fall protection anchor points on all roofs with a slope greater than 2:12

(b) **Installation Preference No. 1.** Provide standing seam metal roofing with either a 20-year comprehensive weather-tight warranty or an included maintenance contract for the period of 20 years and

snow/ice guards. Provide snow/ice guards that are a standard product of the roofing manufacturer and install as recommended by the roofing manufacturer.

(c) Low slope roof systems are only allowed where required in other sections of the RFP documents. Minimum roof slope for low slope roof systems is ¼ inch per foot (2%) and 3 inches per foot (3:12) for all other roof systems. Avoid complex valleys, flashing and venting conditions, where possible.

(d) **Installation Preference No. 2**. Provide brick and/or split face CMU to be incorporated in the exterior walls. Any EIFS provided shall be high impact resistance rated to a distance of 7-feet vertically from finish grade in accordance with applicable criteria. EIFS shall incorporate a means to drain moisture to the exterior.

(e) **Installation Preference No. 3**. Eliminate the use of roof-top units (RTUs), clerestories, and minimize all other roof penetrations.

(f) Provide for attenuation of external noise sources such as airfields in accordance with applicable criteria for exterior walls and roof/ceiling assemblies, doors, windows and interior partitions.

(g) Unless, otherwise specified in paragraph 3, do not exceed levels recommended by ASHRAE Handbook Criteria for sound conditions (and levels) for interior spaces due to the operation of mechanical and electrical systems and devices.

(h) Trim and Flashing. All exterior metals including gutters, downspouts and fascias shall be factory pre-finished metal.

(i) Bird Habitat Mitigation: Provide a means to eliminate the congregating and/or nesting of birds at, on and in the facility. Direct special attention to pedestrian entrances and control of such nuisance.

(j) Exterior Doors and Frames:

(1) Main Entrance Doors: Aluminum storefront doors and frames with Architectural Class 1 anodized finish, fully glazed, with medium or wide stile are encouraged for entry into lobbies or corridors. Storefront systems shall comply with wind load requirements of applicable codes and UFC 4-010-01 requirements. Framing systems shall have thermal-break design. Color shall conform to Appendix F.

(2) Side Entrance Doors: Exterior doors and frames opening to corridors or lobbies shall be insulated hollow metal and comply with ANSI A250.8/SDI 100. Door and frame installation shall comply with applicable codes and UFC 4-010-01 requirements. Color shall conform to Appendix F.

(3) Exterior Non-entrance Doors: Exterior doors and frames opening to spaces other than corridors or lobbies shall be insulated hollow metal and comply with ANSI A250.8/SDI 100. Door and frame installation shall comply with applicable codes and UFC 4-010-01 requirements. Color shall conform to Appendix F.

(k) Finish Hardware

(1) All hardware in the facility shall be consistent and shall conform to ANSI/BMHA standards for Grade 1. Coordinate all requirements for hardware keying with the CO. Hardware finishes shall conform to ANSI/BHMA A156.18. Provide ANSI 626 (Satin Chromium plated on Brass or Bronze) or 630 (Stainless Steel). Install deadbolt locks on mechanical and electrical rooms keyed to the DPW keying system. Coordinate door hardware and security requirements with the functional requirements, the Room-by-Room Criteria and the electrical security/fire alarm system requirements of this document. Provide bored locks per BHMA A156.2. Provide all hardware necessary to meet the requirements of NFPA 80 for fire doors and NFPA 101 for exit doors. Provide door closers for all exterior doors, all doors opening to corridors and as required by codes. The Main entrance door is considered a high traffic door. Provide a high quality door closing mechanism complying with BHMA A 156.4 with adequate strength to ensure safe and easy operation in a high-wind environment.

(2) Programmable Electronic Key Card Access Systems: Even though programmable electronic key card access may be required elsewhere in the contract – do not provide such systems..

(3) Keying for Facilities: Key all doors individually, even if the doors lead to the same room. The mechanical, electrical, and communication rooms may be keyed alike, but the Installation encourages

that they be keyed to the DCF-1. The cores for the mechanical electrical and communications rooms, if not keyed to the DCF-1, shall have a cylinder that is capable of receiving a Best Lock core. Provide four (4) keys for each lock. Provide master keys.

(l) NOT USED

(m) Exterior Windows: Provide operable windows with locks and insect screens removable from the inside.

(n) Thermal Insulation: Do not install Insulation directly on top of suspended panel ceilings.

(o) Exterior Louvers: Provide exterior louvers designed to exclude wind-driven rain, with bird screens, and made to withstand wind loads in accordance with the applicable codes. Provide wall louvers with the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500-D and AMCA 511.

(p) Exterior Paint Systems: Provide Exterior Paint Systems in accordance with the recommendations of the Master Painters Institute (MPI) for the substrate to be painted and the environmental conditions existing at the project site. Provide a minimum one prime coat and two finish coats for exterior surfaces (surfaces except factory pre-finished material). For exterior applications, provide an MPI Gloss Level 5 finish (semi-gloss) unless otherwise specified. Apply all paints in accordance with the manufacturer's instructions.

(b) Appendix RR contains floor plans that the contractor shall use in developing the project. Major changes to the floor plans are not allowed. Minor changes will be considered if they are well justified.

(c) Provide an area within the facility (possibly the shower and locker rooms) as a "Safe Room", designed and constructed in accordance with FEMA 361 standards. The safe room is to be for short term usage only. This is not a community shelter. Doors to showers and locker rooms (if used as the safe room) shall not be provided with dead bolts. In lieu of dead bolts, provide serpentine entrances into safe rooms. Serpentine entrances are to be separated by the Assisted Changing areas to help prevent patrons from entering the wrong area.

(d) Provide a secondary exit from the locker room/showers to accommodate direct access into a future pool areas to keep patrons from traversing through the main fitness area to access the pool.

6.5.3. Programmable Electronic Key Card Access Systems:

Programmable key cards are not required.

6.5.4. INTERIOR DESIGN

6.5.4.1. Interior building signage requirements:

Provide room number and room function signage for all rooms. For changeable sign types, furnish appropriate paper and computer software for User production of paper inserts with text and symbols identical to signage design. Coordinate computer requirements with User.

Fully integrate interior signage as a design element with the architecture and interior design. Provide modular signage for general office areas to accommodate personnel changes or room function changes. Use International symbols to the maximum extent possible. Locate emergency/fire evacuation plans at key areas to ensure fire safety. Coordinate signage plaque colors with the interior color scheme. Provide rooms signs for electrical or mechanical spaces. Provide room control sign for conference room(s).

6.5.4.2. Interior Design Considerations:

Provide maximim use of day lighting and operable windows within the constraints of the contract requirements. Provide interior surfaces that are easy to clean and light in color. Plan the interior spaces to allow maximum flexibility for future modifications.

(a) Interior Partitions and Walls. Non-combustible construction is encouraged even where combustible materials are allowed by code.

(b) Provide each occupied facility with an appropriately sized room that has been “hardened” to resist the forces of tornadoes which are prevalent in Oklahoma. Provide room in accordance with ICC-500 and FEMA 361. (c) Interior Glass and Glazing: Coordinate the arrangement of fenestrations with the proposed furniture layout.

(c) Where moisture or moisture infiltration from the wall cavity cannot be eliminated or sufficiently reduced, consider the use of wall coverings with higher permeability ratings. Don’t use f wall coverings that do not breathe, such as vinyl wall coverings in high humidity areas due to the tendency for mold to develop.

(d) Floors and Ceilings: Non-combustible construction is encouraged even where combustible materials are allowed by code.

(e) Interior Doors and Frames: Provide hollow metal doors and frames or wood doors in accordance with the standard design and requirements of the project. All door frames shall be hollow metal.

(f) Paint: Comply with the recommendations of, the Master Painters Institute (MPI) for the substrate to be painted and the interior environmental conditions existing at the project site. Paint a minimum of one (1) prime coat and two (2) finish coats for interior surfaces, except factory pre-finished material or interior surfaces receiving other finishes. In wet areas, provide an MPI Gloss Level 5 (semi-gloss) finish. Apply all paints in accordance with manufacturer’s instructions.

(g) Gypsum Board: Comply with ASTM C 36. Minimum panel thickness shall be 5/8-inch. Provide moisture resistant panels (glass-mat panels are encouraged) at locations subject to moisture.

6.5.4.3. Specialties and Furnishings

(a) Window Treatments: Provide horizontal mini-blinds or vertical blinds at all exterior glazed areas, unless otherwise noted.

(b) Bulletin Boards: Provide bulletin boards consisting of a tack board, aluminum tabular frame, and sliding aluminum framed glazed doors with a permanent header panel and a general title, such as "Notices" or "Information", and a 1/4-inch cork pinning surface glued to 1/4-inch thick plywood or hardboard backing. Provide cork with a plastic impregnated surface and burlap backing. The cork's surface finish to be smooth and be free from air pockets, raised cork blemishes, and joint imperfections. Provide the door frame with a removable glazing bead applied on the inside. Glazing to be 1/4-inch polished laminated glass. Each bulletin board door shall be complete with hardware including key operated lock. Provide aluminum hardware with anodized finish matching the frame. Header panel to be white letters on standard black background; cork panel - medium gray. Bulletin board dimensions to be 4 feet by 6 feet. Heading message shall be upper and lower case Helvetica medium, 2-inch capital letter height, centered. Secure frame to the wall by means of concealed screws or bolt hangers.

(c) Projection Screens: Provide projection screens that are ceiling recessed mounted and manual. Screens shall be flame retardant, mildew resistant and white matte with black masking borders. Bottom of screen fabric to be weighted with metal rod. Roller to be a rigid metal at least 3 inches in diameter mounted on sound absorbing supports. Ceiling recessed case to be extruded aluminum. Screens shall be UL listed. Projection screen viewing area shall be minimum 7’-3” high x 9’-8” wide. Provide one ceiling recessed mounted projection screen in each conference area.

(d) Projector Mount: Furnish and install a low profile ceiling mounted projector mount system. PROJECTOR NOT INCLUDED IN CONTRACT. Ceiling mount shall consist of a steel ball joint and Universal Projector Bracket. Mount shall project a maximum 6 inches below finished ceiling height and

shall securely attach to ceiling and structure above with steel mounting plate. Provide mounting hardware appropriate to ceiling conditions. Steel ball joint attaches to the Universal Projector Bracket with twist-lock engagement. Mount shall provide up to 30° roll or pitch adjustment and 360° yaw adjustment at ball joint. Two setscrews lock ball joint in position. Silver finish. Maximum load to be 26 lbs. Furnish and install concealed electrical wiring, connections and accessories necessary for projector operation. Provide one low profile ceiling mounted projector mount system in each conference area.

(e) Corner Guards. Provide surface-mounted, high-impact integral color rigid vinyl corner guards at all outside corners of gypsum board walls.

(f) Chair Rail. Install chair rails in areas prone to hi-impact use, such as corridors, classrooms, conference rooms, etc.

(g) Toilet Accessories: All toilet accessories shall be Type 304 stainless steel with satin finish.

6.6. STRUCTURAL DESIGN

6.6.1. Site Specific Loading Requirements:

6.6.1.1. Use basic wind speed of 90 mph 3-second-gust, in miles per hour, for wind loads.

6.6.1.2. Use ground snow load of 10 psf.

6.6.1.3. Use frost penetration of 14 inches.

6.6.1.4. Use the following seismic acceleration parameters for mapped Maximum Considered Earthquake spectral response at short periods and at 1-second period, respectively: Ss: 38 (%g) and S1: 2 (%g).

6.6.2. Equipment Pads: Elevate floor or on-grade mounted equipment on minimum 4 inch thick concrete pads to prevent accumulation of water and metal corrosion.

6.6.3. Foundation

6.6.3.1. Due to soil conditions at Ft. Sill, the use of pier and supported grade beam foundation with structurally supported slab, conventional rib mat slabs or thickened structural slabs is required for this project. Slabs on grade or floating slabs are not permitted.

6.6.3.2. Perform controlled expansion consolidation tests on undisturbed samples collected from the overburden material to assess potential settlement and/or heave for piers and edge lift/center lift conditions for ribbed mat slabs and thickened slabs in accordance with ASTM D 4546, Method C, latest edition. Heave predictions using the Potential Vertical Rise (PVR) method or swell pressure predicted from free swell test are not allowed.

6.6.3.3. Assume a minimum 15-foot active zone measured from top of existing ground for uplift and heave calculations.

6.6.3.4. Provide foundation systems for permanent facilities capable of supporting the typical loadings specified elsewhere in this document that are capable of resisting the soil movement and chemical characteristics of the soils present for the design life of the facility. Systems proposed are to have been used successfully at the Installation for a time period equal to the design life of the proposed facility or submit documentation from an acceptable independent certifying entity certifying that a proposed alternate system has been used successfully for a period of time equal to the design life of the proposed facility on a minimum of 10 facilities where the soil movement and chemical characteristics are the same as at the Installation.

6.6.3.5. Site Features – Retaining Walls/Bridges/etc. Design site features with maximum 2 in 1 slope (same as the earth cover). Design site features to drain properly and tie into the drainage collector system.

6.7. THERMAL PERFORMANCE

There are no additional requirements other than those previously stated/referenced.

6.8. PLUMBING

6.8.1. **Piping Materials:** Provide Piping materials per applicable criteria but pipe materials may be restricted based on specific conditions at a particular site. Type M copper is not allowed. Type L above ground pressure piping and copper Type K for underground pressure pipe are preferred. Non-plastic drainage, waste and venting (DWV) plumbing materials are preferred, however, PVC or ABS waste and vent pipe is acceptable.

6.8.2. **Cross Connection Control**: Follow local site specific requirements for cross connection control / backflow prevention. Provide an inlet water backflow prevention device for each facility. Protect potable water systems from contamination by hydronic water and other industrial and mechanical systems via a reduced pressure zone backflow preventer.

6.8.3. **Natural Gas Supply**: Normally use the standard gas pressure from utility provider's building regulator of 5.3 ounces. If higher pressures are needed, coordinate those requirements with the utility provider. Provide the utility provider with required flow rate and expected gas usage diversity so the utility provider may provide the appropriate metering and regulation equipment. Report no diversity, that is, all loads are firing at the same time in the facility.

6.8.4. **Gas Regulator Venting**: Vent all gas regulators in building to the outside.

6.8.5. **Domestic Water Heating**: The Installation encourage the use of point-of-use instantaneous domestic hot water heaters for small hot water demand areas such as small restrooms (small is considered to be two lavatories or less) and gas-fired hot water storage heaters for larger demand areas such as larger gang restrooms and restrooms with showers.

6.8.6. **Exterior Water Piping Freeze Protection**: Design seasonally utilized (not used in winter) water supply piping for complete drain down.Provide an interior or below grade isolation valve. Insulate exposed water piping that is utilized year round, heat traced and protected with pipe jacketing to ensure that the piping will not freeze.

6.8.7. **Fixture Faucet Mixing Valves**:

(a) For administrative and classroom facilities, the automatic flush and water valves, with long-life batteries and backup manual flush buttons, for water closets, urinals and lavatories perform best.

(b) Provide automatic mixing type with anti-scald temperature control shower valves (pressure balancing/compensating type). Additionally, valves shall not have any internal or exterior plastic parts.

6.8.8. **Wall Hydrants**. Provide non-freeze wall hydrants on all building faces at no more than 100-feet intervals.

6.9. SITE ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.9.1. **Exterior Lighting**. Design and install exterior lighting within the construction limits. Exterior site and area lighting shall be pulse-start metal-halide (PSMH) or induction type, except compact fluorescent lighting is acceptable for walkway lighting where suitable for the climatic conditions. Exterior lighting includes parking areas, hardstands, roadways and walkways. Photo control devices for exterior lighting

shall have adjustable operation range of approximately 0.5 to 5.0 foot candles. Provide protective lighting systems at the perimeter fence where required by the specific project to deter trespassers and to make them visible to guards. Use 90 degree cut off lighting facing any runway.

6.9.2. **Exterior Electrical**: Design and extend the electrical service underground from the pad-mounted transformer to building service equipment/main electrical switchgear.. Coordinate all electric work and interruptions through the CO and Ft Sill DPW. The existing distribution system is a 13,200Y/7,620 V three-phase, four-wire multi-ground system. Duct lines (600-volt) shall be direct buried thick wall type; concrete encased in vehicular traffic areas. Provide two spare conduits from the transformer to the building service equipment/main electrical switchgear..

6.9.3. **Exterior Communications**: Communications service to the buildings shall be underground six-way 4-inch conduit duct banks. Design and install the duct bank from 5-foot outside the building to the building's communications room. In each duct bank; dedicate one (1) 4-inch conduit to copper cables; dedicate one (1) 4-inch conduit to CATV coaxial cable and dedicate one (1) 4-inch conduit with two (2) 3-way fiber mesh to fiber optic cable. The other three (3) 4-inch conduits are spare. Others will provide duct bank, fiber optic and copper cabling from the manhole(s) to within 5-foot of the building at a location closest to the communications room under separate contract. Others will splice and complete the termination of the outside plant cables in the manhole and communications room. Securely fasten all entrance conduits to the building so they can withstand a typical placing operation. Keep area around the entrance conduit free of any construction, storage and mechanical apparatus.

6.10. FACILITY ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.10.1. Power system study shall consist of fault analysis and coordination study.

6.10.2. **Lightning Protection and Grounding**: Provide lightning protection shall be provided based on NFPA 780 (2004) Annex L Lightning Risk Assessment of the facility. Provide grounding, bonding, shielding for all facilities. Provide grounding straps and connect to the building grounding system. Provide grounding points in vehicle and equipment parking areas on 20 foot centers (maximum) and coordinated with the power and data board units. Provide ground strap on walls, and two (2) grounding points on each functional bay floor. Provide a bonding grounding in oil storage room.

6.10.3. **Closed Circuit TV (CCTV):** Install a conduit system to support CCTV throughout designated spaces.The conduit system includes but is not limited to conduits, pull boxes and pull wires. Route all conduits for CCTV signals back to the telecommunications room or the designated monitoring room.

6.10.4. **Telephone and Local Area Network (LAN):** Provide complete riser diagrams and equipment locations on the drawings. Connect the facility to the installation Campus Area Network (CAN) System and telephone system in accordance with the I3A (and SIPRNET guide, where applicable in paragraph 3). Coomumications systems resources will be allocated in accordance with the I3A regarding outlet densities based upon the functionality of the facility's (ies') various component floor spaces. Connect all standard MILCON outlets from the telecommunications room equipment communication patch panels with 2 pair, TIA/EIA 568-B Category 6 unshielded twisted pair (UTP) solid copper station cable. Connect all single 8-position wall outlets from the commercial rack patch panels with one pair TIA/RIA 568-B CAT 6 UTP cable. Provide a weatherproof telephone enclosure located on an exterior wall near the main entrance of each building.

6.10.5. Communication Testing. Provide material and documentation for communication testing. Provide complete end-to-end certification of all wire/cable installed in accordance with the TIA/EIA 568 Standards. Provide 30 days notification of testing. Testing includes but is not limited to:

(a) A submitted and Government approved test plan.

(b) Test of all installation ground bus bars, wiring and ground grids.

(c) Furnishing test results within 7 days of testing performance and prior to final acceptance.

(d) Test results include, as a minimum, electrical resistance readings, continuity readings, insulation and resistance and dB loss readings. Include graphical representation of results. Include: date, time, tester, building number, room number and panel number.

6.10.6. Terminate all components prior to testing. There will be no acceptance of equipment and systems until the required inspections and tests have been made and submittal of the required documentation to the Government.

6.11. HEATING, VENTILATING, AND AIR CONDITIONING

6.11.1. General:

6.11.1.1. Integration of new facilities into the existing EMCS database and monitoring and controls software (such as the Post-wide demand limiting) will require generation of custom graphics matching the style and complexity of the existing graphics. Integration of new facilities shall also include programming of alarm handling and demand load limiting which will require Directorate of Public Works (DPW) input for critical alarm lists and priority of building for demand load limiting. This must be done at the existing EMCS "front-end." Integration will be limited to qualified companies and personnel. Fort Sill's encourages the use of Tour Andover Controls (TAC) or their designated local representative in Oklahoma City, OK (OKC) do the integration; TAC's OKC representative is, Energy Management & Controls Synergy (EMCS), contact Mr. Jeff Houpt, 405-528-3627. Other possible integrators are: Tang & Associates, contact Mr. John Huston, 312-616-7498 or EMC Engineers, contact Mr. Carl Lundstrom, 678-254-1221. Note that TAC and EMC Engineers are the only companies currently familiar with the Fort Sill EMCS.

6.11.2. **Water Quality Analysis and Treatment**: Water quality for the Installation and surrounding area is "hard." Treatment will be required for use as make-up water in HVAC equipment. Water Quality Analysis reports are included at Appendix. . Additional water analysis data from water treatment contractor is provided below:

Chlorides: 16 ppm

Total Alkalinity: 90 – 140 ppm (Total alkalinity varies by season.)

Total Hardness: 157 ppm ($CaCO_3$)

ph: 8.00

Silica: 3.4 ppm ($SiO_2$)

Iron: approx. 0.017 Reactive (Leaving plant; varies with location, age of piping, etc.)

Total Dissolved Solids: 190 ppm

6.11.2.1. Coordinate with water treatment contractor to confirm water data and current water treatment methods to obtain the required quantity and types of chemicals to be initially introduced into the closed loop heating and chilled water systems. Currently, water treatment is contracted by VT Griffin to Nalco Chemical Company.

6.11.3. Fuel for Heating/Cooling

6.11.3.1. **Installation Preference No. 4**. Ft. Sill's preference for heating/cooling systems is geothermal or natural gas heating with geothermal most preferred. The preferred type of geothermal system is drilled wells with closed circuit earth heat exchange pumping and piping system to gather heat from the earth for exchange to water or air for heating in the facilities.

6.11.3.2. HVAC Cooling Building Systems: Electric driven refrigeration and cooling systems are the most prevalent types at Fort Sill. Geothermal systems and other renewable or highly energy-efficient types of cooling are definitely encouraged over standard refrigeration-based equipment (DX, chilled

water, etc.), where they are applicable. Fort Sill currently has several facilities (family housing, UEPH, BEQ, large office buildings, etc.) that are cooled and heated by geothermal closed-loop, drilled vertical borehole systems that are very successful. Evaporative cooling, direct and indirect evaporative building cooling systems, can be energy efficient; and state-of-the-art types proposed will be readily considered as long as site limitations such as climate, dust storms, etc. are taken into account. Do not provide the old style “swamp” direct evaporative pad or media coolers as a form of building cooling as they suffer from water mineral, dirt buildup and are maintenance intensive.

6.11.3.3. HVAC Central Cooling Plant Systems (serving more than one building or facility): Electric driven refrigeration and cooling systems are the most prevalent types at Fort Sill. Chiller plants mainly employ electric centrifugal chillers with water cooling towers. While this type of system is acceptable for maintenance and durability, Ft Sill encourages the use of other types of cooling systems, such as geothermal central plants that have been installed and are in use. Newer plants, where they are proposed or required should be of much higher efficiency than standard energy code minimum systems and are highly encouraged to employ renewable energy such as geothermal. The recommended type of geothermal cooling/heating system is drilled wells with closed circuit earth, lake, etc. heat exchange to water for cooling/heating plants.

6.11.4. Mandatory Equipment Requirements:

6.11.4.1. All mechanical equipment shall automatically restart after a power outage. Provide equipment such as boiler low water boiler cut-offs and controls that can restart in a normal mode after power is restored. Protect all mechanical equipment and controls against power surges and low and high supply voltage situations. Power loss, surges or low or high voltage shall not, in any way, effect HVAC or plumbing equipment or controls, set points, controls bindings etc.

6.11.4.2. Boiler Size: The maximum allowable individual boiler size that can be utilized is 10 million Btu per hour (input); this is a non-negotiable and mandatory Ft Sill requirement for them to operate under their current Environmental Air Quality Permit.

6.11.4.3. HVAC On/Off Switch. Provide an on/off switch for all HVAC systems in a central location as per UFC 4-010-01. Coordinate this requirement and switch features with local installation DPW during design.

6.11.4.4. HVAC Controls: Provide manual button or switch allowing users to have the capability to do minimal “run longer” control. Intent is for building users to work odd shifts without requiring Installation DPW input. HVAC controls shall provide all of the monitoring and controls points as mentioned for EMCS and shall expose all of the reset, tuning, etc. parameters as required for a completely open system as discussed above for EMCS. Coordinate with the CO to obtain the building occupied/unoccupied schedule for the facility; use that schedule for building controls and EMCS.

6.11.4.5. Chilled Water System Volume Requirements. For each chilled water system, the system must contain a minimum of 4-gallons per ton of chilling capacity, or more, if required by the manufacturer of proposed chiller. The volume calculation shall exclude the water volume of the chiller and all load heat exchange developed (coils, etc.) in the system. If the system volume does not contain the minimum volume, a chilled-water storage tank shall be designed to bring the system volume to the required minimum. The chilled-water storage tank shall be piped into the chilled water return line upstream of the chiller.

6.11.4.6. Provide all exterior air cooled HVAC equipment with hail guards.

6.11.4.7. Generator Equipment: Stationary emergency or electrical generator equipment shall use natural gas as a fuel source. This is required by the Installation’s Environmental Permit.

6.11.5. **Installation Preference No. 3.** Ft. Sill prefers that no equipment, including HVAC, be roof mounted. However, if provided by the D/B Contractor, the D/B Contractor shall provide proper permanent ladders, roof-protecting walking surface and adequately large OSHA-approved work surfaces around each device or piece of equipment. See paragraph 6.5.2..

6.11.5.1. Equipment Placement: When possible, place the of air handling equipment to be either within the building spaces (i.e., equipment rooms or plants, etc.) which are sound isolated, within exterior on-grade equipment yards which are enclosed with screen walls or within enclosed roof penthouses. The Installation DPW encourages designers to organize vents, stacks, grilles and placement of mechanical or electrical service fixtures into locations which do not provide visually negative design impacts. Where possible, avoid catwalks especially when up and down travel is required to service multiple equipment pieces. (Coordinate with architectural design and RFP requirement.)

6.11.6. **Fort Sill's Freeze Protection**: Provide full protection down to lowest temperature with propylene glycol (PG) solution (dowfrost HD) or a combination of a lower concentration of PG in combination with controls logic to start and run the chilled water pumps to circulate water to help avoid freezing. If any secondary protection is required or provided it shall be self regulating, industrial grade with shielded jacket heat tracing.

6.12. ENERGY CONSERVATION

6.12.1. General

Provide as required by the design and LEED requirements.

6.12.2. Inclusion of Renewable Energy Features. The following renewable energy features have been determined lifecycle cost effective, are included in the project budget and shall be provided:

Provide as required by the design and LEED requirements.

6.13. FIRE PROTECTION

6.13.1. Fire Sprinkler Service: Provide a separate fire sprinkler service connection within each building that requires fire sprinklers. Provide Knox boxes. Provide a Post Indicator Valve (PIV) and any bollards required for protection.

6.13.2. Provide fire hydrants.

6.13.3. Riser Location: Install fire risers in a dedicated space or mechanical room with external access and keying for the Fire Department.

6.13.4. Fire Sprinkler Seismic Design: Since the installation is located in a seismic zone, design fire sprinkler systems for protection of piping against damage from earthquakes per NFPA 13.

6.13.5. Fire Sprinkler Backflow Prevention: Double check valve backflow preventers are the minimum protection required for all sprinkler systems. Systems utilizing antifreeze require reduced pressure principle backflow preventers.

6.13.6. Mass Notification System (MNS)/Public Address (PA): The MNS system shall be fully functioning and shall be designed and installed to operate as both MNS and PA. The systems shall be zoned and permit zonal selection of paging by both installed microphone jacks and telephone dialup. Indicating devices shall be visual and located throughout the facility including exterior wall locations. All strobes for the MNS shall be synchronized with the fire alarm strobes in the event both are active at the same time. The MNS shall have the ability to interrupt all localized audio systems that are independent of the building-wide PA system. The Installation-wide giant voice system is an ADT MNS. Each building shall

communicate with the ADT Central Control Unit via an existing radio frequency transmitter and antenna. Furnish and connect the following equipment:

(a) One (1) mass notification panel in accordance with the requirements of UFC 4-021-01 and compatible with the existing giant voice system at Fort Sill.

(b) One (1) transceiver with the ability to communicate with the Installation's big voice radio frequency (RF) equipment with the ability to transmit and receive information.

(c) Install One (1) antenna at the facility.

(d) Connect eight (8) dry contacts to the building MNS for controlling prerecorded messages and push-to-talk for audio (remainder of the eight (8) shall become spares). Connect the 600-ohm audio for audio from the central control unit to the MNS.

6.13.7. Fire Alarm Systems: Provide Class A addressable systems consisting of a fire alarm panel, an RF transceiver, initiating devices and notification devices. The Fire Alarm Control Panel shall be fully compatible with the existing Monaco system. Provide pull stations that are single-action, non-glass rod type.

6.13.7.1. **Installation Preference No. 5**: Provide the required fire alarm system with 72 hours of standby with 15 minutes of alarm in lieu of the 24 hours of standby required by code.

6.13.7.2. The RF transceiver shall be a Monaco BT-X (verify with Post Fire Chief) or approved equal operating on a frequency of 141.3625 MHZ. Provide transceiver communication with the Lawton, Oklahoma 911 dispatch located off Post

6.13.7.3. The fire alarm receiving system is a Monaco D-21 system.

6.13.7.4. Provide zone by zone information sent to the Fire Department receiving system. Send All tamper devices to the D-21 system as a supervisory tamper.

6.13.7.5. Provide all initiating devices that are connected, Class A, Style D, to signal line circuits (SLC), Style 6.

6.13.7.6. Provide all alarm appliances connected to notification appliance circuits (NAC), Class A, Style Z.

6.13.8. Furnish all software, software locks, special tools and any other proprietary equipment required to maintain, add devises to or delete devices from the system or test the fire alarm system prior to the final inspection of the system.

6.14. SUSTAINABLE DESIGN

6.14.1. LEED Rating Tool Version. This project shall be executed using LEED-NC Version 3.

6.14.2. The minimum requirement for this project is to achieve LEED Silver level. Each non-exempt facility (building plus sitework) must achieve this level. In addition to any facilities indicated as exempt in paragraph 3, the following facilities are exempt from the minimum LEED achievement requirement: None..

6.14.3. Credit Validation: LEED registration, compiling of documentation at LEED OnLine and use of the LEED Letter Templates is required. Registration and payment of registration fees will be by the Government. Administration/team management of the online project will be by the Contractor. Validation of credits will be accomplished by the Government. LEED certification of the project by the Contractor is required. The Contractor will obtain LEED certification prior to project closeout. Application, payment of certification of fees and all coordination with USGBC during the certification process will be by the

Contractor. GBCI interim review of design phase data is not required by the Government but is recommended. Government validation during project execution does not relieve or modify in any way the Contractor's responsibility to satisfy all requirements for certification as defined by LEED and GBCI. Contractor is not responsible for design phase LEED documentation of any unaltered portion of the design that is accomplished by others. If the project includes unaltered complete design by others, during the certification process Contractor will coordinate all GBCI comments on LEED credits that fall outside Contractor's scope of responsibility with the Government for coordination with the Designer of Record, and Contractor will not be penalized if project fails to achieve certification at the minimum required level due to loss of credits that are the responsibility of others.

6.14.4. Commissioning: See Appendix M for Owner's Project Requirements document(s).

6.14.5. LEED Credits Coordination. The following information is provided relative to Sustainable Sites and other credits.

**SS Credit 1 Site Selection:**

Project site IS NOT considered prime farmland.

Delineation of 100-year flood elevation is shown on site drawings provided in this CONTRACT.

Delineation of threatened or endangered species habitat is shown on site drawings provided in this CONTRACT.

Delineation of water, wetlands and areas of special concern is shown on site drawings provided in this CONTRACT.

Project site WAS NOT previously used as public parkland.

**SS Credit 2 Development Density & Community Connectivity.**

Project site DOES NOT meets the criteria for this credit.

**SS Credit 3 Brownfield Redevelopment.**

Project site DOES NOT meets the criteria for this credit.

**SS Credit 4.1 Public Transportation Access.**

Project site DOES NOT meets the criteria for this credit.

**EA Credit 6 Green Power.**

35% of the project's electricity WILL NOT be provided through an Installation renewable energy contract. Do not purchase Renewable Energy Credits (REC's) to earn this credit.

**MR Credit 2 Construction Waste Management.**

The Installation does not have an on-post recycling facility available for Contractor's use.

**Regional Priority Credits (Version 3 only)**

The project zip code is 73503.

6.14.6. LEED Credit Preferences, Guidance and Resources. See Appendix L LEED Project Credit Guidance for supplemental information relating to individual credits.

6.14.7. Not Used

6.14.8. Additional Information

See LEED Appendices for information.

6.15. ENVIRONMENTAL

6.15.1. Solid Waste Disposal/Diversion Practices:

6.15.1.1. Solid Waste Disposal/Diversion Practices shall be in accordance with all local, State, and Federal requirements and regulations. Contract shall coordinate disposal with the Ft. Sill landfill.. No offsite disposal is permitted. Dispose of all construction material waste and debris from demolition in the Ft Sill landfill (Dodge Hill). Items that can be used to help decrease diversion rates include salvaged items (may be reused by others), scrap metal, masonry products, gravel, asphalt, concrete, rock and topsoil (earth fill is specifically excluded). There are segregated areas at the landfill for disposal of asphalt, concrete and rock. Dispose of waste fill on Post; The Contracting Officer (CO) will coordinate and approve location of disposal areas. There is no charge for using the Ft Sill Landfill. Confine construction limits to the construction site boundaries shown on the drawings within Appendix J.

6.15.1.2. Government policy applies to sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy, (1) Practice efficient waste management when sizing, cutting, and installing products and materials, (2) use all reasonable means to divert construction, and demolition waste from landfills and incinerators and to facilitate their recycling or reuse.

6.15.2. Asbestos containing materials (ACMs), lead based paint (LBP), or PCBs shall not be used in the project.

6.15.3. Air pollution restrictions applicable to this project do not allow materials to be burned on Government premises.

6.15.4. Oil Water Separators (OWS). Fort Sill requires OWS to be installed in a vault per local EQD requirements. Equip the oil water separator with a sensor/alarm panel that indicates when the separator requires service. Also include a sump pump tied to the separator for removal of rainwater from the vault.

6.16. PERMITS

Obtain permits from Fort Sill for each generator required for on-site electrical service. Note that generators equal to or larger than 500 hp, in use for more than 1-year require a permit from Fort Sill EDQ.

6.17. DEMOLITION

No buildings will be demolished as part of this contract.

6.18. ADDITIONAL FACILITIES

No additional facilities are required.

End of Section 01 10 00.T.O. TBD

**SECTION 01 33 00.T.O. TBD**
**SUBMITTAL PROCEDURES**
**(DESIGN-BUILD TASK ORDERS)**

## 1.0 GENERAL

1.13. GOVERNMENT APPROVED OR CONCURRED WITH SUBMITTALS

1.14. INFORMATION ONLY SUBMITTALS

## 1.0 GENERAL

1.1.1. This section contains requirements specifically applicable to this task order. The requirements of Base ID/IQ contract Section 01 33 30 apply to this task order, except as otherwise specified herein.

1.13. GOVERNMENT APPROVED OR CONCURRED WITH SUBMITTALS

Upon completion of review of submittals requiring Government approval or concurrence, the Government will stamp and date the submittals as approved or concurred. The Government will retain four (4) copies of the submittal and return one (1) copy(ies) of the submittal.

1.14. INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe. The Government will retain two (2) copies of information only submittals.

End of Section 01 33 00.T.O. TBD

# SECTION 01 33 16
# DESIGN AFTER AWARD

**1.0 GENERAL INFORMATION**

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1.2. DESIGNER OF RECORD

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**3.0 EXECUTION**

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3.6. FINAL DESIGN REVIEWS AND CONFERENCES

3.7. FINAL DESIGN REQUIREMENTS

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3.7.2. Design Analysis

3.7.3. Specifications

3.7.4. Submittal Register

3.7.5. Preparation of DD Form 1354 (Transfer of Real Property)

3.7.6. Acceptance and Release for Construction

3.8. DESIGN COMPLETE CONSTRUCTION DOCUMENT REQUIREMENTS

3.9. SUBMITTAL DISTRIBUTION, MEDIA AND QUANTITIES

3.9.1. Submittal Distribution and Quantities

3.9.2. Web based Design Submittals

3.9.3. Mailing of Design Submittals

3.10. AS-BUILT DOCUMENTS

**ATTACHMENT A STRUCTURAL INTERIOR DESIGN (SID) REQUIREMENTS**

**ATTACHMENT B FURNITURE, FIXTURES AND EQUIPMENT REQUIREMENTS**

**ATTACHMENT C TRACKING COMMENTS IN DRCHECKS**

**ATTACHMENT D SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW**

**ATTACHMENT E LEED SUBMITTALS**

**ATTACHMENT F BUILDING INFORMATION MODELING REQUIREMENTS**

**ATTACHMENT G DESIGN SUBMITTAL DIRECTORY AND SUBDIRECTORY FILE ARRANGEMENT**

## 1.0 GENERAL INFORMATION

### 1.1. INTRODUCTION

1.1.1. The information contained in this section applies to the design required after award. After award, the Contractor will develop the accepted proposal into the completed design, as described herein.

1.1.2. The Contractor may elect to fast track the design and construction that is, proceed with construction of parts of the sitework and facilities prior to completion of the overall design. To facilitate fast tracking, the Contractor may elect to divide the design into no more than six (6) design packages per major facility type and no more than three (3) design packages for site and associated work. Designate how it will package the design, consistent with its overall plan for permitting (where applicable) and construction of the project. See Sections 01 33 00 SUBMITTAL PROCEDURES and 01 32 01.00 10 PROJECT SCHEDULE for requirements for identifying and scheduling the design packaging plan in the submittal register and project schedule. See also Sections 01 10 00 STATEMENT OF WORK and 01 57 20.00 10 ENVIRONMENTAL PROTECTION for any specified permit requirements. If early procurement of long-lead item construction materials or installed equipment, prior to completion of the associated design package, is necessary to facilitate the project schedule, also identify those long-lead items and how it will assure design integrity of the associated design package to meet the contract requirements (The Contract consists of the Solicitation requirements and the accepted proposal). Once the Government is satisfied that the long-lead items meet the contract requirements, the Contracting Officer will allow the Contractor to procure the items at its own risk.

1.1.3. The Contractor may proceed with the construction work included in a separate design package after the Government has reviewed the final (100%) design submission for that package, review comments have been addressed and resolved to the Government's satisfaction and the Contracting Officer (or the Administrative Contracting Officer) has agreed that the design package may be released for construction.

1.1.4. INTEGRATED DESIGN. To the maximum extent permitted for this project, use a collaborative, integrated design process for all stages of project delivery with comprehensive performance goals for siting, energy, water, materials and indoor environmental quality and ensures incorporation of these goals. Consider all stages of the building lifecycle, including deconstruction.

### 1.2. DESIGNER OF RECORD

Identify, for approval, the Designer of Record (“DOR”) that will be responsible for each area of design. One DOR may be responsible for more than one area. Listed, Professional Registered, DOR(s) shall account for all areas of design disciplines. The DOR’s shall stamp, sign, and date each design drawing and other design deliverables under their responsible discipline at each design submittal stage (see contract clause Registration of Designers). If the deliverables are not ready for release for construction, identify them as "preliminary" or "not for release for construction" or by using some other appropriate designation. The DOR(s) shall also be responsible for maintaining the integrity of the design and for compliance with the contract requirements through construction and documentation of the as-built condition by coordination, review and approval of extensions of design, material, equipment and other construction submittals, review and approval or disapproval of requested deviations to the accepted design or to the contract, coordination with the Government of the above activities, and by performing other typical professional designer responsibilities.

## 2.0 PRODUCTS (Not Applicable)

## 3.0 EXECUTION

### 3.1. PRE-WORK ACTIVITIES & CONFERENCES

3.1.1. Design Quality Control Plan

Submit for Government acceptance, a Design Quality Control Plan in accordance with Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL before design may proceed.

3.1.2. Post Award Conference

3.1.2.1. The government will conduct a post award contract administration conference at the project site, as soon as possible after contract award. This will be coordinated with issuance of the contract notice to proceed (NTP). The Contractor and major sub-contractor representatives shall participate. All designers need not attend this first meeting. Government representatives will include COE project delivery team members, facility users, facility command representatives, and installation representatives. The Government will provide an agenda, meeting goals, meeting place, and meeting time to participants prior to the meeting.

3.1.2.2. The post award conference shall include determination and introduction of contact persons, their authorities, contract administration requirements, discussion of expected project progress processes, and coordination of subsequent meetings for quality control (see Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL), Partnering (see below and SCR: Partnering), and the initial design conference (see below).

3.1.2.3. The government will introduce COE project delivery team members, facility users, facility command representatives, and installation representatives. The DB Contractor shall introduce major subcontractors, and other needed staff. Expectations and duties of each person shall be defined for all participants. A meeting roster shall be developed and distributed by the government with complete contact information including name, office, project role, phone, mailing and physical address, and email address.

3.1.3. Partnering & Project Progress Processes

3.1.3.1. The initial Partnering conference may be scheduled and conducted at any time with or following the post award conference. The Government proposes to form a partnership with the DB Contractor to develop a cohesive building team. This partnership will involve the COE project delivery team members, facility users, facility command representatives, installation representatives, Designers of Record, major subcontractors, contractor quality control staff, and contractor construction management staff. This partnership will strive to develop a cooperative management team drawing on the strengths of each team member in an effort to achieve a quality project within budget and on schedule. This partnership will be bilateral in membership and participation will be totally voluntary. All costs, excluding labor and travel expenses, shall be shared equally between the Government and the Contractor. The Contractor and Government shall be responsible for their own labor and travel costs. Normally, partnering meetings will be held at or in the vicinity of the project installation.

3.1.3.2. As part of the partnering process, the Government and Contractor shall develop, establish, and agree to comprehensive design development processes including conduct of conferences, expectations of design development at conferences, fast-tracking, design acceptance, Structural Interior Design (SID)/ Furniture, Fixtures & Equipment (FF&E) design approval, project closeout, etc. The government will explain contract requirements and the DB Contractor shall review their proposed project schedule and suggest ways to streamline processes.

3.1.4. Initial Design Conference

The initial design conference may be scheduled and conducted at the project installation any time after the post award conference, although it is recommended that the partnering process be initiated with or before the initial design conference. Any design work conducted after award and prior to this conference should be limited to site and is discouraged for other items. All Designers of Record shall participate in

the conference. The purpose of the meeting is to introduce everyone and to make sure any needs the contractor has are assigned and due dates established as well as who will get the information. See also Attachment F, BUILDING INFORMATION MODELING REQUIREMENTS for discussion concerning the BIM Implementation Plan demonstration at this meeting. The DB Contractor shall conduct the initial design conference.

3.1.5. Pre-Construction Conference

Before starting construction activities, the Contractor and Government will jointly conduct a pre-construction administrative conference to discuss any outstanding requirements and to review local installation requirements for start of construction. It is possible there will be multiple Pre-Construction Conferences based on the content of the design packages selected by the Contractor. The Government will provide minutes of this meeting to all participants.

3.2. STAGES OF DESIGN SUBMITTALS AND OVER THE SHOULDER PROGRESS REVIEWS

The stages of design submittals described below define Government expectations with respect to process and content. The Contractor shall determine how to best plan and execute the design and review process for this project, within the parameters listed below. As a minimum, the Government expects to see at least one interim design submittal, at least one final design submittal before construction of a design package may proceed and at least one Design Complete submittal that documents the accepted design. The Contractor may sub-divide the design into separate packages for each stage of design and may proceed with construction of a package after the Government accepts the final design for that package. See discussion on waivers to submission of one or more intermediate design packages where the parties partner during the design process. See also Attachment F, BUILDING INFORMATION MODELING REQUIREMENTS for discussion concerning BIM and the various stages of design submittals and over-the-shoulder progress reviews**.**

3.2.1. Site/Utilities

To facilitate fast-track design-construction activities the contractor may submit a final (100%) site and utility design as the first design submittal or it may elect to submit interim and final site and utility design submittals as explained below. Following review, resolution, and incorporation of all Government comments, and submittal of a satisfactory set of site/utility design documents, after completing all other pre-construction requirements in this contract and after the pre-construction meeting, the Government will allow the Contractor to proceed with site development activities, including demolition where applicable, within the parameters set forth in the accepted design submittal. For the first site and utility design submission, whether an interim or final, the submittal review, comment, and resolution times from this specification apply, except that the Contractor shall allow the Government a 14 calendar day review period, exclusive of mailing time. No on-site construction activities shall begin prior to written Government clearance to proceed.

3.2.2. Interim Design Submittals

The Contractor may submit either a single interim design for review, representing a complete package with all design disciplines, or split the interim design into smaller, individual design packages as it deems necessary for fast-track construction purposes. As required in Section 01 32 01.00 10 PROJECT SCHEDULE, the Contractor shall schedule its design and construction packaging plan to meet the contract completion period. This submission is the Government's primary opportunity to review the design for conformance to the solicitation and to the accepted contract proposal and to the Building Codes at a point where required revisions may be still made, while minimizing lost design effort to keep the design on track with the contract requirements. The requirements for the interim design review submittals and review conferences are described hereinafter. This is not necessarily a hold point for the design process; the Contractor may designate the interim design submittal(s) as a snapshot and proceed with design development at its own risk. See below for a waiver, where the parties establish an effective

over-the-shoulder progress review procedure through the partnering process that would eliminate the need for or expedite a formal intermediate design review on one or more individual design packages.

3.2.3. Over-the-Shoulder Progress Reviews

To facilitate a streamlined design-build process, the Government and the Contractor may agree to one-on-one reviewer or small group reviews, electronically, on-line (if available within the Contractor's standard design practices) or at the Contractor's design offices or other agreed location, when practicable to the parties. The Government and Contractor will coordinate such reviews to minimize or eliminate disruptions to the design process. Any data required for these reviews shall normally be provided in electronic format, rather than in hard copy. If the Government and Contractor establish and implement an effective, mutually agreeable partnering procedure for regular (e.g., weekly) over-the shoulder review procedures that allow the Government reviewers the opportunity to keep fully informed of the progress, contents, design intent, design documentation, etc. of the design package, the Government will agree to waive or to expedite the formal intermediate design review period for that package. The Contractor shall still be required to submit the required intermediate design documentation, however the parties may agree to how that material will be provided, in lieu of a formal consolidated submission of the package. It should be noted that Government funding is extremely limited for non-local travel by design reviewers, so the maximum use of virtual teaming methods must be used. Some possible examples include electronic file sharing, interactive software with on-line or telephonic conferencing, televideo conferencing, etc. The Government must still perform its Code and Contract conformance reviews, so the Contractor is encouraged to partner with the reviewers to find ways to facilitate this process and to facilitate meeting or bettering the design-build schedule. The Contractor shall maintain a fully functional configuration management system as described herein to track design revisions, regardless of whether or not there is a need for a formal intermediate design review. The formal intermediate review procedures shall form the contractual basis for the official schedule, in the event that the partnering process determines that the formal intermediate review process to be best suited for efficient project execution. However, the Government pledges to support and promote the partnering process to work with the Contractor to find ways to better the design schedule.

3.2.4. Final Design Submissions

This submittal is required for each design package prior to Government acceptance of that design package for construction. The requirements for the final design submittal review conferences and the Government's acceptance for start of construction are described herein after.

3.2.5. Design Complete Submittals

After the final design submission and review conference for a design package, revise the design package to incorporate the comments generated and resolved in the final review conferences, perform and document a back-check review and submit the final, design complete documents, which shall represent released for construction documents. The requirements for the design complete submittals are described hereinafter.

3.2.6. Holiday Periods for Government Review or Actions

Do not schedule meetings, Government reviews or responses during the last two weeks of December or other designated Government Holidays (including Friday after Thanksgiving). Exclude such dates and periods from any durations specified herein for Government actions.

3.2.7. Late Submittals and Reviews

If the Contractor cannot meet its scheduled submittal date for a design package, it must revise the proposed submittal date and notify the government in writing, at least one (1) week prior to the submittal, in order to accommodate the Government reviewers' other scheduled activities. If a design submittal is

over one (1) day late in accordance with the latest revised design schedule, or if notification of a proposed design schedule change is less than seven (7) days from the anticipated design submission receipt date, the Government review period may be extended up to seven (7) days due to reviewers' schedule conflicts. If the Government is late in meeting its review commitment and the delay increases the Contractor's cost or delays completion of the project, the Suspension of Work and Defaults clauses provide the respective remedy or relief for the delay.

## 3.3. DESIGN CONFIGURATION MANAGEMENT

### 3.3.1. Procedures

Develop and maintain effective, acceptable design configuration management (DCM) procedures to control and track all revisions to the design documents after the Interim Design Submission through submission of the As-Built documents. During the design process, this will facilitate and help streamline the design and review schedule. After the final design is accepted, this process provides control of and documents revisions to the accepted design (See Special Contract Requirement: Deviating From the Accepted Design). The system shall include appropriate authorities and concurrences to authorize revisions, including documentation as to why the revision must be made. Include the DCM procedures in the Design Quality Control Plan. The DCM data shall be available to the Government reviewers at all times. The Contractor may use its own internal system with interactive Government concurrences, where necessary or may use the Government's "DrChecks Design Review and Checking System" (see below and Attachment C).

### 3.3.2. Tracking Design Review Comments

Although the Contractor may use its own internal system for overall design configuration management, the Government and the Contractor shall use the DrChecks Design Review and Checking System to initiate, respond to, resolve and track Government design compliance review comments. This system may be useful for other data which needs to be interactive or otherwise available for shared use and retrieval. See Attachment C for details on how to establish an account and set-up the DrChecks system for use on the project.

### 3.3.3. Design and Code Checklists

Develop and complete various discipline-specific checklists to be used during the design and quality control of each submittal. Submit these completed checklists with each design submittal, as applicable, as part of the project documentation. See Section 01 45 04.00 10 Contractor Quality Control, Attachment D for a Sample Fire Protection and Life Safety Code review checklist and Attachment E for LEED SUBMITTALS.

## 3.4. INTERIM DESIGN REVIEWS AND CONFERENCES

### 3.4.1. General

At least one interim design submittal, review and review conference is required for each design package (except that, per paragraph 3.2.1, the Contractor may skip the interim design submission and proceed directly to final design on the sitework and utilities package). The DB Contractor may include additional interim design conferences or over-the-shoulder reviews, as needed, to assure continued government concurrence with the design work. Include the interim submittal review periods and conferences in the project schedule and indicate what part of the design work is at what percentage of completion. The required interim design conferences shall be held when interim design requirements are reached as described below. See also Paragraph: **Over-the-Shoulder Progress Reviews** for a waiver to the formal interim design review.

### 3.4.2. Procedures

After receipt of an Interim Design submission, allow the Government fourteen (14) calendar days after receipt of the submission to review and comment on the interim design submittal. For smaller design packages, especially those that involve only one or a few separate design disciplines, the parties may agree on a shorter review period or alternative review methods (e.g., over-the–shoulder or electronic file sharing), through the partnering process. For each interim design review submittal, the COR will furnish, to the Contractor, a single consolidated, validated listing of all comments from the various design sections and from other concerned agencies involved in the review process using the DrChecks Design Review and Checking System. The review will be for conformance with the technical requirements of the solicitation and the Contractor's RFP proposal. If the Contractor disagrees technically with any comment or comments and does not intend to comply with the comment, he/she must clearly outline, with ample justification, the reasons for noncompliance within five (5) days after receipt of these comments in order that the comment can be resolved. Furnish disposition of all comments, in writing, through DrChecks. The Contractor is cautioned that if it believes the action required by any comment exceeds the requirements of this contract, that it should take no action and notify the COR in writing immediately. The Interim Review conference will be held for each design submittal at the installation. Bring the personnel that developed the design submittal to the review conference. The conference will take place the week after the receipt of the comments by the Contractor. For smaller fast-track packages that involve only a few reviewers, the parties may agree to alternative conferencing methods, such as teleconferencing, or televideo, where available, as determined through Partnering.

3.4.3. Conference Documentation

3.4.3.1. In order to facilitate and accelerate the Government code and contract conformance reviews, identify, track resolution of and maintain all comments and action items generated during the design process and make this available to the designers and reviewers prior to the Interim and subsequent design reviews.

3.4.3.2. The DB Contractor shall prepare meeting minutes and enter final resolution of all comments into DrChecks. Copies of comments, annotated with comment action agreed on, will be made available to all parties before the conference adjourns. Unresolved problems will be resolved by immediate follow-on action at the end of conferences. Incorporate valid comments. The Government reserves the right to reject design document submittals if comments are significant. Participants shall determine if any comments are critical enough to require further design development prior to government concurrence. Participants shall also determine how to proceed in order to obtain government concurrence with the design work presented.

3.5. INTERIM DESIGN REQUIREMENTS

Interim design deliverables shall include drawings, specifications, and design analysis for the part of design that the Contractor considers ready for review.

3.5.1. Drawings

Include comments from any previous design conferences incorporated into the documents to provide an interim design for the “part” submitted.

3.5.2. Design Analyses

3.5.2.1. The designers of record shall prepare and present design analyses with calculations necessary to substantiate and support all design documents submitted. Address design substantiation required by the applicable codes and references and pay particular attention to the following listed items:

3.5.2.2. For parts including sitework, include site specific civil calculations.

3.5.2.3. For parts including structural work, include structural calculations.

(a) Identify all loads to be used for design.

(b) Describe the method of providing lateral stability for the structural system to meet seismic and wind load requirements. Include sufficient calculations to verify the adequacy of the method.

(c) Provide calculations for all principal roof, floor, and foundation members and bracing and secondary members.

(d) Provide complete seismic analyses for all building structural, mechanical, electrical, architectural, and building features as dictated by the seismic zone for which the facility is being constructed.

(e) Computer generated calculations must identify the program name, source, and version. Provide input data, including loads, loading diagrams, node diagrams, and adequate documentation to illustrate the design. The schematic models used for input must show, as a minimum, nodes/joints, element/members, materials/properties, and all loadings, induced settlements/deflections, etc., and a list of load combinations. Include an output listing for maximum/minimum stresses/forces and deflections for each element and the reactions for each loading case and combination.

(f) See also the Security (Anti-Terrorism) requirements below for members subject to Anti-Terrorist Force Protection (ATFP) and Progressive Collapse requirements.

(g) Fully coordinate and integrate the overall structural design between two different or interfacing construction types, such as modular and stick-built or multistory, stacked modular construction. Provide substantiation of structural, consolidation/settlement analysis, etc., as applicable, through the interfaces.

3.5.2.4. For Security (Anti-Terrorism): Provide a design narrative and calculations where applicable, demonstrating compliance with each of the 22 standards in UFC 4-010-01, which includes Design of Buildings to Resist Progressive Collapse (use the most recent version of UFC 4-023-03, regardless of references to any specific version in UFC 4-010-01). Where sufficient standoff distance is not being provided, show calculations for blast resistance of the structural system and building envelope. Show complete calculations for members subjected to ATFP loads, e.g., support members of glazed items (jambs, headers, sills) connections of windows to support members and connections of support members to the rest of the structure. For 3 story and higher buildings, provide calculations to demonstrate compliance with progressive collapse requirements.

3.5.2.5. For parts including architectural work, include building floor area analysis.

3.5.2.6. For parts including mechanical work, include HVAC analysis and calculations. Include complete design calculations for mechanical systems. Include computations for sizing equipment, compressed air systems, air duct design, and U-factors for ceilings, roofs and exterior walls and floors. Contractor shall employ commercially available energy analysis techniques to determine the energy performance of all passive systems and features. Use of hourly energy load computer simulation is required (see paragraph 3.5.5.2 for list of acceptable software). Based on the results of calculations, provide a complete list of the materials and equipment proposed with the manufacturer's published cataloged product installation specifications and roughing-in data.

3.5.2.7. For parts including life safety, include building code analysis and sprinkler and other suppression systems. Notwithstanding the requirements of the Codes, address the following:

(a) A registered fire protection engineer (FPE) must perform all fire protection analyses. Provide the fire protection engineer’s qualifications. See Section 01 10 00, paragraph 5 for qualifications.

(b) Provide all references used in the design including Government design documents and industry standards used to generate the fire protection analysis.

(c) Provide classification of each building in accordance with fire zone, building floor areas and height and number of stories.

(d) Provide discussion and description of required fire protection requirements including extinguishing equipment, detection equipment, alarm equipment and water supply. Alarm and detection equipment shall interface to requirements of Electronic Systems.

(e) Provide hydraulic calculations based on water flow test for each sprinkler system to insure that flow and pressure requirements can be met with current water supply. Include copies of Contractor's water flow testing done to certify the available water source.

3.5.2.8. For parts including plumbing systems:

(a) List all references used in the design.

(b) Provide justification and brief description of the types of plumbing fixtures, piping materials and equipment proposed for use.

(c) Detail calculations for systems such as sizing of domestic hot water heater and piping; natural gas piping; LP gas piping and tanks, fuel oil piping and tanks, etc., as applicable.

(d) When the geotechnical report indicates expansive soils are present, indicate in the first piping design submittal how piping systems will be protected against damage or backfall/backflow due to soil heave (from penetration of slab to the 5 foot building line).

3.5.2.9. For elevator systems:

(a) List all criteria codes, documents and design conditions used.

(b) List any required permits and registrations for construction of items of special mechanical systems and equipment.

3.5.2.10. For parts including electrical work, include lighting calculations to determine maintained foot-candle levels, electrical load analysis and calculations, electrical short circuit and protective device coordination analysis and calculations and arc fault calculations.

3.5.2.11. For parts including telecommunications voice/data (including SIPRNET, where applicable), include analysis for determining the number and placement of outlets

3.5.2.12. For Cathodic Protection Systems, provide the following stamped report by the licensed corrosion engineer or NACE specialist with the first design submission. The designer must be qualified to engage in the practice of corrosion control of buried or submerged metallic surfaces. He/she must be accredited or certified by the National Association of Corrosion Engineers (NACE) as a NACE Accredited Corrosion Specialist or a NACE certified Cathodic Protection Specialist, or must be a registered professional engineer with a minimum of five years experience in corrosion control and cathodic protection, Clearly describe structures, systems or components in soil or water to be protected. Describe methods proposed for protection of each.

3.5.2.13. Air Barrier System: Provide a narrative of the design and installation requirements for the Air Barrier system. As part of the design quality control process an air barrier consultant shall review drawing details to assure that details of critical Air Barrier components are properly detailed and incorporated during the design drawings and process (i.e. window flashing details, penetration in air barrier details, door flashing details, roofing/ceiling barrier interface details and etc.). Furnish the Government written review details and results.

3.5.3. Geotechnical Investigations and Reports:

3.5.3.1. The contractor’s licensed geotechnical engineer shall prepare a final geotechnical evaluation report, to be submitted along with the first foundation design submittal. Make this information available as early as possible during the over-the-shoulder progress review process. Summarize the subsurface conditions and provide recommendations for the design of appropriate utilities, foundations, floor slabs, retaining walls, embankments, and pavements. Include compaction requirements for fill and backfill under

buildings, sidewalks, other structures and open areas. Recommend foundation systems to be used, allowable bearing pressures for footings, lateral load resistance capacities for foundation systems, elevations for footings, grade beams, slabs, etc. Provide an assessment of post-construction settlement potential including total and differential. Provide recommendations regarding lateral earth pressures (active, at-rest, passive) to be used in the design of retaining walls. Include the recommended spectral accelerations and Site Class for seismic design along with an evaluation of any seismic hazards and recommendations for mitigation, if required. Include calculations to support the recommendations for bearing capacity, settlement, and pavement sections. Include supporting documentation for all recommended design parameters such as Site Class, shear strength, earth pressure coefficients, friction factors, subgrade modulus, California Bearing Ratio (CBR), etc. Provide earthwork recommendations, expected frost penetration, expected groundwater levels, recommendations for dewatering and groundwater control and the possible presence of any surface or subsurface features that may affect the construction of the project such as sinkholes, boulders, shallow rock, old fill, old structures, soft areas, or unusual soil conditions. Include pH tests, salinity tests, resistivity measurements, etc., required to design corrosion control and grounding systems. Include the raw field data. Arrange a meeting with the Government subsequent to completion and evaluation of the site specific geotechnical exploration to outline any differences encountered that are inconsistent with the Government provided preliminary soils information. Clearly outline differences which require changes in the foundation type, or pavement and earthwork requirements from that possible and contemplated using the Government furnished preliminary soils investigation, which result in a change to the design or construction. Any equitable adjustment is subject to the provisions of the contract's Differing Site Conditions Clause.

3.5.3.2. Vehicle Pavements: The Contractor's geotechnical report shall contain flexible and rigid pavement designs, as applicable for the project, including design CBR and modulus of subgrade reaction and the required compaction effort for subgrades and pavement layers. Provide Information on the types of base course materials available in the area and design strengths.

3.5.3.3. The Contractor and the professional geotechnical engineer consultant shall certify in writing that the design of the project has been developed consistent with the Contractor's final geotechnical report. The certification shall be stamped by the consulting professional geotechnical engineer and shall be submitted with the first design submission. If revisions are made to the initial design submission, a new certification shall be provided with the final design submission.

3.5.4. LEED Documentation:

Assign a LEED Accredited Professional, responsible to track LEED planning, performance and documentation for each LEED credit through construction closeout. Incorporate LEED credits in the plans, specifications and design analyses. Develop LEED supporting documentation as a separable portion of the Design Analysis and provide with each required design submittal. Include the LEED Project checklist for each non-exempt facility (one checklist may be provided for multiple facilities in accordance with the LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects and the LEED SUBMITTALS (Attachment E, herein) with each submittal. Final design submittal for each portion of the work must include all required design documentation relating to that portion of work (example - all site credit design documents with final site design). Submittal requirements are as indicated in Attachment E, LEED SUBMITTALS. Submit all documentation indicated on Attachment E as due at final design at final design submittal (for fast-track projects with multiple final design submittals, this shall be at the last scheduled final design submittal). All project documentation related to LEED shall conform to USGBC requirements for both content and format, including audit requirements and be separate from other design analyses. Maintain and update the LEED documentation throughout project progress to construction closeout and shall compile product data, receipts, calculations and other data necessary to substantiate and support all credits claimed. The Government may audit any or all individual credits. Audit documentation is not required to be submitted unless requested. These requirements apply to all projects. If the project requires the Contractor to obtain USGBC certification, the Contractor shall also be responsible for obtaining USGBC certification and shall provide written evidence of certification with the construction closeout LEED documentation submittal. Install the USGBC building plaque at the location

indicated by the Government upon receipt. If Contractor obtains USGBC interim design review, submit the USGBC review to the Government within 30 days of receipt for information only.

3.5.4.1. LEED Documentation for Technology Solution Set. If the Solicitation provides a Prescriptive Technology Solution Set, use of the Technology Solution set has no effect on LEED documentation requirements. Provide all required LEED documentation, including energy analysis, in accordance with LEED requirements when using the Technology Solution Set.

3.5.5. Energy Conservation:

3.5.5.1. Refer to Section 01 10 00, Paragraph 5. Interim and Final Design submittals shall demonstrate that each building including the building envelope, HVAC systems, service water heating, power, and lighting systems meet the Mandatory Provisions and the Prescriptive Path requirements of ASHRAE 90.1. Use Compliance Documentation forms available from ASHRAE and included in the ASHRAE 90.1 User's Manual for this purpose. The Architectural Section of the Design Analysis shall include completed forms titled "Building Envelope Compliance Documentation Parts I and II". The Heating Ventilating and Air Conditioning (HVAC) Section of the Design Analysis shall include a completed form titled "HVAC Simplified Approach Option - Part I" if this approach is allowed by the Standard. Otherwise, the HVAC Section of the Design Analysis shall include completed forms titled "HVAC Mandatory Provisions - Part II" and "HVAC Prescriptive Requirements - Part III". The Plumbing Section of the Design Analysis shall include a completed form titled "Service Water Heating Compliance Documentation". The Electrical Section of the Design Analysis shall include an explanatory statement on how the requirements of ASHRAE 90.1 Chapter 8 Power were met. The Electrical Section of the Design Analysis shall also include a completed form titled "Lighting Compliance Documentation".

3.5.5.2. Interim and Final Design submittals which address energy consuming systems, (heating, cooling, service hot water, lighting, power, etc.) must also include calculations in a separate Energy Conservation Section of the Design Analysis which demonstrate and document (a) the baseline energy consumption for the facility or facilities under contract, that would meet the requirements of ANSI/ASHRAE/IESNA Standard 90.1 and (b) the energy consumption of the facility or facilities under contract utilizing the materials and methods required by this construction contract. Use the USGBC Energy and Atmosphere (EA) Credit 1 compliance template / form or an equivalently detailed form for documenting compliance with the energy reduction requirements. This template / form is titled PERFORMANCE RATING METHOD and is available when the project is registered for LEED. The calculation methodology used for this documentation and analysis shall follow the guidelines set forth in Appendix G of ASHRAE 90.1, with two exceptions: a) receptacle and process loads may be omitted from the calculation; and b) the definition of the terms in the formula for Percentage Improvement found in paragraph G1.2 are modified as follows: Baseline Building Performance shall mean the annual energy consumption calculated for a building design intended for use as a baseline for rating above standard design meeting the minimum requirements of the energy standard, and Proposed Building Performance shall mean annual energy consumption calculated for the proposed building design intended for construction. This calculation shall address all energy consuming systems in a single integrated methodology. Include laboratory fume hoods and kitchen ventilation loads in the energy calculation. They are not considered process loads. Individual calculations for heating, cooling, power, lighting, power, etc. systems will not be acceptable. The following building simulation software is acceptable for use in calculating building energy consumption: Hourly Analysis Program (HAP) by Carrier Corp., TRACE 700 by Trane Corp., DOE-2 by US Department of Energy, EnergyPlus by DOD/DOE.

3.5.6. Specifications

Specifications may be any one of the major, well known master guide specification sources. Uuse only one source. Examples include specifications from MASTERSPEC from the American Institute of Architects, SPECTEXT from Construction Specification Institute or Unified Facility Guide Specifications (UFGS using MASTERFORMAT 2004 numbering system), etc. The UFGS are available through the "Whole Building Design Guide" website, using a websearch engine. Manufacturers' product specifications, utilizing CSI's Manu-Spec, three part format may be used in conjunction with the selected

specifications. The designers of record shall edit and expand the appropriate Specifications to insure that all project design requirements, current code requirements, and regulatory requirements are met. Specifications shall clearly identify, where appropriate, specific products chosen to meet the contract requirements (i.e., manufacturers' brand names and model numbers or similar product information). Note that the UFGS are NOT written for Design-Build and must be edited appropriately. For instance, they assume that the Government will approve most submittals, whereas in Design-Build, the Designer of Record has that action, unless this Solicitation requires Government approval for specific submittals. The Designer of Record should also note that some UFGS sections might either prescribe requirements exceeding the Government's own design standards in applicable references or contain requirements that should be selected where appropriately required by the applicable references. At any rate, where the UFGS are consistent with other major, well known master commercial guide specifications, then generally retain such requirements, as good practices.

3.5.7. Building Rendering

Present and provide a draft color computer, artist, or hand drawn rendering with the conceptual design submittal of the building exterior. Perspective renderings shall include a slightly overhead view of the entire building to encompass elevations and the roof configuration of the building. After Government review and acceptance, provide a final rendering, including the following:

Three (3) 18" x 24" color prints, framed and matted behind glass with project title underneath the print.

One (1) Image file (high resolution) in JPG format on CD for those in the submittal distribution list.

3.5.8. Interim Building Design Contents

The following list represents what the Government considers should be included in the overall completed design for a facility or project. It is not intended to limit the contractor from providing different or additional information as needed to support the design presented, including the require design analyses discussed above. As the Contractor develops individual design packages and submits them for Interim review, include as much of the applicable information for an individual design package as is developed at the Interim design level for review purposes. These pieces shall be developed as the design progresses toward the design complete stage.

3.5.8.1. Lawn and Landscaping Irrigation System

3.5.8.2. Landscape, Planting and Turfing

3.5.8.3. Architectural

(a) Design Narrative

(b) Architectural Floor Plans, Typical Wall and Roof Sections, Elevations

(c) Finish schedule

(d) All required equipment

(e) Special graphics requirements

(f) Door and Window Schedules

(g) Hardware sets using BHMA designations

(h) Composite floor plan showing all pre-wired workstations

(i) Structural Interior Design (SID) package: See ATTACHMENT A for specific requirements

(j) Furniture, Fixtures & Equipment (FF&E) design package: See ATTACHMENT B for specific requirements

(k) Air Barrier Design: Details of all Air Barrier components, (i.e. window flashing details, penetrations in air barrier details, door flashing details, roofing/ceiling barrier interface details and etc.)

3.5.8.4. Structural Systems. Include:

(a) Drawings showing principal members for roof and floor framing plans as applicable

(b) Foundation plan showing main foundation elements where applicable

(c) Typical sections for roof, floor, and foundation conditions

3.5.8.5. Plumbing Systems

(a) Show locations and general arrangement of plumbing fixtures and major equipment

(b) Plan and isometric riser diagrams of all areas including hot water, cold water, waste and vent piping. Include natural gas (and meter as required), (natural gas and meter as required), (LP gas), (fuel oil) and other specialty systems as applicable.

(c) Include equipment and fixture connection schedules with descriptions, capacities, locations, connection sizes and other information as required

3.5.8.6. HVAC Systems

(a) Mechanical Floor Plans: The floor plans shall show all principle architectural features of the building which will affect the mechanical design. The floor plans shall also show the following:

(1) Room designations.

(2) Mechanical legend and applicable notes.

(3) Location and size of all ductwork and piping.

(4) Location and capacity of all terminal units (i.e., registers, diffusers, grilles, hydronic baseboards).

(5) Pre-Fabricated Paint Spray Booth (where applicable to project scope)

(6) Paint Preparation Area (where applicable to project scope)

(7) Exhaust fans and specialized exhaust systems.

(8) Thermostat location.

(9) Location of heating/cooling plant (i.e., boiler, chiller, cooling tower, etc).

(10) Location of all air handling equipment.

(11) Air balancing information.

(12) Flue size and location.

(13) Piping diagram for forced hot water system (if used).

(b) Equipment Schedule: Provide complete equipment schedules. Include:

(1) Capacity

(2) Electrical characteristics

(3) Efficiency (if applicable)

(4) Manufacturer's name

(5) Optional features to be provided

(6) Physical size

(7) Minimum maintenance clearances

(a) Details: Provide construction details, sections, elevations, etc., only where required for clarification of methods and materials of design.

(b) HVAC Controls: Submit complete HVAC controls equipment schedules, sequences of operation, wiring and logic diagrams, Input/Output Tables, equipment schedules, and all associated information. See the Statement of Work for additional specific requirements.

3.5.8.7. Fire Protection and Life Safety.

(a) Provide plan for each floor of each building that presents a compendium of the total fire protection features being incorporated into the design. Include the following types of information:

(1) The location and rating of any fire-resistive construction such as occupancy separations, area separations, exterior walls, shaft enclosures, corridors, stair enclosures, exit passageways, etc.

(2) The location and coverage of any fire detection systems

(3) The location and coverage of any fire suppression systems (sprinkler risers, standpipes, etc.)

(4) The location of any other major fire protection equipment

(5) Indicate any hazardous areas and their classification

(6) Schedule describing the internal systems with the following information: fire hazard and occupancy classifications, building construction type, GPM/square foot sprinkler density, area of operation and other as required

(b) Working plans and all other materials submitted shall meet NFPA 13 requirements, with respect to required minimum level of detail.

3.5.8.8. Elevators. Provide:

(a) Description of the proposed control system

(b) Description, approximate capacity and location of any special mechanical equipment for elevators.

3.5.8.9. Electrical Systems.

(a) Electrical Floor Plan(s): Show all principle architectural features of the building which will affect the electrical design. Show the following:

(1) Room designations.

(2) Electrical legend and applicable notes.

(3) Lighting fixtures, properly identified.

(4) Switches for control of lighting.

(5) Receptacles.

(6) Location and designation of panelboards. Clearly indicate type of mounting required (flush or surface) and reflect accordingly in specifications.

(7) Service entrance (conduit and main disconnect).

(8) Location, designation and rating of motors and/or equipment which requires electrical service. Show method of termination and/or connection to motors and/or equipment. Show necessary junction boxes, disconnects, controllers (approximate only), conduit stubs, and receptacles required to serve the motor and/or equipment.

(b) Building Riser Diagram(s) (from pad-mounted transformer to unit load center panelboard): Indicate the types and sizes of electrical equipment and wiring. Include grounding and metering requirements.

(c) Load Center Panelboard Schedule(s): Indicate the following information:

(1) Panelboard Characteristics (Panel Designation, Voltage, Phase, Wires, Main Breaker Rating and Mounting.

(2) Branch Circuit Designations.

(3) Load Designations.

(4) Circuit Breaker Characteristics. (Number of Poles, Trip Rating, AIC Rating)

(5) Branch Circuit Connected Loads (AMPS).

(6) Special Features

(d) Lighting Fixture Schedule(s): Indicate the following information:

(1) Fixture Designation.

(2) General Fixture Description.

(3) Number and Type of Lamp(s).

(4) Type of Mounting.

(5) Special Features.

(e) Details: Provide construction details, sections, elevations, etc. only where required for clarification of methods and materials of design.

3.5.8.10. Electronic Systems including the following responsibilities:

(a) Fire Detection and Alarm System. Design shall include layout drawings for all devices and a riser diagram showing the control panel, annunciator panel, all zones, radio transmitter and interfaces to other systems (HVAC, sprinkler, etc.)

(b) Fire Suppression System Control. Specify all components of the Fire Suppression (FS) System in the FS section of the specifications. Clearly describe how the system will operate and interact with other systems such as the fire alarm system. Include a riser diagram on the drawings showing principal components and interconnections with other systems. Include FS system components on drawing legend. Designate all components shown on floor plans “FS system components” (as opposed to “Fire Alarm components”). Show location of FS control panels, HVAC control devices, sensors, and 120V power panel connections on floor plans. Indicate zoning of areas by numbers (1, 2, 3) and detectors sub-zoned for cross zoning by letter designations (A and B). Differentiate between ceiling mounted and under floor detectors with distinct symbols and indicate sub-zone of each.

(c) Public Address System

(d) Special Grounding Systems. Completely reflect all design requirements in the specifications and drawings. Specifications shall require field tests (in the construction phase), witnessed by the Government, to determine the effectiveness of the grounding system. Include drawings showing existing construction, if any.

(e) Cathodic Protection.

(f) Intrusion Detection, Card Access System

(g) Central Control and Monitoring System

(h) Mass Notification System

(i) Electrical Power Distribution Systems

3.5.8.11. Separate detailed Telecommunications drawings for Information Systems including the following responsibilities:

(a) Telecommunications Cabling

(b) Supporting Infrastructure

(c) Outside Plant (OSP) Cabling - Campus or Site Plans - Exterior Pathways and Inter-Building Backbones

(d) Include a layout of the voice/data outlets (including voice only wall & pay phones) on telecommunication floor plan drawing, location of SIPRNET data outlets (where applicable), and a legend and symbol definition to indicate height above finished floor. Show size of conduit and cable type and size on Riser Diagram. Do not show conduit runs between backboard and outlets on the floor plans. Show underground distribution conduit and cable with sizing from point of presence to entrance facility of building.

(e) Layout of complete building per floor - Serving Zone Boundaries, Backbone Systems, and Horizontal Pathways including Serving Zones Drawings - Drop Locations and Cable ID's

(f) Communication Equipment Rooms - Plan Views - Tech and AMEP/Elevations - Racks and Walls. Elevations with a detailed look at all telecomm rooms. Indicate technology layout (racks, ladder-racks, etc.), mechanical/electrical layout, rack elevation and backboard elevation. They may also be an enlargement of a congested area of T1 or T2 series drawing.

## 3.6. FINAL DESIGN REVIEWS AND CONFERENCES

A final design review and review conference will be held upon completion of final design at the project installation, or – where equipment is available - by video teleconference or a combination thereof, for any design package to receive Government acceptance to allow release of the design package for construction. For smaller separate design packages, the parties may agree on alternative reviews and conferences (e.g., conference calls and electronic file sharing, etc.) through the Partnering process. Include the final design conference in the project schedule and shall indicate what part of the design work is at 100% completion. The final design conference will be held after the Government has had seven (7) calendar days after receipt of the submission to review the final design package and supporting data. For smaller packages, especially those involving only one or a few design disciplines the parties may agree on a shorter period.

## 3.7. FINAL DESIGN REQUIREMENTS

Final design deliverables for a design package shall consist of 100% complete drawings, specifications, submittal register and design analyses for Government review and acceptance. The 100% design submission shall consist of drawings, specifications, updated design analyses and any permits required by the contract for each package submitted. In order to expedite the final design review, prior to the conference, ensure that the design configuration management data and all review comment resolutions are up-to-date. Include the 100% SID and 100% FF&E binders for government approval. The Contractor shall have performed independent technical reviews (ITR's) and back-checks of previous comment resolutions, as required by Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL, including providing documentation thereof. Use DrChecks or other acceptable comment tracking system during the ITR and submit the results with each final design package

### 3.7.1. Drawings

3.7.1.1. Submit drawings complete with all contract requirements incorporated into the documents to provide a 100% design for each package submitted.

3.7.1.2. Prepare all drawings with the Computer-Aided Design and Drafting (CADD)/Computer-Aided Design (CAD) system, organized and easily referenced electronically, presenting complete construction information.

3.7.1.3. Drawings shall be complete. The Contractor is encouraged to utilize graphics, views, notes, and details which make the drawings easier to review or to construct but is also encouraged to keep such materials to those that are necessary.

3.7.1.4. Provide detail drawings that illustrate conformance with the contract. Include room finish schedules, corresponding color/finish/special items schedules, and exterior finish schedules that agree with the submitted SID binders.

3.7.1.5. The design documents shall be in compliance with the latest version of the A/E/C CAD Standard, available at https://cadbim.usace.army.mil/CAD. Use the approved vertical Corps of Engineers title blocks and borders on all drawings with the appropriate firm name included within the title block area.

3.7.1.6. CAD System and Building Information Modeling (BIM) (NOTE: If this is a Single Award or Multiple Award, Indefinite Delivery/Indefinite Quantity Contract, this information will be provided for each task order.)

All CAD files shall be fully compatible with MicroStation V8 or higher. Save all design CAD files as MicroStation V8 or higher files. All submitted BIM Models and associated Facility Data shall be fully compatible with Bentley BIM Workspace V8 and the USACE Bentley BIM Workspace Workspace V8

(a) CAD Data Final File Format: During the design development capture geo-referenced coordinates of all changes made to the existing site (facility footprint, utility line installations and alterations, roads, parking areas, etc) as a result of this contract. There is no mandatory methodology for how the geo-referenced coordinates will be captured, however, Engineering and Construction Bulletin No. 2006-15, Subject: Standardizing Computer Aided Design (CAD) and Geographic Information Systems (GIS) Deliverables for all Military Design and Construction Projects identifies the format for final as-built drawings and data sets to be delivered to the government. Close-out requirements at the as-built stage; require final geo-referenced GIS Database of the new facility along with all exterior modifications. The Government will incorporate this data set into the Installation's GIS Masterplan or Enterprise GIS System. See also, Section 01 78 02.00 10 Closeout Submittals.

(b) Electronic Drawing Files: In addition to the native CAD design files, provide separate electronic drawing files (in editable CAD format and Adobe Acrobat PDF version 7.0 or higher) for each project drawing.

(c) Each file (both CAD and PDF) shall represent one complete drawing from the drawing set, including the date, submittal phase, and border. Each drawing file shall be completely independent of any data in any other file, including fonts and shapes not included with the basic CAD software program utilized. Fonts that are not included as part of the default CAD software package installation or recognized as an allowable font by the A/E/C CAD Standard are not acceptable in delivered CAD files. All displayed graphic elements on all levels of the drawing files shall be part of the project drawing image. The drawing files shall not contain any graphic element that is not part of the drawing image.

(d) Deliver BIM Model and associated Facility Data files in their native format. At a minimum, BIM files shall address major architecture design elements, major structural components, mechanical systems and electrical/communication distribution and elements as defined in Attachment F. See Attachment F for additional BIM requirements.

(e) Drawing Index: Provide an index of drawings sheet in CAD as part of the drawing set, and an electronic list in Microsoft Excel of all drawings on the CD. Include the electronic file name, the sheet reference number, the sheet number, and the sheet title, containing the data for each drawing.

(f) Hard Copies: Plot submitted hard copy drawings directly from the "electronic drawing files" and copy for quantities and sizes indicated in the distribution list at the end of this specification section. The Designers of Record shall stamp, sign and date original hard copy sheets as Released For Construction, and provide copies for distribution from this set.

3.7.2. Design Analyses

3.7.2.1. The designers of record shall update, finalize and present design analyses with calculations necessary to substantiate and support all design documents submitted.

3.7.2.2. The responsible DOR shall stamp, sign and date the design analysis. Identify the software used where, applicable (name, version, vendor). Generally, provide design analyses, individually, in an original (file copy) and one copy for the assigned government reviewer.

3.7.2.3. All disciplines review the LEED design analysis in conjunction with their discipline-specific design analysis; include a copy of the separable LEED design analysis in all design analysis submittals.

3.7.2.4. Do not combine multi-disciplined volumes of design-analysis, unless multiple copies are provided to facilitate multiple reviewers (one copy per each separate design analysis included in a volume).

3.7.3. Specifications

Specifications shall be 100% complete and in final form.

3.7.4. Submittal Register

Prepare and update the Submittal Register and submit it with the 100% design specifications (see Specification Section 01 33 00, SUBMITTAL PROCEDURES) with each design package. Include the required submittals for each specification section in a design package in the submittal register.

3.7.5. Preparation of DD Form 1354 (Transfer of Real Property)

This form itemizes the types, quantities and costs of various equipment and systems that comprise the project, for the purpose of transferring the new construction project from the Corps Construction Division to the Installation's inventory of real property. The Government will furnish the DB Contractor's design manager a DD Form 1354 checklist to use to produce a draft Form 1354. Submit the completed checklist and prepared draft Form DD 1354 with the 100% design in the Design Analysis. The Corps will use these documents to complete the final DD 1354 upon completion of construction.

3.7.6. Acceptance and Release for Construction

3.7.6.1. At the conclusion of the Final Design Review (after resolutions to the comments have been agreed upon between DOR and Government reviewers), the Contracting Officer or the ACO will accept the Final Design Submission for the design package in writing and allow construction to start for that design package. The Government may withhold acceptance until all major corrections have been made or if the final design submission requires so many corrections, even though minor, that it isn't considered acceptably complete.

3.7.6.2. Government review and acceptance of design submittals is for contract conformance only and shall not relieve the Contractor from responsibility to fully adhere to the requirements of the contract, including the Contractor’s accepted contract proposal, or limit the Contractor’s responsibility of design as prescribed under Special Contract Requirement: “Responsibility of the Contractor for Design” or limit the Government’s rights under the terms of the contract. The Government reserves the right to rescind inadvertent acceptance of design submittals containing contract deviations not separately and expressly identified in the submittal for Government consideration and approval.

3.8. DESIGN COMPLETE CONSTRUCTION DOCUMENT REQUIREMENTS

After the Final Design Submission and Review Conference and after Government acceptance of the Final Design submission, revise the design documents for the design package to incorporate the comments generated and resolved in the final review conference, perform and document a back-check review and submit the final, design complete documents. Label the final design complete documents “FOR

CONSTRUCTION" or use similar language. In addition to the final drawings and specifications, the following deliverables are required for distribution and field use. The deliverable includes all documentation and supporting design analysis in final form, as well as the final review comments, disposition and the back-check. As part of the quality assurance process, the Government may perform a back-check of the released for construction documentation. Promptly correct any errors or omissions found during the Government back-check. The Government may withhold retainage from progress payments for work or materials associated with a final design package until this submittal has been received and the Government determines that it is complete.

3.9. SUBMITTAL DISTRIBUTION, MEDIA AND QUANTITIES

3.9.1. Submittal Distribution and Quantities

General: The documents which the Contractor shall submit to the Government for each submittal are listed and generally described in preceding paragraphs in this Section. Provide copies of each design submittal and design substantiation as follows (NOTE: If this is a Single Award or Multiple Award, Indefinite Delivery/Indefinite Quantity Contract, this information will be provided for each task order):

| Activity and Address | Drawing Size (Full Size) **[Not Supplied - SubmittalReqDistribution : FULL_SIZE]** Full Sets/ *Partial Sets | Design Analyses & Specs Full Sets/ *Partial Sets | Drawing Size (Half Size) **[Not Supplied - SubmittalReqDistribution : HALF_SIZE]** Full Sets/ *Partial Sets | Non-BIM Data CD-ROM or DVD as Necessary (PDF& **.dgn**) | Furniture Submittal (Per Attachment B) | Structural Interior Design Submittal | BIM Data DVD (Per Attach F) |
|---|---|---|---|---|---|---|---|
| Commander, U.S.Army Engineer District **Tulsa** | 0/0 | 0/0 | 0/0 | 0 | 1 | 0 | 0 |
| Commander, U.S.Army Engineer District, Center of Standardization **[Not Supplied - SubmittalReqDistribution : COS]** | 0/0 | 0/0 | 0/0 | 0 | N/A | 0 | 0 |
| Installation | 0/0 | 0/0 | 0/0 | 0 | 2 | 0 | 0 |

| Activity and Address | Drawing Size (Full Size) **[Not Supplied - SubmittalReqDistribution : FULL_SIZE]** Full Sets/ *Partial Sets | Design Analyses & Specs Full Sets/ *Partial Sets | Drawing Size (Half Size) **[Not Supplied - SubmittalReqDistribution : HALF_SIZE]** Full Sets/ *Partial Sets | Non-BIM Data CD-ROM or DVD as Necessary (PDF& **.dgn**) | Furniture Submittal (Per Attachment B) | Structural Interior Design Submittal | BIM Data DVD (Per Attach F) |
|---|---|---|---|---|---|---|---|
| U.S.Army Corps of Engineers Construction Area Office | 0/0 | 0/0 | 0/0 | 0 | 1 | 0 | 0 |
| Information Systems Engineering Command (ISEC) | 0/0 | 0/0 | 0/0 | 1 | *Partial Set (Work Station/System Furniture- IT Details) | N/A | 1 |
| Huntsville Engineer & Support Center, Central Furnishings Program | N/A | N/A | N/A | N/A | 1 Interim/Refer to attachment B for the final submission Qty | N/A | N/A |
| Other Offices | 0/0 | 0/0 | 0/0 | 0 | N/A | 0 | 0 |

***NOTE: For partial sets of drawings, specifications and design analyses, see paragraph 3.9.3.3, below.**

****NOTE: When specified below in 3.9.2, furnish Installation copies of Drawings as paper copies, in lieu of the option to provide secure web-based submittals.**

3.9.2. Web based Design Submittals

Web based design submittals will be acceptable as an alternative to the paper copies listed in the Table above, provided a single hard-copy PDF based record set is provided to the Contracting Officer for record purposes. Where the contract requires the Contractor to submit documents to permitting authorities, still provide those authorities paper copies (or in an alternate format where required by the authority). Web based design submittal information shall be provided with adequate security and availability to allow unlimited access those specifically authorized to Government reviewers while preventing unauthorized access or modification. File sizes must be of manageable size for reviewers to quickly download or open on their computers. As a minimum, drawings shall be full scale on American National Standards Institute (ANSI) D sheets (34" x 22"). In addition to the optional website, provide the BIM data submission on DVD

to each activity and address noted above in paragraph 3.9.1 for each BIM submission required in Attachment F.

3.9.3. Mailing of Design Submittals

3.9.3.1. Mail all design submittals to the Government during design and construction, using an overnight mailing service. The Government will furnish the Contractor addresses where each copy shall be mailed to after award of the contract (or individual task order if this is an indefinite delivery/indefinite quantity, task order contract). Mail the submittals to zero (0) different addresses. Assemble drawing sheets, specs, design analyses, etc. into individual sets; do not combine duplicate pages from individual sets so that the government has to assemble a set.

3.9.3.2. Each design submittal shall have a transmittal letter accompanying it indicating the date, design percentage, type of submittal, list of items submitted, transmittal number and point of contact with telephone number.

3.9.3.3. Provide partial sets of drawings, specifications, design analyses, etc., as designated in the Table in paragraph 3.9.1, to those reviewers who only need to review their applicable portions of the design, such as the various utilities. The details of which office receives what portion of the design documentation will be worked out after award.

3.10. AS-BUILT DOCUMENTS

Provide as-built drawings and specifications in accordance with Section 01 78 02.00 10, CLOSEOUT SUBMITTALS. Update LEED design phase documentation during construction as needed to reflect construction changes and advancing project completion status (example - Commissioning Plan updates during construction phase) and include updated LEED documentation in construction closeout submittal.

**ATTACHMENT A**
**STRUCTURAL INTERIOR DESIGN (SID) REQUIREMENTS**

## 1.0 GENERAL INFORMATION

Structural Interior Design includes all building related elements and components generally part of the building itself, such as wall finishes, ceilings finishes, floor coverings, marker/bulletin boards, blinds, signage and built in casework. Develop the SID in conjunction with the furniture footprint.

## 2.0 STRUCURAL INTERIOR DESIGN (SID) REQUIREMENTS FOR THE INTERIM AND FINAL DESIGN SUBMITTALS

### 2.1. FORMAT AND SCHEDULE

Prepare and submit for approval an interior and exterior building finishes scheme for an interim design submittal. The DOR shall meet with and discuss the finish schemes with the appropriate Government officials prior to preparation of the schemes to be presented. Present original sets of the schemes to reviewers at an interim design conference.

At the conclusion of the interim phase, after resolutions to the comments have been agreed upon between DOR and Government reviewers, the Contractor may proceed to final design with the interior finishes scheme presented.

The SID information and samples are to be submitted in 8 ½" x 11" format using three ring binders with pockets on the inside of the cover. When there are numerous pages with thick samples, use more than one binder. Large D-ring binders are preferred to O-ring binders. Use page protectors that are strong enough to keep pages from tearing out. Anchor large or heavy samples with mechanical fasteners, Velcro, or double-faced foam tape rather than rubber cement or glue. Fold out items must have a maximum spread of 25 ½". Provide cover and spine inserts sheets identifying the document as "Structural Interior Design" package. Include the project title and location, project number, Contractor/A/E name and phone number(s), submittal stage and date.

Design submittal requirements include, but are not limited to:

#### 2.1.1. Narrative of the Structural Interior Design Objectives

The SID shall include a narrative that discusses the building related finishes. Include topics that relate to base standards, life safety, sustainable design issues, aesthetics, durability and maintainability, discuss the development and features as they relate to the occupants requirements and the building design.

#### 2.1.2. Interior Color Boards

Identify and key each item item on the color boards to the contract documents to provide a clear indication of how and where each item will be used. Arrange finish samples to the maximum extent possible by room type in order to illustrate room color coordination. Label all samples on the color boards with the manufacturer's name, patterns and colors name and number. Key or code samples to match key code system used on contract drawings.

Material and finish samples shall indicate true pattern, color and texture. Provide photographs or colored photocopies of materials or fabrics to show large overall patterns in conjunction with actual samples to show the actual colors. Finish samples must be large enough to show a complete pattern or design where practical.

Color boards shall include but not be limited to original color samples of the following:

All walls finishes and ceiling finishes, including corner guards, acrylic wainscoting and wall guards/chair rail finishes

All tile information, including tile grout color and tile patterns.

- All flooring finishes, including patterns.
- All door, door frame finishes and door hardware finishes
- All signage, wall base, toilet partitions, locker finishes and operable/folding partitions and trim
- All millwork materials and finishes (cabinets, counter tops, etc.)
- All window frame finishes and window treatments (sills, blinds, etc.)

Color board samples shall reflect all actual finish textures, patterns and colors required as specified. Patterned samples shall be of sufficient size to adequately show pattern and its repeat if a repeat occurs.

2.1.3. Exterior Color Boards

Prepare exterior finishes color boards in similar format as the interior finishes color boards, for presentation to the reviewers during an interim design conference. Provide original color samples of all exterior finishes including but not limited to the following:

- All Roof Finishes
- All Brick and Cast Stone Samples
- All Exterior Insulation and Finish Samples
- All Glass Color Samples
- All Exterior Metals Finishes
- All Window & Door Frame Finishes
- All Specialty Item Finishes, including trim

Identify each item on the exterior finishes color boards and key to the building elevations to provide a clear indication of how and where each item will be used.

2.2. STRUCTURAL INTERIOR DESIGN DOCUMENTS

2.2.1. General

Structural interior design related drawings must indicate the placement of extents of SID material, finishes and colors and must be sufficiently detailed to define all interior work. The following is a list of minimum requirements:

2.2.2. Finish Color Schedule

Provide finish color schedule(s) in the contract documents. Provide a finish code, material type, manufacturer, series, and color designations. Key the finish code to the color board samples and drawings.

2.2.3. Interior Finish Plans

Indicate wall and floor patterns and color placement, material transitions and extents of interior finishes.

2.2.4. Furniture Footprint Plans

Provide furniture footprint plans showing the outline of all freestanding and systems furniture for coordination of all other disciplines.

2.2.5. Interior Signage

Include interior signage plans or schedules showing location and quantities of all interior signage. Key each interior sign to a quantitative list indicating size, quantity of each type and signage text.

2.2.6. Interior Elevations, Sections and Details

Indicate material, color and finish placement.

**ATTACHMENT B**
**FURNITURE, FIXTURES & EQUIPMENT (FF&E) REQUIREMENTS**

## 1.0 FF&E REQUIREMENTS FOR THE INTERIM AND FINAL DESIGN SUBMITTALS

### 1.1. FORMAT AND SCHEDULE

Prepare and submit for approval a comprehensive FF&E scheme for an interim design submittal. The Contractor's interior designer, NOT A FURNITURE DEALER, shall develop the design. FF&E is the selection, layout, specification and documentation of furniture and includes but is not limited to workstations, seating, tables, storage and shelving, filing, trash receptacles, clocks, framed artwork, artificial plants, and other accessories. Contract documentation is required to facilitate pricing, procurement and installation. The FF&E package is based on the furniture footprint developed in the Structural Interior Design (SID) portion of the interior design. Develop the FF&E package concurrently with the building design to ensure that there is coordination between the electrical outlets, switches, J-boxes, communication outlets and connections, and lighting as appropriate. In addition, coordinate layout with other building features such as architectural elements, thermostats, location of TV's, GF/GI equipment (for example computers, printers, copiers, shredders, faxes), etc. Locate furniture in front of windows only if the top of the item falls below the window and unless otherwise noted, do not attach furniture including furniture systems to the building. If project has SIPRNET and/or NIPRNET, coordinate furniture layout with SIPRNET and NIPRNET separation requirements. Verify that access required by DOIM for SIPRNET box and conduit is provided. The DOR shall interview appropriate Government personnel to determine FF&E requirements for furniture and furnishings prior to preparation of the scheme to be presented. Determine FFE items and quantities by, but not limited to: (1) the number of personnel to occupy the building, (2) job functions and related furniture/office equipment to support the job function, (3) room functions, (4) rank and grade. Present original sets of the scheme to reviewers at an interim design conference upon completion of the interim architectural submittal or three months prior to the submittal of the final FF&E package (whichever comes first).

Design may proceed to final with the FF&E scheme presented at the conclusion of the interim phase, after resolutions to the comments have been agreed upon between DOR and Government reviewers.

Provide six copies of the electronic versions of all documents upon completion of the final architectural submittal or ten months prior to the contract completion date (whichever comes first), to ensure adequate time for furniture acquisition. Provide unbound, electronic drawings in CAD and BIM. Provide all files needed to v,/iew complete drawings. Submit all text documents in Microsoft Word or Excel..

Submit four copies of the final and complete FF&E information and samples in 8 ½" x 11" format using three ring binders with pockets on the inside of the cover upon completion of the final architectural submittal or ten months prior to the contract completion date (whichever comes first). Use more than one binder when there are numerous pages with thick samples. Large D-ring binders are preferred to O-ring binders. Use page protectors that are strong enough to keep pages from tearing out for upholstery and finish boards. Anchor large or heavy samples with mechanical fasteners, Velcro, or double-faced foam tape rather than rubber cement or glue. Fold out items must have a maximum spread of 25 ½". Provide cover and spine inserts sheets identifying the document as "Furniture, Fixtures & Equipment" package and include the project title and location, project number, Contractor/A/E name and phone number(s), submittal stage and date.

Provide electronic copies of all documents upon completion of the final architectural submittal or ten months prior to the contract completion date (whichever comes first), to ensure adequate time for furniture acquisition. Provide six compact disks with all drawings files needed to view the complete drawings unbound and in the latest version AutoCAD. Provide six additional compact disks of all text documents in Microsoft Word or Excel.

Design submittal requirements include, but are not limited to:

1.1.1. Narrative of Interior Design Objectives

Provide a narrative description of the furniture, to include functional, safety and ergonomic considerations, durability, sustainability, aesthetics, and compatibility with the building design.

1.1.2. Furniture Order Form

Prepare one Furnishings Order Form for each item specified in the design. This form identifies all information required to order each individual item. In addition to the project name and location, project number, and submittal phase, the order form must include:

(a) Furniture item illustration and code

(b) Furniture item name

(c) Job name, location, and date

(d) General Services Administration (GSA) FSC Group, part, and section

(e) GSA Contract Number, Special Item Number (SIN), and contract expiration date

(f) Manufacturer, Product name and Product model number or National Stock Number (NSN)

(g) Finish name and number (code to finish samples)

(h) Fabric name and number, minimum Wyzenbeek Abrasion Test double rubs (code to fabric samples)

(i) Dimensions

(j) Item location by room number and room name

(k) Quantity per room

(l) Total quantity

(m) Special instructions for procurement ordering and/or installation (if applicable)

(n) Written Product Description: include a non-proprietary paragraph listing the salient features of the item to include but not limited to:

(1) required features and characteristics

(2) ergonomic requirements

(3) functional requirements

(4) testing requirements

(5) furniture style

(6) construction materials

(7) minimum warranty

The following is an example for “m” features and characteristics, ergonomic requirements and functional requirements:

Chair Description:

(1) Mid-Back Ergonomic Task Chair

(2) Pneumatic Gaslift; Five Star Base

(3) Mesh Back; Upholstered Seat

(4) Height and Width Adjustable Task Arms:

a. Arm Height: 6”- 11” (+-1/2”)

b. Arm Width: 2”– 4” adjustment

(5) Height Adjustable Lumbar Support

(6) Adjustable Seat Height 16”-21” (+- 1”)

(7) Sliding Seat Depth Adjustment 15”-18” (+-1”)

(8) Standard Hard Casters (for carpeted areas)

(9) Overall Measurements:

a. Overall width: 25” - 27”

b. Overall depth: 25”– 28”

(10) Must have a minimum of the following adjustments (In addition to the above):

a. 360 Degree Swivel

b. Knee-Tilt with Tilt Tension

c. Back angle

d. Forward Tilt

e. Forward Tilt and Upright Tilt Lock

For projects with systems furniture, also provide a written description of the following minimum requirements:

(1) Type furniture systems (panel, stacking panels, spine wall, desk based system, or a combination)

(2) Minimum noise reduction coefficient (NRC)

(3) Minimum sound transfer coefficient (STC)

(4) Minimum flame spread and smoke development

(5) UL testing for task lighting and electrical system

(6) Panel widths and heights and their locations (this may be done on the drawings)Worksurface types and sizes (this may be done on the drawings)

(7) Worksurface edge type

(8) Varying panel/cover finish materials and locations (locations may be shown on the drawings)

(9) Storage requirements

(10) Keyboard requirements

(11) Lock and keying requirements

(12) Accessory components (examples: tack boards, marker boards, paper management)

(13) Electrical and communication raceway requirement; type, capacity and location (base, beltline, below and/or above beltline)

(14) Locations of communication cables (base, beltline, below and/or above beltline, top channel)

(15) Types of electrical outlets

(16) Types of communication jacks; provided and installed by others

(17) Locations of electrical outlets and communication jacks (this may be done on the drawings)

(18) Type of cable (examples: Cat. 5, Cat. 6, fiber optic; UTP or STP, etc.) system needs to support; provided and installed by others

1.1.3. Manufacturer & Alternate Manufacturer List

Provide a table consisting of all the major furniture items in the order forms and two alternate manufacturers for each item. ALTERNATE MANUFACTURER ITEMS MUST BE SELECTED FROM GSA SCHEDULE AND MEET ALL THE SALIENT FEATURES OF THE ORIGINALLY SPECIFIED ITEM. Provide manufacturer name, address, telephone number, product series and product name for each item and the two alternate items. Major furniture items include, but are not limited to, casegoods, furniture systems, seating, and tables. Organize matrix by item code and item name.

1.1.4. FF&E Procurement List

Provide a table that lists all FF&E furniture, mission unique equipment and building Contractor Furnished/Contractor Installed (CF/CI) items. Give each item a code and name and designate whether item will be procured as part of the FF&E furniture, mission unique equipment or the building construction contract. Use the item code to key all FF&E documents including location plans, color boards, data sheets, cost estimate, etc. Divide the FF&E package into different sections based on this listing, applies to order forms and cost estimates.

1.1.5. Points of Contact (POCs)

Provide a comprehensive list of POCs needed to implement the FF&E package. This would include but not be limited to appropriate project team members, using activity contacts, interior design representatives, construction contractors and installers involved in the project. In addition to name, address, phone, fax and email, include each contact's job function. Divide the FF&E package into different sections based on this listing, applies to order forms and cost estimates.

1.1.6. Color Boards

Provide color boards for all finishes and fabrics for all FF&E items. Finishes to be included but not limited to paint, laminate, wood finish, fabric, etc.

1.1.7. Itemized Furniture Cost Estimate

Provide an itemized cost estimate of furnishings keyed to the plans and specifications of products included in the package. This cost estimate should be based on GSA price schedules. The cost estimate must include separate line items for general contingency, installation, electrical hook-up for systems furniture or other furniture requiring hardwiring by a licensed electrician, freight charges and any other related costs. Installation and freight quotes from vendors should be used in lieu of a percentage allowance when available. Include a written statement that the pricing is based on GSA schedules. An estimate developed by a furniture dealership may be provided as support information for the estimate, but must be separate from the contractor provided estimate.

1.2. INTERIOR DESIGN DOCUMENTS

1.2.1. Overall Furniture and Area Plans

Provide floor Plans showing locations and quantities of all freestanding, and workstation furniture proposed for each floor of the building. Key each room to a large scale Furniture Placement Plan showing the furniture configuration, of all furniture. Provide enlarged area plans with a key plan identifying the area in which the building is located. Key all the items on the drawings by furniture item code. Do not provide manufacturer specific information such as product names and numbers on drawings, Drawings shall be non-proprietary. This is typical for FFE on all plans, including those

mentioned below. Coordinate the overall furniture and area plans with the Life Safety Code Review to ensure adequate clearances are provided for egress. Provide a narrative of this coordination to accompany the Furniture and Area plans.

1.2.2. Workstation Plans

Show each typical workstation configuration in plan view. In addition, provide either elevations or an isometric view. Drawings shall illustrate panels and all major components for each typical workstation configuration. Identify workstations using the same numbering system as shown on the project drawings. Key components to a legend on each sheet which identifies and describes the components along with dimensions. Provide the plan, elevations and isometric of each typical workstation together on the same drawing sheet.

1.2.3. Panel Plans

Show panel locations and critical dimensions from finished face of walls, columns, panels including clearances and aisle widths. Key panel assemblies to a legend which shall include width, height, configuration of frames, panel fabric and finishes (if there are different selections existing within a project), powered or non-powered panel and wall mount locations.

1.2.4. Desk Plans

Provide typical free standing desk configurations in plan view. In addition, provide either elevation or an isometric view and identify components to clearly represent each desk configuration.

1.2.5. Reflected Ceiling Plans

Provide typical plans showing ceiling finishes and heights, lighting fixtures, heating ventilation and air conditioning supply and return, and sprinkler head placement for coordination of furniture.

1.2.6. Electrical and Telecommunication Plans

Show power provisions including type and locations of feeder components, activated outlets and other electrical componentsShow locations and quantities of outlets for workstations. Clearly identify different outlets, i.e. electrical, LAN and telecommunication receptacles indicating each type proposed. Show wiring configuration, (circuiting, switching, internal and external connections) and provide as applicable.

1.2.7. Artwork Placement Plans

Provide an Artwork Placement Plan to show location of artwork, assign an artwork item code to each piece of artwork. As an alternative, artwork can be located on the Furniture Plans. Provide a schedule that identifies each piece by room name and number. Provide installation instructions; include mounting height.

1.2.8. Window Drapery Plans

Provide Interior Window Drapery Plans. Key each drapery treatment to a schedule showing color, pattern, material, drapery size and type, draw direction, location and quantities.

1.2.9. Portable Fire extinguishers:

Provide a list of all required portable fire extinguishers, with descriptions (location, size, type, etc.) and total number per type. See also attachment D, "SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW", paragraph 1.14.

1.3. FURNITURE SELECTION

1.3.1. Select furniture from the GSA Schedules. Specify furniture available open market when an item is not available on the GSA Schedules. Provide justification fort items not available on the GSA Schedules.

1.3.2. To the greatest extent possible when specifying furniture work within a manufacturer's family of furniture for selections, example: Steelcase, Turnstone, Brayton International, Metro, and Vecta are all Steelcase companies. Each alternate should also be specified from a manufacturer's family of furniture, example: first set of alternates would be specified from Knoll's family of furniture and the second from Herman Miller family of furniture. It may be necessary to make some selections from other than a manufacturer's family of furniture if costs are not reasonable for particular items, some items are not available or appropriate for the facility or the items are not on GSA Schedule. If this occurs, consider specifying product from an open line that is accessible by numerous dealerships. Select office furniture including case goods, tables, storage, seating, etc. that is compatible in style, finish and color. Select furniture that complies with ANSI/BIFMA and from manufacturer's standard product line as shown in the most recent published price list and/or amendment and not custom product.

1.4. CONSTRUCTION

1.4.1. Provide knee space at workstations and tables that is not obstructed by panels/legs that interfere with knee space of seated person and specificy modesty panels at walls to be of a height or be hinged to allow access to building wall electrical outlets and communication jacks. Provide desks, storage and tables with leveling devices to compensate for uneven floors.

1.4.2. Unless otherwise noted, specify workstations and storage of steel construction. Provide high pressure laminate worksurface tops constructed to prevent warpage (thermallyfused worksurfaces are not acceptable). Provide user friendly features such as radius edges. Do not use sharp edges and exposed connections and ensure the underside of desks, tables and worksurfaces are completely and smoothly finished. Provide abutting worksurfaces that mate closely and are of equal heights when used in side-by-side configurations in order to provide a continuous and level worksurface.

1.4.3. Drawers shall stay securely closed when in the closed position and protect wires from damage during drawer operation. Include a safety catch to prevent accidental removal when fully open

1.4.4. Unless otherwise noted, provide lockable desks and workstations, filing cabinets and storage. Key all locks within a one person office the same; key all one person offices within a building differently. If an office or open office area has more than one workstation, key all the workstations differently, but key all locks within an individual workstation the same. Use tempered glass glazing when glazing is required. Use light-emitting diode (LED)/solid state lighting where task lighting is required in furniture.

1.5. FINISHES AND UPHOLSTERY

1.5.1. Specify neutral colors for casegoods, furniture systems, storage and tables. Specify desk worksurfaces and table tops that are not too light or too dark in color and have a pattern to help hide soiling. Accent colors are allowed in break and lounge areas. Keep placement of furniture systems panel fabric accent colors to a minimum. All finishes shall be cleanable with ordinary household cleaning solutions.

1.5.2. Use manufacturer's standard fabrics; including textile manufacturers fabrics that have been graded into the furniture manufactures fabric grades and are available through their GSA Schedule. Customers Own Material (COM) can be used in headquarter buildings in command suites with executive furniture. Coordinate specific locations with Corps of Engineers Interior Designer.

1.5.3. Specify seating upholstery that meets Wyzenbeek Abrasion Test, 55,000 minimum rubs. Specify a soil retardant finish for woven fabrics if Crypton or vinyl upholstery is not provided for seating in dining areas. Use manufacturer's standard fabrics. This includes textile manufacturers fabrics that have been graded into the furniture manufactures fabric grades and are available through their GSA Schedule. Specify upholstery and finish colors and patterns that help hide soiling. Specify finishes that can be cleaned with ordinary household cleaning solutions.

1.6. ACCESSORIES

1.6.1. Specify all accessories required for completely finished furniture installation. Provide filing cabinets and storage for office supplies. Provide tack surfaces at workstations with overhead storage. Provide tackable surfaces at workstations with overhead storage.

1.6.2. Not Used.

1.6.3. Workstations are to be equipped with stable keyboard trays that have height adjustability, tilting capability, including negative tilt, have a mouse pad at same height as the keyboard tray that can accommodate both left and right handed users, and retractable under worksurface.

1.7. MISSION UNIQUE EQUIPMENT

Funding for FF&E furniture items and mission unique equipment (MUE) items are from two different sources. Separate the designs and procurement documentation for FFE items and MUE. MUE includes, but is not limited to, items such as commerical appliances, fitness equipment, IT equipment and supporting carts. The User will purchase and install mission unique equipment items, unless otherwise noted. Identify locations of known MUE items such as commercial appliances, etc. for space planning purposes.

1.8. SUSTAINABILITY

1.8.1. For all designs provided regardless of facility type, make every effort to implement all aspects of sustainability to the greatest extent possible for all the selections made in the FF&E package. This includes but is not limited to the selection of products that consider: **Material Chemistry and Safety of Inputs** (What chemicals are used in the construction of the selections?); **Recyclability** (Do the selections contain recycled content?); **Disassembly** (Can the selections be disassembled at the end of their useful life to recycle their materials?).

1.8.2. Make selections to the greatest extent possible of products that possess current McDonough Braungart Design Chemistry (MBDC) certification or other "third-party" certified Cradle to Cradle program, Forest Stewardship Council (FSC) certification, GREENGAURD certification or similar "third-party" certified products consisting of low-emitting materials.

1.9. FURNITURE SYSTEMS

1.9.1. General.

Where appropriate, design furniture systems in open office areas. Coordinate style and color of furniture systems with other storage, seating, etc. in open office areas. Minimize the number of workstation typicals and the parts and pieces required for the design to assist in future reconfiguration and inventorying.

1.9.2. Connector Systems.

Specify a connector system that allows removal of a single panel or spine wall within a typical workstation configuration without requiring disassembly of the workstation or removal of adjacent panels. Specify

connector system with tight connections and continuous visual seals. When Acoustical panels are used, provide connector system with continuous acoustical seals. Specify concealed clips, screws, and other construction elements, where possible.

1.9.3. Panels and Spine Walls

Specify panels and spine walls with hinged or removable covers that permit easy access to the raceway when required but are securely mounted and cannot be accidentally dislodged under normal conditions. Panels shall be capable of structurally supporting more than 1 fully loaded component per panel per side. Raceways are to be an integral part of the panel and must be able to support lay-in cabling and have a large capacity for electrical and IT. Do not thread cables through the frame.

1.9.4. Electrical And Information/Technology (IT)

Design furniture with electrical systems that meets requirements of UL 1286 when powered panels are required and UL approved task lights that meet requirements of NFPA 70. Dependent on user requirements and Section 01 10 00, paragraph 3 requirements, it is recommended that workstation electrical and IT wiring entry come from the building walls to eliminate the use of power poles and access at the floor. Design electrical and IT systems that are easily accessed in the spine wall and panels without having to move return panels and components. Electrical and IT management will be easily accessible by removable wall covers which can be removed while workstation components are still attached. Specify connector system that has continuation of electrical and IT wiring within workstations and workstation to workstation.

1.9.5. Pedestals

Specify pedestals that are interchangeable from left to right, and right to left, and retain pedestal locking system capability.

1.10. EXECUTIVE FURNITURE

1.10.1. Design for executive furniture in command areas, coordinate specific locations with Corps of Engineers Interior Designer. Use upgraded furniture, upholsteries and finishes in command suites. This includes but is not limited to wood casegoods, seating and tables. Select executive furniture casegoods from a single manufacturer and style line, to include workstations, credenzas, filing, and storage, etc.

1.10.2. Specify furniture with wood veneer finish with mitered solid wood edge of same wood type. Other executive office furniture such as seating, tables, executive conference room furniture, etc. shall be compatible in style, finish and color with executive furniture casegoods.

1.11. SEATING

1.11.1. General

Specify appropriate chair casters and glides for the floor finish where the seating is located. All task seating shall support up to a minimum of 250 lbs.

1.11.2. Desk and Guest Seating

Select ergonomic desk chairs with casters, waterfall front, swivel, tilt, variable back lock, adjustable back height or adjustable lumbar support, pneumatic seat height adjustment, and padded, contoured upholstered seat and back. Desk and guest chair backs may be other than upholstered such as mesh fabric if it is ergonomically designed, forms to back and is comfortable. Depending on scale of desk chair provide seat pan forward and back adjustment to increase or decrease depth of seat pan. All desk chairs

shall have an adjustable seat height range of 4 1/2", range to include 16 1/2-20". Select guest chairs that are compatible in style, finish and color with the desk chairs.

1.11.3. Conference Room Seating

At tables, select ergonomic conference seating with casters, non-upholstered arms, waterfall front, swivel, tilt, pneumatic seat height adjustment, and padded, contoured seat and back, unless otherwise noted. Select arm height and/or design that allows seating to be moved up closely to the table top. Conference chair backs may be other than upholstered such as mesh fabric if it is ergonomically designed, forms to back and is comfortable. Perimeter conference chairs shall be compatible in style, finish and color with conference seating at the tables.

1.11.4. Lounge, Waiting and Reception Area Seating

Select seating with arms and cushioned, upholstered seat and back. In heavy use areas, arms shall be easily cleaned such as non-upholstered arms or upholstered arms with wood arm caps unless otherwise noted.

1.11.5. Break Room Seating

Select stackable seating that is easily cleaned. Seating shall be appropriate for table and counter heights as applicable with non-upholstered arms if arms are required. Chairs shall have metal legs and composite materials for seats.

1.12. FILING AND STORAGE.

Select storage and shelving units that meet customer’s functional load requirements for stored items. Specify counterweights for filing cabinets when required by the manufacturer for stability. File drawers shall allow only one drawer to be opened at a time. Provide heavy duty storage and shelving if information is not available.

1.13. TRAINING TABLES.

raining tables shall be reconfigurable, moveable and storable; lighter weight folding with dollies or castered as necessary. Plastic laminate self edges are unacceptable. Specify power and data requirements and dollies as required.

1.14. FURNITURE WARRANTIES.

Specify manufacturer's performance guarantees or warranties that include parts, labor and transportation as follows:

Furniture System, unless otherwise noted – 10 year minimum
Furniture System Task Lights – 2 year minimum, excluding bulbs
Furniture System Fabric – 3 year minimum
Wood Desks - 10 year minimum

Metal Desks – 12 year minimum
Seating, unless otherwise noted - 10 year minimum
Seating Mechanisms and Pneumatic Cylinders - 10 years
Seating Fabric - 3 years minimum
Wood Filing and Storage - 10 year minimum

Tables, unless otherwise noted - 10 year minimum
Table Mechanisms – 5 year minimum

Table Ganging Device - 1 year minimum
Items not listed above - 1 year minimum

**ATTACHMENT C**
**TRACKING COMMENTS IN DRCHECKS**

## 1.0 General

The Government and DB Contractor shall set up the project in Dr Checks. Throughout the design process, the parties shall enter, track, and back-check comments using the DrChecks system. Government and Contractor reviewers enter design review comments into DrChecks. Designers of Record shall annotate comments timely and specifically to indicate for the review conference exactly what action will be taken or why the action is not required. After the design review conference and prior to the next design submittal for the package, the DOR's will annotate those comments that require DOR action, design revision, etc. to show how and where it has been addressed in the design documents, This shall be part of the required design configuration management plan. Comments considered critical by the conference participants shall be flagged as such.

## 2.0 DrChecks Review Comments

The Contractor and the Government shall monitor DrChecks to assure all comments are annotated and resolved prior to the next submittal. Print and include the DrChecks comments and responses and included in the design analysis for record in the next design submittal for that package.

2.1. Upon review of comments prior to the design review conference, the DOR(s) shall identify whether they concur, non-concur, mark it "for information only" or mark it "check and resolve". Indicate exactly what action will be taken or why the action is not required.

2.2. Conference participants (reviewers) will expect coordination between Design Analysis calculations and the submitted design. Reviewers will also focus on the design submittal's satisfaction of the contract requirements.

2.3. After the conference, the DOR(s) shall formally respond to each applicable comment in DrChecks a second time prior to the next submittal, clearly indicating what action was taken and what drawing/spec/design analysis changed. Designers of Record are encouraged to directly contact reviewers to discuss and agree to the formal comment responses rather than relying only on DrChecks and review meetings to discuss comments. With the next submittal, reviewers will back-check answers to the comments against the new submittal, in addition to reviewing additional design work.

2.4. Clearly annotate in DrChecks those comments that, in the DB Contractor's opinion, require effort outside the scope of the contract. Do not proceed with work outside the contract until a modification to the contract is properly executed, if one is necessary.

## 3.0 DrChecks Initial Account Set-Up

To initialize an office's use of DrChecks, choose a contact person within the office to call the DrChecks Help Desk at 800-428-HELP, M-F, 8AM-5PM, Central time. This POC will be given an office password to distribute to others in the office. Individuals can then go to the hyperlink at http://www.projnet.org and register as a first time user. Upon registration, each user will be given a personal password to the DrChecks system.

3.1. Once the office and individuals are registered, the COE's project manager or lead reviewer will assign the individuals and/or offices to the specific project for review. At this point, persons assigned can make comments, annotate comments, and close comments, depending on their particular assignment.

## 4.0 DrChecks Reviewer Role

The Contractor is the technical reviewer and the Government is the compliance reviewer of the DB's design documents. Each reviewer enters their own comments into the Dr Checks system. To enter comments:

4.1. Log into DrChecks.

4.2. Click on the appropriate project.

4.3. Click on the appropriate review conference. An Add comment screen will appear.

4.4. Select or fill out the appropriate sections (particularly comment discipline and type of document for sorting) of the comment form and enter the comment in the space provided.

4.5. Click the Add Comment button. The comment will be added to the database and a fresh screen will appear for the next comment you have.

4.6. Once comments are all entered, exit DrChecks by choosing "My Account" and then Logout.

**5.0 DrChecks Comment Evaluation (Step 1 of 2)**

The role of the DOR(s) is to evaluate and respond to the comments entered by the Government's and DB Contractor's reviewers. To respond to comments:

5.1. Log into DrChecks.

5.2. Click on the appropriate project.

5.3. Under "Evaluate" click on the number under "Pending".

5.4. Locate the comments that require your evaluation. (Note: If you know the comment number you can use the Quick Pick window on your home page in DrChecks; enter the number and click on go.)

5.5. Select the appropriate evaluation radio button (concur, non-concur, for information only, or check and resolve) and respond with a brief explanation in the Discussion field. An explanation other than to say "concur" is not necessary for "Concur", but may be useful for the Design Configuration Management purposes.

5.6. Click on the Add button. The evaluation will be added to the database and a fresh screen will appear with the next comment.

5.7. Once evaluations are all entered, exit DrChecks by choosing "My Account" and then Logout.

**6.0 DrChecks Comment Evaluation (Step 2 of 2)**

This is where the DOR(s) respond to each applicable comment in DrChecks after the design review conference, prior to the next submittal, clearly indicating what action was taken and what drawing/spec/design analysis changed. Respond to the previous comments, following the same steps as above, adding the narrative in the discussion field.

**7.0 DrChecks Back-Check**

At the following design conference, (where applicable) or at some other agreed time, Government and Contractor reviewers will back-check comment annotations against newly presented documents to verify that the designers' responses are acceptable and that all revisions have been completed. Reviewers

shall either enter additional back-check comments, if necessary, or close those where actions are complete.

7.1. Log into DrChecks.

7.2. Click on the appropriate project.

7.3. Under “My Backcheck” click on the number under “Pending”.

7.4. If you agree with the designer’s response select “Close Comment” and add a closing response if desired.

7.5. If you do not agree with the designer’s response or the submittal does not reflect the response given, select “Issue Open”, enter additional information.

7.6. Click on the Add button. The back-check will be added to the database and a fresh screen will appear with the next comment.

7.7. Once back-checks are all entered, exit DrChecks by choosing “My Account” and then Logout. The design is completed and final when there are no pending comments to be evaluated and there are no pending or open comments under back-check.

**ATTACHMENT D**
**SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW**

Instructions: Use the information outlined in this document to provide the minimum requirement for development of Fire Protection and Life Safety Code submittals for all building projects. Additional and supplemental information may be used to further develop the code review. Insert N/A after criteria, which may be “not applicable”.

## 1.0 SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW

1.1. Project Name (insert name and location)

1.2. Applicable Codes and Standards

1.2.1. Unified Facilities Criteria (UFC): 3-600-01, Design: Fire Protection Engineering For Facilities

1.2.2. International Building Code (IBC) for fire resistance requirements, allowable floor area, building height limitations and building separation distance requirements, except as modified by UFC 3-600-01.

1.2.3. National Fire Protection Association (NFPA) 101 Life Safety Code (latest edition), for building egress and life safety and applicable criteria in UFC 3-600-01.

1.2.4. ADA and ABA Accessibllity Guidelines. For Buildings and Facilities See Section 01 10 00, Paragraph 3 for facility specific criteria.

1.3. Occupancy Classification
IBC chapters 3 and 4

1.4. Construction Type
IBC chapter 6

1.5. Area Limitations
IBC chapter 5, table 503

1.6. Allowable Floor Areas
IBC section 503, 505

1.7. Allowable area increases
IBC section 506, 507

1.8. Maximum Height of Buildings
IBC section 504

1.9. Fire-resistive substitution

1.10. Occupancy Separations
IBC table 302.3.2

1.11. Fire Resistive Requirements

1.11.1. Exterior Walls - [_____] hour rating, IBC table 601, 602

1.11.2. Interior Bearing walls - [_____] hour rating

1.11.3. Structural frame - [_____] hour rating

1.11.4. Permanent partitions - [_____] hour rating

1.11.5. Shaft enclosures - [_____] hour rating

1.11.6. Floors & Floor-Ceilings - [_____] hour rating

1.11.7. Roofs and Roof Ceilings - [_____] hour rating

1.12. Automatic Sprinklers and others used to determine the need for automatic Extinguishing Equipment, Extinguishing Systems, Foam Systems, Standpipe

1.12.1. UFC 3-600-01, chapters 4 and 6 systems, wet chemical systems, etc. State which systems are required and to what criteria they will be designed.

1.12.2. UFC 3-600-01, Appendix B Occupancy Classification. Note the classification for each room. This may be accomplished by classifying the entire building and noting exceptions for rooms that differ (E.g. The entire building is Light Hazard except boiler room and storage rooms which are [_____], etc.)

1.12.3. UFC 3-600-01, Chapter 3 Sprinkler Design Density, Sprinkler Design Area, Water Demand for Hose Streams (supply pressure and source requirements).

1.12.4. UFC 3-600-01, Chapter 4 Coverage per sprinkler head. Extended coverage sprinkler heads are not permitted.

1.12.5. Available Water Supply. Provide the results of the water flow tests showing the available water supply static pressure and residual pressure at flow. Based on this data and the estimated flow and pressure required for the sprinkler system, determine the need for a fire pump.

1.12.6. NFPA 13, Para. 8.16.4.6.1. Provide backflow preventer valves as required by the local municipality, authority, or water purveyor. Provide a test valve located downstream of the backflow preventer for flow testing the backflow preventer at full system demand flow. Route the discharge to an appropriate location outside the building.

1.13. Kitchen Cooking Exhaust Equipment

Describe when kitchen cooking exhaust equipment is provided for the project. Type of extinguishing systems for the equipment should be provided. per NFPA 96. Show all interlocks with manual release switches, fuel shutoff valves, electrical shunt trips, exhaust fans, and building alarms.

1.14. Portable Fire Extinguishers, fire classification and travel distance. per NFPA 10

1.15. Enclosure Protection and Penetration Requirements. - Opening Protectives and Through Penetrations

1.15.1. IBC Section712, 715 and Table 715.3. Mechanical rooms, exit stairways, storage rooms, janitor [_____] hour rating. IBC Table 302.1.1

1.15.2. Fire Blocks, Draft Stops, Through Penetrations and Opening Protectives

1.16. Fire Dampers. Describe where fire dampers and smoke dampers are to be used (IBC Section 716 and NFPA 90A}. State whether isolation smoke dampers are required at the air handler.

1.17. Detection Alarm and Communication. UFC 3-600-01, (Chapter 5); NFPA 101 para. 3.4 (chapters 12-42); NFPA 72

1.18. Mass Notification. Describe building/facility mass notification system (UFC 4-021-01) type and type of base-wide mass notification/communication system. State whether the visible notification appliances will be combined with the fire alarm system or kept separate. (Note: Navy has taken position to combine visible notification appliances with fire alarm).

1.19. Interior Finishes (classification). NFPA 101.10.2.3 and NFPA 101.7.1.4

1.20. Means of Egress

1.20.1. Separation of Means of Egress, NFPA 101 chapters 7 and 12-42; NFPA101.7.1.3

1.20.2. Occupant Load, NFPA101.7.3.1 and chapters 12-42.

1.20.3. Egress Capacity (stairs, corridors, ramps and doors) NFPA101.7.3.3

1.20.4. Number of Means of Egress, NFPA101.7.4 and chapters 12-42.

1.20.5. Dead end limits and Common Path of Travel, NFPA 101.7.5.1.6 and chapters 12-42.

1.20.6. Accessible Means of Egress (for accessible buildings), NFPA101.7.5.4

1.20.7. Measurement of Travel Distance to Exits, NFPA101.7.6 and chapters 12-42.

1.20.8. Discharge from Exits, NFPA101.7.7.2

1.20.9. Illumination of Means of Egress, NFPA101.7.8

1.20.10. Emergency Lighting, NFPA101.7.9

1.20.11. Marking of Means of Egress, NFPA101.7.10

1.21. Elevators, UFC 3-600-01, Chapter 6; IBC and ASME A17.1 - 2000,(Safety Code for Elevators and Escalators)

1.22. Accessibility Requirements, ADA and ABA Accessibility Guidelines for Buildings and Facilities

1.23. Certification of Fire Protection and Life Safety Code Requirements. (Note: Edit the Fire team membership if necessary). Preparers of this document certify the accuracy and completeness of the Fire Protection and Life Safety features for this project in accordance with the attached completed form(s).

1.24. Designer of Record. Certification of Fire protection and Life Safety Code Requirements. (Note: Edit the Fire team members if necessary). Preparers of this document certify the accuracy and completeness of the Fire Protection and Life Safety features of this project.

Fire Protection Engineer of Record:

_____

Signature and Stamp

Date

OR

Architect of Record:

_____

Signature and Stamp

Date

Mechanical Engineer of Record:

_____

Signature and Stamp

Date

Electrical Engineer of Record:

_____

Signature/Date

**ATTACHMENT E**
**LEED SUBMITTALS**

| LEED Credit Paragraph | Contractor Check Here if Credit is Claimed | **LEED-NC v3 Submittals (OCT09)** | | Provide for Credit Audit Only | | Date Submitted (to be filled in by Contractor) | Government Reviewer's Use |
|---|---|---|---|---|---|---|---|
| **PAR** | | **FEATURE** | **DUE AT** | | **REQUIRED DOCUMENTATION** | **DATE** | **REV** |
| **GENERAL** | | | | | | | |
| | GENERAL - All calculations shall be in accordance with LEED 2009 Reference Guide. | | | | | | |
| | GENERAL: Obtain excel version of this spreadsheet at http://en.sas.usace.army.mil/enWeb, "Engineering Criteria". | | | | | | |
| | GENERAL - For all credits, narrative/comments may be added to describe special circumstances or considerations regarding the project's credit approach. | | | | | | |
| | GENERAL - Include all required LEED drawings indicated below in contract drawings with applicable discipline drawings, labeled For Reference Only. | | | | | | |
| | NOTE: Each submittal indicated with "**" differs from LEED certified project submittals by either having a different due date or being an added submittal not required by GBCI. | | | | | | |
| | NOTE: Projects seeking LEED certification need only submit to GBCI whatever documentation is acceptable to GBCI (for example, licensed professional certifications). This checklist identifies what must be submitted to the Government for internal review purposes. Government review of LEED documentation in no way supercedes or modifies the requirements and rulings of of GBCI for purposes of compliance with project requirement to obtain LEED certifiaction. | | | | | | |
| | GENERAL - Audit documentation may include but is not limited to what is indicated in this table. | | | | | | |
| | | | Closeout | | List of all Final Design submittals revised after final design to reflect actual closeout conditions. Revised Final Design submittals. - OR - Statement confirming that no changes have been made since final design that effect final design submittal documents. | | Proj Engr (PE) |
| **CATEGORY 1 - SUSTAINABLE SITES** | | | | | | | |
| SSPR1 | | Construction Activity Pollution Prevention (PREREQUISITE) | **Final Design | | List of drawings and specifications that address the erosion control, particulate/dust control and sedimentation control measures to be implemented. | | CIV |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | CIV |
| | | | **Final Design | | Narrative that indicates which compliance path was used (NPDES or Local standards) and describes the measures to be implemented on the project. If a local standard was followed, provide specific information to demonstrate that the local standard is equal to or more stringent than the NPDES program. | | CIV |
| SS1 | | Site Selection | Final Design | | Statement confirming that project does not meet any of the prohibited criteria. | | CIV |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | CIV |
| | | | Final Design | X | LEED Site plan drawing that shows all proposed development, line depicting boundary of all bodies of water and/or wetlands within 100 feet of project boundary and a line depicting 5' elevation above 100 year flood line that falls within project boundary. Not required if neither condition applies. | | CIV |
| SS2 | | Development Density & Community Connectivity | Final Design | | Option 1: LEED Site vicinity plan showing project site and surrounding development. Show density boundary or note drawing scale. | | CIV |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | CIV |
| | | | Final Design | | Option 1: Table indicating, for project site and all surrounding sites within density radius (keyed to site vicinity plan), site area and building area. Project development density calculation. Density radius calculation. Development density calculation within density radius. | | CIV |
| | | | Final Design | | Option 2: LEED Site vicinity plan showing project site, the 1/2 mile community radius, pedestrian walkways and the locations of the residential development(s) and Basic Services surrounding the project site. | | CIV |
| | | | Final Design | | Option 2: List (including business name and type) of all Basic Services facilities within the 1/2 mile radius, keyed to site vicinity plan. | | CIV |
| SS3 | | Brownfield Redevelopment | Final Design | | Narrative describing contamination and the remediation activities included in project. Include statement indicating how site was determined to be a brownfield. | | CIV |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | CIV |
| SS4.1 | | Alternative Transportation: Public Transportation Access | Final Design | | Statement indicating which option for compliance applies. State whether public transportation is existing or proposed and, if proposed, cite source of this information. | | CIV |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | CIV |
| | | | Final Design | | Option 1: LEED Site vicinity plan showing project site, mass transit stops and pedestrian path to them with path distance noted. | | CIV |
| | | | Final Design | | Option 2: LEED Site vicinity plan showing project site, bus stops and pedestrian path to them with path distance noted. | | CIV |
| | | | | | | | |
| SS4.2 | | Alternative Transportation: Bicycle Storage & Changing Rooms | Final Design | | FTE calculation. Bicycle storage spaces calculation. Shower/changing facilities calculation. | | CIV |
| | | | Final Design | | List of drawings that show the location(s) of bicycle storage areas. Statement indicating distance from building entrance. | | CIV |
| | | | Final Design | | List of drawings that show the location(s) of shower/changing facilities and, if located outside the buiding, statement indicating distance from building entrance. | | ARC |

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| **PAR** | | **FEATURE** | **DUE AT** | | **REQUIRED DOCUMENTATION** | **DATE** | **REV** |
| SS4.3 | | Alternative Transportation: Low Emitting & Fuel Efficient Vehicles | Final Design | | Statement indicating which option for compliance applies. FTE calculation. Statement indicating total parking capacity of site. | | CIV |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | CIV |
| | | | Final Design | | Option 1: Low-emission & fuel-efficient vehicle calculation. | | CIV |
| | | | Final Design | | Option 1: List of drawings and specification references that show location and number of preferred parking spaces for low-emission & fuel-efficient vehicles and signage. | | CIV |
| | | | Final Design | | Option 1: Statement indicating quantity, make, model and manufacturer of low-emission & fuel-efficient vehicles to be provided. Statement confirming vehicles are zero-emission or indicating ACEEE vehicle scores. | | CIV |
| | | | Final Design | | Option 2: Low-emission & fuel-efficient vehicle parking calculation. | | CIV |
| | | | Final Design | | Option 2: List of drawings and specification references that show location and number of preferred parking spaces and signage. | | CIV |
| | | | Final Design | | Option 3: Low-emission & fuel-efficient vehicle refueling station calculation. | | CIV |
| | | | Final Design | | Option 3: List of drawings and specifications indicating location and number of refueling stations, fuel type and fueling capacity for each station for an 8-hour period. | | CIV |
| | | | Closeout | X | Option 3: Construction product submittals indicating what was provided and confirming compliance with respect to fuel type and fueling capacity for each station for an 8-hour period. | | CIV |
| SS4.4 | | Alternative Transportation: Parking Capacity | Final Design | | Statement indicating which option for compliance applies. | | CIV |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | CIV |
| | | | Final Design | | Option 1: Preferred parking calculation including number of spaces required, total provided, preferred spaces provided and percentage. | | CIV |
| | | | Final Design | | Option 2: FTE calculation. Preferred parking calculation including number of spaces provided, preferred spaces provided and percentage. | | CIV |
| | | | Final Design | | Options 1 and 2: List of drawings and specification references that show location and number of preferred parking spaces and signage. | | CIV |
| | | | Final Design | | Option 3: Narrative indicating number of spaces required and provided and describing infrastructure and support programs with description of project features to support them. | | CIV |
| SS5.1 | | Site Development: Protect or Restore Habitat | **Final Design | | Option 1: List of drawing and specification references that convey site disturbance limits. | | CIV |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | CIV |
| | | | **Final Design | | Option 2: LEED site plan drawing that delineates boundaries of each preserved and restored habitat area with area (sf) noted for each. | | CIV |
| | | | **Final Design | | Option 2: Percentage calculation of restored/preserved habitat to total site area. List of drawings and specification references that convey restoration planting requirements. | | CIV |
| SS5.2 | | Site Development: Maximize Open Space | Final Design | | Option 2: LEED site plan drawing delineating boundary of vegetated open space adjacent to building with areas of building footprint and designated open space noted. | | CIV |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | CIV |
| SS6.1 | | Stormwater Design: Quantity Control | Final Design | | Statement indicating which option for compliance applies. | | CIV |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | CIV |
| | | | Final Design | | Option 1: Indicate pre-development and post-development runoff rate(cfs) and runoff quantity (cf) -OR - Narrative describing site conditions, measures and controls to be implemented to prevent excessive stream velocities and erosion. | | CIV |
| | | | Final Design | | Option 2: Indicate pre-development and post-development runoff rate(cfs) and runoff quantity (cf). Indicate percent reduction in each. | | CIV |
| SS6.2 | | Stormwater Design: Quality Control | Final Design | | For non-structural controls, list all BMPs used and, for each, describe the function of the BMP and indicate the percent annual rainfall treated. List all structural controls and, for each, describe the pollutant removal and indicate the percent annual rainfall treated. | | CIV |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | CIV |
| SS7.1 | | Heat Island Effect: Non-Roof | **Final Design | | LEED site plan drawing indicating locations and quantities of each paving type, including areas of shaded pavement. Percentage calculation indicating percentage of reflective/shaded/open grid area. | | CIV |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | CIV |

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| **PAR** | | **FEATURE** | **DUE AT** | | **REQUIRED DOCUMENTATION** | **DATE** | **REV** |
| | | | | | | | |
| SS7.2 | | Heat Island Effect: Roof | Final Design | | Option 1: Percentage calculation indicating percentage of SRI compliant roof area. List of drawings and specification references that convey SRI requirements and roof slopes. | | ARC |
| | | | Final Design | | Option 1: List of specified roof materials indicating, for each, type, manufacturer, product name and identification if known, SRI value and roof slope. | | ARC |
| | | | **Closeout | | Option 1: List of installed roof materials indicating, for each, manufacturer, product name and identification, SRI value and roof slope. | | PE |
| | | | Closeout | X | Option 1: Manufacturer published product data or certification confirming SRI | | PE |
| | | | Final Design | | Option 2: Percentage calculation indicating percentage of vegetated roof area. | | ARC |
| | | | Final Design | | Option 3: Combined reflective and green roof calculation. | | ARC |
| | | | Final Design | | Option 3: List of specified roof materials indicating, for each, type, manufacturer, product name and identification if known, SRI value and roof slope. | | ARC |
| | | | **Closeout | | Option 3: List of installed roof materials indicating, for each, manufacturer, product name and identification, SRI value and roof slope. | | PE |
| | | | Closeout | X | Option 3: Manufacturer published product data or certification confirming SRI | | PE |
| | | | | | | | |
| SS8 | | Light Pollution Reduction | Final Design | | Interior Lighting: List of drawings and specification references that convey interior lighting requirements (location and type of all installed interior lighting, location of non-opaque exterior envelope surfaces, allowing confirmation that maximum candela value from interiorfixtures does not intersect non-opaque building envelope surfaces). - OR - List of drawings and specification references that show automatic lighting controls compliance with credit requirement. | | ELEC |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | ELEC |
| | | | Final Design | | Exterior Lighting: List of drawings and specification references that convey exterior lighting requirements (location and type of all site lighting and building façade/landscape lighting). | | ELEC |
| | | | Final Design | | Exterior Site Lighting Power Density (LPD): Tabulation for exterior site lighting indicating, for each location identification or description, units of measure, area or distance of the location, actual LPD using units consistent with ASHRAE 90.1, and the ASHRAE allowable LPD for that type of location. Percentage calculation of actual versus allowable LPD for all site lighting. | | ELEC |
| | | | Final Design | | Exterior Building Facade/Landscape Lighting Power Density (LPD): Tabulation for exterior building facade/landscape lighting indicating, for each location identification or description, units of measure, area or distance of the location, actual LPD using units consistent with ASHRAE 90.1, and the ASHRAE allowable LPD for that type of location. Percentage calculation of actual versus allowable LPD for all building facade/landscape lighting. | | ELEC |
| | | | Final Design | | Exterior Lighting IESNA Zone: Indicate which IESNA zone is applicable to the project. | | ELEC |
| | | | Final Design | | Exterior Lighting Site Lumen table indicating, for each fixture type, quantity installed, initial lamp lumens per luminaire, initial lamp lumens above 90 degrees from Nadir, total lamp lumens and total lamp lumens above 90 degrees. Percentage of site lamp lumens above 90 degrees from nadir to total lamp lumens. | | ELEC |
| | | | Final Design | | Exterior Lighting Narrative describing analysis used for addressing requirements for light trespass at site boundary and beyond. | | ELEC |
| | | | | | | | |
| **CATEGORY 2 – WATER EFFICIENCY** | | | | | | | |
| WEPR1 | | Water Use Reduction: 20% Reduction | Final Design | | Statement confirming which occupancy breakdown applies (default or special). For special occupancy breakdown, indicate source and explanation for ratio. | | MEC |
| | | | Final Design | | Occupancy calculation including male/female numbers for FTEs, visitors, students, customers, residential and other type occupants/users | | MEC |
| | | | Final Design | | Statement indicating percent of male restrooms with urinals. Statement indicating annual days of operation. | | MEC |

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|---|---|---|---|---|---|---|---|
| **PAR** | | **FEATURE** | **DUE AT** | | **REQUIRED DOCUMENTATION** | **DATE** | **REV** |
| | | | Final Design | | Baseline flush fixture calculation spreadsheet indicating, for each fixture type, gender, flush rate, daily uses per person for each occupant type identified in occupancy calculation and annual baseline flush fixture water usage. | | MEC |
| | | | Final Design | | Design case flush fixture calculation spreadsheet indicating, for each fixture type, gender, fixture manufacturer, fixture model number, flush rate, percent of occupants using this fixture type, daily uses per person for each occupant type identified in occupancy calculation and annual design case flush fixture water usage. | | MEC |
| | | | Closeout | X | Manufacturer published product data or certification confirming fixture water usage. | | PE |
| WE1.1 | | Water Efficient Landscaping: Reduce by 50% | Final Design | | Statement indicating which option for compliance applies. | | CIV |
| | | | **Final Design | | Delineation and labeling of "LEED Project site boundary" on site plan. | | CIV |
| | | | Final Design | | Calculation indicating, for baseline and design case, total water applied, total potable water applied, total non-potable water applied. Design case percent potable water reduction. If nonpotable water is used, indicate source of nonpotable water. | | CIV |
| | | | Final Design | | List of landscape plan drawings. | | CIV |
| | | | Final Design | | Narrative describing landscaping and irrigation design strategies, including water use calculation methodology used to determine savings and, if non-potable water is used, specific information about source and available quantity. | | CIV |
| WE1.2 | | Water Efficient Landscaping: No Potable Water Use or No Irrigation | Same as WE1.1 | | Same as WE1.1 | | CIV |
| WE2 | | Innovative Wastewater Technologies | Final Design | | Statement confirming which option for compliance applies. | | MEC |
| | | | Final Design | | Statement confirming which occupancy breakdown applies (default or special). For special occupancy breakdown, indicate source and explanation for ratio. | | MEC |
| | | | Final Design | | Occupancy calculation including male/female numbers for FTEs, visitors, students, customers, residential and other type occupants/users | | MEC |
| | | | Final Design | | Statement indicating percent of male restrooms with urinals. Statement indicating annual days of operation. | | MEC |
| | | | Final Design | | Baseline flush fixture calculation spreadsheet indicating, for each fixture type, gender, flush rate, daily uses per person for each occupant type identified in occupancy calculation and annual baseline flush fixture water usage. | | MEC |
| | | | Final Design | | Design case flush fixture calculation spreadsheet indicating, for each fixture type, gender, fixture manufacturer, fixture model number, flush rate, percent of occupants using this fixture type, daily uses per person for each occupant type identified in occupancy calculation and annual design case flush fixture water usage. | | MEC |
| | | | Final Design | | Option 1: If onsite non-potable water is used, identify source(s), indicate annual quantity from each source and indicate total annual quantity from all onsite non-potable water sources. | | MEC |
| | | | Final Design | | Option 1: Summary calculation indicating baseline annual water consumption, design case annual water consumption, non-potable annual water consumption and total percentage annual water savings. | | MEC |
| | | | Final Design | | Option 2: Statement confirming on-site treatment of all generated wastewater to tertiary standards and all treated wastewater is either infiltrated or used on-site. | | MEC |
| | | | Final Design | | Option 2: List of drawing and specification references that convey design of on-site wastewater treatment features. | | CIV |
| | | | Final Design | | Option 2: On-site water treatment quantity calculation indicating all on-site wastewater source(s), annual quantity treated, annual quantity infiltrated and annual quantity re-used on site from each source and totals for annual quantity treated, annual quantity infiltrated and annual quantity re-used on site from all sources. | | CIV |
| | | | Final Design | | Option 2: Wastewater summary calculation indicating design case annual flush fixture water usage, annual on-site water treatment and percentage sewage convyance reduction. | | MEC |
| | | | Final Design | | Narrative describing project strategy for reduction of potable water use for sewage conveyance, including specific information on reclaimed water usage and treated wastewater usage. | | MEC |
| WE3 | | Water Use Reduction: 30% - 40% Reduction | Same as WEPR1 | | Same as WEPR1 | | MEC |
| **CATEGORY 3 – ENERGY AND ATMOSPHERE** | | | | | | | |

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| **PAR** | | **FEATURE** | **DUE AT** | | **REQUIRED DOCUMENTATION** | **DATE** | **REV** |
| EAPR1 | | Fundamental Commissioning of the Building Energy Systems (PREREQUISITE) | **Final Design | | **Owner's Project Requirements document | | ALL |
| | | | **Final Design | | **Basis of Design document for commissioned systems | | MEC, ELEC |
| | | | **Final Design | | **Commissioning Plan | | MEC, ELEC |
| | | | Closeout | | Statement confirming all commissioning requirements have been incorporated into construction documents. | | PE |
| | | | Closeout | | Commissioning Report | | PE |
| EAPR2 | | Minimum Energy Performance (PREREQUISITE) | Final Design | | Statement listing the mandatory provisions of ASHRAE 90.1 that project meets relative to compliance with this prerequisite and indicating which compliance path was used. | | MEC ELEC ARC |
| | | | Final Design | | Statement indicating which compliance path option applies. | | MEC |
| | | | Final Design | | Option 1: Statement confirming simulation software capabilities and confirming assumptions and methodology. | | MEC |
| | | | Final Design | | Option 1: General information including simulation program, principal heating source, percent new construction and renovation, weather file, climate zone and Energy Star Target Finder score. | | MEC |
| | | | Final Design | | Option 1: Space summary listing, for each building use, the conditioned area, unconditioned area and total area and include total area for each category | | MEC |
| | | | Final Design | | Option 1: List of all simulation output advisory message data and show difference between baseline and proposed design | | MEC |
| | | | Final Design | | Option 1: Comparison summary for energy model inputs including description of baseline and design case energy model inputs, showing both by element type | | MEC |
| | | | Final Design | | Option 1: Energy type summary lising, for each energy type, utility rate description, units of energy and units of demand | | MEC |
| | | | Final Design | | Option 1: Statement indicating whether project uses on-site renewable energy. If yes, list all sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost | | MEC |
| | | | Final Design | | Option 1: If analysis includes exceptional calculation methods, statement describing how exceptional calculation measure cost savings is determined | | MEC |
| | | | Final Design | | Option 1: If analysis includes exceptional calculation methods, for each exceptional calculation method indicate energy types and, for each energy type, annual energy savings, annual cost savings, and brief descriptive narrative | | MEC |
| | | | Final Design | | Option 1: Baseline performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand for all four orientations. For each orientation indicate total annual energy use for each orientation and total annual process energy use. | | MEC |
| | | | Final Design | | Option 1: Baseline energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost. | | MEC |
| | | | Final Design | | Option 1: Proposed Design performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand, baseline annual and peak energy demand and percent savings. Indicate total annual energy use and total annual process energy use for both proposed design and baseline and percent savings. | | MEC |
| | | | Final Design | | Option 1: Proposed Design energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost. | | MEC |
| | | | Final Design | | Option 1: Energy cost and consumption by energy type report indicating, for each energy type, proposed design and baseline annual use and annual cost, percent savings annual use and annual cost. Indicate for renewable energy annual energy generated and annual cost. Indicate exceptional calculations annual energy savings and annual cost savings. Indicate building total annual energy use, annual energy cost for proposed design and baseline and indicate percent savings annual energy use and annual energy cost. | | MEC |

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| | | | Final Design | | Option 1: Compliance summaries from energy simulation software. If software does not produce compliance summaries provide output summaries and example input summaries for baseline and proposed design supporting data in the tables. Output summaries must include simulated energy consumption by end use and total energy use and cost by energy type. Example input summaries should represent most common systems and must include occupancy, use pattern, assumed envelope component sizes and descriptive features and assumed mechanical equipment types and descriptive features | | MEC |
| | | | Final Design | | Option 1: Energy rate tariff from project energy providers (only if not using LEED Reference Guide default rates) | | MEC |
| EAPR3 | | Fundamental Refrigerant Management (PREREQUISITE) | Final Design | | Statement indicating which option for compliance applies. | | MEC |
| | | | Final Design | | Option 2: Narrative describing phase out plan, including specific information on phase out dates and refrigerant quantities. | | MEC |
| EA1 | | Optimize Energy Performance | Final Design | | Statement indicating which compliance path option applies. | | MEC |
| | | | Final Design | | Option 1: Statement confirming simulation software capabilities and confirming assumptions and methodology. | | MEC |
| | | | Final Design | | Option 1: General information including simulation program, principal heating source, percent new construction and renovation, weather file, climate zone and Energy Star Target Finder score. | | MEC |
| | | | Final Design | | Option 1: Space summary listing, for each building use, the conditioned area, unconditioned area and total area and include total area for each category | | MEC |
| | | | Final Design | | Option 1: List of all simulation output advisory message data and show difference between baseline and proposed design | | MEC |
| | | | Final Design | | Option 1: Comparison summary for energy model inputs including description of baseline and design case energy model inputs, showing both by element type | | MEC |
| | | | Final Design | | Option 1: Energy type summary lising, for each energy type, utility rate description, units of energy and units of demand | | MEC |
| | | | Final Design | | Option 1: Statement indicating whether project uses on-site renewable energy. If yes, list all sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost | | MEC |
| | | | Final Design | | Option 1: If analysis includes exceptional calculation methods, statement describing how exceptional calculation measure cost savings is determined | | MEC |
| | | | Final Design | | Option 1: If analysis includes exceptional calculation methods, for each exceptional calculation method indicate energy types and, for each energy type, annual energy savings, annual cost savings, and brief descriptive narrative | | MEC |
| | | | Final Design | | Option 1: Baseline performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand for all four orientations. For each orientation indicate total annual energy use for each orientation and total annual process energy use. | | MEC |
| | | | Final Design | | Option 1: Baseline energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost. | | MEC |
| | | | Final Design | | Option 1: Proposed Design performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand, baseline annual and peak energy demand and percent savings. Indicate total annual energy use and total annual process energy use for both proposed design and baseline and percent savings. | | MEC |
| | | | Final Design | | Option 1: Proposed Design energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost. | | MEC |
| | | | Final Design | | Option 1: Energy cost and consumption by energy type report indicating, for each energy type, proposed design and baseline annual use and annual cost, percent savings annual use and annual cost. Indicate for renewable energy annual energy generated and annual cost. Indicate exceptional calculations annual energy savings and annual cost savings. Indicate building total annual energy use, annual energy cost for proposed design and baseline and indicate percent savings annual energy use and annual energy cost. | | MEC |

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| | | | Final Design | | Option 1: Compliance summaries from energy simulation software. If software does not produce compliance summaries provide output summaries and example input summaries for baseline and proposed design supporting data in the tables. Output summaries must include simulated energy consumption by end use and total energy use and cost by energy type. Example input summaries should represent most common systems and must include occupancy, use pattern, assumed envelope component sizes and descriptive features and assumed mechanical equipment types and descriptive features | | MEC |
| | | | Final Design | | Option 1: Energy rate tariff from project energy providers (only if not using LEED Reference Guide default rates) | | MEC |
| EA2.1 | | On-Site Renewable Energy | Final Design | | Statement indicating which compliance path option applies. | | ELEC |
| | | | Final Design | | List all on-site renewable energy sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost. Indicate total annual energy use (all sources), total annual energy cost (all sources) and percent renewable energy cost. | | ELEC MEC |
| | | | Final Design | | Option 1: Indicate, for renewable energy,proposed design total annual energy generated and annual cost. | | ELEC MEC |
| | | | Final Design | | Option 2: Indicate CBECS building type and building gross area. Provide the following CBECS data: median annual electrical intensity, median annual non-electrical fuel intensity, average electric energy cost, average non-electric fuel cost, annual electric energy use and cost, annual non-electric fuel use and cost. | | ELEC MEC |
| | | | Final Design | | Option 2: Narrative describing renewable systems and explaining calculation method used to estimate annual energy generated, including factors influencing performance. | | ELEC MEC |
| EA2.2 | | On-Site Renewable Energy | Same as EA2.1 | | Same as EA2.1 | | ELEC MEC |
| EA2.3 | | On-Site Renewable Energy | Same as EA2.1 | | Same as EA2.1 | | ELEC MEC |
| EA3 | | Enhanced Commissioning | **Final Design | | **Owner's Project Requirements document (OPR) | | ALL |
| | | | **Final Design | | **Basis of Design document for commissioned systems (BOD) | | ELEC MEC |
| | | | **Final Design | | **Commissioning Plan | | ELEC MEC |
| | | | Closeout | | Statement confirming all commissioning requirements have been incorporated into construction documents. | | PE |
| | | | Closeout | | **Commissioning Report | | PE |
| | | | **Final Design | | Statement by CxA confirming Commissioning Design Review | | |
| | | | Closeout | | Statement by CxA confirming review of Contractor submittals for compliance with OPR and BOD | | PE |
| | | | Closeout | | **Systems Manual | | PE |
| | | | Closeout | | Statement by CxA confirming completion of O&M staff and occupant training | | PE |
| | | | Closeout | | **Scope of work for post-occupancy review of building operation, including plan for resolution of outstanding issues | | PE |
| | | | **Predesign | | Statement confirming CxA qualifications and contractual relationships relative to work on this project, demonstrating that CxA is an independent third party. | | MEC |
| EA4 | | Enhanced Refrigerant Management | Final Design | | Refrigerant impact calculation table with all building data and calculation values as shown in LEED 2009 Reference Guide Example Calculations | | MEC |
| | | | Final Design | | Narrative describing any special circumstances or explanatory remarks | | |
| | | | Closeout | X | Cut sheets highlighting refrigerant data for all HVAC components. | | PE |
| EA5 | | Measurement & Verification | Closeout | | Statement indicating which compliance path option applies. | | PE |
| | | | Closeout | | Measurement and Verification Plan including Corrective Action Plan | | PE |
| | | | Closeout | | **Scope of work for post-occupancy implementation of M&V plan including corrective action plan. | | PE |
| EA6 | | Green Power | Closeout | | Statement indicating which compliance path option applies. | | PE |
| | | | Closeout | | Option 1: Indicate proposed design total annual electric energy usage | | PE |
| | | | Closeout | | Option 2: Indicate actual total annual electric energy usage | | PE |
| | | | Closeout | | Option 3: Calculation indicating building type, total gross area, median electrical intensity and annual electric energy use | | PE |

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| | | | Closeout | | Green power provider summary table indicating, for each purchase type, provider name, annual quantity green power purchased and contract term. Indicate total annual green power use and indicate percent green power | | PE |
| | | | Closeout | | Narrative describing how Green Power or Green Tags are purchased | | PE |
| **CATEGORY 4 – MATERIALS AND RESOURCES** | | | | | | | |
| MRPR1 | | Storage & Collection of Recyclables (PREREQUISITE) | Final Design | | Statement confirming that recycling area will accommodate recycling of plastic, metal, paper, cardboard and glass. Narrative indicating any other materials addressed and coordination with pickup. | | ARC |
| MR1.1 | | Building Reuse: Maintain 55% of Existing Walls, Floors & Roof | **Final Design | | If project includes a building addition, confirm that area of building addition does not exceed 2x the area of the existing building. | | ARC |
| | | | **Final Design | | Spreadsheet listing, for each building structural/envelope element, the existing area and reused area. Total percent reused. | | ARC |
| MR1.2 | | Building Reuse: Maintain 75% of Existing Walls, Floors & Roof | Same as MR1.1 | | Same as MR1.1 | | ARC |
| MR1.3 | | Building Reuse: Maintain 95% of Existing Walls, Floors & Roof | Same as MR1.1 | | Same as MR1.1 | | ARC |
| MR1.4 | | Building Reuse: Maintain 50% of Interior Non-Structural Elements | **Final Design | | If project includes a building addition, confirm that area of building addition does not exceed 2x the area of the existing building. | | ARC |
| | | | **Final Design | | Spreadsheet listing, for each building interior non-structural element, the existing area and reused area. Total percent reused. | | ARC |
| MR2.1 | | Construction Waste Management: Divert 50% From Disposal | **Preconstruction | | Waste Management Plan | | PE |
| | | | **Construction Quarterly and Closeout | | Spreadsheet calculations indicating material description, disposal/diversion location (or recycling hauler), weight, total waste generated, total waste diverted, diversion percentage | | PE |
| | | | **Construction Quarterly and Closeout | | Receipts/tickets for all items on spreadsheet | | PE |
| MR2.2 | | Construction Waste Management: Divert 75% From Disposal | Same as MR2.1 | | Same as MR2.1 | | PE |
| MR3.1 | | Materials Reuse: 5% | Closeout | | Statement indicating total materials value and whether default or actual. | | PE |
| | | | Closeout | | Spreadsheet calculations indicating, for each reused/salvaged material, material description, source or vendor, cost. Total reused/salvaged materials percentage. | | PE |
| MR3.2 | | Materials Reuse: 10% | Same as MR3.1 | | Same as MR3.1 | | PE |
| MR4.1 | | Recycled Content: 10% (post-consumer + 1/2 pre-consumer) | Closeout | | Statement indicating total materials value and whether default or actual. | | PE |
| | | | Closeout | | Spreadsheet calculations indicating, for each recycled content material, material name/description, manufacturer, cost, post-consumer recycled content percent, pre-consumer recycled content percent, source of recycled content data. Total post-consumer content materials cost, total pre-consumer content materials cost, total combined recycled content materials cost, recycled content materials percentage. | | PE |
| | | | Final Design or NLT Preconstruction | | **Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal. | | PE |
| | | | Closeout | X | Manufacturer published product data or certification, confirming recycled content percentages in spreadsheet | | PE |
| MR4.2 | | Recycled Content: 20% (post-consumer + 1/2 pre-consumer) | Same as MR4.1 | | Same as MR4.1 | | PE |
| MR5.1 | | Regional Materials:10% Extracted, Processed & Manufactured Regionally | Closeout | | Statement indicating total materials value and whether default or actual. | | PE |
| | | | Closeout | | Spreadsheet calculations indicating, for each regional material, material name/description, manufacturer, cost, percent compliant, harvest distance, manufacture distance, source of manufacture and harvest location data. Total regional materials cost, regional materials percentage. | | PE |
| | | | Preconstruction | | **Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal. | | PE |
| | | | Closeout | X | Manufacturer published product data or certification confirming regional material percentages in spreadsheet | | PE |

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| MR5.2 | | Regional Materials:20% Extracted, Processed & Manufactured Regionally | Same as MR5.1 | | Same as MR5.1 | | PE |
| MR6 | | Rapidly Renewable Materials | Closeout | | Statement indicating total materials value and whether default or actual. | | PE |
| | | | Closeout | | Spreadsheet calculations indicating, for each rapidly renewable material, material name/description, manufacturer, cost, rapidly renewable content percent, rapidly renewable product value. Total rapidly renewable product value, rapidly renewable materials percentage. | | PE |
| | | | Final Design | | **Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal. | | ARC |
| | | | Closeout | X | Manufacturer published product data or certification confirming rapidly renewable material percentages in spreadsheet | | PE |
| MR7 | | Certified Wood | Closeout | | Statement indicating total materials value and whether default or actual. | | PE |
| | | | Closeout | | Spreadsheet calculations indicating, for each certified wood material, material name/description, vendor, cost, wood component percent, certified wood percent of wood component, FSC chain of custody certificate number. Total certified wood product value, certified wood materials percentage. | | PE |
| | | | Final Design or NLT Preconstruction | | **Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal. | | PE |
| | | | Closeout | X | Vendor invoices, FSC chain of custody certificates and anufacturer published product data or certification confirming all certified wood materials percentages in spreadsheet. | | PE |
| **INDOOR ENVIRONMENTAL QUALITY** | | | | | | | |
| EQPR1 | | Minimum IAQ Performance (PREREQUISITE) | Final Design | | Statement indicating which option for compliance applies, stating applicable criteria/requirement, and confirming that project has been designed to meet the applicable requirements. | | MEC |
| | | | Final Design | | Narrative describing the project's ventilation design, including specifics about fresh air intake volumes and special considerations. | | MEC |
| EQPR2 | | Environmental Tobacco Smoke (ETS) Control (PREREQUISITE) | Final Design | | Statement indicating which option for compliance applies, stating applicable criteria/requirement, and confirming that project has been designed to meet the applicable requirements. | | ARC |
| | | | Final Design | | List of drawing and specification references that convey conformance to applicable requirements (signage, exhaust system, room separation details, etc). | | ARC |
| EQ1 | | Outdoor Air Delivery Monitoring | Final Design | | Statement indicating which option for compliance applies and confirming that project has been designed to meet the applicable requirements. | | MEC |
| | | | Final Design | | List of drawing and specification references that convey conformance to applicable requirements. | | MEC |
| | | | Final Design | | Narrative describing the project's ventilation design and CO2 monitoring system, including specifics about monitors, operational parameters and setpoints. | | MEC |
| | | | Closeout | X | Cut sheets for CO2 monitoring system. | | PE |
| EQ2 | | Increased Ventilation | Final Design | | Statement indicating which option for compliance applies and confirming that project has been designed to meet the applicable requirements. | | MEC |
| | | | Final Design | | Narrative describing the project's ventilation design, including specifics about zone fresh air intake volumes and demonstrating compliance. | | MEC |
| | | | Final Design | | Option 2: Narrative describing design method used for determining natural ventilation design, including calculation methodology/model results and demonstrating compliance. | | MEC |
| | | | Final Design | | List of drawing and specification references that convey conformance to applicable requirements. | | MEC |
| EQ3.1 | | Construction IAQ Management Plan: During Construction | **Preconstruction | | Construction IAQ Management Plan | | PE |
| | | | Closeout | | Statement confirming whether air handling units were operated during construction | | PE |
| | | | Closeout | | Dated jobsite photos showing examples of IAQ management plan practices being implemented. Label photos to indicate which practice they demonstrate. Minimum one photo of each practice at each building. | | PE |

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| | | | Closeout | | Spreadsheet indicating, for each filter installed during construction, the manufacturer, model number, MERV rating, location installed, and if it was replaced immediately prior to occupancy. | | PE |
| EQ3.2 | | Construction IAQ Management Plan: Before Occupancy | **Preconstruction | | Construction IAQ Management Plan | | PE |
| | | | Closeout | | Statement indicating which option for compliance applies and confirming that required activities have occurred that meet the applicable requirements. | | PE |
| | | | Closeout | | Option 1a: Narrative describing the project's flushout process, including specifics about temperature, airflow and duration, special considerations (if any) and demonstrating compliance. | | PE |
| | | | Closeout | | Option 1b: Narrative describing the project's pre-occupancy and post-occupancy flushout processes, including specifics about temperature, airflow and duration, special considerations (if any) and demonstrating compliance. | | PE |
| | | | Closeout | | Option 2: Narrative describing the project's IAQ testing process, including specifics about contaminants tested for, locations, remaining work at time of test, retest parameters and special considerations (if any). | | PE |
| | | | Closeout | | Option 2: IAQ testing report demonstrating compliance. | | PE |
| EQ4.1 | | Low Emitting Materials: Adhesives & Sealants | Closeout | | Spreadsheet indicating, for each applicable indoor adhesive, sealant and sealant primer used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data. | | PE |
| | | | Closeout | | Spreadsheet indicating, for each applicable indoor aerosol adhesive, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data - OR - Statement confirming no indoor aerosol adhesives were used for the project. | | PE |
| | | | Closeout | X | Manufacturer published product data or certification confirming material VOCs in spreadsheet | | PE |
| EQ4.2 | | Low Emitting Materials: Paints & Coatings | Closeout | | Spreadsheet indicating, for each applicable indoor paint and coating used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data. | | PE |
| | | | Closeout | | Spreadsheet indicating, for each applicable indoor anti-corrosive/anti-rust paint and coating used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data - OR - Statement confirming no indoor anti-corrosive/anti-rust paints were used for the project . | | PE |
| | | | Closeout | X | Manufacturer published product data or certification confirming material VOCs in spreadsheet | | PE |
| EQ4.3 | | Low Emitting Materials: Flooring Systems | Closeout | | Spreadsheet indicating, for each indoor flooring system used, the manufacturer, product name/model number, if it meets LEED requirement (yes/no) and source of LEED compliance data. | | PE |
| | | | Closeout | | Spreadsheet indicating, for each indoor carpet cushion used, the manufacturer, product name/model number, if it meets LEED requirement (yes/no) and source of LEED compliance data - OR - Statement confirming no indoor carpet cushion was used for the project. | | PE |
| | | | Closeout | X | Manufacturer published product data or certification confirming material compliance label in spreadsheet | | PE |
| EQ4.4 | | Low Emitting Materials: Composite Wood & Agrifiber Products | Closeout | | Spreadsheet indicating, for each indoor composite wood and agrifiber product used, the manufacturer, product name/model number, if it contains added urea formaldehyde (yes/no) and source of LEED compliance data. | | PE |
| | | | Closeout | X | Manufacturer published product data or certification confirming material urea formaldehyde in spreadsheet | | PE |
| EQ5 | | Indoor Chemical & Pollutant Source Control | Closeout | | Spreadsheet indicating, for each permanent entryway system used, the manufacturer, product name/model number and description of system. | | PE |
| | | | Final Design | | List of drawing and specification references that convey locations and installation methods for entryway systems. | | ARC |
| | | | Final Design | | Spreadsheet indicating, for each chemical use area, the room number, room name, description of room separation features (walls, floor/ceilings, openings) and pressure differential from surrounding spaces with doors closed - OR - Statement confirming that project includes no chemical use areas and that no hazardous cleaning materials are needed for building maintenance. | | ARC MEC |
| | | | Final Design | | If project includes chemical use areas: List of drawing and specification references that convey locations of chemical use areas, room separation features and exhaust system. | | ARC MEC |

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| | | | Final Design | | If project includes places where water and chemical concentrate mixing occurs: List of drawing and specification references that convey provisions for containment of hazardous liquid wastes OR - Statement confirming that project includes no places where water and chemical concentrate mixing occurs. | | ARC MEC |
| | | | Closeout | | If project includes chemical use areas: Spreadsheet indicating, for AHUs/mechanical ventilation equipment serving occupied areas, the manufacturer, model number, MERV rating, location installed, and if it was replaced immediately prior to occupancy (yes/no) - OR - Statement confirming that project does not use mechanical equipment for ventilation of occupied areas. | | PE |
| EQ6.1 | | Controllability of Systems: Lighting | Final Design | | Calculation indicating total number of individual workstations, number of workstations with individual lighting controls and the percentage of workstations with individual lighting controls. | | ELEC |
| | | | Final Design | | For each shared multi-occupant space, provide a brief description of lighting controls. | | ELEC |
| | | | Final Design | | Narrative describing lighting control strategy, including type and location of individual controls and type and location of controls in shared multi-occupant spaces. | | ELEC |
| EQ6.2 | | Controllability of Systems: Thermal Comfort | Final Design | | Calculation indicating total number of individual workstations, number of workstations with individual thermal comfort controls and the percentage of workstations with individual thermal comfort controls. | | MEC |
| | | | Final Design | | For each shared multi-occupant space, provide a brief description of thermal comfort controls. | | MEC |
| | | | Final Design | | Narrative describing thermal comfort control strategy, including type and location of individual and shared multi-occupant controls. | | MEC |
| EQ7.1 | | Thermal Comfort: Design | Final Design | | Design criteria spreadsheet indicating, for spring, summer, fall and winter, maximum indoor space design temperature, minimum indoor space design temperature and maximum indoor space design humidity. | | MEC |
| | | | Final Design | | Narrative describing method used to establish thermal comfort control conditions and how systems design addresses the design criteria, including compliance with the referenced standard. | | MEC |
| EQ7.2 | | Thermal Comfort: Verification | Final Design | | Narrative describing the scope of work for the thermal comfort survey, including corrective action plan development | | MEC |
| | | | Final Design | | List of drawing and specification references that convey permanent monitoring system. | | MEC |
| EQ8.1 | | Daylight & Views: Daylight 75% of Spaces | Final Design | | Option 2: Table indicating all regularly occupied spaces with space area and space area with compliant daylight zone. Sum of regularly occupied areas and regularly occupied areas withcompliant daylight zone. Percentage calculation of areas withcompliant daylight zone to total regularly occupied areas. | | ARC |
| | | | Final Design | | Option 1: Simulation model method, software and output data | | ELEC |
| | | | Final Design | | Option 1: Table indicating all regularly occupied spaces with space area, space area with minimum 25 footcandles daylighting illumination, and method of providing glare control. Sum of regularly occupied areas and regularly occupied areas with 25 fc daylighting. Percentage calculation of areas with 25 fc daylighting to total regularly occupied areas. | | ELEC |
| | | | Final Design | | For all occupied spaces excluded from the calculation, provide narrative indicating reasons for excluding the space. | | ARC |
| | | | Final Design | | List of drawing and specification references that convey exterior glazed opening head and sill heights, glazing performance properties and glare control/sunlight redirection devices. | | ARC |
| | | | Closeout | X | Manufacturer published product data or certification confirming glazing Tvis in spreadsheet | | PE |
| EQ8.2 | | Daylight & Views: Views for 90% of Spaces | Final Design | | Table indicating all regularly occupied spaces with space area and space area with access to views. Sum of regularly occupied areas and regularly occupied areas with access to views. Percentage calculation of areas with views to total regularly occupied areas. | | ARC |
| | | | Final Design | | For all occupied spaces excluded from the calculation, provide narrative indicating reasons for excluding the space. | | ARC |
| | | | Final Design | | LEED Floor plan drawings showing line of sight diagramming of views areas in each regularly occupied space. List of drawing/specification references that convey exterior glazed opening head and sill heights. | | ARC |
| | | | | | | | |
| **INNOVATION & DESIGN PROCESS** | | | | | | | |

| LEED Credit Paragraph | Contractor Check Here if Credit is Claimed | **LEED-NC v3 Submittals (OCT09)** | | Provide for Credit Audit Only | | Date Submitted (to be filled in by Contractor) | Government Reviewer's Use |
|---|---|---|---|---|---|---|---|
| **PAR** | | **FEATURE** | **DUE AT** | | **REQUIRED DOCUMENTATION** | **DATE** | **REV** |
| IDc1.1 | | Innovation in Design | Final Design | | Narrative decribing intent, requirement for credit, project approach to the credit. List of drawings and specification references that convey implementation of credit. All other documentation that validates claimed credit. | | |
| IDc1.2 | | Innovation in Design | Final Design | | | | |
| IDc1.3 | | Innovation in Design | Final Design | | | | |
| IDc1.4 | | Innovation in Design | Final Design | | | | |
| IDc2 | | LEED Accredited Professional | Final Design | | Narrative indicating name of LEED AP, company name of LEED AP, description of LEED AP's role and responsiblilities in the project. | | ARC |
| | | | | | | | |

**ATTACHMENT F**
Version 05-31-2011

**BUILDING INFORMATION MODELING REQUIREMENTS**

## 1.0 Section 1 - General

1.1. Definitions. See Section 7 for definitions of terms used in this document.

1.2. Submittal Format

1.2.1. The Model shall be developed using Building Information Modeling ("BIM") supplemented with Computer Aided Design ("CAD") content as necessary to produce a complete set of Construction Documents. Printed design submittal drawings shall be [Not Supplied - SubmittalReqDistribution : FULL_SIZE] size, suitable for half-size scaled reproduction.

1.2.2. BIM submittals shall conform to the requirements of Sections 3 and 4 below.

1.2.3. For each Center of Standardization (CoS) facility type included in this Project, all Models and associated Facility Data shall be submitted in Bentley BIM Workspace V8. The submittals shall be fully operable, compatible, and editable within the native BIM tools.

## 2.0 Section 2 – Design Requirements

2.1. Use of BIM for Design. Contractor shall use BIM application(s) and software(s) to develop Project designs consistent with the following requirements.

2.1.1. Baseline Model. The Contractor will not be provided a baseline multi-discipline BIM Project Model.

2.1.2. USACE BIM Workspace. The USACE Bentley BIM Workspace Workspace V8 must be used and can be downloaded from the CAD/BIM Technology Center website, currently https://cadbim.usace.army.mil.

2.1.3. Reference. Refer to ERDC TR-06-10, "U.S. Army Corps of Engineers Building Information Modeling Road Map" from the CAD/BIM Technology Center website for more information on the USACE BIM implementation goals.

2.1.4. Industry Foundation Class (IFC) Support. The Contractor's selected BIM application(s) and software(s) must be consistent with the current IFC property sets. Any deviations from or additions to the IFC property sets for any new spaces, systems, and equipment must be submitted for Government acceptance.

2.1.5. BIM Project Execution Plan.

2.1.5.1. Develop a BIM Project Execution Plan ("Plan" or "PxP") documenting the BIM uses, analysis technologies and workflows.

2.1.5.2. Contractors shall utilize the link for the USACE BIM PROJECT EXECUTION PLAN (USACE PxP) Template located in Attachment H to develop an acceptable Plan.

2.2. BIM Requirements.

2.2.1. Facility Data. Develop the Facility Data to include material definitions and attributes that are necessary for the Project facility design and construction as described in Section 4.0. Additional data in support of Section 6.0 Contractor Electives is encouraged to be added to the Model.

2.2.2. Model Content. The Model and Facility Data shall include, at a minimum, the requirements of Section 4 below.

2.2.3. Model Granularity. Individual elements may vary in level of detail within the Model, but at a minimum must include all features that would be included on a quarter inch (1/4" = 1'0") scaled drawing (e.g., at least 1/16th, 1/8th and 1/4th), or on appropriately scaled civil drawings.

2.3. Output. Submitted Drawings (e.g., plans, elevations, sections, schedules, details, etc.) shall be derived (commonly known as extractions, views or sheets) from the Model and Facility Data. Drawings derived from the Model shall remain connected to the Model for the life of the Project and documented in the PxP. Drawings not derived from the Model shall also be documented in the PxP.

2.3.1. Drawings derived from the Model shall be compliant with the A/E/C CAD Standard. Deliver electronic CAD files used for the creation of the Construction Documents per requirements in Section 01 33 16, the criteria of the USACE Tulsa District, and as noted herein.

2.3.2. The CAD file format specified for drawings shall not dictate which application(s) are used for development and execution of the Model and Facility Data. Application(s) used shall be documented in the PxP.

2.4. Quality Control Parameters. Implement quality control ("QC") parameters for the Model, including:

2.4.1. Model Standards Checks. QC validation ensures that the Project Facility Data set has no undefined, incorrectly defined or duplicated elements. Identify and report non-compliant elements and submit a corrective action plan. Provide the Government with detailed justification and request Government acceptance for any non-compliant element that the Contractor proposes to be allowed to remain in the Model.

2.4.2. CAD Standards Checks. QC checking ensures that the fonts, dimensions, line styles, levels and other construction document formatting issues are followed per requirements in Section 01 33 16. Identify and report non-compliant content and submit a corrective action plan.

2.4.3. Other Parameters. Develop such other QC parameters as Contractor deems appropriate for the Project and provide to the Government for acceptance.

2.5. Design and Construction Reviews. Perform design and construction reviews at each submittal stage under Section 3 to test the Model, including:

2.5.1. Visual Checks. Checking to ensure the design intent has been followed and that there are no unintended elements in the Model.

2.5.2. Interference Management Checks. Locate conflicting spatial data in the Model where two elements are occupying the same space. Log hard interferences (e.g., mechanical vs. structural, or mechanical vs. mechanical, overlaps in the same location) and soft interferences, (e.g., conflicts regarding equipment clearance, service access, fireproofing, insulation, code space requirements) in a written report and resolve.

2.5.3. IFC Coordination View. Provide an IFC Coordination View in IFC Express format for all deliverables. Provide exported property set data for all IFC supported named building elements.

2.5.4. Other Parameters. Develop other design and construction review parameters as the Contractor deems appropriate for the Project and provide to the Government for acceptance.

**3.0 Section 3 – Submittal Requirements**

3.1. General Submittal Requirements.

3.1.1. Provide submittals in compliance with the PxP deliverables at stages as described below.

3.1.2. For each Interim Design Submittal as set forth in Paragraphs 3.3 through 3.6, provide a Contractor-certified written report confirming that consistency checks as identified in Paragraphs 2.4 and 2.5 above have been completed. This report shall be discussed as part of the review process and shall address cross-discipline interferences, if any.

3.1.3. At each Interim Design Submittal as set forth in Paragraphs 3.3 through 3.6, provide the Government with:

3.1.3.1. The Model, Facility Data, Workspace and CAD Data files in the native BIM/CAD format.

3.1.3.2. A copy of the Model in an interactive review format such as Bentley Navigator, Autodesk Navisworks, Adobe 3D PDF 7.0 (or later), Google Earth KMZ or other format per PxP requirements. The format for reviews can change between submittals.

3.1.3.3. A list of all submitted electronic files including a description, directory, and file name for each file submitted. For all CAD printed sheets, include a list of the sheet titles and sheet numbers. Identify which files have been produced from the Model and Facility Data.

3.1.4. The Government shall confirm acceptability of all submittals identified in Section 3 in coordination with the USACE Geographic District BIM Manager.

3.2. Initial Design Conference Submittal.

3.2.1. Submit a digital copy of the PxP where, in addition to Paragraph 3.1.4, the USACE Geographic District BIM Manager will coordinate with the USACE CoS BIM Manager to confirm acceptability of the Plan or advise as to additional processes or activities necessary to be incorporated into the PxP.

3.2.2. Within thirty (30) days after the acceptance of the PxP, conduct a demonstration to review the Plan for clarification, and to verify the functionality of planned Model technology workflow and processes. If modifications are required, the Contractor shall complete the modifications and resubmit the PxP performing a subsequent demonstration for Government acceptance. There will be no payment for design or construction until the PxP is completed and accepted by the Government. The Government may also withhold payment if there is design and construction for unacceptable performance in executing the accepted PxP.

3.3. Interim Design Submittals.

3.3.1. BIM and CAD Data. Submit the Model with Facility Data per the requirements identified in Paragraphs 2.2 and 2.3 as applicable to the Interim Design package(s).

3.4. Final Design Submissions and Design Complete Submittals.

3.4.1. BIM and CAD Data. Submit the Model with Facility Date per the requirements identified in Paragraphs 2.2 and 2.3. Acceptance according to Paragraph 3.1.4 is required before commencement of construction, as described in Paragraph 3.7.6 of Section 01 33 16.

3.5. Construction Submittals – Over-The-Shoulder Progress Reviews. Periodic quality control meetings or construction progress review meetings shall include quality control reviews on the implementation and use of the Model, including interference management and design change tracking information.

3.6. Final As-Built BIM and CAD Data Submittal. Submit the final Model, Facility Data, and CAD files reflecting as-built construction conditions for Government acceptance, as specified in Section 01 78 02.00 10, PROJECT CLOSEOUT.

**4.0 Section 4 – BIM Model Minimum Requirements and Output**

4.1. General Provisions. The Model shall be developed to include the systems described below as they would be built, the processes of installing them, and to reflect final as-built construction conditions. The deliverable Model at the Interim Design Stage and at the Final Design Stage ("released for construction") shall be developed to include as many of the systems described below as are necessary and appropriate at that design stage.

4.2. Architectural/Interior Design. The Architectural systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Additional minimum Model requirements include:

4.2.1. Spaces. The Model shall include spaces defining actual net square footage and net volume, and holding data to develop the room finish schedule including room names and numbers. Include program information to verify design space against programmed space, using this information to validate area quantities.

4.2.2. Walls and Curtain Walls. Each wall shall be depicted to the exact height, length, width and ratings (thermal, acoustic, fire) to properly reflect wall types. The Model shall include all walls, both interior and exterior, and the necessary intelligence to produce accurate plans, sections and elevations depicting these design elements.

4.2.3. Doors, Windows and Louvers. Doors, windows and louvers shall be depicted to represent their actual size, type and location. Doors and windows shall be modeled with the necessary intelligence to produce accurate window and door schedules.

4.2.4. Roof. The Model shall include the roof configuration, drainage system, penetrations, specialties, and the necessary intelligence to produce accurate plans, building sections and generic wall sections where roof design elements are depicted.

4.2.5. Floors. The floor slab(s) shall be developed in the Structural Model and then referenced by the Architectural Model.

4.2.6. Ceilings. All heights and other dimensions of ceilings, including soffits, ceiling materials, or other special conditions shall be depicted in the Model with the necessary intelligence to produce accurate plans, building sections and wall sections where ceiling design elements are depicted.

4.2.7. Vertical Circulation. All continuous vertical components (i.e., non-structural shafts, architectural stairs, handrails and guardrails) shall be accurately depicted and shall include the necessary intelligence to produce accurate plans, elevations and sections in which such design elements are referenced.

4.2.8. Architectural Specialties. All architectural specialties (i.e., toilet room accessories, toilet partitions, grab bars, lockers, and display cases) and millwork (i.e., cabinetry and counters) shall be accurately depicted with the necessary intelligence to produce accurate plans, elevations, sections and schedules in which such design elements are referenced.

4.2.9. Signage. The Model shall include all signage and the necessary intelligence to produce accurate plans and schedules.

4.2.10. Schedules. Provide door, window, hardware sets using BHMA designations, flooring, wall finish, and signage schedules from the Model, indicating the type, materials and finishes used in the design.

4.3. Furniture. The furniture Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4”=1’0”) scaled drawing, and have necessary intelligence to produce accurate plans. Representation of furniture elements is to be 2D. Contractor may provide a minimal number of 3D representations as examples. Examples of furniture include, but are not limited to, desks, furniture systems, seating, tables, and office storage.

4.3.1. Furniture Coordination. Furniture that makes use of electrical, data or other features shall include the necessary intelligence to produce coordinated documents and data.

4.4. Equipment. The Model may vary in level of detail for individual elements. Equipment shall be depicted to meet layout requirements with the necessary intelligence to produce accurate plans and schedules, indicating the configuration, materials, finishes, mechanical, and electrical requirements.. Examples of equipment include but are not limited to copiers, printers, refrigerators, ice machines and microwaves.

4.4.1. Schedules. Provide furniture and equipment schedules from the model indicating the materials, finishes, mechanical, and electrical requirements.

4.5. Structural. The Structural systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4”=1’0”) scaled drawing. Additional minimum Model requirements include:

4.5.1. Foundations. All necessary foundation and/or footing elements, with necessary intelligence to produce accurate plans and elevations.

4.5.2. Floor Slabs. Structural floor slabs shall be depicted with all necessary recesses, curbs, pads, closure pours, and major penetrations accurately depicted.

4.5.3. Structural Steel. All steel columns, primary and secondary framing members, and steel bracing for the roof and floor systems (including decks), including all necessary intelligence to produce accurate structural steel framing plans, related building/wall sections, and schedules.

4.5.4. Cast-in-Place Concrete. All walls, columns, beams, including necessary intelligence to produce accurate plans and building/wall sections, depicting cast-in-place concrete elements.

4.5.5. Expansion/Contraction Joints. Joints shall be accurately depicted.

4.5.6. Stairs. All framing members for stair systems, including necessary intelligence to produce accurate plans and building/wall sections depicting stair design elements.

4.5.7. Shafts and Pits. All shafts and pits, including necessary intelligence to produce accurate plans and building/wall sections depicting these design elements.

4.5.8. Openings and Penetrations. All major openings and penetrations that would be included on a quarter inch (1/4”=1’0”) scaled drawing.

4.6. Mechanical. The Mechanical systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4”=1’0”)

scaled drawing. Small diameter (less than 1-1/2" NPS) field-routed piping is not required to be depicted in the Model. Additional minimum Model requirements include:

4.6.1. HVAC. All necessary heating, ventilating, air-conditioning and specialty equipment, including air distribution for supply, return, ventilation and exhaust ducts, control systems, registers, diffusers, grills, and hydronic baseboards with necessary intelligence to produce accurate plans, elevations, building/wall sections and schedules.

4.6.1.1. Mechanical Piping. All necessary piping and fixture layouts, and related equipment, including necessary intelligence to produce accurate plans, elevations, building/wall sections, and schedules.

4.6.2. Plumbing. All necessary plumbing piping and fixture layouts, floor and area drains, and related equipment, including necessary intelligence to produce accurate plans, elevations, building/wall sections, riser diagrams, and schedules.

4.6.3. Equipment Clearances. All Mechanical equipment clearances shall be modeled for use in interference management and maintenance access requirements.

4.6.4. Elevator Equipment. All necessary equipment and control systems, including necessary intelligence to produce accurate plans, sections and elevations depicting these design elements.

4.7. Electrical/Telecommunications. The Electrical and Telecommunications systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Small diameter (less than 1-1/2"Ø) field-routed conduit is not required to be depicted in the Model. Additional minimum Model requirements include:

4.7.1. Interior Electrical Power and Lighting. All necessary interior electrical components (i.e., lighting, receptacles, special and general purpose power receptacles, lighting fixtures, panelboards, cable trays and control systems), including necessary intelligence to produce accurate plans, details and schedules. Lighting and power built into furniture/equipment shall be modeled.

4.7.2. Special Electrical. All necessary special electrical components (i.e., security, mass notification, public address, nurse call and other special electrical occupancy sensors, and control systems), including necessary intelligence to produce accurate plans, details and schedules.

4.7.3. Grounding. All necessary grounding components (i.e., lightning protection systems, static grounding systems, communications grounding systems, and bonding), including necessary intelligence to produce accurate plans, details and schedules.

4.7.4. Telecommunications. All existing and new telecommunications service controls and connections, both above ground and underground, with necessary intelligence to produce accurate plans, details and schedules. Cable tray routing shall be modeled without detail of cable contents.

4.7.5. Exterior Building Lighting. All necessary exterior lighting including all lighting fixtures, relevant existing and proposed support utility lines and equipment with necessary intelligence to produce accurate plans, details and schedules.

4.7.6. Equipment Clearances. All Electrical equipment clearances shall be modeled for use in interference management and maintenance access requirements.

4.8. Fire Protection. The fire protection system Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Additional minimum Model requirements include:

4.8.1. Fire Protection System. All relevant fire protection components (i.e., branch piping, sprinkler heads, fittings, drains, pumps, tanks, sensors, control panels) with necessary intelligence to produce accurate plans, elevations, building/wall sections, riser diagrams, and schedules. All fire protection piping shall be modeled.

4.8.2. Fire Alarms. Fire alarm/mass notification devices and detection system shall be indicated with necessary intelligence to produce accurate plans depicting them.

4.9. Civil. The Civil Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a one inch (1"=100') scaled drawing. Additional minimum Model requirements include:

4.9.1. Terrain (DTM). All relevant site conditions and proposed grading, including necessary intelligence to produce accurate Project site topographical plans and cross sections.

4.9.2. Drainage. All existing and new drainage piping, including upgrades thereto, including necessary intelligence to produce accurate plans and profiles for the Project site.

4.9.3. Storm Water and Sanitary Sewers. All existing and new sewer structures and piping, including upgrades thereto, with necessary connections to mains or other distribution points as appropriate, including necessary intelligence to produce accurate plans and profiles .

4.9.4. Utilities. All necessary new utilities connections from the Project building(s) to the existing or newly-created utilities, and all existing above ground and underground utility conduits, including necessary intelligence to produce accurate plans and site-sections.

4.9.5. Roads and Parking. All necessary roadways, parking lots, and parking structures, including necessary intelligence to produce accurate plans, profiles and cross-sections.

## 5.0 Section 5 - Ownership and Rights in Data

5.1. Ownership. The Government has ownership of and rights at the date of Closeout Submittal to all CAD files, BIM Model, and Facility Data developed for the Project in accordance with FAR Part 27, clauses incorporated in Section 00 72 00, Contract Clauses and Special Contract Requirement 1.14 GOVERNMENT RE-USE OF DESIGN (Section 00 73 00). The Government may make use of this data following any deliverable.

## 6.0 Section 6 – Contractor Electives

6.1. Applicable Criteria. If the Contractor elected to include one or more of the following features as an elective in its accepted contract proposal for additional credit, as described in the proposal submission requirements and evaluation criteria, the requirements of paragraphs 6.2 through 6.5 are as applicable for those elective feature(s) that will be included in the project.

6.2. COBIE Compliance. The Model and Facility Data for the Project shall fulfill Construction Operations Building Information Exchange (COBIE) requirements on the Whole Building Design Guide website (www.wbdg.org) , including all requirements for the indexing and submission of Portable Document Format (PDF) and other appropriate records that would otherwise be printed and submitted in compliance with Project operations and maintenance handover requirements.

6.3. Project Scheduling using the Model. In the PxP and during the Initial Design Conference Submittal Demonstration, provide an overview of the use of BIM in the development and support of the Project construction schedule.

6.3.1. Submittal Requirements. During the Stages identified in Paragraphs 3.3 through 3.6, the Contractor shall deliver the construction schedule derived from the Model.

6.3.1.1. Construction Submittals – Over-The-Shoulder Progress Reviews. Periodic quality control meetings or construction progress review meetings shall include quality control reviews on the implementation and use of the Model for Project scheduling.

6.4. Cost Estimating. In the PxP and during the Initial Design Conference Submittal Demonstration, provide an overview of the use of BIM in the development and support of cost estimating, or other costing applications such as comparative cost analysis for proposed changes and estimate validation.

6.4.1. Submittal Requirements. During the Stages identified in Paragraphs 3.3 through 3.6, the Contractor shall deliver cost estimating information derived from the Model.

6.4.2. Project Completion. At Project completion, the Contractor shall provide an Micro Computer Aided Cost Estimating System Generation II ("MII") Cost Estimate that follows the USACE Cost Engineering Military Work Breakdown System ("WBS"), a modified Uniformat, to at least the sub-systems level and uses quantity information supplied directly from Model output to the maximum extent possible, though other "gap" quantity information will be included by the contractor as necessary for a complete and accurate Cost Estimate. (See Paragraph 6.4.2.2).

6.4.2.1. Sub system level extracted quantities from the Model for use within the Estimate shall be provided according to how detailed line items or tasks should be installed/built so that accurate costs can be developed and/or reflected. When developing a Model, the contractor shall be cognizant of construction sequencing at the beginning stages of Model development, such as recognizing tasks performed on the first floor versus the same task on higher floors that will be more labor intensive and, therefore, need to have a separate quantity and be priced differently. Tasks and their extracted quantities from the Model shall be broken down by their location (proximity in the structure) as well as the complexity of installation.

6.4.2.2. At all design Stages it shall be acknowledged that BIM output will not generate all quantities that are necessary in order to develop a complete and accurate cost estimate of the Project based on the design alone. (An example of this would be plumbing that is less than 1.5" diameter and, therefore, not expected to be modeled due to permitted level of design granularity; this information is commonly referred to as "The Gap". Quantities addressing "The Gap" and their associated costs shall be included in the final Project actual Cost Estimates as well even though not derived directly from the Model data).

6.5. Other Analyses and Reports. Structural, energy and efficiency, EPACT 2005 & EISA 2007, lighting design, daylighting, electrical power, psychrometric processing, shading, programming, LEED, fire protection, code compliance, Life Cycle Cost, acoustic, plumbing and other analyses that may be generated from the Model or reports summarizing the data compiled from these analyses shall be submitted in the form established by contractor in its accepted PxP.

## 7.0 Definitions

7.1. The following definitions apply specifically in the context of this attachment only.

7.2. "Model": An electronic, three-dimensional representation of facility elements with associated intelligent attribute data ("Facility Data").

7.3. "Facility Data": The non-graphical information attached to objects in the Model that defines various characteristics of the object. Facility Data can include properties such as parametric values that drive physical sizes, material definitions and characteristics (e.g. wood, metal), manufacturer data, industry standards (e.g. AISC steel properties), and project identification numbers. Facility Data can also

define supplementary physical entities that are not shown graphically in the Model, such as insulation around a duct, or hardware on a door.

7.4. "Workspace": A collection of content libraries and supporting files that define and embody a BIM standard. A workspace includes BIM libraries such as wall types, standard steel shapes, furniture, HVAC fittings, and sprinkler heads. It also contains sheet libraries such as print/plot configurations, font and text style libraries, and sheet borders and title blocks. The USACE has developed Workspaces specific to USACE BIM standards; these workspaces are dependent on specific versions of the BIM applications they serve. All USACE BIM Workspaces can be downloaded from the CAD/BIM Technology Center (https://cadbim.usace.army.mil). In some cases, there is a specific Workspace for a given CoS Facility Standard Design.

7.5. "IFC": Industry Foundation Class, a standard and file format used for the exchange of BIM data; see www.iai-tech.org. Note: In the context of this attachment, IFC does not mean "Issued For Construction."

**ATTACHMENT G**
**DESIGN SUBMITTAL DIRECTORY AND SUBDIRECTORY FILE ARRANGEMENT**

Organize electronic design submittal files in a subdirectory/file structure in accordance with the following table.

The Contractor may suggest a slightly different structure, subject to the discretion of the government.

**Design Submittal Directory and Subdirectory File Arrangement.**

| Directory | Sub-Directory | Sub-Directory or Files | Files |
|---|---|---|---|
| Submittal/Package Name | Narratives | PDF file or files with updated design narrative for each applicable design discipline | |
| | Drawings | PDF (subdirectory) | Single PDF file with all applicable drawing sheets - bookmarked by sheet number and name |
| | | BIM (subdirectory) See Attachment F. | BIM project folder (with files) per the USACE Workspace. Include an Excel drawing index file with each drawing sheet listed by sheet #, name and corresponding dgn file name (Final Design & Design Complete only) |
| | Design Analysis & Calculations | Individual PDF files containing design analysis and calculations for each discipline applicable to the submittal | |
| | | PDF file with Fire Protection and Life Safety Code Review checklist | |
| | LEED | PDF file with updated Leed Check List | |
| | | PDF file or files with LEED Templates for each point with applicable documentation included in each file. | |
| | | LEED SUBMITTALS | |
| | Energy Analysis | PDF with baseline energy consumption analysis | |
| | | PDF with actual building energy consumption analysis | |
| | Specifications | Single PDF file with table of contents and all applicable specifications sections. | |
| | | Submittal Register (Final Design & Design Complete submittal only) | |
| | Design Quality Control | PDF file or files with DQC checklist(s) and/or statements | |
| | Building Rendering(s) | PDF file of rendering for each building type included in contract (Final Design & Design Complete). | |

**ATTACHMENT H**
**USACE BIM Project Execution Plan (PxP) Template Version 1.0**

This template is a tool that is provided to assist in the development of a USACE BIM Project Execution Plan as required per contract. The template provides a standard format for organizations to establish their general means and methods for meeting the scope and deliverable requirements in Attachment F. It was adapted from the buildingSMART alliance™ (bSa) Project "BIM Project Execution Planning" as developed by The Computer Integrated Construction (CIC) Research Group of The Pennsylvania State University. The bSa project is sponsored by The Charles Pankow Foundation, Construction Industry Institute (CII), Penn State Office of Physical Plant (OPP), and The Partnership for Achieving Construction Excellence (PACE). The template can be found at the following link:

https://mrsi.usace.army.mil/rfp/Shared%20Documents/USACE_BIM_PXP_TEMPLATE_V1.0.pdf

Please note: Instructions and examples to assist with the completion of this template are currently in grey. The text can and should be modified to suit the needs of the organization filling out the template. If modified, the format of the text should be changed to match the rest of the document. This can be completed, in most cases, by selecting the normal style in the template styles.

# SECTION 01 45 04.00 10
# CONTRACTOR QUALITY CONTROL

**1.0 GENERAL**

1.1. REFERENCES

1.2. PAYMENT

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## 1.0 GENERAL

### 1.1. REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Refer to the latest edition, as of the date of the contract solicitation.

- ASTM INTERNATIONAL (ASTM)
- ASTM D 3740 Minimum Requirements for Agencies

  Engaged in the Testing and/or Inspection
  of Soil and Rock as Used in Engineering
  Design and Construction
- ASTM E 329 Agencies Engaged in the Testing

  and/or Inspection of Materials Used in
  Construction
- U.S. ARMY CORPS OF ENGINEERS (USACE)

  ER 1110-1-12 Quality Management

### 1.2. PAYMENT

There will be no separate payment for providing and maintaining an effective Quality Control program. Include all costs associated therewith in the applicable unit prices or lump-sum prices contained in the Contract Line Item Schedule.

## 2.0 PRODUCTS (Not Applicable)

## 3.0 EXECUTION

### 3.1. GENERAL REQUIREMENTS

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product, which complies with the contract requirements. The system shall cover all design and construction operations, both onsite and offsite, and shall be keyed to the proposed design and construction sequence. The site project superintendent is responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. The site project superintendent in this context shall be the highest level manager at the site, responsible for the overall site activities, including but not limited to quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the Contracting Officer, and shall be responsible for all construction and construction related activities at the site. Different contractors have different names for the on-site overall project supervisor. For clarification, the term “site project superintendent” refers to the Contractor’s senior site representative or “on-site manager”, or other similar title, as those terms are used in contract Clause 52.236-7, “Superintendence by the Contractor” and in the Division 00 Section(s) of the solicitation for this contract or task order,.or elsewhere in the contract. It does not refer to a construction superintendent, unless that person is also the Contractor’s permanently assigned senior site representative in charge of all on-site activities.

### 3.2. QUALITY CONTROL PLAN

Furnish for Government review, not later than 30 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 30 days of operation. Design and construction may begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. The Government will not permit work outside of the features of work included in an accepted interim plan to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started. Where the applicable Code issued by the International Code Council calls for an inspection by the Building Official, the Contractor shall include the inspections in the Quality Control Plan and shall perform the inspections. The Designer of Record shall develop a program for any special inspections required by the applicable International Codes and the Contractor shall perform these inspections, using qualified inspectors. Include the special inspection plan in the QC Plan.

3.2.1. Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all design and construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents subcontractors, designers of record, consultants, architect/engineers (AE), fabricators, suppliers, and purchasing agents:

3.2.1.1. A description of the quality control organization. Include a chart showing lines of authority and an acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. A CQC System Manager shall report to the project superintendent or someone higher in the contractor's organization.

3.2.1.2. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function. Also include those responsible for performing and documenting the inspections required by the International Codes and the special inspection program developed by the designer of record.

3.2.1.3. A copy of the letter to the CQC System Manager, signed by an authorized official of the firm, which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Furnish copies of these letters.

3.2.1.4. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents subcontractors, designers of record, consultants, architect engineers (AE), offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

3.2.1.5. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. Use only Government approved Laboratory facilities.

3.2.1.6. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

3.2.1.7. Procedures for tracking design and construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

3.2.1.8. Reporting procedures, including proposed reporting formats.

3.2.1.9. A list of the definable features of work. A definable feature of work is a task, which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

3.2.1.10. A list of all inspections required by the International Codes and the special inspection program required by the code and this contract.

3.2.2. Additional Requirements for Design Quality Control (DQC) Plan

The following additional requirements apply to the Design Quality Control (DQC) plan:

3.2.2.1. The Contractor's QCP Plan shall provide and maintain a Design Quality Control (DQC) Plan as an effective quality control program which will assure that all services required by this design-build contract are performed and provided in a manner that meets professional architectural and engineering quality standards. As a minimum, competent, independent reviewers identified in the DQC Plan shall review all documents. Use personnel who were not involved in the design effort to produce the design to perform the independent technical review (ITR). The ITR is intended as a quality control check of the design. Include, at least, but not necessarily limited to, a review of the contract requirements (the accepted contract or task order proposal and amended RFP), the basis of design, design calculations, the design configuration management documentation and check the design documents for errors, omissions, and for coordination and design integration. The ITR team is not required to examine, compare or comment concerning alternate design solutions but should concentrate on ensuring that the design meets the contract requirements. Correct errors and deficiencies in the design documents prior to submitting them to the Government.

3.2.2.2. Include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. Submit these completed checklists at each design phase as part of the project documentation.

3.2.2.3. A Design Quality Control Manager, who has the responsibility of being cognizant of and assuring that all documents on the project have been coordinated, shall implement the DQC Plan This individual shall be a person who has verifiable engineering or architectural design experience and is a registered professional engineer or architect. Notify the Government, in writing, of the name of the individual, and the name of an alternate person assigned to the position.

3.2.2.4. Develop and maintain effective, acceptable design configuration management (DCM) procedures to control and track all revisions to the design documents after the Interim Design Submission through submission of the As-Built documents. Include the DCM plan as a subset of the DQC Plan. See Section ‘Design After Award’.

3.2.3. Acceptance of Plan

Government acceptance of the Contractor's plan is required prior to the start of design and construction. Acceptance is conditional and will be predicated on satisfactory performance during the design and construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4. Notification of Changes

After acceptance of the CQC Plan, notify the Government in writing of any proposed change. Proposed changes are subject to Government acceptance.

3.3. COORDINATION MEETING

After the Postaward Conference, before start of design or construction, and prior to acceptance by the Government of the CQC Plan, the Contractor and the Government shall meet and discuss the Contractor's quality control system. Submit the CQC Plan for review a minimum of 7 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, design activities, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. The Government will prepare minutes of the meeting for signature by both parties. . The minutes shall become a part of the contract file. There may be occasions when either party will call for subsequent conferences to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4. QUALITY CONTROL ORGANIZATION

3.4.1. Personnel Requirements

The requirements for the CQC organization are a CQC System Manager, a Design Quality Manager, and sufficient number of additional qualified personnel to ensure contract compliance. The CQC organization shall also include personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. Provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly furnish complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation to the CQC organization. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2. CQC System Manager

Identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a BA/BS graduate of an ACCE accredited construction management college program. The CQC system Manager may alternately be an engineering technician with at least 2 years of college and an ICC certification as a Commercial Building Inspector (Residential Building Inspector certification will be required for Military Family Housing projects). In addition, the CQC system manager shall have a minimum of 5 years construction experience on construction similar to this contract. The CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. Assign the CQC System Manager no other duties (except may also serve as Safety and Health Officer, if qualified and if allowed by Section 00 73 00, or by Section 00 73 10 if this is a task order). Identify an alternate for the CQC System Manager in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager but the alternate may have other duties in addition to serving in a temporary capacity as the acting QC manager.

3.4.3. CQC Personnel

3.4.3.1. In addition to CQC personnel specified elsewhere in the contract provide specialized CQC personnel to assist the CQC System Manager in accordance with paragraph titled Area Qualifications.

3.4.3.2. These individuals may be employees of the prime or subcontractor; be responsible to the CQC System Manager; **are not intended to be full time, but must be physically present at the construction site during work on their areas of responsibility**; have the necessary education and/or

experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan. **One person may cover more than one area, provided that they are qualified to perform QC activities for the designated areas below and provided that they have adequate time to perform their duties:**

3.4.4. Experience Matrix

3.4.4.1. Area Qualifications

3.4.4.1.1. Civil - Graduate Civil Engineer or (BA/BS) graduate in construction management with 4 years experience in the type of work being performed on this project or engineering technician with 5 yrs related experience.

3.4.4.1.2. Mechanical - Graduate Mechanical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or engineering technician with an ICC certification as a Commercial Mechanical Inspector with 5 yrs related experience.

3.4.4.1.3. Electrical - Graduate Electrical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or engineering technician with an ICC certification as a Commercial Electrical Inspector with 5 yrs related experience.

3.4.4.1.4. Structural - Graduate Structural Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or person with an ICC certification as a Reinforced Concrete Special Inspector and Structural Steel and Bolting Special Inspector (as applicable to the type of construction involved) with 5 yrs related experience.

3.4.4.1.5. Plumbing - Graduate Mechanical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience, or person with an ICC certification as a Commercial Plumbing Inspector with 5 yrs related experience.

3.4.4.1.6. Concrete, Pavements and Soils Materials Technician (present while performing tests) with 2 yrs experience for the appropriate area

3.4.4.1.7. Testing, Adjusting and Balancing Specialist must be a member (TAB) Personnel of AABC or an experienced technician of the firm certified by the NEBB (present while testing, adjusting, balancing).

3.4.4.1.8. Design Quality Control Manager Registered Architect or Professional Engineer (not required on the construction site)

3.4.4.1.9. Registered Fire Protection Engineer with 4 years related experience or engineering technician with 5 yrs related experience (but see requirements for Fire Protection Engineer of Record to witness final testing in Section 01 10 00, paragraph 5.10, Fire Protection).

3.4.4.1.10. QC personnel assigned to the installation of the telecommunication system or any of its components shall be Building Industry Consulting Services International (BICSI) Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification. In lieu of BICSI certification, QC personnel shall have a minimum of 5 years experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products. QC personnel shall witness and certify the testing of telecommunications cabling and equipment.

3.4.5. Additional Requirement

In addition to the above experience and/or education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management for Contractors". This course is periodically offered at Tulsa District Office, 1645 S. 101 E. Ave., Tulsa, OK. Inquire of the District or Division sponsoring the course for fees and other expenses involved, if any, for attendance at this course.

3.4.6. Organizational Changes

When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5. SUBMITTALS AND DELIVERABLES

Make submittals as specified in Section 01 33 00 ***SUBMITTAL PROCEDURES***. The CQC organization shall certify that all submittals and deliverables are in compliance with the contract requirements.

3.6. CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. The CQC organization shall conduct at least three phases of control for each definable feature of the construction work as follows:

3.6.1. Preparatory Phase

Perform this phase prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

3.6.1.1. A review of each paragraph of applicable specifications, reference codes, and standards. Make a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field at the preparatory inspection. Maintain these copies in the field, available for use by Government personnel until final acceptance of the work.

3.6.1.2. A review of the contract drawings.

3.6.1.3. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

3.6.1.4. Review of provisions that have been made to provide required control inspection and testing.

3.6.1.5. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

3.6.1.6. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

3.6.1.7. A review of the appropriate activity hazard analysis to assure safety requirements are met.

3.6.1.8. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

3.6.1.9. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

3.6.1.10. Discussion of the initial control phase.

3.6.1.11. Notify the Government at least 24 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the preparatory phase actions by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2. Initial Phase

Accomplish this phase at the beginning of a definable feature of work. Include the following actions:

3.6.2.1. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

3.6.2.2. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

3.6.2.3. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

3.6.2.4. Resolve all differences.

3.6.2.5. Check safety to include compliance with and upgrading of the Accident Prevention plan and activity hazard analysis. Review the activity analysis with each worker.

3.6.2.6. Notify the Government at least 24 hours in advance of beginning the initial phase. The CQC System Manager shall prepare and attach to the daily CQC report separate minutes of this phase. Indicate exact location of initial phase for future reference and comparison with follow-up phases.

3.6.2.7. Repeat the initial phase any time acceptable specified quality standards are not being met.

3.6.3. Follow-up Phase

Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Conduct final follow-up checks and correct deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work.

3.6.4. Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.7. TESTS

3.7.1. Testing Procedure

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements and project design documents. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory, or establish an approved testing laboratory at the project

site. The Contractor may elect to use a laboratory certified and accredited by the Concrete and cement Reference Laboratory (CCRL) or by AASHTO Materials Reference Laboratory (AMRL) for testing procedures that those organizations certify. The Contractor shall perform the following activities and record and provide the following data:

3.7.1.1. Verify that testing procedures comply with contract requirements and project design documents.

3.7.1.2. Verify that facilities and testing equipment are available and comply with testing standards.

3.7.1.3. Check test instrument calibration data against certified standards.

3.7.1.4. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

3.7.1.5. Include results of all tests taken, both passing and failing tests, recorded on the CQC report for the date taken. Include specification paragraph reference, location where tests were taken, and the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2. Testing Laboratories

3.7.2.1. Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.2.2. Capability Recheck

If the selected laboratory fails the capability check, the Government will assess the Contractor a charge of $1,375 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.7.3. Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4. Furnishing or Transportation of Samples for Government Quality Assurance Testing

The Contractor is responsible for costs incidental to the transportation of samples or materials. Deliver samples of materials for test verification and acceptance testing by the Government to the Corps of Engineers Laboratory, f.o.b., at the following address:

- For delivery by mail:

  As directed by the Contracting Officer's Representative.

  As directed.

  As directed.

As directed.

- For other deliveries:

  As directed by the Contracting Officer's Representative.

  As directed.

  As directed.

  As directed.

The area or resident office will coordinate, exact delivery location, and dates for each specific test.

3.8. COMPLETION INSPECTION

3.8.1. Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the SPECIAL CONTRACT REQUIREMENTS Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications, the CQC Manager shall conduct an inspection of the work. Prepare a punch list of items which do not conform to the approved drawings and specifications and include in the CQC documentation, as required by paragraph DOCUMENTATION. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2. Pre-Final Inspection

As soon as practicable after the notification above, the Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Correct any items noted on the Pre-Final inspection in a timely manner. Accomplish these inspections and any deficiency corrections required by this paragraph within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

3.8.3. Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall attend the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups and major commands may also attend. The Government will formally schedule the final acceptance inspection based upon results of the Pre-Final inspection. Provide notice to the Government at least 14 days prior to the final acceptance inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9. DOCUMENTATION

3.9.1. Maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers using

government-provided software, QCS (see Section 01 45 01.10). The report includes, as a minimum, the following information:

3.9.1.1. Contractor/subcontractor and their area of responsibility.

3.9.1.2. Operating plant/equipment with hours worked, idle, or down for repair.

3.9.1.3. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

3.9.1.4. Test and/or control activities performed with results and references to specifications/drawings requirements. Identify the applicable control phase (Preparatory, Initial, Follow-up). List deficiencies noted, along with corrective action.

3.9.1.5. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

3.9.1.6. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.

3.9.1.7. Offsite surveillance activities, including actions taken.

3.9.1.8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

3.9.1.9. Instructions given/received and conflicts in plans and/or specifications.

3.9.1.10. Provide documentation of design quality control activities. For independent design reviews, provide, as a minimum, identity of the ITR team, the ITR review comments, responses and the record of resolution of the comments.

3.9.2. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. Furnish the original and one copy of these records in report form to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, submit one report for every 7 days of no work and on the last day of a no work period. Account for all calendar days throughout the life of the contract. The first report following a day of no work shall be for that day only. The CQC System Manager shall sign and date reports. The report shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel. The Contractor may submit these forms electronically, in lieu of hard copy.

3.10. NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. 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 such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

End of Section 01 45 04.00 10

# SECTION 01 50 02.T.O. TBD
# TEMPORARY CONSTRUCTION FACILITIES

## 1.0 OVERVIEW

1.1. GENERAL REQUIREMENTS

1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

## 1.0 OVERVIEW

1.1. GENERAL REQUIREMENTS

1.1.1. This section contains requirements specifically applicable to this task order. The requirements of Base ID/IQ contract Section 01 50 02 apply to this task order, except as otherwise specified herein.

1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.3.1. Bulletin Board (As Specified in Base contract)

1.3.2. Project and Safety Signs (Added to Stress standardization of signs, in the event that the Base ID/IQ Section 01 50 02 does not contain this information)

Erect a project sign and a site safety sign with informational details as provided by the Government at the Post award conference, within 15 days prior to any work activity on project site. Update the safety sign data daily, with light colored metallic or non-metallic numerals. Remove the signs from the site upon completion of the project. Engineer Pamphlet EP 310-1-6a contains the standardized layout and construction details for the signs. It can be found through a GOOGLE Search or try http://www.usace.army.mil/publications/eng-pamphlets/ep310-1-6a/s-16.pdf.

End of Section 01 50 02.T.O. TBD

# SECTION 01 57 23

# ENVIRONMENTAL PROTECTION

## 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.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

| | |
|---|---|
| EPAPUB | (2003) NPDES (National Pollution Discharge Elimination System) General Permits for Storm Water Discharges from Construction Sites |

### 1.2 DEFINITIONS

For the purpose of this specification, environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of air, water, and land, and includes management of visual aesthetics, noise, solid waste, radiant energy and radioactive materials, as well as other pollutants.

### 1.3 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 01 33 00.00 10 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan; G.

The environmental protection plan shall address all items in the paragraph ENVIRONMENTAL PROTECTION REQUIREMENTS and shall be submitted with the Quality control Plan as described in Section 01 45 01.00 10.

Storm Water Pollution Prevention Plan (SWP3); G, RE.

The Storm Water Pollution Prevention Plan (SWP3) shall contain all the information required by the Oklahoma Department of Environmental Quality (ODEQ) General Permit OKR10 for storm water discharges from construction activities within the State of Oklahoma. A copy of the OKR10 permit may be found at the following web page:
http://www.deq.state.ok.us/WQDnew/stormwater/construction/okr10_final_permit_13_sep_2002.pdf

Waste Management Plan; G.

The water management plan shall address the waste stream, estimated quantities of waste, describe and tentatively classify the broad waste types as follows:

a. Special wastes such as hazardous waste, medical waste, universal waste, radioactive waste, mixed hazardous/radioactive waste; and other special waste;

b. Wastes including trash, garbage, cardboard, packing and crating, rubble, concrete, asphalt, metals, lumber, salvageable, recyclable, scrap, and others.

Restoration Plan; G.

Submit a restoration plan showing how trees, shrubs, grass areas, flower gardens, etc., scarred or damaged by the Contractor's equipment or operations, shall be restored to the original condition.

Notice of Intent (ODEQ Form 640-571); G

Submit two (2) copies of a completed Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activities for coverage for all construction, demolition, or excavation projects. This form can be obtained from the Oklahoma Department of Environmental Quality at their web site, http://www.deq.state.ok.us. The Contractor shall submit the unsigned NOI forms to the Contracting Officer for submission to Fort Sill environmental personnel.

Notice of Termination (NOT)(ODEQ Form 640-572); G

Submit two (2) copies of the completed form to terminate coverage for Storm Water Discharges from Construction Activities. Form shall be submitted when final stabilization of construction site has been achieved. Final stabilization means all soil disturbing activities have been completed and a uniform vegetative with a density of 70 percent of native background cover has been established. This form can be obtained from the Oklahoma Department of Environmental Quality at their web site, http://www.deq.state.ok.us. The Contractor shall submit the NOT forms to the Contracting Officer for submission to Fort Sill environmental personnel.

## 1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection. 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 Federal, State, and local regulations pertaining to the environment, including but not limited to water, air, and noise pollution.

### 1.4.1 Environmental Protection Plan

Within 15 days after receipt of Notice of Award of the contract and at least 7 days prior to the Preconstruction Conference, the Contractor shall submit in writing, with drawings, an Environmental Protection Plan and meet with representatives of the Contracting Officer to develop mutual understanding relative to compliance with this provision and administration of the environmental protection program. Approval of the Contractor's plan

will not relieve the Contractor of his responsibility for adequate and continuing control of pollutants and other environmental protection measures. The Government reserves the right to make changes in his environmental protection plan and operations as necessary to maintain satisfactory environmental protection performance. The environmental protection plan shall include but not be limited to the following:

1.4.1.1 Laws, Regulations, and Permits

The Contractor shall prepare a list of Federal, State and local laws, regulations, and permits concerning environmental protection, pollution control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations and permits.

1.4.1.2 Notice of Intent (NOI)

If required, the Contractor shall submit two copies of a completed Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activities to the Post Environmental Office as required in paragraph entitled SUBMITTALS contained in this section. The Post will submit the NOI to the State; the State will bill the Contractor for the fee. The Contractor is responsible for all payment of fees.

The Contractor is responsible for submitting the NOI as soon as possible after contract award. Failure to obtain there permit in a timely manner will not be grounds for a contract extension.

1.4.1.3 Protection of Features

The Contractor shall determine methods for the protection of features to be preserved within authorized work areas. The Contractor shall prepare a listing of methods to protect resources needing protection, i.e., trees, shrubs, vines, grasses and ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, archaeological and cultural resources.

1.4.1.4 Procedures

The Contractor shall implement procedures to provide the required environmental protection and to comply with the applicable laws and regulations. The Contractor shall set out the procedures to be followed to correct pollution of the environment due to accident, natural causes or failure to follow the procedures set out in accordance with the environmental protection plan.

1.4.1.5 Permit or License

The Contractor shall obtain all needed permits or licenses for disposal of solid, liquid, chemical, and other waste generated as a result or this contract.

1.4.1.6 Drawings

The Contractor shall include drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, stockpiles of earth materials, and disposal areas for excess earth material and unsatisfactory earth materials.

1.4.1.7 Environmental Monitoring Plans

The Contractor shall include environmental monitoring plans for the job site which incorporate land, water, air and noise monitoring.

1.4.1.8 Traffic Control Plan

The Contractor shall include a traffic control plan for the job site.

1.4.1.9 Surface and Ground Water

The Contractor shall establish methods of protecting surface and ground water during construction activities.

1.4.1.10 Work Area Plan

The Contractor shall include a work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. The plan shall include measures for marking the limits of use areas.

1.4.1.11 Plan of Borrow Area(s)

The Contractor shall include a plan of borrow area(s) for the job site, if applicable.

1.4.1.12 Method of Marking Clearing Limits

The Contractor shall include the method of marking and maintaining markings for limits of clearing, if applicable.

1.4.1.13 Method of Controlling Equipment

The Contractor shall include a plan of the method for controlling equipment maneuvering to avoid environmental damage.

1.4.1.14 Training of Contractor's Personnel

The Contractor shall include a plan for training and control of his personnel for environmental damage.

1.4.1.15 Prevention and Control of Spillage

The Contractor shall include a plan for prevention and control of damaging spillages.

1.4.1.16 Layout of Work Areas and Other Areas

The Contractor shall include a plan of his method for layout of work areas, plant sites, haul roads, and borrow and waste areas.

1.4.1.17 Method and Location of Waste and Debris Disposal

The Contractor shall include the location for disposal of waste and debris.

1.4.1.18 Preplanning

Meetings of the Contractor with Contracting Officer or his authorized

representative as specified in the paragraph MEETINGS, for the purpose of preplanning prevention of environmental damage.

1.4.1.19 Proposed Schedule for Training of Contractor Personnel

The Contractor shall include a schedule of proposed meetings to be attended by all Contractor personnel for the purpose of training for environmental protection with a Contracting Officer's representative present at appropriate intervals. Sufficient length of time to accomplish the purpose shall be included.

1.4.1.20 Method of Training

The Contractor shall include a proposed method of training all new employees in environmental protection before they commence working project.

1.4.1.21 Material Storage

Contractor shall provide a list sorting and identifying by chemical compatibility those materials to be used for the project. This information will be included in the EPP (Environmental Protection Plan) and will be updated periodically to insure all materials are included. It will be used to insure that incompatible chemicals are not stored together.

1.4.1.22 Material Safety Data Sheets (MSDS)

MSDS forms shall be on file prior to use of listed chemicals.

1.5 STORM WATER POLLUTION PREVENTION PLANS (SWPPP OR SWP3)

The Contractor shall prepare a Storm Water Pollution Prevention Plan for the construction activity. [The Contractor is required to comply with the requirements outlined in the Oklahoma Department of Environmental Quality (ODEQ) General Permit for Storm Water Discharges from Construction Activities.] [This plan shall be in accordance with Texas Commission on Environmental Quality TPDES General Permit NO. TXR150000, issued on 05 March 2003, or the most recent Texas general permit issued pursuant to Section 26.040 of the Texas Water Code and Section 402 of the Clean Water Act.] Adequate Best Management Practices (BMPs) and appropriate control measures shall be included in the SWPPP to prevent construction dirt, chemicals, and/or debris from becoming a pollutant source to storm water discharges and to retain sediment on site. Such measures include but are not limited to silt fences, hay bails, earth dikes, sediment traps, storm drain inlet protection and temporary/permanent sediment basins.

Stabilization practices shall also be included in the SWPPP and implemented to preserve existing vegetation and to stabilize those portions of the construction site that were disturbed.

This plan shall be in accordance with EPAPUB NPDES General Permits for Storm Water Discharges from Construction Sites. [The plan shall be in accordance with ODEQ General Permit for Construction, General Permit OKR10 for Storm Water Discharge from Construction Activities within the State of Oklahoma.] The plan shall identify potential sources of pollution resulting from storm water discharge from the project site(s) and present methods for reducing or eliminating such discharge.

The Contracting Officer and the Contractor shall review the SWP3 to determine the adequacy of the plan. The SWP3 may be modified to insure

that all current measures to prevent offsite migration of pollutants, including soils, are included in the plan. Contractor shall be required to amend the SWPPP as necessary, including when there is a change in the project's design, operation, or maintenance and when BMPs/control measures are ineffective in minimizing pollution.

No work that would disturb the natural vegetation shall be performed prior to the submission and approval of the SWP3 and receipt of the permit requested by the Notice of Intent unless approved by the Contracting Officer.

1.5.1 Contents of the Storm Water Pollution Prevention Plan (SWP3)

The SWP3 shall include the following items as a minimum. It is the responsibility of the contractor to ensure the lastest version of the General Permit OKR10 requirements are utilized when developing the SWP3.

1.5.1.1 Site Description

The SWP3 shall provide a description of potential pollutant sources and other information as indicated below:

a. A description of the nature of the construction activity;

b. A description of the intended sequence of major activities that disturb soils for major portions of the site (e.g., grubbing, excavation, grading, utilities and infrastructure installation);

c. Estimates of the total area of the site and the total area of the site that is expected to be disturbed by excavation, grading, or other activities including off-site borrow and fill areas;

d. An estimate of the runoff coefficient of the site for both the pre-construction and post-construction conditions and data describing the soil or the quality of any discharge from the site;

e. A general location map (e.g., USGS quadrangle map, a portion of a city or county map) with enough detail to identify the location of the construction site and the receiving waters within one mile of the site and a site map indicating the following: drainage patterns and approximate slopes anticipated after major grading activities; areas of soil disturbance; areas that will not be disturbed; locations of major structural and nonstructural controls identified in the SWP3; locations where stabilization practices are expected to occur; locations of off-site material, waste, borrow or equipment storage areas; surface waters (including wetlands); and locations where storm water discharges to a surface water;

f. Location and description of any discharge associated with industrial activity other than construction, including storm water discharges from dedicated asphalt plants and dedicated concrete plants, that is covered by the General Permit OKR10;

g. The name of the receiving water(s) and the areal extent and description of wetlands or other special aquatic sites (as defined by 40 CFR 230.3(q-1)) at or near the site that will be disturbed or that will receive discharges from disturbed areas of the project;

h. A copy of the permit requirements (attaching a copy of the General

Permit OKR10 is acceptable);

i. Information on whether listed endangered or threatened species, or critical habitat, are found in proximity to the construction activity and whether such species may be affected by the applicant's storm water discharges or storm water discharge-related activities; and

j. Information on whether storm water discharges or storm water discharge-related activities would have an affect on a property that is protected by Federal, State or local historic preservation laws along with any written agreements reached with the State services to mitigate those effects.

1.5.1.2 Controls

The SWP3 shall include a description of appropriate control measures (i.e., Best Management Practices (BMP)) that will be implemented as part of the construction activity to control pollutants in storm water discharges. The SWP3 must clearly describe for each major activity identified in Part IV. E. 1. b listed in the General Permit OKR10: appropriate control measures and the general timing (or sequence) during the construction process that the measures will be implemented; and which permittee is responsible for implementation (e.g., perimeter controls for one portion of the site will be installed by Contractor A after the clearing and grubbing necessary for installation of the pollution prevention measure, but before the clearing and grubbing for the remaining portions of the site; and perimeter controls will be actively maintained by Contractor B until final stabilization of those portions of the site up-gradient of the perimeter control; and temporary perimeter controls will be removed by the permittee after final stabilization). The description and implementation of control measures shall address the following minimum components.

a. Erosion and Sediment Controls.

(1) Short and Long Term Goals and Criteria.

(a) The construction-phase erosion and sediment controls shall be designed to retain sediment on site to the extent practicable.

(b) All control measures must be properly selected, installed, and maintained in accordance with the manufacturer's specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately, or incorrectly, the permittee must replace or modify the control for site situations.

(c) If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize offsite impact (e.g., fugitive sediment in street could be washed into storm sewers by the next rain and/or pose a safety hazard to users of public streets).

(d) Sediment must be removed from sediment traps or sedimentation ponds when design capacity has been reduced by 50%.

(e) Litter, construction debris, and construction chemicals exposed to storm water shall be prevented from becoming a pollutant source for storm water discharges (e.g., screening outfalls, picked up daily).

(f) Offsite material storage areas (also including overburden and stockpiles of dirt, borrow areas, etc.) used solely by the permitted project are considered a part of the project and shall be addressed in the SWP3.

(2) Stabilization Practices. The SWP3 must include a description of interim and permanent stabilization practices for the site, including a schedule of when the practices will be implemented. Site plans should ensure that existing vegetation is preserved where attainable and that disturbed portions of the site are stabilized. Stabilization practices may include but are not limited to: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other appropriate measures. Use of impervious surfaces for stabilization should be avoided.

The following records shall be maintained and attached to the SWP3: the dates when major grading activities occur; the dates when construction activities temporarily or permanently cease on a portion of the site; and the dates when stabilization measures are initiated.

Except as provided in (a), (b), and (c) below, stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.

(a) Where the initiation of stabilization measures by the 14th day after construction activity temporary or permanently ceased is precluded by adverse climatological conditions (i.e. snow, ice, heavy rains, or drought) stabilization measures shall be initiated as soon as practicable.

(b) Where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 21 days, temporary stabilization measures do not have to be initiated on that portion of site.

(c) In arid areas (areas with an average annual rainfall of 0 to 10 inches), semiarid areas (areas with an average annual rainfall of 10 to 20 inches), and areas experiencing droughts where the initiation of stabilization measures by the 14th day after construction activity has temporarily or permanently ceased is precluded by seasonably arid conditions, stabilization measures shall be initiated as soon as practicable.

(3) Structural Practices. The SWP3 must include a description of structural practices to divert flows from exposed soils, store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable. Structural practices may include but are not limited to: silt fences, earth dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment

basins. Placement of structural practices in floodplains should be avoided to the degree attainable. The installation of these devices may be subject to Section 404 of the Clean Water Act (CWA).

(a) For common drainage locations that serve an area with ten (10) or more acres disturbed at one time, a temporary (or permanent) sediment basin that provides storage for a calculated volume of runoff from a 2 year, 24 hour storm from each disturbed acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. Where no such calculation has been performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. When computing the number of acres draining into a common location it is not necessary to include flows from offsite areas and flows from onsite areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin.

In determining whether installing a sediment basin is attainable, the permittee may consider factors such as site soils, slope, available area on site, etc. In any event, the permittee must consider public safety, especially as it relates to children, as a design factor for the sediment basin and alternative sediment controls shall be used where site limitations would preclude a safe design. For drainage locations that serve ten (10) or more disturbed acres at one time and where a temporary sediment basin or equivalent controls is not attainable, smaller sediment basins and/or sediment traps should be used. Where neither the sediment basin nor equivalent controls are attainable due to site limitations, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries of the construction area and for those side slope boundaries deemed appropriate as dictated by individual site conditions. The Oklahoma Department of Environmental Quality (ODEQ) encourages the use of a combination of sediment and erosion control measures in order to achieve maximum pollutant removal.

(b) For drainage locations serving less than 10 acres, smaller sediment basins and/or sediment traps should be used. At a minimum, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries (and for those side slope boundaries deemed appropriate as dictated by individual site conditions) of the construction area unless a sediment basin providing storage for a calculated volume of runoff from a 2 year, 24 hour storm or 3,600 cubic feet of storage per acre drained is provided. The Oklahoma Department of Environmental Quality (ODEQ) encourages the use of a combination of sediment and erosion control measures in order to achieve maximum pollutant removal.

b. Storm Water Management.

A description of measures that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed must be included in the SWP3. Structural measures should be placed on upland

soils to the degree attainable. The installation of these devices may also require a separate permit under Section 404 of the CWA.

Permittees are only responsible for the installation and maintenance of storm water management measures prior to final stabilization of the site, and are not responsible for maintenance after storm water discharges associated with construction activity have been eliminated from the site. However, post-construction storm water BMPs that discharge pollutants from point sources once construction is completed, may in themselves, need authorization under a separate OPDES permit.

(1) Such practices may include but are not limited to: storm water detention structures (including wet ponds); storm water retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff onsite; and sequential systems (that combine several practices). The SWP3 shall include an explanation of the technical basis used to select the practices to control pollution where flows exceed predevelopment levels.

(2) Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel to provide a non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g. no significant changes in the hydrological regime of the receiving water).

c. Other Controls.

(1) No solid materials, including building materials, shall be discharged to waters of the State, except as authorized by a permit issued under Section 404 of the CWA.

(2) Off-site vehicle tracking of sediments and the generation of dust shall be minimized.

(3) The SWP3 shall be consistent with applicable State and/or local waste disposal, sanitary sewer or septic system regulations to the extent these are located within the permitted area.

(4) The SWP3 shall include a description of construction and waste materials expected to be stored on-site with updates as appropriate. The SWP3 shall also include a description of controls to reduce pollutants from these materials including storage practices to minimize exposure of the materials to storm water, and spill prevention and response.

(5) The SWP3 shall include a description of pollutant sources from areas other than construction (including storm water discharges from dedicated asphalt plants and dedicated concrete plants), and a description of controls and measures that will be implemented at those sites to minimize pollutant discharges.

(6) The SWP3 shall include a description of measures necessary to protect listed endangered or threatened species, or critical habitat, including any terms or conditions that are imposed under the eligibility requirements of the General Permit OKR10 Part I B 3 e (2), unless a determination has indicated that no impact is imminent. Failure to describe and implement such measures will result in storm water discharges from construction activities that

are ineligible for coverage under the General Permit OKR10.

d. Approved State or Local Plans.

(1) Permittees which discharge storm water associated with construction activities must ensure their Storm Water Pollution Prevention Plan is consistent with requirements specified in applicable sediment and erosion site plans of site permits, or storm water management site plans or site permits approved by State or local officials.

(2) Storm Water Pollution Prevention Plans must be updated as necessary to remain consistent with any changes applicable to protecting surface water resources in sediment erosion site plans or site permits, or storm water management site plans or site permits approved by State or local officials for which the permittee receives written notice.

1.5.1.3 Maintenance

All erosion and sediment control measures and other protective measures identified in the SWP3 must be maintained in effective operating condition. If site inspections required by General Permit OKR10 Part IV E 4 identify BMPs that are not operating effectively, maintenance shall be performed before the next anticipated storm event, or as necessary to maintain the continued effectiveness of storm water controls. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable.

1.5.1.4 Inspections

Qualified personnel (provided by the permittee or cooperatively by multiple permittees) shall inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, structural control measures, and locations where vehicles enter or exit the site, at least once every fourteen (14) calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater.

Where sites have been finally or temporarily stabilized, runoff is unlikely due to winter conditions (e.g., site is covered with snow, ice, or frozen ground exists), or during seasonal arid periods in arid areas (areas with an average annual rainfall of 0 to 10 inches) and semi-arid areas (areas with an average annual rainfall of 10 to 20 inches) such inspections shall be conducted at least once every month.

Inspections should at a minimum consist of the following items:

a. Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Sediment and erosion control measures identified in the SWP3 shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Where discharge locations are inaccessible, nearby downstream locations shall be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site

sediment tracking.

b. Based on the results of the inspection, the SWP3 shall be modified as necessary (e.g., show additional controls on map required by General Permit OKR10 Part IV. D. 1; revise description of controls required by General Permit OKR10 Part IV E 2) to include additional or modified BMPs designed to correct problems identified. Revisions to the SWP3 shall be completed within 7 calendar days following the inspection. If existing BMPs need to be modified or if additional BMPs are necessary, implementation shall be completed before the next anticipated storm event. If implementation before the next anticipated storm event is impracticable, they shall be implemented as soon as practicable.

c. A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, and major observations relating to the implementation of the SWP3 shall be made and retained as part of the SWP3 for at least three years from the date that the site is finally stabilized. Major observations should include: the location(s) of discharges of sediment or other pollutants from the site; location(s) of BMPs that need to be maintained; location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location; and location(s) where additional BMPs are needed that did not exist at the time of inspection. Actions taken in accordance with General Permit OKR10 Part IV. E. 4. b shall be made and retained as part of the Storm Water Pollution Prevention Plan for at least three years from the date that the site is finally stabilized. Such reports shall identify any incidents of non-compliance. Where a report does not identify any incidents of non-compliance, the report shall contain a certification that the facility is in compliance with the Storm Water Pollution Prevention Plan and General Permit OKR10. The report shall be signed in accordance with Part VI. G of the General Permit OKR10.

1.5.1.5 Non-Storm Water Discharges

Except for flows from fire fighting activities, sources of non-storm water listed in Part III. A. 2 or 3 of the General Permit OKR10 that are combined with storm water discharges associated with construction activity must be identified in the SWP3. The SWP3 shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

1.5.1.6 Contractor Certifications

This procedure is initiated only at the discretion of the permittee with the cooperation and agreement of applicable contractor(s). The Contractor Certification form, Addendum D of the General Permit OKR10 should be rewritten by the permittee to fit their specific objectives. Contractor Certification is recommended but is not a requirement of the ODEQ.

a. Contractors, subcontractors, builders, installers, regular suppliers, support service companies or others who are not the permittee involved in construction activity, and have not been issued construction general permit authorization, shall execute a Contractor Certification, at the discretion of the permittee, which places the responsibility of complying with and abiding by the intent and purpose of the permit with the contractor for work performed under the authority and direction of the contractor. Contractors must ensure that activities regulated by the Construction General Permit (Permit)

are protective of endangered and threatened species and critical habitat according to Part X.

b. Contractors must be thoroughly familiar with and adhere to the Notice of Intent (NOI), the SWP3, and Best Management Practices (BMP). The SWP3 shall clearly identify, for each control measure identified in the plan, the party, which will implement the measure. The Permittee(s) should insure that all contractors or others involved in construction activity identified in the plan as being responsible for implementing storm water control measures, and sign a copy of the contractor certification, before performing any work in the area covered by the Storm Water Pollution Prevention Plan. All contractor certifications should be included with the Storm Water Pollution Prevention Plan.

c. The Contractor Certification should include the name and title of the person providing the signature, the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification is made. An example of an assignment of certification can be found in the General Permit OKR10 Addendum D.

## 1.6 WASTE MANAGEMENT PLAN

Waste Management plan shall be submitted to the Contracting Officer for Post Environmental Division review within 15 days after contract award and prior to initiating any site preparation work.

### 1.6.1 Government Policy

Government policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy, the Contractor shall:

a. Practice efficient waste management when sizing, cutting, and installing products and materials;

b. Use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse.

### 1.6.2 Management

The Contractor shall take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. In the management of waste, consideration shall be given to the availability of viable markets, the condition of the materials, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. The Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling shall accrue to the Contractor. Firms and facilities used for recycling, reuse, and disposal shall be appropriately permitted for the intended use to the extent required by

federal, state, and local regulations.

1.6.3 Waste Management Plan Content

The plan shall have two sections and include the following information:

a. Section 1, Special Waste.

(1) Waste Streams and Anticipated Quantities to be Generated: The waste streams shall be estimated, described and tentatively classified. Special wastes include items such as hazardous waste, medical waste, universal waste, radioactive waste, mixed hazardous/radioactive waste; and other special waste. The rationale for the assignment of each specific waste classification shall be provided.

(2) Waste Segregation and Temporary Storage: The procedures to be used to segregate wastes of different specific waste types shall be provided. The temporary accumulation or staging of these materials shall be discussed and the applicable regulations regarding quantity or time limitations for storage of these materials, spill prevention and control, inspection procedures, container requirements or other required actions shall be referenced. The procedures to be used to insure compliance with these regulations

(3) Analytical/Physical testing required to dispose waste above and beyond that required in other sections of these specifications.

(4) Waste container marking and labeling, transport vehicle placarding requirements or each specific waste type.

(5) Paperwork Requirements for Disposal of Wastes: For hazardous wastes generated on Fort Sill, the Contractor shall coordinate turn ins and provide transportation of waste to the Post Environmental Division at Building 2592 for proper disposal.

(6) Common items include mercury switches, fluorescent bulbs, lighting ballasts, solvent, paint, coatings, oils, sand or water blast media, cleaning compounds, and others.

(7) Special waste not originally identified shall be reported to the Contracting Officer as soon as practicable to determine disposal requirements.

(8) Asbestos (if applicable) is not included in this plan. Refer to specific specifications for Asbestos Abatement.

b. Section 2, Solid Waste.

(1) Provide the name of individual(s) on the Contractor's staff responsible for waste prevention and management.

(2) Identify actions that shall be taken to reduce solid waste generation.

(3) Describe the specific approaches to be used in recycling/reuse of the various materials generated, including the areas and equipment to be used for processing, sorting, and temporary

storage of wastes.

(4) Provide characterization, including estimated types and quantities, of the waste to be generated.

(5) Identify local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity.

(6) Provide a list of specific waste materials that will be salvaged for resale, salvaged and reused, or recycled. Recycling facilities that will be used shall be identified.

(7) Identify materials that cannot be recycled/reused with an explanation or justification.

(8) Provide anticipated net cost savings determined by the revenue generated by the sale of the materials and landfill cost savings, less Contractor costs.

1.6.4 Records

Records shall be maintained to document the quantity, in actual or estimated weights, of waste generated, the quantity of waste diverted through sale, reuse, or recycling, the quantity of waste disposed at the Fort Sill Municipal Landfill, and the quantity of waste disposed at the Fort Sill Construction and Demolition Landfill. The records shall be delivered to Fort Sill Environmental Division on a monthly basis, at or near the first week of the month.

1.6.5 Collection

The necessary containers, bins and storage areas to facilitate effective waste management shall be provided and shall be clearly and appropriately identified. Recyclable materials shall be handled to prevent contamination of materials from incompatible products and materials.

1.6.6 Disposal

Unless otherwise specified, disposal shall be in accordance with the following:

a. Reuse. First consideration shall be given to salvage for reuse since little or no re-processing is necessary for this method and less pollution is created when items are reused in their original form. Sale or donation of waste suitable for reuse shall be considered. Salvaged materials, other than those specified in other sections to be salvaged and reinstalled, shall not be used in this project.

b. Recycle. Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling whenever economically feasible.

c. Landfill. Materials with no practical use or economic benefit shall be disposed at the Fort Sill Municipal or Construction and Demolition Landfills.

1.7 MEETINGS

The Contractor shall meet with representatives of the Contracting Officer to develop mutual understanding relative to compliance with this section of the specifications and administration of the environment protection program. The Contractor shall be prepared to discuss the program in conferences convened by the Contracting Officer before starting work on each major phase of operation. Approval of the Contractor's plan for environmental protection will not relieve the Contractor of his responsibility for adequate and continuing control of pollutants and protection of environmental features. All Contractor personnel shall be required to attend.

1.8 SUBCONTRACTORS

Assurance of compliance with this section by subcontractors will be the responsibility of the Contractor.

1.9 REGULATORY REQUIREMENTS

The Contractor shall comply with all federal, state, and local regulatory and statutory requirements for all items contained in this section.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 PROTECTION OF ENVIRONMENTAL RESOURCES

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine his activities to areas defined by the contract drawings or specifications. Environmental protection shall be as stated in the following subparagraphs.

3.1.1 Compliance of Storm Water General Permit for Construction Activity (ADD)

The contractor shall comply with all requirements specified in the Oklahoma Cepartment of Environmental Quality (ODEQ) General Permit OKR10 for storm water discharges from construction activities within the State of Oklahoma. A copy of the OKR10 permit may be found at the following web site: http://www.deq.state.ok.us/WQDnew/stormwater/construction/okr10_final_permit_13_sep_2002.pdf

The Contractor shall be responsible to fully understand ther parameters specified with the General Permit OKR10 and determine the permit eligibility of the construction site definition. The Contractor shall complete, sign, and file the Notice of Intent(s) as directed by the General Permit OKR10. The Contractor shall be the permittee and control the activities necessary to ensure full compliance of the conditions within the General Permit OKR10.

3.1.2 Protection of Land Resources

Prior to the beginning of any construction, the Contracting Officer will identify all land resources to be preserved within the Contractor's work area. The Contractor shall not remove, cut, deface, injure, or destroy

land resources including trees, shrubs, vines, grasses, topsoil, and land forms without special permission from the Contracting Officer. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such special emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs.

The Contractor shall make every effort to preserve land resources within the project boundaries and outside the limits of permanent work performed under this contract in their present condition or they shall be restored to a condition, after completion of construction, that shall appear to be natural and not detract from the appearance of the project. The Contractor shall confine his construction activities to areas defined by the plans and specifications, to areas to be cleared for other operations, or to quarry, borrow or waste areas indicated on plans. At the onset of borrow excavation, topsoil shall be saved for use in restoring the borrow area. Waste and borrow areas shall be leveled or trimmed to regular lines and shaped to provide a neat appearance. In all instances, the restored area shall be well drained, to prevent the accumulation of stagnant water. Except in areas marked on the plans to be cleared, the Contractor shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without approval of the Contracting Officer.

3.1.2.1 Work Area Limits

Prior to any construction, the Contractor shall mark the areas where no work is to be performed under this contract. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers shall be protected before construction operations commence and during all construction operations. Where construction operations are to be conducted during darkness, the markers shall be visible during darkness. The Contractor shall convey to his personnel the purpose of marking and/or protection of all necessary objects.

3.1.2.2 Protection of Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features to be preserved, indicated and defined on the drawings submitted by the Contractor as a part of the Environmental Protection Plan, shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques.

3.1.2.3 Reduction of Exposure of Unprotected Erodible Soils

Earthwork brought to final grade shall be finished as indicated and specified. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in instances where the constructed feature obscures borrow areas, quarries and waste material areas, these areas shall not initially be cleared in total. Clearing of such areas shall progress in reasonably sized increments as needed to use the areas developed as approved by the Contracting Officer.

3.1.2.4 Temporary Protection of Disturbed Areas

Such methods as necessary shall be utilized to effectively prevent erosion and control sedimentation, including but not limited to the following:

a. Retardation and Control of Runoff

Runoff from the construction site shall be controlled by construction of diversion ditches, benches, and berms to retard and divert runoff to protected drainage courses, and the Contractor shall also utilize any measures required by area-wide plans approved under Paragraph 208 of the Clean Water Act.

3.1.2.5 Erosion and Sedimentation Control Devices.

The Contractor shall construct or install all temporary and permanent erosion sedimentation control features as indicated on the contract drawings. Temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing and mulching shall be maintained until permanent drainage and erosion control facilities are completed and operative.

3.1.2.6 Stabilization of Disturbed Soils

Stabilization measures of areas involved in the $SWP_3$ shall be initiated on disturbed areas as soon as practicable, but no more than 14 days after the construction activity on a particular portion of the site has temporarily or permanently ceased except as follows:

(a) where construction activities will resume on a portion of the site within 21 days from the time when construction activities temporarily ceased;

(b) where the initiation of the stabilization measure is precluded by snow cover in which case stabilization measures shall be initiated as soon thereafter as practicable.

3.1.2.7 Inspections

Weekly inspections of construction sites shall be conducted by the Contractor to insure that the various controls and components of the various plans required by this section are in place. In addition, the Contractor shall make an inspection within 24 hours following a 1/2 inch or greater rainfall event to insure that the controls are working adequately and have not been impacted by the rainfall event.

The Contractor shall annotate these inspections in a report to be kept on site or at an easily accessible location. The report shall summarize the scope of the inspection, person performing the inspection, the date and time, the major observances relating to the effectiveness of the Storm Water Pollution Prevention Plan, and the corrective actions that were taken, if any. Any instances of non-compliance shall be corrected within 7 days of the inspection.

3.1.2.8 Location of Contractor Facilities

The Contractor's field offices, staging areas, stockpiles, storage, and temporary buildings shall be placed in areas designated on the contract drawings and approved by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only on approval by the Contracting Officer.

3.1.2.9 Borrow Areas on Government Property

Borrow areas on government property shall be managed to minimize erosion and to prevent sediment from entering nearby water courses or lakes.

3.1.2.10 Disposal Areas on Government Property

Disposal areas on Government property shall be managed and controlled to limit material to areas designated on the contract drawings and prevent erosion of soil or sediment from entering nearby water courses or lakes. Disposal areas shall be developed in accordance with the grading plan indicated on the contract drawings.

3.1.2.11 Temporary Excavation and Embankments

Temporary excavation and embankments shall be controlled to protect adjacent areas from contamination.

3.1.2.12 Disposal of Solid Wastes

All waste shall be disposed of in accordance with the approved Waste Management Plan. All handling and transportation shall be the responsibility of the Contractor. Waste shall be handled in such a manner to prevent contamination. The Contractor shall be in compliance with all Federal, state, and local requirements for solid waste disposal.

3.1.2.13 Disposal of Chemical Wastes

Chemical wastes shall be stored in appropriate and compatible containers, transported from the work area to the Post Environmental Division, Building 2592, for proper disposal.

3.1.2.14 Disposal of Discarded Materials

Discarded materials other than those which can be included in the solid waste category shall be handled as directed by the Contracting Officer.

3.1.2.15 Disposal of Materials at Ft. Sill

Disposal of trash, garbage, or domestic waste shall be in the Ft. Sill Post Sanitary Landfill. Demolition rubble shall be disposed of in the Ft. Sill rubble pit. Disposal of metals shall be the responsibility of the Contractor off Government Property. Disposal of Contractor produced POL products, chemicals, or other hazardous or toxic compounds shall be in accordance with Ft. Sill Regulation USAFACFS Regulation 200-2. The Contracting Officer shall be advised of the type of Contractor produced POL products, chemicals, or other hazardous or toxic compounds and the amount of these products. The Contracting Officer will determine the methods of disposal of these products and such actions may require EPA or State permits.

3.2 HISTORICAL, ARCHAEOLOGICAL AND CULTURAL RESOURCES

Existing historical, archaeological and cultural resources within the Contractor's work area will be so designated by the Contracting Officer and precautions shall be taken by the Contractor to preserve all such resources as they existed at the time they were pointed out to the Contractor. The Contractor shall install all protective devices such as off-limit markings, fencing, barricades, or other devices deemed necessary by the Contracting

Officer for these resources so designated on the contract drawings and shall be responsible for their preservation during this contract. If during construction items of apparent archaeological or historical interest are discovered, they shall be left undisturbed and the Contractor shall report the find immediately to the Contracting Officer. ]

3.3 PROTECTION OF WATER RESOURCES

The Contractor shall keep construction activities under surveillance, management and control to avoid pollution of surface and ground waters. Special management techniques as set out below shall be implemented to control water pollution by the listed construction activities which are included in this contract.
See Attachment A, TAFB Section 00 72 00, located at the end of this section.

3.3.1 Washing and Curing Water

Waste waters directly derived from construction activities shall not be allowed to enter water areas. These waste waters shall be collected and placed in retention ponds where the suspended materials can be settled out or the water evaporated in order to separate the pollutants from the water.

3.3.2 Monitoring of Water Areas Affected by Construction Activities

Monitoring of water areas affected by construction activities shall be the responsibility of the Contractor. All water areas affected by construction activities shall be monitored by the Contractor.

3.4 PROTECTION OF FISH AND WILDLIFE RESOURCES

The Contractor shall keep construction activities under surveillance, management and control to minimize interference with, disturbance to and damage of fish and wildlife. Species that require specific attention along with measures for their protection shall be listed by the Contractor prior to beginning of construction operations.

3.5 PROTECTION OF AIR RESOURCES

The Contractor shall keep construction activities under surveillance, management and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or performed by the Contractor in accomplishing the specified construction shall be in strict accordance with all Federal and State of Oklahoma emission and performance laws and standards. Special management techniques as set out below shall be implemented to control air pollution by the construction activities which are included in the contract.

3.5.1 Particulates

Dust particles, aerosols, and gaseous by-products from all construction activities, processing and preparation of materials, such as from asphaltic batch plants, shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause the air pollution standards mentioned in the paragraph "PROTECTION OF AIR RESOURCES" to be exceeded or which would cause a hazard

or a nuisance. Sprinkling, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated at such intervals as to keep the disturbed area damp at all times. The Contractor must have sufficient competent equipment available to accomplish this task. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

3.5.2 Hydrocarbons and Carbon Monoxide

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

3.5.3 Odors

Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

3.5.4 Monitoring Air Quality

Monitoring of air quality shall be the responsibility of the Contractor. All air areas affected by the construction activities shall be monitored by the Contractor.

3.6 TESTS

The Contractor shall establish and maintain quality control for environmental protection operations to assure compliance with contract requirements and maintain records of his quality control for all construction operations, including, but not limited to the following items. The Contractor shall record on daily reports any problems in complying with laws, regulations and ordinances and corrective action taken. Three copies of these records and tests, as well as the records of corrective action taken, shall be furnished the Government as directed by the Contracting Officer.

3.6.1 Protection of Land Resources

The Contractor shall prevent landscape defacement and provide post-construction clean-up.

3.6.2 Protection of Water Resources

The Contractor shall prevent the contamination of lakes, ditches, or other bodies of water with harmful chemicals; the Contractor shall dispose of waste materials; and the Contractor shall provide erosion control.

3.6.3 Pollution Control Facilities

The Contractor shall maintain all constructed facilites and temporary pollution control devices for the duration of the contract or for that length of time construction activities create the particular pollutant. The Contractor shall conduct a training course on the maintenance of pollution control facilities.

3.7 INSPECTION

The Contracting Officer will notify the Contractor in writing of any

observed noncompliance with any of the Contractor's required plans. The Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective action and take such action as may be approved. If the Contractor fails 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 time extensions will be granted or costs or damages allowed to the Contractor for any such suspension.

## 3.8 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all area(s) used for construction.

## 3.9 RESTORATION OF LANDSCAPE DAMAGE

The Contractor shall restore all landscape features damaged or destroyed during construction operations outside the limits of the approved work areas. Such restoration shall be in accordance with the plans submitted for approval by the Contracting Officer.

### 3.9.1 Damage Report

The Contractor shall furnish a report to the Contracting Officer identifying the date, location, type of facility, and cost to repair the damage. The report shall become a part of the permanent record of the construction contract.

### 3.9.2 Inspection of Utility Taken Out of Service

The Contractor may request the Contracting Officer or his representative to confirm in his presence with the appropriate utility supervisor (electricity, gas, compressed air, water, etc.) that the utility has been taken out of service (locked out/tagged out) and is safe to work on.

### 3.9.3 Restoration Requirements for Pavements, Etc.

All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, surface structures, or other Government property affected, damaged, or destroyed directly or indirectly by construction operations in connection with performance of this contract shall be restored to its original condition, as determined and approved by the Contracting Officer. All replacements of surface structures or parts thereof shall be made with new materials conforming to the requirements of the specifications or as approved by the Contracting Officer. Such replacements or repairs shall be made without additional cost to the Government.

## 3.10 RECORD KEEPING

During construction, all records shall be retained onsite. Inspection reports and modifications of the plans required shall be retained for 3 years following construction.

-- End of Section --

# APPENDIX A
# GEOTECHNICAL INFORMATION

SHEPHERD Geotechnical ENGINEERING

# Preliminary Report of Geotechnical Investigation

*OF THE*

**FORT SILL PHYSICAL FITNESS CENTER**

**LAWTON, OKLAHOMA**

***Prepared For:***

C. H. Guernsey & Company
5555 North Grand Boulevard
Oklahoma City, Oklahoma 73112
Attn: Mr. Bob McCombs

***Prepared By:***

Shepherd Geotechnical Engineering, Inc.
720 W. Wilshire Blvd., Suite 110
Oklahoma City, Oklahoma 73116
(405) 840-1002

April 11, 2008
Project No. 08028

SHEPHERD Geotechnical ENGINEERING

April 11, 2008

C. H. Guernsey & Company
5555 North Grand Boulevard
Oklahoma City, Oklahoma 73112

Attn: Mr. Bob McCombs

Re: Preliminary Report of Geotechnical Investigation
**Physical Fitness Center**
**Ft. Sill Army Base**
Lawton, Oklahoma
Project No. 08028

Dear Mr. McCombs:

We are pleased to submit herewith our report entitled "Preliminary Report of Geotechnical Investigation, Fort Sill Physical Fitness Center, Lawton, Oklahoma".

It has been our pleasure to assist you with this project. Should you have any questions regarding the contents of this report, please contact us at your convenience.

Yours very truly,
**Shepherd Geotechnical Engineering, Inc.**
**CA No. 5184 Exp. 06/30/09**

LICENSED PROFESSIONAL ENGINEER
JERRY D. SHEPHERD
4-11-08
8984
OKLAHOMA

Jerry D. Shepherd, P. E.
Senior Geotechnical Engineer
Oklahoma P.E. No.8984

# PRELIMINARY REPORT OF GEOTECHNICAL INVESTIGATION

# FORT SILL PHYSICAL FITNESS CENTER

# LAWTON, OKLAHOMA

# PROJECT NO. 08028

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# PRELIMINARY REPORT OF GEOTECHNICAL INVESTIGATION

# FORT SILL PHYSICAL FITNESS CENTER

# LAWTON, OKLAHOMA

# PROJECT NO. 08028

## INTRODUCTION

### General

This preliminary report presents the results of our geotechnical investigation performed thus far for the proposed Physical Fitness Center (PFC), located north of Wilson road, between Crane Avenue and Sheridan Road on Fort Sill Army Post in Lawton, Oklahoma. The purpose of this investigation is to evaluate the subsurface conditions at the site and to provide recommendations pertaining to the geotechnical aspects of the proposed project. This preliminary report presents recommendations based on past local experience, field observations and subsurface exploration only.

### Proposed Construction

We understand that the project will include the construction of an approximate 80,500 square foot fitness facility with either CMU or tilt up walls and an approximate 30,000 square foot asphaltic concrete parking area.

The structure is anticipated to be lightly loaded with estimated maximum column loads of 15,000 pounds and maximum wall loads of 1,000 to 1,500 pounds per lineal feet. Floor loading is expected to be light.

Precise grade changes have not been provided at the time of this preliminary report, but it is known that the site will be filled to approximately the same finished floor elevation as the Education Center located to the north of the project site. This would include a maximum fill depth of approximately 12 feet. The existing creek is anticipated to be filled and piped beneath the project site.

### Scope of Work

The scope of this investigation thus far includes the following:

1. Review of previous geotechnical and geological information of sites near this site. This was augmented with data obtained during the field investigation phase of the project.

2. Investigation of the foundation and pavement suitability of the subsurface soils by drilling and sampling a total of 17 boreholes within the planned project area.

3. Preliminary recommendations regarding foundation support of the planned facility. Our discussion includes shallow footing, ribbed mat, structural slab and drilled pier foundation systems. Floor slab recommendations are also presented. Foundation depths required for frost protection are given.

4. Determination of an estimated seismic site coefficient in accordance with the IBC 2006 Building Code.

5. Recommendations regarding construction and earthwork including site preparation, cut/fill and wet weather earthwork.

6. Recommendations regarding construction in expansive soils.

7. Recommendations regarding construction in sulfate rich soils.

8. Recommendations for asphalt and concrete pavements.

9. Three copies of a preliminary report containing our findings and conclusions.

## FIELD AND LABORATORY INVESTIGATIONS

### Field Exploration

Subsurface exploration was performed April 2, 3, 4 and 7, 2008. The boring locations were staked in the field by a representative of the client, with the exception of borings B-12, B-16 and B-17 which were located by Shepherd Geotechnical Engineering, Inc. The

boring locations are depicted in approximate locations on the Boring Location Diagram located in Appendix A.

The subsurface exploration program consisted of drilling 17 borings under the supervision of an engineer. Thirteen (13) borings were drilled to depths of 40 feet in the building pad area and 4 borings were drilled to depths of 10 feet in the pavement area. Representative samples were obtained by thin walled tube samples (3 inch Shelby tubes) in general accordance with American Society for Testing and Materials Standards (ASTM) Specifications D1587 and split-barrel sampling procedures (Standard Penetration Test, SPT) in general accordance with ASTM Specifications D1586. Boring B-16 was sampled continuously to a depth of 40 feet.

Samples were collected and transported back to our office for further classification and testing. The preliminary boring logs were developed from the field logs and observations. The stratigraphic contacts indicated are estimates based on field observations and are only for the specific dates and locations reported, and are therefore not necessarily representative of other locations and times. The preliminary boring logs, presenting conditions encountered at each location explored, are included in Appendix A.

**Laboratory Testing**

Representative soil samples will be tested to refine the field classifications and evaluate physical properties of the soils which may affect the geotechnical aspects of project design and construction.

The laboratory testing program includes the following:

- Soil Classifications in general accordance with ASTM D2487
- Liquid and Plastic Limits of soils in general accordance with ASTM D4318
- Washed No. 200 US Standard Sieve tests in general accordance with ASTM Method D1140
- Moisture content tests in general accordance with ASTM Method D2937
- Unconsolidated Undrained Triaxial compressive strength tests on selected samples under structures in general accordance with ASTM D2850
- Controlled expansive consolidated tests on selected samples under the structures in general accordance with ASTM D4546, method C
- Soluble Sulfate tests in accordance with OHD L-49

The results of the physical laboratory tests have not been completed at the time of this preliminary report. Lab testing will be performed by Golder & Associates in Atlanta, Georgia, an USACE approved lab.

## SITE DESCRIPTION

### Surface Conditions

At the time of this investigation, the site surface was mostly covered with short grass and has a small creek running west of the proposed building and through the proposed parking area. The site slopes towards the creek. The slope is significant on the east side of the creek, but less apparent on the west side of the creek. The site experienced significant rain during drilling operations, but the drilling rig experienced no difficulty maneuvering around the site.

The surface elevations at the boring locations were determined by a survey crew hired by the client, except for borings B-12, B-16 and B-17 which were determined by Shepherd Geotechnical Engineering, Inc. According to the information provided by the client, the boring elevations ranged from 1202.9 to 1214.4 feet. The elevation at each boring location is also shown on the boring logs.

### Subsurface Conditions

Information collected during the investigation thus far indicates that the native soil was predominantly variations of fat clay with varying amounts of sand and gravel. The native clays encountered will be expansive. The native soils also contain caliche material, which can have gypsum within it. Gypsum is an indicator of sulfate in the soil. Bedrock was not encountered in any of the borings. More details regarding the subsurface conditions encountered can be found on the preliminary boring logs in Appendix A.

### Groundwater Conditions

Groundwater conditions were monitored after a 24 hour delay following the completion of the drilling operations in a number of the borings. Groundwater was not encountered during drilling operations or after a 24 hour period of delay in borings B-12, B-13, B-14 and B-15. Groundwater and cave in depths after a 24 hour delay in the remaining borings are summarized in Table 1 below. Cave-in depths are often an indication of actual groundwater levels.

**TABLE 1 – APPROXIMATE 24 HOUR GROUNDWATER LEVELS**

| Boring | Water Level, feet | Approximate Elevation, feet | Cave-in Depth, feet | Approximate Elevation, feet |
|---|---|---|---|---|
| B-1 | 7 | 1200 | n/a | n/a |
| B-2 | 2 | 1204 | n/a | n/a |
| B-3 | 3 | 1200 | n/a | n/a |
| B-6 | n/a | n/a | 2 | 1209.5 |
| B-8 | 7 | 1207.5 | n/a | n/a |
| B-11 | 10.5 | 1200 | n/a | n/a |
| B-16 | 30 (while drilling) | 1182 | n/a | n/a |

To obtain more accurate groundwater level information, long-term observations in a well or piezometer that is sealed from the influence of surface water would be needed. Fluctuations in groundwater levels can occur due to seasonal variations in the amount of rainfall, runoff, altered drainage paths, and other factors not evident at the time borings were advanced. Consequently, the contractor should be aware of this possibility while constructing this project.

## CONCLUSIONS AND RECOMMENDATIONS

### GEOTECHNICAL CONSIDERATIONS

There are a number of different geotechnical considerations that should be closely evaluated for the building and parking lot areas of this project. These considerations are summarized below and are discussed in further detail in the following sections.

- **Building Foundation:** The proposed building can be supported on shallow footings, a ribbed mat, a structural slab or dilled pier and grade beam foundation system.
- **Pavement Recommendations:** The pavement sections for this site are typical of pavement areas of a comparable size with similar subsurface conditions.
- **Expansive Soils:** Expansive soils are present at this site. Measures must be taken to combat these difficult soils to prevent soil heave problems for the building and the parking lot in the future.
- **Sulfate Soils:** It is anticipated that the existing onsite soils contain high levels of sulfates. Precautions must be taken to ensure sulfate induced heave is not a problem for the building and the pavement area in the future.

## FOUNDATION RECOMMENDATIONS

Recommendations pertaining to the building pad, floor slab subgrade, foundation systems and an estimated IBC site coefficient are discussed below.

### Building Pad Preparation

Building pad preparation for the proposed building should include the removal of vegetation, topsoil and any other unsuitable materials which may be encountered. Removal depths should be determined at the time of construction by a representative of the geotechnical engineer.

### Floor Slab Subgrade

Structures such as those proposed for this site should be designed for post-constuction vertical floor slab movements of less than 0.5 inch. Based on experience in the area and observed soil conditions on site, a potential vertical heave of approximately 5 inches can be estimated. This value, and the associated recommended removal and replacement depth, may change slightly in the final report.

The in situ soils in the existing condition are not adequate to provide direct support of the floor slab and procedures are recommended below for developing a low volume change soil zone beneath the floor slabs.

An estimated minimum of 7 feet of removal of existing expansive materials and replacement with approved low volume change fill is included in this preliminary report. This preliminary value was obtained by estimating a plasticity index of the soil. As per the USACE scope of work for this project, the final report will include more detailed settlement and heave calculations as part of the foundation design analysis to determine the thickness of soil and potential settlement and heave of the foundations.

- After removing the vegetation and topsoil and performing any required cuts, but before placing any fill, we recommend undercutting the structural area, plus 5 feet in each horizontal direction, to allow placing of **at least** 7 feet of low volume change soil below the design finish subgrade elevation.

- The work area should then be proofrolled with a loaded, tandem-axle dump truck weighing at least 25 tons to locate any areas that are soft or unstable. The proofrolling should involve overlapping passes in mutually perpendicular directions. Where rutting or pumping is observed during proof rolling, the soft

and/or unstable soils should be excavated and/or replaced with a low volume change soil as described below.

- After proofrolling and completing any corrective work, the work area should be scarified to a depth of 8 inches, moisture conditioned and compacted. The moisture content of the scarified soil should be adjusted to its optimum value or above, as determined by test method ASTM 1557, prior to being compacted to at least to 95 percent of its maximum dry density.

- After all of the above recommended steps have been successfully completed, fill material can be placed, if needed. All fill required to develop the design building pad subgrade elevation should consist of an approved low volume change soil that is free of organic matter and debris, placed in lifts not exceeding 9 inches in loose thickness and compacted to at least 95 percent of the maximum dry density and to its optimum moisture content or above as determined by test method ASTM 1557. Low volume change soils are defined to be cohesive materials having a liquid limit less than 40 and a plasticity index between 4 and 12. The zone of compacted fill meeting these criteria should extend beyond the building footprint as described above for stripping.

- The minimum recommended moisture content must be maintained in the building pad materials until the floor slab is constructed. Positive drainage must also be developed away from the building to prevent water from ponding along the perimeter and affecting future floor slab performance.

- The geotechnical engineer or his representative must be present to verify the above recommendations are implemented successfully.

Failure to successfully implement each of the above recommendations could result in severe expansion of the floor slab subgrade soils which is extremely costly to repair.

According to the USACE scope of work for this project, all floor slabs on grade, ribbed mat or thickened mat foundation systems shall be placed on a 15 mil polyethylene vapor barrier and a minimum of 150 mm (6 inch) capillary water barrier. When using a vapor retarder, the slab designer and slab contractor should refer to ACI 302 and/or the USACE equivalent for procedures and cautions regarding the use and placement of a vapor retarder.

For additional guidelines that help minimize the likelihood of other vertical movements caused by expansive soils see the section "Additional Design Considerations" shown later in this report.

## Shallow Footing Foundation System

A shallow footing foundation system can be used to support the proposed building. The footings for the building should be designed to support a net allowable bearing capacity of 2,000 pounds per square foot. The recommended bearing capacity is less than the calculated bearing capacity as a result of the minimum estimated removal of the top 6 feet of the existing soil, replacement with low volume change fill in the building area. If all site preparation procedures are conducted as outlined above, long-term movement is expected to be less than 0.5 inch. Differential movement across the structure is not expected to exceed 0.25 inch.

Continuous footings should have a minimum width of at least 16 inches and isolated column footings should have a minimum with of at least 30 inches. To provide protection from frost heave and to help maintain constant moisture content in the soils below the footings and slab, we recommend that perimeter footings bear at least 2.5 feet below final outside grade. Interior footings may be placed at a shallower depth.

To resist lateral loads, an allowable friction factor of 0.2 (that includes an applied safety factor of approximately 2) can be used between the footing and the underlying soils. Lateral resistance due to friction at the base of the footing should be ignored where uplift also occurs. Additional lateral resistance can be determined using an allowable passive pressure of 150 psf per foot of depth (with an applied safety factor of about 2). This value assumes that the footing is poured directly against undisturbed native materials, or that backfill placed around the formed footing is compacted to at least 95 percent of the maximum dry density as determined according to ASTM Specification 1557, the modified Proctor procedure.

## Ribbed Mat Foundation System

A ribbed mat foundation system can be used to support the proposed building as well. Seven feet removal of existing soil and replacement with low volume change soil is a minimum for the shallow footing foundation, but this can be reduced to 4 of removal and replacement for the ribbed mat foundation.

A stiffened slab-on-ground foundation, such as a ribbed mat foundation, is often used to support structures upon consolidating or expansive soils where soil conditions are relatively uniform, and when a calculated magnitude of movement can be tolerated according to the 2nd Edition of the Post-Tension Institute's "Design and Construction of Post-Tensioned Slabs-on-Ground". The intent of a stiffened slab-on-grade foundation is to allow the

structure and foundation to move vertically in a generally uniform manner while encountering localized soil movements within the superstructure.

Grade beams bearing a minimum depth of 2 feet below the finished grade can be designed for an allowable soil bearing capacity of 2,000 psf. The beams should be a minimum of 12 inches wide to prevent local shear failure. Stiffening beam spacing should be a maximum of 17 feet. The following post-tensioned slab design parameters presented in the table below may be considered. The values presented below are based off of values from a similar project at Fort Sill Army Base with what are believed to be similar soils.

**Ribbed Mat Slab Design Parameters**

| | |
|---|---|
| Edge moisture variation distance, $e_m$ for Center Lift | 5.5 ft. |
| Differential movement, $y_m$ for Center Lift | 2.0 in. |
| Edge moisture variation distance, $e_m$ for Edge Lift | 2.5 ft. |
| Differential movement, $y_m$ for Edge Lift | 1.2 in. |

These values for post-tensioned slab design are dependent upon the building site being prepared as recommended in this report.

Soil supported floor slabs are subject to vertical movements as discussed earlier in this report. This movement often causes distress to interior wall partitions supported by these slabs. Significant separation in grade between the building and the outside sidewalk may also occur. These concerns should be understood and addressed in the design phase of this project.

Utilities that project through slab-on-grade floors should be designed with either some degree of flexibility or with sleeves in order to allow for potential differential movement between these lines should vertical movement occur.

Contraction, control or expansion joints should be designed and placed in various portions of the structure. Properly planned placement of these joints will assist in controlling the degree and location of material cracking which normally occurs due to material shrinkage, thermal affects, soil movements and other related structural conditions.

Excavations for the foundation portions of the slabs should be observed and documented by a representative of Shepherd Geotechnical Engineering, Inc. prior to steel or concrete placement to assess that the foundation materials are capable of supporting the design loads and are consistent with the materials discussed in this report. This is especially important to identify the consistency of the subgrade or fill material under the footings. Soft

or loose soil zones encountered at the bottom of the footing or beam excavations should be removed to the level of competent soils as directed by the geotechnical engineer. Cavities formed as a result of excavation of soft or loose soil zones should be backfilled with compacted low volume change fill.

After opening, footing and beam excavations should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. If it is required that footing excavations be left open an extended period, they should be protected to reduce evaporation or entry of moisture.

**Structurally Supported Floor Slab**

The 6 feet of remove and replace low volume change soil requirement, as described above, can be eliminated by using a structurally supported floor slab. The structurally supported floor slab should be constructed to have a minimum of a 6 inch void between the subgrade and the bottom of the floor slab.

**Drilled Pier and Grade Beam Foundation System**

Straight shaft drilled piers that derive their support from a combination of skin friction and end bearing could be used to support the proposed building. We recommend that drilled piers extend into the very stiff to hard fat clay material to an elevation of 1184 feet or at least 6 feet beginning at the top of deep fat clay (without caliche) layer. The drilled piers should be designed using an allowable end bearing pressure of 5,500 psf and an allowable skin friction of 500 psf. The allowable end bearing and allowable skin friction have a safety factor of 2 and 3, respectively, included. <u>The embedment depth and elevation, allowable end bearing pressure and skin friction values are based on a cohesion of 2,000 psf and may change in the final report.</u>

Long-term settlement for straight shaft piers bearing within the very stiff to hard fat clay and constructed as recommended should be less than ½ inch. Differential settlement should be negligible.

Grade beams should be structurally connected to the top of the piers. Grade beams should extend at least 2.5 feet below the final exterior adjacent grade. A minimum void space of 6 inches beneath the grade beams is required. Excavations for the grade beams should be free of loose material.

Due to variations in the quality and depth of the bedrock across the site, the geotechnical engineer or his representative should be present during pier drilling to verify that the 6 foot embedment is achieved. The straight shaft piers should have a

minimum diameter of 24 inches. The piers should be provided with enough steel reinforcement to provide adequate structural integrity and to resist uplift due to expansive soil.

Earth auger and wet rotary drilling methods were used to penetrate the overburden soils. The pier drilling contractor should be made aware of these subsurface conditions. We anticipate that temporary casing will be needed to prevent caving of the excavation sides in some of the borings. However, the final determination should be made at the time of construction. Groundwater was encountered in all of the building borings. Therefore, groundwater seepage into pier excavations may occur and require dewatering. The need for dewatering will depend on the actual groundwater conditions at the time of construction

Prior to placing concrete, any water or sloughed material should be removed from the base of the drilled piers. If water is encountered and cannot be removed, concrete should be pumped or placed using a tremie pipe and placed from the bottom of the pier excavation to the top, displacing the water to the surface. To facilitate pier construction, concrete should be onsite and ready for placement as pier excavations are completed. In no event should a pier excavation be allowed to remain open overnight.

### IBC Site Coefficient

From the geotechnical investigation, the onsite soils yield a Site Coefficient "D". This site coefficient is based on a maximum boring depth of 40 feet, without testing the hardness of any bedrock material. To obtain a more accurate site coefficient, a deeper boring (100 feet, as per the code) must be used to evaluate the subsurface conditions.

## PAVEMENT RECOMMENDATIONS

We understand all pavements for the Physical Fitness Center project will be constructed with asphaltic concrete.

The parking lot pavement sections were evaluated using the Pavement-Transportation Computer Assisted Structural Engineering (PCASE) software. Based on the PCASE software, the traffic was classified as class F road. Traffic information which was used is summarized in Table 1 below. The POV information is approximate. These assumptions, and the PCASE software output file, can be found in Appendix C. If these assumptions are not acceptable, or if more accurate information is available, please contact us so we may present more accurate pavement recommendations.

**TABLE 2 – TRAFFIC INFORMATION**

| LIGHT DUTY TRAFFIC | | |
|---|---|---|
| **Vehicle Type** | **Number of Vehicles** | **Passes** |
| POV – Car | 30 | 2 per day, 5 days per week |
| POV – Large Truck | 20 | 2 per day, 5 days per week |
| POV – Small Truck | 20 | 2 per day, 5 days per week |
| **HEAVY DUTY TRAFFIC** | | |
| **Vehicle Type** | **Number of Vehicles** | **Passes** |
| Delivery Truck | 1 | 2 per week |
| Semi truck and trailer | 1 | 2 per week |

The traffic information in Table 1 was used to produce a 20 year design of the asphalt parking and drive areas. The pavement sections are listed below in Table 3.

Based on the results of a colorimeter test (OHD L-49), the on-site soils are not suitable for lime stabilization to treat the expansive nature of the soil due to extremely high sulfate content. Removal of the existing expansive soils and replacement with low volume change fill, as described in the Floor Slab Subgrade section of this report, is recommended. A non-woven geotextile should be placed between the low volume change fill subgrade and the aggregate base to prevent infiltration of the aggregate into the subgrade.

**TABLE 3 – PAVEMENT SECTIONS**

| Flexible Pavement Thickness | | |
|---|---|---|
| **Pavement Materials** | **Light Duty** | **Heavy Duty** |
| Asphaltic Concrete | 4.5" | 7.5" |
| Aggregate Base | 6" | 6" |
| Low Volume Change Fill Subgrade | 12" | 12" |

Because of the suspected sulfate content of the natural subgrade soils, the subgrade material should not be lime, fly ash or cement kiln dust (CKD) treated in any form. Removal of the existing expansive soils and replacement with low volume change fill, as described in the Floor Slab Subgrade section of this report, is recommended. A non-woven geotextile should be placed between the low volume change fill subgrade and the aggregate base to prevent infiltration of the aggregate into the subgrade. Even the low volume change fill materials should not be treated due to the possibility of upward

migration of the sulfates in the natural soils. Pending lab results, the recommendation to refrain from modifying the subgrade may change in the final report.

Minimizing subgrade saturation is an important factor in maintaining subgrade strength. Water allowed to pond on or adjacent to pavements could saturate the subgrade and cause premature pavement deterioration. The pavement should be sloped to provide rapid surface drainage, and positive surface drainage should be maintained away from the edge of the paved areas. A 2% slope will be sufficient for rapid surface drainage. Design alternatives that could reduce the risk of subgrade saturation and improve long-term pavement performance include crowning the pavement subgrades to drain toward the edges, rather than to the center of the pavement areas; and installing surface drains next to any areas where surface water could pond. Properly designed and constructed subsurface drainage will reduce the time subgrade soils are saturated and can also improve subgrade strength and performance.

Periodic maintenance extends the service life of the pavement and should include crack sealing, surface sealing and patching of any deteriorated areas. Also, thicker pavement sections could be used to reduce the required maintenance and extend the service life of the pavements. Curbing around the parking lot will prolong the life of the pavement Signs should be placed at the entrances of the pavement areas to designate the weight of trucks which will be allowed.

## CONSTRUCTION CONSIDERATIONS

### Construction in Expansive Soils

It is expected that the soils encountered across the project site are extremely expansive with very high swell potential. Additional design considerations for construction in expansive soils have been included for this project.

The following information has been assimilated after examination of numerous projects constructed in active soils. It is presented here as a convenience to the designers and contractors. If these features are incorporated into the overall design or the project, the performance of the structure should be improved.

- Special considerations should be given to completion items outside the building area, such as stairs, sidewalks, etc. They should be designed to adequately sustain the potential vertical movements mentioned in the report.

- The general ground surface should be sloped away from the building on all sides so that water will always drain away from the structure. Water should not be allowed to pond near the structure after the slab and/or foundation has been placed.

- Roof drainage should be collected by a system of gutters and downspouts and transmitted by pipe to a storm drainage system where the water can drain away without entering the building subgrade.

- Sidewalks should not be structurally connected to the buildings. They should be sloped away from the building so that surface water will drain away.

- Sprinkler lines and sprinkler heads, if used, should not be placed alongside the sidewalls of the buildings, but should be placed away from the buildings or structures such that the water will be sprayed towards the buildings or structures. The purpose of this recommendation is to mitigate the ponding and subsequent percolation of water into the soils beneath the building or structures causing detrimental vertical movements in the event that a sprinkler line or sprinkler head ruptures.

- Utilities that project through the slabs on grade should be designed with either some degree of flexibility or with sleeves. Such design features will help to reduce the risk of damage to the utility lines as vertical movements occur.

- Backfill for utility lines or along grade beams should consist of onsite material. If the backfill is too dense or dry, swelling may form a mound along the ditch line. The soils should be processed through the previously discussed compaction criteria. If non-plastic soil is used for bedding, a clay plug should be constructed at the slab on grade face to diminish access to the interior of the slabs from percolating water transmitted through the bedding material.

- During construction, every attempt should be made to limit the extreme wetting or drying of the subsurface soils since swelling or shrinkage will result. Standard construction practices of providing surface water drainage should be used. A positive slope of the ground away from the foundations and select fill excavations and ditches is recommended along with ditches or swales provided to carry off the runoff water both during and after construction.

### Construction in Sulfate Soils

It is expected that the natural onsite soils will have a high sulfate content due to the presence of gypsum, which was identified in the field. Sulfates are naturally occurring in some soils. If combined with calcium based materials, such as cement, lime, flyash and CKD, sulfate soils can expand up to 250 percent of the original size when exposed to moisture. For this reason, removal and replacement of natural soils with low volume change fill to depths as outlined in the above sections is imperative.

### Wet Weather Earthwork

During or after periods of wet weather, it may be necessary to import granular materials to protect open subgrade soils. It may also be necessary to install a granular working pad to support construction equipment. Delays in site earthwork activities should be anticipated during periods of heavy rainfall. Additionally, site clearing and stripping activities may expose subgrade material that may be damaged if subjected to disturbance from construction traffic.

When a granular working base is used to protect open subgrade material and construction equipment, the base should consist of a suitable thickness of crushed rock or ballast placed by end-dumping off an advancing pad of rock fill. The site contains native lean and fat clays and is moisture sensitive, and it may be necessary to place a geotextile fabric beneath the working blanket to prevent the intrusion of fines into the rock. Because construction practices can greatly affect the amount of rock required, we recommended that if conditions require the installation of a granular working blanket, the design, installation and maintenance be made the responsibility of the contractor. After installation, the working blanket should be compacted with a minimum of four overlapping passes with a smooth-faced steel drum or grid roller.

## CONSTRUCTION MONITORING AND TESTING

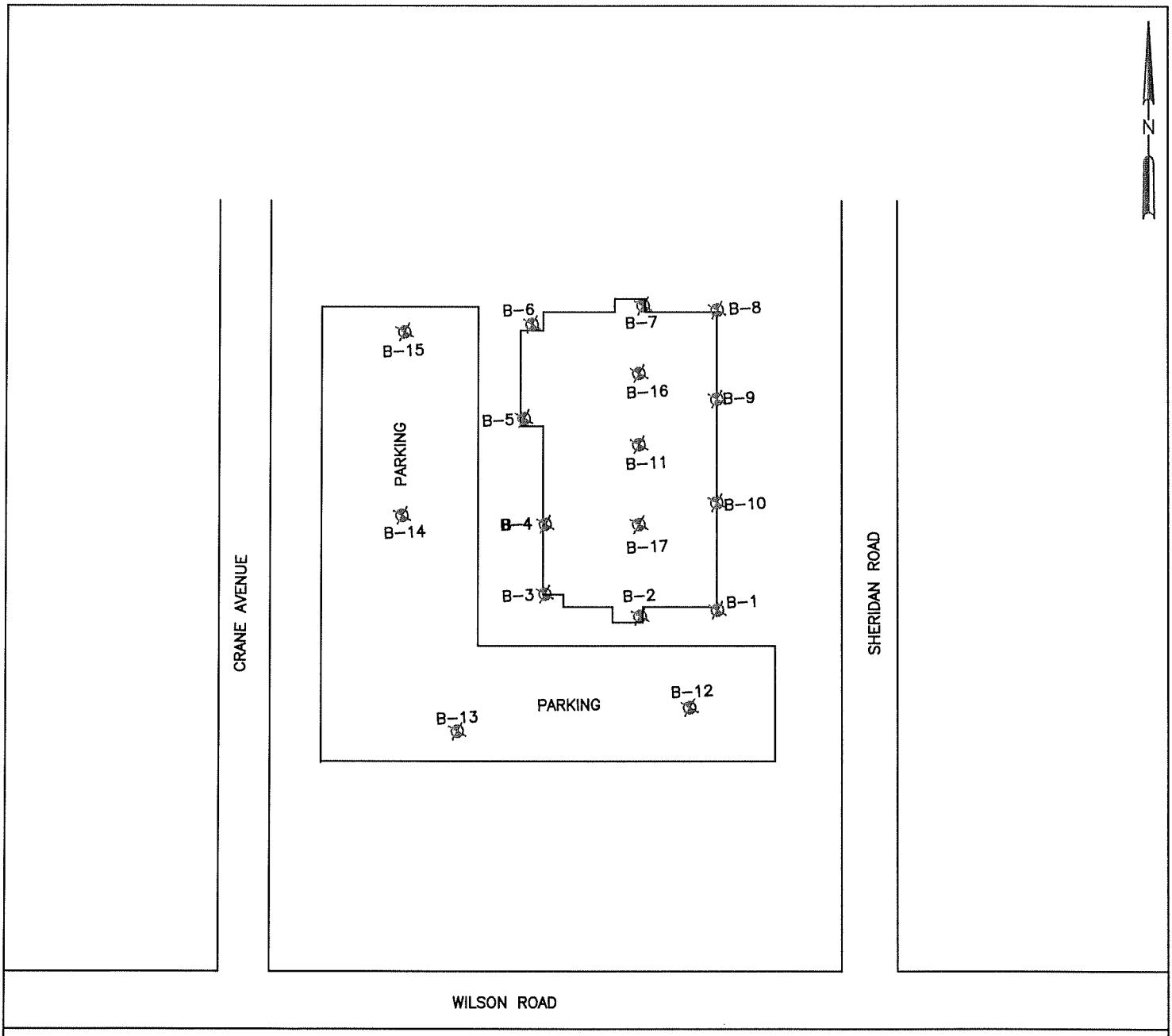
We recommend that Shepherd Geotechnical Engineering, Inc. be retained to provide construction monitoring and testing services during earthwork activities and foundation construction. The purpose of our field monitoring services is to confirm that site conditions are as anticipated, to provide field recommendations as required based on conditions encountered, and to document the activities of the contractor to assess compliance with the project recommendations provided by Shepherd Geotechnical Engineering, Inc.

## CLOSURE

The analysis, conclusions, and recommendations presented in this preliminary report are based on site conditions as they existed at the time of our field exploration, and further assume that the conditions encountered in our exploratory borings are representative subsurface conditions within the study area. If conditions differ from those described in this report are encountered or appear to be present beneath the excavations, Shepherd Geotechnical Engineering, Inc. should be advised at once so that additional recommendations may be provided where necessary.

This preliminary report was prepared for the exclusive use of C.H. Guernsey & Co., the U.S. Army Corps of Engineers, Fort Sill Army Post and their agents and consultants. It should be made available to prospective contractors for information factual data only and not as a warranty of subsurface conditions similar to those interpreted from the boring logs or discussions presented herein.

# APPENDIX A

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**BORING LOCATION DIAGRAM**
**Ft. Sill**
**Physical Fitness Facility**
**Lawton, OK**

| | | | |
|---|---|---|---|
| Project Mngr: | KKB | Project No. | 08028 |
| Designed By: | KKB | Scale: | NOT TO SCALE |
| Checked By: | JDS | Date: | 4-9-08 |
| Approved By: | JDS | Drawn By: | MML |
| File Name: | 08028 | Figure No. | 1 |

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# BORING NUMBER B-1



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/2/08 **COMPLETED** 4/2/08
**GROUND ELEVATION** 1206.9 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** Wet Rotary
**AT TIME OF DRILLING** n/a
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** n/a
**NOTES** PRELIMINARY
**24hrs AFTER DRILLING** 7.0 ft / Elev 1199.9 ft

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CH-ML | **SILTY FAT CLAY**, brown, stiff | SPT | 12 | | | | | |
| | CH | **FAT CLAY with CALICHE**, yellowish brown and greenish brown with white, stiff to very stiff | ST | | | | | | |
| 5 | | | SPT | 18 | | | | | |
| | | | SPT | 14 | | | | | |
| 10 | CH | **FAT CLAY**, yellowish brown, greenish brown, red, brown and green, very still, small gravel from approximately 25 ft to 25.5 ft | SPT | 20 | | | | | |
| 15 | | | SPT | 20 | | | | | |
| 20 | | | SPT | 20 | | | | | |
| 25 | | | SPT | 30 | | | | | |
| 30 | | | SPT | 28 | | | | | |
| 35 | | | SPT | 23 | | | | | |
| 40 | CH | **FAT CLAY with GRAVEL**, brown and yellowish brown to grayish brown and bluish gray, hard | SPT | 58 | | | | | |
| 45 | | Boring Completed and Grouted, 4/2/08 | | | | | | | |

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# BORING NUMBER B-2



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/3/08 **COMPLETED** 4/3/08
**GROUND ELEVATION** 1205.9 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** Wet Rotary
**AT TIME OF DRILLING** n/a
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** n/a
**NOTES** PRELIMINARY
**24hrs AFTER DRILLING** 2.0 ft / Elev 1203.9 ft

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | CH | **FAT CLAY with SAND**, dark brown to reddish brown to brown and greenish brown, stiff | SPT | 9 | | | | | |
| | | | SPT | 9 | | | | | |
| 5 | | | SPT | 10 | | | | | |
| | CH | **FAT CLAY** with trace of CALICHE, brown, greenish brown and yellowish brown with white, stiff | SPT | 10 | | | | | |
| 10 | | | SPT | 9 | | | | | |
| | CH | **FAT CLAY with CALICHE**, brown, greenish brown and yellowish brown, stiff | | | | | | | |
| 15 | CH | **FAT CLAY**, yellowish brown, greenish brown, brown and red to gray, very stiff to hard, small gravel from approximately 35 ft to 35.5 ft | SPT | 20 | | | | | |
| 20 | | | SPT | 24 | | | | | |
| 25 | | | SPT | 22 | | | | | |
| 30 | | | SPT | 38 | | | | | |
| 35 | | | SPT | 25 | | | | | |
| 40 | | | SPT | 55 | | | | | |
| | | Boring Completed and Grouted, 4/3/08 | | | | | | | |
| 45 | | | | | | | | | |

GEOTECH BH COLUMNS 08028 - FT SILL PHYSICAL FITNESS FACILITY.GPJ GINT US.GDT 4/11/08

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# BORING NUMBER B-3



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/2/08 **COMPLETED** 4/2/08
**GROUND ELEVATION** 1202.9 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** Wet Rotary
**AT TIME OF DRILLING** n/a
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** n/a
**NOTES** PRELIMINARY
**24hrs AFTER DRILLING** 3.0 ft / Elev 1199.9 ft

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CH-ML | **SILTY FAT CLAY**, brown, soft | SPT | 4 | | | | | |
| | SP | **POORLY GRADED SAND**, red and brown, loose | | | | | | | |
| | CH | **FAT CLAY with SAND**, grayish brown, soft to medium stiff | SPT | 4 | | | | | |
| 5 | | | SPT | 7 | | | | | |
| | | | ST | | | | | | |
| 10 | | | SPT | 17 | | | | | |
| | CH | **FAT CLAY** with trace of CALICHE, yellowish brown and grayish brown with white, very stiff | | | | | | | |
| 15 | CH | **FAT CLAY**, greenish gray, yellowish brown, dark red and brown, very stiff to hard | SPT | 19 | | | | | |
| 20 | | | | | | | | | |
| 25 | | | SPT | 23 | | | | | |
| 30 | | | SPT | 40 | | | | | |
| 35 | | **2" SANDSTONE**, dark red, soft | SPT | 38 | | | | | |
| | | **FAT CLAY**, greenish brown to dark gray with bluish green, hard | | | | | | | |
| 40 | | | SPT | 47 | | | | | |
| 45 | | | SPT | 41 | | | | | |
| | | Boring Completed and Grouted, 4/2/08 | | | | | | | |

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# BORING NUMBER B-4



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/7/08 **COMPLETED** 4/7/08
**GROUND ELEVATION** 1204.4 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** Wet Rotary
**AT TIME OF DRILLING** n/a
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** n/a
**NOTES** PRELIMINARY
**AFTER DRILLING** n/a

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CH | **SANDY FAT CLAY**, reddish brown, medium stiff | SPT | 5 | | | | | |
| | CH | **FAT CLAY**, dark brown, yellowish brown, red, gray to bluish gray, medium stiff to hard | SPT | 7 | | | | | |
| 5 | | | SPT | 5 | | | | | |
| | | | SPT | 6 | | | | | |
| 10 | | | SPT | 8 | | | | | |
| 15 | | | SPT | 24 | | | | | |
| 20 | | | SPT | 21 | | | | | |
| 25 | | | SPT | 39 | | | | | |
| 30 | | | SPT | 43 | | | | | |
| 35 | | | SPT | 41 | | | | | |
| 40 | | | SPT | 37 | | | | | |
| 45 | | Boring Completed and Grouted, 4/7/08 | | | | | | | |

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# BORING NUMBER B-5



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/7/08 **COMPLETED** 4/7/08
**GROUND ELEVATION** 1209.1 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** Wet Rotary
**AT TIME OF DRILLING** n/a
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** n/a
**NOTES** PRELIMINARY
**AFTER DRILLING** ---

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CH | **FAT CLAY with SAND**, brown, medium stiff | SPT | 8 | | | | | |
| | | | SPT | 8 | | | | | |
| 5 | CH | **FAT CLAY with CALICHE**, light brown, medium stiff to stiff | SPT | 9 | | | | | |
| | | | SPT | 8 | | | | | |
| 10 | | | SPT | 11 | | | | | |
| 15 | CH | **FAT CLAY**, red, reddish brown, yellowish brown and gray, very stiff | SPT | 17 | | | | | |
| 20 | | | SPT | 16 | | | | | |
| 25 | | | SPT | 25 | | | | | |
| 30 | CH | **FAT CLAY with GRAVEL**, grayish brown, hard | SPT | 41 | | | | | |
| 35 | CH | **FAT CLAY**, grayish brown, very stiff to hard | SPT | 34 | | | | | |
| 40 | | | SPT | 30 | | | | | |
| 45 | | Boring Completed and Grouted, 4/7/08 | | | | | | | |

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# BORING NUMBER B-6



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/2/08 **COMPLETED** 4/2/08
**GROUND ELEVATION** 1211.4 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** Wet Rotary
**AT TIME OF DRILLING** n/a
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** n/a
**NOTES** PRELIMINARY
**AFTER DRILLING** Cave in @ 2ft.

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CH, ML, SP, CH | **SILTY FAT CLAY**, brown, very stiff; **POORLY GRADED SAND**, red and brown, medium dense; **FAT CLAY with SAND**, dark brown to brown and red, stiff | SPT | 15 | | | | | |
| | | | ST | | | | | | |
| 5 | CH | **FAT CLAY with CALICHE**, brown, stiff | SPT | 11 | | | | | |
| | | | SPT | 10 | | | | | |
| 10 | CH | **FAT CLAY**, brown, yellowish brown, greenish brown, red, stiff to hard | SPT | 11 | | | | | |
| 15 | | | SPT | 15 | | | | | |
| 20 | | | SPT | 27 | | | | | |
| 25 | | | SPT | 20 | | | | | |
| 30 | | | SPT | 33 | | | | | |
| 35 | CH | **FAT CLAY with GRAVEL**, brown, yellowish brown and greenish brown with red, hard | SPT | 31 | | | | | |
| 40 | | | SPT | 34 | | | | | |
| 45 | | Boring Completed and Grouted, 4/2/08 | | | | | | | |

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# BORING NUMBER B-7



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/7/08 **COMPLETED** 4/7/08
**GROUND ELEVATION** 1213 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** Wet Rotary
**AT TIME OF DRILLING** n/a
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** n/a
**NOTES** PRELIMINARY
**AFTER DRILLING** n/a

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CH-ML | **SILTY FAT CLAY with GRAVEL**, dark brown, stiff | SPT | 14 | | | | | |
| | CH | **FAT CLAY with trace of CALICHE**, greenish brown and yellowish brown, stiff to very stiff | SPT | 13 | | | | | |
| 5 | | | SPT | 24 | | | | | |
| | | | SPT | 24 | | | | | |
| 10 | | | SPT | 17 | | | | | |
| 15 | CH | **FAT CLAY**, red and light brown to gray with bluish green, very stiff to hard | SPT | 19 | | | | | |
| 20 | | | SPT | 23 | | | | | |
| 25 | | | SPT | 15 | | | | | |
| 30 | | | SPT | 27 | | | | | |
| 35 | | | SPT | 43 | | | | | |
| 40 | | | SPT | 43 | | | | | |
| 45 | | Boring Completed and Grouted, 4/7/08 | | | | | | | |

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# BORING NUMBER B-8



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/2/08 **COMPLETED** 4/2/08
**GROUND ELEVATION** 1214.4 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** Wet Rotary
**AT TIME OF DRILLING** n/a
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** n/a
**NOTES** PRELIMINARY
**24hrs AFTER DRILLING** 7.0 ft / Elev 1207.4 ft

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CH | **SANDY FAT CLAY**, brown, medium stiff | SPT | 8 | | | | | |
| | CH | **FAT CLAY with CALICHE**, greenish brown with white, stiff | SPT | 11 | | | | | |
| 5 | | | ST | | | | | | |
| | CH | **FAT CLAY**, red, yellowish brown, greenish brown to greenish gray, very stiff to hard | SPT | 24 | | | | | |
| 10 | | | | | | | | | |
| | | | SPT | 21 | | | | | |
| 15 | | | | | | | | | |
| | | | SPT | 16 | | | | | |
| 20 | | | | | | | | | |
| | | | SPT | 19 | | | | | |
| 25 | | | | | | | | | |
| | | | SPT | 18 | | | | | |
| 30 | | | | | | | | | |
| | | | SPT | 29 | | | | | |
| 35 | | | | | | | | | |
| | | | SPT | 25 | | | | | |
| 40 | | | | | | | | | |
| | | | SPT | 46 | | | | | |
| 45 | | Boring Completed and Grouted, 4/2/08 | | | | | | | |

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# BORING NUMBER B-9



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/3/08 **COMPLETED** 4/3/08
**GROUND ELEVATION** 1211.7 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** Wet Rotary
**AT TIME OF DRILLING** n/a
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** n/a
**NOTES** PRELIMINARY
**AFTER DRILLING** n/a

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CH | **FAT CLAY with SAND**, brown, medium stiff | SPT | 7 | | | | | |
| | CH | **FAT CLAY with CALICHE**, brown with white, stiff | SPT | 9 | | | | | |
| 5 | | | SPT | 10 | | | | | |
| | | | ST | | | | | | |
| 10 | CH | **FAT CLAY**, grayish brown, dark red, yellowish brown, brown to greenish brown to grayish brown, very stiff to hard | SPT | 20 | | | | | |
| 15 | | | SPT | 21 | | | | | |
| 20 | | | SPT | 16 | | | | | |
| 25 | | | SPT | 19 | | | | | |
| 30 | | | SPT | 26 | | | | | |
| 35 | | | SPT | 49 | | | | | |
| 40 | | | SPT | 34 | | | | | |
| 45 | | Boring Completed and Grouted, 4/3/08 | | | | | | | |

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# BORING NUMBER B-10



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/3/08 **COMPLETED** 4/3/08
**GROUND ELEVATION** 1210.5 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** Wet Rotary
**AT TIME OF DRILLING** n/a
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** n/a
**NOTES** PRELIMINARY
**AFTER DRILLING** n/a

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | **6" AGGREGATE BASE** | | | | | | | |
| | CH | **FAT CLAY with SAND**, brown, medium stiff | SPT | 8 | | | | | |
| | CH | **FAT CLAY with CALICHE**, brown, yellowish brown and greenish brown with white, stiff to very stiff | SPT | 13 | | | | | |
| 5 | | | SPT | 15 | | | | | |
| | | | SPT | 15 | | | | | |
| 10 | | | ST | | | | | | |
| | CH | **FAT CLAY**, brown, yellowish brown, greenish brown and red, very stiff, small gravel from approximately 25 ft to 25.5 ft | | | | | | | |
| 15 | | | SPT | 19 | | | | | |
| 20 | | | SPT | 16 | | | | | |
| 25 | | | SPT | 24 | | | | | |
| 30 | | | SPT | 26 | | | | | |
| 35 | CH | **FAT CLAY with GRAVEL**, brown, yellowish brown, grayish grown with red and grayish blue, very stiff | SPT | 26 | | | | | |
| 40 | CH | **FAT CLAY**, grayish brown and brown, hard | SPT | 44 | | | | | |
| 45 | | Boring Completed and Grouted, 4/3/08 | | | | | | | |

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# BORING NUMBER B-11



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/2/08 **COMPLETED** 4/2/08
**GROUND ELEVATION** 1210.5 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** Wet Rotary
**AT TIME OF DRILLING** n/a
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** n/a
**NOTES** PRELIMINARY
**24hrs AFTER DRILLING** 10.5 ft / Elev 1200.0 ft

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CH | **FAT CLAY with SAND**, brown to reddish brown and brown, stiff | SPT | 9 | | | | | |
| | | | SPT | 11 | | | | | |
| 5 | CH | **FAT CLAY with CALICHE**, greenish brown and yellowish brown with white, stiff to very stiff | SPT | 14 | | | | | |
| | | | SPT | 20 | | | | | |
| 10 | CH | **FAT CLAY**, greenish brown, yellowish brown and brown, very stiff, small gravel from approximately 25 ft to 25.5 ft | SPT | 15 | | | | | |
| 15 | | | SPT | 18 | | | | | |
| 20 | | | SPT | 21 | | | | | |
| 25 | | | SPT | 25 | | | | | |
| 30 | | | SPT | 23 | | | | | |
| 35 | CH | **FAT CLAY with GRAVEL**, greenish brown, yellowish brown and brown, hard | SPT | 34 | | | | | |
| 40 | CH | **FAT CLAY**, orange, yellowish brown, greenish brown and brown, very stiff | SPT | 30 | | | | | |
| 45 | | Boring Completed and Grouted, 4/2/08 | | | | | | | |

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# BORING NUMBER B-12



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/2/08 **COMPLETED** 4/2/08
**GROUND ELEVATION** 1200 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** 4.5" augers - CME 55
**AT TIME OF DRILLING** none
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** none
**NOTES** PRELIMINARY
**AFTER DRILLING** none

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CH | **FAT CLAY with SAND and GRAVEL**, brown, stiff | SPT | 9 | | | | | |
| | CH | **FAT CLAY with SAND**, brown to reddish brown, medium stiff | SPT | 7 | | | | | |
| 5 | | | SPT | 8 | | | | | |
| | CH | **FAT CLAY**, red, yellowish brown and grayish brown, stiff | SPT | 13 | | | | | |
| 10 | | | SPT | 9 | | | | | |
| | | Boring Completed and Backfilled, 4/2/08 | | | | | | | |
| 15 | | | | | | | | | |

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# BORING NUMBER B-13



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/2/08 **COMPLETED** 4/2/08
**GROUND ELEVATION** 1206.5 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** 4.5" augers - CME 55
**AT TIME OF DRILLING** none
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** none
**NOTES** PRELIMINARY
**AFTER DRILLING** none

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CH | **SANDY FAT CLAY**, reddish brown and yellowish brown, stiff | SPT | 10 | | | | | |
| | SC | **CLAYEY SAND**, yellowish brown, medium dense | SPT | 15 | | | | | |
| 5 | | | SPT | 23 | | | | | |
| | CH | **FAT CLAY**, yellowish brown and grayish brown, stiff to very stiff | SPT | 20 | | | | | |
| 10 | | | SPT | 10 | | | | | |
| 15 | | Boring Completed and Backfilled, 4/2/08 | | | | | | | |

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# BORING NUMBER B-14



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/2/08 **COMPLETED** 4/2/08
**GROUND ELEVATION** 1209.5 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** 4.5" augers - CME 55
**AT TIME OF DRILLING** none
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** none
**NOTES** PRELIMINARY
**AFTER DRILLING** none

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | CH | **SANDY FAT CLAY**, brown to light brown, medium stiff to stiff | SPT | 6 | | | | | |
| | | | GB | | | | | | |
| 5 | | | SPT | 11 | | | | | |
| | | | SPT | 12 | | | | | |
| 10 | CH | **FAT CLAY with CALICHE**, reddish brown with white, very stiff | SPT | 15 | | | | | |
| 15 | | Boring Completed and Backfilled, 4/2/08 | | | | | | | |

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# BORING NUMBER B-15



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/2/08 **COMPLETED** 4/2/08
**GROUND ELEVATION** 1210 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** 4.5" augers - CME 55
**AT TIME OF DRILLING** none
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** none
**NOTES** PRELIMINARY
**AFTER DRILLING** none

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | CH | **SANDY FAT CLAY**, brown to brown with light brown, soft to stiff | SPT | 4 | | | | | |
| | | | SPT | 9 | | | | | |
| 5 | | | SPT | 4 | | | | | |
| | CH | **SANDY FAT CLAY with GRAVEL**, light brown, stiff | | | | | | | |
| | | | SPT | 10 | | | | | |
| 10 | | | | | | | | | |
| | | | SPT | 13 | | | | | |
| | | Boring Completed and Backfilled, 4/2/08 | | | | | | | |
| 15 | | | | | | | | | |

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# BORING NUMBER B-16



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/4/08 **COMPLETED** 4/4/08
**GROUND ELEVATION** 1212 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** 4.5" augers - CME 55
**AT TIME OF DRILLING** 30.0 ft / Elev 1182.0 ft
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** ---
**NOTES** PRELIMINARY
**AFTER DRILLING** n/a

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CH | **SANDY FAT CLAY with GRAVEL**, brown, medium stiff | SPT | 8 | | | | | |
| | | | ST | | | | | | |
| 5 | CH | **FAT CLAY with CALICHE**, light brown with white, stiff | SPT | 9 | | | | | |
| | | | ST | | | | | | |
| 10 | CH | **FAT CLAY**, greenish brown and yellowish brown, stiff to very stiff | SPT | 12 | | | | | |
| | | | ST | | | | | | |
| 15 | | | SPT | 29 | | | | | |
| | | | ST | | | | | | |
| 20 | CH | **FAT CLAY with CALICHE**, grayish brown and yellowish brown, very stiff to hard | SPT | 22 | | | | | |
| | | | ST | | | | | | |
| | | | SPT | 32 | | | | | |
| 25 | CH | **FAT CLAY with GRAVEL**, grayish brown and yellowish brown, hard | ST | | | | | | |
| | | | SPT | 38 | | | | | |
| | | | ST | | | | | | |
| 30 | CH | **FAT CLAY**, red, brown, grayish brown, yellowish brown, hard | SPT | 49 | | | | | |
| | | | ST | | | | | | |
| | | | SPT | 69 | | | | | |
| 35 | | **Well Graded Gravel**, gray, very dense | SPT | 50/4.0 | | | | | |
| 40 | CH | **FAT CLAY**, grayish brown and yellowish brown, hard | SPT | 53 | | | | | |
| | | | SPT | 48 | | | | | |
| 45 | | Boring Completed and Grouted, 4/7/08 | | | | | | | |

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# BORING NUMBER B-17



**CLIENT** C.H. Guernsey & Co.
**PROJECT NAME** Ft. Sill Physical Fitness Facility
**PROJECT NUMBER** 08028
**PROJECT LOCATION** Lawton, OK
**DATE STARTED** 4/4/08 **COMPLETED** 4/4/08
**GROUND ELEVATION** 1208 ft **HOLE SIZE** 4.5 in
**DRILLING CONTRACTOR** DSO - Drilling Services of Oklahoma
**GROUND WATER LEVELS:**
**DRILLING METHOD** Wet Rotary
**AT TIME OF DRILLING** n/a
**LOGGED BY** BWB **CHECKED BY** KKB
**AT END OF DRILLING** n/a
**NOTES** PRELIMINARY
**AFTER DRILLING** n/a

| DEPTH (ft) | USCS | MATERIAL DESCRIPTION | SAMPLE TYPE | BLOW COUNTS | MOISTURE CONTENT (%) | ATTERBERG LIMITS: LIQUID LIMIT | ATTERBERG LIMITS: PLASTIC LIMIT | ATTERBERG LIMITS: PLASTICITY INDEX | FINES CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | CH | **FAT CLAY with SAND**, reddish brown to yellowish brown, stiff to very stiff | SPT | 12 | | | | | |
| | | | SPT | 9 | | | | | |
| 5 | | | ST | | | | | | |
| | | | SPT | 16 | | | | | |
| 10 | | | | | | | | | |
| | | | SPT | 16 | | | | | |
| | CH | **FAT CLAY with CALICHE**, reddish brown with white, very stiff | | | | | | | |
| 15 | CH | **FAT CLAY with GRAVEL**, grayish brown with red, very stiff | SPT | 17 | | | | | |
| 20 | | | | | | | | | |
| | CH | **FAT CLAY**, grayish brown to gray with bluish green, very stiff to hard | SPT | 33 | | | | | |
| 25 | | | | | | | | | |
| | | | SPT | 22 | | | | | |
| 30 | | | | | | | | | |
| | | | SPT | 25 | | | | | |
| 35 | | | | | | | | | |
| | | | SPT | 37 | | | | | |
| 40 | | | | | | | | | |
| | | | SPT | 31 | | | | | |
| 45 | | Boring Completed and Grouted, 4/4/08 | | | | | | | |

# APPENDIX B

Pavement Design Report
U.S. Army Corps of Engineers
**PCASE Version 2.08**

| | |
|---|---|
| Design Name : | HVY FLEX |
| Design Type : | Roads |
| Pavement Type : | Flexible |
| Road Type : | Parking Lot |
| Terrain Type : | Flat |
| Analysis Type : | CBR |
| Depth of Frost (in) : | 0 |
| Wander Width (in) : | 33.35 |
| Design Index : | 4 |
| Design Class : | F |

**Layer Information**

| Layer Type | Material Type | Frost Code | Analysis | Minimum Thickness (in) | Required Thickness (in) Above Layer | Non frost Design Thickness (in) | Reduced Subgrade Strength (in) | Limited Subgrade Penetratio n (in) | CBR Strength |
|---|---|---|---|---|---|---|---|---|---|
| Asphalt | Asphalt | NFS | Compute | 3 | 0 | 7.43 | 0 | 0 | 0 |
| Base | Unbound Base | NFS | Manual | 4 | 1.27 | 6 | 0 | 0 | 50 |
| Natural Subgrade | Cohesive Cut | NFS | Manual | 0 | 19.18 | 0 | 0 | 0 | 2 |

**Traffic Information**

Pattern Name : HVY DUTY

| Vehicles | Weight (lb) Traffic Area A, B | Weight (lb) Traffic Area C, D | ACN |
|---|---|---|---|
| TRUCK, 2 AXLE 6 TIRE | 25000 | 18750 | 5 |
| TRUCK, 3 AXLE | 35000 | 26250 | 4 |

Pavement Design Report
U.S. Army Corps of Engineers
**PCASE Version 2.08**

| | |
|---|---|
| Design Name : | LIGHT FLEX |
| Design Type : | Roads |
| Pavement Type : | Flexible |
| Road Type : | Parking Lot |
| Terrain Type : | Flat |
| Analysis Type : | CBR |
| Depth of Frost (in) : | 0 |
| Wander Width (in) : | 33.35 |
| Design Index : | 1 |
| Design Class : | F |

**Layer Information**

| Layer Type | Material Type | Frost Code | Analysis | Minimum Thickness (in) | Required Thickness (in) Above Layer | Non frost Design Thickness (in) | Reduced Subgrade Strength (in) | Limited Subgrade Penetratio n (in) | CBR Strength |
|---|---|---|---|---|---|---|---|---|---|
| Asphalt | Asphalt | NFS | Compute | 2 | 0 | 3.74 | 0 | 0 | 0 |
| Base | Unbound Base | NFS | Manual | 4 | 0 | 6 | 0 | 0 | 50 |
| Natural Subgrade | Cohesive Fill | NFS | Manual | 0 | 12.01 | 0 | 0 | 0 | 2 |

**Traffic Information**

Pattern Name : LT DUTY

| Vehicles | Weight (lb) | Passes per Life Span | Equivalent Passes |
|---|---|---|---|
| CAR - PASSENGER | 3000 | 312000 | 82 |
| TRUCK, LARGE PICKUP OR SUV | 7500 | 208000 | 208000 |
| TRUCK, SMALL PICKUP OR SUV | 5000 | 208000 | 8656 |

# APPENDIX B

# LIST OF DRAWINGS

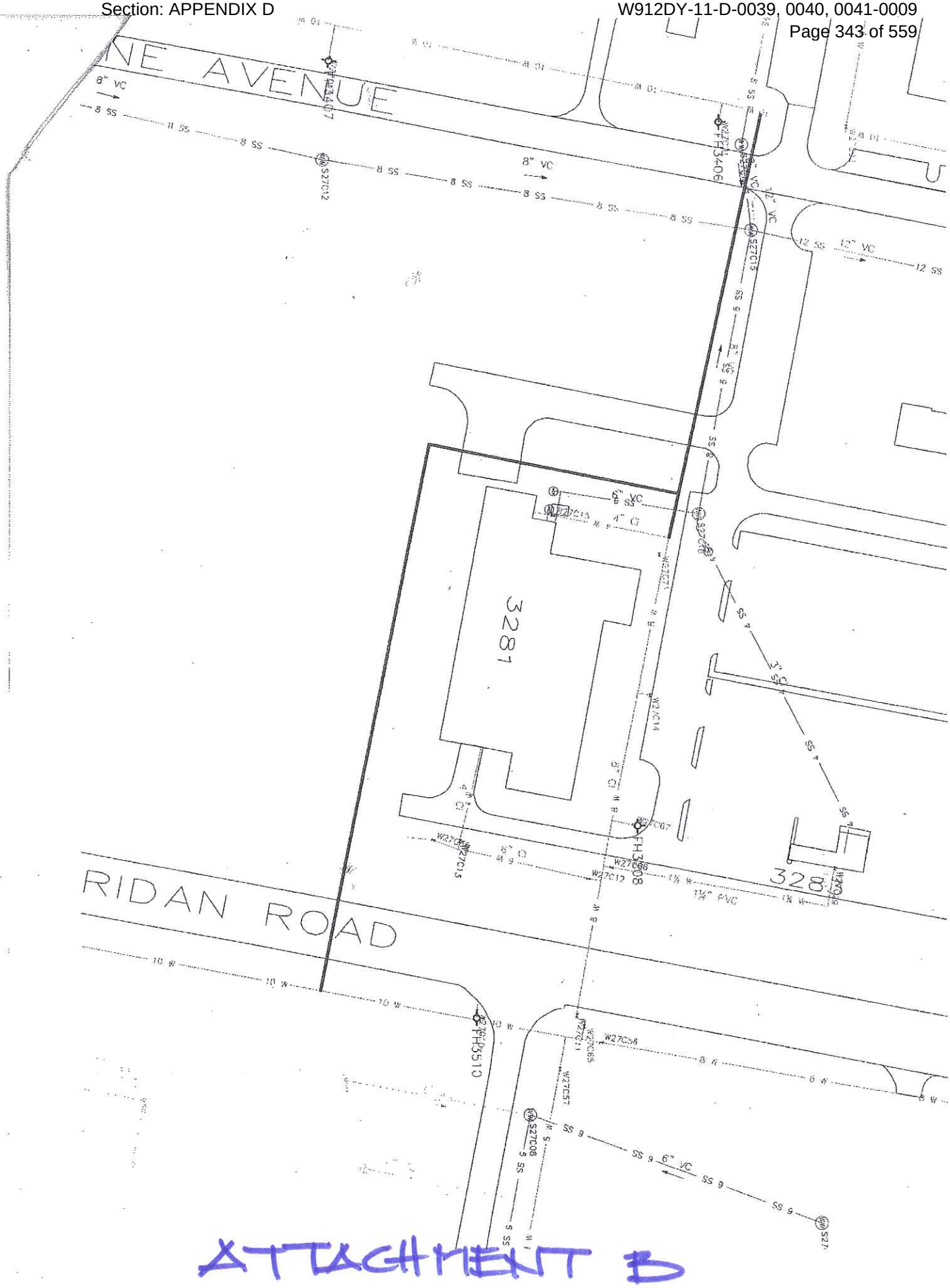
# NOT USED

# APPENDIX C

# UTILITY CONNECTIONS

# (SEE APPENDIX J)

# APPENDIX D
# RESULTS OF FIRE FLOW TESTS




ATTACHMENT B

AMERICAN WATER

**Military Services**

FORT SILL, OK

Date of Test 6/15/2011
Building # 3281

| Date | Time | Flow Hydrant # | Residual Hydrant # | Static Pressure (psi) | Residual Pressure (psi) | c coefficient | Hydrant outlet diameter (d) (in) | Pitot Reading (psi) | sqrt | Qf Observed Flow (gpm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 4/25/2011 | 1335 | 3208 | 3406 | 50 | 48 | 0.9 | 2.5 | 44 | 6.63325 | 1113 |
| 4/25/2011 | 1320 | | | | | 0.9 | 2.5 | | 0 | 0 |
| 4/25/2011 | 1415 | | | | | 0.9 | 2.5 | | 0 | 0 |
| 4/25/2011 | 1345 | | | | | 0.9 | 2.5 | | 0 | 0 |

ATTACHMENT B

# APPENDIX E
# ENVIRONMENTAL INFORMATION

# *Finding of No Significant Impact*
# *Base Realignment at Fort Sill, Oklahoma*

Pursuant to the Council on Environmental Quality (CEQ) Regulations (Title 40 of the *Code of Federal Regulations* [CFR] Parts 1500–1508) for implementing the procedural provisions of the National Environmental Policy Act (Title 42 of the *United States Code*, Part 4321 et seq.) and Army regulation (32 CFR Part 651), Fort Sill, Oklahoma, conducted an Environmental Assessment (EA) of the potential environmental and socioeconomic effects associated with implementing the 2005 Base Realignment and Closure (BRAC) Commission's recommendations at the installation.

## *PROPOSED ACTION*

The BRAC Commission made six recommendations concerning Fort Sill.

- *Operational Army*. Air Defense Artillery (ADA) units at Fort Bliss, Texas, are to be relocated to Fort Sill, and an artillery brigade at Fort Sill is to be relocated to Fort Bliss.
- *Transformation of the Reserve Component in Oklahoma*. The Keathley and Burris U.S. Army Reserve Centers in Lawton and Chickasha, Oklahoma (consisting of Multiple Launch Rocket System, conventional artillery, and communications units); the Wichita Falls U.S. Army Reserve Center in Wichita Falls, Texas; the 1st, 3rd, 5th, and 6th U.S. Army Reserve Centers; and Equipment Concentration Site located on Fort Sill, Oklahoma, are to be closed. The units at those locations are to be relocated into a new Armed Forces Reserve Center on Fort Sill, and a new U.S. Army Reserve Equipment Concentration Site is to be collocated with the Oklahoma Army National Guard Maneuver Area Training Equipment Site on Fort Sill.
- *Command and control of the U.S. Army Reserve in the southwestern United States*. The Major General Harry Twaddle U.S. Armed Forces Reserve Center, Oklahoma City, Oklahoma, is to be closed, and the 95th Division (Institutional Training) is to be relocated to Fort Sill.
- *Fires Center of Excellence* ("Net Fires Center" in the recommendations). The ADA Center and School at Fort Bliss, Texas, is to be relocated to Fort Sill, and that organization is to consolidate with the Field Artillery Center and School to establish a Fires Center of Excellence at Fort Sill.
- *Consolidation of correctional facilities*. Lackland Air Force Base, Texas, Fort Knox, Kentucky, and Fort Sill are to be realigned by relocating the correctional function of each to Fort Leavenworth, Kansas, to form a single Midwest Joint Regional Correctional Facility.
- *Defense Finance and Accounting Service*. Twenty-one Defense Finance and Accounting Service nationwide sites, including the one at Fort Sill, are to be closed. The functions are to be relocated and consolidated in Ohio, Colorado, or Indiana.

Implementation of the proposed action would require renovation of existing facilities and construction of new facilities to accommodate the increase in personnel and functions assigned to Fort Sill. The proposed new buildings would provide more than 2 million square feet of space. Assignment of additional personnel to Fort Sill would also require that the Post construct several ranges.

Four associated actions are also evaluated in the EA: (1) Relocation of the German Air Force Defense School and the German Air Force Command in the United States and Canada from Fort Bliss, Texas, to Fort Sill; (2) Reconfiguration of field artillery brigades into modular Fires Brigades; (3) Relocation of the Receipt-in-Place Location (RIPL), a facility operated by the Defense Reutilization and Marketing Service for receipt of tenant organizations' excess materiel before disposition by redistribution or sale; and (4) Construction of a Training Support Center warehouse to support BRAC-related activities.

Under the BRAC law, the Army must initiate all realignments not later than September 14, 2007, and complete all realignments not later than September 14, 2011. Implementation of the proposed action would occur over a span of approximately 5 years. Facilities renovations and new construction would be synchronized to meet the needs, on a priority basis, of units being relocated to Fort Sill.

## *ALTERNATIVES*

Army Regulation 210-20, *Master Planning for Army Installations*, establishes Army policy to maximize use of existing facilities. Fort Sill's evaluation of its existing inventory of facilities revealed a substantial shortfall in built space to accommodate the additional personnel and equipment associated with the realignment. In a few instances, some units and functions could be assigned to existing facilities and some facilities would require renovation to adequately support new occupants, but overall the evaluation indicated that post would require more than 2 million square feet of additional space to support the proposed actions.

Determination of the locations of the new facilities and functions that would be placed in existing facilities involved consideration of compatibility between the functions to be performed and the installation's land use designation for the site, adequacy of the sites for the function, proximity to related activities, distance from incompatible activities, availability and capacity of roads, efficient use of property, development density, potential future mission requirements, and special site characteristics, including potential environmental incompatibilities. Additionally, the Army had to consider the legal requirement of completing the realignment by September 2011.

Numerous variations of the proposal for siting the facilities could have been developed, but the locations selected were found, upon consideration of the above criteria, to reflect a sound, compatible set of solutions. Alternative siting schemes would have produce different, but not better, layouts. The implementation proposed in the EA, therefore, was the only one carried forth for analysis.

CEQ regulations require inclusion of the no action alternative. The no action alternative serves as a baseline against which the impacts of the proposed action and alternatives can be evaluated. Under the no action alternative, Fort Sill would not implement the proposed action. The BRAC recommendations have the force of law and must be implemented: The no action alternative, therefore, is not possible. Consistent with CEQ requirements, however, the no action alternative is evaluated in detail in the EA.

## *ENVIRONMENTAL CONSEQUENCES*

The environmental and socioeconomic consequences of implementation of the realignment alternative and the no action alternative are summarized below.

### *Realignment Alternative*

***Land Use and Airspace.*** No effects on land use or airspace would be expected. With only minor exception, the realignment plan was found to be compatible with existing land uses in the cantonment area. One of the BRAC parcels borders the Henry Post Army Airfield, but the analysis determined that a land use incompatibility due to noise from the airfield would not be created.

***Aesthetics and Visual Resources.*** Short-term minor adverse effects on aesthetics and visual resources would be expected from the increase of construction activities, which are inherently aesthetically displeasing. In the long term, new and renovated facilities would be expected to improve the functionality of the cantonment area and improve the area's overall aesthetic and visual appeal.

***Air Quality.*** Short- and long-term minor adverse effects on air quality would be expected. Emissions associated with construction and operation of facilities, however, would not exceed *de minimis* thresholds,

be *regionally significant*, contribute to a violation of any federal, state, or local air regulation, or contribute to a violation of Fort Sill's air operating permit.

***Noise.*** Short- and long-term minor adverse effects on the noise environment would be expected. A short-term increase in on-post noise would result from the use of heavy construction equipment, and a long-term increase in noise would result from the use of weapons up to and including 5.56-caliber rifles at the proposed small-arms ranges. All on- and off-installation areas would be compatible with the expected changes to the noise environment.

***Geology and Soils.*** No effects on geology, seismicity, topography, or Prime Farmlands would be expected. Long- and short-term minor adverse effects on soils would be expected from construction activities.

***Water Resources.*** Short-term minor adverse effects on surface waters and groundwaters would be expected. Construction activities would increase soil disturbance and potentially soil erosion, and total suspended solids could thus be increased in nearby waters. Also, leakage from construction equipment could increase petroleum hydrocarbon pollution in surface waters. Waterborne contaminants contributed by construction activities could be transported into the groundwater system, though the BRAC action would not change the long-term quantity or quality of groundwater. No effects on floodplains would be expected: There are no 100-year floodplains within the proposed impact areas.

***Biological Resources.*** Short- and long-term minor adverse effects on vegetation and wildlife would be expected. Construction activities would cause the loss of small areas of native and non-native vegetation, but disturbed areas would be revegetated with native species. Construction activities would also cause losses of habitat at construction sites. Most effects on wildlife would result from their displacement because of being disturbed by construction activities. There would be no effect on threatened, endangered, or other species of concern, or wetlands: All known habitats for sensitive species would be avoided, and no known wetlands are located in the proposed areas.

***Cultural Resources.*** No significant adverse effects would be expected. Long-term beneficial effects would be expected with regard to adaptive reuse and continued maintenance of historic architectural properties. Potential impacts could arise from the activities in the project areas, but adherence to policies and guidelines in the Integrated Cultural Resources Management Plan and consultation with the State Historic Preservation Officer (SHPO) would be expected to avoid or mitigate potential adverse effects to a less than significant level. Construction of facilities would result in adverse impacts if archaeological resources eligible for the National Register of Historic Places were adversely impacted by ground disturbance or if construction resulted in visual impacts to a nearby historic property's setting. Before Fort Sill would begin construction activities, it would identify historic properties, determine whether adverse impacts would occur, and develop mitigation measures, all in consultation with the Oklahoma SHPO and the eight Native American Tribes ( Delaware, Wichita, Kiowa, Fort Sill Apache, Comanche, Chickasaw, Cheyenne and Arapaho, and Caddo) having cultural and historic affiliation at Fort Sill, Oklahoma.

***Socioeconomics.*** Short- and long-term significant beneficial effects on economic development would be expected. The expenditures associated with renovation and construction of facilities on Fort Sill would increase sales volume, employment, and income in the region of influence (ROI). Short-term minor adverse effects on housing and all services would be expected from an increased demand for and reduced availability of housing and services in the ROI, and the increase in population would create a need for additional law enforcement, fire protection, and medical services; family support and social services; and shops, other services, and recreation. In the long-term, the housing market and all services could adapt to the demands of the increased population base. Short-term moderate adverse effects on schools would be expected. The incoming population would increase the number of school children in the ROI, and the Lawton Public School District schools would have to accommodate the increased student load. No

adverse effects on Environmental Justice would be expected, as the realignment of Fort Sill would not create disproportionately high or adverse human health or environmental effects on minority of low-income populations in the ROI. Long-term minor adverse effects on children could occur if families moving to Fort Sill as a result of BRAC were to occupy housing with hazardous materials (such as lead-based paint or asbestos) on Fort Sill or in the surrounding area.

***Transportation.*** Short-term minor adverse effects on transportation would be expected during the construction and renovation phase due to additional traffic congestion and traffic delays caused by construction activities. Wear and tear on installation and surrounding roads would also likely increase.

***Utilities.*** Short-term minor adverse effects on utilities would be expected from service interruptions during construction while new and renovated facilities are being hooked up to existing utilities systems. Only the electrical system, in its current configuration, would be inadequate to meet the added demand of incoming BRAC elements, and the additional demand would be met by the installation of a new 40-mega-watt sub-station. Long-term minor adverse effects would be expected from the consumption of landfill capacity by the construction and demolition debris generated by the Realignment Alternative.

***Hazardous and Toxic Materials.*** No effects on hazardous or toxic materials or wastes would be expected. Facility renovations would adhere to local, federal, and Army regulations for the removal and disposal of hazardous materials, and new facilities would minimize the use of such materials. All materials handling, storage, and disposal, including that of munitions and explosives of concern, would be in accordance with applicable laws and regulations.

***Cumulative Effects.*** No adverse cumulative effects would be expected: No specific concurrent projects have been identified, and as such no cumulative impacts are expected.

### No Action Alternative

No effects on any of the resource areas considered in the EA would be expected to result from implementation of the no action alternative.

## MITIGATION MEASURES

The EA identifies mitigation that would be undertaken to minimize adverse effects on the environment.

## CONCLUSIONS

During the public comment period on the Final EA and draft FNSI, comments from the Comanche Nation and Caddo Nation were received and determined to not be applicable to the proposed action. While revisions to the EA or FNSI were not warranted, the installation is coordinating with all interested tribes in regards to their concerns. Based on the analysis performed in this EA, implementation of the realignment alternative would have no significant direct, indirect, or cumulative effects on the quality of the natural or human environment. Preparation of an Environmental Impact Statement is not required. Issuance of a Finding of No Significant Impact is appropriate.

John Uberti

JOHN UBERTI
Colonel, FA
Garrison Commander

9 November 2006
Date

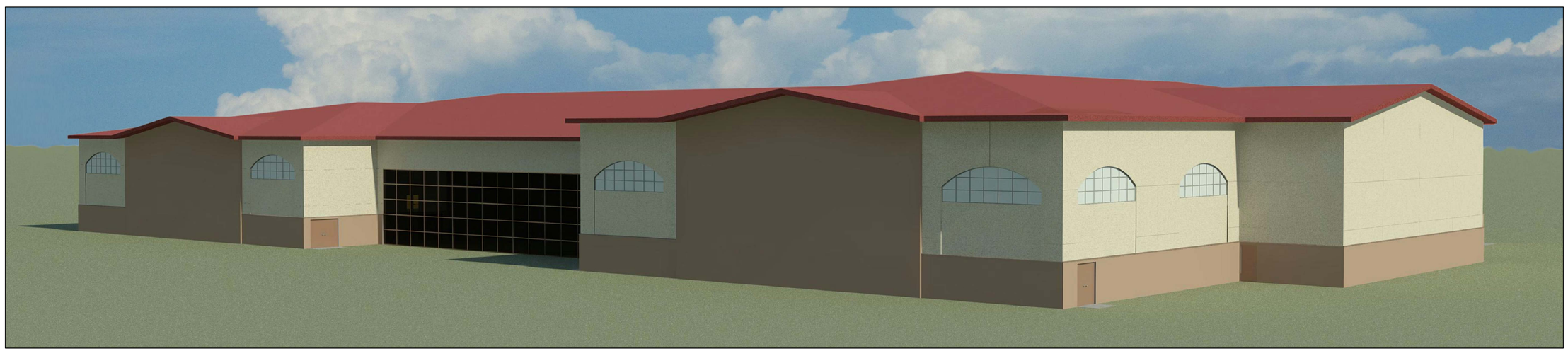
# APPENDIX F

# CONCEPTUAL AESTHETIC CONSIDERATIONS

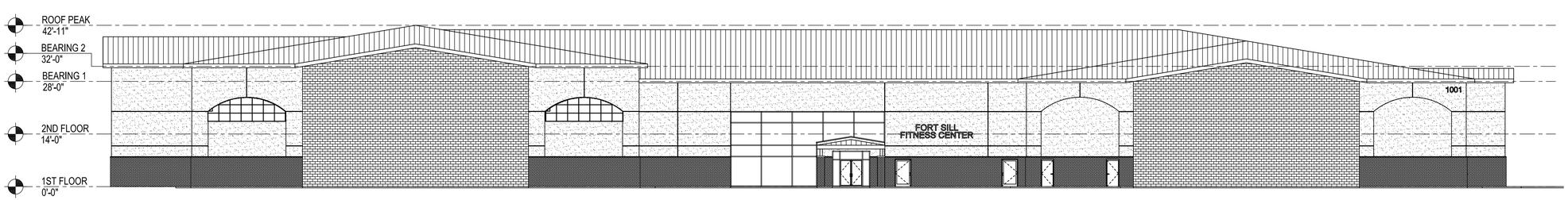
# Appendix F

# Architectural Theme

1 **FRONT PERSPECTIVE**
A-901 | A-901 NOT TO SCALE



2 **REAR PERSPECTIVE**
A-901 | A-901 NOT TO SCALE




3 **FRONT ELEVATION**
A-901 | A-901 SCALE: 1/16" = 1'-0"

**THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL SIGNED AND SEALED DOCUMENT**

NOTE: REFER TO GRAPHIC SCALE IF SHEET IS NOT 22"x34"

GUERNSEY

| Symbol | Description | Date | Appr. | Symbol | Description | Date | Appr. |
|---|---|---|---|---|---|---|---|

Designed by:
Reviewed by:
Drawn by:
Dwg. Code:
Contract Date:
File Name:
Plot Date: 08/15/2008
Plot Scale: AS SHOWN
Contract No.: #
Submitted by: J. J. MASSIMINO Vice President
Invitation No.: _____

U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT

C.H. GUERNSEY & COMPANY
Engineers and Consultants
5555 North Grand Boulevard
Oklahoma City, OK 73112-5507
405-848-9000 www.guernsey.com

PHYSICAL FITNESS CENTER
FORT SILL
FORT SILL, OKLAHOMA

PERSPECTIVE VIEWS

Sheet Reference Number:
**A-901**

US Army Corps of Engineers Tulsa District

**TRAINING COMPLEX UPGRADE**
**FORT SILL ARMY POST, OKLAHOMA**

5.6.5.4 Plant Material: Plan for the replacement of mature trees that are at the end of their lifespan and trim existing damaged or disease trees.

5.6.5.5 Site Elements: Provide additional site amenities (Fig. 5.26). Design and construct well defined entrances to Residential visual zones. Entrances should include landscaped center islands, upright markers or decorative gates. Screen utilities and place overhead power lines under ground.

5.6.5.6 Force Protection: None.

Fig. 5.26 – New Residential Bus Shelter

## 5.7 NEW POST VISUAL ZONE

5.7.1 The New Post visual zones with their Spanish Mission architectural style are the most impressive and identifiable visual zones on the Installation. Spanish Mission architecture which originated in southern California was the first style to diffuse eastward from the West. Most famously, the style was adopted by both the Southern Pacific and Santa Fe Railways for train stations, essentially as an effort to "theme" the Southwest for eastern travelers. Characteristic of the Mission style is simplicity of form (Fig. 5.27). Rounded arches supported by piers interrupt stucco walls. Color and texture are provided in broad red-tiled roofs. Roof eaves with exposed decorative rafters extend well beyond the walls. At times the plain wall surface is continued upward forming a parapet. Curvilinear parapets and small balconies or balconets are common on large buildings.

Fig. 5.27 – Post Headquarters, McNair Hall. Spanish Mission Architecture

5.7.1.1 Flanking the west edge of the Old Post Historic. District the original New Post, mostly constructed in the 1930s, extends to the north revealing a Central Mall that inspired housing area consisting of two story single family and two story fourplex homes (Fig. 5.28). The New Post then extends west along Randolph Road with Mission style structures on either side for nearly two miles. The Post Headquarters Building, McNair Hall, in the classic Beaux Art fashion, situated on a moderately elevated site serves as the eastern terminus of the New Post visual zone. This expansion west along Randolph Road consists of administrative buildings, instructional buildings, stately barracks, additional housing areas, a Post Office, service clubs, Military Police Headquarters

Fig. 5.28 – Spanish Mission Officers Quarters

Fig. 5.29 – Neo-Spanish Mission Dental Clinic

and warehouses. Although not currently being used for their original purposes these structures are in continuous use and are well maintained. Tree lined streets, well maintained lawns and monumental buildings give this area the appearance and feel of strength, unity and discipline. Other small enclaves of Mission style bungalows can be found southeast of the Old Post and adjacent to Henry Post airfield.

Fig. 5.30 – Neo-Spanish Mission Craft Center

5.7.1.2 The impact of the Mission style which generates a dominant visual theme has lead to its widespread use and reinterpretation in other areas of the Installation. Outside of the original New Post development of the 1930's, an eclectic "Neo-Spanish Mission" style has become the preferred and predominant style for all new construction and major exterior renovations of existing building and structures (Fig. 5.29 & 5.30). This Neo-Spanish Mission style borrows the red colored hip roofs, stucco walls, arcades, curvilinear parapets and projecting eaves and combines them with a buff colored brick, painted concrete masonry units or other more contemporary exterior finishes. The color scheme of the original Spanish Mission style and the Neo-Spanish Mission style within the New Post zones is again analogous, beige and brown, plus the complementary red accent.

5.7.2 New Post Visual Analysis Map (Fig. 5.31).

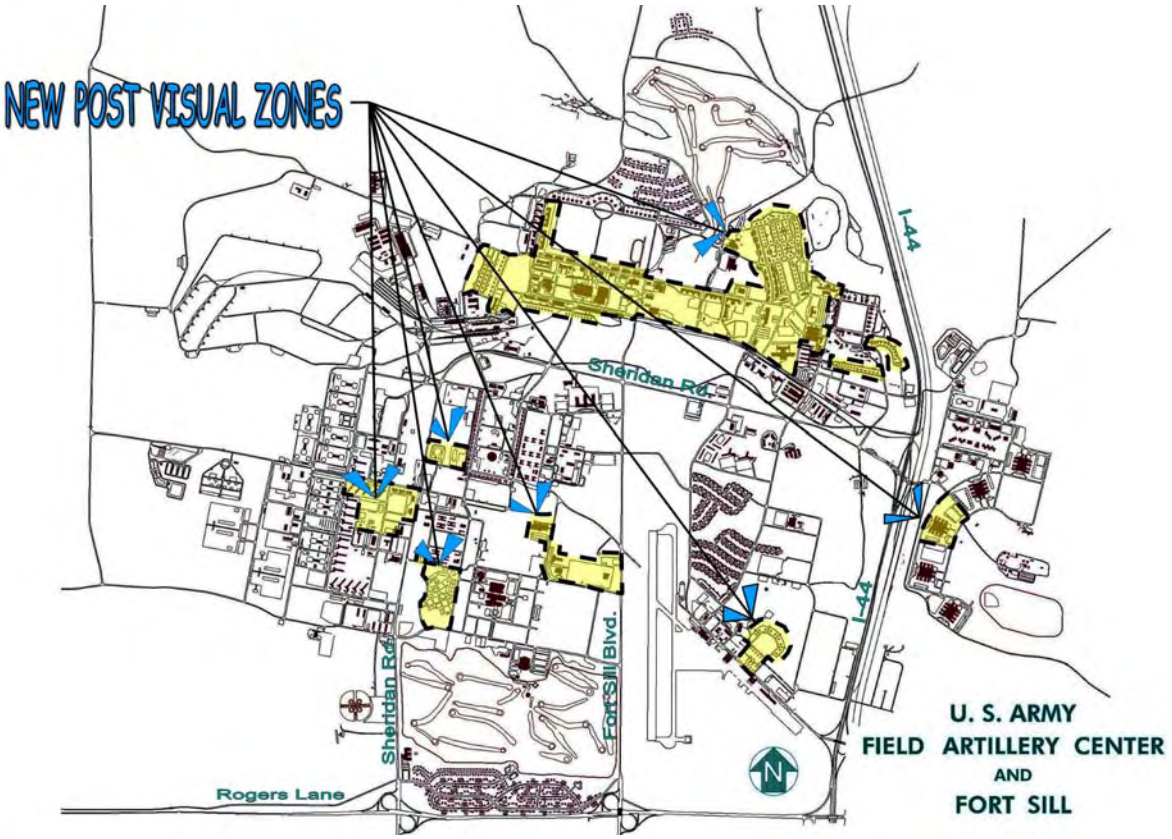



Fig. 5.31 - New Post Visual Zone Map

# EXTERIOR COLOR CHART *Southwest USA*

| Building Design Element | | Required Color Standard | Color Sample (See Note 4) | Notes (Hyperlinked) |
|---|---|---|---|---|
| Walls | Base (primary) Material | Tan Brick or native stone | | |
| | Secondary Material | Almond 11-0907 TPX or Custard 12-0910 TPX | | |
| | | Mocha 16-1210 TPX | | |
| Roof | Sloped Areas | Metal Bronze or Terracotta | | |
| | | Clay Terracotta | | |
| | | Fiberglass Shingle Gray/White | | |
| | "Flat" Areas | White | | |
| Fenestration | Doors | Wood: White 11-0604 TPX | | |
| | | Steel: Dark Brown 18-1027 TPX | | |
| | Storm Doors | White | | |
| | Door & Window Frames | Brown 16-1221 TPX | | |
| | Storm Window or Sash | White | | |
| | Window | White | | |
| Trim Items | Fascia | White | | |
| | Soffit | White | | |
| | Gutters and D.S. | Brown 16-1221 TPX | | |
| | Awnings and Canopies | Tan 12-0910 TPX | | |
| | Stair or Balcony Railings, Balusters, and related Trim | Dark Brown 18-1027 TPX | | |
| | Handrails | Brown 16-1221 TPX | | |

| Building Design Element | | Required Color Standard | Color Sample (See Note 4) | Notes |
|---|---|---|---|---|
| Trim Items | Fire Escapes | Dark Brown 18-1027 TPX | | |
| | Grilles and Louvers | Brown 16-1221 TPX | | |
| | Coping | Brown 16-1221 TPX | | |
| | Roof Ventilators | Blend to match roof | | |
| Related Site Structures | Courtyard Enclosure Walls, Retaining Walls, Fences, Dumpster Enclosures | Red Brick or<br>Dark Brown 18-1027 TPX | | |
| | Porch Crawl Space Enclosure | White | | |

| NOTES: | |
|---|---|
| **Note 1** | For Historic Buildings, Refer to the Fort Sill Historic Preservation |
| **Note 2** | ***Installation: Tab to expand note listings.*** |
| **Note 3** | Identify type, color, and texture of local brick and stone, to include mortar color and joint style. |
| **Note 4** | Color samples are electronic approximations of colors, which should not be construed as accurately representing the color standard. Paint shall match the PANTONE® number. |

**ROOFS**

Roofs should be red and be of the following material:

- Fiberglass face room shingles manufactured by “Eternit” or equal,
- Concrete roof tile manufactured by “BRAAS” or equal, or
- Clay roof tile or equal.

**DOORS, WINDOWS, and ACCENTS**

Doors and accent elements such as windows, gutters, and pilasters shall be painted Altweiss, Color 0029.

Links
Go to Appendix M
Go to Table of Contents

# COLOR BOARD for the Army Installation Design Standards / Appendix L

The color squares shown here are approximations of the PANTONE® TPX numbers indicated. They have been simulated using RGB values and are intended to be reproduced electronically. Color quality may vary with printer. PANTONE® TPX colors are a standard. In order to accurately reproduce the specified colors on these sheets and meet the required US Army standard, you must use the actual PANTONE® TPX swatch of the color indicated. A hard copy supplemental sheet with accurate color representations is available. See Paragraph L.5 for details.

11-0604 TPX
SHELL

11-0907 TPX
ALMOND

12-0910 TPX
CUSTARD

12-4607 TPX
PASTEL SKY

13-1009 TPX
TAN

13-1013 TPX
ALLSPICE

13-1107 TPX
BEIGE

14-4506 TPX
BLUEGRAY

15-1306 TPX
TAUPE

15-1309 TPX
NATURAL

15-5704 TPX
GRAY

16-1210 TPX
MOCHA

16-1221 TPX
BROWN

16-6216 TPX
METAL GREEN

18-1027 TPX
DARK BROWN

18-1444 TPX
SALSA

19-1540 TPX
MAROON

14-4318 TPX
SKY BLUE

18-1027 TPX
NUTMEG BROWN

# PHOTOS OF SURROUNDING BUILDINGS

# Appendix G

# GIS Data

## Fort Sill GIS (Geographic Information Systems) Deliverable Specifications

This document establishes the requirements for geospatial data deliverables produced as part of a contract. It includes description of the:

- **Deliverables**
- **Coordinate System and Datums:**
- **Data Quality Standard:**
- **SDSFIE-Compliant GIS Deliverable Specifications:**
- **FGDC compliant Metadata**

## Deliverables

The intent of the GIS Deliverable set is to provide Fort Sill with comprehensive geospatial information about the facility footprint and site features that exist outside the building (s). The electronic deliverables must be in the file format and data standard used by Fort Sill and defined below.

File or Personal Geodatabase **ESRI 9.3.1** format or **ESRI 9.3.1** Shapefile format
unless otherwise communicated through COR and stated in SOW.
SDSFIE-Compliant GIS Deliverable Specification;
FGDC Compliant Metadata;
Coordinate System and Datum's in this document.

## Coordinate System and Datums

Acceptable coordinate systems are standardized by (USAEC) U.S. Army Environmental Command.

All geospatial deliverables whether obtained via survey or any other collection process, shall be measured in [feet or meters]. The coordinate system for all geospatial data will be:

Coordinate System: GCS_WGS_1984
Projection: UTM (Universal Transverse Mercator), Zone 14N.
Horizontal Datum: WGS84 (World Geodetic Survey) 1984
Vertical Datum: NAVD88 (North American Vertical Datum) 1988

Specifications:
Projected Coordinate System: WGS_1984_UTM_Zone_14N
Projection: Transverse Mercator
False_Easting: 500000.00000
False_Northing: 0.00000
Central_Meridian: -99.00000
Scale_Factor: 0.999600
Latitude_of_Origin: 0.00000
Linear_Unit: Meter

Geographic Coordinate System: GCS_WGS_1984
Datum: D_WGS_1984
Prime Meridian: Greenwich
Angular Unit: Degree

## Data Quality Standard

Topology and positional accuracy are the first components of data quality that will be assessed by Fort Sill. These components are grouped together because changing either component has a direct effect on the other. Topology will be checked prior to positional accuracy, and positional accuracy will only be assessed if the data are topologically sound.

If a data layer is submitted a second time for Fort Sill review, both positional accuracy and topology will be reassessed. The data can only be reported as being topologically correct *and* positionally accurate. Reporting the data as meeting one requirement but not the other is not possible.

Positional accuracy is the difference between the location of features in the GIS data layer and their true locations on the ground. Positional accuracy applies in both the horizontal and vertical plane. The minimum acceptable horizontal and vertical accuracy of each data layer where vertical coordinates are collected is +/- 2cm.

Topology is how point, line, and polygon features share geometry. Fort Sill will verify that each data layer adheres to the topology rules defined below. The contractor shall utilize a topology build and clean routine and assure that the following:

**Point features**

- Must be inside polygons of “Parent” feature class, if applicable.
- Should be digitized as points, not graticules, cells, symbols or icons.

**Line features**

- Must not have erroneous self overlap, self intersect, overshoots, undershoots or dangles.
- Lines should all be continuous, i.e. do not create dashed lines with many small line segments
- Lines shall be surveyed at a minimum of two (2) points along every straight run, at every change of direction, at every tie in point, and at any change in line size.

**Polygon features**

- Must not have erroneous self overlap or gaps.
- Must be covered by the installation_area feature class unless SOW states differently.
- Must contain points of the “Child” feature class, if applicable.
- Digital representation of the common boundaries for all graphic features must be coincident, regardless of feature layers.

The contractor shall use conventional surveying and other methods, such as a total station or GPS for field data collection at an accuracy level in accordance with:
“Geospatial Positioning Accuracy Standards, Part 4: Architecture, Engineering Construction, and Facilities Management.”
Published by the FGDC and available at
http://www.fgdc.gov/standards/standards_publications/index_html.

Fort Sill has determined that the contractor may use industry-accepted standard procedures for preparing drawings showing the location of site features as constructed. The contractor must include in the metadata a brief discussion of the methods used and the resulting horizontal and vertical accuracy of the data.
Fort Sill preference is for the contractor to certify that all features as mapped are accurate within [+/- 0.5 meters] as determined through procedures in accordance with:
“Geospatial Positioning Accuracy Standards, Part 4: Architecture, Engineering Construction, and Facilities Management.”
Published by the FGDC and available at
http://www.fgdc.gov/standards/standards_publications/index_html.

## SDSFIE (Spatial Data Standards for Facilities, Infrastructure and Environment)-Compliant Deliverable Specification

*Geodatabase Template*

Upon request Fort Sill will provide the contractor with an SDSFIE 2.606 -compliant GIS geodatabase template to be used for populating the GIS deliverables required under the contract, or the contractor may download a complete SDSFIE compliant database model from: http://www.sdsfie.org/SDSFIEHome/tabid/36/Default.aspx
The contractor shall populate the layers without modifying the template. The contractor shall ensure that layers to be delivered, but not included in the template are compliant with the current SDSFIE 2.606 standard.
There may be circumstances in which SDSFIE compliance cannot be maintained. In such circumstances, proposed deviations with the standard must be communicated by the contractor and reviewed by Fort Sill.

SDSFIE Browser and Browser Lite are available downloads from:
http://www.sdsfie.org/SDSFIEHome/tabid/36/Default.aspx

These browsers are invaluable tools that contain definition by structure, feature, alias, keyword, attribute or data source. These browsers contain the answers of where layers are stored, the required attributes, domain values and symbology required by Fort Sill and other DOD agencies.

Also available for download is the ESRIGeoDBBuilder Tool. This tool allows the contractor to define what layers are needed and populate these layers with applicable attribute tables according to SDSFIE standard formatting.

## FGDC Compliant Metadata

Metadata is data about data. All metadata generated by or for Federal agencies must meet the Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata (CSDGM). A metadata file is considered complete when all required fields are populated with valid values. Metadata accuracy is a measure of how well the data creator documented the data creation process.

The contractor shall prepare metadata conforming to Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata (CSDGM) most Current version (http://www.fgdc.gov/metadata/contstan.html).
Metadata content will accompany all electronic geospatial data submissions.
This includes both CADD and GIS formats.
A metadata file shall accompany, at minimum, each CADD file and each GIS-format geospatial data layer delivered by the contractor. Metadata should be prepared to FGDC standards and delivered in XML format readable by software applications that use the FGDC XML format standard (such as ESRI ArcCatalog v9.x SML-format metadata files). The digital metadata files shall be provided to Fort Sill along with each product deliverable.

# Section 1 – Identification

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| **1.1 Citation** | | | |
| 1.1 (Citation 8.1) | Identification (Data Set Originator) | The name of the office/branch/section and/or program that created the data set. This will contain USA, a single space, office/branch/section and/or program, a single space, followed by the installation/site name. | *Example values:*<br>"USA Master Planning Office Fort x" |
| 1.1 (Citation 8.2) | Identification (Data Set Publication Date) | The date of release or current version of the file. This represents the date that a given overlay layer and associated metadata file were "locked" for approval by the base-level command authority.<br><br>Lineage: The data when the source was published or otherwise made available for release. | *Format:*<br>yyyymmdd |
| 1.1 (Citation 8.4) | Identification (Data Set Title) | The name by which the data set is referred. For all Army installations data this will contain the SDSFIE Entity Type name followed by the installation/facility name. To enhance searchability all underscores will be replaced with spaces.<br><br>Lineage: The name by which the source of the layer is known. This could be the name of a local study, a national data set, a standard business process by which the data are generated, etc. | *Example values:*<br>"Installation Area Fort x"<br>"Military Range Area Fort x"<br>"Flood Zone Area Camp x"<br>"Wetland Area Fort x"<br>"Mil Qty Distance Arc Area Fort x"<br>"Noise Zone Area Camp x"<br><br>Free text.<br>Ex. "Short-Range Component", "National Hydrology Dataset" |
| 1.1 (Citation 8.6) | Geospatial Data Presentation Form | The mode in which geospatial data depicted in a layer were represented. | "Vector Digital Data" |
| 1.1 (Citation 8.8.2) | Identification (Data Set Publisher) | The name of the Army component or program that published the data set. | *Valid Values*:<br><br>"OACSIM IGI&S", "USAR", "USARNG" "SRP","AEC" |
| | | | |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| **1.2 Description** | | | |
| 1.2.1 | Description, Abstract | A brief narrative of the data set. For all Army installation data the SDSFIE Entity Type Definition will be used. | Valid values: SDSFIE Entity Type Definition<br><br>Ex. Land and water currently owned or used by the military installation or facility |
| 1.2.2 | Description, Purpose | A summary of the intentions with which the data set was developed.<br><br>***Note**: Each program should develop a standard purpose to fit within their program.* | *As defined by Army Program Leads (ARNG, AEC, OACSIM, IMA..etc)* |
| **1.3 Time Period of Content** | | | |
| 1.3 (Citation 9.1.1) | Time Period of Content<br>(Single Calendar Date) | The latest date to which the data content represents conditions on the ground (that is, when the "real world" looked the way it is described in the data). If the data content represents features presented from an image or map product and are not verified to current real world conditions this data must be the date of the image or map product source.<br>Note: This assumes the image or map product source date represents ground conditions for that date.<br><br>If only the month and year of the date are known enter zeros ("0") in the place of "dd" (for day) as shown. Ex. 20050400 represents April 2005. | *Format:*<br>yyyymmdd |
| 1.3.1 | Time Period of Content, Currentness Reference | Reference for the Time Period of Content. For all Army installation data this value will be "ground condition". | *Valid Value*:<br>"Ground Condition" |
| **1.4 Status** | | | |
| 1.4.1 | Status, Progress | The state of the data set.<br><br>**Note**: Data sets required for reporting to the Army GISR are not | *Valid Values:*<br>"Complete"<br>"In-Work" |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| | | complete until approved by the designated Command Authority. | |
| 1.4.2 | Status, Maintenance and Update Frequency | The frequency with which changes and additions are made to the data set after the initial data set is completed.<br><br>**Note**: Data sets required for reporting to the Army GISR will have the update frequency defined by regulation. | *Valid Values:*<br>"Bianually" |
| **1.5 Spatial Domain** | | | |
| 1.5.1 | Spatial Domain, Bounding Coordinates | The outermost limits of coverage of a data set expressed by latitude and longitude values in the order western-most (CSDGM element 1.5.1.1), eastern-most (1.5.1.2), northern-most (1.5.1.3), and southern-most (1.5.1.4). | *Valid Values:*<br>*Latitude:* -90.00 to 90.00<br>*Longitude:* -180.00 to 180.00 |
| **1.6 Keywords** | | | |
| 1.6.1.1 | Theme Keyword Thesaurus | Reference to a formally registered thesaurus or a similar authoritative source of theme keywords. | *Valid Value:*<br>"Spatial Data Standard for Facilities, Infrastructure, and Environment" (version number). |
| 1.6.1.2 | Theme Keyword | Common-use words or phrase words used to describe the subject of the data set. Must include the installation name, entity type, entity class and entity set in addition to one or more of the remaining values in the list. | *Required Keyword Values:*<br>{installation name}<br>{service component}<br>{entity type}<br>{entity class}<br>{entity set}<br><br>*Plus one or more of the following:*<br>"boundaries"<br>"farming"<br>"climatologyMeteorologyAtmosphere"<br>"biota"<br>"economy"<br>"planningCadastre"<br>"society"<br>"elevation"<br>"environment" |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| | | | "structure"<br>"geoscientificInformation"<br>"health"<br>"imageryBaseMapsEarthCover"<br>"inlandWaters"<br>"location"<br>"intelligenceMilitary"<br>"oceans"<br>"transporation"<br>"utilitiesCommunication" |
| | Place Keywords | Geographical location of a dataset. This should include: country, state or territory, region, city, garrison, installation or site. | |
| **1.7 Access Constraints** | | | |
| 1.7 | Access Constraints | Restrictions and legal prerequisites for accessing the data set. These include any access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions on obtaining the data set. | Valid Value:<br>Data are to be used by Army personnel and Army support personnel only unless a written request to the IGI&S Government POC has been approved. |
| **1.8 Use Constraints** | | | |
| 1.8 | Use Constraints | Restrictions and legal prerequisites for using the data set after access is granted. These include constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on using the data set. | *As defined by Army Program Leads (ARNG, AEC, OACSIM, IMA..etc)* |
| **1.9 Point of Contact**<br>*The point of contact should be the Subject Matter Expert (SME) who identified the data source, and shall not be the base-level GIS/mapping POC (unless the POC authoring the metadata file is the same person as the subject matter expert responsible for source selection). In the event the SME expert is a contractor, the organizational information should reflect the government office for which the contractor works, not the contractor company information.*<br>*The name of the individual/organization responsible for creating the metadata file is recorded in CSDGM element 7.4, Metadata Contact.* | | | |
| 1.9 (Citation 10.1.1) | Point of Contact (Contact Person) | Name of Subject Matter Expert responsible for selecting the source for the given layer | Free text field<br>Ex: "John Smith" |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| 1.9 (Citation 10.1.2) | Point of Contact (Contact Organization) | Organization name (or office symbol for military organizations) of the subject matter expert. | Free text field<br>Ex: “Fort Drum Dept of Public Works”, “Fort Monmouth Directorate of Public Safety” |
| 1.9 (Citation 10.3) | Point of Contact (Contact Position/Title) | Title of the subject matter expert. | Free text field |
| 1.9 (Citation 10.4.1) | Point of Contact (Address Type) | The type of address provided. Must be one of the following valid values: | *Valid Values:*<br>“mailing”<br>“physical”<br>“mailing and physical”<br>“po box”<br>Other (describe) |
| 1.9 (Citation 10.4.2) | Point of Contact (Address) | Address line for the subject matter expert. | Free text field<br>Ex: “1230 Main Street” |
| 1.9 (Citation 10.4.3) | Point of Contact (City) | The address city for the subject matter expert. | Free text field<br>Ex: “Honolulu”, “San Diego” |
| 1.9 (Citation 10.4.4) | Point of Contact (State or Territory) | The address state or territory for the subject matter expert. Use accepted two-letter Postal state/territory codes for this field. | Free text field<br>Ex: “NY”, “VA”, “PR” |
| 1.9 (Citation 10.4.5) | Point of Contact (Postal/ZIP Code) | The ZIP code for the subject matter expert. Nine digit ZIP codes, with dashes, preferred, but five digit zip codes will be accepted. | Free text field<br>Ex: “22030-1260” |
| 1.9 (Citation 10.4.6) | Point of Contact (Country) | Subject matter expert address country. | Free text field<br>Ex: “USA” |
| 1.9 (Citation 10.5) | Point of Contact (Telephone Number) | Subject matter expert Telephone number, including all applicable area codes and extensions.<br>Commercial numbers are preferred, and should be preceded with “COMM” as shown. However, if only DSN numbers are | Free text field<br>*Ex:*<br>COMM 123-456-7890<br>DSN 123-4567 |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| | | available, enter that number here and precede the number with "DSN" as shown: | |
| 1.9 (Citation 10.8) | Point of Contact (EMAIL address) | The email address for the subject matter expert. | Free text field<br>Ex: "John.Smith@us.army.mil" |
| **1.12 Security Information** | | | |
| 1.12.1 | Security Classification System | The name of the classification system. | *Valid Values:* |
| 1.12.2 | Security Classification | The name of the handling restrictions on the data set. | *Valid Values:*<br>"FOUO"<br>"Unclassified"<br>"Sensitive" |

# Section 2 – Data Quality Information

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| **2. Data Quality Information** | | | |
| **2.1 Attribute Accuracy** | | | |
| 2.1.1 | Attribute Accuracy Report | Assessment of the accuracy of assigned values in the dataset. Detailed explanation of the accuracy of the dataset values, tests utilized to obtain these accuracy values and a date when the test was executed. | Attribute value domains and ranges are verified against a set domain of values according to SDSFIE. Content is populated according to the Standard Operating Procedures for that layer. Specific value content is verified by an authority with site knowledge and access to other sources. |
| 2.2 | Logical Consistency Report | Logical consistency describes how the geometry was | Free text field |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| | | captured and explains any topological test that may have been performed. Since most commercial GIS software structures data topologically, simply describing the process of how the data was captured addresses this report. | Ex: Topology verified using the ArcINFO clean command. |
| 2.3 | Completeness Report | Information about omissions, selection criteria, generalizations, definitions used, and other rules to derive the dataset.<br><br>Use this field to record if any features (e.g., wetland polygon, floodplain polygon, APZ or ESQD clear zone, noise contour, or installation boundary element) were excluded from the data set for any reason.<br><br>Note: This report should include all feature types that are present in the dataset. | *If no omissions are present – Valid Value:*<br>"Complete data set"<br>*If omissions are present – Valid Value:*<br>Free text, describing any map features/elements that exist on the ground but have been omitted from the dataset due to classification constraints.<br>*Example Values:*<br>"Wetlands from 1999 restoration study not included because {provide justification}"<br>"New boundary from 2003 land transfer to {jurisdiction] not shown as the boundary re-survey has not yet been performed." |
| **2.4 Positional Accuracy** | | | |
| 2.4.1.1 | Horizontal Positional Accuracy Report | A narrative explanation of the accuracy of the horizontal coordinate measurements. Use this field to record the horizontal positional accuracy of digital geospatial data sources and the published map scale of hardcopy/paper map sources, as stated on the selected source.<br>Valid values must be stated in one of the following two fashions:<br>• Circular error, as defined by FGDC STD 007.3-1998, NSSDA, (digital sources) or<br>• Meeting National Map Accuracy Standards (NMAS) at a given printed map scale (hardcopy/paper sources). | *Example Values:*<br>*Circular Error Format:*<br>"4-meter CE 90 (1-meter imagery)"<br>"25-meter CE 90 (5-meter imagery)"<br>*National Map Accuracy Standards:*<br>"Meets National Map Accuracy Standards at {map scale}"<br>*If the layer was created using "heads-up" digitizing techniques and another image or overlay layer was used as reference:*<br>"Referenced to {imagery or overlay layer name}"<br>*If horizontal positional accuracy is unknown:* |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| | | | "Unknown" |
| 2.4.2.1 | Vertical Positional Accuracy Report | Explanation of achieved accuracy, methods for ascertaining the accuracy values and dates of tests utilized to obtain those results. | Valid Values:<br>Free text field or<br>"NA" |

## 2.5 Lineage

*The following section may be repeated numerous times in the event that multiple sources were selected and used to develop any given layer. Most metadata management applications (including ESRI ArcCatalog and the USACE CorpsMet application) can accommodate numerous source citations.*

*A set of Lineage, Process Description and Process Point of Contact elements are used to record the GIS technical point of contact.*

*An additional set of Process Description elements are used to record the process and contact information for the data validation (signature) process.*

*The following Lineage elements are used to record the source data information for the data set described.*

| | | | |
|---|---|---|---|
| 2.5.1.1<br>(Citation 8.1) | Lineage, Source Citation<br>(Source Originator) | The name of the individual or organization that developed the source of the data set. | *Valid Values:*<br>{Source originator name} |
| 2.5.1.1<br>(Citation 8.2) | Lineage, Source Citation<br>(Source Publication Date) | The date when the source was published or otherwise made available for release.<br>If only the month and year are known, but not specific day within the given month, enter zeros ("0") in the place of "dd" as shown.<br>Must be one of the following valid values: | *Valid Values:*<br>"Unknown"<br>"Unpublished material"<br>{date}<br>*Date Format:*<br>yyyymmdd<br>*Example date values:*<br>"20020101" (representing 01 Jan 02)<br>"20031128" (representing 28 Nov 03)<br>"19980100" (representing Jan 98, where the specific day is not provided) |
| 2.5.1.1<br>(Citation 8.4) | Lineage, Source Citation<br>(Source Title) | The name by which the source of the layer is known. This could be the name of a local study, a national data set, a standard business process by which the data are generated, etc. | *Valid Values:*<br>{source name}<br>*Example values:*<br>"National Wetlands Inventory" |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| | | | "USACHPPM Noise Study"<br>"FEMA Flood Insurance Study for {jurisdiction}" |
| 2.5.1.1<br>(Citation 8.6) | Lineage, Source Citation<br>(Geospatial Data Presentation Format) | The mode in which geospatial data depicted in the layer were represented in the source document(s). Must be one of the following valid values: | *Valid Values:*<br>"Diagram"<br>"Map"<br>"Model"<br>"Profile"<br>"Raster digital data"<br>"Spreadsheet"<br>"Tabular digital data" (e.g., coordinates)<br>"vector digital data"<br>Other (specify) |
| 2.5.1.1<br>(Citation 8.8.2) | Lineage, Source Citation<br>(Publisher) | The name of the individual or organization that published the data set source. Must be one of the following valid values: | *Valid Values:*<br>{publisher name/organization}<br>"Unknown"<br>"N/A" |
| 2.5.1.6 | Lineage, Source Contribution | An indicator of which source for the data set was used. | *Example Values for Layers:*<br>Values vary by layer type and by which source was chosen. |
| ***The following Process Description elements describe the actions performed against the above sources in order to create the data. The POC listed below is the GIS technical point of contact.*** | | | |
| 2.5.2.1 | Lineage, Process Description | General description of the process used to convert or create the data. | Free text field |
| 2.5.2.3 | Process Date | Date for the completion of data compilation. | |
| 2.5.2.6<br>(Citation 10.1.1) | Process Point of Contact<br>(Contact Person) | Party or parties responsible for the computation of the processing step information. | Free text field<br>Ex. "John Smith" |
| 2.5.2.6<br>(Citation 10.1.2) | Process Point of Contact<br>(Contact Organization) | Organization name (or office symbol for military organizations) of the POC. | Free text field<br>Ex: "Fort Drum Dept of Public Works", "Fort Monmouth Directorate of Public Safety" |
| 2.5.2.6<br>(Citation 10.3) | Process Point of Contact<br>(Contact Position/Title) | Title of the point of contact. | Free text field |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| 2.5.2.6 (Citation 10.4.1) | Process Point of Contact (Address Type) | The type of address provided. Must be one of the following valid values: | *Valid Values:*<br>"mailing"<br>"physical"<br>"mailing and physical"<br>"po box"<br>Other (describe) |
| 2.5.2.6 (Citation 10.4.2) | Process Point of Contact (Address) | Address line for the point of contact. | Free text field<br>Ex: "1230 Main Street" |
| 2.5.2.6 (Citation 10.4.3) | Process Point of Contact (City) | The address city for the point of contact. | Free text field<br>Ex: "Honolulu", "San Diego" |
| 2.5.2.6 (Citation 10.4.4) | Process Point of Contact (State or Territory) | The address state or territory for the point of contact. Use accepted two-letter Postal state/territory codes for this field. | Free text field<br>Ex: "NY", "VA", "PR" |
| 2.5.2.6 (Citation 10.4.5) | Process Point of Contact (Postal/ZIP Code) | The ZIP code for the point of contact. Nine digit ZIP codes, with dashes, preferred, but five digit zip codes will be accepted. | Free text field<br>Ex: "22030-1260" |
| 2.5.2.6 (Citation 10.4.6) | Process Point of Contact (Country) | Point of contact address country. | Free text field<br>Ex: "USA" |
| 2.5.2.6 (Citation 10.5) | Process Point of Contact (Telephone Number) | Point of contact telephone number, including all applicable area codes and extensions.<br>Commercial numbers are preferred, and should be preceded with "COMM" as shown. However, if only DSN numbers are available, enter that number here and precede the number with "DSN" as shown: | Free text field<br>*Ex:*<br>COMM 123-456-7890<br>DSN 123-4567 |
| 2.5.2.6 (Citation 10.8) | Process Point of Contact (EMAIL address) | The email address for the point of contact. | Free text field<br>Ex: "John.Smith@us.army.mil" |
| ***The following lineage section represents the metadata elements that should be populated for the Signature Authority process and point of contact.*** | | | |
| 2.5.2.1 | Lineage, Process Description | Description of the signature process. | *Valid Values:* |
| 2.5.2.3 | Process Date | Date the data was validated through signature (signature date). | |
| 2.5.2.6 | Signature Authority Point of | Name of the individual appointed as the Signature | Free text field |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| (Citation 10.1.1) | Contact<br>(Contact Person) | Authority. | Ex. “John Smith” |
| 2.5.2.6<br>(Citation 10.1.2) | Signature Authority Point of Contact<br>(Contact Organization) | Organization name (or office symbol for military organizations) of the Signature POC. | Free text field<br>Ex: “Fort Drum Dept of Public Works”, “Fort Monmouth Directorate of Public Safety” |
| 2.5.2.6<br>(Citation 10.3) | Signature Authority Point of Contact<br>(Contact Position/Title) | Title of the Signature Authority. | Free text field |
| 2.6 | Cloud Cover | Area of data set obstructed by clouds expressed as a percentage of the spatial extent. Applicable to raster imagery only. | *Valid Values:* 0-100% |

# Section 3 – Spatial Data Organization Information

Not required

# Section 4 – Spatial Reference Information

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| **4.1 Horizontal Coordinate System Definition**<br>***The Spatial Reference Information should be defined using one of the following Horizontal Coordinate Systems (4.1.1 Geographic or 4.1.2 Planar {UTM}).*** | | | |
| 4.1.1 | Geographic | The quantities of latitude and longitude which define the position of a point on the Earth’s surface with respect to a reference spheroid. | |
| 4.1.1.1 | Latitude Resolution | The minimum difference between two adjacent latitude values expressed in Geographic Coordinate Units of measure. | *Valid Value:*<br>*Value > 0.0* |
| 4.1.1.2 | Longitude Resolution | The minimum difference between two adjacent longitude values expressed in Geographic Coordinate Units of measure. | *Valid Value:*<br>*Value > 0.0* |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| 4.1.1.3 | Geographic Coordinate Units | Measurement units for horizontal coordinates. Must be the following value: | *Valid Value:*<br>"Decimal Degrees" |
| 4.1.4.1 | Horizontal Datum Name | Name of the reference system used for defining horizontal coordinates. Must be the following value: | *Valid Value:*<br>"World Geodetic System of 1984 (WGS 84)" |
| ***The following Spatial Reference information should be used to define a Universal Transverse Mercator (UTM) Coordinate System.*** | | | |
| 4.1.2 | Planar | The quantities of distances, or distances and angles, which define the position of a point on a reference plane to which the surface of the Earth has been projected. | |
| 4.1.2.2 | Grid Coordinate System,<br>Grid Coordinate System Name | A plane-rectangular coordinate system usually based on, and mathematically adjusted to, a map projection so that geographic positions can be readily transformed to and from plane coordinates.<br><br>The name of the grid coordinate system should be "Universal Transverse Mercator" (UTM). This is a grid system based on the transverse mercator projection, applied between latitudes 84 degrees north and 80 degrees south on the Earth's surface and consisting of zones numbered from 1-60. | *Valid Value:*<br>"Universal Transverse Mercator" |
| 4.1.2.2.1 | UTM Zone Number | The identifier for the UTM Zone | *Valid Value:*<br>1 < = UTM Zone Number < = 60 for the northern hemisphere;<br>-60 < = UTM Zone Number < = -1 for the southern hemisphere |
| 4.1.2.1.23.17 | Scale Factor at Central Meridian | A multiplier for reducing a distance obtained from a map by computation or scaling to the actual distance along the central meridian. | *Valid Value:*<br>*Value > 0.0* |
| 4.1.2.1.23.2 | Longitude of Central Meridian | The line of longitude at the center of a map projection generally used as the basis for constructing the projection. | *Valid Value:*<br>*-180.0 < = Longitude of Central Merdian < 180.0* |
| 4.1.2.1.23.3 | Latitude of Projection Origin | The latitude chosen as the origin of rectangular | *Valid Value:* |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| | | coordinates for a map projection. | *-90.0 <= Latitude of Projection Origin <= 90.0* |
| 4.1.2.1.23.4 | False Easting | The value added to all "x" values in the rectangular coordinates for a map projection. This value frequently is assigned to eliminate negative numbers. Expressed in the unit of measure identified in Planar Coordinate Units. | *Valid Value:*<br>*Free Text* |
| 4.1.2.1.23.5 | False Northing | The value added to all "y" values in the rectangular coordinates for a map projection. This value frequently is assigned to eliminate negative numbers. Expressed in the unit of measure identified in Planar Coordinate Units. | *Valid Value:*<br>*Free Text* |
| 4.1.2.4.2.1 | Abscissa Resolution | The (nominal) minimum distance between the "x" or column values of two adjacent points, expressed in Planar Distance Units of measure.<br><br>*NOTE: This field is auto-populated in ArcCatalog.* | *Valid Value:*<br>Value > 0.0 |
| 4.1.2.4.4 | Planar Distance Units | Units of measure used for distances. | *Valid Values:*<br>"meters" |
| 4.1.4.1 | Horizontal Datum Name | Name of the reference system used for defining horizontal coordinates. Must be the following value: | *Valid Value:*<br>"World Geodetic System of 1984 (WGS 84)" |

# Section 5 – Entity and Attribute Information

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| **5.1.1 Entity Type** | | | |
| 5.1.1.1 | Entity Type Label | The name by which the data set is referred. For all Army installation data the SDSFIE Entity Type name will be used. To enhance searchability all underscores will be replaced with spaces. | *Valid Values:*<br>SDSFIE Entity Type (ex: firing line, military range area, noise contour line) |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| 5.1.1.2 | Entity Type Definition | The definition of the entity type. | *Valid Values:*<br>SDSFIE Entity Type Definition<br>Ex: The designated hazard area that follows the projected trajectory of a munition. |
| 5.1.1.3 | Entity Type Definition Source | The source of the entity type definition. | *Valid Value:*<br>"Spatial Data Standards for Facilities, Infrastructure, and Environment" (enter version number) |
| **5.1.2 Attribute** | | | |
| 5.1.2.1 | Attribute Label | The name of the attribute | *Valid Value:*<br>SDSFIE attribute name, common name<br>EX: "Attribute Name: hgt_dim, Common Name: Height dimension" |
| 5.1.2.2 | Attribute Definition | The definition of the attribute | *Valid Value:*<br>SDSFIE attribute definition<br>Ex: "The height of the target." |
| 5.1.2.3 | Attribute Definition Source | The attribute definition source | *Valid Value:*<br>SDSFIE (enter version number) |
| **5.2 Overview Description** | | | |
| 5.2.1 | Entity and Attribute Overview | Statement summarizing the attribute table for the layer.<br><br>Note: If the dataset is in SDSFIE Advance Compliancy, any additional fields in the table must be detailed. | *Example Value:*<br>"Attributes organized by the Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE), NCITS 353, Version 2.4. Attribute table structure meets basic compliance guidelines as defined by the CADD-GIS Technology Center.<br><br>"Several custom fields have been added to store additional information because this |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| | | | information does not fit within the current SDSFIE". |

# Section 6 – Distribution Information

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| **6.2 Resource Description** | | | |
| 6.2 | Resource Description | The identifier by which the distributor knows the data set. Must be one of the following values: | *Valid Values:*<br>*"Live Data and Maps"*<br>*"Downloadable Data"*<br>*"Map Files"*<br>*"Static Map Images"*<br>*"Other Documents"*<br>*"Applications"*<br>*"Geographic Services"*<br>*"Clearinghouses"*<br>*"Geographic Activities"* |
| **6.4 Standard Order Process** | | | |
| 6.4.2.1.1 | Format Name | The name of the data file format. This field can be free text or a value may be selected from the domain table. | Free text field or select a value from the drop down list. |
| 6.4.2.1.7 | Transfer Size | The size, or estimated size, of the transferred data set in megabytes. | *Valid Value:*<br>Transfer size >X |

# Section 7 – Metadata Reference Information

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| **7.1 Metadata Date** | | | |
| 7.1 | Metadata Date | Date the metadata file was created or last updated. | *Format:*<br>yyyymmdd |
| 7.2 | Metadata Review Date | Date of the latest review of the metadata entry. | |
| **7.4 Metadata Contact**<br>*The Metadata Point of Contact (POC) will be the individual responsible for authoring the metadata file. The mission knowledge expert responsible for source selection will be recorded in CSDGM element 1.9, Point of Contact.* | | | |
| 7.4<br>(Citation 10.1.1) | Point of Contact<br>(Contact Person) | Name of individual responsible for preparing the metadata file. | Free text field<br>Ex: “John Smith” |
| 7.4<br>(Citation 10.1.2) | Point of Contact<br>(Contact Organization) | Organization name (or office symbol for military organizations) of the POC. | Free text field<br>Ex: “Fort Drum Dept of Public Works”, “Fort Monmouth Directorate of Public Safety” |
| 7.4<br>(Citation 10.3) | Point of Contact<br>(Contact Position/Title) | Title of the metadata author. | Free text field |
| 7.4<br>(Citation 10.4.1) | Point of Contact<br>(Address Type) | The type of address provided. Must be one of the following valid values: | *Valid Values:*<br>“mailing”<br>“physical”<br>“mailing and physical”<br>“po box”<br>Other (describe) |
| 7.4<br>(Citation 10.4.2) | Point of Contact<br>(Address) | Address line for the metadata author. | Free text field<br>Ex: “1230 Main Street” |
| 7.4<br>(Citation 10.4.3) | Point of Contact<br>(City) | The address city for the metadata author. | Free text field<br>Ex: “Honolulu”, “San Diego” |
| 7.4<br>(Citation 10.4.4) | Point of Contact<br>(State or Territory) | The address state or territory for the metadata author. Use accepted two-letter Postal state/territory codes for this field. | Free text field<br>Ex: “NY”, “VA”, “PR” |
| 7.4 | Point of Contact | The ZIP code for the metadata author. Nine digit ZIP | Free text field |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| (Citation 10.4.5) | (Postal/ZIP Code) | codes, with dashes, preferred, but five digit zip codes will be accepted. | Ex: "22030-1260" |
| 7.4<br>(Citation 10.4.6) | Point of Contact<br>(Country) | Metadata author address country. | Free text field<br>Ex: "USA" |
| 7.4<br>(Citation 10.5) | Point of Contact<br>(Telephone Number) | Metadata author telephone number, including all applicable area codes and extensions.<br>Commercial numbers are preferred, and should be preceded with "COMM" as shown. However, if only DSN numbers are available, enter that number here and precede the number with "DSN" as shown: | Free text field<br>*Ex:*<br>COMM 123-456-7890<br>DSN 123-4567 |
| 7.4<br>(Citation 10.8) | Point of Contact<br>(EMAIL address) | The email address for the metadata author. | Free text field<br>Ex: "John.Smith@us.army.mil" |
| **7.5 Metadata Standard Name** | | | |
| 7.5 | Metadata Standard Name | The name of the metadata standard used to document the data set. Must be the following value: | *Valid Value:*<br>"US Army Installation Geospatial Data Standard tailoring of the FGDC Content Standards for Digital Geospatial Metadata" |
| **7.6 Metadata Standard Version** | | | |
| 7.6 | Metadata Standard Version | Identification of the version of the metadata standard used to document the data set. Must be the following value: | *Valid Values:*<br>"Version 2 - 1998 (FGDC-STD-001 June 1998)"<br><br>"Version 1 – 2005 (OACSIM IGI&S November 2005)" |
| **7.10 Metadata Security Information** | | | |
| 7.10.1 | Metadata Security Classification System | The name of the classification system for the metadata. | *Valid Value:* |

| CSDGM Element Number | CSDGM Element Name | Description | Valid Values |
|---|---|---|---|
| 7.10.2 | Metadata Security Classification | The name of the handling restrictions on the metadata. | *Valid Values:*<br>"FOUO"<br>"Unclassified"<br>"Sensitive" |

# Section 8 – Citation Information

Please see Section 1.1 (Citation)

# Section 9 – Time Period Information

Not required

# Section 10 – Contact Information

Please see Section 7.4 (Metadata Contact)

# Appendix H

# Exterior Signage

## 11.4 SIGNS

11.4.1 Signs are used to visually communicate information. They are highly visible features that should be attractive and compatible with their surroundings. Careful consideration must be given to what a sign says, how it is said, its visual appearance and organization, its location, structural support system, and relation to other signs within the installation. Standardized signage systems facilitate movement, provide a sense of orientation, and reinforce standards of excellence. Signage creates a unifying element throughout the installation that visually ties the installation themes together and builds a reference and continuity that translates into confidence and reassurance when traveling throughout the installation. The standards to apply for signage color,

type, and sizing is found in Technical Manual (TM) 5-807-10, *Signage*.

11.4.2 Sign System Characteristics. There are several basic design characteristics that, by serving to convey necessary information clearly and attractively, are an integral part of any successful signage system.

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

11.4.2.2 Continuity. It is essential that the system be applied uniformly and consistently throughout the entire installation. The importance of consistent implementation extends from the lager issues of sign type and size down to accurate color continuity and matching typestyles.

11.4.2.3 Visibility. Sign location is a very important ingredient within the system. Signs must be located at significant decision points and oriented to provide clear sight lines for the intended user. Close coordination of locations with respect to landscaping, utilities, adjacent signage, and various other street design elements is important to ensure long-term maximum visibility.

11.4.2.4 Legibility. Sign typestyle, line spacing, color, and size all combine to create the crucial design characteristics of legibility. This aspect of sign design should take into consideration users such as motorist, pedestrians or bicyclists, and the relative travel speed at which each type of user will be traveling when viewing the signs.

11.4.3 Vocabulary-Communications.

11.4.3.1 A common language has been created for establishing a signing system. The different components that create the sign package have been named and referred to within the total signing system.

11.4.3.2 The creation of a "signing language" helps generate a unified bond within sign types that make up a signing family.

- Reference

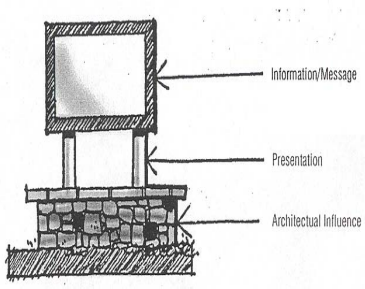



Fig. 11.18 - Signing Language Helps Establish A Signing System

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

11.4.4 Visual Hierarchy.

11.4.4.1 The entire signing system must communicate through a range of sign and typestyle sizes the relative importance of the individual activity that the sign identifies. The system should follow a logical progression from a point of origin to the desired destination.

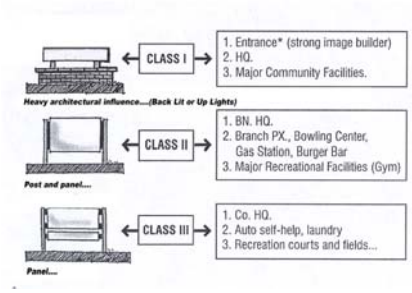



Fig. 11.19 - Signs Can Be Organized Into Classes Within The Visual Hierarchy

11.4.4.2 A stated ranking method supports the visual standard of hierarchy within the signing system. Signs can be organized within assigned classes with emphasis on the function and image of the installation.

11.4.4.3 Within each class, the level of architectural influence evokes the importance of the sign to the installation. This is also critical to the idea of progression. The importance of a sign must be presented in its size and level of detail.

11.4.4.4 As individuals move closer to their destination on the installation, the scale of the sign becomes progressively smaller and the level of the message more detailed.

11.4.5 Types of Signs.

11.4.5.1 Information / Identification Signs.

These are signs that identify entrances to the installation, areas within the installation, major tenants, buildings and organizational or functional components (Fig. 11.20). They identify a location, and greet the visitor to that location. They should be compatible in scale and character with the architecture and also blend with the natural surroundings (Fig. 11.20). These signs are designed to include the following:

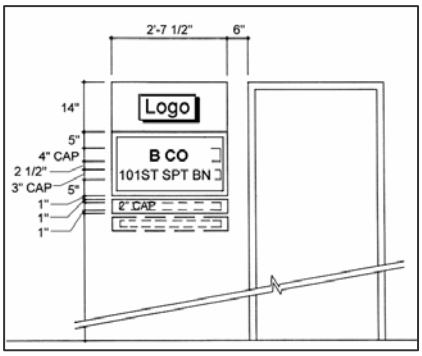



Fig. 11.20 – Building Mounted Information Sign

11.4.5.1.1 Typeface: Lettering is self-adhesive backing material.

- Building Title: Helvetica Medium, Upper and lower case
- Building Numbers: Helvetica regular
- Building Addresses: Helvetica Medium, Upper and lower case

Fig. 11.20 – Use of Street Addresses

11.4.5.1.2 Color:

- Panel: Dark Brown
- Lettering: White
- Post: Dark Brown
- Exposed panel backs and edges: Dark Brown
- All paint semi gloss

11.4.5.1.3 Materials

- Panel: Double-face 1/8" thick aluminum
- Post: Steel Pipe
- Foundation: Concrete pier or direct burial
- Building numbers: Concealed mechanical fasteners at each corner of panel into building wall (Fig. 11.21).

11.4.5.1.4 Building Identification.

11.4.5.1.4.1 Street Addresses. The addressing procedures prescribed in DoD 4525.8-M, *DoD Official Mail Manual* are mandatory for use by all DoD components. DoD 4525.8-M, Chapter 3 prescribes the following:

- All DoD address shall be assigned so they are compatible with the United States Postal Services automated delivery point sequencing. (C3.3)

- The DoD installation is responsible for assigning city-style, street address on the installation. (C3.3.2.2)

- Street addresses shall be assigned and used even though a DoD activity may deliver the mail to the addressee. (C3.3.2.2.1)

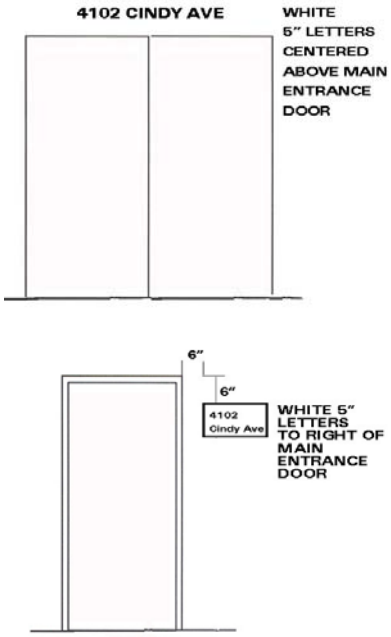



Fig. 11.21 - Street Address Location at Entrance Doors

- Only geographically locatable civilian-style street address (such as 4102 Cindy Avenue, Fig. 11.21) shall be used. (C3.3.2.2.4)

- Installations shall not use one street address for the entire installation and then use secondary unit designators such as "Building 123"to designate the delivery addresses on the installation. (C3.3.2.2.5)

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

11.4.5.1.4.2 Address Placement.

- Place addresses by the front entrance of the building so they can be seen. (C3.3.2.3.1)

- Place both the street name and address number on the building if both the building number and street address are visible from the street.

- Building identification signs will use street addresses (Fig. 11.21).

- Buildings without identification signs shall have the address number and street name centered above the main entrance or located to the right side (Fig. 11.21).

11.4.5.1.4.2 Building Numbers. Where necessary building numbers will be located at a building corner, if visible from the main street and on building side facing parking lots. The size of the sign should be appropriate for the scale of the building and mounting height. See Technical Manual (TM) 5-807-10, *Signage*, para 3-5h, for various sign grid specifications.

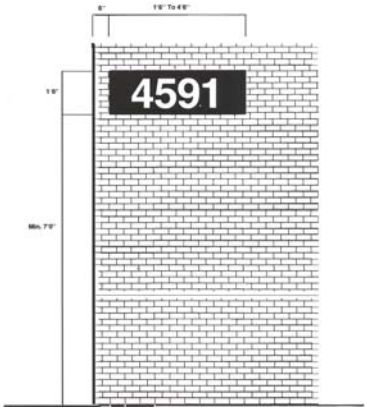


Fig. 11.22 - Dimensions for Building Number Corner Location, Where Necessary

11.4.5.1.5 Housing Areas.

11.4.5.1.5.1 The sign should be complimentary to the architectural setting of the housing area and approved by the installation Real Property Planning Board.

11.4.5.1.5.2 Housing numbers should be placed on the curb in front of the respective house and on the house where lighting will effectively light the numbering.

11.4.5.1.6 Installation Identification Signs.

11.4.5.1.6.1 Installation identification signs name the installation and display the official US Army plaque (Fig. 11.23). The designation "United States Army" must appear at the top of the sign in accordance with AR 420-70, para 2-7h. Every installation entrance shall have an installation identification sign displaying only the US Army plaque, with the words "United States Army, Fort (Name of Fort), and gate name as indicated in "Figure 11.23 - Installation Entrance Signs". The placement of Senior Mission Commander logo, unit crest, and other installation identification signs, monuments or displays shall be located inside the installation beyond the cleared area of the Access Control Point of entry. When used service- wide, these signs convey a uniform image of strength and stability to the public. Emblems, branch colors, unit mottos, names and titles of individuals are not to be displayed.

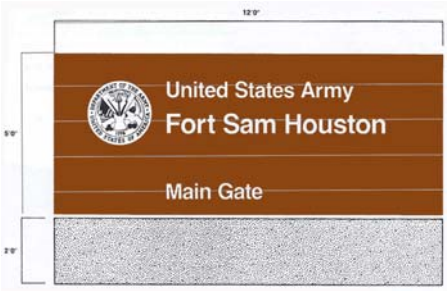



Fig. 11.23 - Installation Entrance Signs

11.4.5.1.6.2 Installation identification signs consist of three types:

- Sign type A1, main entrance sign, identifies the principal visitor entrance.
- Sign type A2, secondary entrance sign, identifies entry points with relatively high volumes of visitor traffic.
- Sign type A3, limited access entry gate signs, identifies entry points with limited public access.

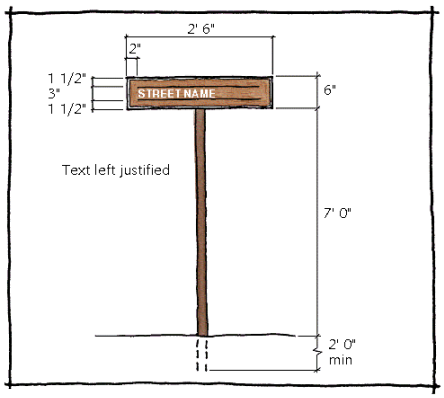



Fig. 11.24 - Typical Street Signs

11.4.5.1.6.3 See Technical Manual (TM) 5-807-10, *Signage*, paragraph 3-3, for sign specifications and paragraph 3-11 for sign placement guidelines.

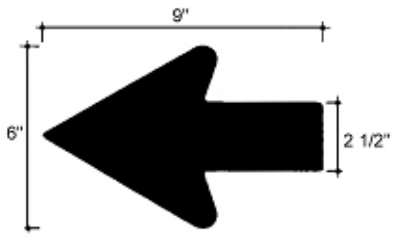



Fig. 11.25 - Typical Arrow For Use On All Destination Signs

11.4.5.1.6 Street Signs.

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

11.4.5.1.7 Wheeled Electrical Signs.

Wheeled electrical signs will have an attractive presentation. Temporary landscape elements should be used whenever possible. The siting of this type of sign will be approved by

the RPPB. No sign of this type will be left in place for longer than six (6) months. After which time, the sign will be removed or turned into a permanent sign.

11.4.5.2 Directional Signs.

These signs guide the motorist or pedestrian in, around, and out of the installation (Fig. 11.26). The legibility and placement of these signs, as well as the ordering of information, is critical to their effectiveness. These signs should be placed in central locations and at major decision points along circulation routes (Fig. 11.26). These signs are designed to include the following:

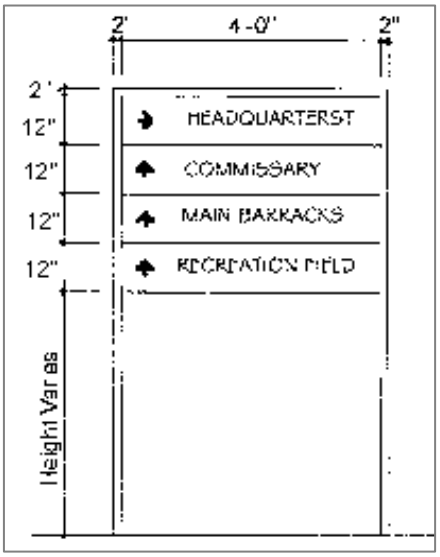



Fig. 11.26 – Direction Sign

11.4.5.2.1 Typeface: Lettering is self-adhesive backing material.

- Helvetica Medium upper and lower case

11.4.5.2.2 Arrow:

- Place at end indicating direction.
- Stoke width: Helvetica Medium cap

11.4.5.2.3 Color:

- Panel: Dark Brown
- Lettering: White
- Post: Dark Brown
- Exposed panel backs and edges: Dark Brown
- All paint semi gloss

11.4.5.2.4 Materials

- Panel: Double-face 1/8” thick aluminum
- Post: Steel Pipe
- Foundation: Concrete pier or direct burial

11.4.5.3 Regulatory Signs.

These signs provide the rules for travel and parking on the installation. They include speed signs, turning and lane use signs, warning signs, parking control signs, etc. (Fig. 11.27). Related to these signs are pavement markings and traffic signals. These signs are designed to include the following:

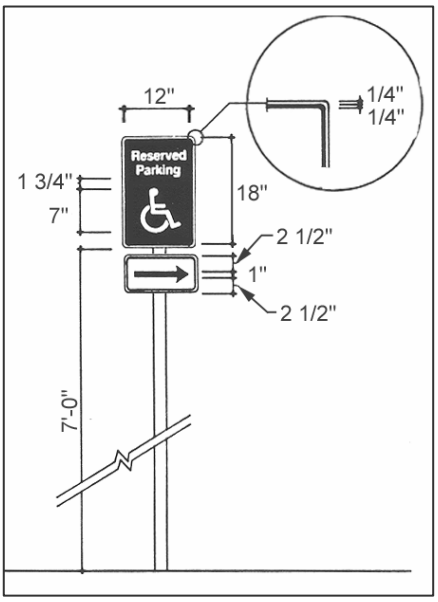



Fig. 11.27 – Regulatory Sign

11.4.5.3.1 Typeface: Lettering is self-adhesive backing material.

- Helvetica Medium upper and lower case

11.4.5.3.2 Color:

- Panel: Dark Brown
- Lettering: White
- Post: Dark Brown
- Exposed panel backs and edges: Dark Brown
- All paint semi gloss

11.4.5.3.3 Materials

- Panel: Double-face 1/8" thick aluminum
- Post: Steel Pipe
- Foundation: Concrete pier or direct burial

11.4.5.3.4 Traffic Control Signs.

11.4.5.3.4.1 CONUS Installations. National highway standards will be used for signs to regulate vehicular traffic on CONUS installation (AR 420-72, *Transportation Infrastructure And Dams*, Para 2-15f). These standards are described in the Manual of Uniform Traffic Control Devices (MUTCD). Also see MTMC Pamphlet 55-14, *Traffic Engineering for Better Signs and Markings*. This pamphlet clarifies existing standards and provides definite guidelines for installation officials to conform to the MUTCD. These standards shall be used installation wide to include installation Access Control Points.

11.4.5.2.4.2 OCONUS Installations. OCONUS installation streets and roads are to be considered extensions of the road system of the host nation and shall use traffic control device standards and criteria of the host nation (AR 420-72, *Transportation Infrastructure and Dams*, Para 2-15e).

11.4.5.3.5 Prohibitory (Warning) Signs. This category of signage is intended to maintain security and safety on the installation perimeter and at other specific secure areas. These signs notify visitors of restrictions, as well as other security procedures. The guidelines for design, fabrication, and placement of warning signs are found in Technical Manual (TM) 5-807-10, *Signage*, para 3-9.

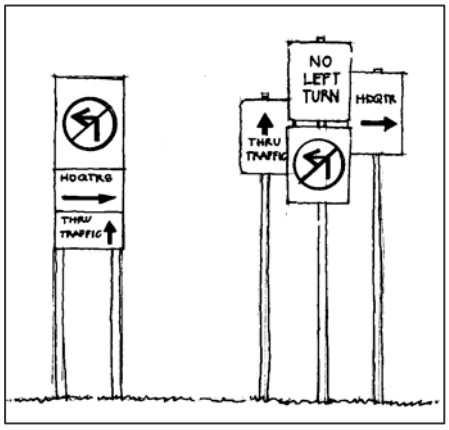



Fig. 11.28 – Sign should be Simple, Legible and Combined

11.4.6 Electronic Exterior Signs

All exterior flashing signs, traveling lights, or signs animated by lights of changing degrees of intensity or color are prohibited.

11.4.7 Sign Placement

Placement of signs differs according to the type of sign and the specific site constraints. The following guidelines apply to placement of the majority of signs.

- Do not place more than one sign at any location. Traffic rules are the exception to this rule (Fig. 11.28).
- Place signs in areas free of visual clutter and landscape materials.
- Place signs in locations that allow enough time for the user to read and react to the message.
- Signs should not be placed to block sight lines at intersections.
- Place signs approximately 1.2 meters (4 feet) above ground level to be within 10 degrees the driver's line of vision (Fig 11.29). Provide proper placement to avoid a hazard to children.

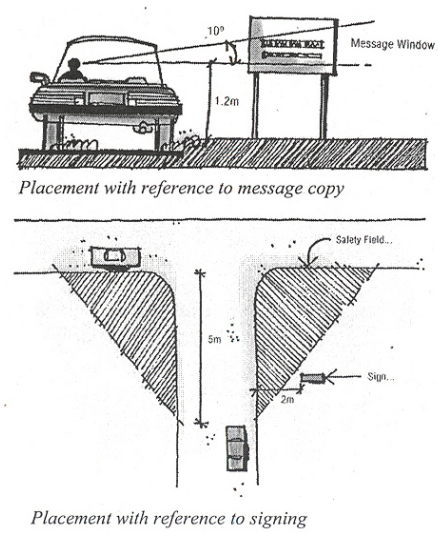



Fig. 11.29 - Placement Is Critical To Ensure Easy Readability

11.4.8 Sign System Typography.

11.4.8.1 Military Emblems. The Army has a rich tradition of military heraldry. Military emblems are an important part of the soldiers' identity and the emblems have been carefully crafted over the years to express unit pride and unique history and function of the unit. The care and use of organizational emblems in a signage system can add visual interest as well as build pride and a sense of history. However, the overuse of miscellaneous emblems can lead to clutter and a dilution of their importance. Colors for military emblems must be in accordance with the Institute of Heraldry.

11.4.8.2 Department of the Army Plaque. The plaque should be displayed on installation identification signage to emphasize the heritage and professionalism of the United States Army. The design of the plaque must be in accordance with Army Regulation (AR) 840-1, Department of

the Army Seal, and Department of the Army Emblem and Branch of Service Plaques, and must be reproduced in full color.

11.4.8.3 Insignias. The use of branch insignia, shoulder sleeve insignia, coat of arms and/or distinctive insignia on headquarters signs is permitted. All military emblems must appear in full color. Motivational symbols or motifs will not be used.

11.4.9 Reduce Visual Clutter.

11.4.9.1 Over-signing detracts form a uniform sign system and if left uncontrolled will eventually destroy the integrity of the system.

11.4.9.2 Clutter creates confusion and ineffectiveness. Often motorist and pedestrians are confused by the bombardment of messages that have no relationship to each other, or the communication is on such a minimal level that the sign serves no purpose.

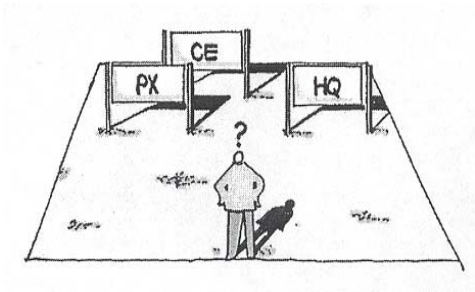



Fig. 11.30 - Visual Clutter Causes Confusion

11.4.10 Location Maps.

11.4.10.1 The location map is an integral element of an installation entrance. The location map display provides information and sense of place to the viewer. The design and construction should be of compatible architectural materials found throughout the installation.

11.4.10.2 The location map should contain the following characteristics within the design.

- Plexiglas covered map for protection
- Architectural compatible materials used for the base
- Paved walk-up area
- Litter receptacle
- Provide parking adjacent
- Provide current takeaway maps

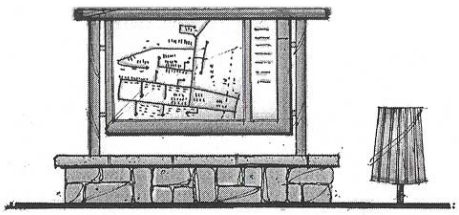


Fig. 11.31 - Location Maps Provide a Sense of Place

# Appendix I

# Acceptable Plant List

*Section 10*

# LANDSCAPE DESIGN STANDARDS

## 10.1 INTRODUCTION

10.1.1 The Landscape Design Standards includes the selection, placement and maintenance of plant material on the installation. Landscape plantings provide a simple and cost effective enhancement to the general appearance of the installation.

10.1.3 The visual image conveyed by a military installation is defined not just by architectural character and site organization, but also by an attractive, organized landscape design. The presence of plant material on the installation greatly enhances the visual character and environmental quality of the installation.

10.1.2 Plantings add an element of human scale to open spaces and can be used functionally to screen undesirable views, buffer winds, reinforce the hierarchy of the circulation system or provide a visual transition between dissimilar land uses.

## 10.2 LANDSCAPE OBJECTIVES

10.2.1 The overall objective of the use of plant material within the installation is to improve the physical and psychological well being of the people who live and work on the installation. This is achieved through the following objectives:

10.2.1.1 Preserve and enhance urban trees, forest lands, and detailed planting features such as shrubs and groundcovers.

10.2.1.2 Improve the overall visual quality of the installation through the use of native plant material to (Fig. 10.1):

10.2.1.2.1 Blend to built environment with the natural environment.

10.2.1.2.2 Provide scale and comfort to pedestrian environments (Fig. 10.2).

10.2.1.2.3 Reinforce the hierarchy of the circulation system.

10.2.1.2.4 Screen unsightly views or elements.

10.2.1.2.5 Buffer incompatible land uses.

10.2.1.2.6 Minimize maintenance through the use of native plant materials that require less maintenance to survive.

10.2.1.2.7 Enhance Antiterrorism capabilities.

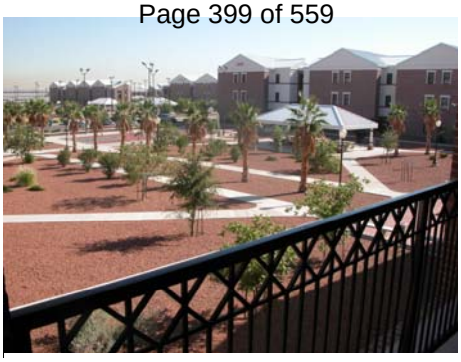


Fig. 10.1 - Use native Plants to Improve Visual Quality

Fig. 10.2 - Provide Comfort to Pedestrian Environment

Fig. 10.3 - Landscaping Reinforces Circulation Hierarchy

## 10.3 PRINCIPLES OF LANDSCAPE DEVELOPMENT

10.3.1 Landscape design is based on the following principles (Fig. 10.4).

10.3.1.1 Unity. The selection and placement of plant material can be used to blend, screen, and soften incompatible architectural or other unattractive visual impacts. Plant material as a unifying element can be placed in front of a building or view to frame and enhance the visual impact.

10.3.1.2 Balance. Plant material can be selected and placed to provide visual equilibrium or balance through the use of either a symmetrical or asymmetrical planting scheme. Symmetrical plantings are generally more formal while asymmetrical plantings are informal.

10.3.1.3 Contrast. Plant material can be selected and placed to provide differences in size and shape that add interest to the environment. Plants can be located to provide a backdrop for other plants such as a hedge behind a bed of annuals or perennials.

10.3.1.4 Rhythm. Repetition of a single plant or a mass of plants provides visual interest and formality to the landscape. Rhythm produces emphasis and unity and is especially effective in articulating main circulation routes.

10.3.1.5 Color and Texture. Plants can be selected and placed to provide visual interest according to their color and texture. Colors are classified as either warm (red, orange, yellow) or cool (violet, blue, green). Texture is classified as either coarse of fine.

10.3.1.6 Simplicity. Landscape plans should be broad and simple in form to limit excessive maintenance. Plant material should grouped in beds with simple edges that are easy to mow. Small turf areas should be avoided because of the difficulty of mowing. The use of annuals should be minimal because of the high maintenance involved.

10.3.1.7 Ultimate Effect. The landscape plan should be prepared with consideration for the mature size of all plants. The spacing of all material should utilize nursery industrial standards for mature material to account for spread as well as height. The ultimate height of the material should also be considered in relation to windows and other visual concerns.

10.3.1.8 Spatial Articulation. Plants can be selected and placed to create enclosed spaces or to separate spaces from one another. They can also be used to direct people by visually defining and reinforcing patterns of movement. The degree of enclosure, separation, or movement is dependent upon the density, form, and type of plants used.

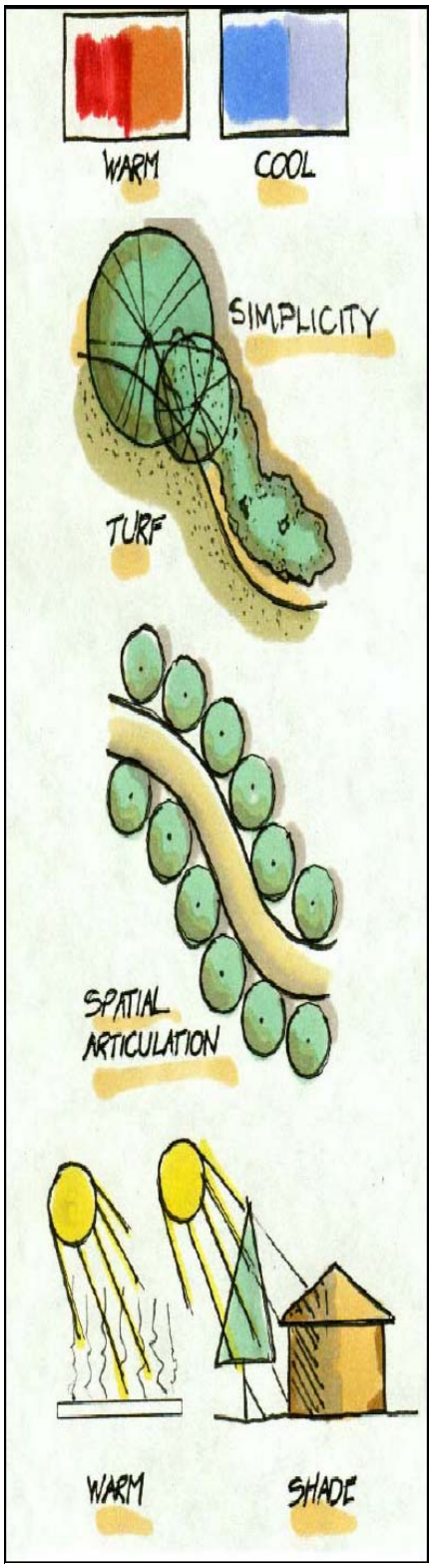



Fig. 10.4 - Principles of Design Illustrated

10.4 Sustainable landscape development

10.4.1 The use of plant material on the installation promotes the sustainability of the development. Trees, shrubs, groundcover, and vines provide aesthetic appeal as well as preservation of fauna and flora, energy conservation, climate modification, erosion control, air purification, and noise abatement (10.5).

## 10.5 LANDSCAPE DESIGN GUIDELINES

10.5.1 Proposed plantings must be reviewed to ensure that site conditions (soil, topography, adjacent uses, and architecture) and climatic criteria (sun, shade, and moisture requirements) are considered in the desired plant design and selection (i.e., form, texture, color, size). The uses and users of the site must also be considered. Landscape planting plans should be approved by qualified personnel to provide quality assurance and promote design consistency within each visual zone.

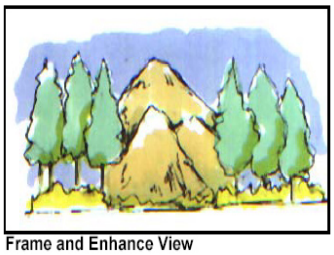
**10.5.2 The following paragraphs present landscaping guidelines for the various locations of plant material use.**

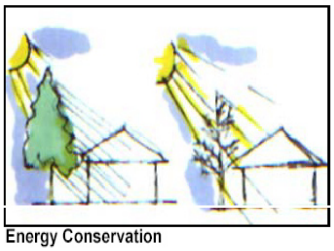
10.5.2.1 **Foundation Planting**. Foundation planting provides a green background for additional plantings, adds scale and character to the building, helps to integrate the building with its surroundings, screens HVAC and other utilities and helps create a sense of arrival (Fig.10.6). When developing foundation planting plans consideration should be given Antiterrorism measures (See paragraph 10.11).

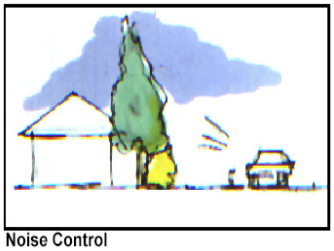
10.5.2.1.1 Focal and seasonal plantings should be located at building entries for pedestrian interest.

10.5.2.1.2 Use the architecture of the building to evaluate the planting design and selection of plants.

10.5.2.1.3 Plant materials should not block windows and views from interior spaces.


Frame and Enhance View


Energy Conservation


Noise Control

Wind Protection

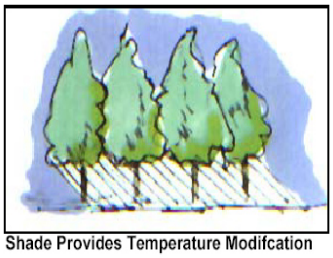

Shade Provides Temperature Modifcation

Fig. 10.5 Plant Material Promotes Sustainability

10.5.2.1.4 Trees shall be setback from the building walls to provide space for mature growth and to prevent root systems from damaging the foundation.

10.5.2.1.5 A symmetrical foundation planting design should be used for a symmetrical building.

10.5.2.1.6 Due to the possibility of insect problems (bee stings, etc.) do not plant flowering plants near entrances.

Fig. 10.6 - Foundation Plantings Help Screen Utilities

10.5.2.2 **Screening.**

10.5.2.2.1 Windscreens. Use a combination of evergreen and deciduous trees to provide windbreak protection from prevailing winds. Windbreak plantings should be irregular in form, rather than straight and evenly spaced, in order to provide more effective wind control and to visually blend with the natural character of the installation.

10.5.2.2.2 Screening of Dumpsters. Landscape planting should be used to supplement wood fence and masonry wall dumpster enclosures (Fig. 10.7).

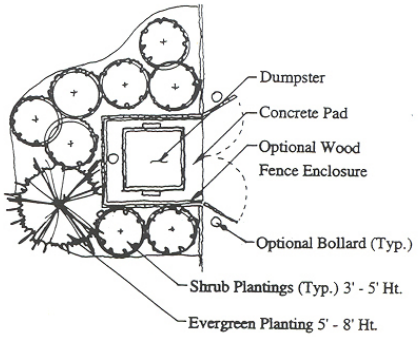



Fig. 10.7 - Screen Dumpsters

10.5.2.3 **Buffer Planting**. Use a mixture of evergreen and deciduous trees and shrubs to visually separate land uses and to help separate visual zones.

10.5.2.4 **Open Space Planting.** Enhance open space areas with planting. Use a mix of evergreen, deciduous, and flowering trees. Plant the same kind of trees in massive groupings to impact the vast open areas (Fig. 10.8).

10.5.2.5 **Street Trees**. Street tree plantings should be used to reinforce vehicular hierarchy, orient and direct traffic, upgrade views and to visually de-emphasize on-street parking (Fig. 10.9). Also, in the design of a street tree planting, separate plant species may be used to identify distinctive details or areas of the installation, for example, a particular land use relationship, historical district, community area or other similar entity.

10.5.2.5.1 Use formal street trees in single rows to visually reinforce primary and secondary roads. Use regularly

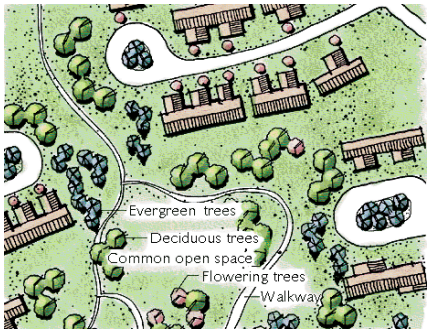



Fig. 10.8 - Enhance Open Spaces with Plantings

spaced and uniformly shaped deciduous trees to provide a regimented appearance.

10.5.2.5.2 Use informal groupings of street trees along tertiary routes. Utilize medium size deciduous trees to screen on-street parking along roadways. Set trees 1 to 2 meters (3 to 6 feet) from the back of curbs (Fig. 10.10). Spacing should be uniform, except where curb cuts interrupt regular spacing.

10.5.2.5.3 As a general rule, street trees should be deciduous species, resistant to salt and root pressure, and should have a 10' to 12' high clearance between the street pavement and branch height to allow adequate clearance for pedestrian and vehicle traffic to pass unimpeded by lower branches.

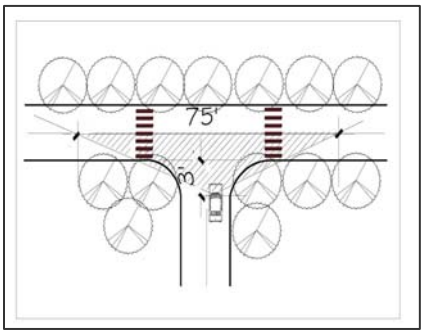



Fig. 10.9 – Use Street Trees to Visually Reinforce Roadway Hierarchy

10.5.2.5.4 The street tree layout should be coordinated with the layout of proposed street lighting.

10.5.2.5.5 Appropriate plant heights should be used within sight triangles to ensure safe views from intersections.

10.5.2.5.6 Weeping trees should not be used in locations where them may hang over the roadway or block views.

10.5.2.6 **Parking Lot Planting**. Parking lots are often the least attractive elements on a military installation. The use of landscape plant material and earth berms can greatly improve the appearance of these areas as well as help define circulation and reduce heat gain during summer months (Fig. 10.10).

10.5.2.6.1 Use shade tree plantings at parking lots to reduce glare and moderate ambient air temperatures on the lot. Optimum spacing of parking lot shade trees is 10 to 12 meters (35 to 40 feet) on center.

10.5.2.6.2 Choose trees and shrubs that require minimum maintenance and will not litter the parking area with leaves, fruit, or nuts.

10.5.2.6.3 Consider sight distances near entrances and exits when selecting and placing plant material.

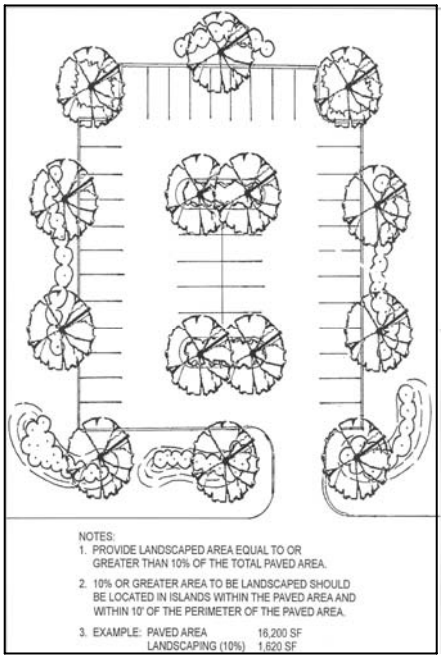



Fig. 10.10 - Provide Parking Lot Planting to Reduce Heat Gain

10.5.2.6.4 Select trees, shrubs, and ground covers that can withstand harsher conditions, such as sun, glare, heat, and reduced water supply.

10.5.5.6.5 Use a mix of evergreen and deciduous plant material to screen parking areas from adjacent uses.

10.5.2.7 **Environmental Control Planting**. When properly placed, plants can provide environmental benefits, as well as address visual concerns.

10.5.2.7.1 Use deciduous trees and shrubs at courtyards, buildings and along streets to provide shade, moderate temperatures and reduce glare during the summer months while allowing solar exposure in the winter.

10.5.2.7.2 Locate deciduous plantings on the southeast and southwest corner of buildings or courtyards to mitigate solar radiation and glare due to heat build-up and lower sun angles in the mid-morning and late afternoon hours.

10.5.2.7.3 Use mixed massings of deciduous shrubs and evergreen trees and shrubs to provide sound control along primary and secondary roads.

10.5.2.8 **Image Planting**. The image of the installation is formed by the visual impressions that exist within the installation. The primary locations of highly visible images are the main gate, along primary circulation systems, and at areas of high concentrations of people. Features such as signs, statues, static displays, and other primary visual images can be improved by the use of trees, shrubs, and ground cover.

10.5.2.9 **Entrances to the Installation**. The entrances and streetscapes into the installation are areas to place landscaping that will develop a strong visual image and provide visual interest during all four seasons. The entrance to the installation creates the first visual impression for the visitor (Fig. 10.11).

10.5.2.9.1 The landscape materials and planting areas should be proportional in scale to the hierarchy of the street on which they are located.

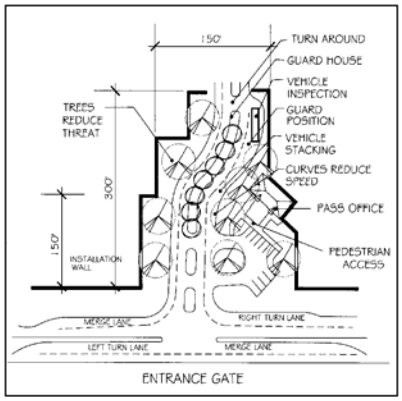



Fig. 10.11 - Landscaping at Entrance Gates will Meet AT/FP Requirements

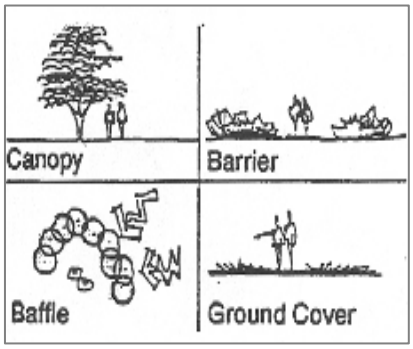



Fig. 10.12 Basic Design Categories

10.5.2.9.2 Landscaping must be integrated with the Force Protection requirements of Section 12. Low shrubs, groundcover, annual/perennial plants and canopy trees provide seasonal interest as well as maintain views required to ensure force protection measures. Large evergreen trees are discouraged in these locations because they may obstruct sightlines and impact the need for force protection. Adequate lines of sight must be maintained fro guard personnel to observe vehicular and pedestrian traffic approaching the gate.

10.5.2.10 **Zeroscaping**. Where appropriate, to conserve water and lower maintenance consider zeroscaping.

10.5.2.11 **Xeriscape.** Xeriscape is the conservation of water and energy through creative and adaptive landscape design. Xeriscape landscapes provide attractive solutions that save money, water, and maintenance. The following website provides guidance on specific design principles of the xeriscape design process and xeriscape design application:

- USAF Landscape Design Guide, Xeriscape

## 10.6 PLANT MATERIAL SELECTION

10.6.1 Trees, shrubs, ground cover and turf are the major elements of a planting composition. Basic plant selection criteria should consider creating a unified composition utilizing native materials for low maintenance and sustainability, avoiding incompatible colors, textures and forms, and matching the appropriate plant to the land use, situation and environmental condition.

10.6.2 The ability of plant material to provide lasting benefit is dependent upon the plant's hardiness and its appropriateness to the site use. Major factors affecting plant hardiness are soil type and organic content, temperature, moisture and light. These climatic conditions can be modified to an extent by specific site conditions, such as wind protection, solar orientation and planting design, to create microclimates.

**Plant Categories**

**Cultural Characteristics**

Growth Rate-Rapid

Growth Rate-Medium

Growth Rate-Slow

Disease/Pest Resistance

**Environmental Characteristics**

Acidic Soil Tolerant

Alkaline Soil Tolerant

Dry Soil Tolerant

Moist Soil Tolerant

Poor/Rocky Soil Tolerant

Salt Tolerant

Shade Tolerant

Summer Wind Tolerant

Urban Condition Tolerant

**Ornamental Characteristics**

Blue Flowers

Ornamental Bark

Fig. 10.13 - Plant Categories

10.6.3 Selecting appropriate plants for a given condition is only one aspect of planting design. Compositional arrangement to provide texture variety and to accent site and building features is another. The selection and composition of a planting design requires an understanding of each plant's characteristics, form, and environmental needs as well as how each plant can relate to and complement other plants in the design. Plants are used in four basic design categories (Fig 10.13):

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

## 10.7 PLANT PALETTE AND PLANT CATEGORIES

10.7.1 The plant palette and categories are designed to help the designer choose the best plant for each particular set of design requirements. The plants that appear on the palette and in the categories were selected for their hardiness and their ability to survive in this geographical area. To use them effectively, the design requirements must be well defined for the specific site.

10.7.2 The Plant Palette.

10.7.2.1 A select group of plant materials has been divided into the following six categories:

- deciduous trees
- coniferous trees
- deciduous shrubs
- coniferous shrubs
- broadleaf evergreen shrubs
- groundcover and vines

10.7.2.2 On the palette, the plants appear in alphabetical order by their botanical name, followed by their common

**Plant Categories Cont.**

**Ornamental Characteristics**

Pink/Purple Flowers

Red/Crimson Flowers

White/Cream Flowers

Yellow/Orange Flowers

Yellow/Orange/Red Fall Color

**Functional Characteristics**

Erosion Control/Bank Stabilizer

Foundation Plants

Large Hedges (+25')

Medium Hedges (10-20')

Low Hedges (4-10')

Naturalizing/Conservation

Park Trees

Large Street Trees (+35')

Small Trees (15-35')

Thorny Plants

Fig. 10.13 - Plant Categories

name, design characteristics, cultural information, recommended use and miscellaneous notes. The plant palette is presented in a matrix format in Appendix O.

10.7.3 The Plant Categories.

10.7.3.1 Plants from the plant palette with similar characteristics have been cataloged in the Plant Categories (Fig. 10.13). These characteristics could be cultural (e.g., upright, narrow form), environmental (e.g., shade tolerant), ornamental (e.g., red fall color), or functional (e.g., screening plant). Characteristics include: Cultural Conditions (mature height and spread, form and growth rate, disease and pest resistance), Environmental Conditions (sun/shade, pH range, soil moisture required, and wind/sun), and Ornamental Characteristics (flower color, autumn color, fruit color, and/or summer leaf color).

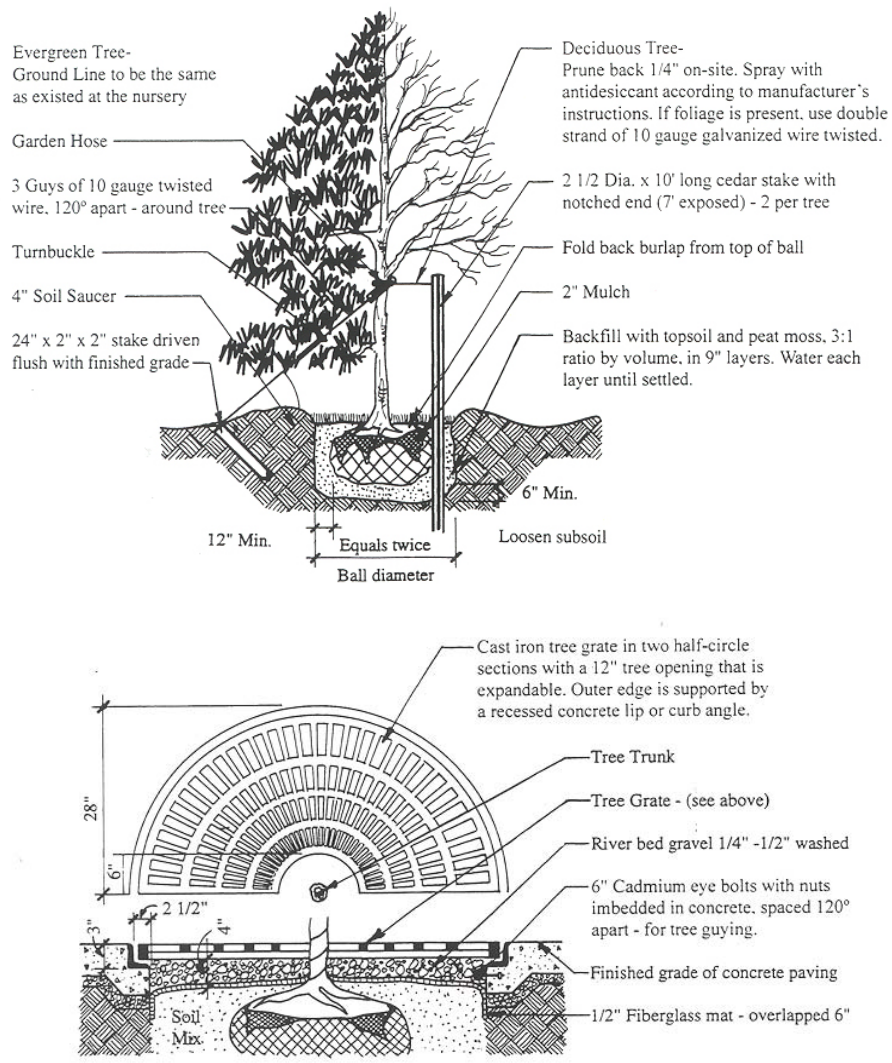


Fig. 10.14 - Install Plant Material According to Industrial Standards

10.7.3.2 Each category describes a list of plants that share a similar quality. For example, materials that are shade tolerant would be placed in the Shade Tolerant group under the "Environmental Conditions" heading. To further explain the Categories, under the "Environmental Conditions" heading, in the Shade Tolerant group, all shade tolerant deciduous

trees would be listed under “Deciduous Trees"; all shade tolerant Coniferous trees would be listed under "Coniferous Trees"; and so on.

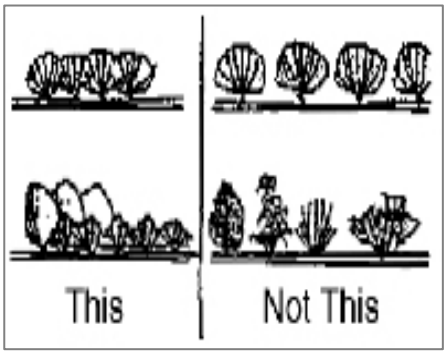



Fig. 10.15 – Space Plants According to their Mature Size

## 10.8 PLANT MATERIAL INSTALLATION

10.8.1 A key step in assuring successful planting is to select plants of the highest quality. Plant material should be of the size, genus, species, and variety to comply with the recommendations and requirements of the "American Standard for Nursery Stock" ANSI Z60.1.

10.8.2 As part of the design process and prior to plant installation, review the installation's Master Plans, Basic Information Maps or As Built Drawings for utility locations and verify with the Directorate of Public Works or equivalent.

10.8.3 The planting and establishment of trees, shrubs, ground covers, and vines is detailed in TM 5-803-13, Chapter 3.

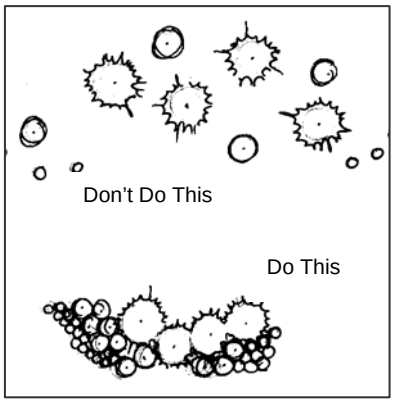



Fig. 10.16 – Grouped Plants Have Greater Impact

10.8.4 General Guidelines for Plant Installation.

10.8.4.1 At planting time, thin plants by removing one-third of the vegetative material.

10.8.4.2 Spray all evergreens with an antidesiccant within 24 hours of planting.

10.8.4.3 Water all plants thoroughly during the first 24-hour period after planting.

10.8.4.4 Site all plants and stakes plumb.

10.8.4.5 Space plants according to their mature size (Fig. 10.X).

10.8.4.6 Install plant materials in groups for greater impact (Fig. 10.17).

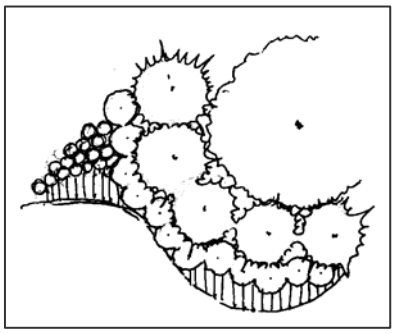


Fig. 10.17 – Group Plants in Mulched Beds to Reduce

10.8.4.6 Installation of Lawn Areas.

10.8.4.7 Installation techniques for turf is detailed in TM 5-803-13, Chapter 4. The details include site evaluation, site

preparation, selection of turf, and maintenance requirements.

## 10.9 MAINTENANCE OF PLANT MATERIAL

10.9.1 The ease of maintenance should be one of the primary goals when considering the success of any planting design.

10.9.2 Pruning. In general plant material should be allowed to conform to its natural shape. This practice allows the plant to mature in a health manner, and saves the time and energy required for trimming. The pruning of trees and shrubs is done to maintain overall plant health, direct plant growth, maintain a desired shape, and increase flower or fruit development.

10.9.2.1 Pruning Shrubs.

- Do not prune shrubs flat across the top.
- Prune branches yearly on thick-branched shrubs and at the base of the shrub.
- When pruning deciduous shrubs prune shrub stems as close to the ground as possible and shrub branches as close to the stem as possible.
- When "thinning out" deciduous shrubs prune about one-third of all branches where they meet their main stem.

10.9.2.2 Pruning Trees.

- Remove a large limb by making three cuts as follows:
- Make the first cut at the bottom of the branch 12-24" from the branch attachment (Cut A, Fig 10.18).
- Make the second cut on the top of the branch within 1" of the undercut (Cut B, Fig 10.18).
- Make the final cut just beyond the outer portion of the branch collar (Cut C, Fig 10.18). The first two

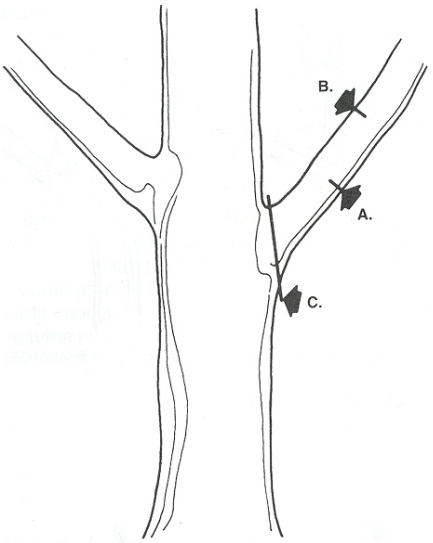


Fig. 10.18 - Proper Tree Pruning Procedures

cuts were necessary to remove the weight of the branch to allow cut #3 to be clean without ripping the bark.

- Never cut the central leader of the tree.
- Coniferous evergreens trees should be pruned, during the spring, by snipping off new growth. Avoid geometrically shaping plant material while pruning.

10.9.3 Mulching.

- Use mulch around the base of plant material to provide for greater moisture and help inhibit the growth of weeds and grasses. Mulch should be maintained at a depth of two (2) to four (4) inches.
- The best time to mulch for water conservation is in the late spring. Apply mulch immediately to new fall plantings.

10.9.4 Ground Cover Maintenance. Although ground covers do not require pruning, they may be periodically dug up in the spring or fall for propagation and to prevent overcrowding in their beds.

10.9.5 Landscape Maintenance Schedule. The general objective of a landscape maintenance schedule is to ensure an orderly and efficient care of the grounds. The landscape maintenance schedule included in the Installation Design Guide (See Appendix F.) identifies times throughout the year when specified maintenance should be undertaken. Use of the landscape maintenance schedule will improve all aspects of landscape on the installation. Materials and supplies can be ordered in a timely fashion, manpower needs can be calculated and anticipated, and a correlation between the level of maintenance and appropriate cost can be derived.

## 10.10 TREE PROTECTION AND PRESERVATION

10.10.1 Existing urban trees and forest should be preserved if they are in good health. Construction should be planned to provide for the preservation of significant trees.

10.10.2 During the clearing and construction process, trees should be protected from damage. Construction barricades should be erected to protect the existing trees to be preserved. The barricades should be no closer to the trunk of the tree than one-half the distance form the trunk to the drip line. Existing trees that cannot be preserved should be considered for transplanting to a different location on site or to a different site.

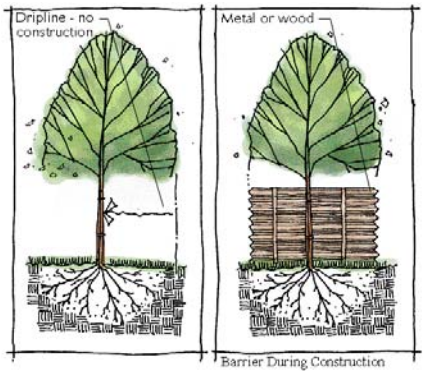



Fig 10.19 - Construct a Barrier at Drip Line During Construction to Maintain Grade

10.10.3 Changes in the grade of the soil around trees can cause extensive root damage and eventually death of the tree. To prevent damage to the tree, it is important to maintain the existing grade for least the size of the threes canopy. (the drip line) (Fig. 10.19).

## 10.11 ANTI-TERRORISM/FORCE PROTECTION CONSIDERATIONS

10.11.1 The presence of vegetation on an installation can have both beneficial and detrimental impacts on security. The selection and placement of landscape plant material on Army installations is an integral element in the provision of protective measures to reduce the threat of terrorism.

10.11.2 Proper selection and placement of trees and shrubs can be utilized to provide visual screening without creating concealment for covert activity. The landscape architect responsible for tree placement should work closely with installation force protection experts to design a landscape plan that provides visual screening without compromising Antiterrorism measures (Fig. 10.20).

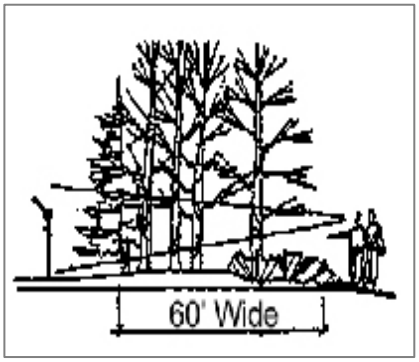



Fig. 10.20 – Establish a Visual Barrier in Perimeter Setback

10.11.3 The plant material must allow building occupants to see out, but must not allow outside forces to monitor interior activity. The landscape architect should incorporate the following aspects into the design:

- Avoid conditions within 10 meters (33 feet) of inhabited structures that permit concealment of aggressors or obscure the view of objects or packages 150-millimeters (6 inches) in height from the view of security personnel. This results in the placement of shrubs and trees that are

loose rather than dense in growth habit and possess multiple small stems rather than a single trunk that will obscure a 150 mm (6 inch) package.

- Vegetation groupings provide reduction of blast effect.
- Plant material selection and placement shall minimize potential hiding places for bombs and aggressors.
- Provide vegetation screens for play areas and outdoor recreation areas to obscure from off-installation view.
- Use trees to obscure sight lines of on-installation buildings from off-installation buildings (Fig. 10.21).

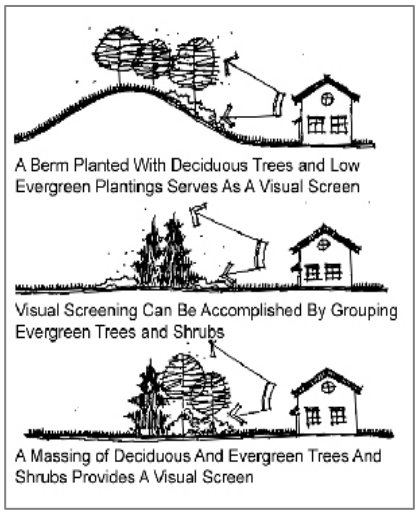



Fig. 10.21 – Use Trees to Obscure Sight Lines

## 10.12 ARMY STANDARDS

10.12.1 The cited Army Standards shall be met.

- Army Regulation (AR) 420-70, *Buildings and Structures*
- Technical Manual (TM) 5-630, *Natural Resources Land Management*
- Technical Manual (TM) 5-803-13, *Landscape Design and Planting*
- American Standard for Nursery Stock, ANSI Z60.1
- Overseas (Host Nation Standards)

## 10.13 REFERENCES

10.13.1 The following references are provided for guidance.

- Unified Facilities Criteria (UFC) *2*-600-01, *Installation Design,* Chap 10
- USAF Landscape Design Guide
- C. Brickell and D. Joyce. *Pruning and Training,* 1996.

Links

Go to Section 11

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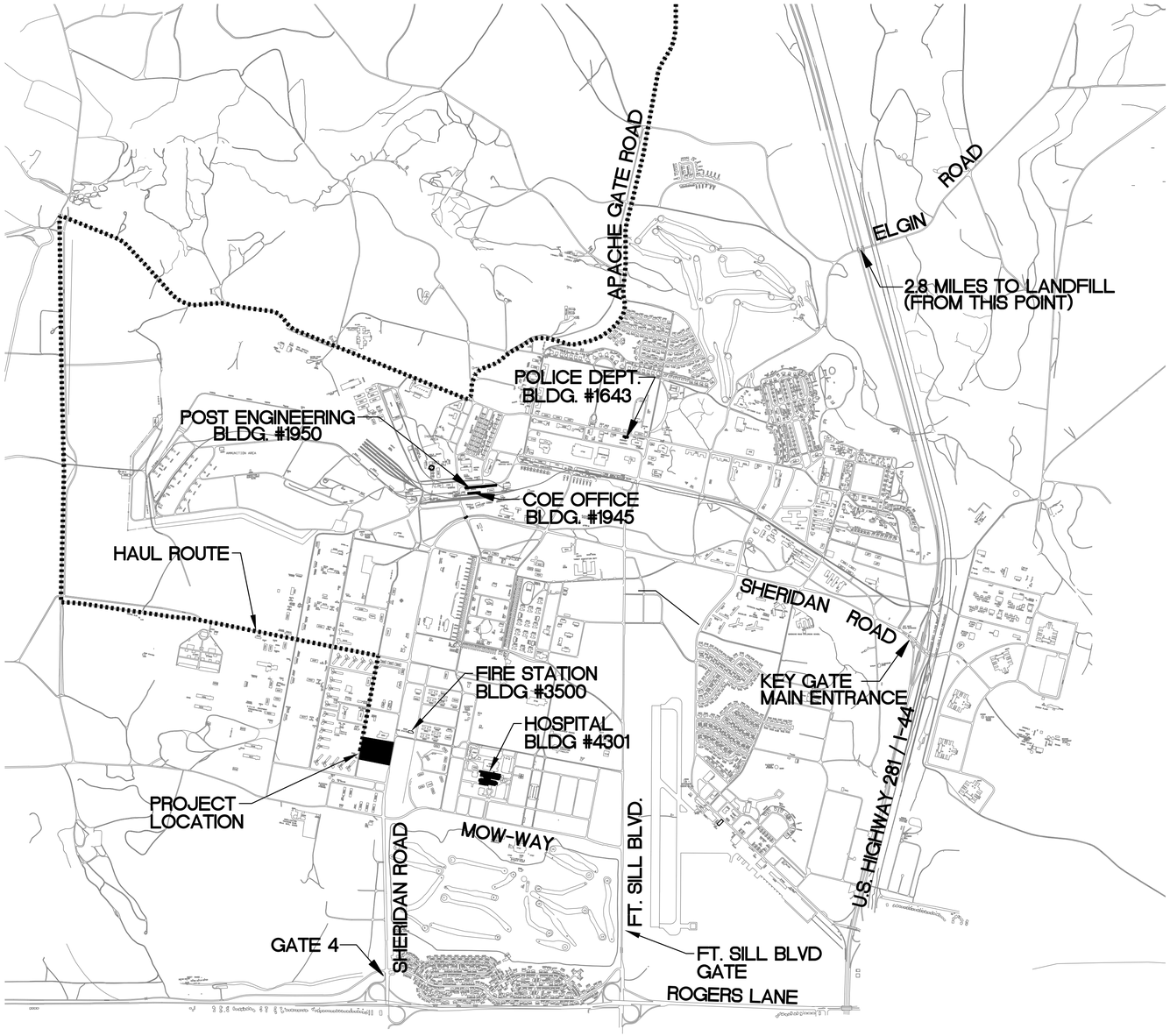
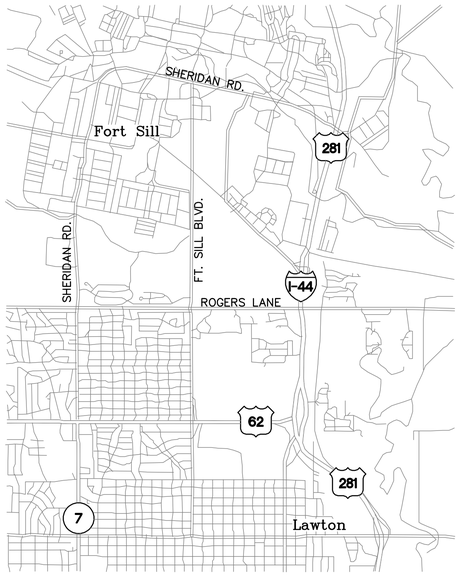
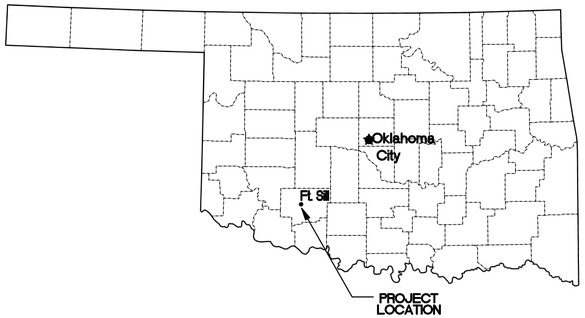
# APPENDIX J
# DRAWINGS




1 G-001 G-001 **PROJECT LOCATION MAP**




2 G-001 G-001 N.T.S. **VICINITY MAP**




3 G-001 G-001 N.T.S. **STATE MAP**

N

1500' 0' 1500' 3000'
SCALE OF FEET

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|---|---|---|---|---|---|---|---|

Designed by: B. McCOMBS
Drawn by: K. HANES
Contract Date:
Reviewed by: K. SULLIVAN
Dwg. Code:
File Name: FS08CDC-G-002
Plot Date:
Plot Scale: AS SHOWN
Submitted by: K. HANEBAUM Vice President
Contract No.: #
Invitation No.: ------

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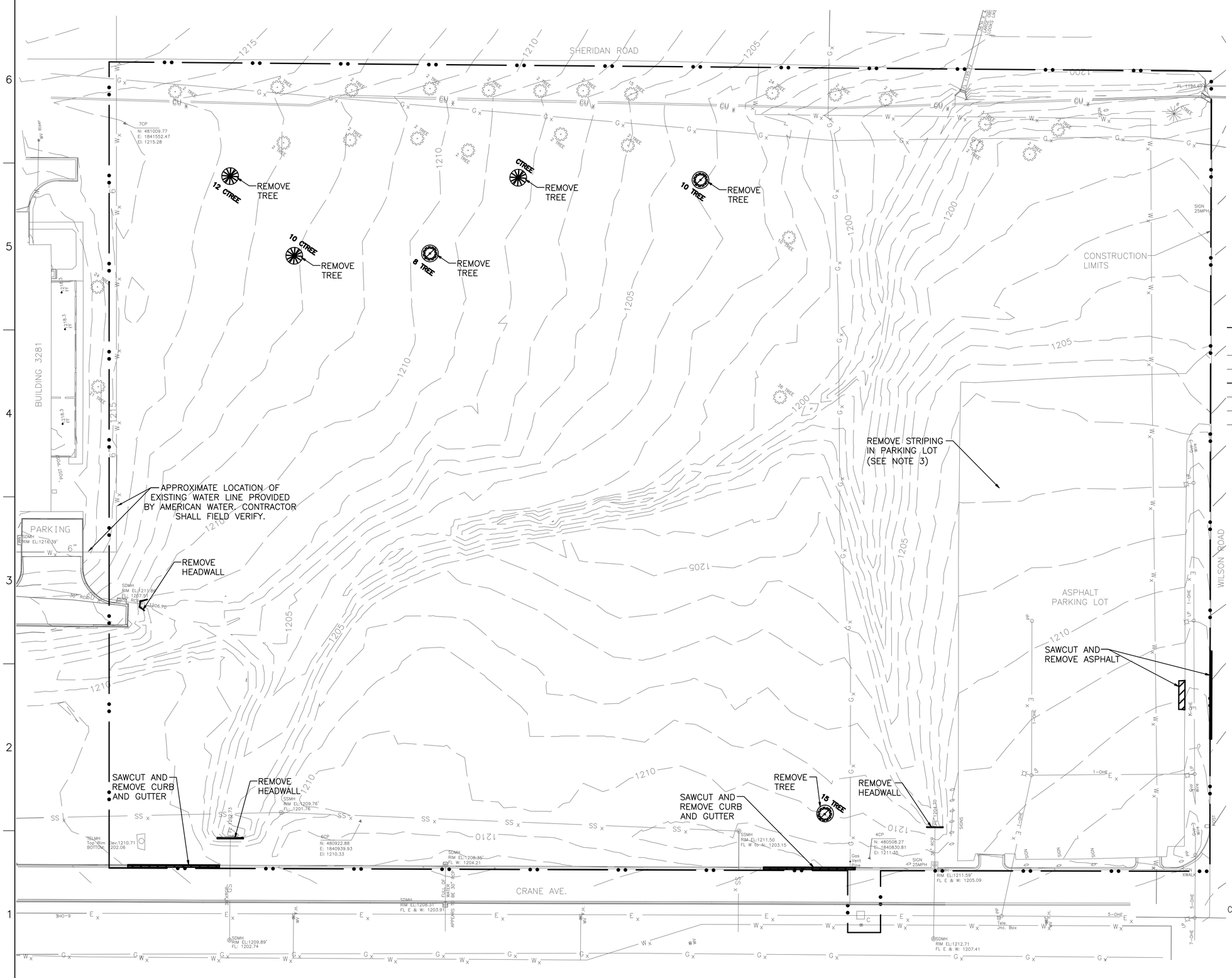
FORT SILL
FORT SILL, OKLAHOMA

PROJECT LOCATION AND VICINITY MAP

Sheet Reference Number:
**G-001**

NOTE: REFER TO GRAPHIC SCALE IF SHEET IS NOT 22"x34"




## LEGEND

REMOVE EXISTING

- FIRE HYDRANT
- WATER VALVE
- SEWER MANOLE
- STORM MANOLE
- HEADWALL
- CATCH BASIN
- LIGHT POLE
- POWER POLE
- COMM. MANHOLE
- COMM. JBOX
- SIGN
- TREES
- CONTROL POINT
- CONSTRUCTION LIMITS
- FIRE PROTECTION LINE
- WATER LINE
- SEWER LINE
- STORM DRAIN
- GAS LINE
- OVERHEAD ELECTRIC
- UNDERGROUND COMM.

ELEVATION DATUM BASED ON N.G.V.D. 1929 DATUM IN US FEET.

HORIZONTAL DATUM IS BASED ON THE NAD 83 OKLAHOMA STATE PLANE COORDINATE SYSTEM, SOUTH ZONE (3502) US FEET.

NOTES:

1. ALL UNDERGROUND UTILITIES SHOWN WERE LOCATED FROM INFORMATION OBTAINED ON SITE, PREVIOUS SURVEY AND RECORDED DOCUMENTS. NO EXCAVATION WAS PERFORMED TO DETERMINE THE SIZE OR LOCATION. NOT NECESSARILY ALL UNDERGROUND UTILITIES ARE SHOWN AND THOSE SHOWN ARE IN APPROXIMATE LOCATION ONLY. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL UNDERGROUND UTILITIES AND THE LOCATION THEREOF PRIOR TO BEGINNING CONSTRUCTION. NO RESPONSIBILITY IS HEREBY EXTENDED FOR LOCATION OF UNDERGROUND UTILITIES.
2. CONTRACTOR STAGING SHALL BE WITHIN CONSTRUCTION LIMITS.
3. THE EXISTING ASPHALT PARKING LOT SHALL REMAIN OPERATIONAL DURING CONSTRUCTION EXCEPT WHEN THE LIMITED WORK IS BEING PERFORMED IN IT. THE CONTRACTOR SHALL NOT USE THE EXISTING ASPHALT PARKING LOT FOR STORAGE OR LAYDOWN. A 30 DAY NOTICE IS REQUIRED PRIOR TO BEGINNING ANY WORK IN THE EXISTING LOT.

0 40' 80'

SCALE:1"=40'

# EXISTING CONDITIONS AND DEMOLITION PLAN

1 C-101 C-101

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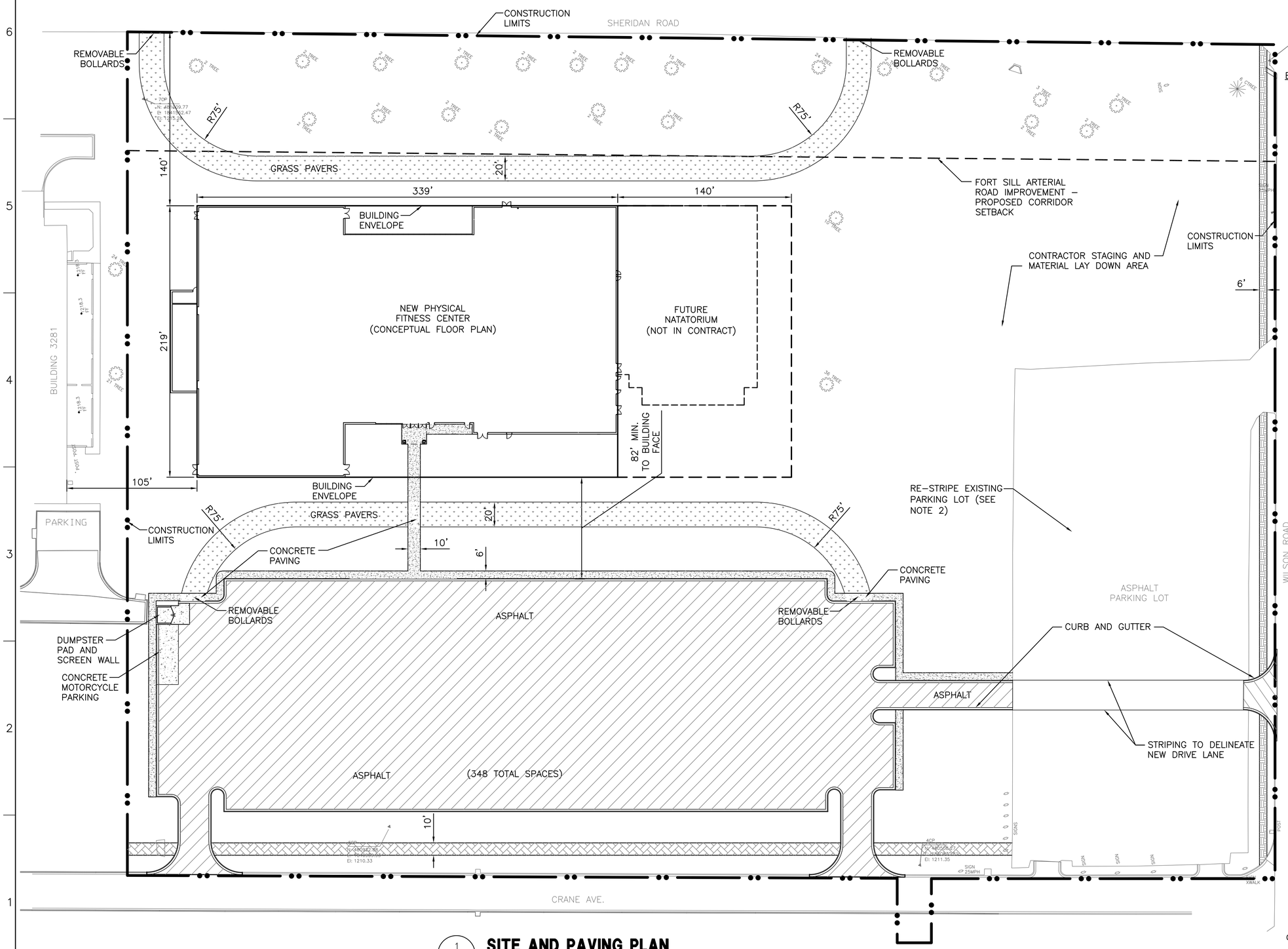
Designed by: B. McCOMBS
Drawn by: K. HANES
Reviewed by: K. SULLIVAN
Dwg. Code:
Submitted by: K. HANEBAUM Vice President
Invitation No.: ------
Contract Date:
File Name:
Date:
Plot Date:
Scale: AS SHOWN
Plot Scale:
Contract No.: #

PHYSICAL FITNESS CENTER
FORT SILL
FORT SILL, OKLAHOMA
EXISTING CONDITIONS AND DEMOLITION PLAN

Sheet Reference Number:
**C-101**

NOTE: REFER TO GRAPHIC SCALE IF SHEET IS NOT 22"x34"




## SITE AND PAVING PLAN

1 C-102 | C-102

### LEGEND

| EXISTING | | NEW |
|---|---|---|
| | FIRE HYDRANT | |
| | WATER VALVE | |
| | SEWER MANOLE | |
| | STORM MANOLE | |
| | HEADWALL | |
| | CATCH BASIN | |
| | LIGHT POLE | |
| | POWER POLE | |
| | COMM. MANHOLE | |
| | COMM. JBOX | |
| | SIGN | |
| | TREES | |
| | CONTROL POINT | |

CONSTRUCTION LIMITS

NEW

- CONCRETE PAVING
- ASPHALT PAVING
- GRASS PAVERS
- SIDEWALK
- SIDEWALK – BID OPTION 1
- SIDEWALK – BID OPTION 3

NOTES:

1. PROVIDE CONCETE PAVED ACCESS TO THE PRIMARY BUILDING MECHANICAL ROOM.
2. THE EXISTING ASPHALT PARKING LOT SHALL REMAIN OPERATIONAL DURING CONSTRUCTION EXCEPT WHEN THE LIMITED WORK IS BEING PERFORMED IN IT. THE CONTRACTOR SHALL NOT USE THE EXISTING ASPHALT PARKING LOT FOR STORAGE OR LAYDOWN. A 30 DAY NOTICE IS REQUIRED PRIOR TO BEGINNING ANY WORK IN THE EXISTING LOT.

0 40' 80'
SCALE: 1"=40'

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|---|---|---|---|---|---|---|---|

Drawn by: K. HANES
Designed by: B. McCOMBS
Submitted by: K. HANES
Contract Date:
Dwg. Code:
Reviewed by: K. SULLIVAN
Vice President
File Name:
Plot Date:
Plot Scale: AS SHOWN
Contract No.:
Invitation No.:

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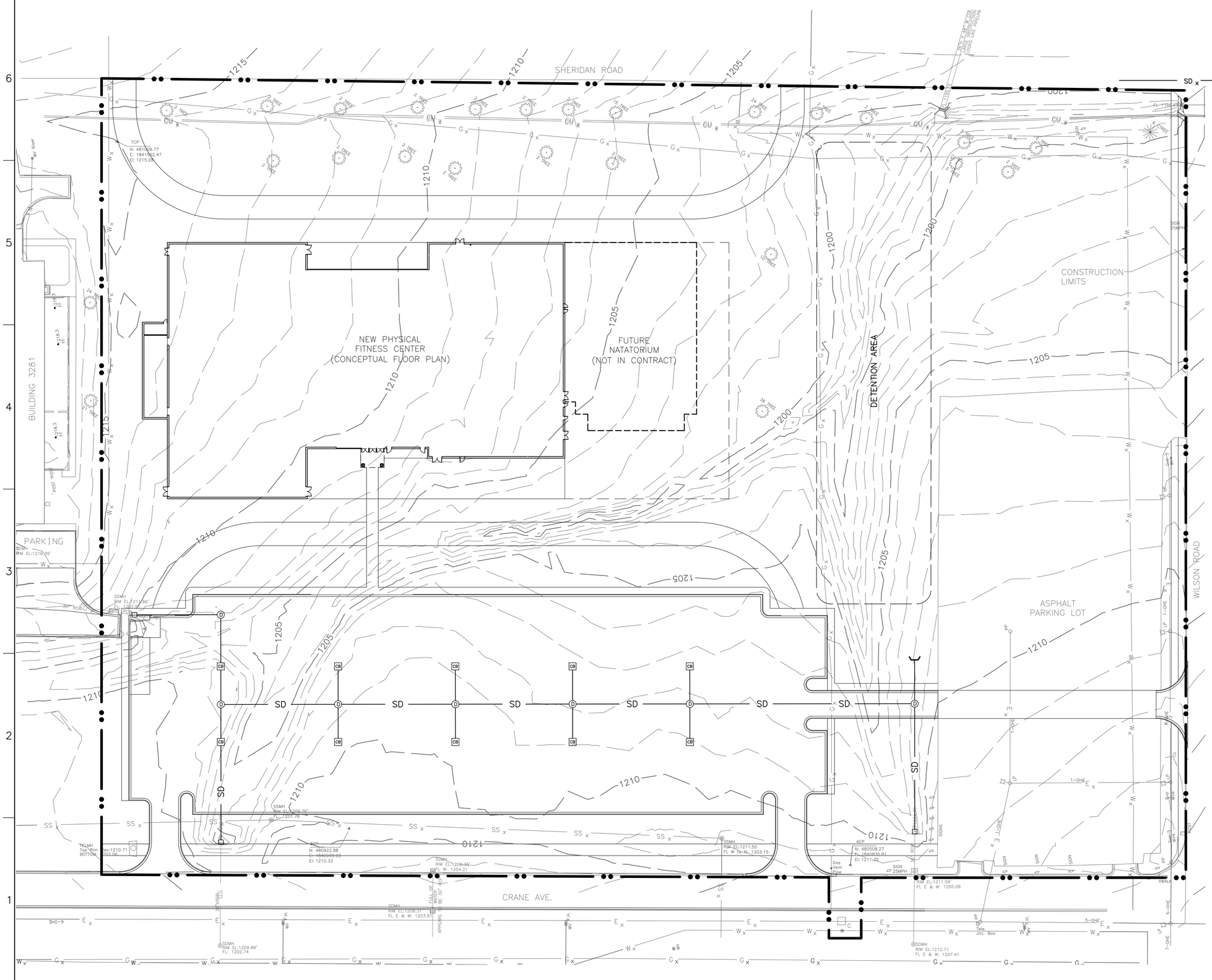
SITE AND PAVING PLAN

Sheet Reference Number:
**C-102**




LEGEND

| EXISTING | | NEW |
|---|---|---|
| | STORM MANOLE | |
| | HEADWALL | |
| | CATCH BASIN | |
| SD | STORM DRAIN | SD |

NOTES:

1. ALL UNDERGROUND UTILITIES SHOWN WERE LOCATED FROM INFORMATION OBTAINED ON SITE, PREVIOUS SURVEY AND RECORDED DOCUMENTS. NO EXCAVATION WAS PERFORMED TO DETERMINE THE SIZE OR LOCATION. NOT NECESSARILY ALL UNDERGROUND UTILITIES ARE SHOWN AND THOSE SHOWN ARE IN APPROXIMATE LOCATION ONLY. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL UNDERGROUND UTILITIES AND THE LOCATION THEREOF PRIOR TO BEGINNING CONSTRUCTION. NO RESPONSIBILITY IS HEREBY EXTENDED FOR LOCATION OF UNDERGROUND UTILITIES.

2. CONTRACTOR IS RESPONSIBLE FOR TEMPORARY AND PERMANENT EROSION CONTROL METHODS/STRUCTURES.

0 40' 80'
SCALE:1"=40'

1 C-103 C-103 **DRAINAGE PLAN**

**THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL SIGNED AND SEALED DOCUMENT**

| Symbol | Description | Date | Appr. | Symbol | Description | Date | Appr. |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

Designed by: B. McCOMBS
Drawn by: K. HANES
Contract Date:
Reviewed by: K. SULLIVAN
Dwg. Code:
File Name:
Submitted by: K. HANEBAUM, Vice President
Invitation No.: ------
Plot Date:
Plot Scale: AS SHOWN
Contract No.: #####

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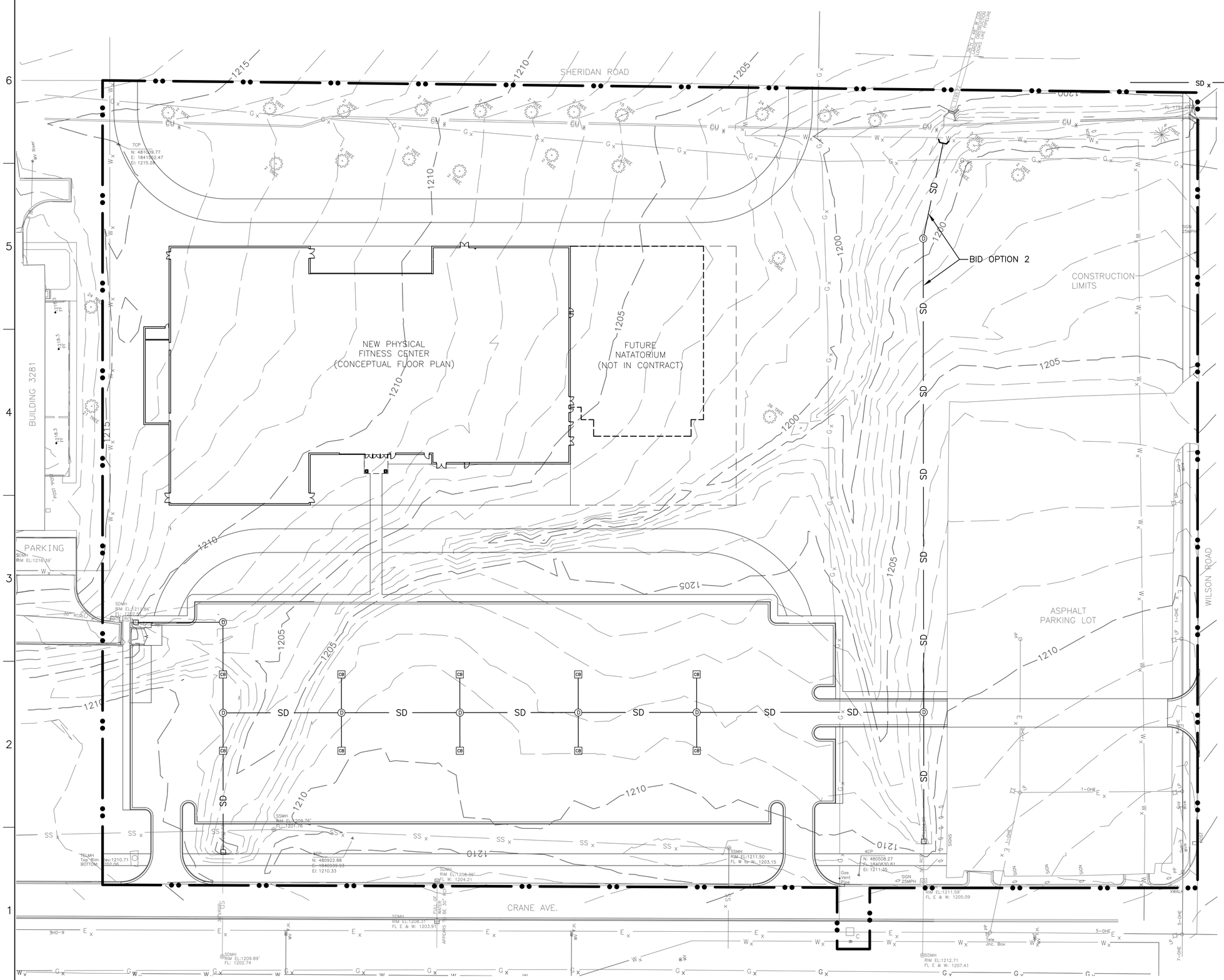
DRAINAGE PLAN

Sheet Reference Number:
**C-103**

NOTE: REFER TO GRAPHIC SCALE IF SHEET IS NOT 22"x34"




LEGEND

| EXISTING | | NEW |
|---|---|---|
| | STORM MANOLE | |
| | HEADWALL | |
| | CATCH BASIN | |
| | STORM DRAIN — SD — | |

NOTES:

1. ALL UNDERGROUND UTILITIES SHOWN WERE LOCATED FROM INFORMATION OBTAINED ON SITE, PREVIOUS SURVEY AND RECORDED DOCUMENTS. NO EXCAVATION WAS PERFORMED TO DETERMINE THE SIZE OR LOCATION. NOT NECESSARILY ALL UNDERGROUND UTILITIES ARE SHOWN AND THOSE SHOWN ARE IN APPROXIMATE LOCATION ONLY. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL UNDERGROUND UTILITIES AND THE LOCATION THEREOF PRIOR TO BEGINNING CONSTRUCTION. NO RESPONSIBILITY IS HEREBY EXTENDED FOR LOCATION OF UNDERGROUND UTILITIES.
2. FOR BID OPTION 2, TRADITIONAL ON-SITE STORM WATER DETENTION IS NOT REQUIRED.
3. CONTRACTOR IS RESPONSIBLE FOR TEMPORARY AND PERMANENT EROSION CONTROL METHODS/STRUCTURES.

0 40' 80'
SCALE:1"=40'

# DRAINAGE PLAN BID OPTION 2

1
C-103 C-103

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| Symbol | Description | Date | Appr. | Symbol | Description | Date | Appr. |
|---|---|---|---|---|---|---|---|

Designed by: B. McCOMBS
Drawn by: K. HANES
Contract Date:
Reviewed by: K. SULLIVAN
Dwg. Code:
File Name:
Submitted by: K. HAUSBLUM Vice President
Invitation No.:
Plot Date:
Plot Scale: AS SHOWN
Contract No.: #

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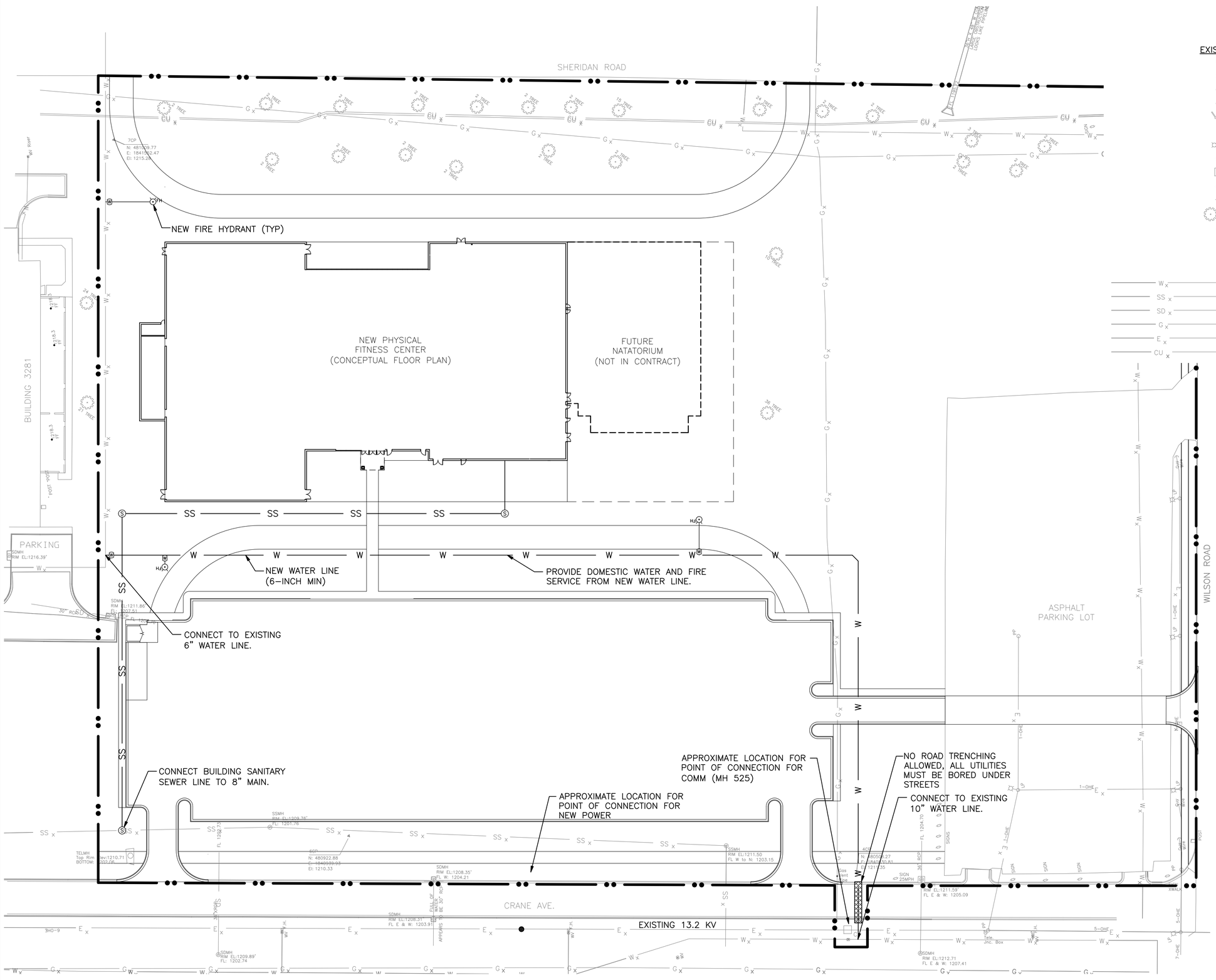
DRAINAGE PLAN
BID OPTION 2

Sheet Reference Number:
C-103A

NOTE: REFER TO GRAPHIC SCALE IF SHEET IS NOT 22"x34"




## LEGEND

| EXISTING | | NEW |
|---|---|---|
| | FIRE HYDRANT | |
| | WATER VALVE | |
| | SEWER MANOLE | |
| | STORM MANOLE | |
| | HEADWALL | |
| | CATCH BASIN | |
| | LIGHT POLE | |
| | POWER POLE | |
| | COMM. MANHOLE | |
| | COMM. JBOX | |
| | SIGN | |
| | TREES | |
| | CONTROL POINT | |
| | CONSTRUCTION LIMITS | |
| | FIRE PROTECTION LINE | F |
| W | WATER LINE | W |
| SS | SEWER LINE | |
| SD | STORM DRAIN | SD |
| G | GAS LINE | |
| E | OVERHEAD ELECTRIC | |
| CU | UNDERGROUND COMM. | |

NOTE:

1. ALL UNDERGROUND UTILITIES SHOWN WERE LOCATED FROM INFORMATION OBTAINED ON SITE, PREVIOUS SURVEY AND RECORDED DOCUMENTS. NO EXCAVATION WAS PERFORMED TO DETERMINE THE SIZE OR LOCATION. NOT NECESSARILY ALL UNDERGROUND UTILITIES ARE SHOWN AND THOSE SHOWN ARE IN APPROXIMATE LOCATION ONLY. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL UNDERGROUND UTILITIES AND THE LOCATION THEREOF PRIOR TO BEGINNING CONSTRUCTION. NO RESPONSIBILITY IS HEREBY EXTENDED FOR LOCATION OF UNDERGROUND UTILITIES.

2. NEW GAS LINE INSTALLATION SHALL BE COORDINATED WITH O.N.G.

0 40' 80'
SCALE:1"=40'

1 C-104 C-104 **UTILITY PLAN**

**THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL SIGNED AND SEALED DOCUMENT**

NOTE: REFER TO GRAPHIC SCALE IF SHEET IS NOT 22"x34"

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| Symbol | Description | Date | Appr. | Symbol | Description | Date | Appr. |
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Drawn by: K. HANES
Reviewed by: K. SULLIVAN
Dwg. Code:
Contract Date:
File Name:
Plot Date:
Plot Scale: AS SHOWN
Contract No.: #
Submitted by: K. J. KAMERSHUM Vice President
Invitation No.: ------

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UTILITY PLAN

Sheet Reference Number:
**C-104**

## PLAN LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| M | MANHOLE |
| H | HANDHOLE |
| 1 | KEYED NOTE, NUMBER IN POSITION "1" INDICATES NOTE NUMBER |
| 1 | DEMOLITION KEYED NOTE, NUMBER IN POSITION "1" INDICATES NOTE NUMBER |
| X | GROUND CONDUCTOR. NO HASH MARKS INDICATE TWO CONDUCTORS PLUS GROUND. CONDUCTOR SIZES GREATER THAN No. 12 AWG ARE NOTED AT POSITION "X" |
| | TRANSFORMER, PADMOUNT (EXISTING) |
| | TRANSFORMER, PADMOUNT (NEW) |
| W-X,Y,Z | CIRCUIT HOMERUN TO PANEL OR CABINET NOTED. W = PANEL, X, Y, Z = CIRCUIT NUMBER. SYMBOL CAN BE USED WITH LONE CONDUIT OR WIRING SYMBOLS. |
| | CONDUIT, CONCRETE ENCASED (DUCT) SYSTEM. QUANTITY OF CIRCLES IN SYMBOL DENOTES QUANTITY AND ARRANGEMENT OF CONDUIT. DARKENED CIRCLE INDICATES CONDUIT WITH CONDUCTORS. |
| 2-3" | CONDUIT AND WIRING RUN, UNDERGROUND. QUANTITY & SIZE AS NOTED |
| X Y Z | DETAIL, SECTION, PLAN OR VIEW REFERENCE SYMBOL. IN POSITION "X" IS THE DETAIL IDENTIFIER NUMBER. IN POSITION "Y" IS THE SHEET NUMBER WHERE DETAIL IS REFERENCED. IN POSITION "Z" IS SHEET NUMBER WHERE DETAIL IS SHOWN |

## LIGHTING SYMBOLS LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| PC | PHOTO-CONTROLLER, INTEGRAL PHOTOELECTRIC CELL AND RELAY |
| | POLE MOUNTED SITE LIGHT FIXTURE |

## ONE-LINE AND CONTROL SCHEMATIC LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| | GROUNDING CONNECTION. WHEN USED WITH TRANSFORMER WINDING SYMBOL IT INDICATES A NEUTRAL GROUNDING CONNECTION (ON SECONDARY SIDE ONLY) |
| △ | DELTA WINDING CONNECTION |
| | SWITCH, DISCONNECT, FUSED, LOAD BREAK. FUSE AMPERE RATING [A] AND FUSE TYPE SHOWN NEXT TO SYMBOL |
| | FUSE, AMPERE RATING [A] AND FUSE TYPE SHOWN NEXT TO SYMBOL |
| | INTEGRAL PHOTOELECTRIC CELL AND RELAY (PHOTOCONTROL) |
| | EQUIPMENT ENCLOSURE |

## SYMBOL MODIFIERS

| SYMBOL | DESCRIPTION |
|---|---|
| E | EXISTING |
| N | NEW |
| W | WEATHERPROOF |

## GROUNDING LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| | GROUND ROD LOCATION |
| | GROUNDING CONNECTION |

## ABBREVIATIONS

| ABBREV. | DESCRIPTION |
|---|---|
| A | AMPERES OR TRIP AMPERES |
| AC | ALTERNATING CURRENT |
| AFF | ABOVE FINISHED FLOOR |
| AFG | ABOVE FINISHED GRADE |
| AIC | SYMMETRICAL AMPS INTERRUPTING CAPACITY |
| CKT | CIRCUIT |
| FT | FEET |
| GFCI | GOVERNMENT FURNISHED CONTRACTOR INSTALLED |
| GFI | GROUND FAULT INTERRUPTER |
| GND | GROUND |
| HPS | HIGH PRESSURE SODIUM |
| HD | HEAVY DUTY |
| KV | KILOVOLTS |
| KVA | KILOVOLT AMPERES |
| KWH | KILOWATT HOURS |
| MFR | MANUFACTURER |
| MH | MANHOLE |
| NEC | NATIONAL ELECTRICAL CODE |
| NEUT | NEUTRAL |
| NIC | NOT IN THIS CONTRACT |
| OH | OVERHEAD |
| OHG | OVERHEAD GUY WIRE |
| PVC | POLYVINYL CHLORIDE |
| RC | RIGID STEEL CONDUIT |
| REQ'D | REQUIRED |
| RGC | RIGID GALVANIZED STEEL CONDUIT |
| RM | ROOM |
| SPARE | SPARE BREAKER OR DEVICE |
| SPECS | CONTRACT SPECIFICATIONS |
| SWBD | SWITCHBOARD |
| TB | TELEPHONE BACKBOARD |
| UL | UNDERWRITERS LABORATORIES |
| UON | UNLESS OTHERWISE NOTED |
| V | VOLTS |
| VA | VOLT-AMPERES |
| W | WATTS |
| W/ | WITH |
| PH | PHASE |
| + | USED WITH A NUMERAL, WHICH INDICATES HEIGHT OF ITEM IN INCHES AFF LEVEL |
| 1/C | SINGLE CONDUCTOR |
| 3/C | THREE CONDUCTOR CABLE |
| S/N | SOLID NEUTRAL |
| 1SP | 1 SPOOL SECONDARY RACK |

## OVERHEAD DISTRIBUTION

| SYMBOL | DESCRIPTION |
|---|---|
| 40'3 | POLE HEIGHT & CLASS (40-FOOT, CLASS 3) |
| C.O. | CUTOUT |
| ● | INDICATES NEW O.H. POLE |
| ○ | INDICATES EXISTING O.H. POLE |
| (P) | PRIMARY PHASE CONDUCTOR |
| (N) | NEUTRAL PHASE CONDUCTOR |
| PDE | PRIMARY DEADEND |
| PTP | POLE TOP PIN |
| GG | GUY GUARD |
| ARR | LIGHTNING ARRESTER |
| PL 2▲10KUA 20A 11-4, G.G. | PLACE 10KVA O.H. TRANSFORMER<br>a) 20A - POWER INSTALLED ANCHOR, 20,000# NOMINAL HOLDING STRENGTH IN CLASS 5 SOIL<br>b) 11-11,000# GUY WIRE STRENGH AT PRIMARY LEVEL<br>c) 4-4,000# GUY WIRE STRENGTH AT SECONDARY LEVEL<br>d) G.G.-GUY GUARD |
| #1AS7 | #1 CONDUCTOR ALUMINUM, STEEL CORE, SEVEN STRAND CABLE |
| #2ACSR | #2 ALUMINUM CABLE STEEL REINFORCED |
| #4ALSSC | #4 CONDUCTOR, ALUMINUM, SELF-SUPPORTING CABLE |
| AGL | ABOVE GROUND LEVEL |
| BC | BARE COPPER |
| 3/C-6ALSSC | #6 ALUMINUM SELF-SUPPORTIVE CABLE |

## LEGEND NOTES

1. BRANCH CIRCUIT NUMBERS MAY BE SHOWN NEXT TO SYMBOLS IN MULTIWIRE CIRCUITS.
2. EQUIPMENT IDENTIFIERS, MATCHING EQUIPMENT SCHEDULES, ARE DISPLAYED ATTACHED TO SYMBOLS BY LEADER ARROWS, UON.
3. SYMBOL ORIENTATION DOES NOT IMPLY DEVICE OR EQUIPMENT ORIENTATION, UNLESS NOTED AS SUCH.

## GENERAL NOTES: (APPLICABLE TO ALL ELECTRICAL SHEETS)

1. EQUIPMENT INTERRUPTING CAPACITIES SPECIFIED IN THE CONTRACT DOCUMENTS ARE BASED UPON EQUIPMENT CHARACTERISTICS AND IMPEDANCES SHOWN ON THE DRAWINGS. IF ACTUAL INSTALLED EQUIPMENT DEVIATES FROM THESE CHARACTERISTICS OR HAS LOWER IMPEDANCES. THE CONTRACTOR SHALL INCREASE THE INTERRUPTING CAPACITIES OF ALL ITEMS ON THE LOAD SIDE OF THE DEVIANT EQUIPMENT IN DIRECT PROPORTION TO THE CHANGED CHARACTERISTICS. INTERRUPTING CAPACITIES SHALL NOT BE REDUCED TO VALUES LESS THAN THOSE REQUIRED BY THE CONTRACT DOCUMENTS.
2. FIRE STOP SHALL BE PROVIDED AT ALL LOCATIONS WHERE ELECTRICAL EQUIPMENT OR SYSTEMS PENETRATE FIRE RATED WALLS. SEE ARCHITECTURAL PLANS FOR RATED WALL LOCATIONS.
3. ALL CONDUCTORS SHALL BE COPPER. ALUMINUM CONDUCTORS ARE NOT ACCEPTABLE FOR THIS PROJECT. UNLESS OTHERWISE NOTED.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND AVOIDING ALL EXISTING OR NEW UNDERGROUND UTILITIES, EVEN IF NOT SHOWN, AT NO ADDITIONAL COST TO THE OWNER. COORDINATE UTILITY "SPOTTING" WITH CONTRACT OFFICER.
5. THE CONTRACTOR SHALL VERIFY PHYSICAL CHARACTERISTICS, VOLTAGE, LOAD AND WIRING REQUIREMENTS FOR ALL EQUIPMENT PRIOR TO ROUGH-IN.
6. ALL BUSES SHALL BE COPPER. ALUMINUM BUSES ARE NOT ACCEPTABLE FOR THIS PROJECT. UNLESS OTHERWISE NOTED.
7. ALL EXISTING ELECTRICAL ITEMS SHALL REMAIN AND BE MAINTAINED IN SERVICE, UNLESS OTHERWISE NOTED.
8. VERIFY THAT THE WIRING BEING REMOVED SERVES ONLY THE ITEM SHOWN TO BE REMOVED ON THESE DRAWING. PROVIDE ALL MATERIALS AND LABOR REQUIRED TO RESTORE CONTINUITY TO CIRCUITS DISRUPTED BY DEMOLITION.
9. COORDINATE LOCATION OF ALL UNDERGROUND PRIMARY SERVICE, SECONDARY SERVICE, TELEPHONE, CATV, LIGHTING, ETC, CONDUITS WITH UNDERGROUND WATER, SANITARY, STORM, GAS, ETC, UTILITY LINES IN THE AREA.
10. REMOVE ALL EXISTING UNUSED WIRING, CONDUIT, BOXES, DEVICES, ETC, UNCOVERED DURING DEMOLITION.
11. NOT ALL SYMBOLS & ABBREVIATIONS SHOWN ARE USED ON THIS PROJECT
12. CONTRACTOR TO INSTALL PULL WIRE IN EMPTY RACEWAY AND INNER-DUCTS. USE #14 ZINC-COATED STEEL OR MONOFLAMENT PLASTIC LINE WITH NO LESS THAN 200LBS TENSILE STRENGTH. LEAVE AT LEAST 24-INCHES OF SLACK AT THE END OF PULL WIRE.

NOTE: REFER TO GRAPHIC SCALE IF SHEET IS NOT 22"x34"

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| Symbol | Description | Date | Appr. | Symbol | Description | Date | Appr. |
|---|---|---|---|---|---|---|---|

Drawn by: J. ANDEEL
Contract Date: --
Designed by: D. STOLL
Dwg. Code:
File Name:
Reviewed by: D. STOLL
Plot Date: 4-15-08
Plot Scale:
Submitted by: D.STOLL
Vice President
Contract No.: 0 #
Invitation No.:

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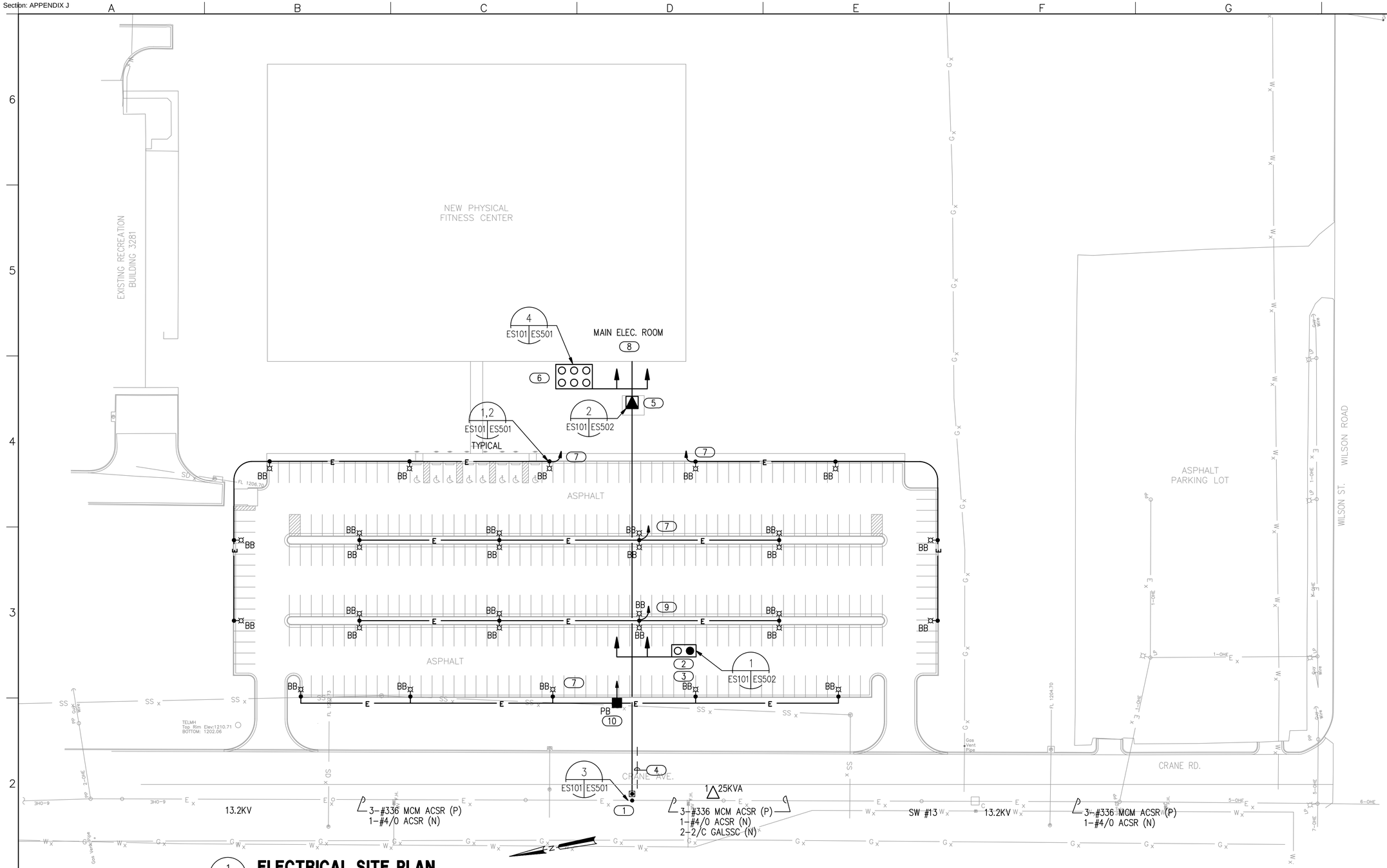
ELECTRICAL LEGEND

Sheet Reference Number:
**E-001**
Sheet of -




# ELECTRICAL SITE PLAN

1 E-101 | E-101 SCALE: 1"=40'-0"

KEYED NOTES:

1. PROVIDE 45'3, 3-PIN UPSWEEP (15"), PTP, 3-C.O., 3-ARR., GRD. (2) 4" RGS PRIMARY RISERS (1-SPARE); PLUG & CAP SPARE CONDUIT AT 10-FEET AGL. FUSE PRIMARY CUTOUT (C.O.) WITH TYPE 'K' FUSE; SIZE TO INSTALLED PADMOUNT TRANSFORMER SIZE.
2. PROVIDE TWO-WAY 4-INCH PVC SCHEDULE 40, CONCRETE-ENCASED DUCT BANK. BURY 48" BFG.
3. INSTALL 3-1/C-#2AWG 15KV COPPER PRIMARY CONDUCTORS, 133% TYPE EPR INSULATION AND 1/C-#2AWG 600V COPPER NEUTRAL CONDUCTOR, 133% TYPE EPR INSULATION IN ONE OF THE 4" PVC SCHEDULE 40 DUCTS FROM PRIMARY RISER POLE TO NEW PADMOUNT TRANSFORMER. TRANSFORMER SIZE TO BE DETERMINED DURING DESIGN PROCESS.
4. BORE BENEATH CRANE ROAD. PROVIDE TWO 6-INCH STEEL CONDUITS BENEATH STREET AND EXTEND 5-FEET BEYOND EACH SIDE OF ROAD. BURY 48" BELOW FINAL GRADE.
5. PROVIDE CONCRETE PAD FOR PADMOUNT TRANSFORMER. COORDINATE EXACT LOACTION WITH CONTRACTING OFFICER REPRESENTATIVE.
6. PROVIDE 6-WAY 4" PVC SCHEDULE 40, CONCRETE ENCASED DUCT BANK FROM PADMOUNT TRANSFORMER TO MAIN ELECTRICAL PANELBOARD IN ELECTRICAL ROOM. BURY 36" BFG. INSTALL PULL WIRE IN ALL CONDUITS. SECONDARY SERVICE CONDUCTORS TO BE SIZED DURING DESIGN PROCESS. COORDINATE EXACT DUCT BANK ROUTING WITH CONTRACTING OFFICER REPRESENTAIVE.
7. PROVIDE 2-#8, #8 GRD, 1" PVC 40 CONDUIT; CONNECT TO LIGHTING CONTACTOR & PHOTOCELL CONTROLLER IN MAIN ELECTRICAL ROOM; BURY 24" BELOW FINISHED GRADE; CIRCUIT NUMBER TO BE PROVIDED AS DESIGN PROGRESSES.
8. PROVIDE LIGHTING CONTACTOR, 60-AMP, AND PHOTO-CONTROLLER IN MAIN ELECTRICAL ROOM.
9. PROVIDE 2-#6, #6 GRD, 1" PVC 40 CONDUIT; CONNECT TO LIGHTING CONTACTOR & PHOTOCELL CONTROLLER IN MAIN ELECTRICAL ROOM; BURY 24" BELOW FINISHED GRADE; CIRCUIT NUMBER TO BE PROVIDED AS DESIGN PROGRESSES.
10. PROVIDE PULL BOX (12"W x 12"L x 24"D).

NOTE: REFER TO GRAPHIC SCALE IF SHEET IS NOT 22"x34"

| Symbol | Description | Date | Appr. | Symbol | Description | Date | Appr. |
|---|---|---|---|---|---|---|---|

Drawn by: J. ANDEEL
Contract Date: --
Designed by: D. STOLL
Dwg. Code:
File Name:
Reviewed by: D. STOLL
Plot Date: 4-15-08
Plot Scale:
Submitted by: D.STOLL
Vice President
Contract No.:
Invitation No.:

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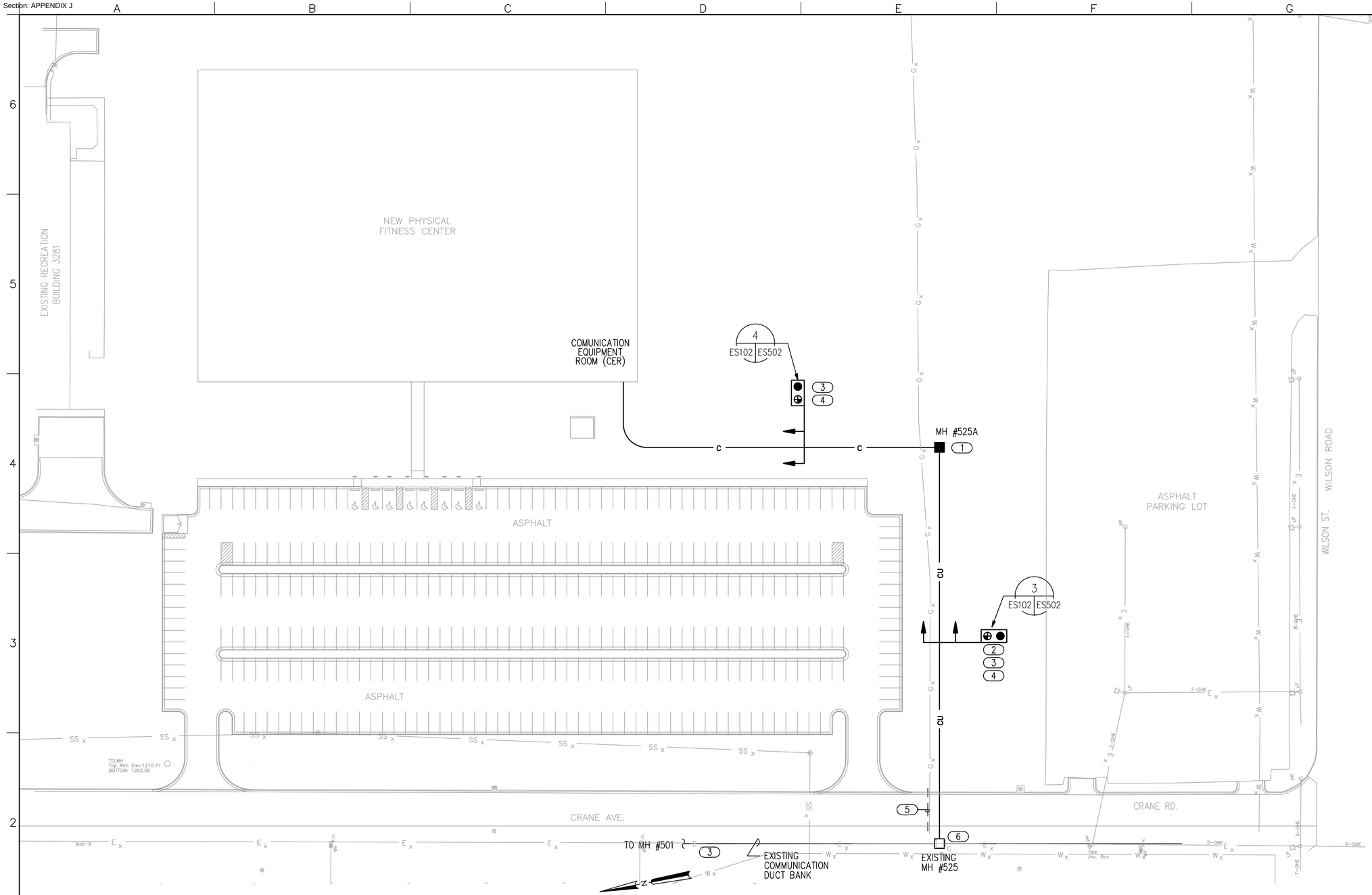
PHYSICAL FITNESS CENTER
FORT SILL
FORT SILL, OKLAHOMA

ELECTRICAL SITE PLAN

Sheet Reference Number:
**ES101**
Sheet of –




## 1 TELECOMMUNICATIONS SITE PLAN

E-102 | E-102 SCALE: 1"=40'-0"

0 40' 80'

SCALE:1"=40'

GENERAL NOTES:

1. CONTRACTOR TO PROVIDE AND INSTALL COMMUNICATION BACKBONE CONDUIT DUCT SYSTEM WITH INNER DUCT; CONTRACTOR TO PROVIDE FIBER OPTIC CABLE AND COPPER PAIR CABLES FOR INSTALLATION BY DOIM.
2. CONTRACTOR TO INSTALL PULL WIRE IN EMPTY RACEWAYS, USE #14 ZINC-COATED STEEL OR MONOFILAMENT PLASTIC LINE WITH NO LESS THAN 200LB TENSILE STRENGTH. LEAVE AT LEAST 24-IINCHES OF SLACK AT EACH END OF PULL WIRE.
3. CONTRACTOR TO COORDINATE TRENCH WITH OTHER EXISTING AND NEW SITE UTILITIES. MAINTAIN SEPARATION ACCORDING TO NESC, NEC, AND LOCAL CODES. COORDINATE MANHOLE LOCATIONS WITH CONTRACTING OFFICER REPRESENTATIVE.

KEYED NOTES:

1. INSTALL MANHOLE FOR H20 LOADING (4' x 6' x 6'). COORDINATE EXACT LOCATION WITH CONTRACTING OFFICER REPRESENTATIVE.
2. PROVIDE 2-WAY CONCRETE ENCASED 4-INCH PVC SCHEDULE 40 DUCT BANK. BURY 24-INCHES BELOW FINISHED GRADE. INSTALL 4-1-INCH INNER DUCTS IN ONE OF THE CONDUITS.
3. PROVIDE 12-STRAND SINGLE-MODE FIBER OPTIC CABLE FROM SWITCH BUILDING LOCATED NORTH OF EXISTING MH #501 THROUGH MH #525 AND MH #525A TO NEW. COMMUNICATION EQUIPMENT ROOM (CER). INSTALL FIBER OPTIC CABLE IN 1" INNER DUCT.
4. PROVIDE 50-PAIR #24 AWG COPPER PE-89 COMMUNICATION CABLE. CABLE TO BE SPLICED IN MANHOLE #525; COORDINATE WITH CONTRACTING OFFICER REPRESENTATIVE & DOIM.
5. BORE BENEATH ROADWAY; PROVIDE TWO SIX-INCH STEEL CONDUITS BENEATH CRANE ROAD; EXTEND ENDS 5-FEET BEYOND EACH SIDE OF ROADWAY; BURY 36" BELOW FINISHED GRADE.
6. CORE BORE EXISTING MH #525; COORDINATE WITH CONTRACTING OFFICER REPRESENTATIVE.

NOTE: REFER TO GRAPHIC SCALE IF SHEET IS NOT 22"x34"

| Symbol | Description | Date | Appr. | Symbol | Description | Date | Appr. |
|---|---|---|---|---|---|---|---|

Designed by: D. STOLL
Reviewed by: D. STOLL
Drawn by: J. ANDEEL
Dwg. Code:
Contract Date: –
File Name:
Plot Date: 4-15-08
Plot Scale:
Contract No.: #
Submitted by: D.STOLL Vice President
Invitation No.:

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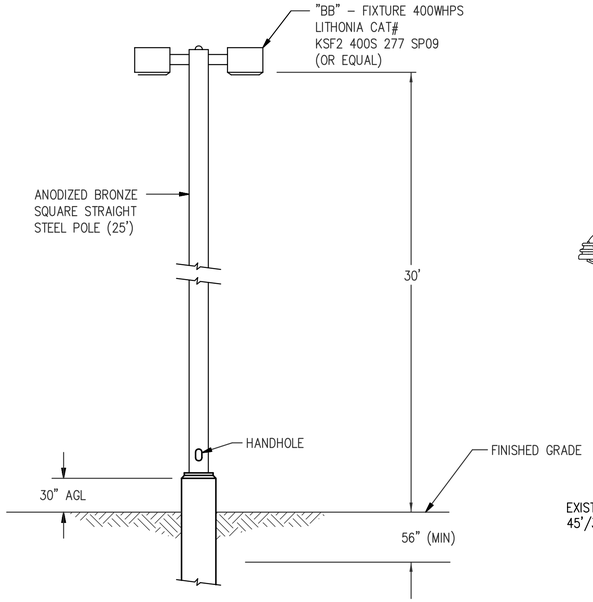
TELECOMMUNICATIONS SITE PLAN

Sheet Reference Number:
**ES102**
Sheet of –

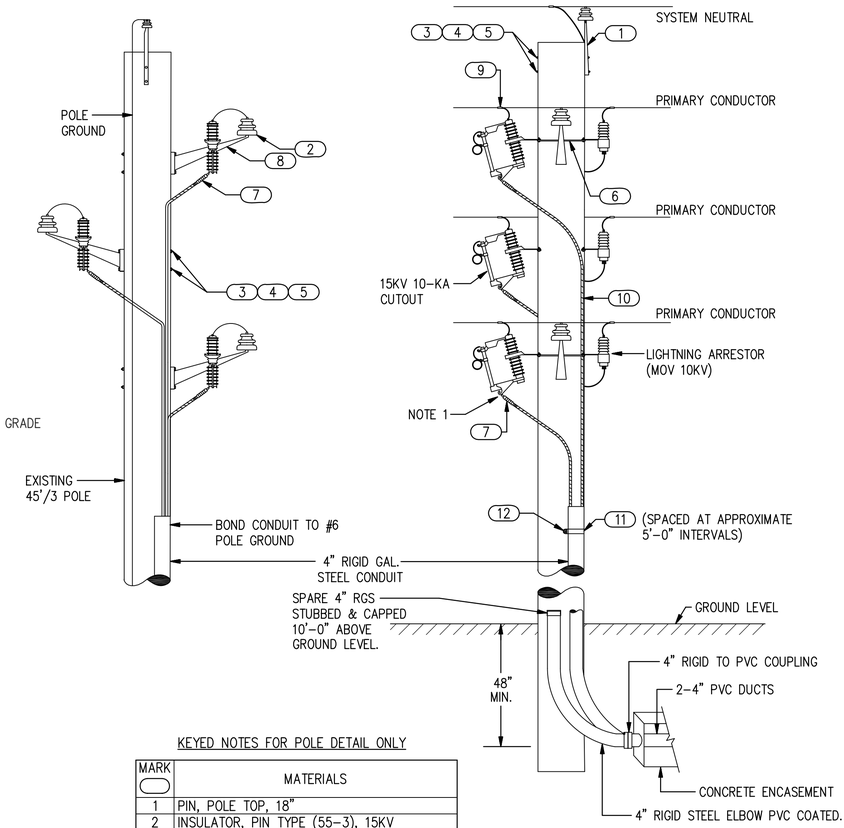



## 1 TYPICAL LIGHT POLE

ES101 ES501 SCALE: NOT TO SCALE

NOTE:

1. LIGHT STANDARD TO BE USED WITH EITHER SINGLE FIXTURE OR DOUBLE FIXTURE, AS APPROPRIATE.




KEYED NOTES FOR POLE DETAIL ONLY

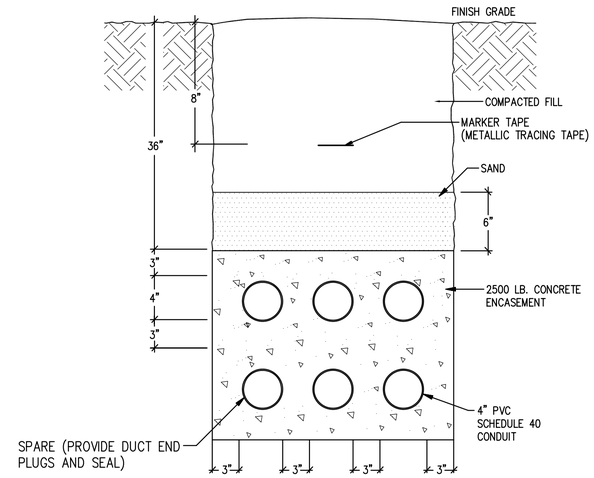
| MARK | MATERIALS |
|---|---|
| 1 | PIN, POLE TOP, 18" |
| 2 | INSULATOR, PIN TYPE (55-3), 15KV |
| 3 | BOLT, MACHINE, 5/8" x REQUIRED LENGTH |
| 4 | WASHER 2 1/4" x 2 1/4" x 3/16", 3/4" HOLE |
| 5 | LOCKNUTS, AS REQURIED |
| 6 | BRACKET, EQUIPMENT (CUTOUT & ARRESTOR) |
| 7 | TERMINATION, STRESS RELEIF |
| 8 | PIN UPSWEEP-15" |
| 9 | CONNECTOR, COMPRESSION |
| 10 | CABLE, 15KV EPR CABLE |
| 11 | TWO HOLE CONDUIT SUPPORT BRACKET |
| 12 | LAG SCREW, 1/2" x 4" |

NOTES:

1. TERMINATOR MUST BE PROPERLY POSITIONED (BEFORE ENERGIZING) SO THAT EXHAUST FROM TUBE WILL NOT BE DIRECTED ON TERMINATOR OR CABLE WHEN FUSE BLOWS. TERMINATOR MUST ALSO BE POSITIONED SO FUSE TUBE WILL NOT STRIKE TERMINATOR AS IT OPENS.

## 3 POLE ATTACHMENT DETAIL (13.2KV)

ES101 ES501 SCALE: NOT TO SCALE



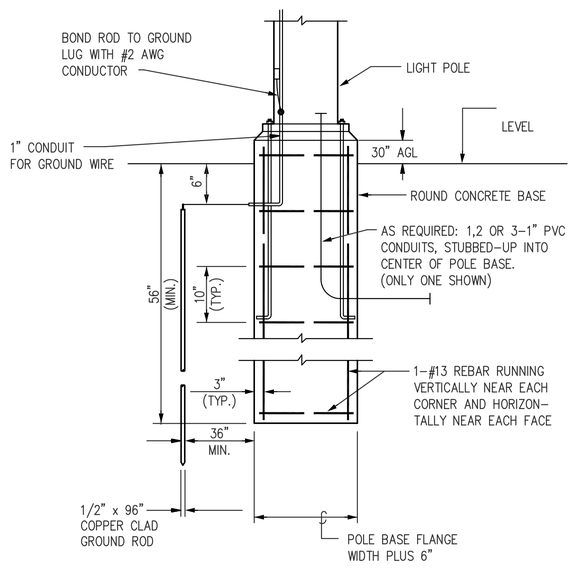

6-WAY

## 4 SIX WAY CONCRETE ENCASED DUCT BANK DETAIL (SECONDARY SERVICE)

ES101 ES501 SCALE: NOT TO SCALE

GENERAL NOTES:

1. COORDINATE UTILITY "SPOTTING" WITH CONTRACTING OFFICER
2. CONDUIT SYSTEM SHALL BE INSTALLED WITH A MINIMUM OF 12" OF HORIZONTAL SEPARATION FROM FOREIGN UTILITES ALREADY IN PLACE.
3. BOTTOM OF TRENCH SHALL BE CLEANED & GRADED TO FINAL ELEVATION & WELL COMPACTED.




## 2 TYPICAL LIGHT POLE BASE DETAIL

ES101 ES501 SCALE: NOT TO SCALE

| Symbol | Description | Date | Appr. | Symbol | Description | Date | Appr. |
|---|---|---|---|---|---|---|---|

Designed by: D. STOLL
Drawn by: J. ANDEL
Contract Date: –
Reviewed by: D. STOLL
Dwg. Code:
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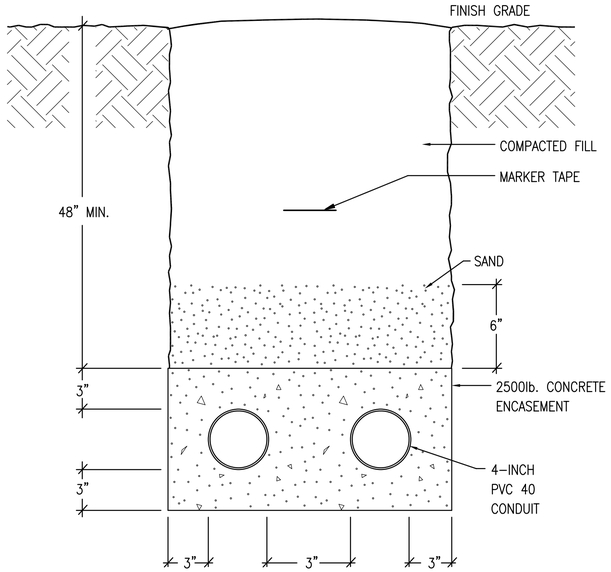
ELECTRICAL
SCHEDULES, DETAILS, AND DIAGRAMS

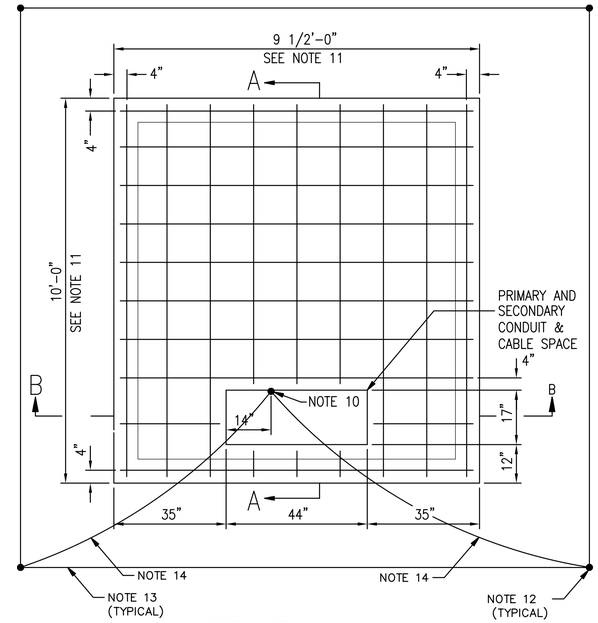
Sheet Reference Number:
**ES501**
Sheet of –

NOTE: REFER TO GRAPHIC SCALE IF SHEET IS NOT 22"x34"



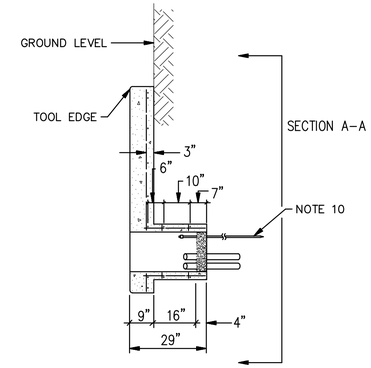

## TWO WAY CONCRETE ENCASED DUCT BANK DETAIL (13.2KV)

1 ES101 ES502 SCALE: NOT TO SCALE



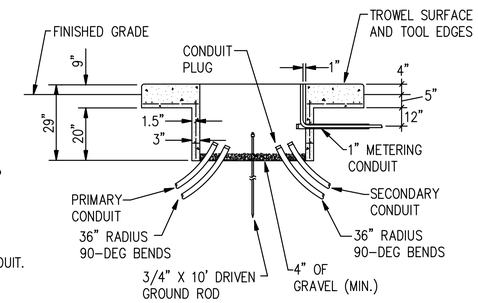

GENERAL NOTE

TRANSITION FROM BELOW GRADE TO ABOVE GROUND IS TO BE WITH GALVANIZED RIGID STEEL CONDUIT.




SECTION A-A

| PAD REQUIREMENTS | | | |
|---|---|---|---|
| CONCRETE (CU. FT.) | REINFORCING STEEL | | PAD WEIGHT ( LB ) |
| | NUMBER | LENGTH (INCHES) | |
| 45 | 9 | 9'-0" | 6,852 |
| | 6 | 9'-6" | |
| | 3 | 7'-0" | |
| | 2 | 29" | |
| | 3 | 6" | |
| | BEAM | | |
| 19 | 2 | 9'-0" | 2,919 |
| | 2 | 9'-6" | |
| 64 | 200' | | 9,771 |



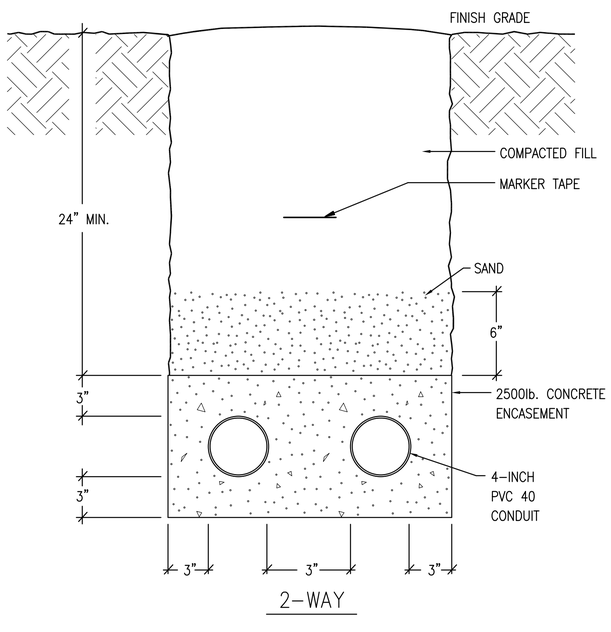

SECTION B-B

NOTES

1. PAD SHALL BE INSTALLED ON A 6" SAND CUSHION. IF PAD IS NOT POURED ON UNDISTURBED EARTH, PIERS OR FOOTINGS SHALL BE PROVIDED.
2. REINFORCING STEEL TO BE #4, GRADE 40, AND IS TO BE TIED WITH MINIMUM #16 TIE WIRE. STEEL TO BE PLACED ON APPROXIMATELY 12" CENTERS BOTH WAYS AND SUPPORTED TO PROVIDE 3" CLEARANCE FROM BOTTOM AND 4" CLEARANCE FROM EDGES OF SLAB. THE ENDS OF THE STEEL TO BE 3" FROM SIDES AND 1 1/2" FROM WINDOWS.
3. MAXIMUM SIZE AGGREGATE 1".
4. CONCRETE TO BE 3500 LBS AT 28 DAYS WITH MINIMUM OF 5 SACKS OF CEMENT PER 1 CUBIC YARD CONCRETE.
5. GRADE BEAMS MAY BE OMITTED WHEN SLAB IS PLACED ON CALICHE, SANDSTONE, ROCK, OR OTHER VERY DENSE SOILS (WHEN APPROVED BY CONTRACTING OFFICER).
6. TOP SURFACE OF PAD TO BE LEVEL WITH 1/8" TOLERANCE. SURFACE TO BE FINISHED BY FLOAT AND STEEL TROWEL. EDGES TO HAVE TOOL FINISH.
7. ALL EXPOSED CONCRETE TO BE TREATED IMMEDIATELY AFTER FINISHING WITH AN APPROVED MEMBRANE TYPE CURING COMPOUND (SIMILAR TO SOUTHERN STATES CHEMICAL) APPLIED WITH AN APPROVED SPRAYER.
8. SLAB TO CURE FOR A MINIMUM OF 7 DAYS BEFORE LOADING.
9. CONCRETE TO BE DRILLED AND EXPANSION ANCHORS INSTALLED TO ACCOMMODATE TRANSFORMER HOLD DOWN BOLTS AND CLEATS.
10. INSTALL 3/4" x 10' COPPERCLAD GROUND ROD, BLACKBURN No. 6258P OR EQUAL, IN PRIMARY COMPARTMENT EXTENDING 3" ABOVE SLAB. CONNECT TO GROUNDING CONDUCTORS FOR ARRESTORS, ENCLOSURE GROUND, PRIMARY NEUTRAL & CABLE SHIELDS.
11. THIS DISTANCE MAY BE REDUCED TO A MINIMUM OF ACTUAL TRANSFORMER DIMENSION (INCLUDING COOLING FINS) PLUS 12".
12. INSTALL 3/4" x 10' COPPERCLAD GROUND ROD, 18" BELOW GRADE.
13. COUNTERPOISE TO BE #2/0 BARE COPPER, BURIED TO A DEPTH OF 30" MINIMUM & 48" FROM PAD; CONNECT TO PRIMARY COMPARTMENT GROUND– NOTE 10
14. SECONDARY GROUNDING CONDUCTOR. PRIMARY & SECONDARY NEUTRALS WILL BE CONNECTED/ GROUNDED IN ACCORDANCE WITH ANSI C2. USE #2/0 BARE COPPER CONDUCTOR.

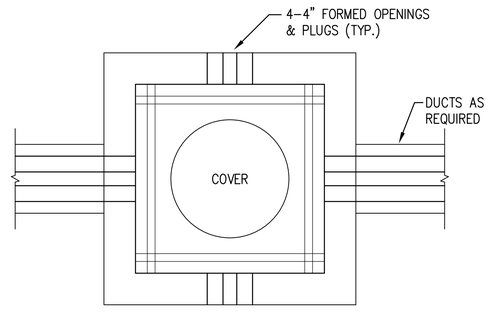
## THREE PHASE TRANSFORMER PAD DETAIL

2 ES101 ES502 SCALE: NOT TO SCALE

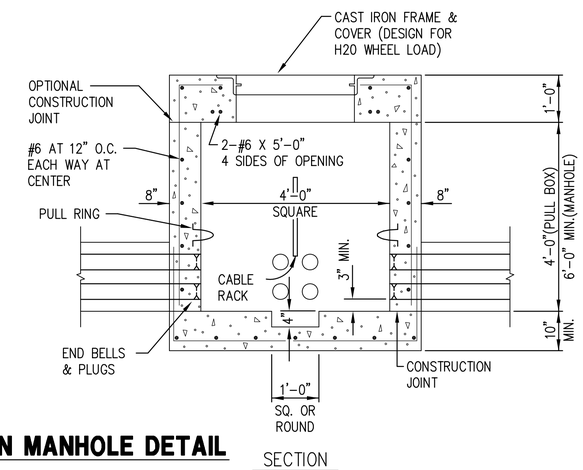



## TWO WAY CONCRETE ENCASED COMMUNICATION DUCT BANK DETAIL

3 ES102 ES502 SCALE: NOT TO SCALE




PLAN




SECTION

## COMMUNICATION MANHOLE DETAIL

4 ES102 ES502 SCALE: NOT TO SCALE

NOTE: REFER TO GRAPHIC SCALE IF SHEET IS NOT 22"x34"

| Symbol | Description | Date | Appr. Symbol | Description | Date | Appr. |
|---|---|---|---|---|---|---|

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Designed by: D. STOLL
Reviewed by: D. STOLL
Drawn by: J. ANGEL
Dwg. Code: –
Contract Date: –
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Plot Date: 4-15-08
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PHYSICAL FITNESS CENTER
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FORT SILL, OKLAHOMA

ELECTRICAL/COMMUNICATION SCHEDULES, DETAILS, AND DIAGRAMS

Sheet Reference Number:
**ES502**
Sheet of –

# Appendix K

# Fuel Cost Information

IMWE-SIL-RMO

24 January 2011

MEMORANDUM FOR: Fort Sill Utility and Refuse Customers

SUBJECT: Change of Utility Rate Schedule

1. In compliance with United States Army Center for Public Works, Technical Note 420-41-1, the required Annual review of utility cost to the government has been completed. The revised rate will be in effect on your January billing.

2. The FY11 rates are calculated from receipt of FY10 cost experience and completion of year-end reporting. In the event that the rates need to be re-evaluated due to the local market a notice will be sent out immediately.

3. The following rates supersede the rates set forth on all past contract modifications or basic contracts.

| | A rate | B rate | H rate |
|---|---|---|---|
| Electric | 0.0618 KWH | 0.0649 KWH | 0.0483 KWH |
| Gas | 11.1410 MCF | 11.6981 MCF | 10.7178 MCF |
| Water | 8.0113 KGAL | 8.4118 KGAL | 6.5884 KGAL |
| Sewage | 6.3431 KGAL | 6.6603 KGAL | 3.8979 KGAL |
| Refuse | 0.0267 LB | 0.0314 LB | |

| | |
|---|---|
| Refuse Rate A per Ton | $53.33 |
| Refuse Rate B per Ton | $62.72 |

4. The (A) rate is the cost to the government including operation, privatization and maintenance costs plus losses/infiltration in transmission. Chargeable to other Federal Government activities, applicable DFMWR activities, and commissaries.

5. The (B) rate is the cost to the government including operation, privatization and maintenance cost, losses/infiltration in transmission, capital charges, and administrative overhead. Chargeable to on post non-federal government activities, lessees of industrial facilities, contractors (MCA, OMA, RDT&E), and direct sales concessionaires. Rate B is also chargeable to off-post non-federal government activities when it is greater than the prevailing rate (LPR) applicable to the customer class.

6. The (H) rate is the cost to the government including normal operation, privatization and maintenance costs plus losses/infiltration in transmission. The maintenance cost excludes major one-time or non-recurring cost maintenance and repair projects (abnormal maintenance). Rate H is chargeable to privatized contractors of housing and lodging or Government employees renting Government quarter's on-post. Rate excludes capital maintenance projects that are not solely beneficial to the customer.

7. Point of contacts for this action are Claudia Ragsdale (580) 442-3181 and Peggy McConnell (580)442-3267, IMCOM-RMO, Budget and Accounting Division, Garrison Resource Management Office.

RANDALL J. BUTLER, P.E.
Director of Public Works

# APPENDIX L
# LEED PROJECT CREDIT GUIDANCE

# LEED for New Construction v2.2
# Registered Project Checklist

Project Name: Physical Fitness Center
Project Address: Ft. Sill, OK

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 4 | 4 | 4 | | **Sustainable Sites** | **14** Points |
| Y | | | Prereq 1 | **Construction Activity Pollution Prevention** | Required |
| 1 | | | Credit 1 | **Site Selection** | 1 |
| | | | Credit 2 | **Development Density & Community Connectivity** | 1 |
| | | 1 | Credit 3 | **Brownfield Redevelopment** | 1 |
| | 1 | | Credit 4.1 | **Alternative Transportation**, Public Transportation Access | 1 |
| | | 1 | Credit 4.2 | **Alternative Transportation**, Bicycle Storage & Changing Rooms | 1 |
| | 1 | | Credit 4.3 | **Alternative Transportation**, Low-Emitting & Fuel-Efficient Vehicles | 1 |
| | 1 | | Credit 4.4 | **Alternative Transportation**, Parking Capacity | 1 |
| 1 | | | Credit 5.1 | **Site Development,** Protect or Restore Habitat | 1 |
| 1 | | | Credit 5.2 | **Site Development,** Maximize Open Space | 1 |
| 1 | | | Credit 6.1 | **Stormwater Design,** Quantity Control | 1 |
| | | 1 | Credit 6.2 | **Stormwater Design,** Quality Control | 1 |
| | | 1 | Credit 7.1 | **Heat Island Effect,** Non-Roof | 1 |
| | | | Credit 7.2 | **Heat Island Effect,** Roof | 1 |
| | 1 | | Credit 8 | **Light Pollution Reduction** | 1 |

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 2 | | 1 | | **Water Efficiency** | **5** Points |
| 1 | | | Credit 1.1 | **Water Efficient Landscaping**, Reduce by 50% | 1 |
| 1 | | | Credit 1.2 | **Water Efficient Landscaping**, No Potable Use or No Irrigation | 1 |
| | | 1 | Credit 2 | **Innovative Wastewater Technologies** | 1 |
| | | | Credit 3.1 | **Water Use Reduction**, 20% Reduction | 1 |
| | | | Credit 3.2 | **Water Use Reduction**, 30% Reduction | 1 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | **Energy & Atmosphere** | **17** Points |
| Y | | | Prereq 1 | **Fundamental Commissioning of the Building Energy Systems** | Required |
| Y | | | Prereq 2 | **Minimum Energy Performance** | Required |
| Y | | | Prereq 3 | **Fundamental Refrigerant Management** | Required |

***Note for EAc1**: All LEED for New Construction projects registered after June 26th, 2007 are required to achieve at least two (2) points under EAc1.

| | | | | | |
|---|---|---|---|---|---|
| | | | Credit 1 | **Optimize Energy Performance** | 1 to 10 |
| | | | | 10.5% New Buildings or 3.5% Existing Building Renovations | 1 |
| | | | | 14% New Buildings or 7% Existing Building Renovations | 2 |
| | | | | 17.5% New Buildings or 10.5% Existing Building Renovations | 3 |
| | | | | 21% New Buildings or 14% Existing Building Renovations | 4 |
| | | | | 24.5% New Buildings or 17.5% Existing Building Renovations | 5 |
| | | | | 28% New Buildings or 21% Existing Building Renovations | 6 |
| | | | | 31.5% New Buildings or 24.5% Existing Building Renovations | 7 |
| | | | | 35% New Buildings or 28% Existing Building Renovations | 8 |
| | | | | 38.5% New Buildings or 31.5% Existing Building Renovations | 9 |
| | | | | 42% New Buildings or 35% Existing Building Renovations | 10 |
| | | | Credit 2 | **On-Site Renewable Energy** | 1 to 3 |
| | | | | 2.5% Renewable Energy | 1 |
| | | | | 7.5% Renewable Energy | 2 |
| | | | | 12.5% Renewable Energy | 3 |
| | | | Credit 3 | **Enhanced Commissioning** | 1 |
| | | | Credit 4 | **Enhanced Refrigerant Management** | 1 |
| | | | Credit 5 | **Measurement & Verification** | 1 |
| | | | Credit 6 | **Green Power** | 1 |

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| | | | **Materials & Resources** | | **13** Points |
| Y | | | Prereq 1 | **Storage & Collection of Recyclables** | Required |
| | | | Credit 1.1 | **Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof | 1 |
| | | | Credit 1.2 | **Building Reuse**, Maintain 95% of Existing Walls, Floors & Roof | 1 |
| | | | Credit 1.3 | **Building Reuse**, Maintain 50% of Interior Non-Structural Elements | 1 |
| | | | Credit 2.1 | **Construction Waste Management**, Divert 50% from Disposal | 1 |
| | | | Credit 2.2 | **Construction Waste Management**, Divert 75% from Disposal | 1 |
| | | | Credit 3.1 | **Materials Reuse**, 5% | 1 |
| | | | Credit 3.2 | **Materials Reuse**,10% | 1 |
| | | | Credit 4.1 | **Recycled Content**, 10% (post-consumer + ½ pre-consumer) | 1 |
| | | | Credit 4.2 | **Recycled Content**, 20% (post-consumer + ½ pre-consumer) | 1 |
| | | | Credit 5.1 | **Regional Materials**, 10% Extracted, Processed & Manufactured Regional | 1 |
| | | | Credit 5.2 | **Regional Materials**, 20% Extracted, Processed & Manufactured Regional | 1 |
| | | | Credit 6 | **Rapidly Renewable Materials** | 1 |
| | | | Credit 7 | **Certified Wood** | 1 |
| Yes | ? | No | | | |
| | | | **Indoor Environmental Quality** | | **15** Points |
| Y | | | Prereq 1 | **Minimum IAQ Performance** | Required |
| Y | | | Prereq 2 | **Environmental Tobacco Smoke** (ETS) **Control** | Required |
| | | | Credit 1 | **Outdoor Air Delivery Monitoring** | 1 |
| | | | Credit 2 | **Increased Ventilation** | 1 |
| | | | Credit 3.1 | **Construction IAQ Management Plan**, During Construction | 1 |
| | | | Credit 3.2 | **Construction IAQ Management Plan**, Before Occupancy | 1 |
| | | | Credit 4.1 | **Low-Emitting Materials**, Adhesives & Sealants | 1 |
| | | | Credit 4.2 | **Low-Emitting Materials**, Paints & Coatings | 1 |
| | | | Credit 4.3 | **Low-Emitting Materials**, Carpet Systems | 1 |
| | | | Credit 4.4 | **Low-Emitting Materials**, Composite Wood & Agrifiber Products | 1 |
| | | | Credit 5 | **Indoor Chemical & Pollutant Source Control** | 1 |
| | | | Credit 6.1 | **Controllability of Systems**, Lighting | 1 |
| | | | Credit 6.2 | **Controllability of Systems**, Thermal Comfort | 1 |
| | | | Credit 7.1 | **Thermal Comfort**, Design | 1 |
| | | | Credit 7.2 | **Thermal Comfort**, Verification | 1 |
| | | | Credit 8.1 | **Daylight & Views**, Daylight 75% of Spaces | 1 |
| | | | Credit 8.2 | **Daylight & Views**, Views for 90% of Spaces | 1 |
| Yes | ? | No | | | |
| | | | **Innovation & Design Process** | | **5** Points |
| | | | Credit 1.1 | **Innovation in Design**: Provide Specific Title | 1 |
| | | | Credit 1.2 | **Innovation in Design**: Provide Specific Title | 1 |
| | | | Credit 1.3 | **Innovation in Design**: Provide Specific Title | 1 |
| | | | Credit 1.4 | **Innovation in Design**: Provide Specific Title | 1 |
| | | | Credit 2 | **LEED® Accredited Professional** | 1 |
| Yes | ? | No | | | |
| 6 | 4 | 5 | **Project Totals** **(pre-certification estimates)** | | **69** Points |

**Certified:** 26-32 points, **Silver:** 33-38 points, **Gold:** 39-51 points, **Platinum:** 52-69 points

# APPENDIX M
# LEED OWNER'S PROJECT REQUIREMENTS

# Owner's Project Requirements Document for LEED Fundamental Commissioning

Project: _____

Approved: _____ _____ _____
Name Owner's Representative Date

_____ _____ _____
Name Design Agent's Representative Date

## Overview and Instructions

The purpose of this document is to provide clear and concise documentation of the Owner's goals, expectations and requirements for commissioned systems, and shall be utilized throughout the project delivery and commissioning process to provide an informed baseline and focus for design development and for validating systems' energy and environmental performance.

The Owner's Project Requirements Document is a required document for LEED Version 2.2 EA Prerequisite 1, Fundamental Commissioning of the Building Energy Systems. It shall be completed by the Corps District/Design Agent based on coordination with the Installation/User/Proponent and shall be approved by the Installation/User/Proponent representative.

Use of this template is not required, nor are there any restrictions on editing of it. It is provided simply as a tool to assist project teams in meeting the documentation requirements for LEED Fundamental Commissioning.

The intent of the Owner's Project Requirements Document, per the LEED v2.2 Reference Guide, is to detail the functional requirements of a project and the expectations of the building's use and operation as it relates to commissioned systems. This template contains the basic recommended components indicated in the LEED v2.2 Reference Guide. It should be adapted as needed to suit the project, remaining reflective of the LEED intent.

The Owner's Project Requirements Document should ideally be completed before the start of design and furnished to the design team. It must be completed prior to the approval of Contractor submittals of any commissioned equipment or systems to meet LEED requirements.

Updates to the Owner's Project Requirements Document throughout the course of project delivery shall be made by the Corps District/Design Agent based on decisions and agreements coordinated with and agreed to by the Installation/User/Proponent.

The Owner's Project Requirements Document shall be included in the project's LEED documentation file under EA PR1, Fundamental Commissioning of the Building Energy Systems.

## Owner's Project Requirements Document for LEED Fundamental Commissioning

## Table of Contents

1. Owner and User Requirements
   - Primary Purpose, Program and Use
   - Project History
   - Broad Goals
2. Environmental and Sustainability Goals
   - Energy Efficiency Goals
   - General
   - Siting
   - Building Façade
   - Building Fenestration
   - Building Envelope
   - Roof
   - Other
3. Indoor Environmental Quality Requirements
   - Intended Use
   - Occupancy Schedule
   - Accommodations for After-Hours Use
   - Lighting, Temperature, Humidity, Air Quality, Ventilation, Filtration
   - Acoustics
   - Occupant Ability to Adjust System Controls
   - Types of Lighting
4. Equipment and Systems Expectations
   - Space Heating
   - Ventilation
   - Air Conditioning
   - Refrigeration
   - HVAC Controls
   - Domestic Hot Water
   - Lighting Controls
   - Daylighting Controls
   - Emergency Power
   - Other
5. Building Occupant and O&M Personnel Requirements
   - Facility Operation
   - EMCS
   - Occupant Training and Orientation
   - O&M Staff Training and Orientation

TABLE 1

## 1. *Owner and User Requirements*

What is the primary purpose, program and use of this project? (example: office building with data center)

_____
_____
_____

Describe pertinent project history. (example: standard design development)

_____
_____
_____

### *Broad Goals*

What are the broad goals relative to program needs?

_____
_____
_____

What are the broad goals relative to future expansion?

_____
_____
_____

What are the broad goals relative to flexibility?

_____
_____
_____

What are the broad goals relative to quality of materials?

_____
_____
_____

What are the broad goals relative to construction costs?

_____
_____
_____

What are the broad goals relative to operational costs?

_____
_____
_____

What are the broad goals relative to life cycle of the equipment?

Other broad goals: *(Insert as applicable)*

## 2. Environmental and Sustainability Goals

What are the project goals relative to sustainability and environmental issues? (example: LEED Silver rating)

What are the project goals relative to energy efficiency? (example: Meet EPACT)

What are the project goals and requirements for building siting that will impact energy use?

What are the project goals and requirements for building facade that will impact energy use?

What are the project goals and requirements for building fenestration that will impact energy use?

What are the project goals and requirements for building envelope that will impact energy use?

What are the project goals and requirements for building roof that will impact energy use?

Other: *(Insert as applicable)*

_____
_____
_____

### *3. Indoor Environmental Quality Requirements*

What is the intended use for all spaces? For all spaces that have an intended use that is not readily apparent from the space name, provide this information in Table 1.

_____
_____
_____

What is the anticipated occupancy schedule (numbers of occupants and time frames) for all occupied spaces? Indicate the default occupancy schedule below and for all spaces that have an occupancy schedule that differs from the default, provide this information in Table 1.

_____
_____
_____

What accommodations for after-hours use are required? (example: access control, lighting controls, HVAC controls) Indicate general accommodations required below and for all spaces that have special requirements, provide this information in Table 1.

_____
_____
_____

What are the lighting, temperature, humidity, air quality, ventilation and filtration requirements for all spaces? Indicate the default requirements below and for all spaces that have a requirement that differs from the default, provide this information in Table 1.

Lighting: _____
Temperature: _____

Humidity: _____
Air Quality: _____

Ventilation: _____

Filtration: _____

What are the acoustical requirements for all spaces? Indicate the default acoustical requirements below and for all spaces that have a requirement that differs from the default, provide this information in Table 1.

_____
_____
_____

What is the desired level of occupant ability to adjust systems controls? Indicate the default desired levels below and for all spaces that have a desired level that differs from the default, provide this information in Table 1.

Lighting: _____

Temperature: _____
Humidity: _____
Air Quality: _____

Ventilation: _____

What, if any, specific types of lighting are desired? (example: fluorescent in 2x2 grid, accent lighting, particular lamps)

_____
_____
_____

### *4. Equipment and System Expectations*

*(Complete for each category as applicable or indicate "none identified" or "N/A". Add desired features information for other anticipated commissioned systems as applicable)*

Indicate desired features for the following commissioned system: Space Heating

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility: _____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Ventilation

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Air Conditioning

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Refrigeration

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies:

Indicate desired features for the following commissioned system: HVAC Controls

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Domestic Hot Water

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Lighting Controls

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Daylighting Controls

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Emergency Power

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Other - _____

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

### *5. Building Occupant and O&M Personnel Requirements*

How will the facility be operated? Who will operate the facility?

_____
_____
_____

Will the facility be connected to an EMCS? If so, what are the interface requirements? (example: monitoring points, control points, scheduling)

_____
_____
_____

What is the desired level of training and orientation for building occupants to understand and use the building systems?

_____
_____
_____

What is the desired level of training and orientation for O&M staff to understand and maintain the building systems?

_____
_____
_____

***Table 1***

| Space | Use / Activity | Num of Occs | Special Occupancy Schedule | After Hours Use Reqmt. | Special Cooling Reqmt. | Special Heating Reqmt. | Special Humidity Reqmt. | Special Ventil./Filtration Reqmt. | Special Acoustic Reqmt. | Special Lighting Reqmt. | Special Occup Adjustability Reqmt. |
|---|---|---|---|---|---|---|---|---|---|---|---|
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# APPENDIX N
## LEED Requirements for Multiple Contractor Combined Projects

Not Used

# APPENDIX O
## LEED Strategy Tables

Not Used

# APPENDIX P

## LEED Registration of Army Projects

## 15 April 2010

**Number of Registrations**
Each building must be registered separately, except multiple instances of a standard building on a shared site may be registered as a single project. If a single registration for multiple buildings is chosen, all buildings under the single registration must earn exactly the same points. Do not register buildings that are exempt from a specific LEED achievement requirement.

**Typical Registration Procedure**
1. Login, complete the online registration form (see guidance below) at the GBCI LEED Online website http://www.gbci.org/DisplayPage.aspx?CMSPageID=174 and submit it online.
2. Pay the registration fee via credit card (USACE staff: credit card PR&C is funded by project design or S&A funds).
3. GBCI will follow up with a final invoice, the LEED-online passwords and template information.
4. The individual who registers the project online is, by default, the Project Administrator.

**Completing the Registration Form**

**BEFORE YOU BEGIN:**
**Create a personal account with USGBC if you do not have one.**
**You will need the following information:**
**Project name as it appears in P2 (obtain from USACE Project Manager)**
**Building number/physical address of project**
**Zip code for Installation/project location**
**Anticipated construction start and end dates**
**Total gross area all non-exempt buildings in registration**
**Total construction cost all non-exempt buildings only (see Project Details Section instructions below)**

**ACCOUNT/LOGIN INFORMATION**
1. The person registering the project **must have an account with USGBC** (login and password) to complete the form. Go to http://www.gbci.org/ , click on “register a project” at the drop-down menu for project certification (at the top of the page) and select “register now for LEED 2009” to start the project registration process. If you have an account, login with your email address and password and select “register new project” to proceed. If you do not have an account, you may select “register a new account” and follow the instructions. It is recommended that you create an account separately on the USGBC website before you start the form. IMPORTANT: USACE team members are members of USGBC and are eligible for Member prices. USACE team members registering projects should be sure to include the USACE Corporate Access ID in their personal account profile (if you do not have it contact richard.l.schneider@usace.army.mil or judith.f.milton@usace.army.mil for the number).
2. The Account/Login Information section is filled out by the person registering the project. It may be a Contractor or a USACE staff member.

**ELIGIBILITY SECTION**
Follow directions (accepting the terms and conditions)
Review your profile information and make corrections if needed

**RATING SYSTEM SELECTION SECTION**
Select single project registration and I know which rating system.
Select the rating system - currently only LEED-NC and LEED for Homes are approved for Army use without special approval.
LEED Minimum Program Requirements: select YES

**RATING SYSTEM RESULTS SECTION**

Confirm selected rating system.

**PROJECT INFORMATION SECTION**

**Project Title:** Begin the project title with a one-word identifier for the Installation. Do not include the word "Fort". After this match the project name used in P2 (contact the USACE Project Manager for this information) and identify the building being registered. Example: "Stewart 4th IBCT - DFAC".
**Project Address 1 and 2:** This is the physical location of the project. Provide building number, street address, block number or whatever is known to best describe the location of the project on the Installation.
**Project City:** Installation Name
**State, Country, Zip Code:** Self-explanatory
**Anticipated Construction Start and End Dates:** Self-explanatory – give your best guess if unknown. Note that required data entry format is: 1 or 2 digit month/1 or 2 digit date/4 digit year (example 3/23/2010)
**Gross Square Footage:** Provide total area all buildings in LEED project. Exclude the area of any buildings that are exempt from the LEED achievement requirement (for example, exclude an unconditioned storage shed to be constructed with a barracks complex).
**Is Project Confidential:** Indicate NO except, if project has security sensitivity (elements that are FOUO or higher security), indicate YES.
**Notification of Local Chapter:** Indicate NO unless Government/USACE Project Manager requests you to indicate YES.
**Anticipated Project Type:** Select the most appropriate option from the drop-down menu.
**Anticipated Certification Level:** Select the applicable option from the drop-down menu (Silver is the usual level).

**PROJECT OWNER INFORMATION SECTION**

**Project Owner First Name, Last Name, email, phone, address:** The Project Owner is the USACE Project Manager. Obtain this info from the USACE Project Manager.
**Organization:** U.S. Army Corps of Engineers. This field MUST be completed this way because it will be used as a search field by higher HQ to find all USACE registered projects. You may supplement it with district name at the end but DO NOT revise or use an acronym.
**May we publish Owner information:** Indicate NO
**Owner Type:** Pick Federal Government from drop-down menu.
**Project Owner Assertion:** Check the box

**PAYMENT INFORMATION**

Self-explanatory

# APPENDIX Q
# REV 2.1 – 30 SEP 2010
# AREA COMPUTATIONS

**Computation of Areas:** Compute the "gross area" and "net area" of facilities (excluding family housing) in accordance with the following subparagraphs:

**(1) Enclosed Spaces:** The "gross area" is the sum of all floor spaces with an average clear height ≥6'-11" (as measured to the underside of the structural system) and having perimeter walls which are ≥4'-11". The area is calculated by measuring to the exterior dimensions of surfaces and walls.

**(2) Half-Scope Spaces:** Areas of the following spaces shall count as one-half scope when calculating "gross area":

- Balconies
- Porches
- Covered exterior loading platforms or facilities
- Covered but not enclosed spaces, canopies, training, and assembly areas
- Covered but not enclosed passageways and walks
- Open stairways (both covered and uncovered)
- Covered ramps
- Interior corridors (Unaccompanied Enlisted Personnel Housing Only)

**(3) Excluded Spaces:** The following spaces shall be excluded from the "gross area" calculation:

- Crawl spaces
- Uncovered exterior loading platforms or facilities
- Exterior insulation applied to existing buildings
- Open courtyards
- Open paved terraces
- Uncovered ramps
- Uncovered stoops
- Utility tunnels and raceways
- Roof overhangs and soffits measuring less than 3'-0" from the exterior face of the building to the fascia

**(4) Net Floor Area:** Where required, "net area" is calculated by measuring the inside clear dimensions from the finish surfaces of walls. If required, overall "assignable net area" is determined by subtracting the following spaces from the "gross area":

- Basements not suited as office, special mechanical, or storage space
- Elevator shafts and machinery space
- Exterior walls
- Interior partitions
- Mechanical equipment and water supply equipment space
- Permanent corridors and hallways
- Stairs and stair towers
- Janitor closets
- Electrical equipment space
- Electronic/communications equipment space

# Appendix R

# Preliminary Submittal Register

# RMS SUBMITTAL REGISTER INPUT FORM

CONTRACT NUMBER | DELIVERY ORDER

TITLE AND LOCATION

Button <-----Right click for Instructions

| SECTION | PARAGRAPH NUMBER | DESCRIPTION OF ITEM SUBMITTED | TYPE OF SUBMITTAL | | | | | | | | | | | CLASSIFICATION | | | | | | REVIEWING OFFICE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 01 - PRECON SUBMITTALS | 02 - SHOP DRAWINGS | 03 - PRODUCT DATA | 04 - SAMPLES | 05 - DESIGN DATA | 06 - TEST REPORTS | 07 - CERTIFICATES | 08 - MFRS INSTRUCTIONS | 09 - MFRS FIELD REPORT | 10 - O&M DATA | 11 - CLOSEOUT SUBMITTALS | FIO - FOR INFORMATION ONLY | GA - GOVERNMENT APPROVED | DA - DESIGNER OF RECORD APPROVAL | CR - CONFORMANCE REVIEW | DA / CR | DA / GA | DO - DISTRICT OFFICE | AO - AREA OFFICE | RO - RESIDENT OFFICE | PO - PROJECT OFFICE | DR - DESIGNER OF RECORD | AE - ARCHITECT / ENGINEER |
| 00 72 00 | 52.236-13 | Accident Prevention Plan | X | | | | | | | | | | | | | | X | | | | X | | | | |
| 00 73 00 | 1.11 | Dev. From Accept. Design. No Deviation from Contract | | | | | X | | | | | | | | | | | X | | | X | | | X | |
| 00 73 00 | 1.11 | Dev. From Accepted Design - Deviates from Contract | | | | | X | | | | | | | | | | | | X | | X | | | X | |
| 00 73 00 | 1.17 | Supplemental Price Breakdown | X | | | | | | | | | | | X | | | | | | | X | | | | |
| 00 73 00 | 1.18 | SSHO Qualifications | X | | | | | | | | | | | | X | | | | | | X | | | | |
| 01 10 00 | 5.2.3.1 | (if concrete pavement) Joint Layout Plan with design drawings | | | | | X | | | | | | | | | | X | | | | | | | | |
| 01 10 00 | 5.5.2 | Building Envelope Sealing Performance Testing | | | | | | X | | | | | | X | | | | | | | X | | | | |
| 01 10 10 | *** | Tests as Req by Codes - DOR Develops Test Program | | | | | | X | | | | | | X | | | | | | | X | | | X | |
| 01 10 00 | 5.8.3 | BAS Review Information | | X | | | | | | | | | | | | | | X | | X | X | | | X | |
| 01 10 00 | 5.8.3 | BAS Performance Verification Test | | | | | | X | | | | | | X | | | | | | | X | | | X | |
| 01 10 00 | 5.8.4 | Testing Adjusting and Balancing | | | | | | X | | | | | | X | | | | | | | X | | | X | |
| 01 10 00 | 5.8.5 | Commissioning | | | | | | X | | | | | | X | | | | | | | X | | | X | |
| 01 10 00 | 6.15 | Environmental As Required for Site Specific | | | | | X | | | | | | | | | | X | | | | X | | | X | |
| 01 10 00 | 6.16 | Permits as required for Site specific | | | | | X | | | | | | | | | | X | | | | X | | | X | |
| 01 10 00 | 5.10.2 | Fire Protection Tests | | | | | | X | X | | | | | X | | | | | | | X | | | X | |
| 01 32 01.00 10 | 3.4.1 | Preliminary Project Schedule | X | | | | | | | | | | | | X | | | | | | X | | | | |
| 01 32 01.00 10 | 3.4.2 | Initial Project Schedule | X | | | | | | | | | | | | X | | | | | | X | | | | |
| 01 32 01.00 10 | 3.4.3 | Design Package Schedule | X | | | | | | | | | | | | X | | | | | | X | | | | |
| 01 32 01.00 10 | 3.6.1 | Periodic schedule updates from the Contractor | X | | | | | | | | | | | | X | | | | | | X | | | | |
| 01 32 01.00 10 | 3.7 | Time Extension Request (Schedule) | X | | | | | | | | | | | | X | | | | | | X | | | | |
| 01 33 00 | 1.8 | Submittal Register - DOR Input Required | X | | | | | | | | | | | | X | | | | | | X | | | X | |
| 01 33 00 | 1.8 | Submittal Register Updates (Design Packages, etc.) | X | | | | | | | | | | | | X | | | | | | X | | | X | |
| 01 33 00 | 1.3.1 | Substitution of Manuf or Model Named in Proposal | | X | X | | | | | | | | | | | | | X | | | X | | | X | |
| 01 33 16 | 1.2 | Identify Designer(s) of Record | X | | | | | | | | | | | | X | | | | | | X | | | | |
| 01 33 16 | 1.1.2 / 3.2.4 | Fast Track Design Package(s) | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 1.2 | Identification of all Designers of Record | X | | | | | | | | | | | | | | X | | | | X | | | | |
| 01 33 16 | 3.2.1 | Site and Utility Des Package, incl. Substantiation | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.2.2/3.5 | Interim Des Subm Package(s), incl. Substantiation | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.1 | Drawings | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.2.2 | Sitework Design Analyses | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.2.3 | Structural Design Analyses | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.2.4 | Security Design Analyses | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.2.5 | Architectural Design Analyses | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.2.6 | Mechanical Design Analyses | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.2.7 | Life Safety Design Analyses | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.2.8 | Plumbing Design Analyses | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.2.9 | Elevator Design Analyses (as Applicable) | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.2.10 | Electrical Design Analyses | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.2.11 | Telecommunications Design Analyses | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.2.12 | Cathodic Protection Design Analyses | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.3 | Geotechnical Investigations and Reports | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.4 | LEED Submittals | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.5 | Energy Conservation Documentation | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.6 | Specifications | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.5.7 | Building Rendering | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.2.4/3.7 | Final Des Submittal Package(s), incl. Substantiation | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.7.5 | DD Form 1354 (Transfer of Real Property) | | | | | | | | | | | X | | | | X | | | | X | | | | |
| 01 33 16 | 3.7 | Independent Technical Review | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.2.5/3.8 | Design Complete Submittal Package(s) | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | 3.3.3 | Design and Code Review Checklists | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 33 16 | A-2.0 | SID - Interim and Final (as applicable) | | | X | X | X | | | | | | | | X | | | | | | X | | | | |
| 01 33 16 | B-2.0 | FFE (as Applicable) | | | | | X | | | | | | | | X | | | | | | X | | | | |
| 01 33 16 | F-3.1.3 | BIM Model and data | | | | | X | | | | | | | | | | X | | | X | X | | | | |
| 01 45 04.00 10 | 3.2 | Design and Construction QC Plan | X | | | | | | | | | | | | | | X | | | | X | | | | |
| 01 57 20.00.10 | 1.2 | Environmental Protection Plan | X | | | | | | | | | | | | | | X | | | | X | | | | |
| 01 78 02.00 10 | 1.2.1 | Final as-Built Drawings/ BIM Model | | | | | | | | | | | X | | X | | | | | | | | | | |
| 01 78 02.00 10 | 1.2.3.11 | Non-Hazardous Solid Waste Diversion Reports | | | | | | | X | | | | | X | | | | | | | X | | | | |
| 01 78 02.00 10 | 1.2.7 | Provide final as-built CADD and BIM Model files | | | | | | | | | | | X | | X | | | | | | X | | | | |
| 01 78 02.00 10 | 1.2.9 | Provide scans of all other docs in Adobe.pdf format | | | | | | | | | | | X | | X | | | | | | X | | | | |
| 01 78 02.00 10 | 1.3.1 | Equip-in-Place list of all installed equip and cost | | | | | | | | | | | X | | X | | | | | | X | | | | |
| 01 78 02.00 10 | 1.3.2 | Data on equip not addressed in O&M manuals | | | | | | | | | | | X | | X | | | | | | X | | | | |
| 01 78 02.00 10 | 1.3.3 | Final as-built specs - electronic files | | | | | | | | | | | X | | X | | | | | | X | | | | |
| 01 78 02.00 10 | 1.4.2.1 | Warranty management plan - FAR 52.246-21 | | | | | | | | | | | X | | X | | | | | | X | | | | |
| 01 78 02.00 10 | 1.4.2.1 | Certificates of Warranty for extended warranty items | | | | | | | | | | | X | | X | | | | | | X | | | | |
| 01 78 02.00 10 | 1.4.2.1 | Contractor's POCs for implementing warranty process | | | | | | | | | | | X | | X | | | | | | X | | | | |
| 01 78 02.00 10 | 1.4.2.1 | List of each warranted equip, item, feature or system | | | | | | | | | | | X | | X | | | | | | X | | | | |
| 01 78 02.00 10 | 1.5 | See also Section 01 10 00 par. 5.8.4 and 5.8.5 | | | | | | | | | | | X | | X | | | | | | X | | | | |
| 01 78 02.00 10 | 1.6.1.2 | Equipment O&M Manuals - 1 electronic / 2 hard copies | | | | | | | | | | | X | | X | | | | | | X | | | | |
| 01 78 02.00 10 | 1.7 | Field Training DVD Videos | | | | | | | | | | X | | X | | | | | | | X | | | | |
| 01 78 02.00 10 | 1.8 | Pricing of CF/CI and GF/CI Property | | | | | | | | | | | X | X | | | | | | | X | | | | |
| 01 78 02.00 10 | 1.11 | List of Completed Cleanup Items | | | | | | | | | | | X | | | | X | | | | X | | | | |
| 01 78 02.00 10 | 1.12 | Interim Form DD 1354 | | | | | | | | | | | X | | | | X | | | | X | | | | |



**Export to RMS in CSV(MS-DOS) (*.csv) Format**

**Note:** Reviewing Office Optional

# Appendix S

**REV 1.1 JUL 2011.**

## Manufacturing Performance Requirements for Plumbing Fixtures From The Energy Policy Act of 1992 (PL 102-486) (Including Exceptions for Projects Registered for LEED 3.0 or higher)

**Note: This information is for use in establishing the Baseline to calculate flow rate reductions from said Baseline, where required by the contract.**

**Subtitle C--Appliance and Equipment Energy Efficiency Standards**

**SEC. 123. ENERGY CONSERVATION REQUIREMENTS FOR CERTAIN LAMPS AND PLUMBING PRODUCTS.**

… (j) STANDARDS FOR SHOWERHEADS AND FAUCETS- (1) The maximum water use allowed for any showerhead manufactured after January 1, 1994, is 2.5 gallons per minute when measured at a flowing water pressure of 80 pounds per square inch. Any such showerhead shall also meet the requirements of ASME/ANSI A112.18.1M-1989, 7.4.3(a).

`(2) The maximum water use allowed for any of the following faucets manufactured after January 1, 1994, when measured at a flowing water pressure of 80 pounds per square inch, is as follows:

`Lavatory faucets: 2.5 gallons per minute **(BUT SEE BELOW**)**

`Lavatory replacement aerators: 2.5 gallons per minute

`Kitchen faucets : 2.5 gallons per minute

`Kitchen replacement aerators: 2.5 gallons per minute

`Metering faucets: 0.25 gallons per cycle

`(k) STANDARDS FOR WATER CLOSETS AND URINALS- (1)(A) Except as provided in subparagraph (B), the maximum water use allowed in gallons per flush for any of the following water closets manufactured after January 1, 1994, is the following:

`Gravity tank-type toilets --1.6 gpf.

`Flushometer tank toilets --1.6 gpf.

`Electromechanical hydraulic toilets --1.6 gpf.

`Blowout toilets --3.5 gpf.

`(B) The maximum water use allowed for any gravity tank-type white 2-piece toilet which bears an adhesive label conspicuous upon installation consisting of the words `Commercial Use Only' manufactured after January 1, 1994, and before January 1, 1997, is 3.5 gallons per flush.

`(C) The maximum water use allowed for flushometer valve toilets, other than blowout toilets, manufactured after January 1, 1997, is 1.6 gallons per flush.

`(2) The maximum water use allowed for any urinal manufactured after January 1, 1994, is 1.0 gallon per flush.

**** EXCEPTIONS for Projects Registered under LEED 3.0 or higher.**

1. Any exceptions identified in the applicable LEED criteria.

2. Public lavatory faucets shall deliver a maximum flow rate of 0.5 gallons per minute, when tested in accordance with ASME A 112.18/CSA B125. Use that flow rate as the Baseline figure for calculating any required reductions from the Baseline.

# APPENDIX T
# FUNCTIONAL AREA LIGHTING CONTROL STRATEGY (FALCS)

## A. GENERAL LIGHTING CONTROL SYSTEM ENERGY MANAGEMENT STRATEGIES

SUMMARY: This appendix describes various lighting energy management strategies to utilize across functional areas. These strategies are intended to supplement and NOT supersede the requirements of ASHRAE 90.1.

1. Consider LIGHT LEVEL TUNING to maintain the appropriate light level for a given space. Initial light levels are set high to compensate for light depreciation over time. Where dimming ballasts or dimmable LED drivers are used, they shall be digital and addressable in nature (where available) that can provide individual fixture light level tuning and reconfigurability that dims the light level to the target level, saving the energy that otherwise would be used to compensate for future light depreciation. Provide a life-cycle cost-benefit analysis (LCCBA) of light level tuning for all spaces where the general lighting luminaires are equipped with digital addressable dimming ballasts or LED drivers. The LCCBA shall follow the methodology contained in the IESNA Lighting Handbook. Provide light level tuning where the LCCBA shows it to be economical.

2. Use OCCUPANCY/VACANCY SENSORS to automatically turn off lighting a specified time after all occupants leave the space. The off time shall be adjustable settable to 1, 5, 15, or 30 minutes. Select the type (single or dual technology, wired or wireless) based on the use and configuration of the space. Lighting control system shall have the capability to manage both hard-wired and wireless sensors where applicable. Single technology solutions shall incorporate signal processing technology that distinguishes between background noise and actual motion without automatically changing their sensitivity threshold. To maximize energy savings potential, all occupancy sensors shall be either MANUAL ON – AUTOMATIC OFF (vacancy sensor) or AUTOMATIC ON (to a specified light level of 50% or less) – AUTOMATIC OFF to maximize energy savings. Occupancy/Vacancy sensors properly located in the space and set appropriately can offer typical lighting energy savings of 15% or more.

3. Use DAYLIGHT HARVESTING to control lighting in areas within at least two window head heights (head height is the distance from the floor to the top of the glazing) adjacent to exterior view windows. Typical daylight penetrates three times the window head height into the space. To maximize energy savings, daylight dimming strategies need to penetrate beyond the first row of luminaires (first daylight zone). When daylighting installed fluorescent or LED luminaires, accomplish daylight harvesting by digitally addressable dimming ballasts or drivers. As the natural light in the space increases, the artificial light level should dim gradually to maintain a uniform light level and prevent disruption to the occupants. One daylight sensor must be able to control multiple daylighting zones (cross-zoning) without the need of adding more sensors. All controls (daylight sensors, occupancy sensors, wall stations) shall have the capability to connect to the system via hard wire or wireless. Apply the same daylighting strategies to areas where skylights are available (refer to ASHRAE 189.1 daylight zone definitions). Daylighting systems properly tuned and calibrated can offer typical lighting energy savings of 15% or more.

4. Consider AUTOMATED SHADING in spaces utilizing daylight harvesting to maximize the energy savings of the day lighting system. The shades shall be controlled to reduce glare and unwanted heat gain while still allowing natural light to enter the space. When utilizing automated shading consider the following :

   A. For ease of use and space aesthetics, operate the automated shades by common controls, wired or wireless (i.e. same appearance and design) with the lighting control system.
   B. For maximum energy savings the automated shading system shall predictably position the shades based on a combination of time of day, façade direction, and sky conditions.
   C. For maximum design flexibility and ease of installation, shade system should have the capability to address and control each shade individually.
   D. The shading system shall have a manual override that allows the occupant to temporarily adjust the shades to any desired position. The system will revert back to automatic control after a specified period of time.

   Provide a life-cycle cost-benefit analysis (LCCBA) of automated shading for all spaces where daylight harvesting is provided. The LCCBA shall follow the methodology contained in the IESNA Lighting Handbook. Provide automated shading where the LCCBA shows it to be economical.

5. Use SCENE BASED DIMMING in multiple-use areas including auditoriums, conference rooms and classrooms. Also provide scene based dimming in dining rooms and gymnasiums with multiple functions. One button preset touch recall shall allow multiple zones of light within a space to go to the appropriate light levels, known as a scene, for a specific task or use. Scene based control shall allow the integration of AV controls, shading/projection screens and lighting to work seamlessly with one button preset touch (i.e. lights dim, projection screen lowers, and shades go down). If dimming ballasts or LED drivers are used, they shall also be digital and addressable in nature (where available) to take advantage of installation and life-cycle reconfiguration benefits.

6. Provide PERSONAL CONTROL of lighting in spaces to allow the user of the space to vary the general light level based on the task at hand. Personal control can be achieved by wall mounted controls (hard wired or wireless), Infrared or Radio Frequency (RF) wireless devices, or via computer. Digital addressable ballasts and LED drivers allow the control flexibility of personal dimming of installed lighting on the occupant's work area (i.e. dim the luminaire over their cubicle to the appropriate light level).

7. Consider WIRELESS lighting control options for all installations, including retrofit projects (easy installation, lower installed cost, no power packs necessary). Wireless products shall include but not be limited to occupancy / vacancy sensors, daylight sensors, local wall controls, plug in switching and dimming appliance and parasitic load modules. To avoid interference, wireless products should communicate in an FCC frequency band that does not allow continuous transmissions and is free of Wi-Fi devices.

**B. FUNCTIONAL TESTING AND MANUFACTURER SUPPORT**

SUMMARY: This section describes functional testing to be performed on the lighting control system and the support required from the lighting control manufacturer.

1. Hire an independent agent with no less than three years experience in testing of complex lighting control systems to conduct and certify functional testing of lighting control devices and control systems. The testing agent shall not be directly involved in either the design or construction of the project and shall certify the installed lighting controls meet or exceed all requirements of ASHRAE 90.1 and all documented performance criteria. The lighting control manufacturer's authorized technical representative may serve as the testing agent. Submit qualifications of the testing agent for approval. Submit copies of test results to the Government.

2. LIGHTING CONTROL MANUFACTURER SUPPORT shall include technical phone support located in the United States. The technical phone support shall be available 24 hours a day, 365 days a year.

# Appendix AA

# Fort Sill IDG Excerpts

Signage.

Signage may be informational, directional, or regulatory. Informational signage provides the user with information and includes room or area labels, bulletin boards, menus, artwork descriptions, and emergency information. Directional signage directs circulation and provides orientation. It includes entry directories, directional arrows, and maps. The purpose of regulatory signage is control: providing prohibitions, warnings, emergency instructions, and use restrictions (Fig. 8.19).

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

I.7.4 Interior Signage.

I.7.4.1 Scope. The standards identified herein are applicable to all interior facilities signage in use on Fort Sill and its sub-installations. Signage for training, special events, exercises, conferences, and other temporary signage is specifically excluded.

I.7.4.2 Policy.

I.7.4.2.1 All requirements for installation of new or replacement of existing deteriorated or missing signs shall be reviewed and approved by the DPW prior to accomplishment.

I.7.4.2.2 All approved facility signs shall be listed in a Building Sign Inventory.

I.7.4.2.3 Unauthorized facility signs shall be removed when found.

I.7.4.2.4 Authorized facility signs which fail to conform to standards but which otherwise are serviceable shall not be replaced solely to conform to standards (AR 420-70).

I.7.4.2.5 Signs for facilities authorized as construction shall be fabricated and installed solely by the DPW. As these type signs become unserviceable, they shall be replaced by the DPW as part of the normal maintenance and repair process.

I.7.4.2.6 All other interior facility signs shall be fabricated and installed as Equipment in Place (EIP). If accomplished by the DPW, fabrication and installation shall be on a cost reimbursable basis. Requestors may, upon approval of the DPW, fabricate and install EIP facility signs. Regardless of the source for fabrication and installation, all interior signs shall conform to standards as identified in this Installation Design Guide. Facility signs provided as EIP shall not be replaced by the DPW as normal maintenance and repair. They shall be removed when they become serviceable and replaced only after receipt, review, and approval of a funded request from the user.

I.7.4.3 Interior sign types authorized as construction are:

I.7.4.3.1 Type BB-4, Room Number Sign. Mandatory for all facilities.

I.7.4.3.2 Type BB-7, Restroom Sign. Mandatory for all facilities with a restroom.

I.7.4.3.3 Type DD-1 or DD-2, Mandatory, Prohibitory Sign. Mandatory for fire extinguisher and fire system locations. This sign is also mandatory for identification of permanent non-smoking areas, such as corridors, public assembly areas, toilets, mechanical areas, stairwells, etc.

I.7.4.3.4 Type AA-5 or AA-6, Directional Signs. These signs may be used to display room numbers only in facilities with complex floor plans.

I.7.4.3.5 Type AA-1, Building Directory. One of these signs is authorized for multi-story buildings or for buildings with complex floor plans.

I.7.4.3.6 Type AA-3, Area or small directory. This sign is optional for multi-story facilities and is limited to areas adjacent to locations of entry to the floor, such as stairwell and elevator doors. Only Sign Grid 2 is authorized.

I.7.4.3.7 Type CC-1, Building Information Sign, Map. This sign is optional for buildings with complex floor plans, is limited to one per floor, and must reflect permanent type facility fixtures, such as areas separated by fire walls, toilets, mechanical rooms, etc.

I.7.4.3.8 Type CC-2, Bulletin Board. This sign is limited to one per facility. If additional CC-2 signs are provided, they shall be provided as Equipment in Place (EIP).

I.7.4.4 Room Schedules. For the purpose of locating the Type BB-4 signs, all projects that involve additional rooms or revisions to the size of existing rooms shall incorporate a room schedule as part of the design package. The room schedule shall incorporate, as a minimum, the following information.

I.7.4.4.1 Room number. The following criteria shall apply to room numbers:

I.7.4.4.1.1 Each individual room shall be assigned a unique room number. The use of a pure numerical designation system is preferred to an alpha-numeric designation system.

I.7.4.4.1.2 Each individual room shall have a single function/purpose. Where there is an open or semi-open area that includes differing purposes, a separate room number shall be identified for each area and some form of structural or architectural demarcation shall be provided between the areas.

I.7.4.4.1.3 Where there is an existing room number system, the room number system utilized in the room schedule shall be an extension of the existing room number schedule. If the work is sufficiently extensive that an extension of the existing room number schedule is impractical, the project scope shall include a complete renumbering of all rooms in the facility and Type BB-4 signs for all rooms.

I.7.4.4.2 Net square feet.

I.7.4.4.3 Room function/purpose.

I.7.4.4.4 Ceiling height at wall.

# Appendix BB

# ONG Requirements

OKLAHOMA NATURAL GAS
A DIVISION OF ONEOK

# NEW SERVICE LINE POLICY EXPLANATION

**FORM 1931**

**New rules approved by the Oklahoma Corporation Commission allow Oklahoma Natural Gas Company (ONG) to put the natural gas meter next to your house and to install the natural gas piping between the property line and your house. The following is a summary of your options and rights and responsibilities, as well as those of ONG.**

**ONG will:**

1. Discuss your options with you and work out a mutually agreeable location for the meter near the outside wall of the first building to be served.
2. Install a service line, at ONG's cost up to a maximum allowable investment based on anticipated revenue, under normal conditions. This includes installations of service to new homes, replacement of deteriorated yard lines, and replacement of lines damaged during excavation, provided prudent care was taken during such excavation.
3. Locate distribution mains and service lines, upon request, beginning January 1, 2001.
4. Perform periodic main and service line leakage surveys according to ONG policy.
5. Inspect and test ONG's piping system, as well as your piping system, for leakage or other purposes as necessary.
6. Repair any leaks on our service line and meter and replace them when necessary.
7. Make reasonable efforts to restore your yard, but ONG cannot be responsible for normal construction damages.

**You, the owner, will:**

1. Provide a suitable location for the meter, away from potential hazards.
2. Grant ONG reasonable access to your property to install the service line and meter and to perform maintenance and repair.
3. Be responsible for any extraordinary construction costs, such as replacing pavement, patios, and decks, modifying your house piping to meet local building codes, excavating in hard rock or frozen ground, installing footage of service line, or installing a service line greater than 1-1/4" diameter.
4. Be responsible for any additional lines to gas grills, gas lights, additional buildings, etc., as well as for any yard line you might need to install between the meter and your home.
5. Advise ONG if there are any changes on, or to, your property, that might place the meter in a potentially hazardous situation.
6. Notify ONG prior to building any permanent structures over the service line.
7. Be required to pay for any relocation of ONG's service line or meter due to your construction.
8. Refrain from enclosing the meter or any portion of ONG's aboveground piping.

YOU MAY REQUEST AN ALTERNATE METER LOCATION AWAY FROM THE BUILDING. You will, however, be responsible for the installation and maintenance of the line from the meter to the building. ONG will still respond to requests to locate your yard line and perform leakage surveys on the line.

Our goal is to provide you with safe, reliable gas service. Please call if I can be of further service.

ONG Representative _____

Phone Number _____

# LINE EXTENSION DATA SHEET - FORT SILL

JOB ORDER NO./ ESTIMATE NO.

Ft Sill P/N

Main | Main & Services | Services Only

LEGAL DESCRIPTION

**DATE OF APPLICATION**

**DATE REQUIRED**

DRAWING ATTACHED

ATLAS PAGE NO.

WALL MAP NO.

*REMARKS OR SPECIAL REQUESTS?* [ ] NO [x] YES (See Remarks Below)

THIS JOB WILL SERVE THE FOLLOWING LOCATION:

REMARKS

REQUESTING ORGANIZATION

P.O.C.

CONTACT INFORMATION

METER LOCATION

PROJECTED LIFE OF PROJECT

| RESIDENTIAL / COMMERCIAL/INDUSTRIAL | | | Monthly Flat Rate | REVENUE |
|---|---|---|---|---|
| RESIDENTIAL | Number of Meters | 0 | $21.70 | $0.00 |
| COMMERCIAL 201 | Number of Meters | 0 | $113.23 | $0.00 |
| COMMERCIAL 202 | Number of Meters | 0 | $31.61 | $0.00 |
| INDUSTRIAL | Number of Meters | 0 | $238.11 | $0.00 |
| | | TOTAL | | $0.00 |

| FITTINGS | QT | COST | TOTAL | LABOR AND EQUIP. | UNIT | RATE | TOTAL | METER INSTALL | UNIT | COST |
|---|---|---|---|---|---|---|---|---|---|---|
| Excess Flow Valve | 0 | $0.00 | $0.00 | Labor (Hrs) | 0 | $0.00 | $0.00 | 250 | 0 | $0.00 |
| Tapping Tee 2 X 3/4" | 0 | $0.00 | $0.00 | GP 4 | 0 | $0.00 | $0.00 | 425 | 0 | $0.00 |
| HV Tapping Tee 2 X 2" | 0 | $0.00 | $0.00 | GP 6 | 0 | $0.00 | $0.00 | 630 | 0 | $0.00 |
| HV Tapping Tee 4 X 2" | 0 | $0.00 | $0.00 | 2/Ton with Trailer | 0 | $0.00 | $0.00 | 800 | 0 | $0.00 |
| Pipe 3/4" | 0 | $0.00 | $0.00 | Backhoe | 0 | $0.00 | $0.00 | 1.5 M | 0 | $0.00 |
| Pipe 2" | 0 | $0.00 | $0.00 | Other | 0 | $17.00 | $0.00 | 3 M | 0 | $0.00 |
| Other | 0 | | $0.00 | Other | 0 | $18.00 | $0.00 | 5 M | 0 | $0.00 |
| Other | 0 | | $0.00 | Other | 0 | $19.00 | $0.00 | 7 M | 0 | $0.00 |
| Other | 0 | | $0.00 | Other | 0 | $20.00 | $0.00 | 11 M | 0 | $0.00 |
| Other | 0 | | $0.00 | Other | 0 | $21.00 | $0.00 | Other | 0 | $0.00 |
| TOTAL | | | $0.00 | TOTAL | | | $0.00 | TOTAL | | $0.00 |

*Note: All calculations are estimated. Customer Co-Payment will be based actual costs incurred by Contractor.

| | |
|---|---|
| INSTALLATION COST (Main line, service lines, and metering) | $0.00 |
| MAXIMUM ALLOWABLE INVESTMENT BY CONTRACTOR | $0.00 |
| CUSTOMER CO-PAYMENT | $0.00 |

Oklahoma Natural Gas (Contractor) and Fort Sill Army Post (Government) understand and agree that
1. Government has received and read a copy of the company's New Service Line Policy Explanation, which explains the Contractor's and Government's rights and responsibilities regarding ownership, maintenance, ar repair of service lines and meters

2.Government agrees to provide Contractor appropriate access to Government premises for the purpose of installing, maintaining and repairing service lines and meter

3.The company will install measurement equipment at a suitable site on the Government's premise, which normall will be located at the building wall, but may be located at another mutually agreedupon site. Government a Contractor agree that the measurement equipment shall be located at site listed abov

Authorizing Agent: _____ _____ Date _____
Signature

Contractor Representative: _____ _____ Date _____
Signature

# SERVICE LINE COST AND AGREEMENT

FORM 1930 (2/2004)

| SERVICE ADDRESS | | ACCOUNT NO. |
|---|---|---|
| TENANT NAME | DAY PHONE | EVENING PHONE |
| OWNER NAME | DAY PHONE | EVENING PHONE |

| BILLING ADDRESS | STREET ADDRESS |
|---|---|
| | CITY/STATE/ZIP CODE |

## COST CALCULATION

| | | | |
|---|---|---|---|
| Total Length: | Ft. | | |
| Home Size | Sq. Feet | | |
| Heating Only | ☐ | | |
| Heat & Water Heat | ☐ | | |
| Heat, Water, & Cooking | ☐ | | |
| Electric Heat Pump / Gas Backup | ☐ | | |
| Other | 100 Dth ☐ | | |
| **COMMERCIAL LOAD** | ☐ | | |
| Total Load Dth/Hr | 1.500 | | |
| Max Daily (MDQ) | 15.00 | | |
| Total Annual Dth | 1,500 | | |
| Number of Meters | 0 | | |
| **FITTINGS** | | | |
| Excess Flow Valves (EFV) | 0 | | |
| Tapping Tee 2" x 3/4" | 0 | | |
| Tapping Tee 4" x 3/4" | 0 | | |
| Tee, Service, Trans 1"x3/4" | 0 | | |

| **SERVICE LINE COST** | | |
|---|---|---|
| Labor (Manhours) | 0 | Hours |
| Pick-Up, Group 4 | 0 | Hours |
| Pick-Up, Group 6 | 0 | Hours |
| 2-Ton w/Trailer | 0 | Hours |
| Backhoe | 0 | Hours |
| Pipe - 1/2" | 0 | Feet |
| Pipe - 3/4" | 0 | Feet |
| Pipe - 1 1/4" | 0 | Feet |
| Pipe - 2" | 0 | Feet |
| Pipe - 4" | 0 | Feet |
| **METER INSTALLED COST** | | |
| Meter - 250 | 0 | |
| Meter - AL 425 | 0 | |
| Meter - AL 800 | 0 | |
| Meter - AL 1000 | 0 | |
| Meter - 3M | 0 | |
| Meter - 5M | 0 | |

| | |
|---|---|
| ONG Labor / Materials | $0.00 |
| Concrete Cut | $0.00 |
| Other | $0.00 |
| Other | $0.00 |
| Other | $0.00 |
| Other | $0.00 |
| Other | $0.00 |
| Other | $0.00 |
| Other | $0.00 |
| Other | $0.00 |
| Other | $0.00 |
| **CONSTRUCTION COST** | $0.00 |
| **LESS ALLOWABLE REVENUE CREDIT** | $424.73 |
| **PLUS CREDIT** | $300.00 |
| **LIHEAP QUALIFIED Yes** ☐ | $0.00 |
| **TOTAL OWNER COST**** | $0.00 |
| **LESS PAYMENT RECEIVED** | $0.00 |
| **REMAINING BALANCE** | $0.00 |

* An experienced construction employee should estimate extraordinary construction barriers or pipe size requirements larger than 1 1/4 inch.

## FINANCE AGREEMENT

** If the Total Owner cost exceeds $300.00, the owner may make a downpayment of $100.00, and pay the remaining balance in installments for a period not to exceed 12 months. The monthly installments shall be equal to the greater of 1/12 of the remaining balance owed or $50.00. If owner pays less than the Total Owner Cost at the time of signing this agreement, owner shall be deemed to have elected the monthly payment option. Any payment obligation will be added to owner's gas bill.

## SERVICE LINE AGREEMENT

The undersigned property owner ("Owner"), _____ has authorized Oklahoma Natural Gas Company ("Company") to install a service line or replace the Owner's existing service line and/or yardline and to place the gas measurement equipment on the Owner's property.

The Company and the Owner understand and agree that:

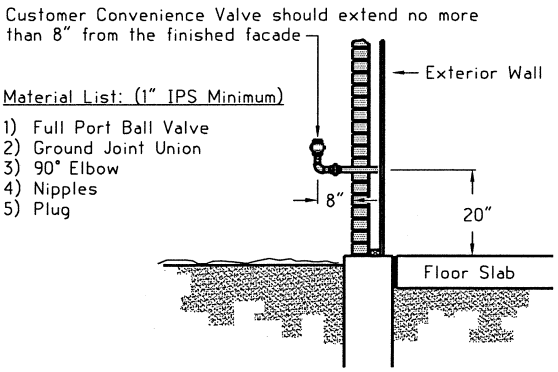
1. Owner has received and read a copy of the Company's New Service Line Policy Explanation, which explains the Company's and Owner's rights and responsibilities regarding ownership, maintenance, and repair of service lines and meters.
2. Owner agrees to provide the Company appropriate access to Owner's premises for the purpose of installing, maintaining, and/or repairing service lines and meters.
3. The Company will install measurement equipment at a suitable site on the Customer's premise, which normally will be located at the building wall, but may be located at another mutually agreed-upon site. Owner and Company agree that the measurement equipment shall be located at the following location:

LOCATION DESCRIPTION: _____

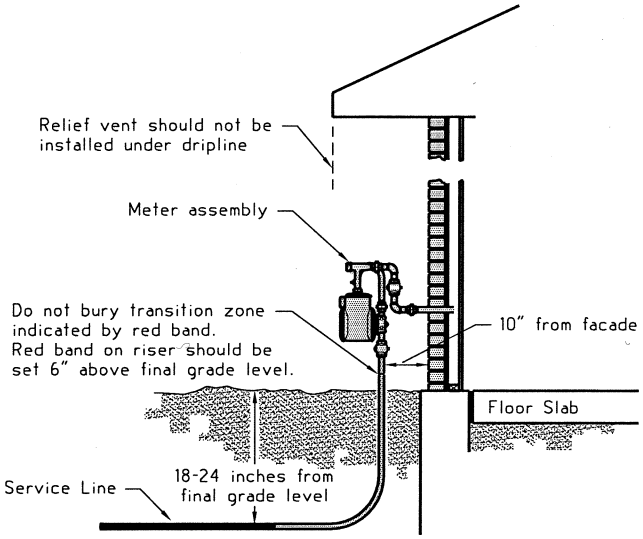
| **OWNER(s)** | | **OKLAHOMA NATURAL GAS COMPANY** |
|---|---|---|
| | DATE | |
| | DATE | |

Distribution: Operating - Accounting - Customer

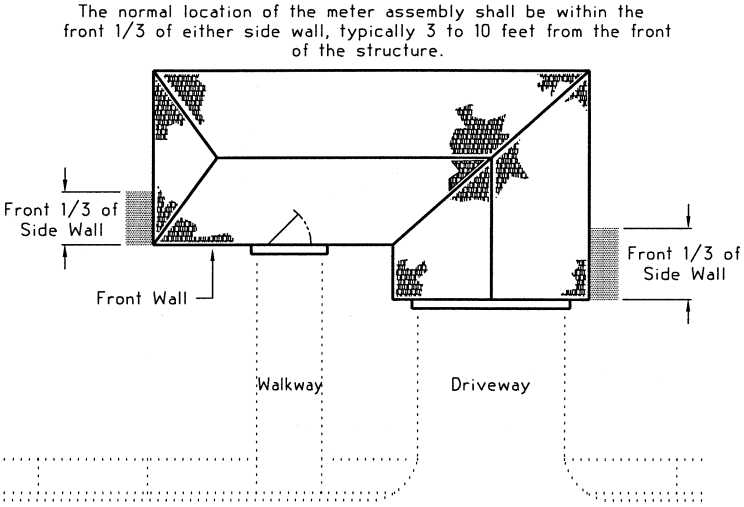
**NEW CONSTRUCTION**
Rev. Date: 09/28/04



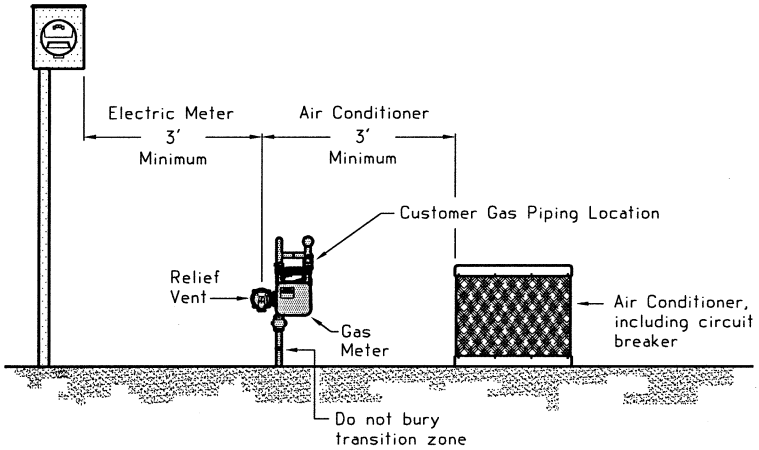

**Customer Gas Piping Location**
**Figure G–2401.5a**



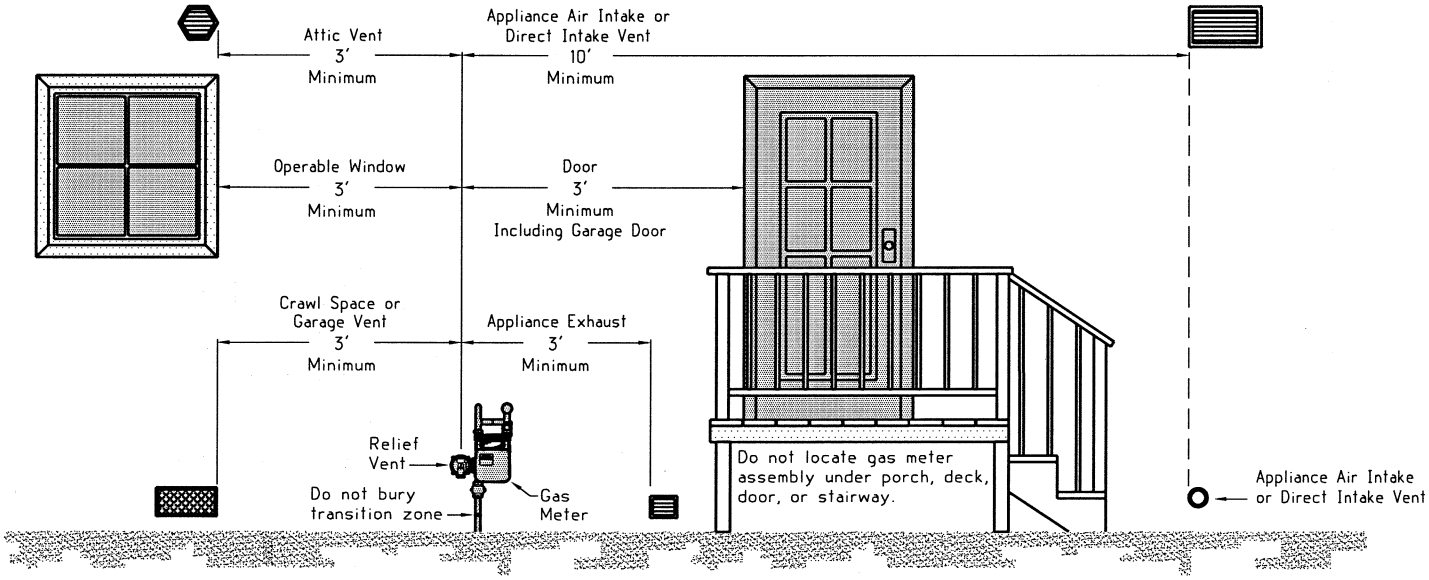

**Customer Gas Piping Location**
**Figure G–2401.5b**




**Meter Location**
**Figure G–2401.5c**




**Gas Meter Clearances**
**Figure G–2401.5d**




**Gas Meter Clearances**
**Figure G–2401.5e**

OKLAHOMA NATURAL GAS

2106-04

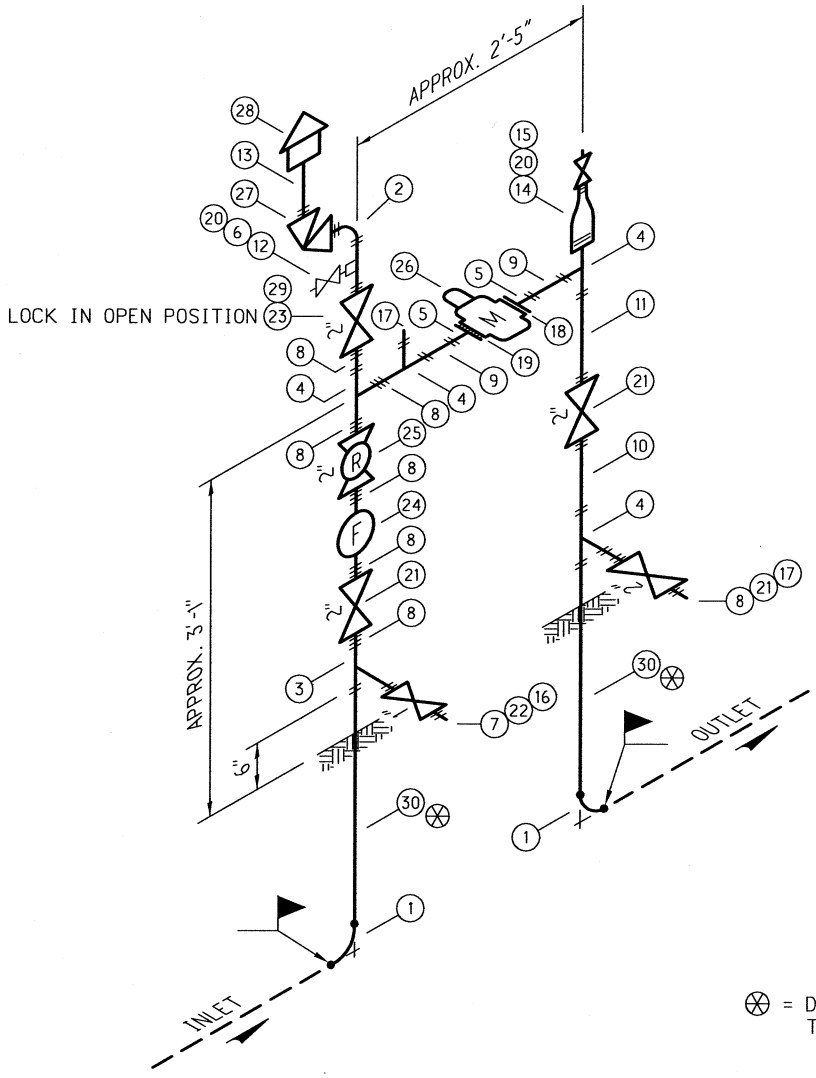
Form 789

GOSM – Standard Drawings Manual

Subject: **Rotary Meter Setting, MP (60 Psig and Less) Inlet Design**
**3–M Meter, Measurement via Oz or PCI Index, Threaded Outlet**

Issued: 03-01-97
Revised: 12-22-04

| ITEM | QTY | SIZE | DESCRIPTION OF MATERIAL REQUIRED | ITEM | QTY | SIZE | DESCRIPTION OF MATERIAL REQUIRED |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 2" | ELL, STD, SMLS. B, 90° LR | 17 | 2 | 2" | PLUG, PIPE, STEEL |
| 2 | 1 | 2" | ELL, STREET, M.I., 90°, 150# W.P. (Sc.) | 18 | 1 | 2" | GASKET, NON-ASBESTOS, ANSI 150 |
| 3 | 1 | 2"x2"x1" | TEE, REDUCING, M.I., 150# W.P. (Sc.) | 19 | 1 | 2" | INSULATING SET, ANSI 150, 285# W.P. |
| 4 | 4 | 2" | TEE, STD, M.I., 150# W.P. (Sc.) | 20 | 2 | 1/2" | VALVE, BALL, 1000# W.P. MIN. (Sc.) |
| 5 | 2 | 2" | FLANGE, FF FLG'D, ANSI 150, 285# W.P. (Sc.) | 21 | 3 | 2" | VALVE, BALL or NON-LUB. PLUG, 175# W.P. MIN. (Sc.) |
| 6 | 1 | 1/2"x2 1/2" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | 22 | 1 | 1" | VALVE, BALL or NON-LUB. PLUG, FULL CAPACITY, (Sc.) 175# W.P. MIN. |
| 7 | 1 | 1"x3" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | | | | |
| 8 | 7 | 2"x3" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | 23 | 1 | 2" | VALVE, BALL or NON-LUB. PLUG, FULL CAPACITY, (Sc.) 175# W.P. MIN. |
| 9 | 2 | 2"x6" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | | | | |
| 10 | 1 | 2"x10" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | 24 | 1 | 2" | FILTER, 175# W.P. MIN. (Sc.) |
| 11 | 1 | 2"x12" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | 25 | 1 | 2" | REGULATOR, SERVICE (Sc.) (SIZE ON FORM 761) |
| 12 | 1 | 2"x6" | NIPPLE, TEST, STEEL (Sc.) w/ 1/2" COUPLING & PLUG | 26 | 1 | 2" | METER, ROTARY, 3M-175 w/ COATED BOLTS, 175# W.P. MIN. |
| 13 | 1 | 2"x6" | NIPPLE, STD, SMLS. B, 800# W.P., T.O.E. | 27 | 1 | 2" | VALVE, RELIEF (Sc.) (SIZE ON FORM 761) |
| 14 | 1 | 2"x1/2" | NIPPLE, SWAGE, X-HVY, SMLS. B, 2000# W.P. (Sc.) | 28 | 1 | 2" | VENT CAP |
| 15 | 1 | 1/2" | PLUG, PIPE, STEEL | 29 | 1 | - | LOCKING DEVICE |
| 16 | 1 | 1" | PLUG, PIPE, STEEL | 30 | 9 FT. | 2 3/8" O.D. | PIPE, 3.65# (0.154" W.T.), SMLS. B, FBE COATED, PRETESTED |




⊗ = DETERMINE LENGTH AND THREAD ONE END IN FIELD

OKLAHOMA NATURAL GAS

2106-06

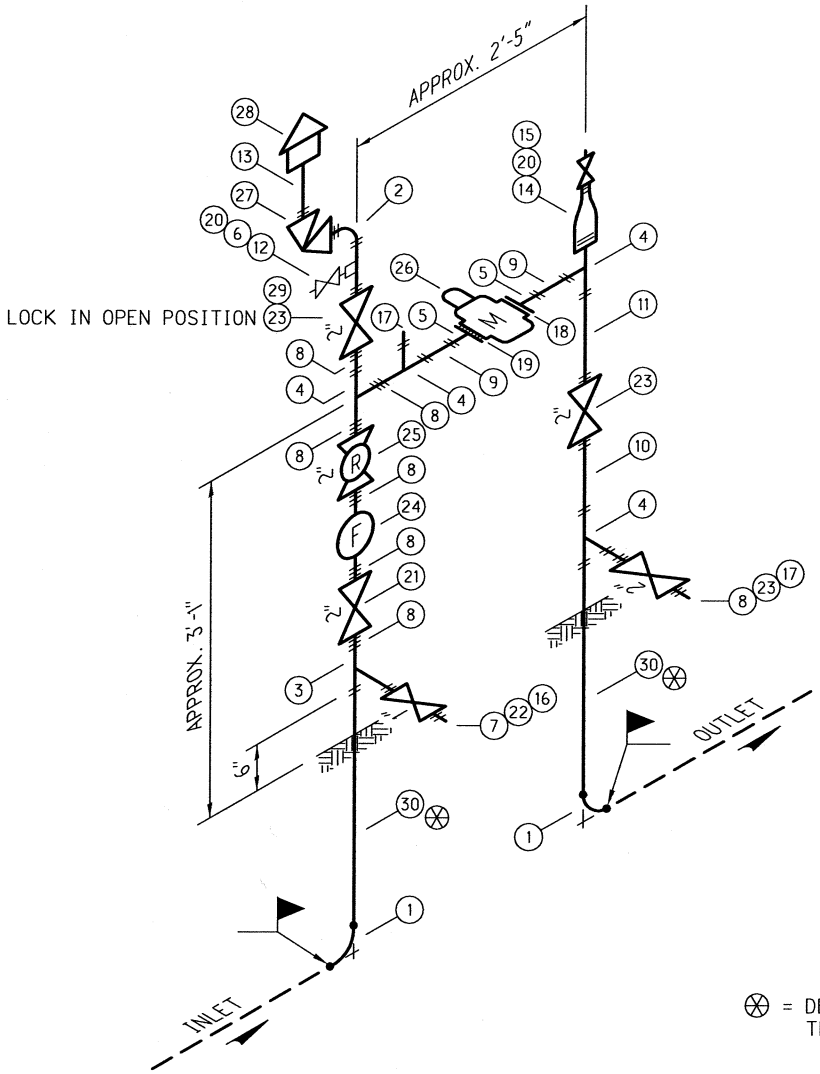
Form 789

# GOSM – Standard Drawings Manual

Subject: **Rotary Meter Setting, MP (60 Psig and Less) Inlet Design**
**5–M Meter, Measurement via Oz or PCI Index, Threaded Outlet**

Issued: 03-01-97
Revised: 12-22-04

| ITEM | QTY | SIZE | DESCRIPTION OF MATERIAL REQUIRED | ITEM | QTY | SIZE | DESCRIPTION OF MATERIAL REQUIRED |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 2" | ELL, STD, SMLS. B, 90° LR | 17 | 2 | 2" | PLUG, PIPE, STEEL |
| 2 | 1 | 2" | ELL, STREET, M.I., 90°, 150# W.P. (Sc.) | 18 | 1 | 3" | GASKET, NON-ASBESTOS, ANSI 150 |
| 3 | 1 | 2"x2"x1" | TEE, REDUCING, M.I., 150# W.P. (Sc.) | 19 | 1 | 3" | INSULATING SET, ANSI 150, 285# W.P. |
| 4 | 4 | 2" | TEE, STD, M.I., 150# W.P. (Sc.) | 20 | 2 | 1/2" | VALVE, BALL, 1000# W.P. MIN. (Sc.) |
| 5 | 2 | 2"x7 1/2" | FLANGE, REDUCING, FF FLG'D, ANSI 150, 285# W.P. (Sc.) | 21 | 1 | 2" | VALVE, BALL or NON-LUB. PLUG, 175# W.P. MIN. (Sc.) |
| 6 | 1 | 1/2"x2 1/2" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | 22 | 1 | 1" | VALVE, BALL or NON-LUB. PLUG, FULL CAPACITY, (Sc.) 175# W.P. MIN. |
| 7 | 1 | 1"x3" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | | | | |
| 8 | 7 | 2"x3" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | 23 | 3 | 2" | VALVE, BALL or NON-LUB. PLUG, FULL CAPACITY, (Sc.) 175# W.P. MIN. |
| 9 | 2 | 2"x6" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | | | | |
| 10 | 1 | 2"x10" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | 24 | 1 | 2" | FILTER, 175# W.P. MIN. (Sc.) |
| 11 | 1 | 2"x12" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | 25 | 1 | 2" | REGULATOR, SERVICE (Sc.) (SIZE ON FORM 761) |
| 12 | 1 | 2"x6" | NIPPLE, TEST, STEEL (Sc.) w/ 1/2" COUPLING & PLUG | 26 | 1 | 3" | METER, ROTARY, 5M-175 w/ COATED BOLTS, 175# W.P. MIN. |
| 13 | 1 | 2"x6" | NIPPLE, STD, SMLS. B, 800# W.P., T.O.E. | 27 | 1 | 2" | VALVE, RELIEF (Sc.) (SIZE ON FORM 761) |
| 14 | 1 | 2"x1/2" | NIPPLE, SWAGE, X-HVY, SMLS. B, 2000# W.P. (Sc.) | 28 | 1 | 2" | VENT CAP |
| 15 | 1 | 1/2" | PLUG, PIPE, STEEL | 29 | 1 | - | LOCKING DEVICE |
| 16 | 1 | 1" | PLUG, PIPE, STEEL | 30 | 9 FT. | 2 3/8" O.D. | PIPE, 3.65# (0.154" W.T.), SMLS. B, FBE COATED, PRETESTED |




⊗ = DETERMINE LENGTH AND THREAD ONE END IN FIELD

OKLAHOMA NATURAL GAS

2106-08

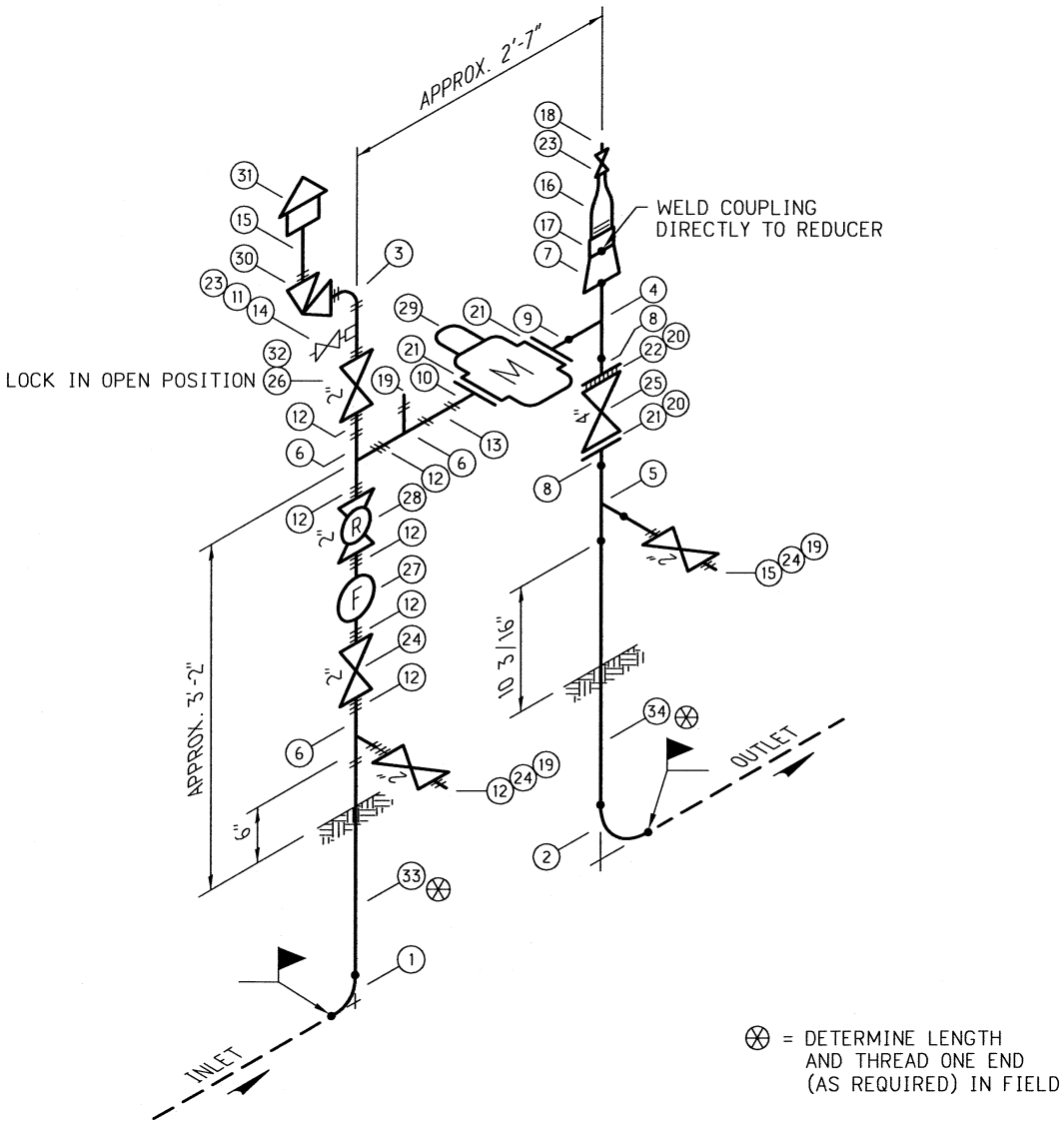
Form 789

GOSM – Standard Drawings Manual

Subject: **Rotary Meter Setting, MP (60 Psig and Less) Inlet Design**
**11–M Meter, Measurement via Oz or PCI Index**

Issued: 03-01-97
Revised: 12-22-04

| ITEM | QTY | SIZE | DESCRIPTION OF MATERIAL REQUIRED | ITEM | QTY | SIZE | DESCRIPTION OF MATERIAL REQUIRED |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 2" | ELL, STD, SMLS. B, 90° L.R. | 19 | 3 | 2" | PLUG, PIPE, STEEL |
| 2 | 1 | 4" | ELL, STD, SMLS. B, 90° L.R. | 20 | 16 | 5/8"x3 3/4" | BOLT, STUD, w/ 2 HEX NUTS |
| 3 | 1 | 2" | ELL, STREET, M.I., 90°, 150# W.P. (Sc.) | 21 | 3 | 4" | GASKET, NON-ASBESTOS, ANSI 150 |
| 4 | 1 | 4" | TEE, STD, SMLS. B | 22 | 1 | 4" | INSULATING SET, ANSI 150, 285# W.P. |
| 5 | 1 | 4"x4"x2" | TEE, REDUCING, STD, SMLS. B | 23 | 2 | 1/2" | VALVE, BALL, 1000# W.P. MIN. (Sc.) |
| 6 | 3 | 2" | TEE, STD, M.I., 150# W.P. (Sc.) | 24 | 3 | 2" | VALVE, BALL or NON-LUB. PLUG, 175# W.P. MIN. (Sc.) |
| 7 | 1 | 4"x2" | REDUCER, STD, SMLS. B | 25 | 1 | 4" | VALVE, BALL or NON-LUB. PLUG, RF FLG'D., 175# W.P. MIN. |
| 8 | 2 | 4" | FLANGE, WN RF, ANSI 150, 285# W.P. | 26 | 1 | 2" | VALVE, BALL or NON-LUB. PLUG, FULL CAPACITY, (Sc.) 175# W.P. MIN. |
| 9 | 1 | 4" | FLANGE, WN FF, ANSI 150, 285# W.P. | | | | |
| 10 | 1 | 2"x9" | FLANGE, REDUCING, FF FLG'D, ANSI 150, 285# W.P. (Sc.) | 27 | 1 | 2" | FILTER, 175# W.P. MIN. (Sc.) |
| 11 | 1 | 1/2"x2 1/2" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | 28 | 1 | 2" | REGULATOR, SERVICE (Sc.) (SIZE ON FORM 761) |
| 12 | 7 | 2"x3" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | 29 | 1 | 4" | METER, ROTARY, 11M-175 w/ COATED BOLTS, 175# W.P. MIN. |
| 13 | 1 | 2"x6" | NIPPLE, STD, STEEL, 500# W.P. (Sc.) | 30 | 1 | 2" | VALVE, RELIEF (Sc.) (SIZE ON FORM 761) |
| 14 | 1 | 2"x6" | NIPPLE, TEST, STEEL (Sc.) w/ 1/2" COUPLING & PLUG | 31 | 1 | 2" | VENT CAP |
| 15 | 2 | 2"x6" | NIPPLE, STD, SMLS. B, 800# W.P., T.O.E. | 32 | 1 | - | LOCKING DEVICE |
| 16 | 1 | 2"x1/2" | NIPPLE, SWAGE, X-HVY, SMLS. B, 2000# W.P. (Sc.) | 33 | 5 FT. | 2 3/8" O.D. | PIPE, 3.65# (0.154" W.T.), SMLS. B, FBE COATED, PRETESTED |
| 17 | 1 | 2" | COUPLING, F.S., 3000# W.P. (Sc.) | 34 | 5 FT. | 4 1/2" O.D. | PIPE, 10.79# (0.237" W.T.), SMLS. B, FBE COATED, PRETESTED |
| 18 | 1 | 1/2" | PLUG, PIPE, STEEL | | | | |



OKLAHOMA NATURAL GAS CO.

CONTACT LIST APRIL, 2010

FOR EMERGENCIES DURING REGULAR WORKING HOURS 8:00 AM THRU
: 5:00 PM, CALL 1-800-551-6601 OR 1-405-247-2345. OR FOR FORT SILL: 580-353-1985/ 580-695-0499

FOR AFTER HOUR EMERGENCIES CALL: 1-800-551-6601

CONTACTS IN ORDER:

ROBERT SIMS, MANAGER, FORT SILL:
OFFICE: 580-353-1985
CELL: 580-695-0499
HOME: 580-588-3333

DAVID BURNS: OPERATING TECH, FORT SILL
CELL: 405-933-1076
HOME: 405-247-9871

STEVE GIBSON: OPERATING SUPERVISOR
OFFICE: 405-247-1222
CELL: 580-515-1507
HOME: 405-247-2203

DAVID ALLEN: MEASUREMENT
OFFICE: 405-247-1232
CELL: 580-774-8708
HOME: 405-247-2654

RON TAYLOR, AREA MANAGER
OFFICE: 405-247-1231
CELL: 405-641-5969
HOME: 405-247-6709

# Appendix CC

## American Water Enterprises (AWE) Specifications

## (http://www.amwater.com/products-and-services/federal-services/military-services/design-specifications.html)

# Appendix DD

# Fort Sill Fire Alarm Requirements

16 Nov 04

MEMORANDUM FOR: COE, DPW

Subject: Installation Guidelines for FA Systems

1. The following are guidelines for the installation/upgrade of fire alarm systems in all dormitories, hotels, apartments, or any sleeping type facilities other than family housing.

a. Smoke detectors/heat (rate of rise) will be installed in all sleeping rooms and will sound within the room (sounder base only) if activated by smoke and ensure that the detector (smoke-side) does not latch in place and send a general alarm through the panel.

b. If two or more adjacent rooms are activated it will ring the general alarm.

c. All hallway smoke detectors shall ring the general alarm.

d. All administrative type areas that are not separated from the sleeping room shall have smoke detectors that will activate the general alarm and all other areas, i.e., mechanical room, storage room, janitors closet will have a heat detector/fix temp unless the building is protected by a sprinkler system.

e. All activations (alarm or trouble) will require manual reset.

f. All fire alarm panels will activate a trouble signal/supervisory trouble signal through the transmitter (BTX-2) .

g. A smoke detector shall be installed above the fire alarm panel.

h. Class A addressable system shall be installed.

I. All devices must be labeled (indicating device address) on the exterior base in contrasting colors.

j. Access code for fire alarm panel shall indicate which area the building is located, (1, 2, 3, or 4) and must have enough access levels to disable devices.

k. Remote digital type enunciator shall be installed.

l. A 72 back up battery test shall be required in order to approve any new or upgraded system.

2. These guideline must be followed as much as possible. Any deviation shall be approved by the Fire Prevention Branch, 442-5911.

3. POC is Assistant Chief Landry, 442-5911.

HELEN LANDRY
A/C Fire Prevention
Department of Emergency Services

# Appendix GG

# Requirements for Contractor Applied Pesticides

**Requirements for information for contractor applied Pesticides**
**Minimum of 3 days prior to proposed application**

1. Copy of current State License for company and applicator.
2. Copy of current company insurance verification for vehicle and Pesticide application coverage
3. Square footage of treatment area and linier feet of vertical (thickened slab GC must provide to subcontractor)
4. MSDS and label of Pesticide. The only Installation authorized pesticide for pre-treatment are:

    - TERMIDOR 80WG 80.00% (Fipronil)
    - TERMIDOR SC 9.10% (Fipronil)

    Due to the effectiveness and low odor, AEC requires TERMIDOR 80WG or TERMIDOR SC be used.

5. Nomenclature of pump, and sprayer, (if possible- not required)
6. Mixing tank capacity
7. A written plan of application to include dilution calculations and application.
8. All chemical containers to be used will be unopened (seal and label intact) and inspected by Government Rep. or Installation Pest Management Coordinator
9. All empty containers shall be disposed of off-post.
10. All submittal requirements of the contract.
11. The Label is the Law. Label information shall be strictly followed!

**21 days prior to proposed application**

If a different chemical is requested for use, DPW pest management coordinator must have the MSDS and a copy of the label 3 weeks in advance of proposed treatment to see if chemical is legal in Oklahoma and attempt AEC approval.

**Day of Application and submittal was approved**

1. Demonstrate with water only, calibration of spray equipment and applicator
2. Government inspects unopened pesticide containers
3. Rain must not be expected the day of application (Label is the Law)
4. Contractor shall prepare a certification document to include Name of chemical, percent of active ingredient, pounds of active ingredients that were applied to the site, and total square footage / Linier footage (witch ever applies) that received pesticide. There shall be a signature line for the Applicator and the Government Representative.

# APPENDIX HH
# DESIGN SUBMITTAL
# DISTRIBUTION MATRIX

NOTE: APPENDIX HH SUPERSEDES THE SUBMITTAL DISTRIBUTION MATRIX SHOWN IN SECTION 01 33 16 DESIGN AFTER AWARD.

*AM4 ADDED APPENDIX

## PHYSICAL FACILITY DESIGN SUBMITTAL DISTRIBUTION MATRIX

| Activity & Address | Full Size Drawings | Half-Size Drawings | Design Analysis | Specs | CD w/D.A, specs, .pdf & CADD dwgs | Furniture, Furnishings & Equipment Submittal (CID) | Structural Interior Design Submittal | BIM DVD (Per 01 33 16, Attach F) |
|---|---|---|---|---|---|---|---|---|
| US Army Corps of Engineers<br>ATTN: Edwina Poole<br>CESWT-EC-DM<br>1645 S. 101st E Ave.<br>Tulsa, OK 74128<br>918-669-7019 | 0 | 5 | 5 | 5 | 8 | 1 | 1 | 2 |
| US Army Corps of Engineers<br>ATTN: Todd Hughes<br>CESWF-PP-PM<br>801 Cherry Suite 860<br>Ft. Worth, TX 76102-0300<br>580-581-4116 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| US Army Corps of Engineers<br>ATTN: Rick West, COE Res Ofc<br>Bldg 1945 Barbour Road<br>Fort Sill, OK 73503<br>580-355-6148 | 1 | 2 | 3 | 3 | 4 | 2 | 2 | 1 |
| Cmdr, IMWE-SIL-PWM<br>ATTN: Mr Jeffrey Banner<br>Bldg 1950 Barbour Rd.<br>Ft. Sill, OK 73503<br>580-442-6339 | 0 | 12 | 12 | 12 | 12 | 1 | 1 | 1 |
| Public Works Division<br>Installation Mgmt Agency, SW Region<br>ATTN: IMW-OWD-M (Pat Caraway)<br>1835 Army Blvd (B2000)<br>Ft. Sam Houston<br>San Antonio, TX 78234-2686<br>210-295-2164 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| US Army Engineering & Support Center<br>ATTN: CEHNC-IS-MI (G. Havo)<br>4820 University Square<br>Huntsville, AL 35816<br>256-895-1956 | 0 | 1 | 1 | 1 | 2 | 1 | 1 | 1 |
| USAISEC-FDED<br>ATTN: AMSEL-IE-DE-IN-OP<br>(G. GAFFNEY)<br>1435 Porter Street, Suite 230<br>Fort Detrick, MD 21702'<br>301-619-6501 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| USA Family Morale, Welfare, &<br>Recreation Command<br>CYS Directorate<br>ATTN: Janet McKinnon<br>4700 King Street<br>Alexandria, VA 22302-4418<br>Phone: | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 |

**DIRECRORATE OF PUBLIC WORKS**
**Fort Sill, Oklahoma**
**Project requirements**
**Updated: July 13, 2011**

**Point of Contact**
**Ahmad Santina, Electrical Engineer, P.E.**
**TEL: (580) 442-6026**
**E-mail: Ahmad.Santina@us.army.mil**

# ELECTRICAL GENERAL REQUIREMENT

## 1. SECTION: ELECTRICAL DISTRIBUTION SYSTEM, AERIAL

1.1 Existing Medium Voltage (MV) distribution system is 13,200/7,620 Volt, 3-phase, 4 wires, multi-grounded system installed on wood poles and/or underground. New work shall be required to be underground. Coordinate with DPW.

1.2 Transformers: Provide transformer with a spare capacity of 15% minimum. Provide Delta-Wye connection system, primary voltage:13200, Secondary voltage 480/277V, 208/120V, copper windings.

1.3 Pole-mounted sectionalizing switches: Provide sectionalizers as needed, coordinate with source.

1.4 Provide Fault Current Analysis, Protective Device Fully Coordination Study, see section 16375 below

1.5 Bare medium-voltage line conductors: Provide Aluminum-Conductor-Steel-Reinforced, ACSR.

1.6 Insulated Medium-Voltage line conductors: Provide 15kV, ethylene-propylene-rubber (EPR), 133 percent insulation level, copper.

1.7 Wood poles: Provide pressure treated, with creosote. Poles shall be branded with information such as height-class, year-month made, etc (ANSI standard info), metal tag is not acceptable. Poles with transformers, cutout or any equipment must be provided with metal tags showing feeder no.-pole number, fuse ratings, and other information, coordinate with DPW.

1.8 Guy assemblies: Provide where required zinc-coated steel, extra-high-strength, with 8 feet, ¾″ diameter guy rods minimum. Provide yellow Guy marker, 2″ diameter and/or width, 8′ minimum height.

1.9 Provide Armless Construction, where single phase is used, prepare for 3-phase construction. Coordinate with DPW.

1.10 Guy assemblies: Provide zinc-coated steel, extra-high-strength, with 8 feet, ¾″ diameter guy rods. Provide Guy marker, 2″ diameter minimum where required.

1.11 Cutouts: Provide 15KV, type K fuse link.

1.12 Surge arresters: Provide for protection of aerial-to underground transitions, transformers and other equipment as required.

1.13 Air-break switches: Provide Gang operated switches Normally open (NO) or Normally closed (NC) switches to connect to other feeders as required.

1.14 Ground rod: Provide copper-clad steel not less than 3/4 inch in diameter by 10 feet in length. Ground rods must be driven into undisturbed earth, 2′ minimum away from the pole edge, structure or concrete foundations. It is not acceptable to install rod in the hole with riser pole or driven into backfill

1.15 Provide Rigid Galvanized Steel Conduit in areas subject to vehicular traffics

1.16 Provide Metal poles with velocity 100mph minimum at the base of the pole, 1.3 wind gust factor, height and drag factor as recommended by AASHTO LTS-4. Effective projected area of luminaries and other equipment shall be considered in the pole design. Calculation shall be provided to support the pole design. Chipped, scratched, stained or dented poles shall not be acceptable.

1.17 Provide mower guard, 36″ height minimum, above finished grade for all pole grounds protection.

## 2. SECTION: ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND

2.1 Medium Voltage Cables, MV: Provide copper, 15 kV, concentric neutral underground distribution cable, with EPR 133% insulation level, with PVC jacket, copper.

2.2 Low Voltage Cables, service entrance, underground service entrance: Provide copper conductor with XLP or EPR insulation, copper

2.3 Cables in the same duct with MV cables shall have same type insulation

2.4 MV, Duct lines shall be PVC SCH 40, concrete-encased in trench, installed at 36 inches minimum below grade to the top of conduit. Under roads, use directional boring, provide conduit in casing, with spacers. Provide spare conduit of equal size. Provide spare conduit of equal size.

2.5 Low Voltage, Duct lines shall be direct-burial, thick-wall type SCH 40, SCH 80, Concrete encased if installed in vehicular traffic areas. Coordinate application with DPW.
Do not use PVC conduit in areas subject to physical damage, including but not limited to mechanical, electrical rooms, penetrating fire rated walls, floors or partitions.

2.6 Provide Rigid Galvanized Steel conduit, PVC coated or wrapped for transitions from below to above grade.

2.7 Transformer, pad mounted: Provide Loop feed type, dead front construction, copper windings with current limiting fuses, arresters, High-voltage warning signs, Dial-type thermometer, liquid-level gauge, and drain valve with built-in sampling device, Refer to TM 5-811-1/AF AFJMAN 32-1080 for other guidance. Transformer pad shall be a minimum of 6 inches larger than the transformer enclosure to include the cooling system.

2.8 Watt-hour meter: Provide electronic meter equal to SQD power-logic circuit monitor series 4000 or equal, include KYZ pulse initiation hardware for energy monitoring and control system (EMCS).

2.9 Padlock: Provide provision for padlock for major equipment. Coordinate with DPW

2.10 COORDINATED POWER SYSTEM PROTECTION:

2.10.1 The study shall be performed by a registered professional engineer with demonstrated experience in power system coordination in the last three years.

2.10.2 Scope Analysis: The fault current analysis, and protective device coordination study shall begin at the source bus and extend down to system bused where fault availability is 10,000 amperes (symmetrical) for

building/facility 600 volt level distribution buses. Coordinate with DPW

2.10.3 Determination of facts: The time-current characteristics, features, and nameplate data for each existing protective device shall be determined and documented. The Contractor shall coordinate with the commercial power company for fault current availability at the site.

2.10.4 A single line diagram shall be prepared to show the electrical system buses, devices, transformation points, and all sources of fault current (including generator and motor contributions). A fault-impedance diagram or a computer analysis diagram may be provided. Each bus, device or transformation point shall have a unique identifier. If a fault-impedance diagram is provided, impedance data shall be shown. Locations of switches, breakers, and circuit interrupting devices shall be shown on the diagram together with available fault data, and the device interrupting rating.

2.10.5 Coordination Study: The study shall demonstrate that the maximum possible degree of selectively has been obtained between devices specified, consistent with protection of equipment and conductors from damage from overloads and fault conditions. The study shall include a description of the coordination of the protective devices in this project. Provide a written narrative that describes: which devices may operate in the event of a fault at each bus; the logic used to arrive at device ratings and settings; situations where system coordination is not achievable due to device limitations (an analysis of any device curves which overlap); coordination between upstream and downstream devices; and any relay settings. Recommendations to improve or enhance system reliability, and detail where such changes would involve additions or modifications to the contract and cost changes (addition or reduction) shall be provided.

2.10.6 Study Report: The report shall include

a- narrative describing the analyses performed; the bases and methods used; and the desired method of coordinated protection of the power system.

b- Descriptive and technical data for the new protective devices proposed.

c- Document utility company data including system voltages, fault MVA, system X/R ratio, time-current characteristics curves, current transformer ratios, and relay device numbers and settings; and existing power system data including time-current characteristic curves and protective device ratings and settings.

d- Fully coordinated composite time-current characteristic curves for each bus in the system, as required to ensure coordinated power system protection between protective devices or equipment. The report shall include recommended ratings and settings of all protective devices in tabulated form.

e- Provide the calculation performed for the analyses, including computer analysis programs utilized. A software package, of the same version used for the short circuit and coordination study shall be provided.

**3. SECTION: MOTOR CONTROL CENTERS, SWITCHBOARDS/GEAR and PANELBOARDS**

3.1 Switchgear and Panel Bus bars shall be copper. Size 200% Neutral for non-linear load. Switchgear bus bars shall be silver plated. Provide directories to show load served and source.

3.1.1 Ground bus: Provide full width at the bottom of the motor control center line-up. A full clamp-type solderless copper or copper alloy lug for No. 2/0 AWG stranded copper cable minimum shall be provided at each end of the bus for connection to the main grounding system.

3.1.2 Neutral Bus: A fully rated neutral bus shall be provided continuous through the control center. 200% rated neutral shall be provided for panels supplying electronics

3.2 Voltage Fault Protection: Provide protection against voltage faults, phase unbalance, phase loss, phase reversal, under-voltage and over-voltage

3.3 Distribution Transformers: Provide 200% neutral for dry type transformers supplying nonlinear loads. Use K-Factor rated, K4 for 50% and K13 for 100% connected nonlinear loads. Provide Copper windings type.

3.4 Switchboards: Provide dead-front construction. Mount switchgear on concrete slab.

3.5 Size panel to provide a minimum of 15% minimum future expansion.

**4. ELECTRICAL WORK, INTERIOR**

4.1 Use copper conductor only, Aluminum conductors shall not be used. Underground service entrance conductor shall be USE rated, with XLP or EPR insulation. Use THHN/THWN for interior wiring, minimum size for branch circuit conductor shall be No.12 minimum, no.8 AWG and larger shall be stranded, no.10 AWG and smaller shall be solid.

4.2 Equipment ground conductor: provide insulated green conductor in all conduits.

4.3 Provide Transient voltage surge suppressors (TVSS) at service entrance panels, and panels supporting electronic equipments, show on drawings schedules and/or line diagram.

4.4 CIRCUIT BREAKERS: Provide bolted type breakers, All ratings shall be clearly visible. Breakers used for switching shall be rated ”SWD”.
Use of "Subfeed Breakers" is not acceptable unless specifically indicated otherwise. Main breaker shall be "separately" mounted "above" or "below" branch breakers. Where "space only" is indicated, make provisions for future installation of breakers.

4.5 Electrical, Zinc-Coated Steel Metallic Tubing (EMT),(IMC): Use EMT in the interior and dry location areas, conduit shall be concealed. Where physically protected, Use EMT in mechanical and electrical rooms, otherwise provide Galvanized Rigid steel conduit. Where conductors are to be installed concealed in wall, floor or ceiling, and conductors are subject to removal and replacement as a result of damaged insulation during construction or as a result of short circuit, conductors shall be installed in EMT, IMC or rigid steel conduit. MC or Romax Cables are not be acceptable.

4.6 Control wiring related to mechanical equipment such as HVAC, installed in the mechanical room, un-accessible areas and areas subject to traffic shall be installed in conduit. Cable shall be rated for the applications. All control related to electrical equipment, such as motors, lighting control, etc. shall be installed in conduit.

4.7 Each motor of 1/8 hp or larger shall be provided with thermal-overload protection and heavy duty disconnecting mean. Provide spare parts fuses.

4.8 Pull wires: Provide a pull wire in each empty raceway 50 feet in length and contains more than the equivalent of two 90-degree bends, or where the raceway is more than 150 feet in length.

4.9 Stub-Up & through slabs-on-grade conduits: Where conduits are to be stubbed up through concrete floors, a short elbow shall be installed below grade to transition from the horizontal run of conduit to a vertical run. A conduit coupling fitting, threaded on the inside shall be installed, to allow terminating the conduit flush with the finished floor. Conduit shall be Galvanized rigid steel.

4.10 Communications: Use Army Technical Guide for Installation Information infra structure architecture (I3A). Coordinate with DOIM.

4.11 Receptacles: Provide one receptacle per wall minimum, and every 12’, coordinate with the user if more receptacles are needed. Use 20A heavy duty, grounding type receptacles, side wired. Receptacles with ground fault circuit interrupters shall be UL Class A type, with Set-reset buttons of contrast color.

4.11.1 Wet location Receptacles: Receptacles in wet locations shall be installed in an assembly rated for such use whether the plug is inserted or withdrawn.

4.12 Switches: Switches shall be rated for quit type AC only, 120/277volts with 20A current rating.

4.13 Splices: Use wire nut connectors for no.10 AWG and smaller. Do not use Quick Connect wire connectors type. Use solderless connectors for No.8 and larger and cover with insulation material same rating as conductor insulation.

4.14 Provide calculations for Panel Loads, Lighting, Feeders, Voltage drop, short circuit, load analysis, Coordination study, etc. See other sections.

4.15 Use fluorescent lighting fixtures with 100% electronic high frequency type, instant start ballasts, 95% minimum HPF, with no magnetic core and coil. Ballast shall be

connected in parallel, where if one or more lamps fails or are removed shall permit the operation of other lamps. Use 32W, T8 lamps, 10% THD maximum. Do not use ballast to serve multi fixtures. With emergency fixture, provide a back up power, red light indicator (LED) and test switch. Use other lighting as coordinated and approved for the applications.

4.16 Use LED type exit light with backup power, red light indicator (LED) and test switch.

4.17 Contractor shall provide temporary power as required to keep the facility in operation during the construction period. Coordinate in the field.

4.18 For Facilities with COM and TV, provide copper bus bar suitable for indoor application to conform to TIA J-STD-607-A grounding requirements, size ¼″ X 2″ X (length as required)

5. SECTION, FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE
(Refer to the fire department, (580) 442-5911)

5.1 Use factory painted RED color EMT conduit inside the building

5.2 Use MONACO transceiver; transmit at a frequency of 141.3625 MHZ, Coordinate with Monaco Enterprise and the fire department.

5.3 Provide 72 hours battery backup power, 15 minutes Alarm test.

5.4 Fire Alarm system shall be Class A, NAC devices style Z, IDC devices style D, SLC devices style 6. Size each SLC and NAC to provide 40 percent addressable expansion without hardware modifications to the panel.

5.5 Provide OVERVOLTAGE AND SURGE PROTECTION at the input power of panels, circuits that exit or enter a building.

5.6 provide a graphic Annunciator panel or remote control (LCD) panel as required by the fire department.

5.7 Use single action key operated pull station. Break glass, wrench operated pull station are not acceptable.

5.8 SECTION, Mass Notification System (MNS)
Coordinate with the fire department, (580)442-5911
Force Protection, David Fritz, (580)442-2532) & Karrie Lovins, (580) 442-5973

6. SECTION: LIGHTNING PROTECTION SYSTEM

6.1 Provide lightning protection as required. System shall be certified.

a. Provide Safety Tip air terminals

b. Where Ground grid/counterpoise is used, install 30 inches below grade minimum, at a distance not less than 3 feet nor more than 8 feet from the structure.

c. All Connections between the building steel columns and ground (counterpoise, Rods) shall be at the bottom of the columns. Use Cad-weld connections.

d. Where poles are used for overhead system and ground rods are required, install the first ground rod a minimum of 6 feet from the pole base.

7. SECTION: CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE)

7.1 Provide cathodic protection system, sacrificial to the sprinkler system riser entering the building from below grade. Coordinate with AWE for water piping and ONG for gas in other areas.

**Notes:**

1. The Unified Facilities Criteria (UFC) system, the installation design guide and the most indicated stringent requirement shall be used as guidance regarding the design and construction.
2. All section: provide details to show but not limited to transformers, pads, risers, trenching, pole details, controls, line diagrams etc.
3. As-built drawings: After completion of work, as built drawings shall be provided to reflect as-built conditions after all related work are completed and shall be on reproducible full-size Mylar film (one set) and CAD (Micro Station “DGN” format (latest edition used by DPW), on CDs.

# APPENDIX KK

# SUPPLEMENTAL REQUIREMENTS

**PHYSICAL FITNESS FACILITY PROJECT SPECIFIC REQUIREMENTS**

**Paragraph 3, 4, 5 & 6 located within Section 01 10 00 contains language that assumes multiple contractors will be working on the site, which is not the case with this project. This appendix contains supplemental requirements to Section 01 10 00 STATEMENT OF WORK, Paragraphs 5 & 6, that must be included in the project design and construction.**

**Also note that Installation preferences are as shown in Section 00 22 30.**

**The following paragraphs add new paragraphs or supersede the paragraphs of the same number in Section 01 10 00:**

*AM2 Chapter 3: Plumbing Fixtures in Locker rooms: Base the number of toilets, showers, lavatories, and urinals in the locker rooms, and the second floor restrooms on UFC 3-420-01 and TI 800-01. The number of fixtures will be based on participants in the chart for gymnasiums located in the RFP. First floor restrooms off the lobby are to be sized based on spectators, based on the chart for theaters in the referenced documents.*

Chapter 4.0 add the following criteria: UFC 3-501-01 Electrical Engineering

6.3.1.2 Site Design. The Contractor is responsible for the shape of the footprint and the building orientation of the proposed facility on the designated parcel of land with respect to adjacent and future facilities shown on the drawings. The Government must approve any proposed changes from the layout identified in the RFP. Connect all utilities from the building to the service connection point, with the exception of natural gas. Coordinate with the drawings and utility providers through the Contracting Officer's Representative a minimum of 48 hours in advance of utility outages.

6.3.1.3 Upon finalizing the building footprint, provide proposed building footprint, site orientation and requests for deviations from the drawings for Government concurrence. Set finish floor as indicated in the RFP drawings (if applicable) and at least a minimum of 8 inches higher that predominant exterior grade. Slope exterior finish grade down and away from each building at a minimum of 5% slope for the first 10 feet. Under no circumstances shall any slope exceed 20% unless retaining structures are not feasible.

6.3.3.1 Storm water Management (SWM) Systems. The SWM system is existing. Any modification to the existing system shall be the responsibility of the Contractor. Coordinate connection of roof drain leaders to the storm water systems; coordinate the location and size for connection of roof drain leaders to the site storm water system through the Contracting Officer prior to finalizing building design and a minimum of 45 days prior to beginning building construction. Contractor is responsible for the Storm Water Pollution Prevention Plan (SWPPP) of the entire construction site. Submit the SWPPP in accordance with the requirements contained in Section 01 57 23 TEMPORARY STORM WATER POLLUTION CONTROL (Appendix II). Make any piping connection from the building to the connection point

Include all information in the SWPPP required by the Oklahoma Department of Environmental Quality (ODEQ) General Permit OKR10 for storm water discharges from construction activities within the State of Oklahoma. A copy of the OKR10 permit may be found at the following web page:
http://www.deq.state.ok.us/WQDnew/stormwater/construction/okr10_final_permit_13_sep_2007

6.4.6.1 Utilities: The Installation's DPW services infrastructure and utilities. Most utilities are privatized. Points of contact for utilities are shown in Section 00 73 10 SUPPLEMENTAL CONTRACT REQUIREMENTS. Existing utility services such as potable water, sanitary sewer, electric, natural gas and COMM are all located near the site such that lengthy utility extensions are not anticipated for this facility. Refer to Appendix J for utility main routing and general orientation for points of connection.

6.4.6.1(a): *AM2 Storm Drainage System: Storm Drainage System layouts are shown on the drawings in Appendix J for both the base bid and bid option 2. These layouts are conceptual in nature. The final design of the storm sewer system is the responsibility of the contractor. Storm sewer piping shall be sized using the 10 year storm. The contractor is responsible for all temporary and permanent erosion control methods/structures.

The underground storm sewer system for the base bid is shown in drawing C-103. Storm water from the three (3) existing headwalls on the site shall be collected in a new storm sewer system and discharged at the south end of the site as shown in the drawing. On-site detention is required for the base bid. The detention pond shall be sized for the 10, 25, 50, and 100 year storms. The bottom of the detention pond shall have a minimum slope of 1 percent and shall have a concrete trickle channel for low flow scenarios.

The underground storm sewer system for bid option 2 is shown in drawing C-103A. Storm water from the three (3) existing headwalls on the site shall be collected in a new storm sewer system and discharged at the southeast corner of the site as shown in the drawing. On site detention is not required for bid option 2. ~~Storm Drainage System: Storm Drainage System tie-in points are shown on the drawings in Appendix J. Tie into these systems as appropriate. Take all existing storm water underground in RCP and take all new flows underground as soon as possible into the new RCP trunk line used for existing storm drainage.~~ *

6.4.6.1(b): Natural Gas: Natural gas distribution lines are shown on drawings at Appendix J for reference. The privatized service provider is Oklahoma Natural Gas (ONG). ONG will provide natural gas service up to and including a meter and regulator to the face of the building set near the mechanical room. The D/B Contractor must provide the required gas loads and coordinate the location of the mechanical room with ONG. D/B Contractor is responsible for connecting to the meter and all natural gas piping past the meter outlet. The D/B Contractor is not responsible for costs incurred for services provided by service provider (ONG). Coordinate and provide gas load and pressure (if different from the standard pressure) requirements with ONG. Gas service is requested and coordinated through the COR who coordinates with the Ft Sill DPW's contract administrator to start, coordinate and administer the process of getting a new gas service provided to the facility. See also Appendix BB.

6.4.6.1(c): Water mains are shown on the drawings at Appendix J. Coordinate points of connection through the CO with the privatized service provider, American Water Enterprises (AWE). Work on this project shall be accomplished in accordance with AWE specifications; see Appendix CC. Provide potable water service from the project site limits or utility main to the facility and within the building through a backflow preventer, generally located in the mechanical room. Provide primary or main water pipe distribution, including the water meter and vault. Design and install the water service line (including the meter and vault) to meet the utility provider's installation details and specifications; Provide hydrant locks to meet Ft Sill Force Protection requirements per AWE specifications for the locks and installation. Note that water and fire water service are required to be run separately to the facility.

6.4.6.1(d): Sanitary Sewer: The D/B Contractor shall design and construction the sanitary sewer service line between the sanitary sewer main to the building, include cleanout or manhole. Sanitary sewer mains are shown in Appendix J. Coordinate points of connection through the CO with the service provider, AWE.

6.4.6.1(e): ELECTRICITY: Provide extension of the existing Ft. Sill electrical distribution system underground to a new pad-mounted transformer. Provide the electrical service underground from the pad-mounted transformer to building service equipment/main electrical switchgear. Coordinate all electric work and interruptions through the CO and Ft. Sill DPW. The existing distribution system is 13,200Y/7,620 V three-phase, four-wire, multi-ground system. Duct lines, cables, transformer, and transformer pad shall be designed and installed in accordance with Appendix II. D/B contractor shall locate electric meters in service entrance electrical equipment/switchgear located in the main electrical room. See Paragraph entitles Site Electrical (Section 01 10 00, paragraph 6) for more information. D/B Contractor is responsible to verify the existing condition of the riser pole. See Paragraph entitled SITE ELECTRICAL (Section 01 10 00, paragraph 6) for more information. D/B Contractor is responsible to verify the existing condition of the riser pole.

6.4.6.1(f): COMMUNICATIONS: Communications design shall be coordinated through COR with Fort Sill's Network Enterprise Center (NEC), previously Directorate of Information Management (DOIM). The D/B Contractor will determine the requirements and capacity for the facility per the I3A Technical Guide and verify with the NEC, through the COR, that the infrastructure being provided by Ft Sill supports the requirements and capacity of the project. Design and installation of the trunk systems will be provided by the D/B Contractor in coordination with Fort Sill's NEC. Conduit and cabling from the connection point into the facility communication room shall be designed and installed by the D/B Contractor. See paragraph entitled SITE ELECTRICAL SYSTEMS and elsewhere herein for more information.

(1) Communication Systems: The facility shall be connected to the Installation-wide, campus area network system (WCAN) and telephone system in accordance with the I3A guide and SIPRNET guide. Communication system resources will be allocated IAW the I3A Technical Guide regarding outlet amounts based on the functionality of the facility's various component floor spaces. The standard MILCON information outlet shall consist of dual 8-position connectors (providing both voice and data service) dedicated inside and outside plant duct space for the purpose of fiber optic cable. Connect all standard MILCON outlets from the telephone terminal back board and /or communications equipment room with two, 4 pair, TIA/EIA 568-B Category 6 unshielded twisted pair(UTP) solid copper station cable. Connect all single 8 -position wall/pay telephone outlets from the telephone terminal back board with one pair TIA/EIA 568-B CAT6, UTP cable.
(2) Communications are not privatized. Design of the trunk systems shall be provided by the Installation. See paragraph entitled SITE ELECTRICAL (Section 01 10 00) for more information. Communications conduit duct bank from the limits of the project site to the main communications room shall be designed and installed by the D/B Contractor. Terminations of outside plant (OSP communications shall be completed by NEC.

***AM7 6.4.6.1(g) Cable TV is privatized. The privatized utility (Sudden Link) will provide OSP cable and terminate to provide service to the building. Provide outlet locations in the building(s), including backbox, mud ring, and raceway and vertical/horizontal coaxial cable wire management including, but not limited to, labeling and identification. Provide a pre-wire CATV system throughout designated spaces. CATV system includes, but is not limited to, cables, conduits, pull boxes and CATV jacks.**

**Route all CATV signal conduits and cables back to the communications room or other designated room/closet.**

6.4.6.1(h): Local telephone service it-in points are shown on the drawings in Appendix J. Provide telephone conduit duct bank from the primary distribution manhole to the communications room in the facility. Share the telephone duct bank with the communication duct bank. NEC will provide telephone cabling from the manhole to the building.

6.4.9.3 For proposal purposes, the D/B Contractor may assume utilities are available from the nearest connection during construction at the project site. See Section 00 73 10, paragraph entitled "Availability and Use of Utility Services" for additional information.

6.4.11 Landscaping: *AM2 Provide xeriscape at the front entrance of the facility. Coordinate landscaping scheme with the Acceptable Plant List contained in Appendix I and the Contracting Officer. *Slopes shall not exceed 10:1 unless otherwise noted or shown on the rough grading plan shown in Appendix J. No irrigation system is required. Rip-rap is not permitted for erosion control. Use stone or brick edging for planting beds. Steel or plastic edging is not permitted. Plant trees such that grade around the tree is recessed 2 inches. Place mulch up to grade. Do not berm around trees. Make minimal use of pine and evergreen trees.

***AM9 6.5.2.6 (c) Low-slope roof systems are allowed, however, are not encouraged. The preference at Ft. Sill is a sloped, standing seam metal roof (SSMR) with a minimum slope of 2:12 with 3:12 slope preferred. Standing seam metal roof with a slope greater than 2:12 up to the maximum height allowed for the facility is preferred over a low-slope roof system. If a low-slope roof system is used, the minimum slope shall be 1/4 inch per foot with the preferred slope of 3:12 for other than SSMR systems. Avoid complex valleys, flashing and venting conditions, where possible. Maximum height of the facility shall not exceed the height stated in paragraph 6.5.2.3.***

6.9 SITE ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.9.1. EXTERIOR LIGHTING: Exterior lighting will be designed and installed by D/B Contractor. Lighting shall comply with the recommendations of the Illumination Engineering Society of North America (IESNA). Exterior lighting shall be pulse-start metal halide (PSMH) or Induction type, or LED type, except compact fluorescent lighting shall be acceptable for walkway lighting where suitable for the climatic conditions. Photo control devices for exterior lighting systems shall have adjustable operation range of approximately 0.5 to 5.0 foot candles. Use 90 degree cut off lighting facing any runway.

6.9.3: EXTERIOR COMMUNICATIONS: ***AM7 Provide a new 4-way, 4-inch PVC 40, concrete-encased duct bank from the Communication POC and extend to a new manhole, located on the East side of Crane Road and approximately SW of the proposed foot print of the new Physical Fitness Facility, then on to the main Communication Equipment Room (CER). One 4-inch PVC conduit shall be provided with 4, 1-inch inner-duct and used for fiber optic cable; and 1, 4-inch PVC 40 conduit shall be used as a spare.** ~~The D/B Contractor shall design and install the duct bank the manhole to the building's communication room. In each duct bank: one (1) 4-inch conduit shall be dedicated to copper cables; one (1) 4 inch conduit shall be dedicated to CATV coaxial cable and one (1) 4" conduit with four (4) 1" inner ducts shall be dedicated to fiber optic cable. The other three (3) 4-inch conduits are spare.~~ ***** Pull strings shall be provided in all conduits and inner ducts. Others shall splice and complete the termination of the OSP cables in the manhole and communication room. Securely fasten all entrance conduits to the building so they can withstand a typical placing operation. Keep area around the

entrance conduit free of any construction, storage and mechanical apparatus. Conduits shall be sealed inside the building end to prevent rodents, water, or gases from entering the building. Reseal conduits after cable is placed in them.

6.9.4: CORROSION CONTROL : Cathodic protection shall be furnished on all ferrous metal pipes, tanks or other equipment in contact with earth. D/B Contractor shall evaluate the need for cathodic protection on the existing pipes and provide remedial action. Cathodic protection shall comply with the recommendations of the National Association of Corrosion Engineers (NACE).

6.9.4.1: The Contractor shall obtain the services of a “Corrosion expert” to design, supervise, inspect, and test the installation and performance of the cathodic protection system. “Corrosion expert” refers to a person, who by thorough knowledge of the physical sciences and the principles of engineering and mathematics, acquired by professional education and related practical experience, is qualified to engage in the practice of corrosion control of buried or submerged metallic surfaces. Such a person must be accredited or certified by NACE as a NACE Accredited Corrosion Specialist or a NACE certified Cathodic Protection (CP) Specialist or be a registered professional engineer who has certification or licensing that includes education and experience in corrosion control of buried or submerged metallic piping and tank systems, if such certification or licensing includes 5 years experience in corrosion control on underground metallic surfaces of the type under this contract. The “Corrosion expert” shall obtain soil resistivity data, acknowledging the type of pipeline coatings to be used and reporting to the Contractor the type of cathodic protection required.

6.10: FACILITY ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.10.1: Power System study shall consist of fault analysis and coordination study. See additional requirements in Fort Sill Electrical Requirements (Appendix II ). The power study shall be conducted and power shall be distributed throughout the facility at 480/277 V for mechanical equipment, and lighting with 208/120V step down transformers. Dedicated circuits will be provided for receptacles feeding computers and communication equipment. Step down transformers shall be copper wound 150 degree C, 220 degree C insulation and rated for non-linear loads. The non-linear loads generate harmonics, which can over load conventionally sized conductors or equipment and thereby cause safety hazards and premature failures. Circuits serving such devices shall be equipped with separate neutral conductor not shared with other circuits. Panel boards carrying non-linear loads shall be designed accordingly. Provide transient voltage surge protection in the main distribution panel board and in all the panels serving computer and other electronic equipment.

6.10.1.1: INTERIOR LIGHTING: Lighting shall comply with the recommendations of the Illumination Engineering Society of North America (IESNA) and as indicated below. Interior lighting levels shall be measured at 2.5 feet above finished floor, unless noted otherwise. Emergency egress and exit lighting with powered back up in accordance with ANSI/NFPA 101, Life Safety code will be provided. Lighting designs will incorporate any necessary hazardous area requirement of the latest NFPA 72, National Electric Code. Local Manual controls shall supplement automatic controls in offices and specialized areas such as conference rooms. Occupancy sensor controls shall be provided in restrooms, electrical rooms, telecommunication rooms and similar spaces. Lighting fixtures with dimming ballasts capable of dimming to 5 percent shall be provided in conference rooms.

6.10.1.2: INTERIOR POWER: Power shall be provided for all receptacles, HVAC equipment, special power equipment, all other motorized equipment and Government Furnished Contractor Installed equipment (if applicable) and government furnished government installed equipment (if applicable). Receptacles

shall be provided in all spaces. Provide power receptacles for all dryers. Receptacles with ground fault protection must be provided in latrines/restroom areas break areas, exterior wall locations, drinking fountains and where required by NEC. In rest rooms, there shall be a minimum of one duplex receptacle for every two lavatories. In corridors, there shall be a minimum of one receptacle in each wall of the common areas. Receptacles shall be installed so spaced at a maximum of eight feet along walls. There shall be one quad receptacle mounted on each wall of each communications room. Each quad receptacle shall be on its own dedicated 20 amp circuit. There shall be one quad receptacle mounted on each communication rack**.*AM7 There shall also be a 30-amp dedicated circuit mounted on each communication rack; verify voltage requirement with Ft. Sill NEC during design stage.*** Each quad receptacle shall be on its' own dedicated 20 amp circuit. There shall be a minimum of one 120 volt, 20 amp duplex receptacle on each wall of mechanical rooms. Receptacles shall be installed so that no point along the wall line is more than 6 feet measured horizontally from a receptacle. Provide duplex receptacles adjacent to each duplex (voice/data) outlet and CATV outlet.

6.10.2: LIGHTNING PROTECTION AND GROUNDING: Provide lightning protection based on NFPA 780 Annex L (Lightning Risk Assessment of the facility). Provide grounding, bonding, shielding for all facilities.

6.10.3: CLOSED CIRCUIT TV (CCTV): Provide and install a conduit system to support CCTV throughout designated spaces. The conduit system shall include, but not be limited to, conduits, pull boxes and pull wires. All conduits for CCTV signals shall be routed back to the telecommunication room or the designated monitoring room. All CCTV outlets shall be F type outlets properly terminated using RG-6/U quad-shielded coaxial cable individually run back to the communications room. Leave ten feet of slack cable in the communication room at a location designated for the CATV box. Outlets shall be flush surface mounted with white plastic outlet covers.

6.11.1.1 Integration of new facilities into the existing EMCS database and monitoring and controls software (such as the Post-wide demand limiting) will require generation of custom graphic matching the style and complexity of the existing graphics. Integration of new facilities shall also include programming of alarm handling and demand load limiting which will require Directorate of Public Works (DPW) input for critical alarm lists and priority of building demand load limiting. This must be done at the existing EMCS "front-end". Integration will be limited to qualified companies and personnel. Connect and integrate to either the TRANE front end in B1955 (BACNET) or to the TAC/Schneider Electric front end with an open LONWORKS implementation using UFGS specifications for LonWorks controls and EMCS or the BACNET version.

6.11.4.6 Provide all exterior air cooled HVAC equipment with factory hail guards.

6.11.7 Thermostat, Temperature Sensor and Space Temperature Controls: For user -occupied areas, provide thermostatic controls (sensor with user input ) that allows limited adjustment from the project-post standard chosen design heating and cooling set points (for most administrative or assembly occupancies, use 76 deg F (db)/50% relative humidity for summer and 68 deg F (db) for winter – reconfirm at start of design process for all spaces); user input will allow adjustment of plus or minus 2 degrees F from the project/Post standard set point. The intent is to allow the occupant some input and control while limiting and controlling energy consumption. Thermostatic control set points shall normally be set and adjusted both locally at the building (by maintenance personnel) equipment controls and by the Post-wide EMCS. For all but Battalion and Company HQ occupancies, provide only sensors in living spaces. Hide or protect sensors to similar to correctional facility occupancy to guard against physical abuse. Post experience shows that HVAC controls/sensors are physically damaged by trainees if they are accessible and not protected.

6.13.6: MASS NOTIFICATION SYSEM (MNS)/PUBLIC ADDRESS (PA): A MNS shall be designed and installed in each building with occupancy of 12 or more persons. There shall be a speaker system mounted on the exterior of the building that will cover a 30-ft. wide area around the perimeter of the buildings. There shall be a minimum of one MNS speaker located in each sleeping room. A speaker shall be placed outside of the restroom for notification of personnel in the bathroom without being subjected to steam or splashing from showers or bath. Mass Notification System shall be provided per UFC 4-021-01. The MNS System shall be fully functioning and shall be designed and installed to operate as both MNS and PA. The systems shall be zoned and permit zonal selection of paging by both installed microphone jacks and telephone dialup. Indicting devices shall be visual and located throughout the facility including exterior wall locations. All strobes for the MNS shall be synchronized with the fire alarm strobes in the event both are active at the same time. The MNS shall have the ability to interrupt all localized audio systems that are independent of the building –wide PA system. The installation-wide giant voice system is an ADT MNS. Each building shall communicate with the ADT Central Control Unit via an existing radio frequency transmitter and antenna. The following equipment shall be furnished and connected by the D/B Contractor:

a. One (1) mass notification panel in accordance with the requirements of UFC 4-021-01 and compatible with the existing giant voice system at Fort Sill. One single mode Fiber Optics (FO) modem with a minimum of two CAT 6 connections.

b. One (1) transceiver with the ability to communicate with the Installation's big voice radio frequency (RF) equipment with the ability to transmit and receive information.

c. One (1) antenna installed at the facility.

d. One CAT 6, IP addressed interface module from the FO modem to the MNS Autonomous Control Panel. The connection from the interface module shall consist of eight relay contacts, one 600 ohm audio output, one RS-232 port and one spare RS-485 port. Eight (8) dry contacts shall be connected to the building MNS for controlling prerecorded messages and push-to-talk for audio (remainder of the eight (8) shall become spares). The 600-ohm audio shall be connected for audio from the central control unit to the MNS.

e. The following are requirements that have to be met to be successful with the installation of mass notification at Fort Sill, OK.

(1) Mass Notification shall meet the requirements of UFC 4021-01, 9 April 2008.
(2) The following are items that need to be included in the project design but many not be inclusive of all items.
    - Combination Fire Alarm/Mass Notification System (For new construction, the ACU shall be integrated with the building fire alarm control panel (FACP to form one combined system).
    - System includes subsystems: autonomous control unit (ACU); local operating consoles (LOC); notification appliance network; and interface with the wide area MNS and DOD installation.
    - System design and wiring must meet NFPA 72 requirements for MNS and fire alarm systems.
    - The ACU monitors and controls for notification network. Action of the ACU takes precedence over actions taken at any other locations.
    - The LOC is a unit designed to allow emergency response forces and building occupants to operate the individual building MNS, including initiating delivery a pre-recorded voice

messages, providing live voice messages and appliances, overriding external voice announcements, and terminating mass notification functions.

- Notification Appliance Network: Consists of a set of audio speakers, and strobes. Speakers are provided at all location in the building at entrances and exits and other outdoor areas commonly used by building occupants, such as courtyards). Speakers must include intelligibility and audio intensity. The Mass Notification strobes shall be amber in color with the words ALERT on the side of the strobe device and the strobe shall be clear for fire alarm with the words FIRE on the device. One speaker can be used for both mass notification and fire alarm system as long as they are installed IAW NFPA 72.

(3) Since Fort Sill does not have a wide area MNS at this time, the Mass Notification system shall be engineered so that it shall be able to receive an audio line–level input.

(4) Pre-Recorded Messages shall be recorded with female voice and state as follows:

- For Fire: Five seconds of siren are played, followed by the message: "Attention, attention, a fire emergency has been reported. Please leave the building using the nearest exit."

- For Weather: Five seconds of 100KHZ steady tone are played, followed by the message: "The national weather service has issued a weather alert for this areas; further information will be broadcast as it becomes available. "

- For Force Protection Antiterrorism Threat: Five seconds of fast whoop sound followed by the message: "Attention, all personnel remain indoors, follow shelter in place procedures and monitor television and radio for further instructions. "

- For Evacuation Message: Five seconds of wail are played, followed by the message: " Exit immediately using emergency exit procedures and rally at your designated point. "

- For All-Clear: Five seconds of chime sound are played, followed by the message: "The emergency has now ended. Please resume normal operations."

(5) An emergency Air Distribution Shutoff—For all new and existing inhabited buildings, an emergency shutoff switch in the HVAC control system shall be installed that can immediately shut down the air distribution system throughout the building except where interior pressure and airflow control would more efficiently prevent the spread of airborne containments and/or ensure the safety of egress pathways. Locate the switch (or switches) to be easily accessible by building occupants preferably near the remote annunciator. Provide all outside air intakes, relief air, and exhaust openings with low leakage dampers that are automatically closed when the emergency air distribution shutoff switches activated. The low leakage dampers will have maximum leakage rates of 3 cfm/square foot with a differential pressure of one inch of water gage across the damper.

6.15.4 Oil Water Separators (OWS). Not required.

***AM5 PARAGRAPH 3:**

**Insert the attached page 29a into Section 01 10 00 STATEMENT OF WORK, paragraph 3.0 Physical Fitness Center, Technical Criteria for U.S. Army Physical Fitness Facilities (Updated June, 2010), following Page 29 (shown in the footer at left).***

# Appendix NN

# Water Quality Analysis

**What does this report mean?** This report shows the results of our water quality analyses. Every regulated contaminant that was detected in the water, down to the most minute traces, is listed here. The report contains the name of each substance, the highest level allowed by regulation (MCL), and the ideal goals for public health, the amount detected, the usual sources of such contaminants, footnotes explaining our finding, and a key to units of measurements.

**Maximum Contaminant Level or MCL:** The highest level of a contaminant allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

**Maximum Contaminant Level Goal or MCLG:** The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

**Action Level:** The concentration of a contaminant which, if exceeded, triggers a treatment or other requirement, a water system must follow.

**Treatment Technique:** A required process intended to reduce the level of a contaminant in drinking water.

**Turbidity:** Measurement of the cloudiness of the water. It is monitored because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

**Definitions:**

Pci/L=Pico curies per liter (radioactivity measurement)
MCLG=Maximum Contaminant Level Goal
NTU=Nephelometric Turbidity units
MCL=Maximum Contaminant Level
TT=Treatment Technique
AL=Action Level
ppm=parts per million or milligrams per liter (mg/L)
ppb=parts per billion or micrograms per liter (ug/L)
BPQL=Below practical quantitive limits

## 2005 WATER QUALITY DATA
## REGULATED AT THE TREATMENT PLANT

| CONTAMINANT | DATE TESTED | UNIT | MCL | MCLG | DETECTED LEVEL | RANGE | MAJOR SOURCE | VIOLATION |
|---|---|---|---|---|---|---|---|---|
| MERCURY (INORGANIC) | 10/31/2005 | ppb | 2 | 2 | BPQL | NONE | Erosion of natural deposit | NO |
| FLUORIDE | 11/07/2005 | ppm | 4 | 4 | 1.36 | .12-1.36 | Erosion of natural deposit Treatment addition | NO |
| ARESNIC | 10/31/2005 | ppb | 10 | 0 | <2 | NONE | Erosion of natural deposit | NO |
| SELENIUM | 10/31/2005 | ppb | 50 | 50 | <1 | NONE | Erosion of natural deposit | NO |
| NITRATE-NITRITE | 10/2005 | ppm | 10 | 10 | <.10 | NONE | Runoff from fertilizer use; leaching from spectic tanks, sewage, erosion of natural deposit | NO |
| ALPHA EMITTERS | 2002 | pCi/L | 15 | 0 | .3025 | .18- .51 | Erosion of natural deposits | NO |
| BETA/PHOTON EMITTERS | 2002 | pCi/L | 50 | 0 | 2.93 | 2.66-3.22 | Decay of natural and man-made deposits | NO |
| TURBIDITY | 8/12/2005 | NTU | TT=. 3NTU TT=% OF SAMPLES <.3 NTU | 0 | .65 100% | NONE | Soil runoff | NO |
| BARIUM | 10/31/2005 | ppm | 2 | 2 | .082 | NONE | Discharge of drilling wastes; discharge from metal refineries; Erosion of natural deposit | NO |
| TOTAL ORGANIC CARBON* (results based on a yearly avg ratio) | 12/2005 | ppm | TT=Annual avg % removal based on raw water TOC levels and alkalinity. To be in compliance yearly avg ratio must be 1 or greater than 1. | N/A | SEE BELOW yearly avg ratio: 1.02 | | Naturally present in environment. Has no health effects. Provides a medium for the formation of disinfection by products, including Trihalomethanes and Haloacetic Acids. | YES |

| * MONTH | 1/05 | 02/05 | 03/05 | 04/05 | 05/05 | 06/05 | 07/05 | 08/05 | 09/05 | 10/05 | 11/05 | 12/05 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SOURCE WATER TOC | 4.53 | 4.93 | 4.73 | 4.61 | 5.55 | 4.43 | 4.53 | 4.41 | 4.31 | 4.52 | 4.79 | 4.52 |
| SOURCE WATER ALKALINITY | 123 | 129 | 134 | 131 | 131 | 137 | 118 | 108 | 107 | 112 | 118 | 125 |
| FINISHED WATER TOC | 3.42 | 3.37 | 3.22 | 3.46 | 4.46 | 3.36 | 3.18 | 2.99 | 2.87 | 2.96 | 3.31 | 3.50 |
| Required % removal | 25% | 25% | 25% | 25% | 25% | 25% | 35% | 35% | 35% | 35% | 35% | 25% |
| Actual % removal | 25% | 32 % | 32 % | 25% | 20% | 24% | 30% | 32% | 33% | 35% | 31% | 23% |

## REGULATED IN THE DISTRIBUTION SYSTEM

| CONTAMINANT | DATE TESTED | UNIT | MCL | MCLG | DETECTED LEVEL | RANGE OF DETECTION | MAJOR SOURCE | VIOLATION |
|---|---|---|---|---|---|---|---|---|
| TOTAL COLIFORMS | 12/2005 (Monthly) | % Positive | No more than 5% positive | 0 | 0 | <1 % positive | Naturally present in the environment | NO |
| TOTAL TRIHALOMETHANES | 12/2005 (quarterly) | ppb | 80 Avg | 0 | 63.18 (highest quarter) | 31.78-63.18 | by-product of chlorination | NO |
| HALOACTIC ACIDS (HAA5) | 12/2005 (quarterly) | ppb | 60 Avg | 0 | 13.56 (highest quarter) | <10-19.00 | by-product of chlorination | NO |
| BROMATE | 12/2005 (monthly) | ppb | 10 | 0 | 174 (highest month) | <5-174 | by-product of ozone disinfection | YES |

## REGULATED AT THE CUSTOMERS TAP

| CONTAMINANT | DATE TESTED | UNIT | MCL | MCLG | DETECTED LEVEL | RANGE | MAJOR SOURCE | VIOLATION |
|---|---|---|---|---|---|---|---|---|
| COPPER | 8/2003 | ppm | AL=1.3 ppm | 1.3 | 1.1 | 0 sites>AL | Corrosion of household plumbing systems | NO |
| LEAD | 8/2003 | ppb | AL=15 ppb | 0 | 3.1 | 0 sites>AL | Corrosion of household plumbing systems | NO |

**SPECIAL INFO AVAILABLE**: Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone transplants, people with HIV/Aids or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the safe drinking water hotline 1-800-426-4791.

Your water supply is safe in ALL water quality parameters. If you have any questions, please contact the Water Treatment Plant at 580-529-2703.

VOLUME 1 NO. 8 APRIL 20, 2006

# CITY OF LAWTON WATER TREATMENT PLANT
# 2005 WATER QUALITY REPORT

**BILLING/CUSTOMER SERVICE INFORMATION: (580) 581-3308** **W EB SITES: www.cityof.lawton.ok.us or www.epa.gov/safewater/**

## WATER QUALITY

The City of Lawton is committed to providing residents with a safe and reliable supply of high-quality drinking water. This annual **A Consumer Confidence Report≅** required by the Safe Drinking Water Act (SDWA), tells you where your water comes from, how the treated water quality compares to the required quality standards and other things you should know about drinking water.

### CRYPTOSPORIDIUM

Cryptosporidium is a microscopic organism that when ingested can result in diarrhea, fever and other gastrointestinal symptoms. This organism is found in most lakes and streams. Cryptosporidium comes from animals and humans whom are the carriers of the organism and have contact with the source water supplies. Cryptosporidium is eliminated by effective treatment combinations including filtration, sedimentation and disinfection.

### TRIHALOMETHANES *BY-PRODUCTS OF CHLORINATION*

Million of people every year are affected by microbial contaminants (bacteria) in drinking water due to inadequate disinfection of the water supply. This is a real problem. AMicrobial risks are real≅. Chlorination of your water system is essential in order to protect public health. However, when chlorine is introduced into untreated water, chlorine and naturally occurring organics in the water form by products called TRIHALOMETHANES (THMS). Some people who drink water containing THMS in excess of the MCL over many years may experience problems with their liver, kidneys or central nervous system, and may have an increased risk of cancer.

### TOC VIOLATIONS

During the first, second and third quarter of 2005 the Water Treatment Plant was out of compliance for the required TOC removal. TOC has no health effects; however, TOC can provide a medium for the formation of disinfectant by products. The Water Treatment Plant is now in full compliance with this requirement.

### BROMATE MCL VIOLATION

Our water system recently violated a drinking water standard. Although this is not an emergency, as our customers, you have a right to know what happened, what you should do, and what we are doing to correct this situation.

The average of the eight bromate samples submitted by the City of Lawton Water Treatment Plant for the twelve months of 2005 is .033 mg/L. This value exceeds the MCL of .010 mg/L for bromate; therefore, the WTP is in violation for exceeding the MCL for bromate.

*The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that bromate is a health concern at certain high levels of exposure. Bromate is formed as a by-product of ozone disinfection of drinking water. Ozone reacts with naturally occurring bromide in water to form bromate. The EPA has set a drinking water standard to limit exposure to bromate.*

WHAT SHOULD I DO? **You do not need to use an alternative (e.g. bottled) water supply**. However, if you have specific health concerns, consult your doctor.

WHAT DOES THIS MEAN? This is not an immediate risk. If it had been, you would have been notified immediately. However, some people who drink water containing bromate in excess of the MCL over many years may have an increased risk of getting cancer.

WHAT HAPPENED? WHAT IS BEING DONE?

The water treatment plant will try to control Bromate formation by lowering the pH of the water through the ozonization process and by lowering the ozone concentration used for disinfection.

### SOURCE WATER PROTECTION

The City of Lawton is in the process of putting together a source water protection program. This is an ongoing effort to identify sources of possible pollution.

As these sources are identified, we will work to eliminate this pollution or to minimize its effect on the water supply. Your help is needed for this program to succeed. For more information, please visit www.epa.gov/owow/watershed.

**Sources of pollution on the Lake Lawtonka or Lake Ellsworth reservoirs or their watershed should be reported to the Water Treatment plant by calling 580-529-2703**

Please use care when using pesticides or herbicides as over application can runoff into the reservoir. Septic tanks should be serviced regularly to keep nutrients such as nitrogen and phosphorus out of the reservoir.

### MONITORING REQUIREMENT NOT MET

Our water system violated a drinking water standard over the past year. Even though this was not an emergency, as our customers, you have a right to know what happened and what we did to correct this situation.

*We are required to monitor your drinking water for specific contaminants on a regular basis. The results of regular monitoring are an indicator of whether or not our drinking water meets health standards. During September –December 2005 we did not monitor or did not complete all monitoring for Bromate and therefore cannot be sure of the quality of our drinking water during that time.*

WHAT SHOULD I DO?

There is nothing you need to do at this time.

WHAT HAPPENED? WHAT IS BEING DONE?

In the month of September 2005 the laboratory doing the WTP compliance analysis for Bromate lost its certification for this analysis. The WTP was notified of this in March 2006 and has started sending the monthly compliance sample to the ODEQ laboratory. The monthly analysis for Bromate for 6 months was performed by a laboratory that was not certified for that analysis and as such those results cannot be relied on for accuracy.

For more information, please contact David Herring at 580-529-2703.

*Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.*

### WATER INFORMATION

**TOTAL WATER TREATED:** 6,632,700,000

**DAILY AVG TREATED:** 18,171,781

**MAX DAILY FLOW:** 28,100,000

**WATER PUMPED FROM ELLSWORTH:** 2,850,728,000

**WATER PUMPED FROM WAURIKA:** 35,099,000

**TOTAL RAINFALL:** 20.84”

**AVG ATMOSPHERIC TEMPERATURE:** 62 **WATER**: 63

**PH RANGE**: 6.76-9.03

**HARDNESS** 157 PPM OR 9.16 GRAINS/GAL

**ALKALINITY:** 111 PPM

**FLUORIDE:** .99 PPM

**TURBIDITY:** .077 NTU

### SOURCES OF WATER FOR THE CITY OF LAWTON

The water for the City of Lawton comes entirely from surface sources. The primary water supply is Lake Lawtonka. Lake Lawtonka has a watershed that covers approximately 92 square miles. Lake Ellsworth and Lake Waurika are the city’s secondary water supplies.
The watershed for Lake Ellsworth covers approximately 249 square miles, while the Lake Waurika watershed covers 562 square miles.
As water travels over the land’s surface or through the ground, it dissolves naturally occurring minerals and radioactive material, and can be polluted by animals or human activity.
Contaminants that might be expected in untreated water include: biological contaminants, such as viruses and bacteria; inorganic contaminants, such as salts and metals; pesticides and herbicides; organic contaminants from industrial or petroleum use and radioactive materials. Drinking water, including bottled water, may reasonably be expected
to contain at least small amounts of some contaminants. Presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the ***U.S. Environmental Protection Agency=s (EPA) Safe Drinking Water Hotline at* 1-800-426-4791.**

PRSRT STD
US POSTAGE
PAID
PERMIT NO. 46
LAWTON OK

LAWTON WATER TREATMENT PLANT
PO BOX 27
MEDICINE PARK OK 73557

# Appendix OO

# Fort Sill Public Works Engineering Design Guide

# FORT SILL ENGINERING DESIGN GUIDE

## DIRECTORATE OF PUBLIC WORKS

**Fort Sill, Oklahoma**

# General

1. Coordination of designs between all disciplines is of primary importance to producing a quality product, which in this case is the contract document(s) (drawings and specifications).

2. Design analyses texts shall follow the standard for format and content as required in the U.S. Army Corps of Engineers, Southwestern Division Architectural and Engineering Instruction Manual (SWD-AEIM), Chapter IX.

3. This document is intended to encompass design requirements which are common for all project designs and is broken out by design discipline.

# Architectural Design

1. Architectural Compatibility. The designer shall provide a descriptive architectural design analysis. The analysis shall indicate to the project reviewers the logic and rationale for the selected architectural design. The analysis shall clearly indicate that the neighboring facilities were considered in the design and that the design as illustrated is compatible with surrounding facilities and/or the entire Base/Post and Base or Command Architectural compatibility documents. If the designer feels that worthy buildings do not exist, then so state and continue to support the designs selected and clarify why they are worthy, and are in the best interest of the future architectural improvement of the Base or Post. The analysis may incorporate words, sketches, illustrations, maps, photographs and color as desired to clarify the presented solution.

2. Roofing shall be standing seam metal type for structures. This type of roofing is currently being installed on most new buildings. Built-up roofing if required for mechanical systems shall have built-in walkway pads for equipment servicing and other heavy foot traffic areas. If it is necessary to install mechanical equipment on the roof OSHA requirements for safe access and handling of tools and parts must be followed. These requirements may include hoisting swing arm, guard rails, safety line anchor points, etc.

3. Entry Doors for Mechanical, Main Communications (USAF) and Electrical Rooms. Entry doors for mechanical, main communications and electrical rooms shall be exterior only. Entry of the electrical room from the mechanical room is acceptable provided an acceptable corridor space for access is provided. **ACCESS FROM THE OCCUPIED INTERIOR OF A FACILITY IS NOT ACCEPTABLE--THE BASE OR POST MAINTENANCE STAFF WILL NORMALLY BE THE ONLY PERSONS ALLOWED INTO THE MECHANICAL OR ELECTRICAL ROOMS FROM DEDICATED EXTERIOR DOORS.**

4. Building Surfaces Overall U-value Compliance. See the chapter on mechanical design for required calculations which will ensure each facility complies with the required maximum overall U-factor numbers as specified by current energy codes.

5. Building Exterior Surfaces Air Seal-up for HVAC Pressurization.

5.1 All buildings require complete detailed air leakage seal-up to eliminate uncontrolled outside air infiltration and ex-filtration to/from occupied areas. Seal-up allows mechanical air handling systems to pressurize occupied spaces, which eliminates or slows uncontrolled infiltration.

5.2 All traditional building penetrations will be sealed with an appropriate long-life (25-year minimum) material, such as elastomeric caulks, expanding foams, solid rubber stripping, spring metallic seals, etc. Traditional building penetrations will include items such as pipe penetrations, doors, windows, wall louvers, floor/wall intersections, skylights, dryer exhaust ducts, etc.

5.3 Seal-up of non-traditional building leakage locations is vitally important to enabling building pressurization by air handling systems.

5.3.1 For spaces served by "plenum" return-air handling systems, the entire heated or air-conditioned space (including the

above ceiling return-air plenum) will be sealed air tight. Seal-up will include all penetrations by mechanical, electrical, structural or architectural items. This will include items, areas or intersections of: roof surfaces, roof joist/wall connections, roof peaks, roof/wall intersections, floor/wall intersections, intersections between different wall types, intersections of walls with beams or columns, etc. Seal-up materials will include items impervious to airflow such as elastomeric caulks, expanding spray foams, etc. Batt or board insulations will not be considered adequate sealants on a stand alone basis, but will be allowed as part of a sealant system.

5.3.2 For spaces served by air-handling systems with fully ducted return-air systems, the space above the room ceilings is no longer a conditioned space. Since the space above the ceiling is a "cutoff" or un-vented attic, it is extremely prone to frost, condensation, mold, etc. if the ceiling or roof is not correctly insulated and air/vapor sealed. Seal-up locations and methods will be the same as discussed above for plenum-return systems. Suspended lay-in ceilings are not acceptable for vapor/air seals.

5.3.3 Review for compliance with building envelop seal-up requirements will be conducted at the 30% level, irregardless of whether the project is to have a 30% design review or not. Sketches, wall sections building sections, floor plans, notes etc. will be submitted at the 30% design point for seal-up compliance review. Obviously, building seal-up must be coordinated with building thermal insulation method, structural design, etc. **THE FACILITY DESIGN SHALL NOT PROCEED PAST THE 30% POINT UNTIL THE BUILDING SEAL-UP METHODS, DRAWINGS AND NOTES WHICH WILL BE INCORPORATED INTO THE CONTRACT DRAWINGS ARE APPROVED. FAILURE TO PROVIDE THE BUILDING SEAL-UP INFORMATION FOR REVIEW IS GROUNDS FOR DESIGN RESUBMITTAL.**

6. Mechanical & All Wall Louvers. Louvers shall be completely specified on the mechanical drawings (size, airflow, max. pressure drop, function/usage, min. net free area, descriptor/mark, how thick or deep, notes and requirements, such as bird screening); provide supplemental louver requirements (finishes, metal, construction, etc.) in only one place in the specifications. Architect and Mechanical engineer will coordinate to ensure requirements such as air tightness, thickness, color, etc. are fully described in the design or contract requirements. Additionally, specify louvers which shall not admit water into the building or any ductwork under any weather condition (wind or storm driven rain, etc.; this feature shall be fully coordinated with structural and mechanical engineers.

7. Location of Mechanical Plants and Main Mechanical Equipment Rooms. Mechanical plants and mechanical equipment rooms containing plant equipment (boilers, chillers, pumps, etc.) shall not be constructed in basements or on facility floors above the "ground" floor. Air Handling units or "fan rooms" may be planned and constructed on floors above grade to suit building design requirements and conditions. Do not use basements for fan rooms or for any mechanical or electrical equipment spaces.

8. Equipment Access Requirements. The architect will coordinate with the mechanical and structural engineers to provide access platforms, ladders and

catwalks for all equipment which is otherwise inaccessible because it is above user areas, ceilings, etc. Provide means of accessing equipment for removal (removable railings) and structural beams and trolley for user maintenance use in removing large and heavy items.

# MECHANICAL DESIGN

1. All new building or major renovation or facility utility services shall be metered.

1.1 Water meters shall be equipped with an electrical pulse metering output transducer for connection to a future or existing Base/Post-wide Utility/Energy Monitoring and Control System (U/EMCS).

To be useful, the characteristics of the U/EMCS water meter pulse initiator must balance the limitations of the device receiving the pulses (U/EMCS) and the requirements of reasonable metering resolution. Pulse initiators shall provide a maximum of 500 pulses per minute, but not less than one pulse per 100 cubic feet of water (2.8 cubic meters). These requirements upon the pulse initiator should be reflected on the contract drawings. The limitation requirements given here are general and vary with the type of existing U/EMCS and a building's energy consumption; therefore, the pulse metering device must be tailored to the design where a Base or Post has an existing U/EMCS.

1.2 Gas meters shall be equipped with an electrical pulse (metering) output transducer for connection to a future or existing Base/Post-wide Energy Monitoring and Control System (EMCS).

To be useful, the characteristics of the EMCS natural gas meter pulse initiator must balance the limitations of the device receiving the pulses (EMCS) and the requirements of reasonable metering resolution. Pulse initiators shall provide a maximum of 500 pulses per minute, but not less than one pulse per 100 cubic feet (2.8 cubic meters) of natural gas. These requirements upon the pulse initiator should be reflected on the contract drawings. The limitation requirements given here are general and vary with the type of existing EMCS and a building's energy consumption; therefore, the pulse metering device must be tailored to the design where a Base or Post has an existing EMCS.

1.3 Electrical meters, instrument transformers, and all other utility systems shall be compatible/suitable for connection, via a pulsing or similar transducer, to the existing Base/Post-wide Utility/Energy Monitoring and Control System (U/EMCS) unless it is stated in the RFP or design scope of work that they will not need EMCS provisions.

To be useful, the characteristics of the U/EMCS electrical meter pulse initiator must balance the limitations of the device receiving the pulses (U/EMCS) and the requirements of reasonable metering resolution. Pulse initiators shall provide a maximum number of pulses per KWH up to 500 per minute, but not less than one pulse per KWH. These requirements upon the pulse initiator should be reflected on the contract drawings. The limitation requirements given here are general and vary with the type of existing U/EMCS and a building's energy consumption, therefore, the pulse metering device must be tailored to the design where a Base or Post has an existing EMCS.

2. Design conditions to be in accordance with TM 5-785 ENGINEERING WEATHER DATA for Fort Sill/Post AAF, OKLAHOMA (Location 34°39'N & 98°24'W, 361.8 meters (1187 feet) Elevation). Heating annual degree days 3367 and cooling is 2217

OUTDOOR
SUMMER 37.2°C DB (99°F DB), 24.4°C WB (76°F WB)
WINTER -8.9°C DB (16°F DB)

INDOOR as regulated by (USAFACFS 420.11)
Living quarters
SUMMER 25.6°C DB (78°F DB), 18.2°C WB (64.8°F WB), 50%RH
WINTER 20°C DB (68°F DB),
Administrative
SUMMER 25.6°C DB (78°F DB), 18.2°C WB (64.8°F WB), 50%RH
WINTER 20°C DB (68°F DB),
Work Bay
WINTER 12.8°C DB (55°F DB)
Warehouse
WINTER 10°C DB (50°F DB)
Mechanical Room (Boiler/Chiller Room)

WINTER 4.6°C DB (40°F DB)

1.1 Calculations:

1.1.1 Computer HVAC load programs may not include all loads. The designer will submit complete, detailed manual block load calculations which shall agree with computer block cooling and heating load outputs with a difference of 5% or less. Cooling block loads shall be submitted on AF form 108. Heating block loads shall be submitted on Southwestern Division (SWD) form 157-R.

1..1.2 Designer attention is directed to the equipment sizing and load calculation adjustments (additions) allowed and detailed in Chapter 13 of the OCE-AEI. The designer should use these adjustments whenever deemed necessary. For details, applications and questions, contact Fort Sill, DPW Mech. Design Section.

2.2 Preheating Coils or Other Freeze Protection:

2.2.1 Designer shall use the lowest recorded temperature for the design of critical freeze protection equipment in lieu of the standard 99% heating design dry bulb temperature. Critical equipment would include mech. space heating and freeze protection preheating coils. The applicability of this special design condition shall be discussed and verified with Fort Sill, DPW Mech. Design Section.

3. Mechanical ventilation to be in accordance with ASHRAE standard 62.1-2004. Lecture classroom (Educational Facility) space 3.8 L/sec/occupant (7.5 CFM/occupant), Computer classroom (Educational Facility) space 5 L/sec/occupant (10 CFM/occupant) and Office space (Administrative Facility) space 2.5 L/sec/occupant (5 CFM/occupant).

4. Locker room and toilets exhaust to be in accordance with ASHRAE 1999 Systems Ventilation of the Industrial Environment. Locker rooms 5 L/S sq.m (1 CFM/SQ.FT.), Toilet spaces 10 L/S sq.m (2 CFM/SQ.FT.); at least 10 L/S/toilet facility (25 CFM/toilet facility); 90 L/S minimum (200 CFM minimum). Shower spaces 10 L/S sq.m (2 CFM/SQ.FT.); at least 20

L/S/shower head (50 CFM/shower head); 90 L/S minimum (200 CFM minimum), Storage space 5 L/S sq.m. (1 CFM/SQ.FT.). Janitorial closets to treated the same as a toilet space 10 L/S sq.m (2 CFM/SQ.FT.). No return air from latrines back to air handling units, furnaces, etc.

5. Seismic zone maps and tables, design criteria, etc. shall be taken from the Seismic design technical manual, TM 5-809-10 Seismic Design for Buildings, TM 5-809-10-1 Seismic Design Guidelines for Essential Buildings and TM 5-809-10-2 Seismic Design Guidelines for Upgrade of Existing Buildings. Seismic Design for Fort Sill buildings to be per Zone 2 requirements.

5.1 The designer will include the standard mechanical seismic guide specification. The specification and standard drawing compliment each other. The specification is Section 13080 - Seismic Protection for Mechanical, Electrical Equipment.

5.2 Seismic zone maps and tables, design criteria, etc. shall be taken from the Seismic design technical manual, TM 5-809-10 Seismic Design for Buildings, TM 5-809-10-1 Seismic Design Guidelines for Essential Buildings and TM 5-809-10-2 Seismic Design Guidelines for Upgrade of Existing Buildings.

6. Energy Monitoring and Control System (EMCS/UMCS): Energy Monitoring and Control System (EMCS): All new Mechanical systems (pumps, chillers and boilers) shall be connected to the existing post wide EMCS system ( t.a.c. Tour Andover Controls, 1650 West Crosby Road, Carrollton, TX 75006-USA, (972) 323-5460)). The EMCS system shall monitor the utility consumption (electricity, gas and water). Temperature control system to be designed in-accordance with TM 5-815-3 and specifications UFC 13801 Heating, Ventilation and Air Conditioning (HVAC) Control Systems. Control system to be Direct Digital Controls for HVAC (DDC) as identified in specification section UFC 15951. Control system for buildings 10 tons and larger to be Digital Controls for HVAC (DDC) with EMCS and buildings with less than a total load of 10 tons to be microprocessor-based thermostat with password control code.

6.1 EMCS/UMCS: Fort Sill uses a central utility monitoring and control system. It is an “open” protocol; LonWorks based system by TAC (Tour Andover Controls) Americas, located in Dallas, TX. These new facilities shall be connected to the UMCS. The connection method is via LAN; The D/B contractor will have to coordinate with Fort Sill DOIM to obtain a static IP address and to get their construction requirements (crossover mech/electrical) requirement.

6.2 All mechanical building equipment and systems shall be connected to EMCS, including but not limited to air handlers, makeup air units, pumps, chillers, boilers, cooling equipment down to 5-tons, etc. Buildings with a total load (all spaces) larger than 10 tons shall be connected to the base wide EMCS system using the base Local Area Network (LAN) for communication to the existing head end. Buildings with total loads less than this may be stand alone building management EMCS panel or microprocessor type thermostat that required an access code to execute changes from heating to cooling, hours of operation and temperature setting.

6.3 Monitoring and Control hardware and software requirements are: Standard Input/Output (I/O) points to be connected and integrated for monitoring and control (starter list which is not necessarily complete); Will need alarm limits, etc. as appropriate for all I/O:
Outside Temperature (F)

Outside Humidity (%)
Boiler Safeties (All)
Chiller Safeties (All)
Air Handler Safeties (Freezestats, Firestats, etc.)
Air Flow Monitor (normal/low)
Start/Stop Monitor (normal/low)
Air Handler Hot Deck (F)
Air Handler Cold Deck (F)
Return Air Temperature (F)
Mixed Air Temperature (F)
Supply Temperature for each Zone or Main Supply Temp (F), etc.
Room Air Temperature for each Zone (F)
Humidity for each Zone (%)
Chilled Water Supply (F)
Chilled Water Return (F)
Chilled Water Flow (GPM)
Chiller Start/Stop Control and Load Limiting Input/
Tower Fan Status (on/off)
Condenser Water Supply & Return Temps (F)
Chilled Water Pump Status (on/off)
Economizer Control
Hot Water Pump Status (on/off)
Hot Water Supply & Return Temperatures (F)
Hot Water Flow (GPM)
Filter Media Differential Pressure Alarms
Motor Run Time (elapsed)
Moisture Alarms in Raised Floor Areas
Enable/Disable
Start/Stop
Run-longer user interface (usually 2 hours) to delay unoccupied modes

6.4 Standard Monitoring and Control Software that will be provided, both at the building or be integrated into or used at the existing EMCS are (again not a comprehensive list):

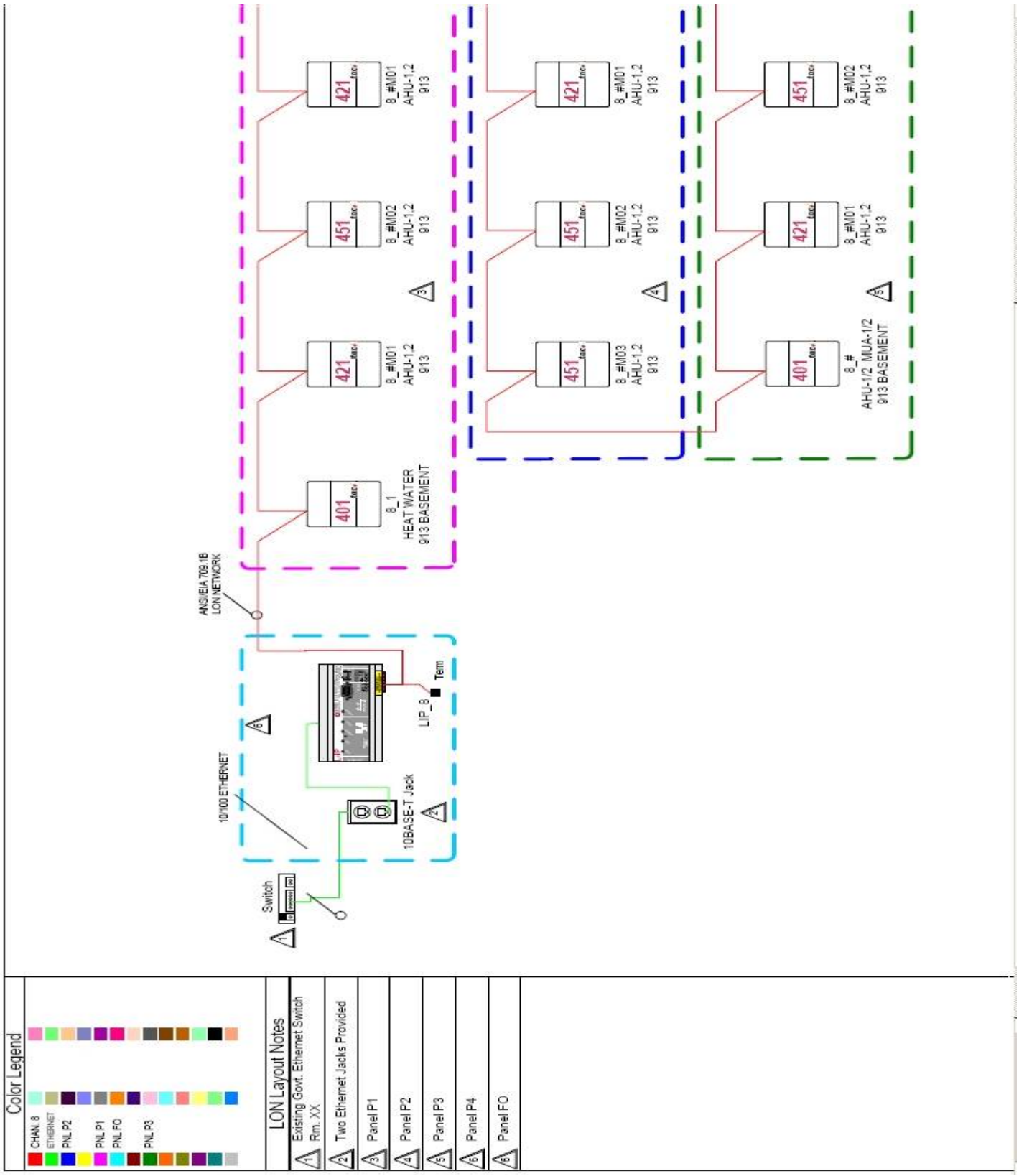
High and low temperature limit alarming
High and low humidity limit alarming
Equipment runtime and status (on/off, enabled, etc.)
Scheduled and optimum start/stop
Duty cycling
Demand limiting (motor start/stop restrictions, motor size, etc.)
Occupied/Unoccupied
Time Scheduling
Day/Night Setback
Economizer
Ventilation and Recirculation, Vent Delay, etc.
Hot and Cold deck reset
Reheat coil reset
Boiler plant – boiler optimization
Chiller plant - chiller optimization
Heating water supply temperature reset
Chilled water supply temperature reset
Condenser water reset
Postwide demand limiting

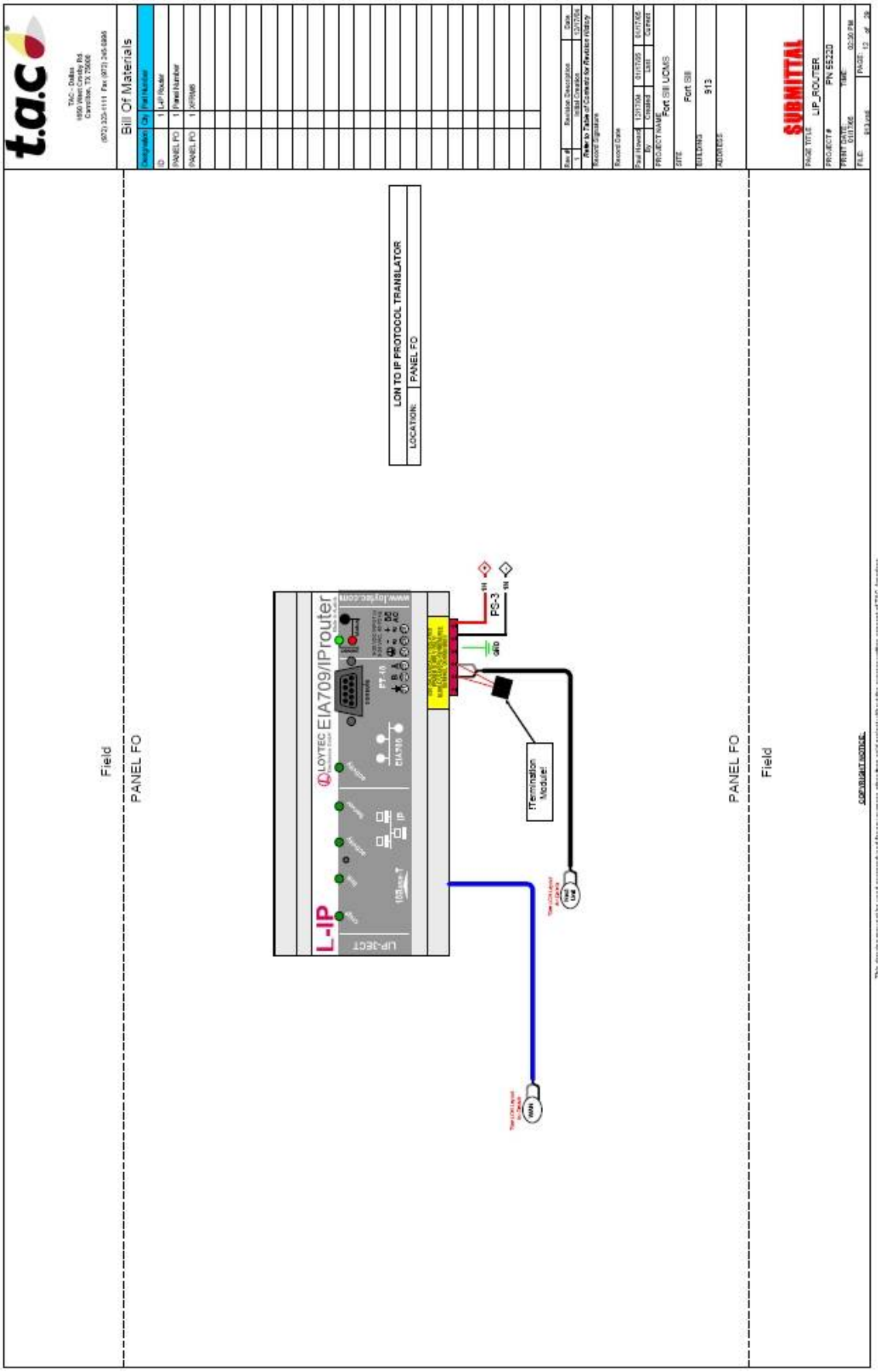
6.5 Integration of new facilities into the existing EMCS database and monitoring and controls software (such as the postwide demand limiting) will require generation of custom graphics matching the

style and complexity of the existing graphics. This will have to be done at the existing EMCS “front-end”. Fort Sill does not want just anyone trying to do integration, but prefers that TAC or their designated local representative in Oklahoma City, OK (OKC) do the integration; TACs OKC rep. is , Energy Management & Controls Synergy (EMCS), POC is Mr. Jeff Houpt, 405-528-3627 or Welchweb Integration POC Mr. Charles Lee Welch, 817-857-1054. Other possible integrators (although not familiar with Ft Sill) are: Tang & Associates, POC is Mr. John Huston, 312-616-7498 or EMC engineers, POC is Mr. Carl Lundstrom, 678-254-1221.

6.6 Physical Interfacing Requirements: physical interfacing requirements are illustrated below with illustrations of a typical building interface and wiring layout and a LON to IP (L-IP) router connection diagram (as is typical on existing EMCS). If a building does not contain a government ethernet switch for LAN interface, it must be installed by DOIM at a cost to the project. Additionally, at this time DOIM is providing the “drop” from the switch to the location of the EMCS interface; the drop includes wiring and wiring from the switch to a two ethernet jack on a box. The drop also includes an IP address for the L-IP ethernet router. The project must also pay DOIM for providing the “drop”. Note that these requirements and cost may change so during each project connectivity must be planned and costed with DOIM coordination.

Point Naming Convention: Fort Sill has requirements for naming of EMCS database points. Obtain and include this drawing and data as a requirement for each contract.


Color Legend
CHAN. 8
ETHERNET
PNL P2
PNL P1
PNL FO
PNL P3
LON Layout Notes
1 Existing Govt. Ethernet Switch Rm. XX
2 Two Ethernet Jacks Provided
3 Panel P1
4 Panel P2
5 Panel P3
6 Panel P4
6 Panel FO
Switch
10/100 ETHERNET
10BASE-T Jack
LIP_8
Term
ANSI/EIA 709.1B LON NETWORK
401
8_1 HEAT WATER 913 BASEMENT
421
8_#M01 AHU-1,2 913
451
8_#M02 AHU-1,2 913
8_#M03 AHU-1,2 913
8_# AHU-1/2 MUA-1/2 913 BASEMENT


t.a.c
TAC - Dallas
1950 West Crosby Rd.
Carrollton, TX 75006
(972) 323-1111 Fax (972) 245-6995
Bill Of Materials
Designation
Qty
Part Number
ID
1 L-IP Router
PANEL FO
1 Panel Number
PANEL FO
1 XFRAME
Rev #
Revision Description
Date
Prepared for Submittal
Prepared for Review/Approval
Prepared for Review/History
Second Signature
Second Date
Final Revision By
Created
Last
Current
PROJECT NAME
Fort Sill UCMS
SITE
Fort Sill
BUILDING
913
ADDRESS
SUBMITTAL
PAGE TITLE
LIP_ROUTER
PROJECT #
PN 55220
PRINT DATE
01/17/05
TIME
02:30 PM
FILE:
913.cad
PAGE: 12 of 28
LON TO IP PROTOOOL TRANSLATOR
LOCATION:
PANEL FO
Field
PANEL FO
LOYTEC
EIA709/IProuter
L-IP
LIP-3EGT
www.loytec.com
FT-10
EIA709
IP
PG-3
GND
IT Termination Module
PANEL FO
Field

7. Geothermal ground or water source Heat Pumps shall be considered for all heating and cooling administrative and billeting areas. Gas fired furnaces with DX split system air conditioning shall be considered for buildings with cooling load of 10 tons or less. Package air cooled chillier with thermal storage (Calmac® propylene glycol type), hot water boiler and (multi-zone and/or single zone) air handler(s) for system larger shall be considered for buildings with cooling load of 10 tons or larger. The use of natural gas radiant heaters with hot surface ignition, in the apparatus bay and mechanical room shall be used in-lieu-of unit heaters where possible. In the mechanical room(s) gas fired radiant heater(s) with millivolt and standing pilot system shall be used for freeze protection. This type will not require electrical connections and will continue to operate in the event of a power outage.

8. Air conditioning and heating equipment should be industrial grade with a 14 + SEER on the air cooled chiller or air conditioning units and 80 + AFFUE rating with electronic pilot ignition on the boiler or furnace. The condenser coil(s) construction to be copper tube with copper or aluminum fins, all fins to be the flat plate type. Refrigerants shall be one of the fluorocarbon gases. Refrigerants shall have number designations and safety classifications in accordance with ASHRAE 34. Refrigerants shall meet the requirements of ARI 700 as a minimum. Refrigerants shall have an Ozone Depletion Potential (ODP) of less than or equal to 0.05. Equipment needs to be industrial grade clafication.

9. Hot Water Boiler Systems:

9.1 Single building, hot water boiler systems shall be designed to include a hot water storage tank with a minimum size equivalent to one minute of hot water system flow. The designer shall coordinate the incorporation of the tank into the heating system with Design Section.

9.2 Boilers to be the condensing type 97 + AFFUE rating with the associated acoustical and vibration isolation kits. In design utilizing mutable boilers to achieve the heating load requirements primary and secondary pumping and EMCS programming to stage and optimize the boilers efficiency shall be used.

10. Mechanical Wall Louvers:

10.1 Louvers shall be completely specified on the drawings and in only one place in the specifications. Coordinate with the project architect to ensure requirements such as rain tightness, thickness, color, etc. are fully coordinated.

11. Design Coordination:

11.1 Coordination of Mechanical and Structural Designs: Coordination shall be both formal and informal. The mechanical calculations in the design analysis shall include a listing of mechanical equipment loads (weights), loading areas, etc. which have been given to the structural engineer(s). The loading list shall contain information for all devices on each project including fans, VAV or dual duct boxes, piping, air handling units, ductwork (as a standard weight/unit area) and any special mechanical device or equipment. The mechanical and structural designers shall jointly mark up floor plans to show the location of all supported equipment and platforms, mechanical penetrations of roof structures, grade beams, joists, beams, platforms, etc. with the

purpose of ensuring that loading, penetrations, etc. are all accounted for in the design and coordinated. The marked up plans shall not be included in the design analysis "book", but shall be submitted by the structural designer for review at the 90% design level. Of course, any addition or change to the design after 90% design shall require re-submittal of marked up coordination drawings. Note that minimum size of coordination markup drawings shall be 1/2-size or 1/2 of a full size drawing sheet.

11.2 Design of mechanical room(s) shall show equipment locations with their required service areas and paths of travel for removal of equipment. The path of travel shall not require the removal and reinstallation of other equipment.

12. Water Treatment.

12.1 On all systems where water is used for either primary or secondary heating or cooling, equipment and chemicals must be installed for chemical treatment. This applies to both closed and open type re-circulating systems. Unless specifically told otherwise, the designer shall design and install a bypass filter/feeder type water treatment system complete with isolation valves, drain, flow control (calibrate balancing valve with flow measurement taps, etc.)

12.2 The equipment installation will be based upon specific information obtained at the construction site and will be consistent with existing Base or Post treatment methods. Required design information includes data such as a current analysis of Base or Post water.

12.3 Industrial Wastes. All industrial buildings, maintenance shops, or other facilities generating waste water of other than sanitary wastes should be considered for connection of such wastes to an industrial waste sewer, if available. Wastes are to be identified both in characteristics and quantities in the project design analysis.

13. Chillers: Systems 100 tons or less use package chillier where practical, to keep refrigerants out of buildings. Large systems over 100 tons or group of buildings use central Chiller plant with Centrifugal or Absorption. Additionally, indoor refrigeration systems shall provide all design requirements to meet the safety requirements mandated by ASHRAE Standard 15.

13.1 Refrigerants shall be one of the fluorocarbon gases. Refrigerants shall have number designations and safety classifications in accordance with ASHRAE 34. Refrigerants shall meet the requirements of ARI 700 as a minimum. Refrigerants shall have an Ozone Depletion Potential (ODP) of less than or equal to 0.05.

13.2 Chiller tube fouling factors shall be a minimum be 0.001, for both evaporator and condenser bundles. Condenser bundle fouling factors may have to go higher (0.002 or greater) if continuous, extremely dirty open cooling tower sumps or other fouling problems are expected.

13.3 Air-cooled condensing unit and/or air-cooled condenser design. The base entering ambient air design temperature, for air entering the refrigerant condensing coil(s) will be the summer design 0.4%

Occurrence dry bulb from UFC 3-400-02; then 3 to 5 degrees F (1.67 to 2.78 degrees C) shall be added to the 1% dry bulb entering ambient to account for air re-circulation and ground heating affected caused by the building structure, walls, landscaping, roofs, etc. Additionally, with the implementation of force protection requirements, some designs are taking outside air in from above roof penthouses or ventilators, if this is the case, the designer will use the use the 1% Occurrence summer ambient, but add 1 deg F(0.56 deg C) to the air handler, etc. intake temperatures to account for heat pickup from the roof and intake device due to solar heating. This means that designers can’t rely directly on HVAC load and analysis programs to size coil loads for them; Rooftop intake opening, from closest point on roof to lowest portion of the intake shall be not less than 18 inches.

13.4 Chilled water system volume requirements: For each chilled water system, the system must contain a minimum of 4.294 L (4 gallon) of water/ Propylene glycol per ton of chilling capacity, excluding the water volume of the chiller and all load heat exchange devices (coils) in the system. If the system volume as described above does not contain a minimum of 4.294 L/kW (4 gallon/ton), a chilled water storage tank shall be designed to bring the system volume up to a min. of 4.294 L/kW (4 gallon/ton). The chilled water storage tank shall be piped into the chilled water return line upstream of the chiller.

13.5 Provisions will be made for removal of equipment from each chiller for maintenance. Tube bundles will have provisions for easy removal for maintenance, i.e. A-frames or monorails structurally adequate to support the loads and proper distance between system components and walls, etc. to ensure ability to clean, repair, and/or replace tube bundles.

13.5 Package chiller tube bundle and piping shall be heat taped to eliminate freezing problems; Install Propylene Glycol in the system and chiller piping to prevent freezing to the temperature of -8.9°C DB (16°F DB) and programming in the EMCS to cycle the pumps for additional protection.

14. Cooling Towers and Condenser Water Systems:

13.1 To eliminate condenser water pump cavitation problems: First, as a minimum to ensure positive pump priming, the top(s) of the condenser water pumps shall be 3 feet lower than the cooling tower basin water surface. Second, the designer will evaluate the maximum Net Positive Suction Head Required (NPSHR) for the pumps selected (specific manufacturer). Then using elevated cooling tower cell(s) and/or putting the condenser water pumps in a pit, the maximum NPSHR with a safety factor of two shall be provided, that is, the NPSH (Available) shall exceed the maximum NPSHR by at least the safety factor.

14.2 Condenser water pumps and piping shall be heat taped to eliminate freezing problems; Install condenser water pumps in the mechanical room or plant. Install condenser water piping below grade and provide positive drainage for the required above grade portions. Of course, other non-freeze designs are possible. The basic condenser water systems design, including freeze protection shall be discussed and finalized at the pre-design conference.

14.3 Provide one large mesh, duplex strainer on the condenser water main up stream of the pumps. The duplex strainer eliminates strainer cleaning downtime.

14.4 The designer shall detail and show the required condenser water pipe supports to ensure all condenser water piping is supported "independently" from the cooling tower and the cooling tower inlet/balancing valve(s).

14.5 The designer shall provide enough condenser water piping flanged connections to enable piping removal for all tower maintenance, including complete fill replacement and tower cell replacement.

14.6 Cooling towers shall be concrete or stainless steel casing. FRP, Zinc-Coated steel and/or PVC casings are not acceptable, due to short life and environmental concerns.

15. Duct system(s) to be constructed of galvanized sheet metal except for very small amounts of flexible diffuser runouts shall be sheet exterior insulated sheet metal only. Duct liner to be only used as required for acoustical control, use duct wrap or board insulation. Fiber glass duct board system(s) are not acceptable and shall NOT be used.

15.1 Ducting from and to an Air handling unit: Air handling units in mechanical spaces, fan rooms, etc. shall be fully ducted, that is ductwork shall extend from the supply fan outlet connection to the mechanical space wall and beyond to the entire SA duct system; Return Air ductwork shall extend, at least from the mechanical space wall continuously back to the air handler and exhaust and/or relief ductwork shall be ducted from the air handler to the building exterior; Outside air intake ductwork shall be ducted from the building exterior to the air handler.

15.2 Duct Runs:

15.2.1 FITTINGS: Do not use splitters, scoops or extractors. Show manual balancing dampers for all duct runouts and branches on the plans.

15.2.2 FLEXIBLE DUCT: Limit flex duct lengths to 1500 mm (5"-0") and straight runs. Provide hard elbows as required for all bends. Do not use more than one section of flex duct in a single duct run.

15.2.3 Duct liner: Duct liner shall only be used for exterior ductwork and for acoustical purposes; Its used shall be strictly limited due to problems with duct cleaning. Additionally, add to the specifications that duct liner will not "count" toward duct insulation values and requirements (except for exterior(outdoor) internally insulated ducts, ducts shall be insulated the same weather internally lined for acoustics or not.

15.2.4 Duct Seal Classes: Put this in the specifications; This information will both save energy and reduce or eliminate requirements for duct leakage testing: Constant Volume HVAC systems, all ductwork seal class A. Exhaust and ventilation systems, seal class A. VAV HVAC systems –

seal class A to the VAV terminals, then seal class C downstream of the terminals.

15.2. CALCULATIONS:

15.2.1 GENERAL:

15.2.1.1 Do not use static regain for calculating VAV system duct pressure losses.

15.2.1.2 Maximum Duct velocity shall not exceed 2000 feet per minute. This velocity may be too high for good acoustical performance in many cases and must be used with discretion.

15.2.1.3 HAND CALCULATIONS: Provide a hand calculation of the longest duct run for each Air handling unit. Each hand calculation must be accompanied with a sketch showing the duct system, lengths used in calculations, and air quantities entering or leaving the duct system. Calculations should be presented in a point-to-point tabular form and must include both pressure loss and velocity for each duct section in the longest duct run. The calculations must be traceable to the HVAC plans.

15.2.1.4 COMPUTER CALCULATIONS: Provide a sketch showing all nodes. Provide a point-to-point summary of the pressure losses for the governing duct run. The point-to-point summary may be hand written if the software used for the calculations is not capable of providing such a summary.

16. Do not place equipment on the roof. Roof top air handler(s), self contained heating/cooling units, condensing units, air cooled condensers, exhaust fans, supply fans, etc. are not acceptable.

17. Provide make up air quantity equal to exhaust air, which is to include air exhausted from battery rooms and vehicle exhaust systems.

18. Battery rooms, vehicle exhaust systems, and other industrial ventilation systems to meet the requirements of the latest edition of the “industrial ventilation” manual of the American conference of governmental industrial hygienists.

19. Use ASHRAE 15 SAFETY CODE FOR MECHANICAL REFRIGERATION requirements for separation of boilers and air conditioning equipment containing fluorocarbon refrigerant gases.

20. All new building or facility water services shall be metered. Water meters shall be equipped with an electrical pulse (metering) output transducer for connection to an existing base-wide Utility/Energy Monitoring and Control System (U/EMCS). New water lines under existing roads are to be bored. Cutting the road is not acceptable.

20.1 To be useful, the characteristics of the U/EMCS water meter pulse initiator must balance the limitations of the device receiving the pulses (U/EMCS) and the requirements of reasonable metering resolution. Pulse initiators shall provide a maximum of 500 pulses per minute, but not less than one pulse per 100 cubic feet of water. These requirements upon the pulse initiator should be reflected on the contract drawings. The limitation requirements given here are general and vary with the type of existing U/EMCS and a buildings energy consumption, therefore the pulse metering device must be tailored to the design where a base or post has an existing U/EMCS.

20.2 All new building or facility natural gas services will be metered. Gas meters shall be equipped with an electrical pulse (metering) output transducer for connection to a future or existing base-wide Energy Monitoring and Control System (EMCS). New gas lines under existing roads are to be bored. Cutting the road is not acceptable.

20.3 To be useful, the characteristics of the EMCS natural gas meter pulse initiator must balance the limitations of the device receiving the pulses (EMCS) and the requirements of reasonable metering resolution. Pulse initiators shall provide a maximum of 500 pulses per minute, but not less than one pulse per 100 cubic feet of natural gas. These requirements upon the pulse initiator should be reflected on the contract drawings. The limitation requirements given here are general and vary with the type of existing EMCS and a buildings energy consumption, therefore the pulse metering device must be tailored to the design where a base or post has an existing EMCS.

21. HVAC Pipes

21.1 GENERAL:

21.1.1 Pipe Sizing Criteria for hydronic systems:

General piping sizing criteria is a friction loss rate of between 1 and 4 feet per 100 feet of pipe (97.9 to 391.5 Pa/m of pipe) with a best nominal pipe sizing friction loss rate being used of 2.5 feet per 100 feet of pipe (245 Pascals per meter of pipe).

Additionally, to limit piping noise - maximum pipe velocity shall not exceed 4 feet per second (1.219 m/s) for piping 2 inches (50mm) and smaller and shall be sized with a pressure drop per unit length of no greater than 4 ft of water per 100 ft of pipe (392 Pa/m) for piping over 2" (50mm) in size.

21.1.2 Do not use reverse return systems unless the systems served are configured such that no additional piping is required than would be required for a direct return system. Design-Build contractors may use reverse return piping systems at their discretion.

21.1.3 Hand Calculations. Provide a hand calculation of the longest pipe run for each HVAC hydronic system. Each hand calculation must be accompanied with a sketch showing the pipe system, lengths used in calculations, and water quantities flowing into or out of the piping system. Calculations should be

presented in a point-to-point tabular form and must include both pressure loss and velocity for each pipe section in the longest run. The calculations must be traceable to the HVAC plans.

21.1.4 Computer Calculations. Provide a sketch showing all nodes. Provide a point-to-point summary of the pressure losses for the governing pipe run. The point-to-point summary may be hand written if the software used for the calculations is not capable of providing such a summary.

22. MISCELLANEOUS ITEMS RELATED TO EQUIPMENT SELECTIONS AND CALCULATIONS:

22.1 Provide psychometric charts for each air handling system.

22.2 Provide calculations for each fan and pump used. For fans allow for additional (safety factor) pressure losses due to construction tolerances. This is especially true for exhaust systems since exhaust ductwork generally follows the most torturous routing during construction. Also, a reasonable fan static pressure safety factor is also required to enable balancing according to the current testing and balancing specification, which is +10%, -0% for airflows.

22.3 Provide fan curves and pump curves for all fans and pumps. The curves shall show both the fan and system curves.

22.4 Documentation of Equipment Selections in Design Analysis: Provide catalog cuts for major pieces of mechanical equipment (chillers, boilers, air compressors, furnaces, air handlers, condensers, condensing units, pumps, VAV terminals, heat exchanges, water softeners, etc.) for both the 30% and 90% design submittals. If equipment types have radically changed or been added after 90% design, provide catalog cuts for the new or changed equipment. Provide catalog selections from at least 2 viable manufacturers for space planning purposes, with the largest equipment being used for that planning.

22.4.1 Fan Selection: To control fan sound energy generation in conjunction with the acoustical design, fans shall be selected as near to maximum efficiency as possible and adjacent ductwork shall be properly designed to limit turbulence, etc.

22.4.2 Pump Selection: Pumps shall be selected utilizing all required factors of the install/designed situation including flow, total dynamic head, liquid temperature, maximized efficiency, required motor voltage, etc. All of the above considerations are detailed in ASHRAE handbooks. Additionally, pumps shall normally be selected -15% and +5% of the 100% Best Operating Point(BEP) flow and shall be selected well to the right of any point of instability. Finally, pumps for use in variable speed pumping situations shall be selected optimally for energy savings with a pump that has exhibits a pump curve of relative "steepness" to avoid problems of flow control & instability.

22.4.3 Boiler Selections and Documentation in the Design Analysis: Each design shall include complete

documentation of boiler, or other heating source device selection. This will include a summary of all connected loads and flows and allowances added for piping heat losses and pickup allowance. This work shall be done by hand and shall also include manufacturers adjustments for elevation, delivery temperature, ambient temperatures, fuel type, flow rates, glycol solutions, etc.

22.4.4 Chiller Selections and Documentation in the Design Analysis: Each design shall include complete documentation of chiller, or other cooling source device selection. This will include a summary of all connected loads, diversity and flows and allowances added for piping and pumping heat gains, etc. This work shall be done by hand and shall also include manufacturers adjustments for elevation, delivery temperature, ambient temperatures, flow rates, glycol solutions, etc.

23. Computer Energy System Analyses (CESA):

23.1 The CESA shall be a stand alone document which shall contain a summary report for the energy budget analysis and if required, the building mechanical systems and features life cycle cost analysis and selection.

23.2 All buildings and facilities require a computer energy systems analysis (CESA).See appendix SA1 for Energy Conservation Policy - US Army Corps of Engineers.

23.3 THE REQUIREMENT FOR LIFE CYCLE COST MECHANICAL SYSTEMS SELECTIONS IS CONGRESSIONAL AND IS NOT WAIVABLE! THE DECISION AS TO WHICH PROJECTS WILL REQUIRE LIFE CYCLE COST EQUIPMENT SELECTIONS WILL BE MADE BY THE TULSA DISTRICT, MILITARY DESIGN SECTION FOR EACH PROJECT. If a life cycle cost (LCC) study is required, before any work is done, the designer shall formally submit (in writing through the USACOE A/E contract manager) a letter stating which mechanical building systems which are proposed to be studied (min. of 3 competitive systems) for approval by the USACOE, Tulsa Dist., Mil. Design Section; the letter will also include the building systems, which are common to all study alternatives. Systems other than mechanical, such as glazing or wall insulation may also be studied by the designer, however those “other” study category items will not normally substitute for the mechanical systems study alternatives. The study alternatives will be discussed, changed and/or finalized with the designer. The designer, after finalization of the study alternatives with Tulsa Dist. will submit the final alternative choices (written letter format) to the USACOE A/E contract manager for the official file.

23.4 ENERGY BUDGET ANALYSES ARE REQUIRED FOR ALL NEW FACILITIES REGARDLESS OF SIZE AND FOR MOST ADD/ALTERED FACILITIES. THE ENERGY BUDGET REQUIREMENT IS BASIC ARMY/DOD CRITERIA AND IS NOT WAIVABLE! Energy budget studies will ordinarily require a minimum of two separate computer building energy simulations. The first simulation containing the mech. LCC study alternatives and using the “actual” building operation schedule and all process loads. The alternatives energy consumption’s from the first simulation is utilized as LCC input data. After selecting one mech. system alternative, via LCC study, a second simulation is run using the chosen system, no process loads and a predetermined operation

schedule. The predetermined schedule and no-process loads allow comparison of the results of the second simulation with target energy budget figures. The target figures and predetermined occupancy schedules by occupancy/function are given in either AF ETL 94-4, Energy Budget Figures (EBFs) for Facilities in the Military Construction Program (U.S. Air Force projects) or the USACOE Architectural and Engineering Instructions (AEI), Chapter 11 (U.S. Army Projects).

23.5 Copies of a sample CESA summary report are available to the designer through the USACOE A/E contract manager.

23.6 Complete manual calculations shall be submitted to show compliance with the max. allowable overall U-factor requirements for walls, roofs and floors. The max. allowable overall U-factors shall be those shown in AF ETL 94-4, attachment 6 (Air Force Projects) or U.S. Army Corps of Engineers, Architectural and Engineering Instructions Design Criteria, Chapter 11, Table 11-4A Building Envelope Component Guidelines (Army Projects). Manual calculations shall follow the procedure of ASHRAE 1993 Fundamentals Handbook, Chapter 22, page 22.12, in the paragraph on U-overall Concept.

24. Acoustical analyses:

24.1 A complete acoustical analysis will be required for mechanical ducted and unducted fan systems (room noise levels due to duct-borne noise) and for noise from mech. equipment transmitted through building surfaces to critical spaces/areas. Critical spaces are, occupied spaces next to mech. rooms or rooms next to outside equipment, rooms affected by jet noise, etc. Determination of which room(s) is(are) critical on a duct system is not always obvious and may require the designer to analyze multiple paths, to initially identify the critical room(s). For duct-borne noise, use procedures in the ASHRAE Fundamentals Handbook. For noise and vibration transmitted through building surfaces and structure, use Army Technical Manual TM 5-805-4, Noise and Vibration Control for Mechanical Equipment including submittal of all required calculation forms.

25. Acoustical analysis requirements are referenced in the SWD-AEIM. The SWD-AEIM references the Southwestern Division (SWD) criteria letter of 6 February 1997. A copy of the criteria letter may be obtained via the USACOE A/E manager.

26. The Mandatory Computerized Energy Systems Analysis (CESA) and Report Requirements: The CESA is comprised of studies, analyses, and reports for facilities energy conservation (Energy Usage, Conservation & Budget) and Life Cycle Cost Equipment Selection/Analysis (LCCA). The CESA incorporates all life cycle cost analyses (LCCA) and reports in an attempt to determine the best method to provide the most life cycle cost and energy effective building for our customers. In general, LCCA for a facility includes selection of building features as alternative HVAC systems (plant and/or building, building surfaces insulation levels or more efficient lighting systems. Selection of systems and features to study is guided and governed by the Corps District and will normally include 3 alternatives for each building feature studied. Energy Usage, Conservation and Budget entails reporting that the features, systems, etc. of the facilities meet mandatory limits imposed by ASHRAE standard 90.1 and EPACT 2005.

26.1 Energy and Study Criteria; if a date or version for criteria is not given, then the latest adopted or authorized version or edition is to be utilized. If the designer has a question, call the District Office for clarification:

26.2 The guiding document for energy conservation and life cycle cost selection is the Unified Facilities Criteria (UFC) 3-400-01 which references the following basic criteria. Note that the UFC has been coordinated, signed and released for use by all 4 military services:

26.3 Overall energy criteria: The energy criteria and goals can vary dependent upon the type of project, Model RFP/Modularity or stand project (milcon, POCA, O&M, etc.), see the following paragraphs:

26.3.1. Refer to Engineering and Construction Bulletin No. 2005-20 and EPACT 2005, http://www.wbdg.org/ccb/ARMYCOE/COEECB/ecb_2005_20.pdf

26.3.2. Model RFPs for Army modularity projects require:

The Model RFP basically states the following, energy conservation strategies and HVAC and lighting systems selections shall achieve at least 30% energy savings over ANSI/ASHRAE/IESNA Standard 90.1-2004. Selection of solutions and technologies to achieve energy performance requirements shall be based on life cycle cost analysis. Some ways/best practices to achieve these requirements are listed in the Advanced Energy Design Guide: Small Office Buildings (ANSI/ASHRAE/IESNA).

UFC 3-410-01FA states "ENERGY COMPLIANCE ANALYSIS. In order to comply with the Energy Policy Act of 2005 (EPAct 2005), designs must achieve energy consumption levels that are a minimum of 30 percent below the level required by ASHRAE Standard 90.1. To demonstrate compliance with the EPAct 2005, the designer shall prepare an Energy Compliance Analysis (ECA) that includes a narrative of the path taken to demonstrate compliance (including reference to each paragraph in ASHRAE 90.1 that make up the proposed compliance “path”; identification of any software used to prepare calculations, input to and output from all calculations (with adequate explanation so that a reviewer can understand what all of the data means); a description of each energy conservation feature or change considered and the corresponding impact that it had on calculated energy consumption; and a description of the design proposed as a result of the ECA along with its calculated energy consumption".

All other projects shall meet the 30% energy reduction within project budget and if life cycle cost effective. Obviously, this will require computerized hourly energy analyses and life cycle cost analyses all of which will need to follow the standard procedures and criteria herein above for such studies and reports, etc. One large item to note, if budgets do not allow, the energy savings goals are not to be completely abandoned, instead save as

much as possible within budget and life cycle cost effectiveness.

UFC 3-400-02, Engineering Weather Data

ASHRAE Handbook of Fundamentals, American Society of Heating Refrigeration and Air Conditioning Engineers, Inc., Atlanta, Georgia

Title 10 Code of Federal Regulations, Part 436 – Federal Energy Management and Planning Programs, Subpart A – Methodology and Procedures for Life Cycle Cost Analysis

ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings, User's Manual, American Society of Heating Refrigeration and Air Conditioning Engineers, Inc., Atlanta, Georgia

ASHRAE Standard 62.1, Ventilation for Acceptable Indoor Air Quality

UFC 3-400-01 describes basic criteria and procedures for CESA for the USACOE Districts and their Contractors. The CESA shall be a stand alone document, provide all analysis input, output, assumptions, sketches, reduced floor plans, etc. to support the calculations, analyses and reports. The requirement for a CESA is mandatory for all projects to implement congressional requirements and as such is not waivable (see Appendix SA1 for Energy Conservation Policy), but required work varies by project or facility based upon size and complexity. The requirement for life cycle cost building systems and features selection is congressional and cannot be waived, even by a project or technical manager. Decisions as to which or any systems or features are worthy of study will be made by the District office, Military Design Section for each project. Design-Build projects will normally indicate which studies are required and which systems shall be studied; refer to the RFP. The Architect-Engineer A/E firm shall submit a written list with a minimum of 3 equivalent and competitive mechanical systems and perhaps some other building features for review and approval. No studies shall proceed without prior District approval of the intended building systems and features. The Designers should note that the UFC relies on ASHRAE standard 90.1 to ensure compliance with federal energy guidelines and reduction targets.

26.3.3. Mandatory and Suggested Software Tools and Forms: Energy Conservation, LCCA and HVAC/Energy Analysis Software Tools:

For building load and energy analyses, choose one from the following approved:

Building Loads and System Thermodynamics (BLAST), Trane TRACE, Carrier Hourly Analysis Program (HAP); Please take note; it is mandatory that all software used shall be the latest versions/subversions for MS® Windows.

For life cycle cost analyses, choose from the following mandatory software for data input, output and reports:

Life cycle costing shall be in accordance with Title 10 Code of Federal Regulations Part 436, Subpart A. The life cycle costing program to be utilized and in full compliance with the Federal Regulation and updated with the latest economic factors is the Building Life Cycle Costing (BLCC) program available from the National Institute of Standards and Technology. The Department of Energy's building energy tools web site has a link to BLCC (under Energy Economics) and it can also be found at http://www.eren.doe.gov/femp/techassist/softwaretools/softwaretools.html . For LCCA, the designer shall include LCCA alternative costs based upon actual equipment and materials involved, not just a "stock" cost per unit floor area time floor area.

To report Energy Usage, Conservation and Budget:

The A/E may be allowed to utilize manual means, as in forms from ASHRAE std 90.1 or software, as provided by DOE, RES check (for residential building energy code compliance) or COMcheck• EZ (for Commercial Building Code Compliance); COMcheck• EZ is the software that would normally be applied to COE projects. Currently, the software is available at web location, http://www.energycodes.gov/ The designer must get permission to utilize the above in lieu of CESA (computerized energy runs, life cycle costing, etc.) so do not assume that you can use these programs without permission.

26.3.4. Required Manual Calculations with the CESA: Manual calculations and sketches shall be provided for building surfaces U-factors, R-Values and surfaces weights/unit area as part of the reported input to any energy analysis; the calculations shall follow the procedure of ASHRAE Fundamentals Handbook, for detailed calculation of overall corrected U-factors and shall include all thermal holes, thermal ties, etc. Additionally, exterior thermal air film resistance coefficient used for R value calculations for wall sections shall be a maximum of 0.17 sq ft-deg F-hr/BTU. Additionally, provide listings or spreadsheets showing building internal loads by space, user occupancy schedules, etc. All of these calculations will be part of the CESA report but shall also be used for normal HVAC load analyses.

26.3.5. CESA Report: Caution – The CESA is a stand-alone document and will NOT be bound with the design analysis or regular calculations; Additionally, it required to be complete at the first review submittal (normally 35% or 60% design) and will be updated and resubmitted if significant (as determined by the District) changes are made in the facility after the first design submittal . The A-E shall provide a summary report for the CESA listing all pertinent data on the project, the purpose of the study, study alternatives description, software packages used, any noteworthy input data (user occupancy schedules,

etc.) and results of energy analysis and/or LCCA. The summary report shall be submitted in both hard and software copies (MS Word). In addition to the summary report, the A-E may submit the entire CESA Adobe "PDF" or MS Word format; however hard copies shall always be required. The rest of the CESA report for shall include all input and output for energy and HVAC load analysis, LCCA analysis software inputs and output reports, Energy Usage, Conservation and Budget input and output reports, Manual Calculations and any other supporting data, drawings, sketches, etc. that may be deemed necessary.

27. Mechanical Equipment Vibration Isolation Design. All designs will incorporate vibration isolation drawing and/or specification provisions. It is preferable to put the vibration isolation requirements on the drawings for archival purposes. Designers shall incorporate a complete vibration isolation design in the form of drawing notes, details, and tables (isolation static deflection, isolation type required, etc.) for all mechanical equipment. The design shall be based upon the pre-designed (canned) recommendations, notes and text given by Army TM 5-805-4 (AFM 88-37), Noise and Vibration Control for Mechanical Systems. Design for items not covered by TM 5-805-4 will be accomplished by the design A/E or Design-Build contractor.

28. New sewer lines under existing roads are to be bored. Cutting the road is not acceptable.

29. Show all dimensions in English as well as SI.

# Maintainability Design

1. General - Reuse of Existing Material. Caution must be exercised in the planned reuse of any existing materials (or materials that are to be Government-furnished equipment). In the time period between project inception/design and actual construction, either the condition of the material, or its availability may change. For major items of equipment, both show where they are located/stored. Additionally, specify by manufacturer's nameplate data exactly which items are to be used and their condition, which shall be verified by the contractor.

2. Corrosion Control.

   2.1 Cathodic Protection.

   2.1.1 Apply cathodic protection on all buried or submerged ferrous piping, tanks, structure and related facilities. Under no circumstances will coated facilities be installed without cathodic protection. This requirement includes ferrous materials such as cast iron.

   2.1.2 All cathodic protection designs must be based upon specific field tests made at the construction site. Tests shall include soil resistivity and water conductivity.

   2.2 Water Treatment.

   2.2.1 On all systems, where water is used for either primary or secondary heating or cooling, equipment and chemicals must be installed and maintained for proper chemical treatment. This applies to both closed and open type re-circulating systems. The RFP or drawings and/or specifications require the contractor to follow water treatment regimes required by the Base or Post during construction.

   2.2.2 The equipment installation will be based upon specific information obtained at the construction site and will be consistent with existing Base or Post water treatment methods. Required design information includes data such as a current analysis of Base/Post water, favored or mandatory treatment chemical systems, etc.

3. Air Conditioning Systems, Chillers, and Air Handling Units.

   3.1 Provisions will be made and dedicated space allocated for removal of equipment for maintenance. Tube bundles will have provisions for easy removal for maintenance (i.e., A-frames or monorails structurally adequate to support the loads and proper distance between system components and walls, etc.) to ensure ability to clean, repair, or replace tube bundles. Normally, a minimum of 30-inches space around all items of equipment shall be maintained. Dedicated maintenance space and height shall be shown on all plan and elevation drawings.

   3.2 For water cooled equipment such as chillers, install duplex plant cooling tower water strainers so that they may be cleaned without plant shutdown.

4. Electrical.

4.1 Use fully enclosed pad-mounted transformers in-lieu-of pole mounted types (where size is available and economics dictate). Insure sufficient clearance for access to drain plugs and front clearance for maintenance and switched isolation, etc.

4.2 Ensure adequate clear space around electrical equipment in accordance with the National Electrical Code.

5. Liquid Fuels and all Other Piping Systems (Above and Below Grade).

5.1 Pipelines and Hydrants. All designs and installations must ensure that maintenance personnel will be able to physically perform routine tasks with tools and equipment readily available on Base/Post. Items of consideration should include:

5.1.1 Assuring that parallel or crossing pipelines are at least 1-foot apart to permit repair and/or equipment use in between the pipes. Large diameter pipes require even greater separation.

5.1.2 Providing fueling hydrant outlet pits or equipment pits large enough for tool use in the pit while replacing or maintaining valves, flanges, pumps, nut and bolts, e.g., to perform gasket replacement, etc.

5.1.3 Assuring that sufficient flanges, unions, etc. are installed to permit ease of pipe and equipment repair or replacement, e.g. pipe cutting or welding would not be permitted in a pump house, therefore, flanged piping is required.

5.1.4 Providing sectionalizing valves in piping systems to shut down piping sections for repair, maintenance and pressure testing.

5.2 Fuel Storage Tank Area Considerations and Welding.

5.2.1 Dikes or basins around storage tanks must be designed to allow tank cleaning, maintenance and repair equipment to be easily transported into the diked area. This includes providing clear access to the tank manholes without climbing over piping.

5.2.2 Clearance must be provided between parallel buried tanks or other structures so that each tank can be easily excavated and removed, e.g., tanks may be too close together for mechanized equipment use.

5.2.3 Welding. All welding will be performed by a welder certified in accordance with ANSI B31.1 Power Piping or API 1104 Welding of Pipelines and Related Facilities codes. Welds must be made and inspected in accordance with ANSI B31.8 Gas Transmission and Distribution Piping Systems requirements. No welding on any contract shall be allowed without the required Base or Post welding permit being issued to the contractor.

6. Sanitary Utilities and Systems.

6.1 Water.

6.1.1 Ensure all equipment (HVAC systems, fire sprinklers, etc.) connected to potable water supplies cannot cause across-connection/back-flow hazard. Provide properly selected back-flow preventers, where required, as specified for the degree of hazard.

6.1.2 Irrigation/sprinkler systems served by potable water systems must include a suitable back-flow preventer to protect the potable water supply.

6.1.3 Backflow prevention devices shall be shown and installed between 1 and 3 feet above the finished ground floor to allow for maintenance and testing.

6.2 Industrial Wastes.

6.2.1 All industrial buildings, maintenance shops, or other facilities generating waste water of other than sanitary wastes should be considered for connection of such wastes to an industrial waste sewer, if available. Wastes are to be identified (both in characteristics and quantities) in project design analysis.

6.2.2 Materials for industrial waste drains, sewers, tanks, pumps and other features must be carefully selected for suitability with the worst-case expected waste characteristics. Once selected, these materials must be clearly and thoroughly specified in the project specifications. Also, substitutions shall be prohibited, both in the specifications and during the contractor submittal reviews.

7. Service and Maintenance Access Space, Doors, Etc.

7.1 Designers shall show dedicated service or airflow space (including a minimum height above floor or grade) and a note(s) shall be added to the drawings to preclude a contractor from installing anything (including larger types/manufacturer’s versions) other than the equipment for which the access space is being shown. Encroachment upon dedicated access space shall constitute a variance from the contract requirements.

7.2 Service access panels or doors of ample size for complete maintenance shall be shown for all valves, water hammer arrestors, controls, etc. which are concealed behind walls, ceilings or floors. The access doors or panels shall be shown on the contract drawings by mechanical and electrical designers as well as by the project architect. Service access panels or doors shall be labeled as to the type of services contained behind the panel or door.

# ENERGY AND SUSTAINABLE DESIGN

1. General. Energy conservative facilities designs are the rule. This will be accomplished through passive solar techniques, building insulation and many other means to meet military and commercial construction criteria and goals; some positive means of savings are by selection of mechanical and electrical equipment which is the lowest life-cycle cost, use of high-efficiency motor specifications, etc.

   1.1 Life-cycle cost analyses will be completed to determine the best capital asset investments to reduce the total ownership cost of facilities; improve energy efficiency and water conservation; provide safe, healthy and productive built environment; promote sustainable environmental stewardship; and reduce environmental impact/footprint of operations in accordance with AR 415-15. Life-cycle cost means the total cost related to energy conservation measures of owning, operating, and maintaining a building over its useful life as determined in accordance with 10 CFR part 436 (reference Federal Register). This policy applies worldwide to all construction activities on permanent Army Installations, Army Reserve Army Readiness Centers, and Armed Forces Reserve Centers, regardless of funds source.

   1.2 New Construction existing policy requiring all vertical construction projects will climate control to achieve a minimum of the Silver level of the Leadership in Energy and Environmental Design (LEED) for new construction per the U.S. Green Building Council (USGBC) rating system. Horizontal construction (e.g. ranges, roads, and airfields) will incorporate sustainable design features to the maximum extent possible.

   1.3 Existing Buildings all major renovation and repair projects exceeding $7.5 million (requiring congressional notification) shall incorporate sustainable design features where life-cycle cost effective to achieve a minimum of the Certified level of the LEED Existing Building rating system. The installation Director of Public Works or Reserve Component equivalent, supporting Engineer District, designer of record, and/or the prime construction contractor will jointly verify the final LEED score and rating. USGBC certification is not required.

   1.4 The main energy criteria for most of our construction is ASHRAE standard 90.1. And other criteria that influence the design are as follow:

      1.4a Memorandum, DASA (I&H), 5 Jan 06, subject: Sustainable Design and Development Policy Update – SpiRiT to LEED Transition.

      1.4b AR 415-15, Army Military Construction and Non-Appropriated Funded Construction Program Development and Execution, 12 Jun 06.

      1.4c Energy Policy Act of 2005, 8 Aug 05.

      1.4d DoDI 4170.11, Installation Energy Management, 22 Nov 05.

1.4e Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings, Memorandum of Understanding, 6 Mar 06.

1.4f Federal Register, Vol. 71, No. 232, Rules and Regulations, 4 Dec 06.

1.4g Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management, 26 Jan 07.

See mechanical design section for implementation and reporting requirements for designers.

2. Solar Systems Design.

2.1 Active solar systems design criteria and requirements are listed in the most current copy of the Southwestern Division –Architectural and Engineering Instructions Manual (SWD-AEIM).

2.2 Currently, active solar heating systems are economically feasible and cooling systems economically feasibility is questionable. However, designers are required to "fill out" and submit the form on the following page within their 35% mechanical design analysis calculations package. Solar

3.0 Sustainable Design for the Army & LEED.

3.1 LEED: All design disciplines will normally have input to completion of holistic design and completion of a LEED analysis, using the LEED rating systems and guidelines to meet the current min. LEED certification level; current minimum goal for all projects varies, so refer to the design or design-build contract; reference for LEED is, http://www.usgbc.org/ .

3.2 Sustainable Design and Development reference website, http://www.cecer.army.mil/SustDesign/ . Sustainable design is important to the US Army, DOD, the nation and world for the following reasons, sustainable design is to be incorporated to the maximum extent possible within the given budget; additionally, requirements for sustainable design vary by installation and so should be researched at the start of design with facility representatives:

3.2.1. Meets the needs of the present without compromising the quality of life of future generations.

3.2.2. Maintains economic growth while producing an absolute minimum of pollution, repairing environmental damages of the past, producing less waste, and extending opportunities to life in a pleasant and healthy environment.

3.2.3. Meets human needs by maintaining a balance between development, social equality, ecology, and economics.

3.2.4. Demands systematic considerations of environmental impact, energy use, natural resources, economy, and quality of life.

3.2.4. Has optimal benefit only when addressed at the inception of a project, and throughout the entire life cycle of a project

-- from concept to planning, to programming, design, construction, and ownership.

## APPENDIX

PRESCRIBED TEMPERATURE

| AREA | HEATING TEMPERATURE RANGE | COOLING TEMPERATURE RANGE | DOMESTIC HOT WATER TEMPERATURE |
|---|---|---|---|
| Family Quarters | 65-70 | 76-80 | 95 |
| Troop Living | 65-70 | 76-80 | 95 |
| Administrative Areas | 65-70 | 76-80 | 95 |
| Classrooms | 65-70 | 76-80 | 95 |
| Dining Facility | 65-70 | 76-80 | General use 140<br>Pre-wash 160<br>Final rinse 180 |
| Recreation | 65-70 | 76-80 | 95 |
| Motor Pools | 50-65 | Not applicable | 95 |
| Dental Clinics | 70-75 | 70-75 | 140 |
| Medical Clinics | 70-75 | 70-75 | 140 |
| Child Care | 70-75 | 70-75 | 95 |
| Operating Delivery | 70-75 | 65-70 | 140 |
| Intensive Care | 75-80 | 70-75 | 140 |
| Warehouse | 55 | Not applicable | 95 |

1. Energy and Utilities

1.1 The Energy Policy Act (EPAct) of 2005 (Public Law 109-58), signed into law on August 8, 2005, establishes various energy management and conservation goals for all federal agencies. Executive Order (EO) 13423, signed and executed by President Bush on January 24, 2007 reinforces and strengthens those goals. Focus garrison efforts on complying with the following four key provisions of the EPAct of 2005 and EO 13423:

1.1.a Reduce total facility energy consumption by 3% per year thru FY 2015 with the goal of a 30% reduction relative to the garrison's FY 2003 baseline for energy intensity.

1.1.b Reduce the garrison's total water consumption by 2% per year beginning FY 2008 relative to the garrison's FY 2007 usage baseline with a goal of 16% reduction by FY 2015.

1.1.c Increase use of renewable energy to meet the goals of using not less than:

- 3 percent of renewable energy in FY07 - FY09
- 5 percent of renewable energy in FY10 - FY12
- 7.5 percent of renewable energy in FY13 and thereafter

1.1.d Procure only energy efficient products (e.g. computers, peripherals, mechanical equipment, washers, etc.) as listed by Energy Star© or designated as such by the Federal Energy Management Program (FEMP).

1.2 More details on the Energy Policy Act of 2005, Executive Order 13423, and Energy Star Program can be found at:
http://www1.eere.energy.gov/femp/about/legislation_epact_05.html
http://army-energy.hqda.pentagon.mil/programs/energy_star.asp

**ACTIVE SOLAR HVAC SYSTEMS ANALYSIS REPORTING FORM**

1. Project Number and Fiscal Year:

2. Project Name:

3. Project Location:

4. Design Agency:

5. Designer:

6. Fuel Type(s):

7. Fuel Cost in $/MBtu and $/Mjoule[1]:

8. Fuel Cost For 25 Year Payback (from Generic Solar Study) in $/MBtu and $/Mjoule*:

9. U.S. Bureau of Census Geographic Region:

10. Date of Generic Solar Study Referenced:

In accordance with SWD Criteria Letter V-1-191, an active solar analysis for this project indicates active solar is (not feasible) (requires further analysis as given herein).

[1] The M symbol indicates Mega prefix for 1 X $10^6$.

# PLUMBING DESIGN

1. Domestic Water:

   1.1 Ensure all equipment (HVAC systems, fire sprinklers, etc.) connected to potable water supplies cannot cause cross-connection/back flow hazard. Provide properly selected back flow preventers where required as specified for the degree of hazard.

   1.2 Reduced Pressure Back flow Preventers (RPBP) shall be installed between 12 inches and 36 inches above finished floor, while providing 30-inches clear access space (maintenance and testing) in front of the RPBP. Also, the designer shall include a drain pan, piped to a floor drain below the RPBP isolation chamber to catch water discharges.

   1.3 Plumbing shall be designed to meet the National Standard Plumbing Code-Illustrated by National Association of Plumbing-Heating-Cooling Contractors.

2. Domestic water piping, above the slab, to be type “L” or “K” copper tubing. The use of plastic pipe (Schedule 80, PVC or CPVC), plastic fittings and solvent welded plastic will be permitted provided that the Contractor takes measures to minimize the exposure of the pipe and fittings to ultra violet (UV) light. This protection should be, as a minimum, covering the pipe and fitting with shade material while in storage or transit. Domestic water piping, below the slab, to be type “L” or “K” insulated copper tubing with all joints above the slab.

3. Sanitary sewer piping to be cast iron below slab. The use of plastic pipe (Schedule 40, PVC), plastic fittings and solvent welded plastic will be permitted provided that the Contractor takes measures to minimize the exposure of the pipe and fittings to ultra violet (UV) light. This protection should be, as a minimum, covering the pipe and fitting with shade material while in storage or transit. Cast iron, copper, or stainless steel to be used above the slab. Plastic pipe (PVC or CPVC) can be used above the slab except where exposed to the exterior. PVC pipe used below the slab shall be bedded in non-expansive fill material a minimum of 6-inch to 8-inch in all directions.

   3.1 Floor drains shall be channeled to the appropriate sewer system (industrial or storm) based upon a water quality study determined by the designer with concurrence of the design agency (USACOE). Floor drains should be connected to an industrial waste line, if available and appropriate. Where no industrial waste system exists, other arrangements will be made, such as an oil/water separator, thence to sanitary sewer system, etc. Disposition of wastes from a facility should be discussed at the pre-design meeting.

   3.2 Depth of cover for sanitary sewers shall be at least 30 inches (760mm) to protect the pipe from superimposed live loads of ordinary traffic.

4. Use wall hung fixtures on carriers where possible. Floor drains shall be channeled to the appropriate sewer system (industrial or storm) based upon water quality study determined by the designer with concurrence of the design agency. Floor drains should be connected to an industrial waste line, if available. Where no industrial waste system exists, other

arrangements will be made, such as oil/water separator thence to sanitary sewer system, etc. Disposition of wastes from a facility should be discussed at the pre-design meeting.

5. Domestic hot water to be produced by instantaneous type heaters where possible. Electric powered heaters may be used for location with very low usage.

6. Industrial Wastes:

6.1 All industrial buildings, maintenance shops, or other facilities generating wastewater of other than sanitary wastes should be considered for connection of such wastes to an industrial waste sewer, if available, if not then pre-treat the wastewater before disposal into the sanitary sewer. Wastes are to be identified both in characteristics and quantities in project design analysis.

6.2 All industrial buildings, maintenance shops, or other facilities generating storm water runoff, should consider collection of such wastes water and the processing of it through an oil water separator before disposal into the sanitary sewer.

6.3 Materials for industrial waste drains, sewers, tanks, pumps and other features must be carefully selected for suitability with the worst case expected waste characteristics. Once selected, these materials must be clearly and thoroughly prescribed in the project specifications. Also, substitutions should be prohibited—both in the specifications and during the contractor submittal reviews.

7. Service/Maintenance Access Space, Doors, Etc.

7.1 Designers shall show dedicated service or airflow space including a minimum height above floor or grade and note(s) shall be added to the drawings to preclude a contractor from installing anything, including larger types/manufacturers versions of the equipment for which the access space is being shown.

7.2 Service access panels of ample size for complete maintenance shall be shown for all valves, water hammer arrestors, controls, etc. which are concealed behind hard walls, ceilings or floors. The access doors shall be shown by mechanical and electrical designers as well as by the project architect.

8. Natural Gas Systems.

8.1 Regulators. All distribution regulator sets must be installed with:

8.1.1 Regulators that do not fail in the "valve open" position, that is, do not use pilot-loaded regulators, since they fail open.

9. New utility lines (natural gas, water, sewer, etc.) under existing roads are to be bored. Cutting the road is not acceptable.

10. Show all dimensions in English as well as SI.

# FIRE PROTECTION DESIGN

1. Means of egress will comply with NFPA 101 Life Safety Code.

2. Fire separations will meet Uniform Building Code (UBC) and NFPA 101.

3. Fire protection designs will be governed by Fire Protection Engineering for Facilities (UFC 3-600-01), NFPA 13 (plus any other applicable NFPA codes), all applicable Air Force or Army design manuals/criteria and the authority having jurisdiction (base or post Fire Marshal).

4. Fire protection sprinkler systems containing “water only” should have double check valve back flow preventers. Systems containing antifreeze or other hazardous chemicals require a reduced pressure type back flow preventer.

5. Sprinkler system design will normally be by performance specification. One exception is aircraft hangar(s) which will be a complete design by the A/E.

6. Adequacy of water supply for fire suppression systems will be determined at or before the 30% design level. Requests for flow tests should be sent (in writing) to the project manager before the 10% design level.

# CIVIL DESIGN

1. ***Storm Drains***: Use concrete pipe, reinforced concrete pipe, ductile iron pipe, or high strength vitrified clay pipe for storm drains, culverts, etc. Smooth interior corrugated polyethylene pipe may be used for storm drains in areas with light weight vehicle traffic such as POV parking lots. Do not use PVC pipe because it becomes brittle. Soils at Ft. Sill are highly corrosive. Do not use steel or corrugated galvanized steel pipe.

2. ***Domestic Water***: Water service is owned and operated by American Water Enterprises. All domestic water lines and components 5 feet outside building line must conform to American Water Enterprises' specifications.

3. ***Sanitary Sewer***: Sanitary sewer service is owned and operated by American Water Enterprises. All sanitary sewer lines and components 5 feet outside building line must conform to American Water Enterprises' specifications.

4. ***Natural Gas***: Natural gas service is owned and operated by Oklahoma Natural Gas Company. All natural gas lines and components 5 feet outside building line must conform to Oklahoma Natural Gas Company specifications.

5. ***Foundations:*** Soils at Ft. Sill are highly expansive clay soils, mostly CH soil classification. Floating slabs are prohibited. Use ribbed mat foundations or structural slabs with voids between the slab and the ground supported by piers and grade beams.

6. ***Existing Roads***: Cutting existing pavement for utilities is not acceptable. Bore under all roads.

7. ***Drainage***: Ensure positive drainage away from buildings.

8. ***Dimensions***: Show all dimensions in English as well as SI.

9. Civil design shall be in accordance with the SWD-AEIM, the U.S. Army Corps of Engineers, Architectural and Engineering Instructions (AEI) and all applicable Air Force or Army design criteria (tech. manuals, engineering tech. letters, etc.)

# Landscape Architectural Design

1. Irrigation/sprinkler systems served by potable water systems must include a suitable back-flow preventer to protect the potable water supply.

2. On projects requiring sprinkler system installation, the sprinkler system designer will coordinate the location of the irrigation controller (provide space on the wall in mechanical or electrical space) and will coordinate the location of the outside water stub out, if a contractor designed-performance-type specification for the sprinkler system is to be used. Finally, if an interior reduced pressure back-flow preventer (dedicated to the sprinkler system) is required, coordinate the location and installation with the mechanical designer.

3. Landscaping. Landscaping material considerations should be influenced by low maintenance, geographic suitability, disease and insect resistance, and Base or Post criteria. Other considerations would be year-round color or effect, mature size for the location planted, coordination with and balance of the building, and litter of fruit or seeds on sidewalks or parking areas and any possible interference of litter with mechanical equipment which is to be avoided.

# Electrical Design

1. All project designs shall be in accordance with the latest edition of the National Fire Protection Association Standard No. 70, which is also known as the National Electrical Code.

2. All new building services shall be metered; types and details may be specified for each individual design (in the RAMP or RFP or at the pre-design meeting). Meters shall all be checked under load by a qualified meter technician.

3. Meters, instrument transformers, and all other utility systems shall be compatible/suitable and connection, via a pulsing or similar transducer, to the existing Base/Post-wide Utility/Energy Monitoring and Control System (U/EMCS) unless it is stated in the RFP or design scope of work that they will not need EMCS provisions.

To be useful, the characteristics of the U/EMCS electrical meter pulse initiator must balance the limitations of the device receiving the pulses (U/EMCS) and the requirements of reasonable metering resolution. Pulse initiators shall provide a maximum number of pulses per KWH up to 500 per minute, but not less than one pulse per KWH. These requirements upon the pulse initiator should be reflected on the contract drawings. The limitation requirements given here are general and vary with the type of existing U/EMCS and a building’s energy consumption, therefore, the pulse metering device must be tailored to the design of the existing EMCS.

4. New fire alarm transmitters and annunciators shall be compatible with and connected to the existing Base or Post alarm system.

# AS-BUILT DRAWINGS, OPERATION and MAINTENANCE MANUALS

1. Operation and Maintenance Data

Six manuals listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance, at least 14 days prior to field training. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment.

2. As-Built Drawings

As-built drawings, at least 14 days, but not more than 90 days after completion. The Building and Mechanical System Drawings shall be updated to reflect as-built conditions after all related work is completed and shall be on reproducible full-size mylar film (one set) and CAD (one set in Micro Station “DGN” format on CD(s) or 3-1/2” Double Sided, High Density Diskettes.

# Supplemental Appendices

# SA1

## Information on Life Cycle Cost and Energy Studies and the Legal and Policy Basis for Them

# Engineering Bulletin

**No 94-01** **Issuing: CEMP-ET** **Issue Date: 28 Jan 94**

SUBJECT: Life Cycle Cost Studies in Design

Applicability: INFORMATION

1. Reference Enclosure 1, HQUSACE, CEMP-ET, letter dated 11 December 1992, Subject: Energy Conservation Policy, and Enclosure 2, EIRS Bulletin No. 91-05, dated 31 May 1991, Subject: Planning and Engineering Studies.

2. The enclosures explain legal requirements for performing life cycle cost (LCC) analyses in design and provide information in order to facilitate ease of compliance. Although these directives help to minimize the burden for complying with LCC requirements some confusion remains over the extent and depth of analyses required.

3. Designers are responsible to determine the most LCC effective selection from among the viable alternatives available. Designers also are responsible to minimize the level of effort necessary in arriving at that determination. The following should be considered whenever a LCC analyses is anticipated:

a. Make maximum use of previous or generic LCC analyses. Revise only as necessary to apply to a new design or situation. Do not generate a new LCC analyses unless absolutely necessary for the application.

b. Don't perform a LCC analysis if the best viable alternative is obvious to the designer. Just document the project file.

c. Don't perform a LCC if the cost of the study exceeds the possible benefits derived. Just document the project file.

d. Only consider viable alternatives that will provide good performance, meet the functional requirements of the building, and meet the needs and expectations of the customer. For example, don't consider a heating and cooling system with complex controls if the installation does not have a reasonable capability for providing maintenance after it has been installed. If only one viable alternative exists, there is no further need to consider a LCC analyses.

SUBJECT: Life Cycle Cost Studies in Design

Applicability: INFORMATION

4. In applying the principles of life cycle cost analyses, common sense and the capabilities of designers should be combined to arrive at the most feasible and economic selection for the application at hand.

5. The point of contact for this subject is Mr. Dan Gentil, HQUSACE, CEMP-ET, 202-272-8622 (Autovon 285-8622).

2 Encls

RICHARD C. ARMSTRONG, P.E.
Chief, Engineering Division
Directorate of Military Programs

CEMP-ET (1110) 11 December 1992

ATTENTION OF:

REPLY TO:

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Energy Conservation Policy

1. The enclosed memorandum provides current information on energy conservation directives, the legal and policy basis for those directives, and information on compliance.

2. Recent directives, including Presidential Executive Order 12759 and P.L. 102-486, have placed renewed emphasis on the energy conservation program and have established new energy reduction goals. The issues concerning energy conservation are directly related to serious environmental problems and will continue to be of prominent concern in the years ahead. Continued support and participation in the energy conservation effort will best prepare us to meet these challenges.

3. The point of contact for this guidance is Mr. Dan Gentil, HQUSACE, CEMP-ET, 202-272-8622.

FOR THE DIRECTOR OF MILITARY PROGRAMS:

Encl

RICHARD C. ARMSTRONG, P.E.
Chief, Engineering Division
Directorate of Military Programs

# ENERGY CONSERVATION POLICY

**U.S. ARMY CORPS OF ENGINEERS**

## Summary

The following items represent important criteria and issues in the energy conservation program for the U.S. Army Corps of Engineers:

a. A significant amount of rules and regulation governing energy conservation focus on existing facilities and the responsibilities of the installations. However, some of the rules and regulations also pertain to new designs.

b. All the mandatory requirements of 10 CFR 435 have been incorporated into Corps of Engineers criteria and cannot be waived.

c. The Design Energy Use and Energy Use Budget method of compliance indicates conformance with 10 CFR 435 and Executive Order 12759. This requirement cannot be waived but previous studies can be used to verify compliance, when applicable.

d. Life cycle cost analysis is mandatory in conformance with 10 CFR 436 and cannot be waived. However, previous studies may be utilized to insure selection of the optimum alternative, when applicable.

**Legal and Policy Basis**

The legal and policy basis for energy conservation has evolved over many years as a result of several Executive Orders and Public Laws. From the period FY 76 to FY 85, the Army vigorously pursued an Energy Management Program designed to reduce energy consumption in compliance with the provisions of Executive Order 12003 (1977). This order established a systematic approach to the cost of owning, operating, and maintaining a building over its economic life (Life Cycle Cost) including its fuel and energy costs and evaluation of alternative building systems. As a result of this effort, the Army was able to reduce facility energy consumption 21.8 percent and administrative mobility energy consumption 25.9 percent. These achievements enabled the Army to exceed the Presidentially mandated goals, resulting in a cost avoidance in excess of 3.2 billion dollars and gave the Army the distinction of being the only Service to exceed both the facility and mobility goals.

In 1988, the Federal Energy Management Improvement Act was passed. Section 543(a) of this Act required each Federal agency to apply energy conservation measures and improve the design of its facilities so that the energy consumption per gross square foot of Federal buildings in use during FY 95 is at least 10 percent less than the energy consumption of Federal buildings in use during FY 85. Later in July 1989, the U.S. Department of Energy developed its energy conservation standards for new building (10 CFR 435) which required the adoption of any one of several methods to be employed in the design of energy efficient Federal buildings.

Recent government mandates include Executive Order 12759, April 17, 1991. This document requires Federal agencies to develop and implement energy strategy plans that insure compliance with certain overall energy reduction levels. In brief, the Executive Order 12759 requires:

a. By the year 2000, a 20 percent overall reduction in energy use levels for all Federal buildings from 1985 energy use levels, to the extent that these measures minimize life cycle costs in accordance with 10 CFR 436.

b. Each agency will prescribe policies under which its industrial facilities in the aggregate increase energy efficiency by at least 20 percent in Fiscal Year 2000, in comparison to Fiscal Year 1985.

c. A 10 percent design efficiency improvement in new buildings.

d. A conservation of 5 percent of our energy usage to renewable resources.

e. Implementation of procedures for innovative energy savings contracts such as Demand Side Management and Shared Energy Savings. These programs are designed to shift the first cost of energy saving retrofits away from the Government.

To insure compliance with all energy conservation mandates, the Corps of Engineers has adopted the Building Energy Compliance Alternative path as illustrated in 10 CFR 435. The requirements of this path have been incorporated into Chapter 11 of the Architectural and Engineering Instruction (AEI), Design Criteria, including revisions through September 1992. The thrust of this regulation required compliance with Energy Use Budgets that have been developed in accordance with 10 CFR 435.112 and follow the Building Energy Compliance Alternative. There are also minimum compliance requirements in lighting, electric power and others which are mandatory for all compliance paths. Compliance is obtained by conformance to the minimum requirements applicable to all paths and by verifying that the Design Energy Usage (DEU) for a facility is less than or equal to the calculated Energy Use Budget (EUB). All of these Federal requirements have been incorporated into the UFGS guide specifications, technical manuals, and other criteria. The present methodology that the Corps has adopted for the design and construction of Army facilities is the best method to insure cost effective compliance with all the applicable energy related Federal Regulations and Executive Orders.

The most recent Federal energy legislation is the Comprehensive National Energy Policy Act passed by Congress and signed into law (P.L. 102-486) on October 24, 1992 by President Bush. This bill establishes a comprehensive Federal buildings efficiency program, which requires installation of cost-effective efficiency measures in all Federal buildings, allows agencies to participate in utility incentive programs; and includes a Federal building demonstration program of energy-efficient products.

It requires, not later than January 1, 2005, each agency, to the maximum extent practicable, to install in Federal buildings owned by the United States, all energy and water conservation measures with payback periods of less than 10 years. Additionally, it allows agencies to participate in such programs as the Environmental Protection Agency's "Green Lights" program for purposes of receiving technical assistance.

Not later than December 31, 1993, a plan must be submitted describing how each agency intends to meet requirements, including how it will -

a. Designate personnel primarily responsible for achieving such requirements;

b. Identify high priority projects through calculation of payback periods;

c. Take maximum advantage of contracts that provide financial incentives and other services available from utilities for efficiency investment, and other forms of financing to reduce the direct costs to the Government.

The Secretary of Energy will be required to establish a Federal Energy Efficiency Fund to enable agencies to meet the requirements of the Act. The current planned appropriations to carry out the requirements of this bill are not more than $10,000,000 for Fiscal Year 1994, $50,000,000 for Fiscal Year 1995, and such sums as may be necessary for Fiscal Years thereafter. All agencies will be eligible to submit proposals for grants from the Fund and Awards will be based on a competitive assessment of the technical and economic effectiveness of each agency's proposal.

The Secretary of Energy will also establish a Financial Incentive Program for Facility Energy Managers to reward outstanding facility energy managers in agencies. Not later than June 1, 1993, the Secretary of Energy will issue procedures for the bonus program, including the criteria to be used in selecting outstanding energy managers. There is authorized to be appropriated to carry out the Incentive Program not more than $250,000 for each of the Fiscal Years 1993, 1994, and 1995.

**The Energy Compliance Plan**

The bottom line is that the Federal government is concerned about energy conservation and its relation to the environment. To fulfill these responsibilities the Corps has adopted the most cost effective and practicable means

by which all Federal energy laws and mandates can be met. Whether or not new requirements will be imposed as a result of the recent National Energy Act and future directives is uncertain.

Continued compliance with existing Corps regulations and guidance on energy conservation will best enable us to meet any new challenges which may be ahead. Although a difficult task in the face of shrinking budgets and re-organization, designers can meet requirements by utilizing existing tools and methods already available. An example of this would be to utilize a professionally acceptable computer grogram that accurately predicts the energy consumption of a proposed building. Utilization of such a program, that provides accurate results without inclusion of an unknown safety factor, can make it easier to verify that the DEU is within the EUB. Other computer programs are available which help to simplify the life cycle analysis process. The LCCID life cycle computer program, developed by the BLAST Support Office at CERL, is the only program maintained current to include up-to-date energy and discount factors published by the National Institute of Standards for the U.S. Department of Energy.

To sustain the already successful Corps energy conservation effort, while minimizing design expenditures, it is important to be innovative, creative and practicable wherever possible. For example it is not the intent of the Corps AEI criteria to require designers to perform a life cycle cost analysis on every material, installation, equipment, and system that must be considered during the course of design. The designer, however, does have the responsibility to evaluate all possible alternatives of the major facets, features and systems of a facility in order to insure a high quality design satisfying the functional requirements of the facility, providing comfort to the occupants, is consistent with energy conservation mandates, and has the lowest life cycle costs. Consistent with previous guidance, the following considerations should be analyzed before assuming that a new life cycle cost analysis is required:

a. Use a previous study at the same installation if the conditions have not changed.

b. Use existing studies from other installation with similar conditions.

c. Apply the results of a previous study to justify an alternative is using new data will not materially affect the old data rather than starting a new study from scratch.

d. Update an existing study by revising the conclusions of that study.

e. A filing system could be set up to catalog life cycle cost studies and make them easily accessible to all designers.

f. Consider the capability of an installation to operate and maintain a specific system before considering it as a viable alternative.

g. Create a filing system which can be used to determine accurate and realistic operation and maintenance costs, and life expectancies, for different systems based on actual experiences, in cooperation with the installations.

h. Avoid considering alternatives in life cycle analysis that are clearly impractical due to physical limitations, past design and construction experience or other predominant circumstances.

With the recent passage of P.L. 102-486, the Federal government has reaffirmed its resolve to sustain the energy conservation effort. The driving forces include serious environmental problems such as ozone destroying refrigerants (CFCs), poor indoor air quality, pollution caused by utility power generation, and the need to reduce dependence on foreign and nonrenewable resources. The Corps will be best poised to meet future anticipated directives by being innovative, creative, and by adhering to guidelines and utilizing resources which are already available.

**Latest Criteria – EPACT 2005:**

1. Refer to Engineering and Construction Bulletin No. 2005-20 and EPACT 2005, http://www.wbdg.org/ccb/ARMYCOE/COEECB/ecb_2005_20.pdf

2. Model RFPs for Army modularity projects require:

The Model RFP basically states the following, energy conservation strategies and HVAC and lighting systems selections shall achieve at least 30% energy savings over ANSI/ASHRAE/IESNA Standard 90.1-2004. Selection of solutions and technologies to achieve energy performance requirements shall be based on life cycle cost analysis. Some ways/best practices to achieve these requirements are listed in the Advanced Energy Design Guide: Small Office Buildings (ANSI/ASHRAE/IESNA).

UFC 3-410-01FA states "ENERGY COMPLIANCE ANALYSIS. In order to comply with the Energy Policy Act of 2005 (EPAct 2005), designs must achieve energy consumption levels that are a minimum of 30 percent below the level required by ASHRAE Standard 90.1. To demonstrate compliance with the EPAct 2005, the designer shall prepare an Energy Compliance Analysis (ECA) that includes a narrative of the path taken to demonstrate compliance (including reference to each paragraph in ASHRAE 90.1 that make up the proposed compliance “path”; identification of any software used to prepare calculations, input to and output from all calculations (with adequate explanation so that a reviewer can understand what all of the data means); a description of each energy conservation feature or change considered and the corresponding impact that it had on calculated energy consumption; and a description of the design proposed as a result of the ECA along with its calculated energy consumption".

All other projects shall meet the 30% energy reduction within project budget and if life cycle cost effective. Obviously, this will require computerized hourly energy analyses and life cycle cost analyses all of which will need to follow the standard procedures and criteria herein above for such studies and reports, etc. One large item to note, if budgets do not allow, the energy savings goals are not to be completely abandoned, instead save as much as possible within budget and life cycle cost effectiveness.

# Appendix PP

# Fort Sill Contractor's Installation Passes

**DEPARTMENT OF THE ARMY**
U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
P.O. BOX 33159
FORT SILL, OKLAHOMA 73503

REPLY TO
ATTENTION OF

CESWT-EC-FF

21 April 2011

MEMORANDUM FOR Record

SUBJECT: Contractor MOBILISA Cards

1. The Fort Sill Corp of Engineers Resident Office has verified **(Input Prime KTR)** and their subcontractors are authorized access to Fort Sill via Fort Sill's access control points to work on **(Input Project Name/Number/Location).**

2. Normal work day is Monday thru Saturday, 0630-2000hrs. Any exceptions to this policy will be coordinated thru U.S. Army Corps of Engineers employees.

3. Scheduled contract completion date is **(Input Date). See attachments for subcontractor pass information to include: subcontract duration, list of employees with last four of SSN.**

4. The POC for this memorandum is MAJ John A. Dills III at john.dills@usace.army.mil or by phone (580) 581-4128 office / (580) 262-1000.

//Original Signed//
JOHN A. DILLS III
MAJ, EN
U.S. Army Corps of Engineers

# FORT SILL GATE PASS

Project Name/Number: _____

General Contractor: _____

Sub-contractor:_____

Employee (s) see attached list: _____

SSN Last 4 (or) see attached list: _____

Duration of Access: Start: _____ End: _____

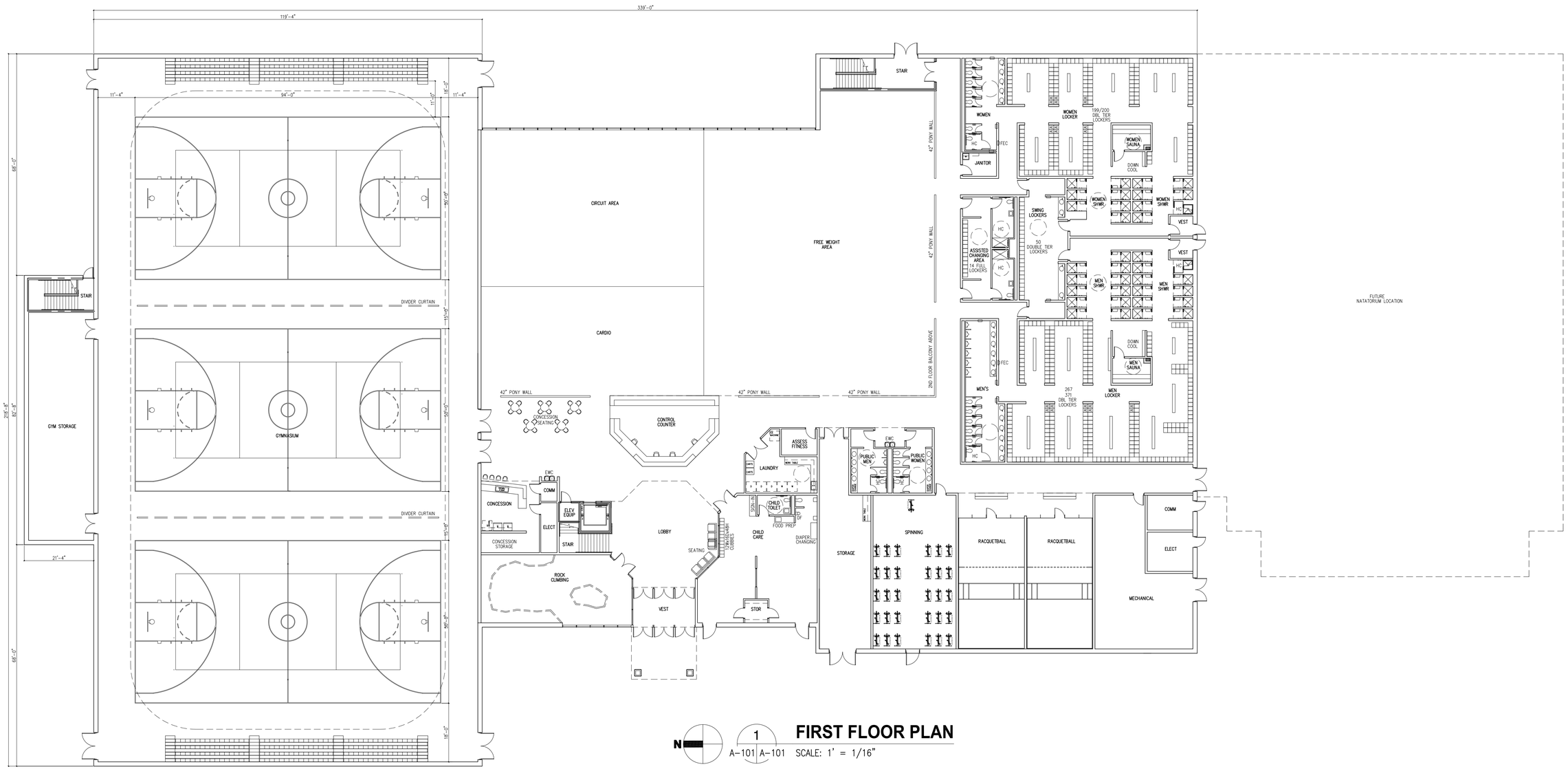
Times Authorized: From: _____ To: _____

Days Authorized: S M T W T F S (Circle all that apply)

***Passes are issued/returned to BLDG 5030**

****Provide USACE QA/CM updated list of names with pass numbers monthly**

# APPENDIX RR
# FLOOR PLANS

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1 A-101 A-101 **FIRST FLOOR PLAN**

SCALE: 1' = 1/16"

16' 8' 0 16'

SCALE: 1/16"=1'-0"

**THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL SIGNED AND SEALED DOCUMENT**

NOTE: REFER TO GRAPHIC SCALE IF SHEET IS NOT 22"x34"

| Symbol | Description | Date | Appr. | Symbol | Description | Date | Appr. |
|---|---|---|---|---|---|---|---|

Designed by:
Drawn by:
Reviewed by:
Drwg. Code:
Contract Date:
File Name:
Plot Date: 04/09/2012
Plot Scale: AS SHOWN
Contract No.:

U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT

C.H. GUERNSEY & COMPANY
Architect - Engineers - Consultants
5555 North Grand Boulevard
Oklahoma City, OK 73112-5507
405-848-9000 www.guernsey.com

Submitted by:
S. ANNE MUNN
Vice President
Invitation No.:

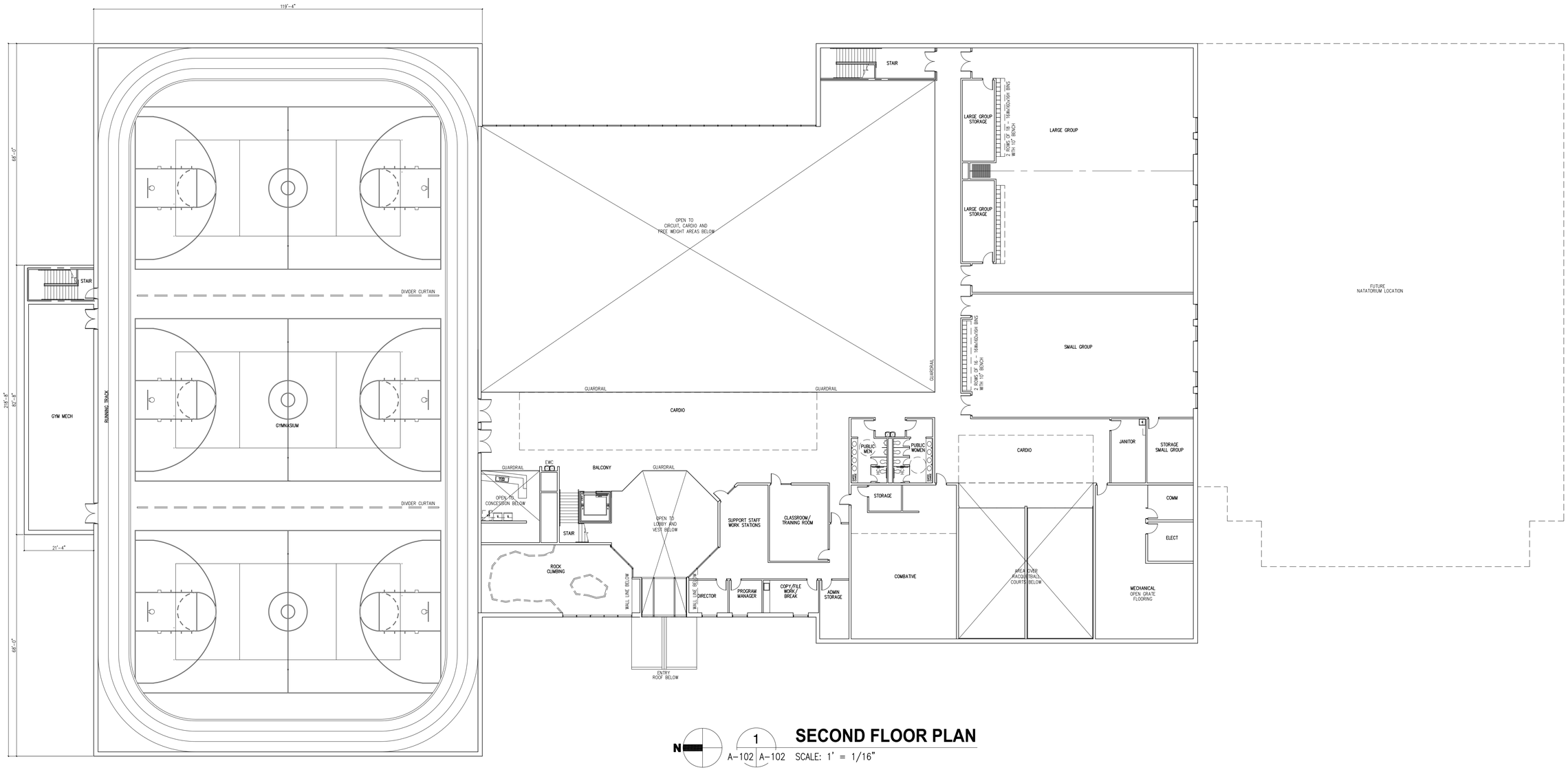
PHYSICAL FITNESS CENTER
FORT SILL
FORT SILL, OKLAHOMA

FIRST FLOOR PLAN

Sheet Reference Number:

**A-101**

*AM8

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1

A-102 A-102 SCALE: 1' = 1/16"

# SECOND FLOOR PLAN

16' 8' 0 16'

SCALE: 1/16"=1'-0"

**THIS DOCUMENT IS PRELIMINARY IN NATURE AND IS NOT A FINAL SIGNED AND SEALED DOCUMENT**

NOTE: REFER TO GRAPHIC SCALE IF SHEET IS NOT 22"x34"

| Symbol | Description | Date | Appr. | Symbol | Description | Date | Appr. |
|---|---|---|---|---|---|---|---|

Designed by:
Drawn by:
Reviewed by:
Drwg. Code:

Submitted by:
K. A. HASTEDT, P.E.
Vice President
Invitation No:

Contract Date:
File Name:
Plot Date: 04/09/2012
Plot Scale: AS SHOWN
Contract No:

U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT

C.H. GUERNSEY & COMPANY
Engineers • Architects • Consultants
5555 North Grand Boulevard
Oklahoma City, OK 73112-5507
405-848-9000 www.guernsey.com
GUERNSEY

PHYSICAL FITNESS CENTER
FORT SILL
FORT SILL, OKLAHOMA

SECOND FLOOR PLAN

Sheet Reference Number:

**A-102**

*AM8

# APPENDIX SS
# FT. SILL FIRE HYDRANT REQUIREMENTS

# SECTION 33 12 19

# FIRE HYDRANTS

## PART 1 GENERAL

1.01 SCOPE

A. Fire hydrants.

B. Adjustment of fire hydrants and gate valves.

1.02 SUBMITTALS

A. Conform to requirements of Section 01 33 00 - Submittals.

B. Submit name of hydrant manufacturer, type of bonnet paint, and engineering control drawing number for hydrant proposed for use.

## PART 2 PRODUCTS

2.01 HYDRANTS

A. Provide hydrants in conformance with AWWA C 502, Standard for Dry Barrel Fire Hydrants (Latest Edition). Hydrants are approved by AW by issuance of a Certificate of Responsibility. Hydrants shall open left (counterclockwise). The following hydrant has been approved. Alternate hydrants will not be considered.

APPROVED HYDRANT TYPE

- The AW MSG approved hydrant at all locations is Mueller Model Super Centurion 250.
- Fire hydrants installed at Fort Leavenworth shall be Waterous, manufactured by American Flow Control.
- Fire hydrants installed at Fort Sill shall be Mueller Super Centurion (A-423) and shall require Hydra-Shield Neo Custodian Hydrant Locks. (Note: These locks are proprietary.) Hydrant Locks must be installed prior to hydrants being connected to live water mains **AND** Hydrant Locks must be installed prior to newly installed water mains being connected to the existing distribution system. No active water main line shall have a fire hydrant that is not secured with a Hydra-Shield Neo Custodian Hydrant Lock.

B. The AW Project Manager may, at any time prior to or during installation of hydrants, randomly select furnished hydrant for disassembly and

laboratory inspection, at AW's expense, to verify compliance with Specifications. When hydrant is found to be non-compliant, replace, at Contractor's expense, hydrants, with hydrants that comply with Specifications.

C. Provide lower hydrant barrel fabricated from Ductile Iron Pipe as single piece, connected to upper hydrant barrel by means of joint coupling that will provide three hundred sixty (360) degree rotation of upper barrel.

2.02 LEADS

A. Branches (Leads): Conform to requirements of Section 33 11 00.15 - Ductile Iron Pipe and Fittings and Section 33 11 00.11 - Polyvinyl Chloride Pipe.

2.03 HYDRANT PAINTING

A. New hydrants and refurbished hydrants shall be shop coated as specified herein.

B. Hydrant Locks installed on fire hydrants shall not be painted and paint shall not be allowed to enter or affect the hydrant lock mechanism.

C. Exterior Above Traffic Flange (Including Bolts & Nuts).

1. Surface preparation to be in accordance with SSPC-SP 10 (NACE 2) near white blast cleaned surface.
2. Coat with three coat alkyd/silicone alkyd system with total dry film thickness (DFT) of 6 - 9 mils as follows:
   a. Prime Coat - Oil modified alkyd primer, to be in general conformance with SSPC Paint Specification No. 25. Total dry film thickness (DFT) 2 - 3 mils.
   b. Intermediate Coat - Heavy Duty Industrial Alkyd Enamel to be in general conformance with SSPC Paint Specification No. 104, and Federal Standard A-A-2962A. Total dry film thickness (DFT) of 2 -3 mils.
   c. Finish Coat - Silicone Alkyd Resin Enamel to be in general conformance with SSPC Paint Specification No. 21. Total dry film thickness (DFT) to be 2 - 3 mils. Exception - hydrant bonnet shall not be finished shop coated, only intermediate coated. Install color coded finish coating of bonnet in field.
   d. Bonnet Paint - Field apply finish coat of Silicone Alkyd Resin Enamel to be in general conformance with SSPC Paint Specification No. 21. Dry film thickness of 2 - 3 mils. Bonnet colors are to be as specified in Paragraph 3.01 to designate the available fire flow at 20 psi residual.
3. Colors - Primer: Manufacturers standard color. Finish coat of hydrant

body and connection caps, to be painted to match the color of existing in service hydrants on the base. Approval of the color paint to be used on the hydrants shall be approved by the American Water Utility Manger or Capital Project Manager prior to the final application of paint to the newly installed hydrant.

D. Field Maintenance Painting (Exterior Above Traffic Flange)

1. Surface Preparation to be in accordance with SSPC - SP2, Hand Tool Cleaning, or SSPC - SP3, Power Tool Cleaning, depending on condition of existing paint and extent of corrosion. It is not necessary to remove tightly adhered mill scale, rust, and paint. Mill scale, rust and paint are considered tightly adherent when they cannot be removed with dull putty knife. In some severe cases where it is necessary to remove majority of existing paint, surface should be cleaned in accordance with SSPC - SP11, Power Tool Cleaning to Bare Metal.
2. When surface is cleaned to bare metal (SSPC - SP11), coat hydrant with three coat Alkyd/Silicone Alkyd system in accordance with Paragraph 2.03.B.2 as for new hydrants. When surface is cleaned to SSPC - SP2 or SSPC - SP3, coat hydrant with Silicone Alkyd Resin Enamel in general conformance with SSPC Paint Specification No. 21. Total dry film thickness of 3 - 6 mils surface is cleaned to bare metal (SSPC - SP11), coat hydrant with three coat Alkyd/Silicone Alkyd system in accordance with Paragraph 2.03.B.2 as for new hydrants.

E. Exterior Below Traffic Flange

1. Surface preparation in accordance with SSPC- SP10 (MACE 2) Near White Blast Cleaned Surface.
2. Primer and intermediate coat: coal tar epoxy in general conformance with SSPC Paint Specification No. 16. Apply two (2) coats with dry film thickness (DFT) of 8 - 10 mils each for total DFT of 16 -20 mils.
3. Finish coat: Water based vinyl acrylic mastic Apply one coat with dry film thickness of 6 - 8 mils. Color of finish coat to be same as finish coat for exterior above traffic flange, i.e., glossy Red

F. Interior Surfaces Above and Below Water Line Valve

1. Material used for internal coating of hydrant interior ferrous surfaces below water line valve must meet the requirements of local state standards.
2. Coating shall be liquid or powder epoxy system in accordance with AWWA Standard C - 550 (latest revision). Coating may be applied in two or three coats, according to manufacturer's recommendations, for total dry film thickness of 12 -18 mils.

## PART 3 EXECUTION

### 3.01 INSTALLATION (FIRE HYDRANT)

A. Set fire hydrant plumb and brace at locations and grades as shown on Drawings. When barrel of hydrant passes through concrete slab, place 1-inch-thick piece of standard sidewalk expansion joint material around section of barrel passing through concrete.

B. Locate nozzle center line minimum 18 inches above finish grade.

C. Place 12-inch by 12-inch yellow indicators (plastic, sheet metal, plywood, or other material approved by Project Manager) on pumper nozzles of new or relocated fire hydrants installed on new water lines not in service. Remove indicators after new water line is tested and approved by Project Manager.

D. Do not cover drain ports when wrapping for cathodic protection or when placing concrete thrust block.

E. Obtain Project Manager's approval in writing prior to installation of hydrants which require changes in bury depth due to obstructions not shown on Drawings. Unit price adjustments will not be allowed for changes in water line flow line or fire hydrant barrel length caused by obstructions.

F. Plug branch lines to valves and fire hydrants shown on Drawings to be removed. Deliver fire hydrants designated for salvage to the American Water on base depot location.

G. Install branches (leads) in accordance with Section 22 11 16.11.

H. Coating Requirements:

1. Apply coatings in strict accordance with manufacturer's recommendations. No requirements of this specification shall cancel or supersede written directions and recommendations of specific manufacturer so as to jeopardize integrity of applied system.
2. Furnish affidavit of compliance that coatings furnished complies with requirements of this specification and referenced standards, as applicable.

I. Per NFPA standards, provide a color code for the hydrant bonnet to indicate the hydrant’s available flow at 20 psi according to the following table:

| Supply Water Line Flow Characteristics | Bonnet Color |
|---|---|
| Less than 500 GPM | Red |

| | |
|---|---|
| 500-999 GPM | Orange |
| 1000-1499 GPM | Green |
| 1500 GPM & Above | Light Blue |

J. Remove and dispose of unsuitable materials and debris in accordance with requirements of Waste Material Disposal.

3.02 INSTALLATION (HYDRA-SHIELD NEO CUSTODIAN HYDRANT LOCK INSTALLATION AT FORT SILL)

A. Due to the proprietary nature of the Hydrant Lock, the locks shall be acquired by AW. Due to the secure nature of the Hydrant Lock requirement, locks shall be installed by AW. All costs incurred by AW for the provision and installation of the Hydrant Lock shall be paid for by "The Project" through modification of the existing AW Contract with the Government. "The Project" shall be responsible for initiating the AW Contract Modification through AW's Contracting Officer (KO) or the Contracting Officer's Representative (COR).

B. Upon AW's receipt of the Contract Modification, AW shall contact "the Project" within ten (10) working days to schedule the installation of the hydrant lock(s) on the hydrants purchased by "the Project". (Note: The availability of the hydrant locks is subject to the manufacturer's schedule and delivery. The installation process normally takes thirty (30) minutes per hydrant.)

C. Hydrant(s) shall be accessible with adequately clear area around hydrant(s) for the installation process. Palletized Hydrant(s) [newly purchased and delivered on pallet(s)] shall not be stacked more than three (3) rows [one (1) pallet] high for safe installation and a minimum of 20 feet in front of the top of the hydrant(s) shall be clear and accessible. (Note: New hydrants should never be stored on the ground.) Installed Hydrants [hydrants newly installed on a water main(s) that are not yet connected to the water distribution system] shall be backfilled to natural ground with level surface with 20 feet clear and accessible 360° around hydrant.

D. Hydrant Lock Installation(s) shall be inspected by AW as the owner of the lock and AW's KO/COR for payment verification purposes.

**END OF SECTION 33 12 19**