US Army Corps
of Engineers
Louisville District

Design-Build Request For Proposal

OPERATIONAL READINESS TRAINING COMPLEX (ORTC) - PHASE I FACILITIES & SITE (PACKAGE 1)

PN 65374, FY12, P2 333141

FORT HOOD, TX
(NORTH FORT)

SECOND PHASE OF SOLICITATION
APRIL 2012
SOLICITATION # W9126G-12-R-0002

Prepared by Louisville District
US Army Corps of Engineers, Louisville District
600 Dr Martin Luther King Jr Place
Louisville, KY 40202

SECTION 01 10 00
STATEMENT OF WORK

1.0 PROJECT OBJECTIVES

1.1. SECTION ORGANIZATION

2.0 SCOPE

2.1. OPERATIONAL READINESS TRAINING COMPLEX

2.2. SITE

2.3. GOVERNMENT-FURNISHED GOVERNMENT INSTALL EQUIPMENT (GFGI)

2.4. FURNITURE REQUIREMENTS

3.0 OPERATIONAL READINESS TRAINING COMPLEX

3.1. GENERAL REQUIREMENTS

3.2. FUNCTIONAL AND AREA REQUIREMENTS

4.0 APPLICABLE CRITERIA

4.1. INDUSTRY CRITERIA

4.2. MILITARY CRITERIA

5.0 GENERAL TECHNICAL REQUIREMENTS

5.1. SITE PLANNING AND DESIGN

5.2. SITE ENGINEERING

5.3. ARCHITECTURE AND INTERIOR DESIGN

5.4. STRUCTURAL DESIGN

5.5. THERMAL PERFORMANCE

5.6. PLUMBING

5.7. ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

5.8. HEATING, VENTILATING AND AIR CONDITIONING

5.9. ENERGY CONSERVATION

5.10. FIRE PROTECTION

5.11. SUSTAINABLE DESIGN

5.12. CONSTRUCTION AND DEMOLITION (C&D) WASTE MANAGEMENT

5.13. SECURITY (ANTI-TERRORISM STANDARDS)

6.0 PROJECT SPECIFIC REQUIREMENTS

6.1. GENERAL

6.2. APPROVED DEVIATIONS

6.3. SITE PLANNING AND DESIGN

6.4. SITE ENGINEERING

6.5. ARCHITECTURE

6.6. STRUCTURAL DESIGN

6.7. THERMAL PERFORMANCE

6.8. PLUMBING

6.9. SITE ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.10. FACILITY ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.11. HEATING, VENTILATING AND AIR CONDITIONING

6.12. ENERGY CONSERVATION

6.13. FIRE PROTECTION

6.14. SUSTAINABLE DESIGN

6.15. ENVIRONMENTAL

6.16. PERMITS

6.17. DEMOLITION

6.18. ADDITIONAL FACILITIES

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
Battalion Headquarters Building	Office Building
Barracks	Dormitory
Officers Quarters	Dormitory

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. OPERATIONAL READINESS TRAINING COMPLEX (ORTC)

2.1.1. BATTALION HEADQUARTERS BUILDING

Provide Battalion Headquarters to house transient battalion level administrative functions and classrooms for soldiers. This facility is intended to be similar both functionally and technically to office and classroom type facilities in the private sector community.

The total gross area for the Battalion Headquarters Building is 11,237 square feet.

2.1.2. BARRACKS

Provide Barracks facilities to house transient soldiers in an open bay configuration and senior leaders in a 2 bed per room configuration. Showers, toilets and laundry facilities are also provided. This facility is intended to be similar both functionally and technically to college dormitory facilities in the private sector community

Four-Story Barracks: Number of personnel to be housed is 336 per building. The total gross area for the Barracks is 61,116 square feet.

2.1.3. OFFICERS QUARTERS

Provide Officers Quarters facilities for 80 persons, accommodating transient senior leaders in a 2 bed per room configuration, each with a bathroom. This facility is intended to be similar both functionally and technically to hotels in the private sector community.

The total gross area for the Officers Quarters is 22,579 square feet.

2.1.4. NOT USED

2.1.5. NOT USED

2.1.6. NOT USED

2.1.7. NOT USED

2.1.8. NOT USED

2.2. SITE:

.

Provide site improvements necessary to support the new building(s) and supporting facilities. Supporting facilities include, but are not limited to utilities, electric service, exterior and security lighting, fire protection and alarm systems, water, gas, sewer, parking, sidewalks, landscaping and handicap accessibility.

Approximate area available 19.20 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. All Computers and related hardware, copiers, faxes, printers, video projectors, VCRs and TVs are GFGI.

The following are also GFGI items: The FF&E Package shall be developed using the furnishings and equipment shown on the ORTC Standard Design (SD) Drawings in Attachment A of 01 10 00, Paragraph 3.0 and the Preliminary FF&E information in Appendix BB. The Preliminary FF&E information defines furniture dimensions sizes as shown in the SD. After award, early coordination of the furniture and equipment schedule is required to identify actual FF&E items to be procured so the facility is complete and usable at turnover.

2.4. FURNITURE REQUIREMENTS

2.4.1 Barracks and Officers Quarters Requirements:

A Furniture, Fixtures and Equipment design and package is NOT required for the Barracks or Officers Quarters facility type. However, Structural Interior Design (SID) is required for all facility types regardless of the requirements for the FF&E design and package. The 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, lighting, ventilation, and accessibility is still required as part of the SID submittal, reference applicable Appendix for Preliminary FF&E Information including furniture dimensions sizes as shown in the Standard Design.

(a) Paragraphs 1.1 and 1.2 of Section 01 33 16, ATTACHMENT B, FURNITURE, FIXTURES & EQUIPMENT (FF&E) REQUIREMENTS shall NOT BE USED for Barracks and Officers Quarters.

(b) The Contractor shall provide a furniture layout, for reference and coordination only to the Installation and Sub-Contractors at each submittal. Furniture shall be Government-furnished, Government-installed. The Installation shall be responsible for completing the Barracks and Officers Quarters furniture package based on the furniture layout provided by the Contractor. The furniture package shall be submitted by the Installation to Huntsville Center Furniture Team to be bid, purchased, and installed.

2.4.2 Brigade and Battalion Headquarters, Dining Facility, Company Headquarters, and Vehicle Maintenance Shop Requirements:

Provide furniture design for all 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 OPERATIONAL READINESS TRAINING COMPLEX (ORTC)

3.1. GENERAL

The standard design drawings graphically integrate Army Standard requirements, including net square footage, functional adjacencies, and control zones. The designer of record shall utilize regional and climatic criteria to influence the building design.

Functional floor plans and conceptual site plans are provided for this facility in the applicable appendices. Use of these plans for the interior functional arrangement is mandatory. However, the plans may be modified to accommodate local, regulatory, engineering, architectural, life safety, and/or construction requirements at time of proposal. Additional consideration will be give for innovative, creative, or cost-saving proposals which meet or exceed the minimum requirements as established in the RFP. Floor and site plans may change after award with installation and the Center of Standardization (COS) approval to enhance design, comply with codes, or support constructibility.

3.2. FUNCTIONAL AND AREA REQUIREMENTS

The following applies to all ORTC standard building designs unless otherwise indicated:

3.2.1. BUILDING AREA REQUIREMENTS

3.2.1.1. Gross Building Area

Maximum building gross areas indicated in paragraph 2.0 SCOPE shall not be exceeded. A smaller overall gross area is allowed if all functional relationships in the floor plans and mandated net areas indicated in the building finish schedules are met. Contractor shall clearly indicate proposed overall building(s) gross area calculation, to include net areas, building gross area, and half scope areas.

3.2.1.2. Net Area

The standard floor plans mandate authorized space allowances for the functional areas as indicated on the drawings in the building finish schedules. Net area is measured to the inside face of the room finish walls. Net area requirements for programmed spaces are sized to accommodate the functional requirements, overall gross area limitations, and other recognized design principles. If net area requirements are not indicated as mandated, the space shall be sized to accommodate the required function, comply with code requirements, and comply with overall gross area.

3.2.1.3. Spaces Excluded from Gross Building Area

The following shall not be included in the gross building area: Crawl spaces; exterior uncovered loading platforms or facilities, either depressed, ground level, or raised; open paved terraces; roof overhangs and soffits for weather protection 3’-0” or less in width; uncovered ramps; uncovered stoops; and utility tunnels and raceways.

3.2.1.4. Half Scope Area

Half scope areas shall be included in the gross area for balconies and porches; overhangs greater than 3’-0” in width, exterior covered loading platforms or facilities, either depressed, ground level, or raised; covered but not enclosed passageways or walks; covered and uncovered but open stairs; and covered ramps.

3.2.2. CIVIL DESIGN CRITERIA

3.2.2.1. POV Parking

Provide paved and striped parking for privately owned vehicles (POV) for 10-25% of the ORTC Battalion Complex's intended number of occupants. Include handicap accessible parking spaces near buildings required to be handicap accessible. Provide bus drop-off locations near barracks.

Include 65 parking spaces for dining facility employees within close proximity.

3.2.2.2. Tactical Vehicle Road and Hardstand

Provide concrete pavement adjacent to the Company Headquarters Building, Vehicle Maintenance Shop, and Company Shed(s) for storage and circulation of the Tactical Vehicles.

A. This area shall consist of rigid concrete pavement for mobilization and parking of organizational vehicles (wheeled and heavy and tracked), commercial vehicles (Contractor support), trailers and generators. Organizational vehicle hardstand includes building aprons, parking spaces, and circulation lanes on site. Rigid concrete pavement shall accommodate the installations heaviest organizational vehicle(s) as indicated in Section 01 10 00, Para 6.

B. Provide primary and secondary entrance drives with gates to connect organizational vehicle hardstand to roads and/or tank trails as shown in site plans. The primary and secondary entrance drives shall be 30 feet wide.

C. Provide positive surface drainage with a 1-percent minimum slope in the direction of drainage. Maximum pavement slope shall be 2 percent.

D. The COS does not dictate the layout of spaces or overall quantities of organizational vehicles due to the transient training requirement of the ORTC. Organizational vehicle requirements shall be coordinated with the installation (i.e. type and sizes).

E. Striping of the hardstand area for parking is not suggested to ensure flexibility.

3.2.2.3. Bootwash

Provide bootwash facilities at all exterior main entrance doors of all buidings. Bootwash facilities shall accommodate boot washing, drainage, and grit/dirt removal. Each boot wash facility shall include minimum two freeze-proof hose bibs, removable bar grating for sediment clean-out, mounted boot brushes, and drying rack/handrail. Coordinate location and bootwash features preferred by the Installation.

3.2.2.4. Dumpster and Recycle Enclosures

A. The dumpster and recycle enclosures shall meet Installation construction requirements. Enclosures shall be compatible with the building's architectural theme.

B. Locate dumpsters in accordance with AT/FP standoff distance requirements. Where top protection is required per AT/FP, assure adequate height is provided for maintenance without removal of top protection.

3.2.2.5. Equipment Enclosures

A. Provide mechanical equipment horizontal enclosures, sized to allow clearance for maintenance as required by the equipment manufacturer.

3.2.2.6. Utility Pads

A. Install all concrete utility pads located outside the building exterior for any mechanical or utility device needed for the building operation and function. Include all necessary piping, wiring, or utility extensions for the device to function as designed. Locate mechanical equipment next to existing or proposed sidewalks, pathways, or parking areas to eliminate the need to construct additional hard surface access.

3.2.3. ARCHITECTURAL CRITERIA

3.2.3.1. Variations Due to Construction Materials

Minor variations in the basic design forms for the buildings are permissible to accommodate modular/pre-fabricated construction processes and materials. Building durability shall not be diminished with the use of such systems as compared to the construction systems and finishes indicated within this package.

3.2.3.2. Room Finishes

Where concrete masonry units (cmu) are required as the room finish in the drawings on the building finish schedules for the Barracks and Officers Quarters, alternative high impact wall finishes may be used, including high impact gypsum board and high impact plaster coatings. Impact resistance shall be as approved by the Installation.

3.2.3.3. Windows

Where operable windows are used, window screens shall be provided. Coordinate with Installation DPW for preference of window type(s). Dining Facilities shall only use fixed window type(s).

3.2.3.4. Restroom and Bathroom Accessories

All restroom and bathroom accessories shall be heavy duty, commercial grade, metal (stainless steel where available) to withstand heavy use.

3.2.3.5. Room Noise Criteria and Testing

In addition to designing adequate sound transmission reduction between spaces, construction shall accommodate room noise criteria as follows:

A. Occupancy classification establishes acceptable background sound in rooms over the frequency range of 16 Hz to 4000 Hz, particularly measuring rumbling, rattling, buzzing, hissing, and humming from building mechanical and electrical systems. Rooms shall not exceed the Room Criteria (RC) indicated below. All RC ratings shall be neutral (N). Designers of Record shall determine adequate construction requirements to achieve the following RC limits:

Open Offices:	RC 35 (N)
Private Offices:	RC 30 (N)
Conference Rooms:	RC 25 (N)
Classrooms:	RC 25 (N)
Sleeping Rooms/Bays:	RC 25 (N)
Reading Rooms:	RC 25 (N)

B. Test all rooms with all building systems operating, including air compressors. Measure the sound pressure level in dB referenced to 20 micro Pascals. Report the results of the tests by plotting the sound pressure level in each octave band from 32-4000 Hertz on Room Criterion Curve sheets published by ASHRAE. Provide an individual plot for each room and a narrative discussion

explaining the test results. Rooms exceeding the above RC shall have either systems or sound attenuation altered until the RC rating is met.

3.2.4. STRUCTURAL CRITERIA

System design and construction shall meet all applicable criteria identified herein and in 01 10 00 Para 4.0 & 5.0.

3.2.4.1. Building Category

Barracks:	II
Officers Quarters:	II
Dining Facility:	III
Company Headquarters:	II
Company Headquarters Hardstand:	I
Vehicle Maintenance Shop:	II
Company Sheds:	II
Brigade Headquarters:	II

3.2.4.2. Seismic Importance Factor (IE)

Barracks:	1.0
Officers Quarters:	1.0
Dining Facility:	1.25
Company Headquarters:	1.0
Company Headquarters Hardstand:	1.0
Vehicle Maintenance Shop:	1.0
Company Sheds:	1.0
Brigade Headquarters:	1.0

3.2.5. MECHANICAL SYSTEMS CRITERIA

System design and construction shall meet all applicable criteria identified herein and in 01 10 00 Para 4.0 & 5.0.

3.2.5.1. Design Conditions

A. The outdoor design temperature for comfort cooling shall be the 1% dry bulb and the corresponding wet bulb temperature for the locale, or the 1% dehumidification dewpoint temperature and the corresponding dry bulb temperature, whichever produces the greater cooling load.

B. The outdoor design temperature for heating shall be the 99% dry bulb temperature for the locale.

C. The indoor design temperature for comfort cooling shall be 15 degrees F less than the 1% outdoor air temperature, but will be no lower than 75 degrees F, nor any greater than 78 degrees F.

D. The indoor design relative humidity shall be 50%.

E. The indoor design temperature for comfort heating shall be 68 degrees F. Winter humidification shall be required where the indoor relative humidity is expected to fall below 20%.

3.2.6. PLUMBING SYSTEMS CRITERIA

System design and construction shall meet all applicable criteria identified herein and in 01 10 00 Para 4.0 & 5.0.

3.2.6.1. Fixtures

Plumbing fixtures shall be required to be provided complete with fitting and trim.

3.2.6.2. Water Service

The domestic water service to the building shall enter the building in the mechanical room. The water service shall be provided with a reduced pressure backflow preventer to isolate each building from the base water system. A main shut-off valve shall be provided inside each building,coordinate location Installation DPW.

3.2.6.3. Distribution

A horizontal water distribution system shall serve the building, with isolation valves at each branch to common areas serving two or more fixtures, and at each wall hydrant or equipment connection. Water connections for mechanical equipment systems make-up will be isolated from the domestic water system with a reduced pressure backflow preventer.

3.2.6.4. Sanitary

A sanitary drain, waste and vent system will extend from the connection to the site utility system to all fixtures and equipment requiring service. Drainage and vent stacks shall extend vertically and be vented through the roof. Trap primers shall be provided for drains susceptible to loss of water seal by evaporation.

3.2.6.5. Floor Drains

Floor drains shall be provided in mechanical rooms, janitor rooms, vending machine areas, restrooms, laundries, and for equipment requiring drainage. All floor drains shall be automatically primed by single trap primers.

3.2.6.6. Wall Hydrants

Wall hydrants shall be provided at a maximum spacing interval of 150 feet around the perimeter of the building. Wall hydrants shall be box type, freeze-proof, with integral vacuum breaker/backflow preventer.

3.2.6.7. Water Hammer Arresters

Water hammer arresters will be provided for shock suppression. The placement of water hammer arresters shall be as referenced in the IPC.

3.2.6.8. Gas Distribution

The design and installation of interior natural gas distribution systems shall be in accordance with manufacturer’s recommendations and the applicable sections of ASME B31.8, NFPA 54.

3.2.7. FIRE PROTECTION CRITERIA

System design and construction shall meet all applicable criteria identified herein and in 01 10 00 Para 4.0 & 5.0.

3.2.7.1. Fire Pump

A fire pump or fire booster pump shall be provided if required, based on the available flow and pressure. (Prior to award, contractors shall use the flow test data provided. After award, designer of record shall be responsible for performing a hydrant flow test.) Data from this test shall be used as the basis for design as indicated above for automatic sprinkler protection.

When a fire pump is required, an additional room shall be created, preferably within or near the mechanical room, changing the building floor plan without adding to the total floor area. These changes shall be made during design and will require COS approval.

3.2.8. ELECTRICAL SYSTEMS CRITERIA

System design and construction shall meet all applicable criteria identified herein and in 01 10 00 Para 4.0 & 5.0.

3.2.8.1. Interior Lighting Systems

A. Security lighting shall be provided at service entrances and at utility rooms. Wall mounted security lighting fixtures shall be shrouded to minimize glare.

B. Illuminated exit signs and egress/emergency lighting shall be provided by self-contained emergency battery units for all emergency exits and passageways as required by NFPA 101. Exit signs shall be LED type, letter color per Installation. If installed on a switched circuit, emergency lighting shall be configured so that the emergency lamp is illuminated regardless of the position of the control switch.

C. Interior vacancy sensors shall be utilized for lighting controlin areas such as public toilets, storage rooms, private offices, lounges, and laundry rooms.

3.2.8.2. Exterior Lighting Systems

A. Exterior lighting systems shall be provided per the site design contract. Areas include sidewalks, roadways, service yards, facility aprons, open storage areas, company sheds, and parking areas.

B. Poles located within the service yards, facility aprons, and hardstand parking areas shall be located and protected to minimize damage from vehicles. Building mounted light fixtures may be used around the building perimeter to supplement pole mounted light fixtures. Coordinate the control of the exterior lighting with the Installation.

3.2.8.3. Interior Electrical Systems

A. Transient voltage surge suppression (TVSS) shall be provided for all buildings. TVSS devices shall parallel the operating devices in providing a path to ground for an electrical surge and thereby limiting the magnitude of the transient voltage surges on the system. TVSS devices shall be mounted adjacent to or integral with the main distribution panel in accordance with the manufacturer's recommendation. TVSS devices shall be hard wired into the electrical distribution system utilizing a circuit breaker connection. TVSS units shall be tested in accordance with IEEE C62.45 using IEEE C62.41 Category B waveform. Units shall be UL 1449 listed and labeled. The modes of protection shall be the normal mode (L-N, L-L) and common mode (L-G, N-G). TVSS units shall include self-diagnostic and self-testing capabilities, a resettable transient event counter, and a local audible alarm with mute capability.

B. Receptacles shall be provided adjacent to all CATV and data jack locations.

C. All switchboards, panelboard, load centers, and feeders shall be designed with 15% spare capacity for future additions and changes.

3.2.8.4. Grounding

A. For the Vehicle Maintenance Shop, the open hardstand, the Covered Hardstand, and the Company Sheds, grounding points shall be provided in each repair area and each maintenance area. Grounding points shall be provided in vehicle and equipment parking areas on 40-foot centers (maximum) and coordinated with the parking layout. Provide a minimum of one grounding point for every eight vehicles parked in a double row, and one grounding point for every four vehicles parked in a single row configuration..

3.2.8.5. Exterior Electrical Systems

A. System design and installation shall provided in accordance with 01 10 00, Para 6.

3.2.8.6. Telecommunications Systems

A. In the Barracks and Officers Quarters, each sleeping room shall be provided with a single 8P8C voice outlet and one CATV outlet.

B. Each utility space shall be provided with at least one wall phone outlet located near the entrance door.

C. Provide an empty conduit from each Company Shed to the Vehicle Maintenance Shop Communications Room for data connectivity.

D. Utilize a conduit or cable tray system from the Brigade Headquarters Conference Room, Brigade Headquarters Emergency Operations Center, and the Battalion Headquarters Conference Room to the Communications Room in that building to facilitate video teleconferencing. Specific requirements for the wiring infrastructure shall be coordinated with the Installation.

3.2.8.7. Intrusion Detection System (IDS)

A. A power and signal conduit and box system for an IDS shall be provided for the following:

- Each arms vault in the Company Headquarters.
- SIPRNET Room in the Company Headquarters.
- SIPRNET Room in the Battalion Headquarters, and
- SIPRNET Room in the Brigade Headquarters.

B. The requirements for the power and signal conduit and box system shall be coordinated with the Installation IDS System Administrator.

3.2.8.8. Fire Detection and Alarm System Design

A. Smoke detection devices in sleeping areas and rooms shall be individually monitored and addressed. Tampering with a smoke detector shall transmit a trouble signal to the Fire Department.

B. A smoke detector with sounder shall be provided in the individual sleeping rooms and bays of the barracks and sleeping rooms in the officers quarters. The fire alarm system shall be programmed so that the activation of the smoke detector shall activate the sounder in the sleeping room, but shall be connected to the FACP for supervision only and shall not activate the general alarm.

3.2.9. SUSTAINABLE DESIGN REQUIREMENTS

ORTC Company Sheds and Covered Hardstand are exempt from LEED requirements.

3.3. BATTALION HEADQUARTERS BUILDING

3.3.1. GENERAL NOTES & CODE REQUIREMENTS

The Battalion Headquarters Facility supports command and control (C2), and assembly functions.

Fully protect building throughout with an automatic sprinkler system in accordance with NFPA and UFC documents. Accessibility for the disabled shall be provided per ABA. The facility shall be considered "primary gathering" with respect to AT/FP requirements.

Suggested Use and Occupancy Classifications:

A. IBC: Group A-2 (Classrooms) & Group B (all other areas)

B. NFPA 101: New Assembly (Classrooms) & New Business (all other areas)

3.3.2. BUILDING DESCRIPTION & MATERIALS

The Battalion Headquarters consists of a single story. The function and flexibility of the facility requires large open areas and spaces without intermediate columns.

3.3.2.1. Doors:

A. All spaces shall include minimum 3'-0" wide doors.

B. Entrances shall include vestibules with full glazed aluminum storefront doors. All other exterior doors shall be metal with metal frames.

C. Interior rooms shall be solid-core wood with metal frames.

3.3.3. FLOOR PLAN REQUIREMENTS

3.3.3.1. Administration Area:

A. Provide the following private offices: Commander, CSM, Executive Officer (XO), S1 Officer, S2 Officer, S3 Officer, S4 Officer, S6 Officer, and Medical Storage.

B. Provide open office space for 20 workstations at 6'x6' each. Include adequate circulation, file storage, and printer/copier/fax space.

C. Provide a conference room to accommodate a minimum of 14 PN with direct access to the open office area. Provide a 4'-0" high x 8'0" wide marker board, projection screen, and power for a ceiling mounted projector.

3.3.3.2. Break area:

A. Provide a 6'-0" long solid polymer countertop with 19"x19" stainless steel sink and 4" high coved back and side splash. Include base and wall cabinets.

3.3.3.3. Soldier Service Areas:

A. Provide a private office for the Chaplain.

B. Provide storage area for supplies.

C. Provide three classrooms divided by operable panel partitions and provided with appropriate entrances and exits to allow for one combined classroom, two classrooms, or three classrooms. Each

divided classroom shall accommodate 56 PN seated at tables, one instructor desk, one marker board, a projector screen, and power for ceiling mounted projector. Operable panel partitions shall have a minimum STC of 45.

D. Provide room adjacent to classrooms for storage of chairs and tables.

3.3.3.4. Men's Toilet Room:

A. Provide a solid polymer countertop with five integrally molded lavatories and 6" high coved back and side splash.

B. Provide vanity light fixtures above glass mirror for length of the vanity.

C. Provide minimum one handicap accessible and two standard floor mounted toilet with full seats.

D. Provide minimum of one wall hung handicap accessible urinal and two standard wall hung urinals.

E. Provide floor drains at toilet area and lavatory area.

F. Accessories shall include solid polymer toilet partitions and urinal screens, toilet tissue dispensers, soap dispensers, paper towel dispensers, and waste receptacles.

3.3.3.5. Women's Toilet Room:

A. Provide a solid polymer countertop with five integrally molded lavatories and 6" high coved back and side splash.

B. Provide vanity light fixtures above glass mirror for length of the vanity.

C. Provide minimum one handicap accessible floor mounted toilet with full seat and provide five standard floor mounted toilets with full seats.

D. Provide floor drains at toilet area and lavatory area.

E. Accessories shall include solid polymer toilet partitions, toilet tissue dispensers, napkin dispensers, paper towel dispensers, and waste receptacles.

3.3.3.6. Janitor Closet:

A. Provide floor mop sink with 4'-0" high stainless steel, tile, or solid polymer backsplash, service faucet with hose and bracket, mop rack for three mops, minimum 6'-0" of linear stainless steel shelving capable of supporting minimum 30 lb. per linear feet, and floor drain.

3.3.3.7. Mail Distribution Room:

A. Locate on an outside wall.

3.3.3.8. Vending/Recycling Area:

A. Include space for one soft drink and one snack vending machine, which will be provided by others. Provide adequate power for vending machines.

B. Provide appropriate utilities for the ice machine which shall be GFGI, provided by the Installation..

C. Provide floor drain near ice machine.

D. Provide space for five (5) recycling bins.

3.3.3.9. Corridor:

A. Minimum corridor width shall be 6'-0".

B. Provide standard and accessible electric water coolers.

3.3.3.10. Mechanical:

A. Size and locate mechanical room to allow equipment removal and maintenance.

B. Provide doors opening to exterior only.

3.3.3.11. Electrical:

A. Size and locate electrical room to allow equipment removal and maintenance.

3.3.3.12. Communications:

A. Provide a dedicated interior room for communications equipment, minimum 1.1% of the building footprint.

3.3.3.13. SIPRNET:

A. Provide a dedicated interior room for SIPRNET equipment, sized minimum 6'x6'. Provide conduit and pull wire from SIPRNET Room to Commander and XO Offices.

3.4. NOT USED

3.5. 4-STORY BARRACKS

3.5.1. GENERAL NOTES & CODE REQUIREMENTS

The Barracks portion of the Battalion set consists of two 4-story buildings. Each building has sixteen (16) open bays. The HVAC and other utility systems shall be zoned for each bay to operate independently, allowing unused bays to be shut down or set to minimum sustainment levels. In addition to the open bays, each building has eight semi-private rooms with baths for senior leaders.

Each Barracks building is intended to house 320 personnel in grades E1-E6 for Options A and B shown on drawing A010A and 16 Senior Leader personnel. A Battalion set of Barracks therefore provides 640 E1-E6 personnel (Options A and B) and 32 Senior Leader personnel exclusive of the Officers' Quarters.

The facility HVAC, utility systems, and fixtures shall be designed to support an additional four persons in each of the E1-E6 bays, which can be achieved by double bunking four bunks in each bay, as shown on drawing A010A, Option C. This increases the total capacity of the building to 384 E1-E6 and 16 Senior Leader spaces for a total of 400 persons, increasing the capacity of a Battalion set of Barracks from 672 (intended) to 800 (maximum).

The Barracks shall be fully protected throughout by an automatic sprinkler system in accordance with NFPA and UFC documents. Accessibility for the disabled is not required since this facility will be occupied by able-bodied personnel only. The Barracks shall be considered "billeting" with respect to AT/FP requirements.

Suggested Use and Occupancy Classification:

A. IBC – Group R-1 (Residential Transient)

B. NFPA 101 – New Hotels & Dormitories

3.5.2. BUILDING DESCRIPTION & MATERIALS

The function and flexibility of the barracks requires large living/sleeping bays without intermediate columns. The first floor shall be slab on grade with elevated concrete slab s on the upper floors.

3.5.2.1. Doors

A. All spaces shall include minimum 3’-0” wide doors unless otherwise noted.

B. Entrances shall include vestibules with full glazed aluminum storefront doors. All other exterior doors shall be metal with metal frames.

C. Interior room doors shall be solid-core wood with metal frames.

3.5.3. FLOOR PLAN REQUIREMENTS

3.5.3.1. Corridors

A. Provide two electric water coolers on each floor.

B. Provide a minimum 6’-0” aisle between sleeping areas in open bay.

C. Provide space for minimum two vending machines.

D. Provide space for (5) recycling bins to meet LEED credit requirements.

3.5.3.2. Stair

A. Provide circulation to upper floors at each end and near the front entrance.

3.5.3.3. Elevator

A. Provide one elevator with minimum 2500 lb capacity, primarily to move furnishings and to assist soldiers in reaching upper floors with assigned equipment and personal luggage. Elevator is not intended to escape fire or provide handicap accessibility.

B. Elevator interior clear floor area shall be sized to accommodate a gurney; therefore, minimum elevator cab clear depth shall be 7’-6”.

C. Minimum elevator finishes shall include stainless steel walls and doors with paver floors and lighted ceiling. Freight pads and attachment hardware shall be provided.

3.5.3.4. Mechanical

A. Size and arrange mechanical rooms to allow equipment removal and maintenance.

B. Upper floor mechanical rooms shall include an interior access door and double exterior doors for equipment replacement. Double height mechanical rooms are acceptable in lieu of a mechanical room on each floor.

3.5.3.5. Electrical

A. Size and locate rooms to allow for equipment removal and maintenance with main electrical room on ground level.

3.5.3.6. Communications Room

A. Provide a dedicated interior room for communications equipment on each floor.

B. First floor room shall be a minimum of 8’x10’. Upper floor rooms shall be a minimum of 6’x8’.

3.5.3.7. Open Bays

A. Provide minimum of 10 exterior windows per bay, coordinating wall space needed for bunks and storage cabinets. Each window shall be as large as possible, minimum of 2’-0” high x 2’-0” wide. Recommend use of translucent glazing.

3.5.3.8. Each Laundry Room

A. Eight heavy duty clothes washers shall be provided as part of the FF&E Package which is not in this contract.

B. Ten heavy duty clothes dryers shall be provided as part of the FF&E Package which is not in this contract.

C. One solid polymer utility sink shall be provided with gooseneck faucet.

D. One solid polymer built in clothes folding table shall be provided with clothes rod above.

E. Floor drains shall be provided.

3.5.3.9. Each Latrine

A. Four floor mounted toilets shall be provided with solid polymer toilet partitions.

B. A continuous solid polymer vanity shall be provided with four integrally molded 16” x 12” lavatories and 6” high coved back and side splash.

C. A glass mirror shall be provided for the length of the vanity with wall mounted light fixtures above.

D. Floor drains shall be provided.

E. Accessories shall include toilet tissue dispensers, napkin disposals, soap dispensers, paper towel dispensers, and waste receptacles.

3.5.3.10. Each Shower Room

A. Provide six shower stalls with seat in dressing area.

B. Provide a curtain and rod at each shower and at each dressing area.

C. Provide solid polymer shower partitions.

D. Provide a floor drain at each dressing area as well as in the shower room.

E. Include towel pins, clothes hooks, and soap and shampoo shelf in each shower/dressing area.

3.5.3.11. Each Janitor Closet

A. Provide floor mop sink with 4’-0” high stainless steel, tile, or solid polymer backsplash, service faucet with hose and bracket, mop rack for three mops, minimum 6’-0” of linear stainless steel shelving capable of supporting minimum 30 lb. per linear feet, and floor drain.

3.5.3.12. Each Senior Leader Sleeping Room

A. Built-in closets shall include minimum 3'-0" wide doors and a wire shelf with hanger bar capable of supporting minimum 30 lb. per linear foot.

B. Each room shall include at least one exterior window at 3'-0" above finish floor with blinds.

3.5.3.13. Each Senior Leader Bath and Sink Area

A. Provide a minimum 3'-0" wide solid polymer countertop with integrally molded 16"x12" lavatory and 4" high coved back and side splashes on base cabinet with hinged door(s).

B. Provide a glass mirror, full width of countertop with wall mounted vanity light fixture above.

C. Provide a floor mounted toilet with full seat and seat cover.

D. Minimum 3'-0" x 3'-0" fiberglass shower unit shall be provided with integral soap shelves, curtain, and curtain rod.

E. Provide a minimum 2'-4" wide door.

F. Towel pins and toilet tissue dispensers shall be provided.

3.5.3.14. Each Team Room

A. Provide space for seating minimum 14 people at a conference table and space for a wall mounted television. The television and mounting bracket shall not be in the contract since it will be included in the government's FF&E Package.

B. Provide data/internet ports along walls and cable connection for television.

C. Provide casework along wall at door on upper floors to accommodate a coffee maker.

3.6. OFFICERS QUARTERS

3.6.1. GENERAL NOTES & CODE REQUIREMENTS

The Officers' Quarters is a two-story building housing up to 80 leaders in 40 living/sleeping rooms. The Officers' Quarters are sized to accommodate a heavy armor BCT to include the E7 and E8 personnel that cannot be housed in the semi-private Senior Leader rooms in the Barracks.

Each living module consists of two semi-private rooms. Each room has a bathroom with shower, a sink outside the bathroom, two closets, and a space for two beds. The rooms can be assigned as double or single occupancy consistent with space authorized by grade. Laundry rooms, activity rooms, and vending are available on each floor.

If two Battalion complexes are required, and two Officers' Quarters are required, the two buildings may be combined into a single facility. Methods for combining the buildings, including adding stories, shall meet the design criteria set forth in this Standard Design as determined by the COS.

The Officers' Quarters shall be fully protected throughout by an automatic sprinkler system in accordance with NFPA and UFC documents. Accessibility for the disabled is not required since this facility will be occupied by able bodied personnel only. The Officers' Quarters shall be considered "billeting" with respect to AT/FP requirements.

Suggested Use and Occupancy Classification:

A. IBC: Group R-1 (Hotel, Transient)

B. NFPA 101: New Hotels and Dormitories

3.6.2. BUILDING DESCRIPTION & MATERIALS

The Officers' Quarters consists of a two story structure housing officers in semi-private rooms, each having separate bathrooms.

The first floor shall be slab on grade with an elevated concrete slab on the second floor

3.6.2.1. Doors:

A. All spaces shall include minimum 3'-0" wide doors except as indicated for bathroom doors.

B. Entrances shall include vestibules with full glazed aluminum storefront doors. All other exterior doors shall be metal with metal frames.

C. Interior rooms shall include solid-core wood with metal frames.

3.6.3. FLOOR PLAN REQUIREMENTS

3.6.3.1. Stairs:

A. Provide circulation to second floors at the vestibule and at the opposite end of the corridor.

B. End stairs shall either be covered or enclosed as determined by the installation and climatic conditions.

3.6.3.2. Interior Corridor:

A. Provide electric water cooler on each floor.

B. Minimum corridor width shall be 5'-0".

3.6.3.3. Mechanical:

A. Size and locate room to allow equipment removal and maintenance

B. Provide mechanical room on ground floor with doors opening to exterior only.

C. Second floor mechanical room shall include an interior access door and double exterior doors for equipment replacement. A double height mechanical room is acceptable in lieu of a mechanical room on each floor.

3.6.3.4. Electrical:

A. Size and locate rooms to allow equipment removal and maintenance

B. Locate main electrical room on ground floor.

3.6.3.5. Communications Room

A. Provide dedicated interior rooms for communications equipment, minimum 8'x10' for first floor and 6'x8' for the second floor.

3.6.3.6. Each Living/Sleeping Room:

A. Provide two built-in closets including wire shelf with hanger bar capable of supporting minimum 30 lb. per linear foot.

B. Provide minimum of one exterior window with blinds.

3.6.3.7. Each Living/Sleeping Room Bath:

A. Provide 3’-0” wide solid polymer countertop with integrally molded lavatory and 6” high coved back and side splashes. Provide vanity base cabinet with hinged door(s).

B. Provide wall mounted vanity light fixture above glass mirror for full width of vanity countertop.

C. Provide floor mounted toilet with full seat and seat cover.

D. Provide minimum 3’-0” x 3’-0” fiberglass shower unit shall be provided with integral soap/shampoo shelves, curtain, and curtain rod.

E. Towel pins and toilet tissue dispensers shall be provided.

F. Provide minimum 2’-4” wide door to bathroom.

3.6.3.8. Each Common Area:

A. Provide seating area to view wall mounted television. The television and mounting bracket shall not be in the contract since it will be included in the government’s FF&E Package. Also, provide adequate power and cable television.

B. Provide space for tables with seating.

C. Within the common area on the second floor, provide kitchenette with space for a refrigerator/freezer as part of the FF&E (which is not part of this contract), stainless steel double basin sink, and space for a microwave oven which will be provided by others. Provide base and wall cabinets, 8’-0” minimum length.

3.6.3.9. Each Storage Room

A. Provide built-in shelving with capability of supporting minimum 30 lb. per linear foot in storage rooms.

3.6.3.10. Each laundry

A. Provide four clothes washers as part of the FF&E Package which is not in this contract.

B. Provide five clothes dryers as part of the FF&E Package which is not in this contract.

C. Provide one solid polymer built-in clothes folding counter with clothes hanging rod above, with minimum dimension 120”x24”x36”.

D. Provide one solid polymer sink with gooseneck faucet.

E. Provide floor drain.

3.6.3.11. Each Janitor Closet

A. Provide floor mop sink with 4’-0” high stainless steel, tile, or solid polymer backsplash, service faucet with hose and bracket, mop rack for three mops, minimum 6’-0” of linear stainless steel shelving capable of supporting minimum 30 lb. per linear feet, and floor drain.

3.6.3.12. Each Vending

A. Provide location for soft drink and snack vending machines.

B. Provide appropriate utilities for the ice machine which shall be included in the FF&E Package, not in this contract.

C. Provide floor drain near ice machine.

3.7. NOT USED

3.8. NOT USED

3.9. NOT USED

3.10. NOT USED

3.11. NOT USED

ATTACHMENT A

ARMY STANDARD DESIGN DRAWINGS:

All Drawings are in compliance with Army Standard (AS) and the USACE A/E/C CADD Standards.

STANDARD DESIGNDRAWING INDEX

BATTALION HEADQUARTERS BULDING: TRANSIENT TRAINING

A001	BATTALION HEADQUARTERS BUILDING FLOOR PLAN
A002	BATTALION HEADQUARTERS BUILDING ELEVATIONS

2-STORY BARRACKS: TRANSIENT TRAINING

A003	NOT USED
A004	NOT USED
A004A	NOT USED
A005	NOT USED
A006	NOT USED

4-STORY BARRACKS: TRANSIENT TRAINING

A007	BARRACKS FIRST FLOOR PLAN : (4-STORY)
A008	BARRACKS SECOND FLOOR PLAN : (4-STORY)
A009	BARRACKS THIRD FLOOR PLAN : (4-STORY)
A010	BARRACKS FOURTH FLOOR PLAN : (4-STORY)
A010A	BARRACKS OPTIONAL FURNITURE LAYOUTS : (4-STORY)
A011	BARRACKS ENLARGED FLOOR PLANS : (4-STORY)
A012	BARRACKS ELEVATIONS : (4-STORY)

OFFICERS QUARTERS: TRANSIENT TRAINING

A013	OFFICERS QUARTERS FLOOR PLANS
A014	OFFICERS QUARTERS ENLARGED FLOOR PLANS
A015	OFFICERS QUARTERS ELEVATIONS

DINING FACILITY: TRANSIENT TRAINING

A016	NOT USED
A016A	NOT USED
A017	NOT USED
A017A	NOT USED
A082	NOT USED

COMPANY HEADQUARTERS BULDING: TRANSIENT TRAINING

A019	NOT USED
A020	NOT USED
A021	NOT USED

VEHICLE MAINTENANCE SHOP: TRANSIENT TRANING

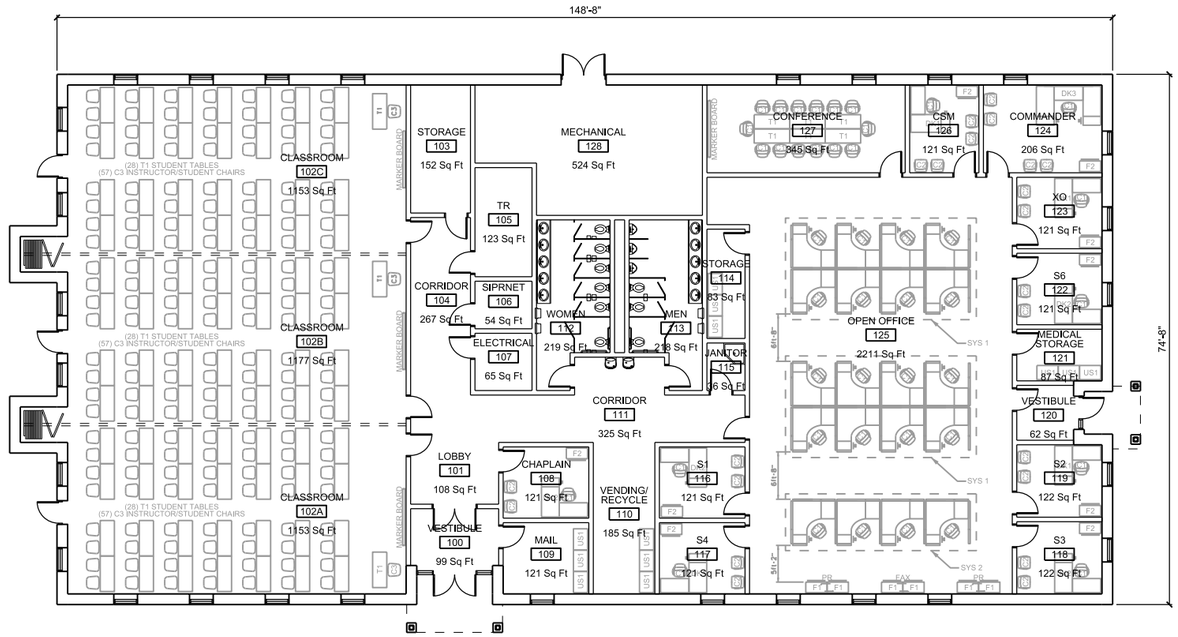
A022	NOT USED
A023	NOT USED

STORAGE SHED, GENERAL PURPOSE

A024	NOT USED

BRIGADE HEADQUARTERS BULDING: TRANSIENT TRAINING

A025	NOT USED
A026	NOT USED



C1 BATTALION HEADQUARTERS FLOOR PLAN

3/32" = 1'-0"

0 5' 10' 20'

BATTALION HQ - FINISH SCHEDULE

ROOM NO.	ROOM NAME	FINISH FLOOR	FINISH BASE	FINISH WALL	FINISH CLNG	MIN. CLNG HEIGHT	MIN. STC	NET SF	NOTES
COMMANDERS SUITE									
124	COMMANDER	CONC	RB	GWB	ACT	9'-0"	45	206 SF	
126	CSM OFFICE	CONC	RB	GWB	ACT	9'-0"	45	121 SF	
123	XO OFFICE	CONC	RB	GWB	ACT	9'-0"	45	121 SF	
119	S2 OFFICE	CONC	RB	GWB	ACT	9'-0"	45	122 SF	
118	S3 OFFICE	CONC	RB	GWB	ACT	9'-0"	45	122 SF	
117	S4 OFFICE	CONC	RB	GWB	ACT	9'-0"	45	121 SF	
116	S1 OFFICE	CONC	RB	GWB	ACT	9'-0"	45	121 SF	
122	S6 OFFICE	CONC	RB	GWB	ACT	9'-0"	45	121 SF	
121	MEDICAL STORAGE	CONC	RB	GWB	ACT	9'-0"	45	87 SF	
125	OPEN OFFICE	CONC	RB	GWB	ACT	9'-0"	45	2,211 SF	
127	CONFERENCE ROOM	CONC	RB	GWB	ACT	9'-0"	45	345 SF	
114	STORAGE	CONC	RB	GWB	ACT	9'-0"	45	83 SF	
SOLDIER SERVICES									
108	CHAPLAIN	CONC	RB	GWB	ACT	9'-0"	45	121 SF	
109	MAIL DISTRIBUTION	CONC	RB	GWB	GWB	9'-0"	45	121 SF	
111/104	CORRIDOR	CONC	RB	GWB	ACT	9'-0"	45	592 SF	
120A/B/C	CLASSROOMS	CONC	RB	GWB	ACT	9'-0"	50	3,483 SF	DIVIDE SF BETWEEN THREE CLASSROOMS
113	MEN	CT	CT	MRG	MRG	9'-0"	45	218 SF	
112	WOMEN	CT	CT	MRG	MRG	9'-0"	45	219 SF	
101	LOBBY	CONC	RB	GWB	ACT	9'-0"	~	108 SF	
120/100	VESTIBULE	CONC	RB	GWB	ACT	9'-0"	~	99 SF	
110	VENDING/RECYCLING	CONC	RB	GWB	ACT	9'-0"	~	185 SF	
115	JANITOR	CONC	RB	GWB	MRG	9'-0"	~	36 SF	
SERVICE									
103	CHAIR STORAGE	CONC	RB	GWB	ACT	9'-0"	~	152 SF	
128	MECHANICAL	CONC	RB	MRG	EXP	9'-0"	45	524 SF	
105	TELECOMMUNACTION	CONC	RB	GWB	GWB	9'-0"	~	123 SF	MIN ROOM = 1.1% OF BLDG AREA
106	SIPRNET	CONC	RB	GWB	GWB	9'-0"	~	54 SF	MIN 6'X6' ROOM
107	ELECTRICAL	CONC	RB	GWB	GWB	9'-0"	~	65 SF	

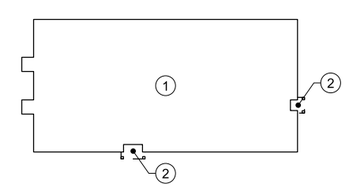
FINISH LEGEND

CONC - SEALED CONCRETE
RB - RUBBER BASE
GWB - PAINTED GYPSUM WALL BOARD
ACT - 2'-0"x2'-0" ACOUSTICAL TILE CEILING
EXP - EXPOSED, PAINTED STRUCTURE & DECK
MRG - MOISTURE RESISTANT GYPSUM BOARD, PAINTED

NOTES

1. ROOM FNISHES SHOWN ARE MINIMUM REQUIRED.
2. PROPOSED NET SF SHOWN IS AS REFLECTED IN THE STANDARD FLOOR PLAN. AREAS MAY CHANGE TO ALLOW FOR ADJUSTMENTS DUE TO STRUCTURAL, UTILITIES, & CODE REQUIREMENTS, WITHOUT AFFECTING FUNCTION.
3. SEE APPLICABLE APPENDIX "PRELIMINARY FF&E INFORMATION" FOR FURNITURE AND EQUIPMENT SYMBOLS & TAGS SHOWN ON THE FLOOR PLAN.

AREA CALCULATIONS



1	BUILDING AREAS AT FULL VALUE:	11,138 SF
	EXTERIOR COVERED AREA AT HALF VALUE:	
2	PORCHES	[(118 + 80) x 1/2] = 99 SF
		BUILDING TOTAL GROSS AREA = 11,237 SF

US ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT

REVISIONS
DESCRIPTION | DATE | APPR. | SYMBOL

DESIGNED BY: COE LOUISVILLE DISTRICT
DRAWN BY:
CHECKED BY:
COE LOUISVILLE DISTRICT PROJECT ENGINEER/ARCHITECT
DATE: V 4.4 23 SEPT 2011
SCALE: 3/32"=1'-0"
DRAWING CODE:
DATE

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS LOUISVILLE, KENTUCKY

OPERATIONAL READINESS TRAINING COMPLEX STANDARD DESIGN

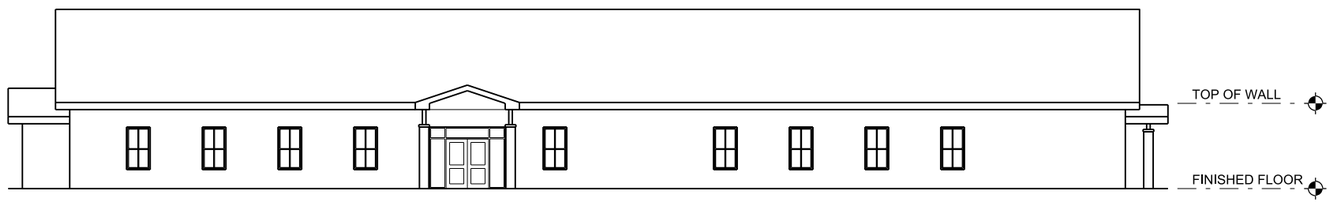
DEPARTMENT OF THE ARMY FACILITY STANDARDIZATION PROGRAM

BATTALION HEADQUARTERS FLOOR PLAN

SHEET REF NUMBER:
A001
SHEET 4 OF 33

A001.dgn
19-OCT-2011

Section:



C1 BATTALION HEADQUARTERS FLOOR PLAN
3/32" = 1'-0"
0 5' 10' 20'

C1 BATTALION HEADQUARTERS FLOOR PLAN
3/32" = 1'-0"
0 5' 10' 20'

C1 BATTALION HEADQUARTERS FLOOR PLAN
3/32" = 1'-0"
0 5' 10' 20'

ELEVATION DESIGN NOTES:

1. THE EXTERIOR ELEVATIONS ILLUSTRATE MASSING, NOT MANDATING A PARTICULAR ARCHITECTURAL THEME OR ANY SPECIFIC MATERIALS. THE SELECTION OF MATERIALS FOR THE EXTERIOR ENVELOPE SHALL BE GUIDED BY LOCAL CLIMATIC AND GEOGRAPHIC CONDITIONS, LOCAL CONSTRUCTION MATERIALS, AND OTHER ECONOMIC CONSIDERATIONS. THE EXTERIOR ENVELOPE MUST BE ANALYZED TO ASSURE CONFORMANCE WITH THE INSTALLATION ARCHITECTURAL THEME AS DESCRIBED IN THE INSTALLATION DESIGN GUIDE AND OTHER DESIGN REQUIREMENTS.
2. THE INTENT IS TO ALLOW DESIGNERS THE FLEXIBILITY IN AESTHETIC DESIGN WHILE MANDATING FUNCTIONAL REQUIREMENTS FOR THE BUILDING PLAN. THERMAL PROTECTION ALONG WITH DURABLE INTERIOR AND EXTERIOR WALL SURFACES WITH APPROPRIATE AESTHETIC QUALITIES SHALL BE GIVEN PRIORITY TO CREATE SUSTAINABLE AND FUNCTIONAL ARCHITECTURE.
3. BUILDING HEIGHTS SHOWN ON THE ELEVATIONS ARE FOR ILLUSTRATION ONLY. BUILDING HEIGHTS SHALL BE DETERMINED BY THE DESIGNER, MAINTAINING MINIMUM CEILING AND CLEAR HEIGHTS INDICATED IN THE FINISH SCHEDULES IN THE DRAWINGS, AND TO PROVIDE ADEQUATE SPACE FOR UTILITIES AND STRUCTURE ABOVE FINISH CEILINGS AND ABOVE REQUIRED CLEAR HEIGHTS WHERE STRUCTURE IS EXPOSED.
4. SEE APPENDIX F FOR INSTALLATION'S ARCHITECTURAL THEME INCLUDING EXTERIOR COLORS AND MATERIALS.

US ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT

SYMBOL	REVISION'S DESCRIPTION	DATE	APPR.

DESIGNED BY: COE LOUISVILLE DISTRICT
DRAWN BY:
CHECKED BY:
COE LOUISVILLE DISTRICT PROJECT ENGINEER/ARCHITECT DATE
DATE: V 4.4 23 SEPT 2011
SCALE: 3/32"=1'-0"
DRAWING CODE:

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS LOUISVILLE, KENTUCKY

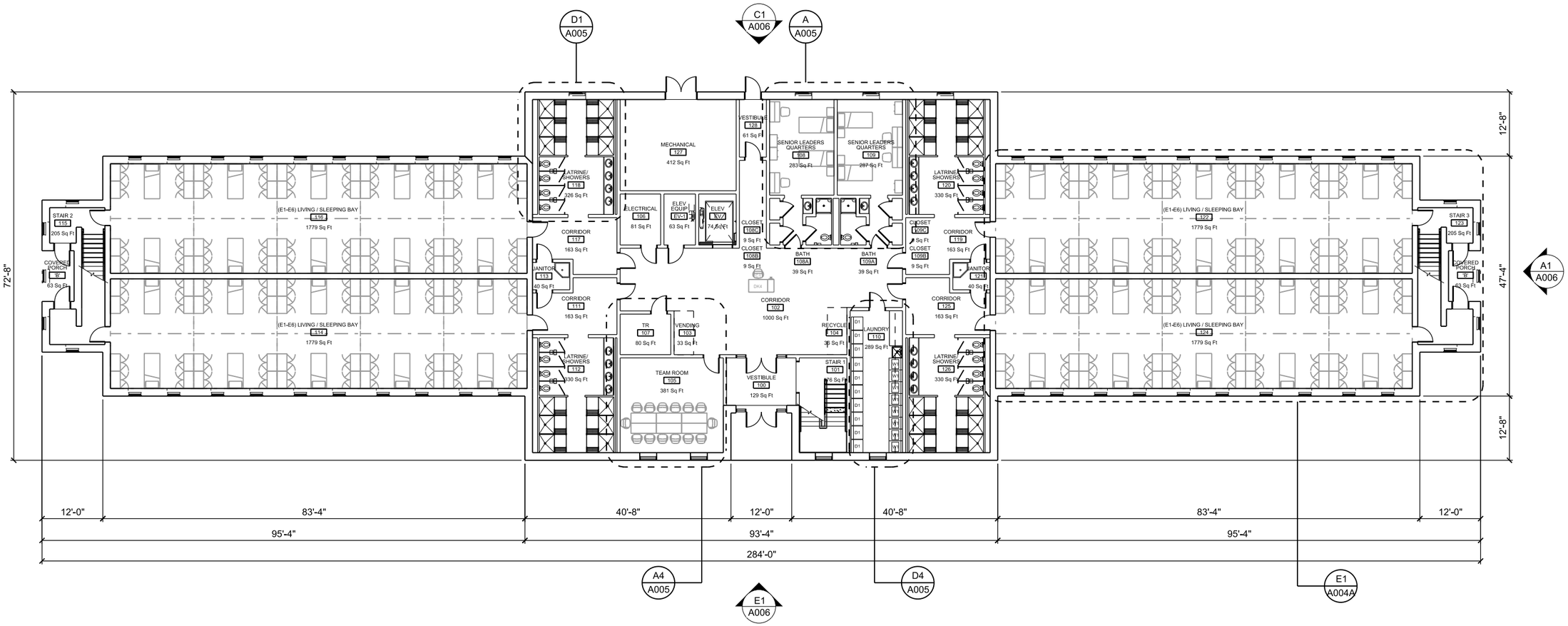
OPERATIONAL READINESS TRAINING COMPLEX STANDARD DESIGN

DEPARTMENT OF THE ARMY FACILITY STANDARDIZATION PROGRAM

BATTALION HEADQUARTERS ELEVATIONS

SHEET REF NUMBER:
A002
SHEET 5 OF 33

A002.dgn
19-OCT-2011



C1 BARRACKS FIRST FLOOR PLAN: (4-STORY)

SCALE: 3/32" = 1'-0"

0 5' 10' 20'

(4-STORY) BARRACKS - FINISH SCHEDULE

ROOM NO.	ROOM NAME	FINISH FLOOR	FINISH BASE	FINISH WALL	FINISH CLNG	MIN. CLNG HEIGHT	MIN. STC	NET SF	NOTES
OPEN BAY									
114/116/122/124, 214/216/222/224, 314/316/322/324, 414/416/422/424	(E1-E6) LIVING/SLEEPING BAY	CONC	~	CMU	NOTE 2	10'-0"	50	1,779 SF EA	
E7-E8 MODULE									
108/109, 208/209, 308/309, 408/409	SENIOR LEADERS QUARTERS/CLOSETS	CONC	~	CMU	NOTE 2	8'-0"	50	285 SF EA	
108A/108A, 208A/208A, 308A/309A, 488A/409A	BATH	CONC	~	CMU	MRG	8'-0"	50	39 SF EA	
COMMONS									
112/118/120/126, 212/218/220/226, 312/318/320/326, 412/418/420/426	LATRINE & SHOWERS	CONC	~	CMU	MRG	9'-0"	50	330 SF EA	
100	VESTIBULE	CONC	~	CMU	MRG	9'-0"	~	129 SF	
128	VESTIBULE	CONC	~	CMU	MRG	9'-0"	~	61 SF	
105, 205/305/405	TEAM ROOMS	CONC	~	CMU	NOTE 2	9'-0"	~	381 SF (1ST FLR) 515 SF EA (OTHER)	
104/204/304/404	LAUNDRY	CONC	~	CMU	NOTE 2	9'-0"	50	289 SF EA	
113/121, 213/221, 313/321, 413/421	JANITOR	CONC	~	CMU	NOTE 2	8'-0"	~	40 SF EA	
102	CORRIDOR/VENDING/RECYCLI	CONC	~	CMU	NOTE 2	8'-0"	~	1069 SF	
202/302/402	CORRIDOR/VENDING/RECYCLI	CONC	~	CMU	NOTE 2	8'-0"	~	1039 SF EA	
111/117/119/125, 211/217/219/225, 311/317/319/325, 411/417/419/425	CORRIDOR	CONC	~	CMU	NOTE 2	8'-0"	~	163 SF EA	

ROOM NO.	ROOM NAME	FINISH FLOOR	FINISH BASE	FINISH WALL	FINISH CLNG	MIN. CLNG HEIGHT	MIN. STC	NET SF	NOTES
101/201/301/401	STAIR 1	CONC	~	CMU	NOTE 2	8'-0"	~	352 SF	
115/215/315/415	STAIR 2	CONC	~	CMU	NOTE 2	8'-0"	~	500 SF	
123/223/323/423	STAIR 3	CONC	~	CMU	NOTE 2	8'-0"	~	500 SF	
EV-1	ELEV ROOM	CONC	~	CMU	NOTE 2	8'-0"		35 SF	
EV-1	ELEVATOR							71 SF	MIN 7'-6" CAB DEPTH
SERVICE									
127, 227/327/427	MECHANICAL	CONC	~	CMU	~	10'-0"	50	412 SF (1ST FLR) 577 SF EA (OTHER))	
106, 206/306/406	ELECTRICAL	CONC	~	CMU	~	8'-0"	~	81 SF (1ST FLR) 105 SFEA (OTHER)	
107, 207/307/407	TELECOMMUNACTION	CONC	~	CMU	~	8'-0"	~	80 SF (1ST FLR) 80 SF EA (OTHER)	MIN 8x10 ROOM ON 1ST FLR. MIN 6x8 ROOM ON UPPER

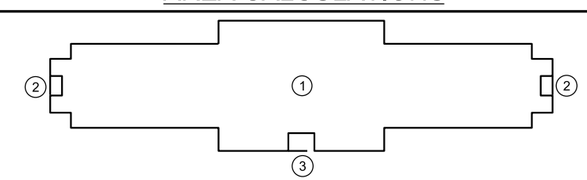
FINISH LEGEND

CONC - SEALED CONCRETE
CMU - PAINTED CMU
MRG - MOISTURE RESISTANT GYPSUM BOARD, PAINTED

NOTES

1. ROOM FINISHES SHOWN ARE MINIMUM REQUIRED.
2. WHEN PRECAST CONCRETE STRUCTURE IS USED, PAINT EXPOSED CONCRETE & STEEL STRUCTURE FOR AN ACCEPTABLE CEILING FINISH. FOR OTHER STRUCTURAL CONDITIONS (SUCH AS TRUSSES, JOISTS, ETC.) PROVIDE PAINTED GYPSUM BOARD FOR THE MINIMUM CEILING FINISH.
3. PROPOSED NET SF SHOWN IS AS REFLECTED IN THE STANDARD FLOOR PLAN. AREAS MAY CHANGE TO ALLOW FOR ADJUSTMENTS DUE TO STRUCTURAL, UTILITIES, & CODE REQUIREMENTS, WITHOUT AFFECTING FUNCTION.
4. SEE APPLICABLE APPENDIX, "PRELIMINARY FF&E INFORMATION" FOR FURNITURE AND EQUIPMENT SYMBOLS & TAGS SHOWN ON THE FLOOR PLAN. THE FF&E PACKAGE WILL BE DEVELOPED BY THE GOVERNMENT. THE FURNITURE IN THE FF&E PACKAGE WILL BE PROVIDED BY THE GOVERNMENT. THE CONTRACTOR SHALL COORDINATE FURNITURE & UTILITY REQUIREMENTS WITH THE FF&E PACKAGE.

AREA CALCULATIONS



FIRST FLOOR GROSS AREA CALCS

1ST FLOOR
FULL VALUE:

1	INTERIOR SPACE	15,152 SF

HALF VALUE:

2	EXTERIOR COVERED	[(65 x2) x 1/2] = 65 SF
3	EXTERIOR COVERED	(124 x 1/2) = 62 SF

FIRST FLOOR TOTAL GROSS AREA: 15,279 SF

US ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT

REVISIONS
SYMBOL | DESCRIPTION | DATE | APPR.

DESIGNED BY: COE LOUISVILLE DISTRICT
DRAWN BY:
CHECKED BY:
DATE: V 4.4 23 SEPT 2011
SCALE: 3/32"=1'-0"
DRAWING CODE:
COE LOUISVILLE DISTRICT PROJECT ENGINEER/ARCHITECT
DATE

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS LOUISVILLE, KENTUCKY

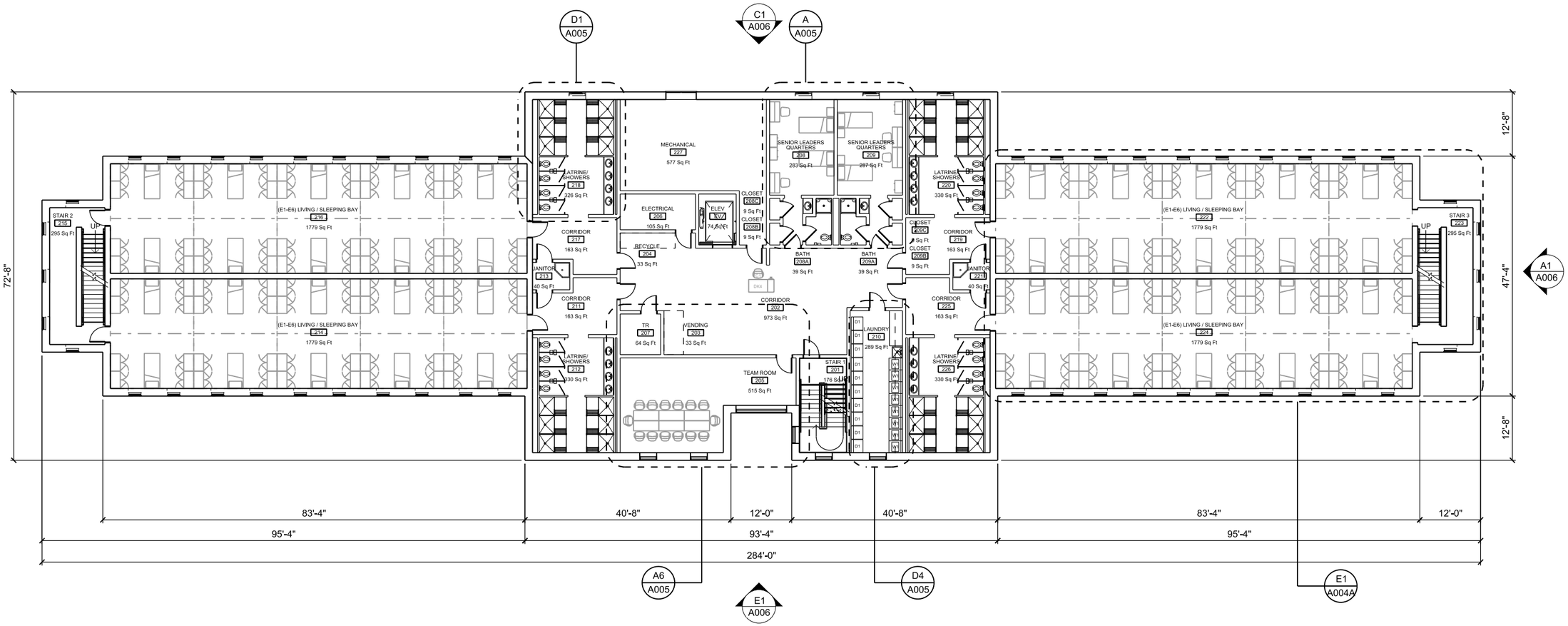
OPERATIONAL READINESS TRAINING COMPLEX STANDARD DESIGN

DEPARTMENT OF THE ARMY FACILITY STANDARDIZATION PROGRAM

BARRACKS FIRST FLOOR PLAN: (4- STORY)

SHEET REF NUMBER:
A007
SHEET 11 OF 33

A007.dgn
19-OCT-2011

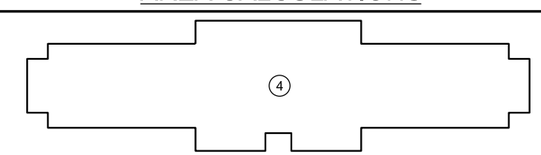


C1 BARRACKS SECOND FLOOR PLAN: (4-STORY)

SCALE: 3/32" = 1'-0"

0 5' 10' 20'

AREA CALCULATIONS



SECOND FLOOR GROSS AREA CALCS

2ND FLOOR
FULL VALUE:

4	INTERIOR SPACE 15,279 SF	
	2ND FLOOR TOTAL:	15,279 SF

1ST FLOOR TOTAL:	15,279 SF
2ND FLOOR TOTAL:	15,279 SF
BUILDING TOTAL TOTAL GROSS AREA:	30,558 SF

US ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT

REVISIONS
DESCRIPTION | DATE | APPR. | SYMBOL

DESIGNED BY: COE LOUISVILLE DISTRICT
DRAWN BY:
CHECKED BY:
DATE: V 4.4 23 SEPT 2011
SCALE: 3/32"=1'-0"
DRAWING CODE:
COE LOUISVILLE DISTRICT PROJECT ENGINEER/ARCHITECT
DATE

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS LOUISVILLE, KENTUCKY

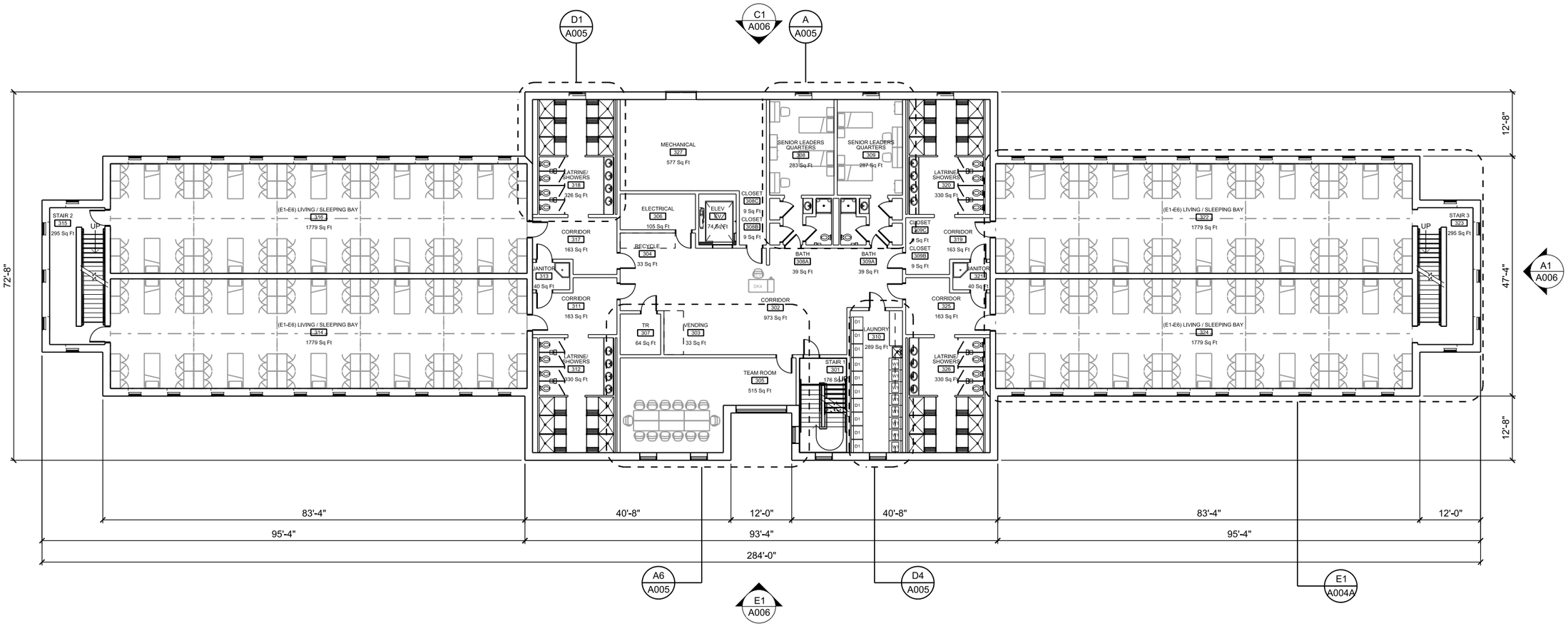
OPERATIONAL READINESS TRAINING COMPLEX STANDARD DESIGN

DEPARTMENT OF THE ARMY FACILITY STANDARDIZATION PROGRAM

BARRACKS SECOND FLOOR PLAN: (4-STORY)

SHEET REF NUMBER:
A008
SHEET 12 OF 33

A008.dgn
19-OCT-2011

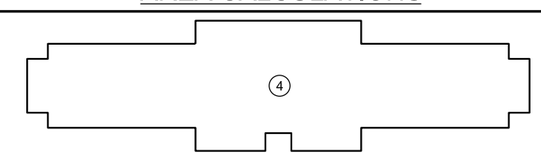


C1 BARRACKS THIRD FLOOR PLAN: (4-STORY)

SCALE: 3/32" = 1'-0"

0 5' 10' 20'

AREA CALCULATIONS



THIRD FLOOR GROSS AREA CALCS

2ND FLOOR
FULL VALUE:

4 INTERIOR SPACE 15,279 SF

2ND FLOOR TOTAL: 15,279 SF

1ST FLOOR TOTAL: 15,279 SF

2ND FLOOR TOTAL: 15,279 SF

BUILDING TOTAL TOTAL GROSS AREA: 30,558 SF

US ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT

REVISIONS DESCRIPTION	DATE	APPR.
SYMBOL		

DESIGNED BY: COE LOUISVILLE DISTRICT
DRAWN BY:
CHECKED BY:
DATE: V 4.4 23 SEPT 2011
SCALE: 3/32"=1'-0"
DRAWING CODE:
COE LOUISVILLE DISTRICT
PROJECT ENGINEER/ARCHITECT
DATE

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

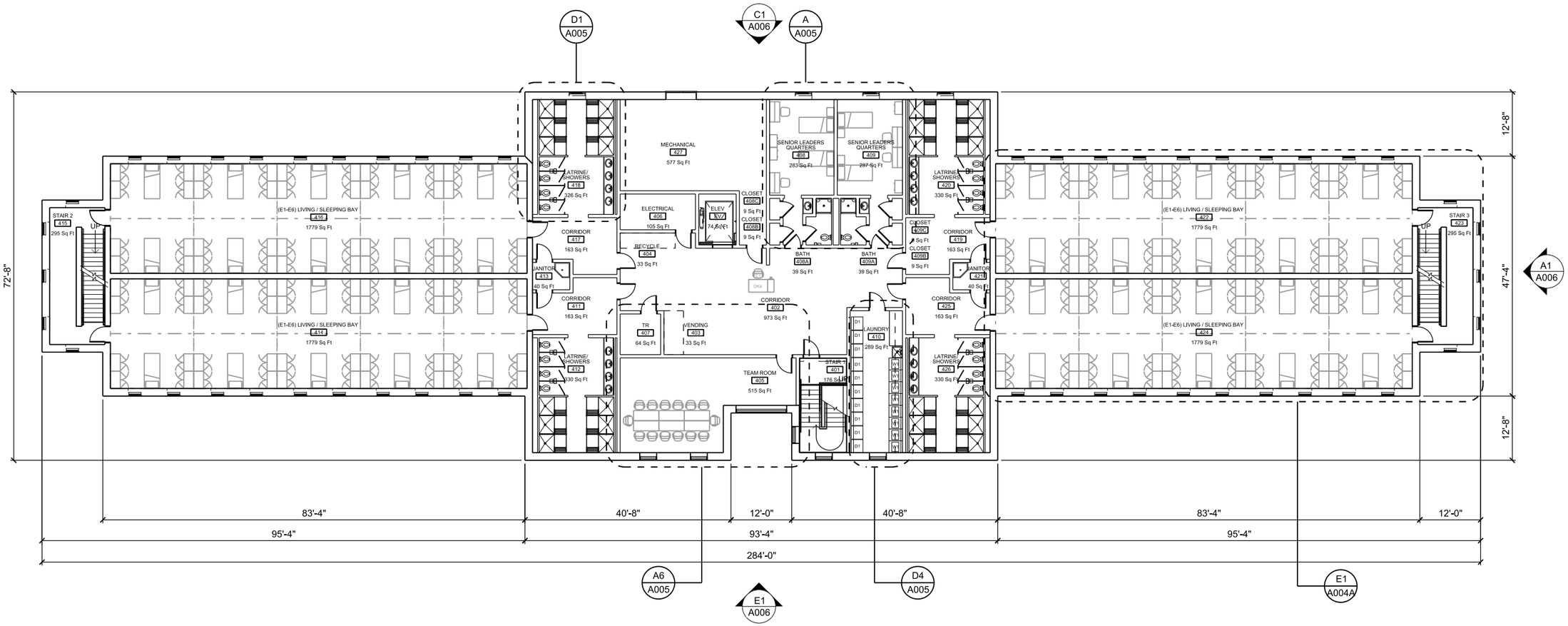
OPERATIONAL READINESS
TRAINING COMPLEX
STANDARD DESIGN

DEPARTMENT OF THE ARMY
FACILITY STANDARDIZATION PROGRAM

BARRACKS
THIRD FLOOR PLAN:
(4-STORY)

SHEET REF NUMBER:
A009
SHEET 13 OF 33

A009.dgn
19-OCT-2011

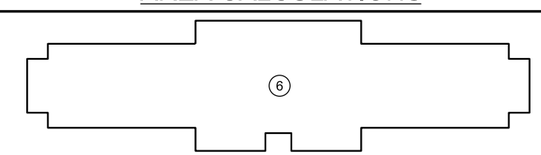


C1 BARRACKS FOURTH FLOOR PLAN: (4-STORY)

SCALE: 3/32" = 1'-0"

0 5' 10' 20'

AREA CALCULATIONS



FORTH FLOOR GROSS AREA CALCS

4TH FLOOR
FULL VALUE:

6	INTERIOR SPACE	15,279 SF
	4TH FLOOR TOTAL:	15,279 SF

1ST FLOOR TOTAL:	15,279 SF
2ND FLOOR TOTAL:	15,279 SF
3RD FLOOR TOTAL:	15,279 SF
4TH FLOOR TOTAL:	15,279 SF
BUILDING TOTAL:	61,116 SF

US ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT

REVISIONS
DESCRIPTION | DATE | APPR. | SYMBOL

DESIGNED BY: COE LOUISVILLE DISTRICT
DRAWN BY:
CHECKED BY:
DATE: V 4.4 23 SEPT 2011
SCALE: 3/32"=1'-0"
DRAWING CODE:
COE LOUISVILLE DISTRICT PROJECT ENGINEER/ARCHITECT
DATE

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS LOUISVILLE, KENTUCKY

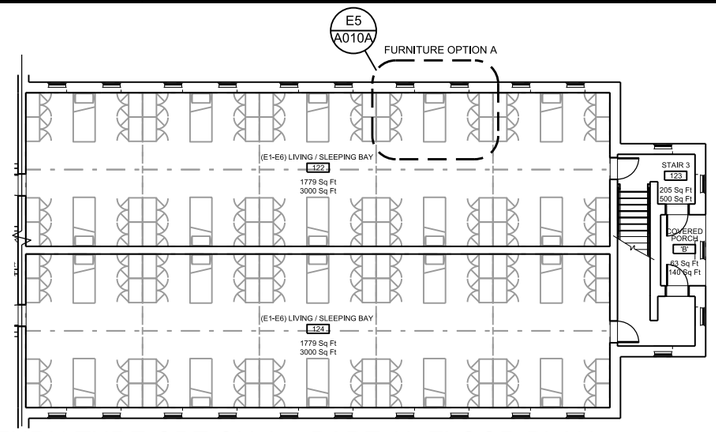
OPERATIONAL READINESS TRAINING COMPLEX STANDARD DESIGN

DEPARTMENT OF THE ARMY FACILITY STANDARDIZATION PROGRAM

BARRACKS FOURTH FLOOR PLAN: (4-STORY)

SHEET REF NUMBER:
A010
SHEET 14 OF 33

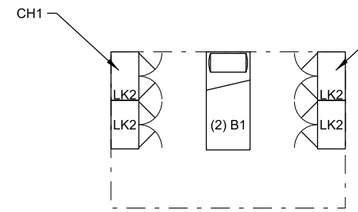
A010.dgn
19-OCT-2011



E1 FURNITURE OPTION A: PARTIAL FLOOR PLAN

SCALE: 3/32" = 1'-0"

0 5' 10' 20'



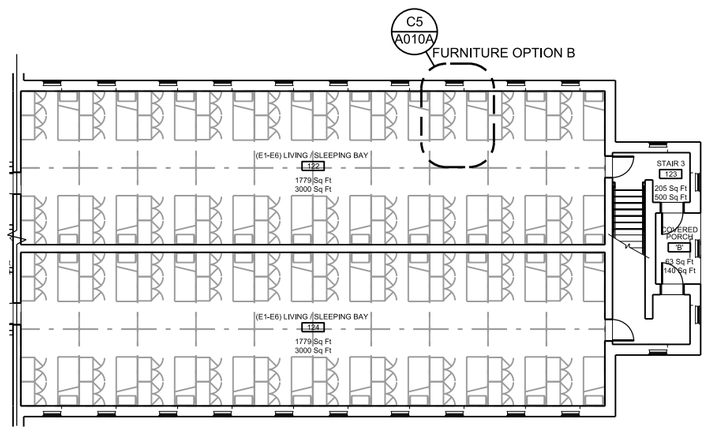
E1-E6 BED SPACE (160 PN)

1. PROVIDE MINIMUM 90 NET SQUARE FEET PER OCCUPANT. AREA INCLUDES CIRCULATION.
2. (1) BUNK BED 40"x 85"x 75" H WHICH IS MADE UP OF (2) B1.
3. (4) STORAGE CABINETS MINIMUM 42"Wx24"Dx78"H

E5 (E1-E6) BED SPACE - OPTION A

SCALE: 3/16" = 1'-0"

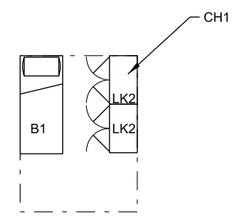
0 4' 8' 12'



C1 FURNITURE OPTION B: PARTIAL FLOOR PLAN

SCALE: 3/32" = 1'-0"

0 5' 10' 20'



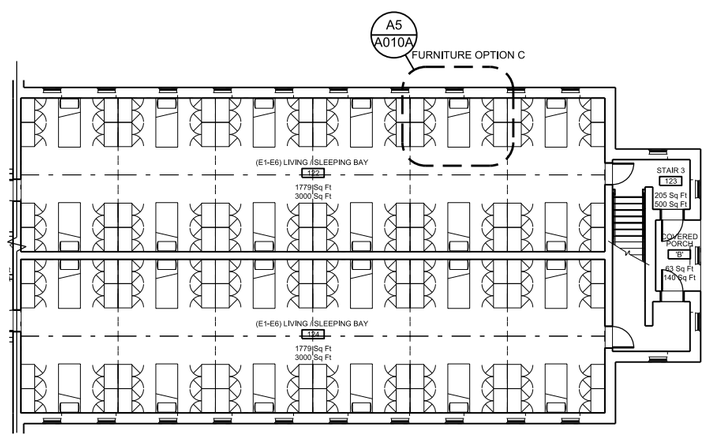
E1-E6 BED SPACE (160 PN)

1. PROVIDE MINIMUM 90 NET SQUARE FEET PER OCCUPANT. AREA INCLUDES CIRCULATION.
2. (1) BED 40"x 85"x 36" H
3. (2) STORAGE CABINETS MINIMUM 42"Wx24"Dx78"H

C5 (E1-E6) BED SPACE - OPTION B

SCALE: 3/16" = 1'-0"

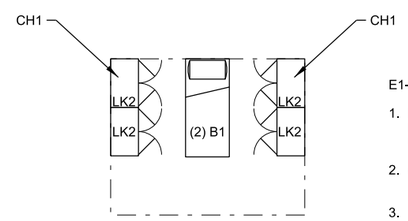
0 4' 8' 12'



A1 FURNITURE OPTION C: PARTIAL FLOOR PLAN

SCALE: 3/32" = 1'-0"

0 5' 10' 20'



E1-E6 BED SPACE (192 PN)

1. PROVIDE MINIMUM 72 NET SQUARE FEET PER OCCUPANT. AREA INCLUDES CIRCULATION.
2. (1) BUNK BED 40"x 85"x 75" H WHICH IS MADE UP OF (2) B1.
3. (4) STORAGE CABINETS MINIMUM 42"Wx24"Dx78"H

A5 (E1-E6) BED SPACE - OPTION C

SCALE: 3/16" = 1'-0"

0 4' 8' 12'

US ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT

SYMBOL	DESCRIPTION	DATE	APPR.
	REVISIONS		

DESIGNED BY: COE LOUISVILLE DISTRICT
DRAWN BY:
CHECKED BY:
DATE: V 4.4 23 SEPT 2011
SCALE: 3/32"=1'-0"
DRAWING CODE:
COE LOUISVILLE DISTRICT PROJECT ENGINEER/ARCHITECT
DATE

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS LOUISVILLE, KENTUCKY

OPERATIONAL READINESS TRAINING COMPLEX STANDARD DESIGN

DEPARTMENT OF THE ARMY FACILITY STANDARDIZATION PROGRAM

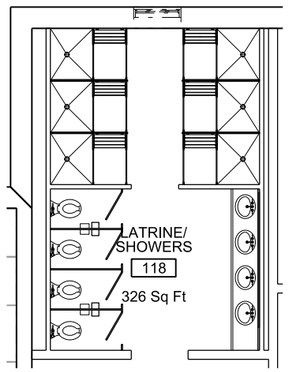
BARRACKS OPTIONAL FURNITURE LAYOUT (4-STORY)

SHEET REF NUMBER:

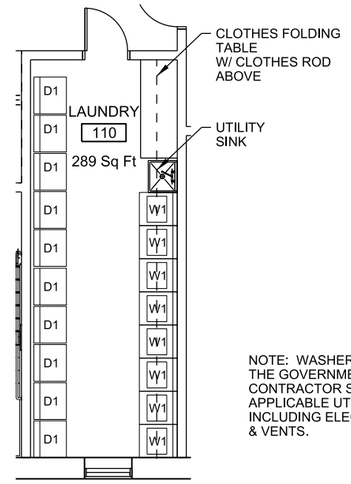
A010A

SHEET 15 OF 33

A010A.dgn
19-OCT-2011

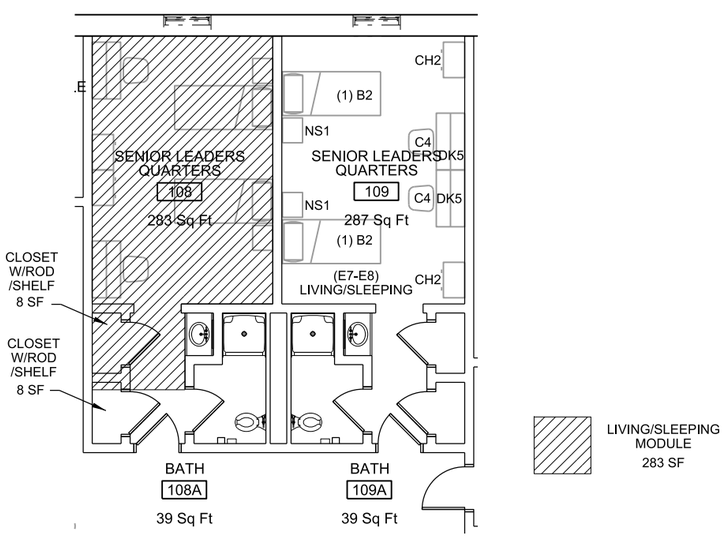


D1 LATRINE / SHOWER MODULE
SCALE: 3/16" = 1'-0"

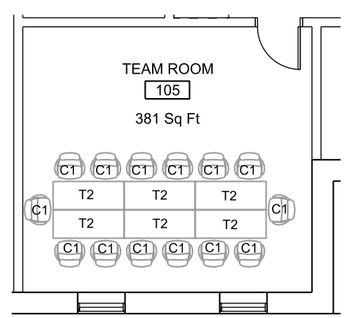


NOTE: WASHERS & DRYERS ARE GFGI THRU THE GOVERNMENT PROVIDED FF&E PACKAGE. CONTRACTOR SHALL COORDINATE & PROVIDE APPLICABLE UTILITY REQUIREMENTS INCLUDING ELECTRIC, GAS, WATER, DRAINS, & VENTS.

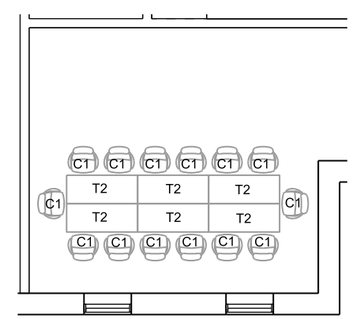
D4 LAUNDRY
SCALE: 3/16" = 1'-0"



A1 MODIFIED 2+2 MODULE
SENIOR LEADERS QUARTERS
SCALE: 3/16" = 1'-0"



A4 FIRST FLOOR
TEAM ROOM
SCALE: 3/16" = 1'-0"



A6 SECOND / THIRD /
FOURTH FLOOR
TEAM ROOM
SCALE: 3/16" = 1'-0"

US ARMY CORPS
OF ENGINEERS
LOUISVILLE DISTRICT

REVISIONS
SYMBOL | DESCRIPTION | DATE | APPR.

DESIGNED BY: COE LOUISVILLE DISTRICT
DRAWN BY:
CHECKED BY:
DATE: V 4.4 23 SEPT 2011
SCALE: 3/16"=1'-0"
DRAWING CODE:
COE LOUISVILLE DISTRICT
PROJECT ENGINEER/ARCHITECT
DATE

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

OPERATIONAL READINESS
TRAINING COMPLEX
STANDARD DESIGN

DEPARTMENT OF THE ARMY
FACILITY STANDARDIZATION PROGRAM

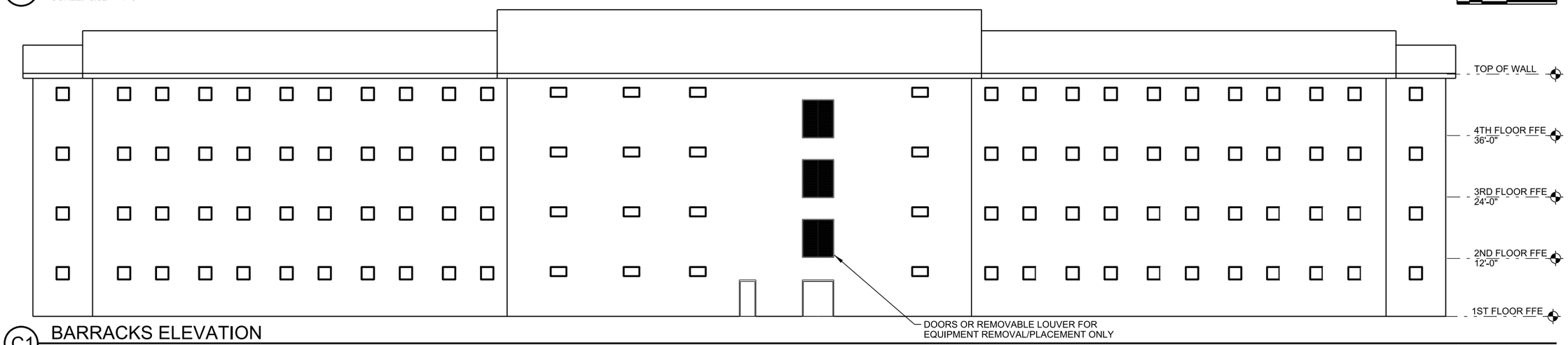
BARRACKS ENLARGED
ENLARGED PLANS
(4-STORY)

SHEET REF NUMBER:
A011
SHEET 16 OF 33

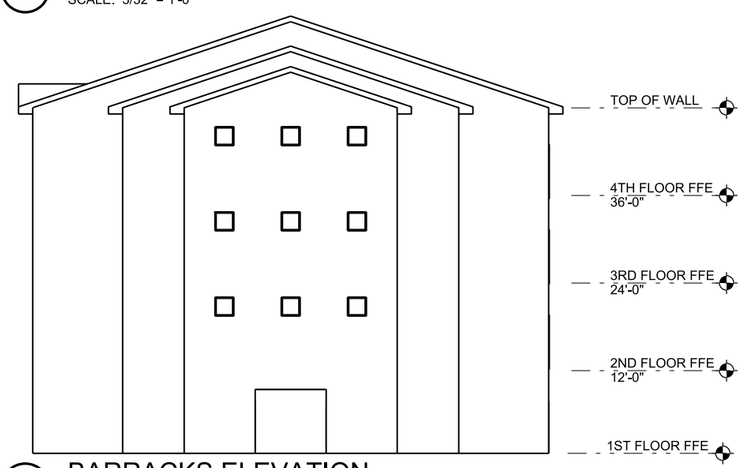
A011.dgn
19-OCT-2011

Section:

E1 BARRACKS ELEVATION
SCALE: 3/32" = 1'-0"



C1 BARRACKS ELEVATION
SCALE: 3/32" = 1'-0"



A1 BARRACKS ELEVATION
SCALE: 3/32" = 1'-0"

ELEVATION DESIGN NOTES:

1. THE EXTERIOR ELEVATIONS ILLUSTRATE MASSING, NOT MANDATING A PARTICULAR ARCHITECTURAL THEME OR ANY SPECIFIC MATERIALS. THE SELECTION OF MATERIALS FOR THE EXTERIOR ENVELOPE SHALL BE GUIDED BY LOCAL CLIMATIC AND GEOGRAPHIC CONDITIONS, LOCAL CONSTRUCTION MATERIALS, AND OTHER ECONOMIC CONSIDERATIONS. THE EXTERIOR ENVELOPE MUST BE ANALYZED TO ASSURE CONFORMANCE WITH THE INSTALLATION ARCHITECTURAL THEME AS DESCRIBED IN THE INSTALLATION DESIGN GUIDE AND OTHER DESIGN REQUIREMENTS.
2. THE INTENT IS TO ALLOW DESIGNERS THE FLEXIBILITY IN AESTHETIC DESIGN WHILE MANDATING FUNCTIONAL REQUIREMENTS FOR THE BUILDING PLAN. THERMAL PROTECTION ALONG WITH DURABLE INTERIOR AND EXTERIOR WALL SURFACES WITH APPROPRIATE AESTHETIC QUALITIES SHALL BE GIVEN PRIORITY TO CREATE SUSTAINABLE AND FUNCTIONAL ARCHITECTURE.
3. BUILDING HEIGHTS SHOWN ON THE ELEVATIONS ARE BASED ON 12-FOOT FLOOR-TO-FLOOR HEIGHTS WHICH SHALL BE CONSIDERED THE MINIMUM REQUIREMENT. FLOOR-TO-FLOOR HEIGHTS SHALL BE INCREASED IF REQUIRED TO MAINTAIN MINIMUM CLEAR HEIGHTS INDICATED IN THE FINISH SCHEDULES IN THE DRAWINGS, AND TO PROVIDE ADEQUATE SPACE FOR UTILITIES ABOVE FINISH CEILINGS AND ABOVE REQUIRED CLEAR HEIGHTS WHERE STRUCTURE IS EXPOSED.
4. SEE APPENDIX F FOR INSTALLATION'S ARCHITECTURAL THEME INCLUDING EXTERIOR COLORS AND MATERIALS.

US ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT

REVISIONS
SYMBOL | DESCRIPTION | DATE | APPR.

DESIGNED BY: COE LOUISVILLE DISTRICT
DATE: V 4.4 23 SEPT 2011
DRAWN BY:
SCALE: 3/32"=1'-0"
CHECKED BY:
DRAWING CODE:
COE LOUISVILLE DISTRICT
PROJECT ENGINEER/ARCHITECT
DATE

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

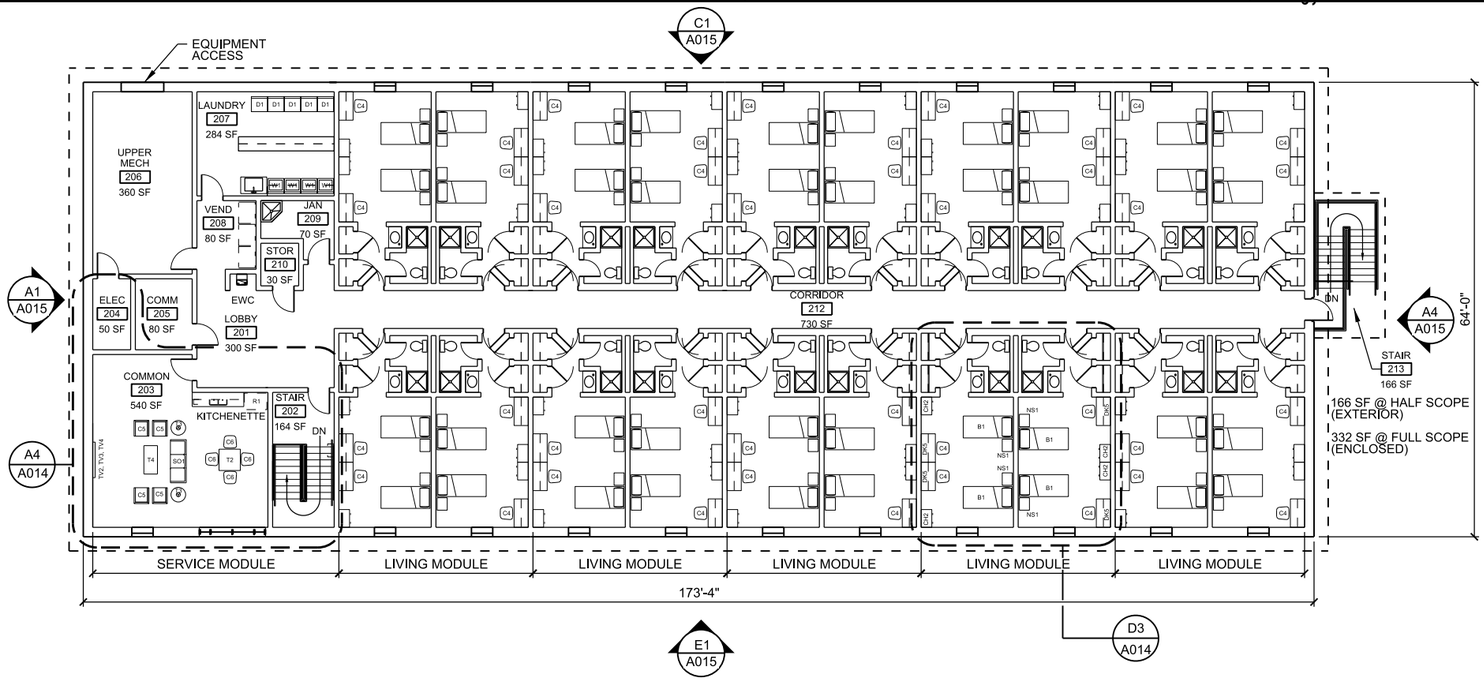
OPERATIONAL READINESS
TRAINING COMPLEX
STANDARD DESIGN

DEPARTMENT OF THE ARMY
FACILITY STANDARDIZATION PROGRAM

BARRACKS
ELEVATIONS
(4-STORY)

SHEET REF NUMBER:
A012
SHEET 17 OF 33

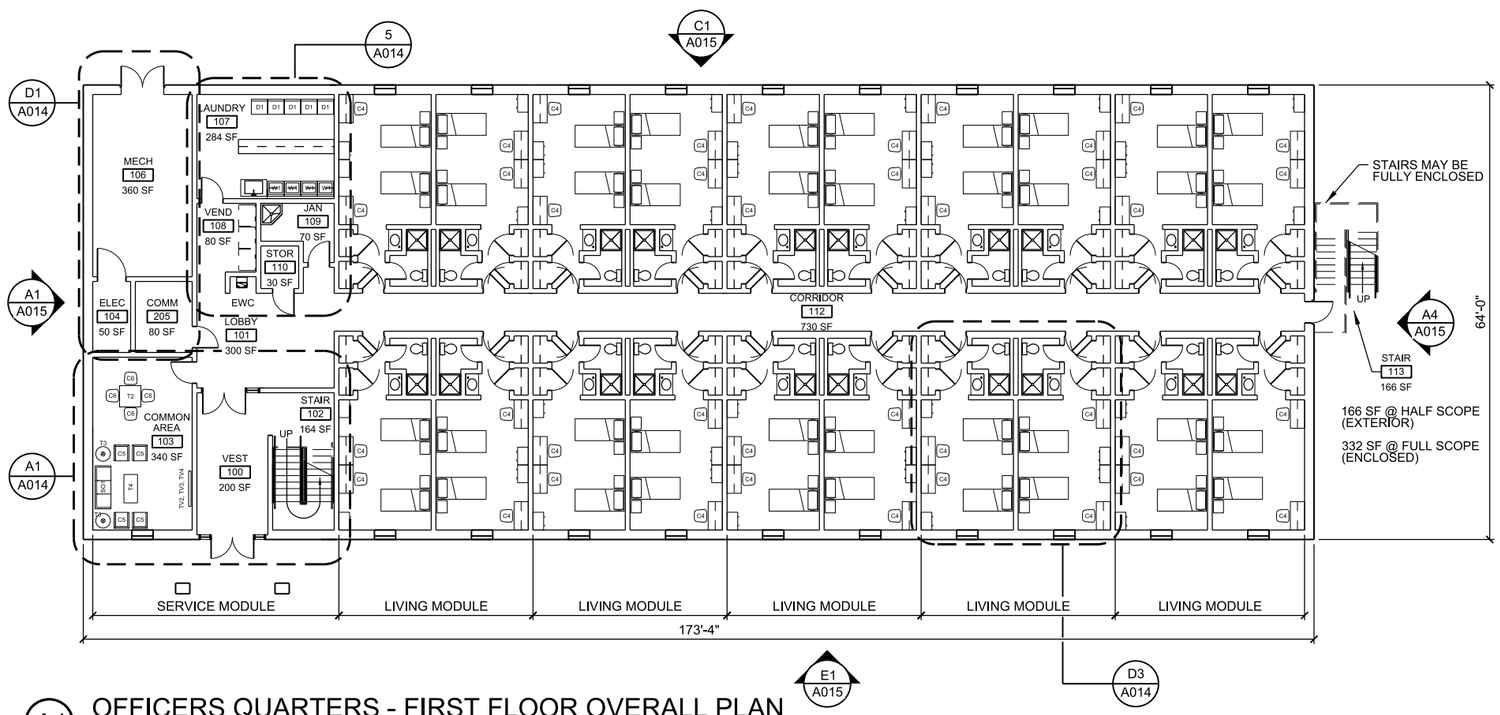
A012.dgn
19-OCT-2011



D1 OFFICERS QUARTERS - SECOND FLOOR OVERALL PLAN

SCALE: 3/32" = 1'-0"

0 5' 10' 20'



A1 OFFICERS QUARTERS - FIRST FLOOR OVERALL PLAN

SCALE: 3/32" = 1'-0"

0 5' 10' 20'

OFFICERS QUARTERS - FINISH SCHEDULE

ROOM NO.	ROOM NAME	FINISH FLOOR	FINISH BASE	FINISH WALL	FINISH CLNG	MIN. CLNG HT.	MIN. STC	NET SF	NOTES
MODULE									
EACH	LIVING/SLEEPING RM	CONC	~	CMU	GWB	8'-0"	50	296 SF	20 MODULES (40 ROOMS)
EACH	BATH & SINK AREA	CONC	~	CMU	MRG	8'-0"	50	45 SF	40 BATH/SINK AREAS
FIRST FLOOR - COMMONS									
100	VESTIBULE	CONC	~	CMU	EXP	9'-0"	~	200 SF	
101	LOBBY	CONC	~	CMU	EXP	9'-0"	~	300 SF	
103	COMMON AREA	CONC	~	CMU	EXP	9'-0"	~	340 SF	
102	STAIR	CONC	~	CMU	EXP	9'-0"	~	164 SF	
108	VENDING	CONC	~	CMU	EXP	8'-0"	~	80 SF	
107	LAUNDRY	CONC	~	CMU	EXP	9'-0"	50	284 SF	
109	JANITOR	CONC	~	CMU	MRG	8'-0"	~	70 SF	
112	CORRIDOR	CONC	~	CMU	EXP	8'-0"	~	730 SF	
113	STAIR	CONC	~	CMU	EXP	9'-0"	~	166 SF	FINISHES APPLY FOR ENCLOSED STAIR
FIRST FLOOR - SERVICE									
110	STORAGE	CONC	~	CMU	EXP	8'-0"	~	30 SF	
106	MECHANICAL	CONC	~	CMU	EXP	8'-0"	50	360 SF	
104	ELECTRICAL	CONC	~	CMU	EXP	8'-0"	~	50 SF	
105	COMM	CONC	~	CMU	GWB	8'-0"	~	80 SF	
SECOND FLOOR - COMMONS									
201	LOBBY	CONC	~	CMU	EXP	9'-0"	~	300 SF	
202	STAIR	CONC	~	CMU	EXP	9'-0"	~	164 SF	
203	COMMON AREA	CONC	~	CMU	EXP	9'-0"	~	540 SF	
208	VENDING	CONC	~	CMU	EXP	8'-0"	~	80 SF	
207	LAUNDRY	CONC	~	CMU	EXP	9'-0"	50	284 SF	
209	JANITOR	CONC	~	CMU	EXP	8'-0"	~	70 SF	
212	CORRIDOR	CONC	~	CMU	EXP	8'-0"	~	730 SF	
213	STAIR	CONC	~	CMU	EXP	9'-0"	~	166 SF	FINISHES APPLY FOR ENCLOSED STAIR
SECOND FLOOR - SERVICE									
210	STORAGE	CONC	~	CMU	EXP	8'-0"	~	210 SF	
206	UPPER MECHANICAL	CONC	~	CMU	EXP	8'-0"	50	360 SF	
204	ELECTRICAL	CONC	~	CMU	EXP	8'-0"	~	50 SF	
205	COMM	CONC	~	CMU	GWB	8'-0"	~	80 SF	MINIMUM 8'X10' ROOM

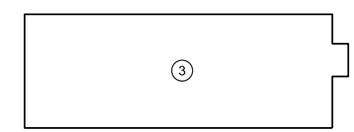
FINISH LEGEND

CONC - SEALED CONCRETE
CMU - PAINTED CMU
GWB - PAINTED GYPSUM WALL BOARD
MRG - MOISTURE RESISTANT GYPSUM BOARD, PAINTED
EXP - EXPOSED, PAINTED STRUCTURE & DECK (SEE NOTE 2)

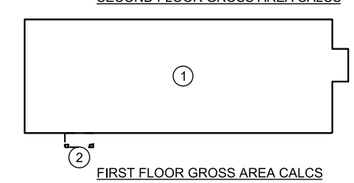
NOTES

1. ROOM FINISHES SHOWN ARE MINIMUM REQUIRED.
2. WHEN PRECAST CONCRETE STRUCTURE IS USED, PAINT EXPOSED CONCRETE & STEEL STRUCTURE. FOR OTHER STRUCTURAL CONDITIONS (SUCH AS TRUSSES, JOISTS, ETC.) PROVIDE MRG FOR BATH & LAUNDRY CEILINGS AND GWB IN OTHER AREAS FOR THE MINIMUM CEILING FINISH. MECHANICAL & ELECTRICAL MAY REMAIN EXP.
3. PROPOSED NET SF SHOWN IS AS REFLECTED IN THE STANDARD FLOOR PLAN. FLOOR AREAS MAY CHANGE TO ALLOW FOR ADJUSTMENTS DUE TO STRUCTURAL, UTILITIES, & CODE REQUIREMENTS, WITHOUT AFFECTING FUNCTION.
4. SEE APPLICABLE APPENDIX "PRELIMINARY FF&E INFORMATION" FOR FURNITURE AND EQUIPMENT SYMBOLS & TAGS SHOWN ON THE FLOOR PLAN. THE FF&E PACKAGE WILL BE DEVELOPED BY THE GOVERNMENT. THE FURNITURE IN THE FF&E PACKAGE WILL BE PROVIDED BY THE GOVERNMENT. THE CONTRACTOR SHALL COORDINATE FURNITURE & UTILITY REQUIREMENTS WITH THE FF&E PACKAGE.PLAN.

AREA CALCULATIONS



SECOND FLOOR GROSS AREA CALCS



FIRST FLOOR GROSS AREA CALCS

1ST FLOOR
FULL VALUE:

(1) LIVING MODULES, LAUNDRY, COMMON SPACE MECHANICAL, CORRIDOR, STAIRS ETC. 11,259 SF

1ST FLOOR
HALF VALUE:

(2) EXTERIOR COVERED (122.0 x 1/2) = 61.0 SF

1ST FLOOR TOTAL: 11,320 SF

2ND FLOOR
FULL VALUE:

(3) LIVING MODULES, LAUNDRY, COMMON SPACE MECHANICAL, CORRIDOR, STAIRS ETC. 11,259 SF

2ND FLOOR TOTAL: 11,259 SF

BUILDING TOTAL GROSS AREA: 22,579 SF

US ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT

REVISIONS
SYMBOL | DESCRIPTION | DATE | APPR.

DATE: V 4.4 23 SEPT 2011
SCALE: 3/32"=1'-0"
DRAWING CODE:

DESIGNED BY: COE LOUISVILLE DISTRICT
DRAWN BY:
CHECKED BY:
COE LOUISVILLE DISTRICT PROJECT ENGINEER/ARCHITECT | DATE

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS LOUISVILLE, KENTUCKY

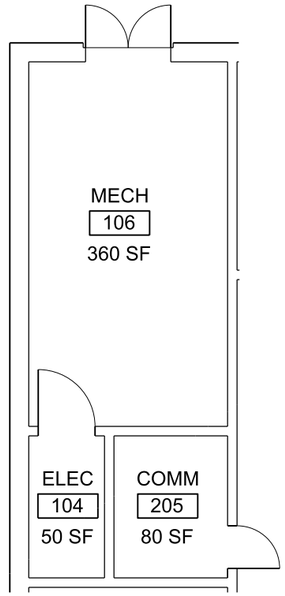
OPERATIONAL READINESS TRAINING COMPLEX STANDARD DESIGN

DEPARTMENT OF THE ARMY FACILITY STANDARDIZATION PROGRAM

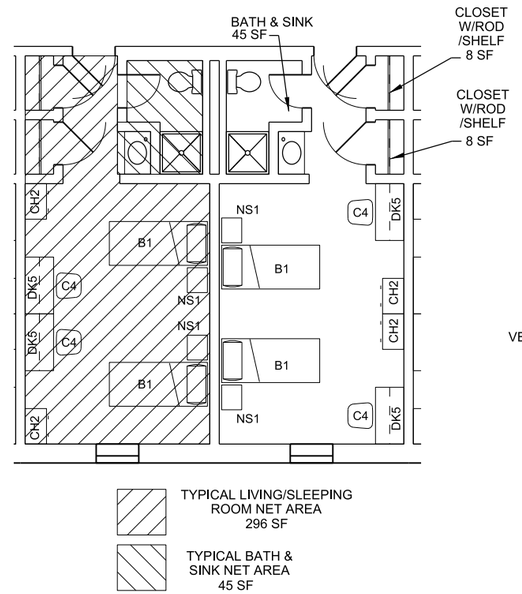
OFFICERS QUARTERS FLOOR PLAN:

SHEET REF NUMBER:
A013
SHEET 18 OF 33

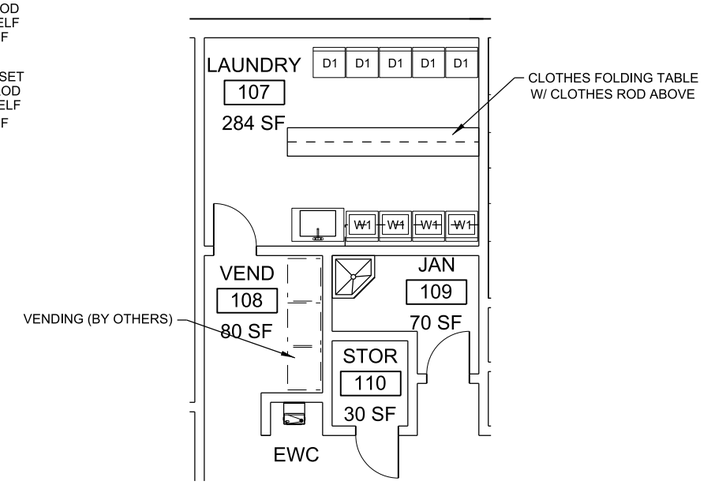
A013.dgn
19-OCT-2011



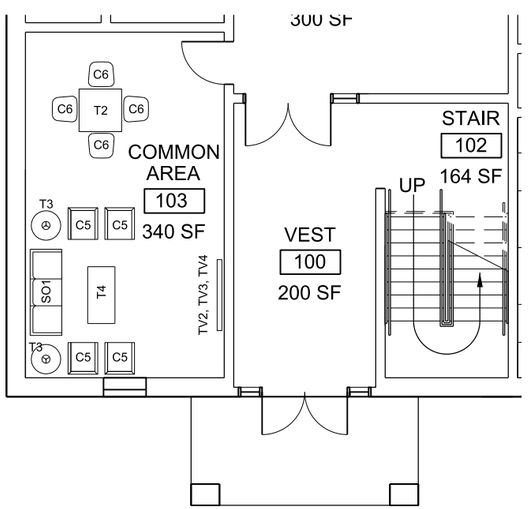
D1 SERVICE AREA
SCALE: 3/16" = 1'-0"



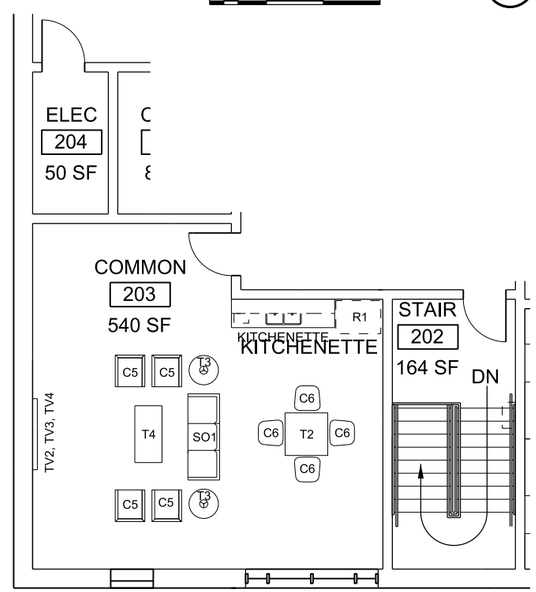
D3 MODIFIED 2+2 MODULE FLOOR PLAN
SCALE: 3/16" = 1'-0"



D5 VENDING AND LAUNDRY AREA
SCALE: 3/16" = 1'-0"



A1 COMMON AREA - FIRST FLOOR
SCALE: 3/16" = 1'-0"



A4 COMMON AREA - SECOND FLOOR
SCALE: 3/16" = 1'-0"

US ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT

SYMBOL	DESCRIPTION	DATE	APPR.
	REVISIONS		

DESIGNED BY: COE LOUISVILLE DISTRICT
DRAWN BY:
CHECKED BY:
DATE: V 4.4 23 SEPT 2011
SCALE: 3/16"=1'-0"
DRAWING CODE:
COE LOUISVILLE DISTRICT
PROJECT ENGINEER/ARCHITECT
DATE

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

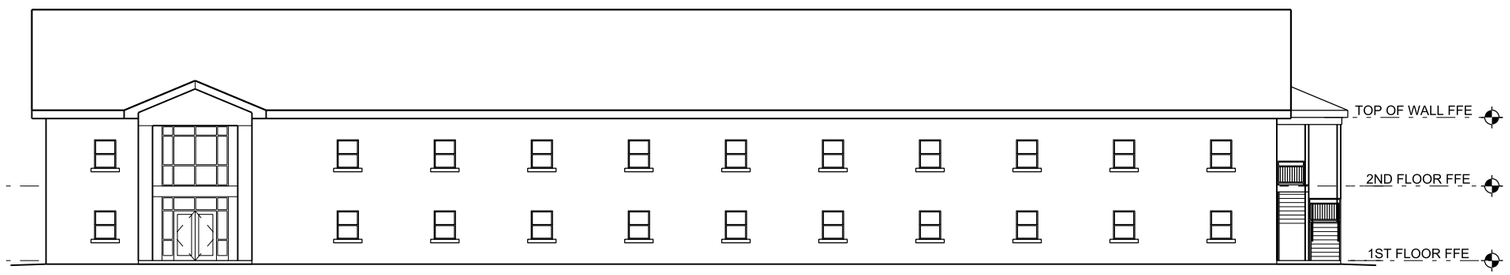
OPERATIONAL READINESS
TRAINING COMPLEX
STANDARD DESIGN

DEPARTMENT OF THE ARMY
FACILITY STANDARDIZATION PROGRAM

OFFICERS QUARTERS
ENLARGED FLOOR
PLAN

SHEET REF NUMBER:
A014
SHEET 19 OF 33

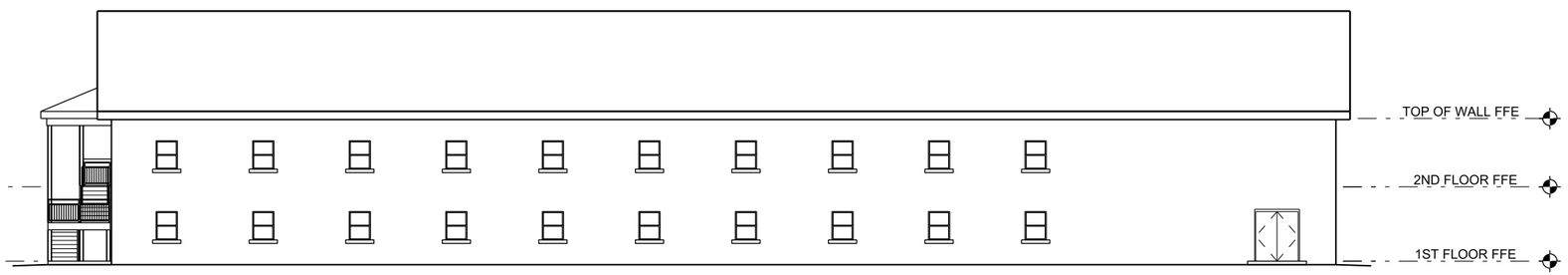
A014.dgn
19-OCT-2011



E1 OFFICERS QUARTERS ELEVATION

SCALE: 3/32" = 1'-0"

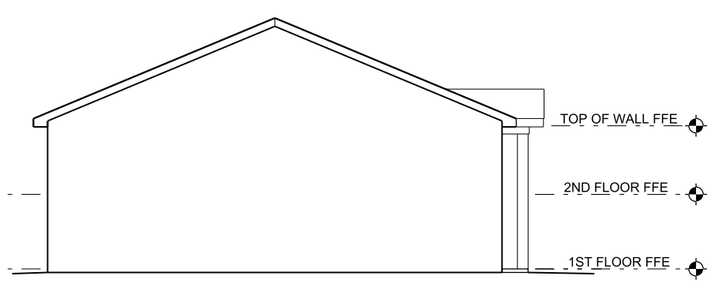
0 5' 10' 20'



C1 OFFICERS QUARTERS ELEVATION

SCALE: 3/32" = 1'-0"

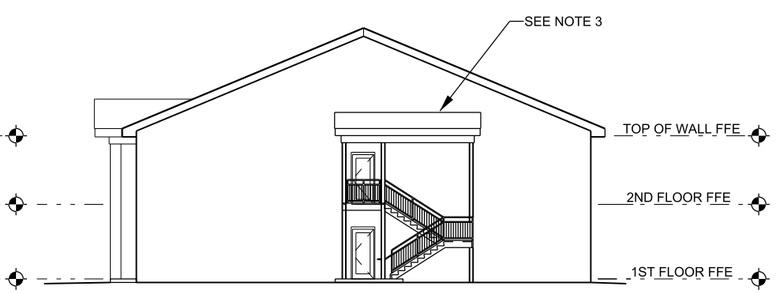
0 5' 10' 20'



A1 OFFICERS QUARTERS ELEVATION

SCALE: 3/32" = 1'-0"

0 5' 10' 20'



A4 OFFICERS QUARTERS ELEVATION

SCALE: 3/32" = 1'-0"

0 5' 10' 20'

ELEVATION DESIGN NOTES:

1. THE EXTERIOR ELEVATIONS ILLUSTRATE MASSING, NOT MANDATING A PARTICULAR ARCHITECTURAL THEME OR ANY SPECIFIC MATERIALS. THE SELECTION OF MATERIALS FOR THE EXTERIOR ENVELOPE SHALL BE GUIDED BY LOCAL CLIMATIC AND GEOGRAPHIC CONDITIONS, LOCAL CONSTRUCTION MATERIALS, AND OTHER ECONOMIC CONSIDERATIONS. THE EXTERIOR ENVELOPE MUST BE ANALYZED TO ASSURE CONFORMANCE WITH THE INSTALLATION ARCHITECTURAL THEME AS DESCRIBED IN THE INSTALLATION DESIGN GUIDE AND OTHER DESIGN REQUIREMENTS.
2. THE INTENT IS TO ALLOW DESIGNERS THE FLEXIBILITY IN AESTHETIC DESIGN WHILE MANDATING FUNCTIONAL REQUIREMENTS FOR THE BUILDING PLAN. THERMAL PROTECTION ALONG WITH DURABLE INTERIOR AND EXTERIOR WALL SURFACES WITH APPROPRIATE AESTHETIC QUALITIES SHALL BE GIVEN PRIORITY TO CREATE SUSTAINABLE AND FUNCTIONAL ARCHITECTURE.
3. THE END STAIR MAY BE FULLY ENCLOSED AS APPROPRIATE FOR CLIMATIC CONDITIONS.
4. BUILDING HEIGHTS SHOWN ON THE ELEVATIONS ARE BASED ON 12-FOOT FLOOR-TO-FLOOR HEIGHTS WHICH SHALL BE CONSIDERED THE MINIMUM REQUIREMENT. FLOOR-TO-FLOOR HEIGHTS SHALL BE INCREASED IF REQUIRED TO MAINTAIN MINIMUM CLEAR HEIGHTS INDICATED IN THE FINISH SCHEDULES IN THE DRAWINGS, AND TO PROVIDE ADEQUATE SPACE FOR UTILITIES ABOVE FINISH CEILINGS AND ABOVE REQUIRED CLEAR HEIGHTS WHERE STRUCTURE IS EXPOSED.
4. SEE APPENDIX F FOR INSTALLATION'S ARCHITECTURAL THEME INCLUDING EXTERIOR COLORS AND MATERIALS.

US ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT

SYMBOL	REVISIONS DESCRIPTION	DATE	APPR.

DESIGNED BY: COE LOUISVILLE DISTRICT
DRAWN BY:
CHECKED BY:
DATE: V 4.4 23 SEPT 2011
SCALE: 3/32"=1'-0"
DRAWING CODE:
COE LOUISVILLE DISTRICT PROJECT ENGINEER/ARCHITECT DATE

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS LOUISVILLE, KENTUCKY

OPERATIONAL READINESS TRAINING COMPLEX STANDARD DESIGN

DEPARTMENT OF THE ARMY FACILITY STANDARDIZATION PROGRAM

OFFICERS QUARTERS ELEVATIONS

SHEET REF NUMBER:
A015
SHEET 20 OF 33

A015.dgn
19-OCT-2011

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 Note: All references in the International Building Code to the International Electrical Code shall be considered to be references to NFPA 70. 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. 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 – Note: For all references to “HEATING AND COOLING LOAD CALCULATIONS”, follow ASHRAE 90.1 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 NFPA 25	Standard for the Installation of Private Fire Service Mains and Their Appurtenances [underground fire protection system design] 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 Derived from the ADA and ABA Accessibility Guidelines: Specifically includes: ABA Chapters 1 and 2 and Chapters 3 through 10. Use this reference in lieu of IBC Chapter 11. Excluded are: (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). (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.

•

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. 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 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. Because required CxA contractual relationship may not be acceptable to GBCI for LEED certification, the project cannot earn LEED Credit EA3 Enhanced Commissioning. However, still complete, maintain and provide copies of all necessary LEED documentation for Credit EA 3. This LEED Credit cannot be included to meet the required LEED rating for this project. Contractor may attempt this as an additional credit for GBCI certification but the Government will not accept it until GBCI accepts it.

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 NC version 2.2 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 HOOD, TX

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.

NONE

6.3. SITE PLANNING AND DESIGN

6.3.1. General:

6.3.1.1. Site Development Plan (SDP). The SDP provided by the government is included within the Appendices. Bring any discrepancies which are found in the furnished plans to the attention of the Contracting Officer's Representative.

6.3.1.2. Building Setback and Force Protection: Lay the site out based on the facility threat security level to protect against exterior attack by providing standoff distance between an aggressor or bomb, barriers, and to facilitate visual monitoring of the site. See the force protection requirements in UFC 4-010-01.

6.3.1.3. Building Spacing: Fire clearance separations shall be in accordance with UFC 3-600-01 and the International Building Code. Verify that fire clearances and access for equipment is acceptable to the installation's Fire Chief. Separation for buildings shall conform to force protection requirements per UFC 4-010-01.

6.3.1.4. Confine pad preparation operations to the work area defined by the SDP.

6.3.1.5. Walks: Locate walks paralleling buildings beyond the eave drip line and at least 5 feet from the foundation. Walks paralleling parking areas shall be at least 6 feet wide and shall abut the back of the curb.

6.3.1.6. Troop Formation Areas: Walkways for troops marching in formation shall be wide enough to accommodate personnel walking four abreast. The walkways shall be constructed of portland cement concrete at minimum 10 ft width.

6.3.1.7. Parking Areas:

See Appendix J (Site Plans) for additional information.

6.3.2. Site Structures and Amenities

6.3.2.1. Dumpsters: Coordinate location of the dumpsters with the Installation. Provide concrete loading aprons for the first 15 feet in front of the dumpster pads to accommodate loading and to avoid rutting of the pavement in front of the dumpsters. Provide the following number of dumpsters:

(a) Dumpster & Mechanical Yard Screen Wall.

Provide screen walls for the dumpsters and mechanical yards as indicated in the Infrastructure/Site Design drawings, Appendix J. The masonry color shall coordinate with nearby building exterior materials.

6.3.2.2. PT Field Requirements. No lighting, running/walking track, or equipment is required. See Appendix J (Site Plans and Specifications) for additional information.

6.3.2.3. Complex Monument Sign. Reference Appendix H and J for Signage requirements.

6.3.2.4 Provide minimum 4-inch thick concrete pads for mechanical and electrical equipment.

6.3.3. Site Functional Requirements:

6.3.3.1. Stormwater Management (SWM) Systems.

(a) Comply with the requirements of general permit number

(i) Storm drainage system design is shown within the drawings at Appendix J (A/E Integrator Drawings). The D/B Contractor shall be responsible for design of any additional storm drain system required by the project. If the D/B Contractor chooses to connect roof drain leaders to the storm water systems, the location and size for connection of roof drain leaders to the site storm water system must be coordinated with Contracting Officer prior to finalizing building design a minimum of 45 days prior to beginning building construction. Coordination of connection points to the main system shall be through the Contracting Officer. During construction of the facility, the D/B Contractor shall be responsible for the Storm Water Pollution Prevention Plan (SWPPP) of the entire construction site. D/B Contractor shall submit site specific SWPPP in accordance with requirements contained in Section 01 57 23 TEMPORARY STORM WATER POLLUTION CONTROL. The D/B Contractor shall be responsible for any piping connection from the building to the connection point.

(ii) The Storm Water Pollution Prevention Plan (SWPPP) shall contain all the information required by the Texas Commision on Environmental Quality (TCEQ).

(b) Storm Drainage System Plans are shown within the SDP. Tie into these systems as appropriate for his areas of design responsibility. Design and construction of the storm drainage system shall be in accordance with Federal Aviation Administration Advisory Circular FAA AC 150-5320-5C, Surface Drainage Design; Federal Highway Administration Publication No. FHWA-NHI-01-021, Hydraulic Engineering Circular No. 22, Second Edition, URBAN DRAINAGE DESIGN MANUAL; and U.S. Weather Bureau Technical Paper No. 40, dated May 1961, Rainfall Frequency Atlas of the United States for Durations from 30 minutes to 24 hours, and return periods from 1 to 100 years. Base the design of drainage structures on a 10-year storm frequency. Incorporate the principles of Low Impact Development (LID), as detailed in UFC 3-210-10 DESIGN: LOW IMPACT DEVELOPMENT MANUAL. Construct manholes, surface inlets, and curb inlets of reinforced concrete or pre-cast reinforced concrete. Design structures in pavement to handle H-20 loading. Structures in turfed areas can be constructed for lighter weight loading. Design the storm drainage system to be as economical as possible, while taking into account the topography, drainage area, and outfall locations, as well as coordination with existing drainage systems, and existing and future underground utilities. Profiles are required for underground storm drainage systems and sections are required for culverts.

(c) Underground Systems: Whenever possible, match pipe crowns in elevations. Profiles of pipes shall show all existing and new underground utilities and pertinent surface features. Design the minimum pipe gradient shall be designed to provide a minimum velocity (full flow) of 3.0 fps. Design the new outfall and receiving channel to withstand the shear stress acting on the channel from the runoff to prevent erosion. Size new underground storm drainage pipes by computation of backwater surface profiles. The minimum pipe size shall be 12 inches, unless the pipe is a part of the roof drain system, in which case the minimum size of laterals and collector pipes is 4 inches.

(d) Street Drainage: Accomplish street drainage by the use of curb and gutter and curb inlets. Curb gaps can be considered in areas where roadside ditches are used. The center one-third of the street shall not convey runoff during the passing of the design storm. Do not use inverted crown sections for the streets without prior approval. Do not locate curb inlets in the radius of street intersections, at curb returns, or where pedestrian traffic is most likely to occur.

(e) POV Parking and Hardstands: Do not concentrate the flow of storm runoff on asphalt pavement. Convey storm runoff within POV parking areas to perimeter curbs by sheetflow. However, if it is necessary to concentrate flow within a parking area, provide concrete paving at the swale flowline. Concentrated flow will not be permitted to flow from POV parking or hardstand areas onto adjacent gravel areas or turfed slopes. Examine sheetflow from parking areas and hardstands onto adjacent gravel or turfed areas for possible erosive effects.

(f) Ditches and Swales: Use a minimum longitudinal ditch or swale gradient of 0.5% with an absolute minimum of 0.3% . Side slopes on ditches or swales shall be no steeper than 1 vertical on 2-1/2 horizontal. Pave steeper slopes. Use Turf Reinforcement Matting (TRM) in ditches that are subject to high velocity storm runoff. Use erosion control matting as necessary to control erosion on steeper slopes.

(g) Culverts: The recommended gradient of culverts shall be 0.5% with an absolute minimum of 0.3%. Provide concrete headwalls or end sections for all culverts. Design headwalls and end sections to reduce velocities to levels that are non-erosive for the soil types encountered.

6.3.3.2. Erosion and Sediment Control: Prepare and comply with Storm Water Pollution Prevention Plans (SWPPP) for the limits of the entire construction site. Include silt fences, mulch straw/hay bales around inlets, and sediment traps to control erosion during construction.

6.3.3.3. Vehicular Circulation.

(a) Geometric Features: Geometric design of all roads, streets, access drives, and parking areas shall conform to the requirements presented in AASHTO, a Policy of Geometric Design of Highways and Streets. Verify with the local installation that access for fire equipment is adequate. Radii, to back of curb, for intersections are standardized as follows:

Primary and Secondary Intersection - 30 feet
Tertiary intersections - 20 feet
Access drives at end parking space - 5 feet

(b) Parking: Provide perimeter concrete curbs and gutters for all parking areas and access drives in developed areas. In remote or little used areas, use concrete curbs and gutters only when required to control drainage. Where flexible pavements are used, removable prefabricated reinforced concrete wheel stops, as approved, may be used.

(c) Service Drives: Widths of drives to unloading ramps or docks for usual types of trucks or tractor trailers are:

Trucks, Single-Unit - 12 feet
Semi-trailers - 16 feet

6.4. SITE ENGINEERING

6.4.1. Existing Topographical Conditions: The government furnished survey Horizontal and Vertical control complies with EM 1110-1-8005, Table 2-1, Military Construction, Building or Structure Design.

(a) A three dimensional digital topographic and utility survey for this site has been prepared by the Government and included as a part of this contract. Any discrepancies which are found in the Government furnished survey shall be brought to the immediate attention of the Government for clarification.

6.4.2. Existing Geotechnical conditions: See Appendix A for a preliminary geotechnical report.

6.4.2.1. Existing Subsurface Conditions: A Government Preliminary Geotechnical Report has been prepared, and is appended to these specifications (Appendix A). The Government Geotechnical Report provides a general overview of the areal geologic conditions with detailed descriptions of the subsurface strata encountered during the Government geotechnical field investigation. Based on the results of the field investigation, laboratory testing program, and engineering analyses, the Government Geotechnical Report further provides parameters and minimum foundation design requirements. However, as stated in

the Government Geotechnical Report, the Contractor is responsible for drilling additional borings at the site, and performing additional laboratory testing (specified in the Government Geotechnical Report). The Contractor's additional geotechnical field investigations shall be ONLY for the purpose of supplementing the data regarding subsurface conditions provided by the Government geotechnical field investigation, as presented in the Government Geotechnical Report.

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.

(a) A water system for the entire project area shall be constructed by the D/B contractor. Model results for the water system can be found in Appendix D. The D/B Contractor shall be responsible for verifying the model results by conducting a fire flow test after the construction of the water system. The D/B Contractor shall be responsible for incorporating any required changes to the building design and construction based on the fire flow test.

(b) The water model results in Appendix D shall be used by the contractor for bidding purposes.

6.4.4. Pavement Engineering and Traffic Estimates:

6.4.4.1. Pavements: Geometric design of roads and streets shall follow the guidance provided in AASHTO - A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS and GUIDELINES FOR GEOMETRIC DESIGN OF VERY LOW-VOLUME LOCAL ROADS (ADT≤400). Design pavement structures in accordance with criteria contained in AASHTO - GUIDE FOR DESIGN OF PAVEMENT STRUCTURES. Vehicle types expected to occupy the pavements and their frequency of use are as follows:

In addition to the requirements listed in the paragraph 5.2.3 VEHICLE PAVEMENTS, a pavement design life of 25 years shall be used. See Appendix J (Site Plans) for additional information.

Paved access is required to mechanical rooms/yards. New curb and gutter shall be concrete paved.

6.4.4.2. Emergency Vehicle Access: Provide access drives to allow access for fire trucks and emergency vehicles in accordance with NFPA and UFC 3-600-1. Emergency access drives shall have minimum turning radii of 45 feet to accommodate fire vehicles. Access to the emergency drive(s) shall be restricted by using removable bollards or metal pipe swing gates with a removable center bollard. Refer to the gate detail in the drawings.

6.4.4.3. Concrete Hardstands for Vehicle Parking and Storage Areas: Develop a joint pattern plan showing locations of each type of joint to be used. Spot elevations are required at the intersection of each joint to facilitate placement of forms during construction.

6.4.5. Traffic Signage and Pavement Markings

6.4.5.1. Permanent and construction roadway signs shall be as required by the FHWA MUTCD and FHWA Standard Highway Signs.

6.4.5.2. Pavement markings and striping shall be in accordance with state DOT standards and the Manual of Uniform Traffic Control Devices (MUTCD). Channelization and pavement markings shall be as required by the FHWA MUTCD and FHWA Standard Highway Signs.

6.4.6. Base Utility Information

(a) Do not place underground utility lines such as sanitary sewer, water, and gas under existing or proposed pavements. Place the utility between the back slope of a road ditch and building, or back of curb. Coordinate deviations to the aforementioned requirements with the COR. Do not locate above ground utility features in front of, or in such a manner as to detract from the facility, make landscaping

more difficult, or restrict or negate close-in recreational areas. Do not locate high pressure gas lines closer than 100 feet from an occupied building without special protective provisions and COR approval.

(b) Coordinate and plan utility information with the Installation's DPW through the COR. The SDP provides existing utility routing and general orientation for points of connection. Specific connection locations not shown are noted hereinafter.

6.4.6.1. Connect all utilities from the building to the service connection points shown on the SDP or listed herein. Coordinate between the SDP and utility providers, as well as coordinating utility outages with the installation and service provider.

6.4.6.2. Water Distribution System: The water distribution system is shown on the SDP. Coordinate points of connection through the COR with the American Water Operations and Maintenance, Inc. Design and construction of potable water service between the main line and the facility shall be the responsibility of the Contractor. Design and install the water system and meter in accordance with the requirements of the American Water Operations and Maintenance, Inc. Install valves on the water service lines near the connection point and on each service line to the building. For water mains, provide 2 valves at tees and 3 valves at crosses. Velocities in water lines shall be less than 7 feet per second (fps) to prevent possible water hammer effects.

(a) Potable Water Disinfection – Verify water line disinfection per AWWA C651-05. Analyze the samples by an analytical lab that holds a current state license and certification. Repeating disinfection protocols per AWWA C651-05 is required until satisfactory results are obtained (two consecutive sets of acceptable samples taken 24 hours apart). Collect water samples in proper sterilized containers, and perform a bacterial examination in accordance with state approved methods. As a minimum, collect one water sample from each 1000 linear feet segment of disinfected water line. The water supply system disinfection is not approved for usage until each test result is negative for bacteriological examination. Provide the water sample analytical results to the DPW's Environmental Office for record keeping. The commercial laboratory shall be certified by the state's approving authority for examination of potable water.

6.4.6.3. Natural Gas Distribution: Natural Gas distribution lines are shown on the SDP. Coordinate points of connection to the facility with the installation DPW. The Installation DPW will provide natural gas service to the face of the building and shall install the site gas distribution piping. The Installation DPW shall install the gas meter and connect the meter to the building stub out. The contractor shall stub the gas feed out of the building. The Contractor is not responsible for costs incurred for services provided by the Installation DPW. Design and construct the natural gas service lines with ANSI B31.8, Gas Transmission Distribution and Piping Systems. Natural gas shall be provided to the building. Provide a meter/regulator assembly for the facility with a valved bypass.

6.4.6.4. Sanitary Sewer System: The sanitary sewer system is shown on the SDP. Coordinate points of connection through the COR with the DPW. Design and constructthe sanitary sewer system in accordance with American Society of Civil Engineers (ASCE) and the Water Environment Federation (WEF), Gravity Sanitary Sewer Design and Construction, Second Edition (ASCE Manuals and Reports on Engineering Practice No. 60 / WEF Manual of Practice No. FD-5). Provide sanitary sewer service to the building. Install two-way cleanouts and all structures required by criteria, as well as, all piping between the designated point of connection and the building. Minimize the use of lift stations. If a lift station is required, provide a packaged unit assembled of coated materials that do not easily corrode. Provide an audible and visible alarm. Ensure location of lift station is accessible by service vehicles. Provide manholes at every change of direction and every 400 feet. Provide drop manholes if pipe elevations differ more than 18 inches. The minimum sewer main size shall be 8-inch. Provide 6-inch minimum sewer connections to buildings. Provide two-way cleanouts every 100 feet along a sewer branch connection from a building, and provide two-way cleanouts at the building connection. Construct manhole inlets of reinforced concrete or pre-cast reinforced concrete. Design structures in pavement to handle H-20 loading. Structures in turfed areas can be constructed for lighter weight loading. Profiles are required for underground sanitary sewer systems.

6.4.6.5. Oil-Water Separators: Provide oil-water separators for the pretreatment of wastewater containing free-floating oils and grease prior to discharge into sanitary sewers. Additionally, determine the pretreatment limits required by the receiving wastewater utility and select or design a system to meet these discharge limits and to resist buoyant forces acting on the structure.

(a) Prepackaged Separators: The design shall consider the anticipated flow rate and the quantity of dirt and grit contained in the wastewater. High-volume wastewater containing large amounts of solids will usually require design of a cast-in-place separator.

(b) Cast-in-Place Separators: Cast-in-place reinforced concrete separators are required for the pretreatment of wastewater generated at outdoor facilities such as washracks. Provide a grit chamber either upstream of the separator, or integrally with the separator at the upstream end of the separator when large quantities of sediments are expected. In all cases, when the flow rate resulting from storm runoff significantly exceeds the normal operating flow rate, include a bypass in order to divert the storm water into the storm drainage system instead of allowing it to flow into the treatment system. Design cast-in-place oil/water separators to conform to Chapters 5 and 6 of the American Petroleum Institute's Manual on Disposal of Refinery Wastes. This manual provides minimum detention times. Provide slotted, rotation-type or belt type oil skimmer and waste oil storage tanks in accordance with user requirements.

6.4.6.6. Cable TV (CATV) Cable TV is privatized and provided by others. Privatized utility will provide design and service to the building(s) and is not in this contract.

6.4.7. Cut and Fill

6.4.7.1. Strive to achieve a balanced cut and fill for earthwork. Do not waste excess soil within the SDP work area without the written approval of the Contracting Officer’s Representative (COR).

6.4.7.2. Grading Requirements:

(a) Finished Floor Elevations: A building's finished floor elevation shall be a minimum of 12 inches above the highest point of the adjacent outside finished grade, unless there is an overriding technical reason to deviate. Slope the finished grade a minimum of 5% for the first 10 feet away from the building.

(b) Turfed Areas Adjacent to Buildings: Slope outside finished grade away from the building at a 5% grade for the first 10 feet. Extend the 5% grade to 20 to 30 feet in areas with expansive soils. When site conditions require the use of steep slopes near buildings, provide a berm that is a minimum of 6 feet wide at a 5% grade adjacent to the building. Indicate these requirements on the grading plan with critical spot elevations.

(c) Lawn Areas: Lawn areas beyond the 5% finished grade stated above shall have a 1% minimum slope and a desirable maximum slope of 25%. If it becomes necessary to use slopes steeper than 25%, provide slope protection, but in no case shall the slope exceed 33%. Base the type and amount of slope protection provided on the soil type, slope length, and aesthetic, environmental, and economic considerations.

(d) Roads, Streets, and Access Drives: Gradients for roads, streets and access drives shall be as outlined in AASHTO, A Policy of Geometric Design of Highways and Streets. Accomplish grade changes in excess of 1% by means of vertical curves. Determine the length of vertical curves in accordance with the aforementioned AASHTO criteria. Profiles are mandatory for vertical control of centerline gradients. Show roads, streets and highways using of half-plan/half-profile type drawings.

(e) Parking Areas: Pavement grades shall provide positive surface drainage with a 1 percent minimum slope in the direction of drainage. Provide a maximum slope within a 90-degree parking space of 5 percent from front to rear end and 1-½ percent from side to side. Provide a maximum slope within a 45-degree or 60-degree parking space of 5 percent from front to rear end and 1 percent from side to side. Slope grade perpendicular to direction of parking 5 percent maximum for bituminous or concrete surfaces and 3 percent for other surfaces.

(f) Finish Grade Contours and Spot Elevations: Provide finish grade contours at 1-foot intervals and spot elevations to construct all site development features. Spot elevations on the drawings should be

sufficient so that interpolation between contours is not required for structures, grading or paved areas. Provide spot elevations where grade changes a minimum of 1 percent and use at point of tangency for curbs on end islands and at corners of parking lots.

(g) The government will provide grading as described in Appendix J (Site Plans).

6.4.8. Borrow Material

See Appendix J (Site Plans) for additional information.

6.4.9. Haul Routes and Staging Areas

6.4.9.1. See Appendix J, DRAWINGS for the project location and the location of haul routes and Contractor's staging area. Construction limits shall be confined to the construction site boundaries as shown on the Site Development Plan (SDP) within the Appendices.

6.4.9.2. The Contractor will be allotted an area as shown on the SDP for the placement of a construction trailer complex and storage for the Contractor and respective Subcontractors. Permanent Trailers are not permitted within the building envelope work areas. Trailers within the work area may be required to be relocated at no additional cost to the Government to accommodate site activities. The Contractor shall be responsible for the site preparation, fencing, access drives, and maintenance of the compound at all times. Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, remove the fence. . Restore areas used by the Contractor for the storage of equipment or material, or other use, to the original or better condition. Remove gravel used to traverse grassed areas and restore the area to its original condition, including top soil and seeding as necessary.

6.4.9.3. For proposal purposes, assume Contractor will be responsible for providing temporary utilities (water, sewer, and electricity, etc.) during construction at the project site. A water fill point will be provided as indicated on the SDP. It may be necessary, initially, for the Contractor to truck water to the project site until new utilities are constructed. Contractor is responsible for installation and maintenance of the haul road from the water fill point to the entrance of the construction site.. Coordinate routing of haul roads with the COR.

6.4.10. Clearing and Grubbing:

See Appendix J (Site Plans & Specifications) for additional information.

6.4.11. Landscaping:

(a) Provide native or well adapted species of plants in the landscaping plan. Choose trees, shrubs, and ground covers from the preferred plant list included in Appendix I. Provide shade trees . Use flowering vegetation at focal points to provide visual interest. All landscaping within 33 feet of the facility shall adhere to force protection clear zone requirements as specified in UFC 4-010-01.

(b) The landscaping integrated design shall emphasize the goal to achieve energy efficiency and water conservation. Select t vegetation based on hardiness, availability, and drought tolerance, which aids in the conservation of water, as well as, maintenance resources. Locate the trees to optimize shading opportunities, which aids in energy efficiency of the buildings by cooling during the summer.

(c) Landscape Irrigation.

See Appendix J (Site Plans & Specifications) and Appendix I (Acceptable Plant List) for additional information and guidance.

6.4.12. Turf:

See Appendix J (Site Plans & Specifications) and Appendix I (Acceptable Plant List) for additional information and guidance.

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 and shall conform with the Fort Hood's Real Property Master Plan. 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 Hood'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 Hood's identified preferences. Implement these preferences considering the following:

(a) Achievable within the Construction Contract Cost Limitation (CCL)

(b) Meets Milestones within Maximum Performance Duration.

(c) Achieves Full Scope indentified in this Solicitation

(d) Best Life-Cycle Cost Design

(e) Meets the Specified Sustainable Design and LEED requirements.

(f) 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:

(a) Package 1 facilities shall be fundamentally sustainable, require minimum operation and maintenance inputs, reflect the military hierarchy of their occupants and blend harmoniously with the new adjacent ORTC Dining Facility (DFAC), Package 2. The desired features related to aesthetics and architectural character shall follow the ORTC DFAC, Package 2. The ORTC DFAC captures the Central Texas Architectural Theme as established by the Installation Design Guide (IDG) and shall be applicable to all facilities within the North Fort ORTC, Package 1. Moreover; the North Fort ORTC Architectural Theme shall include a professional image with the high technology associated with advanced training to include installation mission, regional and climatic imperatives of the regions context; nature, color, scale, and aesthetics of Central Texas. Architectural Theme and requirements of the North Fort ORTC are included in this section as well as in Appendix F, Conceptual Aesthetic Considerations.

(b) Package 1 facilities shall capture the preferred and approved Fort Hood materials and massing. Exterior rendering and elevations for the ORTC DFAC, Package 2 has been provided to illustrate preferred design objectives and features. Minor variations to the Standard Design (SD) floor plan(s) are

permissible to include the architectural theme (i.e. elevations and massing); however, all mandatory floor area requirements and functional adjacencies shall be provided.

(c) The ORTC DFAC, Package 2 includes the Installation's Architectural Theme's design objectives and features. Package 1 design shall coordinate with these design objectives and features including:

(i) Exterior walls consist of masonry and indigenous Texas Limestone veneer, Texas blend color or similar, Ashlar pattern with block size of 4-inch, 6-inch and 8-inch height, full veneer 3-1/2-inches to 5 inches thick, random length, sawn top and bottom. Hot hip galvanized ties, 12 gauge minimum are included. Mortar for limestone is off-white or similar. Mortar color on masonry wall blends with masonry unit color. Exterior wall includes Insulating Concrete Form (ICF) as backup. Includes masonry window sill for all exterior windows.

(ii) Roof material is standing seam metal with a minimum 3:12 sloped hip roof. Permanent (fixed) fall protection anchors are provided.

(iii) The Main Entrances are aluminum storefronts having Architectural Class 1 "clear" anodized finish frames with full height glazing of light green, low-E, insulating units having interior laminated panes with medium stiles, and a thermal break design.

(iv) Exterior Non-entrance Doors are galvanized, painted, insulated hollow metal with hollow metal painted frames (“best bronze”).

(v) Exterior Windows have “clear” anodized aluminum frames with light green, low-E, insulating units having interior laminated panes.

(vi) Exterior louvers include bird screens and design to prevent wind-driven rain.

(vii) Porticos, canopies, and awnings are indentified as solar heat gain controls for day light exposure.

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 Hood. 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

6.5.3. Programmable Electronic Key Card Access Systems:

Provide Stanley Security Solution Inc, B.A.S.I.S. G system or an approved equal.

(a) Description: Stanley BASIS G Mortise Lockset w/ Mag-Stripe reader, Key Over-ride sensor, extended battery and Patented Core.

(b) Part Number: 45HG7TV4MS-626-EXBB-SH-TRK-3-KOS.

6.5.4. INTERIOR DESIGN

Provide the following Installation Interior Design features:

6.5.4.1 Window Treatments

(a) Provide 1" aluminum horizontal mini-blind window treatments.

(b) Provide conference room windows with light blocking window treatments.

(c) Provide solid polymer sills at all windows, coordinating color with the interior color pallet.

6.5.4.2 Interior Walls, Ceilings, and Floors (reference SD finish schedules for each building)

(a) Where sealed concrete floors are required, provide an epoxy or polymer coating to protect the concrete floors from chemical, oil, etc. spills or fluid leaks. Epoxy coating improves clean-up and avoids permanent staining on concrete floors.

(b) Provide built-in recessed grille mat(s) at entry vestibules.

(c) Provide 2-inch x 2-inch dot-mounted on 1-ft x 2-ft three-color blend porcelain tile with epoxy grout on all wet floors with 3-inch x 3-inch sanitary cove base. Blend color with field tile.

(d) Provide 24-inch x 24-inch carpet tile having antron fiber, dyed yarn with fiberglass reinforced thermoplastic composite backing. Include field and accent carpet tile.

(e) Provide brushed aluminum color door hardware. Include stainless steel or aluminum door kickplates.

Interior building signage requirements:

Provide highly visible, room theme, identification signage and minimal directional signage meeting the interior design theme to visually communicate wayfinding information in accordance with Appendix CC.

(a) Interior signage shall be meet ABA requirements in only those faciliities indicated as requiring ABA compliance in Section 01 10 00, paragraph 3.0.

(b) Interior signage shall be wall mounted with concealed hardware. Sign plate color and lettering type shall be coordinated with DPW-Master Planning. All shared offices' sign plates shall include two windows for paper insert, otherwise only one window for paper insert is required. Room sign plate shall be 9-inch x 9-inch.

6.6. STRUCTURAL DESIGN

6.6.1. General

Analyze, design, and detail each building as a complete structural system. Design structural elements to preclude damage to finishes, partitions, and other frangible, nonstructural elements; to prevent impaired operability of moveablecomponents; 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 (BIA).

Place floor mounted mechanical and electrical equipment on a 4” minimum concrete pad.

6.6.2. Project Specific Design Loads:

6.6.2.1. Wind Speed: 90 mph

6.6.2.2. Seismic Design Data: The mapped maximum considered earthquake (MCE) spectral response accelerations for site class B are:

Ss (at short periods) = 8% g

S_1 (at 1-second period) = 4% g.

The acceleration values identified are for the general location of the facility. Verify and use site specific criteria based on the final site location of the facility. Adjust site class per IBC to match specific site information in geotechnical report.

6.6.2.3. For design of structural components subjected to dynamic loads, the U.S. Army Corps of Engineers Protective Design Center (PDC) developed SBEDS, Single-Degree-of-Freedom Blast Effects Design Spreadsheets (SBEDS). SBEDS is available at the software tab of the PDC website, https://pdc.usace.army.mil/.

6.6.3. Foundation

Coordinate the need for a vapor barrier with the architectural floor finishes and requirements of the geotechnical report. Use a a vapor barrier system with a minimum 10-mil polyethylene membrane under all slab-on-grade to receive a coating (e.g. epoxy) or to receive an overlaying finish (e.g. carpet or tile).

6.6.4. Site Features – Retaining Walls/Bridges/etc.

Design site features, e.g. retaining walls, culverts, bridges, in accordance with the appropriate American Association of State Highway and Transportation Officials (AASHTO) criteria including AASHTO LRFD Bridge Design Specifications, AASHTO Standard Specifications for Highway Bridges, and AASHTO Guide Specifications for Design of Pedestrian Bridges. Consider operation and maintenance requirements, e.g. painting, mowing, inspecting, routine maintenance. Design site features to drain properly in order to meet loading assumptions.

6.7. THERMAL PERFORMANCE

Consider moisture protection . Consider protection from damage to flooring and wall finishes when designing floor slabs and walls. This could be as simple as placing a vapor barrier under the floor slab, building wrap, or vapor barrier on the walls.

6.8. PLUMBING

The following are Installation required plumbing features:

(a) Faucets with automatice shut-off valve type.

(b) Toilets with infrared or ultrasonic sensors.

(c) Showerheads with 2.8 gpm with aerator, or 2.2 with laminar flow.

(d) Wall-mounted urinals.

6.9. SITE ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.9.1. Derive electrical service from the existing aerial 7200/12,470 Volt primary service located as shown on the exterior power plans in Appendix J. Primary service shall be 3-phase. Coordinate construction associated with the removal of the existing and the installation of the new primary electrical system and communication systems at the site with the Fort Hood DPW. Perform all work on existing

systems “hot” unless permission is obtained in advance from the contracting officer and Fort Hood DPW. Obtain permission for any connections a minimum of 72 hours in advance from the contracting officer and Fort Hood DPW. All underground electrical shall be in conduit, and all underground primary shall be concrete encased with red concrete. For secondary system, utilize marker tape – minimum 12 inches below finished grade – except in isolated areas.

(a) Jack and bore all road crossings . Open cuts are not permissible.

(b) If outages are unavoidable, schedule them with the DPW no less than two weeks in advance.

(c) Coordinate all communications work through the Ft. Hood DOIM.

(d) Transformers shall be pad mounted and loop fed with load break switches (3-2 position).

6.9.2. Install an aerial to underground transition with fused cutout switch at the power riser pole. Use 15 KV primary conductors for primary service. Provide one spare 4" conduit for future primary.

(a) Use armor rods rather than ties for connection of conductors to pin insulators.

(b) Use heavy air switches with arc snuffers for all branch distribution circuits that serve multiple buildings.

(c) Provide fiberglass guy insulators for all guys that come in proximity to phase conductors.

(d) Use three quarter inch minimum size bolts for pole hardware.

(e) Use spring washers under all hardware bolts including cross-arms.

(f) Use flat metal braces or wood braces for #4 ACSR conductors and smaller. Use angle braces for conductors larger than #4 ACSR.

(g) Provide at least one thru-bolt for all pole-mounted floodlights. Do not use lag bolts.

(h) Use metal gains for all cross-arms that do not come pre-gained.

(i) Use arm construction rather than armless construction for phase 3 aerial lines and equipment poles.

(j) Use minimum three quarter inch ground rods.

(k) Use ACSR aluminum rather than copper for all aerial conductors with minimum size of #4 AWG.

(l) At the pole mounted overhead to underground transition, use wet process porcelain terminators rather than elastomeric terminators.

(m) Use the two bushing aerial pole mount transformers rather than the self-protected (lightning arrestor) terminators,

(n) Connect line to lightning arrestor to cutout rather than from line to cutout and jumper to lightning arrestor.

(o) Provide 29 foot clearance of electrical high voltage lines at street crossing.

6.9.3. Lighting: Provide power for all required site lighting to include parking lot lighting from the new facility. Site lighting shall be pulse-start metal-halide (PSMH) or induction type. Operate lighting off of a lighting contactor and shall be 480 volt where available.

6.9.4. Provide for demolition (if necessary) as noted on the exterior power plans in Appendix J.

6.9.5. Provide electric meter mounted to the pad mounted transformer. Electrical watt-hour demand meters at Ft. Hood shall be encoded type, electromechanical type conforming to ANSI C12.10 and equipped with an electronic pulse initiator, or an electronic type meter with pulse output. Pulse type meters shall be capable of operating at speeds up to 500 pulses per minute with no false pulses and shall provide a pulse output of one pulse per kilowatt-hour. Supply all programming device or software required

for programming with the meter. Further requirements for metering are included in the appendices for Metering Requirements.

6.9.6. Telecommunications Install all communications cabling in ducts as shown on the exterior communications plans in Appendix J. Where 1” inner duct is required per the drawings, do not extend the inner duct more than 4” beyond the entrance and exit ducts within manholes. Install nylon pull cord in all empty conduits. Outside plant cables to the new facility shall consist of 1-12 strand single mode fiber optic cable installed in a 1” inner duct and 150 pairs copper cabling in a 4” duct. Coordinate all associated work and requirements including final location of duct banks and manholes with Fort Hood DOIM thru the contracting officer’s representative and Fort Hood DPW.

6.9.6.1. Use concrete encased duct banks.

6.9.6.2. Core drill existing MHs.

6.9.6.3. Ducts entering MHs shall start at the bottom of the wall and work up.

6.10. FACILITY ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.10.1. Telecommunications:

6.10.2. Cable TV (CATV):

6.10.2.1. Leave ten feet of slack cable in the telecommunications room at a location designated for the CATV box.Homerun all cabling throughout the building back to the main telecommunications room to allow for just one connectivity point to the outside cable provided by the local CATV company. All CATV cabling shall be RG6 Quad shield, and all CATV cabling shall be tested for operability.

6.10.2.2. Covers for CATV outlets shall match electrical and other outlet plates; either white or ivory plastic. Mismatched colors are unacceptable.

6.10.3. Metering: All electrical and water meters shall include ability to interface and connect to the installation’s existing LonWorks network. The controls contractor is responsible for final connection of the gas, water, and electric meters to the ILON 600 – making data points available to the EMCS.

6.10.4. Mount motor starters at 4 foot above flood level for ease of maintenance.

6.11. HEATING, VENTILATING, AND AIR CONDITIONING

The existing UMCS is LonWorks.

6.11.1. Supply Building Point of Connection to Base-wide UMCS: A Building Point of Connection (BPOC) in accordance with ANSIIEIA 709.1 B. Routers (including routers configured as repeaters) shall meet the requirements of ANSI/EIA 709.1B and shall provide connection between two or more ANSIIEIA 709.3 TPIFT-1O channels. The building point of connection (BPOC) router shall be iLon 600 *TP/FT* -10 24v *ac/dc* Model 72603R which is required for proper integration to the existing UMCS head-end and insure maintaining Networthiness/ DIACAP" certifications (security of the DOIM/basewide LAN). Integration of building into base-wide UMCS is not a part of this contract (NIC).

6.11.2. UMCS Interoperability: Be fully compatible for future interface with the existing Fort Hood base-wide LonWorks UMCS. Utility meters shall be LonWorks certified.

6.11.3. DDC Panels: DDC panels shall include a Local Display Panel (LDP) that provides an operator interface with the control system (mainly to view LonWorks I/O and change setpoints). The LDP shall reside as a node on the building LON bus.

6.11.4. Required Additional Deliverables to Government upon acceptance of system: XIF files and plug-ins.

6.11.5. Programmable Controllers:

6.11.5.1. Programmable Controllers shall have a fixed Program ID and shall be programmable over the network using an LNS Plug-in. Programmable controllers shall have a fixed XIF file (the XIF file shall not change when the controller programming changes).

6.11.5.2. Analog outputs and binary outputs (also known as "digital outputs") of programmable controllers which are connected to another device shall have a hardware manual override. Analog outputs and binary outputs of application specific controllers used for non-terminal unit control and that are connected to an output device shall have a hardware manual override.

(a) The manual override switch for binary outputs shall provide for overriding the output open or closed.

(b) The manual override switch for analog outputs shall either provide for overriding the output to 0% or 100% or provide for overriding through the range of 0% to 100%.

(c) The manual override shall be integrated with the controller hardware or an external override co-located with the controller (in the same enclosure).

6.11.6. HVAC Refrigerants: HVAC equipment shall use non-R22 refrigerants.

6.12. ENERGY CONSERVATION

6.12.1. 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:

None specified.

6.12.2 Solar Hot Water Heater (SHWH) system that provides at least 30% of the domestic hot water demand of the facility. Contractor is free to satisfy a greater proportion that 30% if so desires and is able to do so without an increase in overall project pricing.

6.12.3 Recommended Energy Enhancement Strategies (reference Section 00 22 11, Paragraph 5.3.1 for application):

1. Optimize building orientation (East-West Axis with Passive Solar shading geometry).

2. Tight construction with Infiltration less than .15 cfm per square foot of exterior envelope area at 75 PA. Recommend the use of Insulated Concrete Form (ICF) for the exterior building envelope.

3. Added insulation to high performance ‘Passivhaus’ levels (See the Building Envelope section of the Energy and Water Conservation Design Guide referred to above for minimum R/U values per climatic zone).

4. Design detailing to avoid thermal bridges that allow heat to bypass insulation.

5. Windows: Triple-pane, Energy Star, with low-E coatings appropriate to climatic zone.

6. Lighting: Lower lighting consumption to average 0.75W/ft2 or less. To achieve this performance, consider the following:

a. Low maintenance, low wattage-per-lumen technologies, e.g. SSL/LED fixtures.

b. Occupancy, Vacancy, and Daylighting sensors for active ambient light control.

c. Use digital multi-zone lighting controls with individually addressable fixtures.

7. ‘Cool Roof’ finishes where cooling load exceeds heating (e.g. Climate Zones 1-5).

8. Top Tier Energy Star or FEMP rated appliances and equipment.

9. Demand/user controlled High Efficiency HVAC equipment per ASHRAE 189.1.

10. Optimize HVAC zones with respect to user schedules and occupancy.

11. Include Energy Recovery Ventilation (ERV) systems with >75% efficiency.

12. Dedicated Outside Air System (DOAS) for ventilation with heat recovery. Heat recovery during heating season only.

13. Indirect Evaporative Pre-Cooling (IEPC or IDEC) for Dry Climates (Climate Zones xB).

14. HVAC equipment efficiency ratings (e.g. COP) that exceed ASHRAE 189.1 (C) requirements.

15. High Efficiency condensing boilers with >90% efficiency and/or incorporate Ground-Source Heat Pump technology.

16. NEMA MG1 Premium Efficiency/ Electronically Commutated Motors (ECM) motors.

17. Variable Air Volume (VAV) or hydronic distribution; consider “Radiant” cooling systems in ceilings.

18. Measurement and Verification (M&V) systems.

19. On-site Renewable Energy elements:

a. Transpired Solar Collectors.

b. SSL/LED parking and street lighting; site-specific light distribution patterns.

c. Prepackaged pole-mounted solar site lighting solutions.

20. Maximum flow rates for plumbing fixtures per ASHRAE 189.1;

a. Dual-flush toilets.

21. Stormwater management: Meet local codes and Low Impact Development (LID) best practices (e.g. pervious pavement, rainwater harvesting, swales, bioretention ponds).

6.13. FIRE PROTECTION

6.13.1. Verify the hydrant flow test data listed in Appendix D prior to design of the building fire protection sprinkler system.

6.13.2. DELETED

6.13.3. Fire Alarm System: Fire alarm systems shall be Class A looped.

6.13.3.1. The RF Transceiver shall be compatible with the Fire Department receiving system.

(a) The receiver shall be equivalent to a Monaco BT-XM operating on a frequency of 139.3750 MHz.

(b) The installation fire alarm receiving system is a Monaco D-21 system.

(c) All applicable ZIDs shall report fire alarm system Alarm, Supervisory and Trouble conditions to the central reporting station by from the following choices: a) Individual fire sprinkler riser flow switches identified by location. b) Room smoke detectors as a supervisory upon activation. c) Elevator smoke detectors by floor, machine room, and hoist-way. d) Elevator machine room tamper switch. e) Elevator machine room flow switch. f) Elevator pit tamper switch. g) Fire Suppression tamper switches grouped by room identified by location. h). Exterior PIV. I) Supervisory low temperature for fire sprinkler systems not in controlled environments. j) Manual pull stations by floor and wing. k) Fire alarm panel general trouble. l) Fire alarm panel general alarm. m) Each knox-box identified by location at location(s) preferred by FHFD. n) AC failure. o) Fire Pump running. p) Fire Pump trouble.

6.13.3.2. Key all fire alarm pull stations to single bitted, 5 disc keyway based on the Fort Lock KS00V key blank, key coded to CAT 15.

6.13.3.3. Key the fire alarm control panel(s) to single bitted, 5 disc keyway based on the Fort Lock KS00V key blank, key coded to CAT 15.

6.13.3.4. Fire Lanes shall be in accordance with applicable building codes, ADA, UFAS and Force Protection UFC and NFPA 1 and the striping and signage scheme provided.

6.13.3.5. All special tools, software, connecting cables, and proprietary equipment necessary for the maintenance, testing, and reprogramming of the equipment shall be furnished to the Contracting Officer Representative.

6.13.4. Mass Notification System (MNS)

6.13.4.1. Key to single bitted, 5 disc keyway based on the Fort Lock KS00V key blank key coded to CAT 15.

6.13.4.2. Program the following 4 messages into the system:

(a) FIRE (Siren X 5 Seconds) (Female voice) "ATTENTION, ATTENTION, A FIRE EMERGENCY HAS BEEN REPORTED. PLEASE REMAIN CALM AND EXIT THE BUILDING USING THE NEAREST EXIT".

(b) WEATHER (100 KHZ Steady tone X 5 Seconds) (Female voice) "THE NATIONAL WEATHER SERVICE HAS ISSUED A SEVERE WEATHER ALERT FOR THIS AREA. TUNE TO LOCAL RADIO AND TELEVISION STATIONS FOR FURTHER GUIDANCE".

(c) SUSPICIOUS ACTIVITY (Fast whoop X 5 Seconds) (Female voice) "MAY I HAVE YOUR ATTENTION PLEASE! A POSSIBLE BREACH IN SECURITY HAS BEEN REPORTED. PLEASE REMAIN CALM. YOU ARE INSTRUCTED TO TAKE APPROPRIATE SECURITY MEASURES AND TO REPORT SUSPICIOUS PERSONNEL, VEHICLES, PACKAGES OR ACTIVITIES TO SECURITY PERSONNEL".

(d) TOXIC CHEMICAL HAZARD EMERGENCY (Chime tone X 5 Seconds) (Female Voice) "MAY I HAVE YOUR ATTENTION PLEASE! A TOXIC CHEMICAL HAZARD HAS BEEN REPORTED, PLEASE REMAIN CALM AND TAKE APPROPRIATE MEASURES TO AVOID THE HAZARD".

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: N/A.

6.14.3. Credit Validation: The project is a standard design building(s) portion of a multiple contractor Combined Project. 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. See Appendix LEED Requirements for Multiple Contractor Combined Projects for information about registered standard designs. Validation of credits will be accomplished by the Government. LEED certification of the project by the Contractor is not required. The Government may choose to seek LEED certification of the project, in which case the Government will pay certification fees and coordinate with GBCI and the Contractor will furnish audit data as requested at no additional cost.

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.

MR Credit 2 Construction Waste Management.

The Installation has an on-post recycling facility. Contact Fort Hood Recycling at 254-288-5307 (http://www.hood.army.mil/dpw/Environmental/Recycle.aspx), for C&D debris contract Fort Hood IMMU at 254-288-5307 for information about materials accepted.

Regional Priority Credits (Version 3 only)

The project zip code is 76544.

See LEED Multiple Contractor Responsibilities Table(s) for additional information.

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. Multiple Contractor Combined Project. When site work and building(s) are accomplished by separate contractors, it is a Multiple Contractor Combined Project for purposes of LEED scoring and documentation. This project is part of a Multiple Contractor Combined Project that includes site work and building(s) accomplished by separate contractors. See Appendix LEED Requirements for Multiple Contractor Combined Projects and Appendix LEED Multiple Contractor Responsibilities Table(s) for special requirements for this project.

6.14.8. Additional Information

The last two sentences in paragraph 6.14.3 shall not apply to this project. The Contractor shall obtain and provide LEED Silver level certification through GBCI prior to project closeout.

6.14.8.1. LEED-NC 2009/Version 3 Certification: As a minimum requirement, design and construct the subject project, obtaining Green Building Certification Institute (GBCI) Certified at the LEED Silver level, NC 2009/Version 3 .

6.14.8.2. Government Anticipated Credits: Coordinate with the Government to include the Government's anticipated LEED credits from the Package 1 site design, into the project's online templates. The ORTC Package 1 site design includes LEED-NC 2009/Version 3 project registration, LEED Project Checklist, and online template documentation. Package 1 site design includes the site specific credits associated with Phase 1 of the ORTC. The subsequent project building designs associated with Package 1 and

Package 2 (Dining Facility) shall refer back to the Package 1 project for those site credits. The contractor is not responsible for Package 1 site design LEED documentation; however, contractor shall coordinate GBCI online templates and comments on such credits, with the Government for coordination with the Designer of Record. Contractor shall not be penalized if project fails to achieve certification at the minimum required level due to loss of such credits which are the responsibility of others. Reference Appendix N for additional information concerning project registration.

6.14.8.3 Government Acceptance: Submit documentation for Government acceptance of anticipated LEED Design and Construction Credits to the Government at each design submittal to include the Government anticipated credit documentation for reference. Within 60 days after issuance of Design Complete documents for construction, submit anticipated LEED Design and Construction Credit documentation updates to the Government monthly, for acceptance. Completion of LEED Credit updates shall be tied to pay application review and approvals. Submittals shall be in PDF format on three (3) CD's with formatting and directory structure designed for easy access to documentation. Government acceptance during project execution does not relieve or modify the contractor's responsibility to satisfy all requirements for LEED Silver Certification as defined by LEED and GBCI.

6.14.8.4. Appendix L contains modified LEED-NC 2009/Version 3 Registered Project Checklists for the ORTC LEED. This checklist identifies:

(a) those specific Credits/Prerequisites that the DB Contractor must provide for all MCA projects, listed in the “Yes DB" column,

(b) those Credits/Prerequisites that the Government will provide, listed in the “Yes GOV" column,

(c) points that the DB Contractor may provide, above and beyond those points required per LEED prerequisite or elsewhere in the RFP (applies to Energy and Atmosphere Credit 1, where 2 points are required under EA Prerequisite 2, but an additional 8 points may be achieved at the DB Contractor's option) listed in the “? D/B" column,

(d) those Credits that may be possible by the Government, but should not be considered in the total point count by the DB Contractor, listed in the "? GOV" column,

(e) those Credits that the DB Contractor is prohibited from pursuing, listed in the “NO" column, and

(f) those Credits not identified as "YES" or "NO" are considered to be Contractor specified, thus allowing flexibility and creative control during the design and construction process.

6.15. ENVIRONMENTAL

NO ADDITIONAL REQUIREMENTS

6.16. PERMITS

No additional requirements.

6.17. DEMOLITION

See Appendix J (A/E Integrator Drawings) for additional information.

6.18. ADDITIONAL FACILITIES

No additional facilities.

End of Section 01 10 00

SECTION 01 32 01.00 10
PROJECT SCHEDULE

1.0 GENERAL

1.1. REFERENCES

1.2. QUALIFICATION

2.0 PRODUCTS (NOT APPLICABLE)

3.0 EXECUTION

3.1. GENERAL REQUIREMENTS

3.2. BASIS FOR PAYMENT AND COST LOADING

3.3. PROJECT SCHEDULE DETAILED REQUIREMENTS

3.4. PROJECT SCHEDULE SUBMISSIONS

3.5. SUBMISSION REQUIREMENTS

3.6. PERIODIC SCHEDULE UPDATE MEETINGS

3.7. REQUESTS FOR TIME EXTENSIONS

3.8. DIRECTED CHANGES

3.9. WEEKLY PROGRESS MEETINGS

3.10. OWNERSHIP OF FLOAT

3.11. TRANSFER OF SCHEDULE DATA INTO RMS/QCS

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.

U.S. ARMY CORPS OF ENGINEERS (USACE) ER 1-1-11 (1995) Progress, Schedules, and Network Analysis Systems (Available through the Publications page of the US Army Corps of Engineers TECHINFO Website at http://www.hnd.usace.army.mil/techinfo/. See link for Engineer Regulation ER 1-1-11).

1.2. QUALIFICATIONS

Designate an authorized representative who shall be responsible for the preparation of the schedule and all required updating (statusing) and preparation of reports. The authorized representative shall be experienced in scheduling projects similar in nature to this project and shall be experienced in the use of the scheduling software that meets the requirements of this specification.

2.0 PRODUCTS (Not Applicable)

3.0 EXECUTION

3.1. GENERAL REQUIREMENTS

3.1.1. Submit a project schedule as specified herein for approval showing the sequence in which the Contractor proposes to perform the work and dates on which the Contractor contemplates starting and completing all schedule activities. The scheduling of the entire project, including the design and construction sequences is required. Contractor management personnel shall actively participate in its development. Designers, subcontractors and suppliers working on the project shall also contribute in developing an accurate project schedule. The schedule must be a forward planning as well as a project monitoring tool. The approved project schedule shall be used to measure the progress of the work and to aid in evaluating requests for excusable time extensions. The schedule shall be cost loaded and activity coded as specified herein. The schedule will provide the basis for all progress payments. If the Contractor fails to submit any schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments until the Contractor submits the required schedule

3.1.2. Status the schedule on at least a monthly basis, as specified herein. If in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress including those that may be required by the Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained. See paragraph 3.7.4.

3.1.3. Failure of the Contractor to comply with the requirements of the Contracting Officer shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of the contract.

3.2. BASIS FOR PAYMENT AND COST LOADING

The schedule shall be the basis for determining contract earnings during each update period and therefore the amount of each progress payment. Lack of an approved schedule update or qualified

scheduling personnel will result in an inability of the Contracting Officer to evaluate contract earned value for the purposes of payment. Failure of the Contractor to provide all information, as specified herein will result in the disapproval of the preliminary, initial and subsequent schedule updates. In the event schedule revisions are directed by the Contracting Officer and those revisions have not been included in subsequent revisions or updates, the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until such revisions to the project schedule have been made. Activity cost loading shall be reasonable as determined by the Contracting Officer. The aggregate value of all activities coded to a contract CLIN as specified herein shall equal the value of the CLIN on the Schedule.

3.3. PROJECT SCHEDULE DETAILED REQUIREMENTS

The computer software system utilized to produce and update the project schedule shall be capable of meeting all requirements of this specification. Failure of the Contractor to meet the requirements of this specification will result in the disapproval of the schedule. Scheduling software that meets the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER-1-1-11(1995) referenced herein are Primavera Project Planner (P3) by Primavera, and Open Plan by Deltek.

3.3.1. Use of the Critical Path Method

Use the Critical Path Method (CPM) of network calculation to generate the project schedule. Prepare the project schedule using the Precedence Diagram Method (PDM).

3.3.2. Level of Detail Required

Develop the project schedule to an appropriate level of detail. Failure to develop the project schedule to an appropriate level of detail, as determined by the Contracting Officer, will result in its disapproval. The Contracting Officer will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:

3.3.2.1. Activity Durations

Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods. Less than 2 percent of all non-procurement activities shall have Original Durations (OD) greater than 20 work days or 30 calendar days. Procurement activities are defined herein.

3.3.2.2. Design and Permit Activities

Include design and permit activities, including necessary conferences and follow-up actions and design package submission activities. Include the design schedule in the project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific contract period. This shall be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. Include review and correction periods associated with each item.

3.3.2.3. Procurement Activities

Include activities associated with the submittal, approval, procurement, fabrication and delivery of long lead materials, equipment, fabricated assemblies and supplies. Long lead procurement activities are those with an anticipated procurement sequence of over 90 calendar days. A typical procurement sequence includes the string of activities: submit, approve/review, procure, fabricate, and deliver.

3.3.2.4. Mandatory Tasks

Include and properly schedule the following tasks (See also the Sample Preliminary Submittal Register Input Form):

(a) Submission, review and acceptance of design packages, including BIM

(b) Submission of mechanical/electrical/information systems layout drawings

(c) Submission and approval of O & M manuals

(d) Submission and approval of as-built drawings

(e) Submission and approval of 1354 data and installed equipment lists

(f) Submission and approval of testing and air balance (TAB)

(g) Submission of TAB specialist design review report

(h) Submission and approval of fire protection specialist

(i) Submission and approval of testing and balancing of HVAC plus commissioning plans and data. Develop the schedule logic associated with testing and commissioning of mechanical systems to a level of detail consistent with the contract commissioning requirements.

(j) Air and water balancing

(k) HVAC commissioning

(l) Controls testing plan submission

(m) Controls testing

(n) Performance Verification testing

(o) Other systems testing, if required

(p) Contractor's pre-final inspection

(q) Correction of punch list from Contractor's pre-final inspection

(r) Government's pre-final inspection

(s) Correction of punch list from Government's pre-final inspection

(t) Final Inspection

3.3.2.5. Government Activities. Show Government and other agency activities that could impact progress. These activities include but are not limited to: approvals, design reviews, review conferences, release for construction of design package(s), environmental permit approvals by State regulators, inspections, utility tie-ins, Government Furnished Property/Equipment (GFP) and Notice to Proceed for phasing requirements, if any.

3.3.2.6. Activity Responsibility Coding (RESP)

Assign Responsibility Code for all activities to the Prime Contractor, Subcontractor or Government agency responsible for performing the activity. Activities coded with a Government Responsibility code include, but are not limited to: Government approvals, Government design reviews, environmental permit approvals by State regulators, Government Furnished Equipment (GFE) and Notice to Proceed (NTP) for phasing requirements. Code all activities not coded with a Government Responsibility Code to the Prime Contractor or Subcontractor responsible to perform the work. Activities shall not have more than one Responsibility Code. Examples of acceptable activity code values are: DOR (for the designer of record); ELEC (for the electrical subcontractor); MECH (for the mechanical subcontractor); and GOVT (for USACE). Unacceptable code values are abbreviations of the names of subcontractors.

3.3.2.7. Activity Work Area Coding (AREA)

Assign Work Area code to activities based upon the work area in which the activity occurs. Define work areas based on resource constraints or space constraints that would preclude a resource, such as a particular trade or craft work crew from working in more than one work area at a time due to restraints on

resources or space. Examples of Work Area Coding include different areas within a floor of a building, different floors within a building, and different buildings within a complex of buildings. Activities shall not have more than one Work Area Code. Not all activities are required to be Work Area coded. A lack of Work Area coding will indicate the activity is not resource or space constrained.

3.3.2.8. Contract Changes/Requests for Equitable Adjustment (REA) Coding (MODF)

Assign Activity code to any activity or sequence of activities added to the schedule as a result of a Contract Modification, when approved by Contracting Officer, with a Contract Changes/REA Code. Key all Code values to the Government's modification numbering system. Any activity or sequence of activities added to the schedule as a result of alleged constructive changes made by the Government may be added to a copy of the current schedule, subject to the approval of the Contracting Officer. Assign Activity codes for these activities with a Contract Changes/REA Code. Key the code values to the Contractor's numbering system. Approval to add these activities does not necessarily mean the Government accepts responsibility and therefore liability for such activities and any associated impacts to the schedule, but rather the Government recognizes such activities are appropriately added to the schedule for the purposes of maintaining a realistic and meaningful schedule. Such activities shall not be Responsibility Coded to the Government unless approved. An activity shall not have more than one Contract Changes/REA Code

3.3.2.9. Contract Line Item (CLIN) Coding (BIDI)

Code all activities to the CLIN on the Contract Line Item Schedule to which the activity belongs. An activity shall not contain more than one CLIN Item Code. CLIN Item code all activities, even when an activity is not cost loaded.

3.3.2.10. Phase of Work Coding (PHAS)

Assign Phase of Work Code to all activities, based upon the phase of work in which the activity occurs. Code activities to either a Design Phase or a Construction Phase. Code fast track design and construction phases proposed by the Contractor to allow filtering and organizing the schedule by fast track design and construction packages. If the contract specifies construction phasing with separately defined performance periods, identify a Construction Phase Code to allow filtering and organizing the schedule accordingly. Each activity shall have only one Phase of Work code.

3.3.2.11. Category of Work Coding (CATW)

Assign Category of Work code to all Activities based upon the category of work which the activity belongs. Category of Work Code must include, but is not limited to: Design, Design Submittal, design reviews, review conferences, Construction Submittal, Approvals (if any), Acceptance, Procurement, Fabrication, Delivery, Weather Sensitive Installation, Non-Weather Sensitive Installation, Start Up, Test, and Turnover. Assign a Category of Work code to each activity. Each activity shall have only one Category of Work Code.

3.3.2.12. Definable Features of Work Coding (FOW1, FOW2, FOW3)

Assign a Definable Feature of Work Code to appropriate activities based on the definable feature of work to which the activity belongs. Definable Feature of Work is defined in Specification Section 01 45 04.00 10, Contractor Quality Control. An activity shall not have more than one Definable Feature of Work Code. Not all activities are required to be Definable Feature of Work Coded.

3.3.3. Scheduled Project Completion and Activity Calendars

The schedule interval shall extend from NTP date to the required contract completion date. The contract completion activity (End Project) shall finish based on the required contract durationin the accepted

contract proposal, as adjusted for any approved contract time extensions. The first scheduled work period shall be the day after NTP is acknowledged by the Contractor. Schedule activities on a calendar to which the activity logically belongs. Activities may be assigned to a 7 day calendar when the contract assigns calendar day durations for the activity such as a Government Acceptance activity. If the Contractor intends to perform physical work less than seven days per week, schedule the associated activities on a calendar with non-work periods identified including weekends and holidays. Assign the Category of Work Code - Weather Sensitive Installation to those activities that are weather sensitive. Original durations must account for anticipated normal adverse weather. The Government will interpret all work periods not identified as non-work periods on each calendar as meaning the Contractor intends to perform work during those periods.

3.3.3.1. Project Start Date

The schedule shall start no earlier than the date on which the NTP was acknowledged. Include as the first activity in the project schedule an activity called "Start Project" or “NTP”. The "Start Project" activity shall have an "ES" constraint date equal to the date that the NTP was acknowledged, with a zero day duration.

3.3.3.2. Schedule Constraints and Open Ended Logic

Constrain completion of the last activity in the schedule by the contract completion date. Schedule calculations shall result in negative float when the calculated early finish date of the last activity is later than the contract completion date. Include as the last activity in the project schedule an activity called "End Project". The "End Project" activity shall have an "LF" constraint date equal to the contract completion date for the project, and with a zero day duration or by using the “project must finish by” date in the scheduling software. The schedule shall have no constrained dates other than those specified in the contract. The use of artificial float constraints such as “zero fee float” or “zero total float” are typically prohibited. There shall only be 2 open ended activities: Start Project (or NTP) with no predecessor logic and End Project with no successor logic.

3.3.3.3. Early Project Completion

In the event the Preliminary or Initial project schedule calculates an early completion date of the last activity prior to the contract completion date, the Contractor shall identify those activities that it intends to accelerate and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. The Contractor shall include all project and site overhead expenses through the required contract duration period in the contract cost. The Contractor will not be entitled to a time extension or price adjustment for extended overhead related costs due to any delays which may affect early contract completion prior to the required contract completion date. The last activity shall have a late finish constraint equal to the contract completion date and the schedule will calculate positive float. The Government will not approve an early completion schedule with zero float on the longest path. The Government is under no obligation to accelerate activities for which it is responsible to support a proposed early contract completion.

3.3.4. Interim Completion Dates

Constrain contractually specified interim completion dates to show negative float when the calculated early finish date of the last activity in that phase is later than the specified interim completion date.

3.3.4.1. Start Phase

Include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The “Start Phase X" activity shall have an "ES" constraint date equal to the date on which the NTP was acknowledged, and a zero day duration.

3.3.4.2. End Phase

Include as the last activity for a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have an "LF" constraint date equal to the specified completion date for that phase and a zero day duration.

3.3.4.3. Phase “X” Hammock

Include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" hammock activity shall be logically tied to the earliest and latest activities in the phase.

3.3.5. Default Progress Data Disallowed

Do not automatically update Actual Start and Finish dates with default mechanisms that may be included in the scheduling software. Activity Actual Start (AS) and Actual Finish (AF) dates assigned during the updating process shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the AS and AF dates on the Daily Quality Control report for every in-progress or completed activity, and failure to ensure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's updated schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. Updating of the percent complete and the remaining duration of any activity shall be independent functions. Disable program features which calculate one of these parameters from the other.

3.3.6. Out-of-Sequence Progress

Activities that have progressed before all preceding logic has been satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case basis subject to approval by the Contracting Officer. Propose logic corrections to eliminate all out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule..

3.3.7. Negative Lags and Start to Finish Relationships

Lag durations contained in the project schedule shall not have a negative value. Do not use Start to Finish relationships (SF).

3.3.8. Calculation Mode

Schedule calculations shall retain the logic between predecessors and successors even when the successor activity starts and the predecessor activity has not finished. Software features that in effect sever the tie between predecessor and successor activities when the successor has started and the predecessor logic is not satisfied (“progress override”) will not be allowed.

3.3.9. Milestones

Include milestone activities for each significant project event including but not limited to: milestone activities for each fast track design package released for construction; design complete; foundation/substructure construction complete; superstructure construction complete; building dry-in or enclosure complete to allow the initiation of finish activities; permanent power complete; and building systems commissioning complete.

3.3.10. Use of Primavera “P6”

If P6 is being used, the following settings are mandatory in the Preliminary Project Schedule, Initial Project Schedule and all schedule submissions to the Government:

3.3.10.1. Activity Codes shall be Project Level not Global or EPS level.

3.3.10.2. Calendars shall be Project Level not Global or Resource level.

3.3.10.3. Set Activity Duration Types to "Fixed Duration & Units".

3.3.10.4. Set Percent Complete Types to "Physical".

3.3.10.5. Use Default Time Period Admin Preferences "8.0 hr/day, 40 hr/week, 172 hr/month, 2000 hr/year". Set Calendar Work Hours/Day to 8.0 Hour days. This is not to mandate the Contractor's work week. Alternate workweeks may be set up in "Calendar Settings".

3.3.10.6. Set Schedule Option for defining Critical Activities "Longest Path".

3.3.10.7. Set Schedule Option for defining progressed activities "Retained Logic".

3.3.10.8. Set up Cost loading a single lump sum Resource. The Price/Unit shall be $1/hr, Default Units/Time shall be "8h/d", and select settings "Auto Compute Actuals" and "Calculate costs from units".

3.3.10.9. Activity ID's shall not exceed 10 characters.

3.3.10.10. Activity Names shall have the most defining and detailed description within the first 30 characters.

3.4. PROJECT SCHEDULE SUBMISSIONS

Provide the submissions as described below. The data CD, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

3.4.1. Preliminary Project Schedule Submission

Submit the Preliminary Project Schedule, defining the Contractor's planned operations for the first 90 calendar days for approval within 15 calendar days after the NTP is acknowledged. The approved Preliminary Project Schedule will be used for payment purposes not to exceed 90 calendar days after NTP. Completely cost load the Preliminary Project Schedule to balance the contract award CLINS shown on the Price Schedule. Detail it for the first 90 calendar days. It may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as previously specified. The Preliminary Project Schedule forms the basis for the Initial Project Schedule specified herein and must include all of the required Plan and Program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) as well as design activities, the planned submissions of all early design packages, permitting activities, design review conference activities and other non-construction activities intended to occur within the first 90 calendar days. Schedule any construction activities planned for the first 90 calendar days after NTP. Constrain planned construction activities by Government acceptance of the associated design package(s) and all other specified Program and Plan approvals. Activity code any activities that are summary in nature after the first 90 calendar days with Responsibility Code (RESP) and Feature of Work code (FOW1, FOW2, FOW3)

3.4.2. Initial Project Schedule Submission

Submit the Initial Project Schedule for approval within 42 calendar days after NTP. The schedule shall demonstrate a reasonable and realistic sequence of activities which represent all work through the entire contract performance period. The Initial Schedule shall be at a reasonable level of detail as determined by the Contracting Officer. Include detailed design and permitting activities, including but not limited to identification of individual design packages, design submission, reviews and conferences; permit

submissions and any required Government actions; and long lead procurement activities required prior to design completion. The Initial Project Schedule shall include the entire construction sequence and all fast track construction activities, with as much detail as is known at the time but, as a minimum, shall include all construction start and completion milestone activities, and detailed construction activities through the dry-in milestone, including all activity coding and cost loading. Include the remaining construction, including cost loading, but it may be scheduled summary in nature. As the design proceeds and design packages are developed, fully detail the remaining construction activities concurrent with the monthly schedule updating process. Constrain construction activities by Government acceptance of associated designs. When the design is complete, incorporate into the then approved schedule update all remaining detailed construction activities that are planned to occur after the dry-in milestone.

3.4.3. Design Package Schedule Submission:

With each design package submitted to the Government, submit a frag-net schedule extracted from the then current Preliminary, Initial or Updated schedule which covers the activities associated with that Design Package including construction, procurement and permitting activities.

3.4.4. Periodic Schedule Updates

Based on the result of the meeting specified in PERIODIC SCHEDULE UPDATE MEETINGS, submit periodic schedule updates. These submissions shall enable the Contracting Officer to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgment of the Contracting Officer or authorized representative is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made. Update the schedule to include detailed lower WBS activities procurement and construction activities as the design progresses, but not later than the submission of the final, un-reviewed design submission for each separate design package. The Contracting Officer may require submission of detailed schedule activities for any distinct construction that is started prior to submission of a final design submission, if such activity is authorized.

3.4.5. Standard Activity Coding Dictionary

Use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11, Appendix A. This exact structure is mandatory, even if some fields are not used. A template SDEF compatible schedule backup file (sdef.prx) is available on the QCS website: http://rms.usace.army.mil .

The SDEF format is as follows:

Field	Activity Code	Length	Description
1	WRKP	3	Workers per Day
2	RESP	4	Responsible Party (e.g. GC, subcontractor, USACE)
3	AREA	4	Area of Work
4	MODF	6	Modification or REA number
5	BIDI	6	Bid Item (CLIN)
6	PHAS	2	Phase of Work

7	CATW	1	Category of Work
8	FOW1	10	Feature of Work (used up to 10 characters in length)
9	FOW2	10	Feature of Work (used up to 20 characters in length)
10	FOW3	10	Feature of Work (used up to 30 characters in length)

3.5. SUBMISSION REQUIREMENTS

Submit the following items for the Preliminary Schedule, Initial Schedule, and every Periodic Schedule Update throughout the life of the project:

3.5.1. Data CD's

Provide two sets of data CD's containing the project schedule in the backup format. Each CD shall also contain all previous update backup files. File medium shall be CD. Label each CD, indicating the type of schedule (Preliminary, Initial, Update), full contract number, Data Date and file names. Each schedule shall have a unique file name as determined by the Contractor.

3.5.2. Narrative Report

Provide a Narrative Report with the Preliminary, Initial, and each Periodic Update of the project schedule, as the basis of the progress payment request. The Narrative Report shall include: a description of activities along the 2 most critical paths where the total float is less than or equal to 20 work days, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken or required to be taken. The narrative report is expected to communicate to the Government, the Contractor's thorough analysis of the schedule output and its plans to compensate for any problems, either current or potential, which are revealed through its analysis. Identify and explain why any activities that, based their calculated late dates, should have either started or finished during the update period but did not.

3.5.3. Approved Changes Verification

Include only those project schedule changes in the schedule submission that have been previously approved by the Contracting Officer. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

3.5.4. Schedule Reports

The format, filtering, organizing and sorting for each schedule report shall be as directed by the Contracting Officer. Typically reports shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date Total Float, Actual Start Date, Actual Finish Date, and Percent Complete. The following lists typical reports that will be requested. One or all of these reports may be requested for each schedule submission.

3.5.4.1. Activity Report

A list of all activities sorted according to activity number.

3.5.4.2. Logic Report

A list of detailed predecessor and successor activities for every activity in ascending order sorted by activity number.

3.5.4.3. Total Float Report

A list of all incomplete activities sorted in ascending order of total float. List activities which have the same amount of total float in ascending order of Early Start Dates. Do not show completed activities on this report.

3.5.4.4. Earnings Report by CLIN

A compilation of the Contractor's Total Earnings on the project from the NTP to the data date. This report shall reflect the earnings of specific activities based on the agreements made in the schedule update meeting defined herein. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining progress payments. Group activities by CLIN Item number and sort by activity number. This report shall: sum all activities coded to a particular CLIN and provide a CLIN Item percent earned value; and complete and sum CLIN items to provide a total project percent complete. The printed report shall contain, for each activity: the Activity Number, Activity Description, Original Budgeted Amount, Quantity to Date, Percent Complete (based on cost), and Earnings to Date.

3.5.5. Network Diagram

The network diagram is required for the Preliminary, Initial and Periodic Updates. Depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.5.1. Continuous Flow

Show a continuous flow from left to right with no arrows from right to left. Show the activity number, description, duration, and estimated earned value on the diagram.

3.5.5.2. Project Milestone Dates

Show dates on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.5.3. Critical Path

Clearly show the critical path.

3.5.5.4. Banding

Organize activities as directed to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

3.5.5.5. S-Curves

Earnings curves showing projected early and late earnings and earnings to date.

3.6. PERIODIC SCHEDULE UPDATE MEETINGS

Conduct periodic schedule update meetings for the purposes of reviewing the Contractor’s proposed out of sequence corrections, determining causes for delay, correcting logic, maintaining schedule accuracy and determining earned value. Meetings shall occur at least monthly within five days of the proposed

schedule data date and after the Contractor has updated the schedule with Government concurrence respecting actual start dates, actual finish dates, remaining durations and percent complete for each activity it intend to status. Match the acutal start and finish dates with the dates exported, as described in paragraph 3.3.5. Provide a computer with the scheduling software loaded and a projector during the meeting which allows all meeting participants to view the proposed schedule update during the meeting. The meeting and resultant approvable schedule update shall be a condition precedent to a formal submission of the update as described in SUBMISSION REQUIREMENTS and to the submission of an invoice for payment. The meeting will be a working interactive exchange which will allow the Government and the Contractor the opportunity review the updated schedule on a real time and interactive basis. The Contractor's authorized scheduling representative will organize, sort, filter and schedule the update as requested by the Government. The meeting will last no longer than 8 hours. A rough draft of the proposed activity logic corrections and narrative report shall be provided to the Government 48 hours in advance of the meeting. The Contractor's Project Manager and Authorized Scheduler shall attend the meeting with the Authorized Representative of the Contracting Officer.

3.6.1. Update Submission Following Progress Meeting

Submit a complete update of the project schedule containing all approved progress, revisions, and adjustments, pursuant to paragraph SUBMISSION REQUIREMENTS not later than 4 working days after the periodic schedule update meeting, reflecting only those changes made during the previous update meeting.

3.6.2. Status of Activities

Update statusing information, including Actual Start Dates (AS), Actual Finish Dates (AF), Remaining Durations (RD) and Percent Complete shall be subject to the approval of the Government prior to the meeting. As a minimum, address the following items on an activity by activity basis during each progress meeting:

3.6.2.1. Actual Start and Finish Dates

Accurately status the AS and/or AF dates for each activity currently in-progress or completed since the last update The Government may allow an AF date to be assigned with the percent complete less than 100% to account for the value of work remaining but not restraining successor activities. Only assign AS dates when actual progress occurs on an activity.

3.6.2.2. Remaining Duration

Update the estimated RD for all incomplete activities independent of Percent Complete. Remaining durations may exceed the activity OD or may exceed the activity's prior update RD if the Government considers the current OD or RD to be understated based on current progress, insufficient work crews actually manning the job, unrealistic OD or deficiencies that must be corrected that restrain successor activities.

3.6.2.3. Percent Complete

Update the percent complete for each activity started based on the realistic assessment of earned value. Activities which are complete but for remaining minor punch list work and which do not restrain the initiation of successor activities may be statused 100 percent complete. To allow for proper schedule management, cost load the correction of punch list from Government pre-final inspection activity(ies) not less than 1% of the total contract value, which activity(ies) may be declared 100 percent complete upon completion and correction of all punch list work identified during Government pre-final inspection(s).

3.6.2.4. Logic Changes

Specifically identify and discuss all logic changes pertaining to NTP on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, and other changes that have been made pursuant to contract provisions. The Government will only approve logic revisions for the purpose of keeping the schedule valid in terms of its usefulness in calculating a realistic completion date, correcting erroneous logic ties, and accurately sequencing the work.

3.6.2.5. Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary. 3) Changes required to correct a schedule that does not represent the actual or planned prosecution and progress of the work.

3.7. REQUESTS FOR TIME EXTENSIONS

In the event the Contractor believes it is entitled to an extension of the contract performance period, completion date, or any interim milestone date, furnish the following for a determination by the Contracting Officer: justification, project schedule data, and supporting evidence as the Contracting Officer may deem necessary. Submission of proof of excusable delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is a condition precedent to any approvals by the Government. In response to each Request For Proposal issued by the Government, the Contractor shall submit a schedule impact analysis demonstrating whether or not the change contemplated by the Government impacts the critical path.

3.7.1. Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with its request. The Contracting Officer's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information.The Contractor will not be entitled to a time extension or price adjustment for extended overhead related costs due to any delays which may affect early contract completion prior to the required contract completion date.

Actual delays that are found to be caused by the Contractor's own actions, which result in a calculated schedule delay, will not be a cause for an extension to the performance period, completion date, or any interim milestone date.

3.7.2. Submission Requirements

Submit a justification for each request for a change in the contract completion date of less than 2 weeks based upon the most recent schedule update at the time of the NTP or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

3.7.2.1. A list of affected activities, with their associated project schedule activity number.

3.7.2.2. A brief explanation of the causes of the change

3.7.2.3. An analysis of the overall impact of the changes proposed.

3.7.2.4. A sub-network of the affected area

Identify activities impacted in each justification for change by a unique activity code contained in the required data file.

3.7.3. Additional Submission Requirements

The Contracting Officer may request an interim update with revised activities for any requested time extension of over 2 weeks. Provide this disk within 4 days of the Contracting Officer's request.

3.7.4. If Progress Falls Behind the Approved Project Schedule

3.7.4.1. Should progress fall behind the approved schedule (more than 20 work days of negative float) due to Contractor generated problems, promptly provide a supplemental recovery or completion schedule that illustrates its efforts to regain time to assure a completion by the required contract completion date.

3.7.4.2. The supplemental recovery or completion schedule will not replace the original, approved schedule as the official contract schedule. Continue to update the original, approved schedule on at least a monthly basis. In addition, the Contractor and the Contracting Officer will monitor the supplemental recovery or completion schedule on at least a bi-weekly basis to determine its effect on regaining the rate of progress to assure project completion by the contractually required completion date.

3.7.4.3. Do not artificially improve progress by simply revising the schedule logic, modifying or adding constraints, or shortening future work activity durations. Resource and manpower load the supplemental recovery schedule or completion schedule with crew size and productivity for each remaining activity, indicating overtime, weekend work, and/or double shifts needed to regain the schedule, in accordance with FAR 52.236.15, without additional cost to the Government. Indicate assumptions made and the basis for any logic, constraint, or duration changes used in the creation of the supplemental recovery or completion schedule in a narrative submitted for the Contracting Officer’s approval. Any additional resources or manpower must be evident at the work site. Do not modify the official contract schedule to include these assumptions.

3.7.4.4. Failure to perform work and maintain progress in accordance with the supplemental recovery or completion schedule may result in an interim and final unsatisfactory performance rating and/or may result in corrective action by the Contracting Officer in accordance with FAR 52.236-15.

3.8. DIRECTED CHANGES

If the NTP is issued for changes prior to settlement of price and/or time, submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The Contracting Officer will approve proposed revisions to the schedule prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor with suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, the Contractor shall continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.9. WEEKLY PROGRESS MEETINGS

3.9.1. The Government and the Contractor shall meet weekly (or as otherwise mutually agreed to) between the meetings described in paragraph PERIODIC SCHEDULE UPDATE MEETINGS for the purpose of jointly reviewing the actual progress of the project as compared to the as planned progress

and to review planned activities for the upcoming two weeks. The then current and approved schedule update shall be used for the purposes of this meeting and for the production and review of reports. The Contractor's Project Manager and the Authorized Representative of the Contracting Officer shall attend. The weekly progress meeting will address the status of RFI's, RFP's and Submittals.

3.9.2. Provide a bar chart produced by the scheduling software, organized by Total Float and Sorted by Early Start Date, and a two week "look-ahead" schedule by filtering all schedule activities to show only current ongoing activities and activities schedule to start during the upcoming two weeks, organized by Work Area Code (AREA) and sorted by Early Start Date.

3.9.3. The Government and the Contractor shall jointly review the reports. If it appears that activities on the longest path(s) which are currently driving the calculated completion date (driving activities), are not progressing satisfactorily and therefore could jeopardize timely project completion, corrective action must be taken immediately. Corrective action includes but is not limited to: increasing the number of work crews; increasing the number of work shifts; increasing the number of hours worked per shift; and determining if Government responsibility coded activities require Government corrective action.

3.10. OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

3.11. TRANSFER OF SCHEDULE DATA INTO RMS/QCS

Download and upload the schedule data into the Resident Management System (RMS) prior to RMS databases being transferred to the Government and is considered to be additional supporting data in a form and detail required by the Contracting Officer pursuant to FAR 52.232-5 - Payments under Fixed-Price Construction Contracts. The receipt of a proper payment request pursuant to FAR 52.232-27 - Prompt Payment for Construction Contracts is contingent upon the Government receiving both acceptable and approvable hard copies and electronic export from QCS of the application for progress payment.

End of Section 01 32 01.00 10

SECTION 01 33 00
SUBMITTAL PROCEDURES

1.0 GENERAL

1.1. DEFINITIONS

1.2. NOT USED

1.3. SUBMITTAL CLASSIFICATION

1.4. APPROVED OR CONCURRED WITH SUBMITTALS

1.5. DISAPPROVED SUBMITTALS

1.6. WITHHOLDING OF PAYMENT

1.7. GENERAL

1.8. SUBMITTAL REGISTER

1.9. SCHEDULING

1.10. TRANSMITTAL FORM (ENG FORM 4025)

1.11. SUBMITTAL PROCEDURES

1.12. CONTROL OF SUBMITTALS

1.13. GOVERNMENT APPROVED SUBMITTALS

1.14. INFORMATION ONLY SUBMITTALS

1.15. STAMPS

1.0 GENERAL

1.1. DEFINITIONS

1.1.1. Submittal

Contract Clauses "FAR 52.236-5, Material and Workmanship," paragraph (b) and "FAR 52.236-21, Specifications and Drawings for Construction," paragraphs (d), (e), and (f) apply to all "submittals."

1.1.2. Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by SD numbers and titles as follows.

SD-01 Preconstruction Submittals

- Certificates of insurance.
- Surety bonds.
- List of proposed subcontractors.
- List of proposed products.
- Construction Progress Schedule.
- Submittal register.
- Schedule of prices.
- Accident Prevention Plan.
- Work plan.
- Quality control plan.
- Environmental protection plan.

SD-02 Shop Drawings

- Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.
- Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.
- Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

- Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.
- Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

- Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.
- Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.
- Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies that are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

- Calculations, mix designs, analyses or other data pertaining to a part of work.
- Design submittals, design substantiation submittals and extensions of design submittals.

SD-06 Test Reports

- Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)
- Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.
- Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.
- Investigation reports.
- Daily checklists.
- Final acceptance test and operational test procedure.

SD-07 Certificates

- Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.
- Document required of Contractor, or of a supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.
- Confined space entry permits.
- Text of posted operating instructions.

SD-08 Manufacturer's Instructions

- Preprinted material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

- Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- Factory test reports.

SD-10 Operation and Maintenance Data

- Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

SD-11 Closeout Submittals

- Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

1.1.3. Approving Authority

Office authorized to approve submittal.

1.1.4. Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.2. NOT USED

1.3. SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.3.1. Designer of Record Approved (DA)

1.3.1.1. Designer of Record (DOR) approval is required for all extensions of design, critical materials, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". Provide the Government the number of copies designated hereinafter of all DOR approved submittals, after the DOR has taken appropriate action. The DOR shall ensure that submittals conform to the Solicitation, the Accepted Proposal and the completed design, however see below for those submittals proposing a deviation to the contract or a substitution of a material, system, or piece of equipment that was identified by manufacturer, brand name or model description in the accepted contract proposal.

1.3.1.2. The DOR shall ensure that the submittals comply with all applicable Buy American Act and Trade Agreement Act clauses in the contract. The DOR may confer with the Contracting Officer's Representative for advice and interpretation of those clauses, as necessary.

1.3.1.3. The Government may, but is not required to, review any or all DOR approved submittals for conformance to the solicitation, accepted proposal and the completed design. Except for submittals designated as deviating from the Solicitation, the Accepted Proposal or completed design, the Contractor may proceed with acquisition and installation upon DOR approval. Government Approved (GA)

1.3.2. Government Approved (GA)

Government approval is required for any item specifically designated as requiring Government approval in the Solicitation, for internal and external color finish selections and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.3.3. Government Conformance Review of Design (CR)

The Government will review all intermediate and final design submittals for conformance with the technical requirements of the solicitation. Section 01 33 16 **DESIGN AFTER AWARD** covers the design submittal and review process in detail. Review will be only for conformance with the applicable codes, standards and contract requirements. Design data includes the design documents described in Section 01 33 16 **DESIGN AFTER AWARD**. Generally, design submittals should be identified as SD-05 Design Data submittals.

1.3.4. Designer of Record Approved/Government Conformance Review (DA/CR)

1.3.4.1. Deviations to the Accepted Design. Designer of Record approval and the Government’s concurrence are required for any proposed deviation from the accepted design which still complies with the contract (the Solicitation and Accepted Proposal) before the Contractor is authorized to proceed with material acquisition or installation. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings.” If necessary to facilitate the project schedule, the Contractor and the DOR may discuss a submittal proposing a deviation with the Contracting Officer's Representative prior to officially submitting it to the Government. However, the Government reserves the right to review the submittal before providing an opinion, if it deems it necessary. In any case, the Government will not formally agree to or provide a preliminary opinion on any deviation without the DOR's approval or recommended approval. The Government reserves the right to non-concur with any deviation from the design, which may impact furniture, furnishings, equipment selections or operations decisions that were made, based on the reviewed and concurred design.

1.3.4.2. Substitutions. Unless prohibited or provided for otherwise elsewhere in the Contract, where the accepted contract proposal named products, systems, materials or equipment by manufacturer, brand name and/or by model number or other specific identification, and the Contractor desires to substitute manufacturer or model after award, submit a requested substitution for Government concurrence. Include substantiation, identifying information and the DOR's approval, as meeting the contract requirements and that it is equal in function, performance, quality and salient features to that in the accepted contract proposal.

1.3.5. Designer of Record Approved/Government Approved (DA/GA)

Any proposed deviation to the solicitation and/or the accepted proposal constitutes a change to the contract. In addition to the above stated requirements for proposed deviations to the accepted design, both Designer of Record and Government Approval and, where applicable, a contract modification are required before the Contractor is authorized to proceed with material acquisition or installation for any proposed deviation to the contract. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". The Government reserves the right to accept or reject any such proposed deviation at its discretion.

1.3.6. Information Only

All submittals not requiring Designer of Record or Government approval will be for information only. Provide the Government "For Information Only" copies of all submittals not requiring Government approval or concurrence, after the Designer of Record has taken the appropriate action.

1.4. APPROVED OR CONCURRED WITH SUBMITTALS

Do not construe the Contracting Officer's approval of or concurrence with submittals as a complete check, but only that design, general method of construction, materials, detailing and other information appear to meet the Solicitation and Accepted Proposal. Approval or concurrence will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for design, dimensions, all design extensions, such as the design of adequate connections and details, etc., and the satisfactory construction of all work. The Government won't consider re-submittals for the purpose of substituting previously approved materials or equipment unless accompanied by an explanation of why a substitution is necessary.

1.5. DISAPPROVED SUBMITTALS

Make all corrections required by the Contracting Officer, obtain the Designer of Record's approval when applicable, and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. Resubmit any "information only" submittal found to contain errors or unapproved deviations from the Solicitation or Accepted Proposal as one requiring "approval" action, requiring both Designer of Record and Government approval. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, provide prompt notice in accordance with the Contract Clause "Changes" to the Contracting Officer.

1.6. WITHHOLDING OF PAYMENT

No payment for materials incorporated in the work will be made if all required Designer of Record or required Government approvals have not been obtained. No payment will be made for any materials incorporated into the work for any conformance review submittals or information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

1.7. GENERAL

Make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, the Contractor's Quality Control (CQC) System Manager and the Designer of Record, if applicable, shall check, approve, sign, and stamp all items, indicating action taken. Clearly idenify proposed deviations from the contract requirements. Include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Schedule and make submittals requiring Government approval prior to the acquisition of the material or equipment covered thereby. Pick up and dispose of samples remaining upon completion of the work in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

1.8. SUBMITTAL REGISTER (GA)

Develop a complete list of submittals, including each separate design package submittal. Submit the initial submittal register within 15 days after Notice to Proceed, including, as a minimum, the design packages and other initial submittals required elsewhere in the contract. The Designer of Record shall identify required submittals in the specifications, and use the list to prepare the Submittal Register, utilizing the government-provided software, QCS (see Section 01 45 01.10), to create the ENG Form 4288. Appendix R is a preliminary submittal register input form for use with the Quality Management System and the Resident Office Management System (QCS and RMS). The Government will provide the Contractor the actual Excel Spreadsheet version of this sample input form after award to modify and to use for input into QCS. The Excel Spreadsheet is not totally inputable into QCS, so additional keystroke input will be necessary. The sample input form is not all-inclusive. In addition, additional submittals may be required by other parts of the contract. After award, the parties will meet to discuss contract specific (or task order specific for a task order contract) distribution for the submittals all-inclusive and additional submittals may be required by other parts of the contract. Develop and complete the submittal register as the design is completed. Submit it to the Contracting Officer with the un-reviewed final design package submission or as soon as the design specifications are completed, if before the final design submission. When applicable, if the Contractor elects to fast track design and construction, using multiple design package submissions, update the submittal register to reflect the submittals associated with each design submission, clearly denoting all revisions to the previous submission. The submittal register serves as a scheduling document for submittals and for control of submittal actions throughout the contract period. Coordinate the submit dates and need dates used in the submittal register with dates in the Contractor prepared progress schedule. Submit monthly updates to the submittal register showing the Contractor action codes and actual dates with Government action codes and actual dates or until all submittals have been satisfactorily completed. Revise and submit the submittal register when revising the progress schedule.

1.9. SCHEDULING

Schedule submittals covering component items forming a system or items that are interrelated to be coordinated and submitted concurrently. Schedule certifications to be submitted with the pertinent drawings. Allow adequate time (a minimum of 15 calendar days exclusive of mailing time) and show on the register for those items requiring Government approval or concurrence. No delay damages or time extensions will be allowed for time lost in late submittals by the Contractor.

1.10. TRANSMITTAL FORM (ENG FORM 4025)

Use the transmittal form (ENG Form 4025) for submitting submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor or are included in the QCS software if the Contractor is required to use QCS for this contract. Use a separate transmittal form for each specification section Complete this form by filling out all the heading blank spaces and identify

each item submitted. Exercise special care to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

1.11. SUBMITTAL PROCEDURES

Make submittals as follows:

1.11.1. Procedures

The Government will further discuss detailed submittal procedures with the Contractor at the Post-Award Conference.

1.11.2. Deviations

For submittals which include proposed deviations requested by the Contractor, check the column "variation" of ENG Form 4025. Set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

1.12. CONTROL OF SUBMITTALS

Carefully control his procurement operations to ensure that each individual submittal is made on or before the scheduled submittal date shown on the approved "Submittal Register."

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 three (3) 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 one (1) copies of information only submittals.

1.15. STAMPS

Use stamps similar to the following on the submittal data to certify that the submittal meets contract requirements:

CONTRACTOR

(FIRM NAME)

_____ Approved

_____

Approved with corrections as noted on submittal data and/or attached sheet(s)

_____

Signature: _____

Title: _____

Date: _____

For design-build construction, both the Contractor Quality Control System Manager and the Designer of Record shall stamp and sign to certify that the submittal meets contract requirements.

SECTION 01 33 16
DESIGN AFTER AWARD

1.0 GENERAL INFORMATION

1.1. INTRODUCTION

1.2. DESIGNER OF RECORD

2.0 PRODUCTS (Not Applicable)

3.0 EXECUTION

3.1. PRE-WORK ACTIVIES & CONFERENCES

3.1.1. Design Quality Control Plan

3.1.2. Post Award Conference

3.1.3. Partnering & Project Progress Processes

3.1.4. Initial Design Conference

3.1.5. Pre-Construction Conference

3.2. STAGES OF DESIGN SUBMITTALS AND OVER THE SHOULDER PROGRESS REVIEWS

3.2.1. Site/Utilities

3.2.2. Interim Design Submittals

3.2.3. Over-the-Shoulder Progress Reviews

3.2.4. Final Design Submissions

3.2.5. Design Complete Submittals

3.2.6. Holiday Periods for Government Review or Actions

3.2.7. Late Submittals and Reviews

3.3. DESIGN CONFIGURATION MANAGEMENT

3.3.1. Procedures

3.3.2. Tracking Design Review Comments

3.3.3. Design and Code Checklists

3.4. INTERIM DESIGN REVIEWS AND CONFERENCES

3.4.1. General

3.4.2. Procedures

3.4.3. Conference Documentation

3.5. INTERIM DESIGN REQUIREMENTS

3.5.1. Drawings

3.5.2. Design Analyses

3.5.3. Geotechnical Investigations and Reports

3.5.4. LEED Documentation

3.5.5. Energy Conservation

3.5.6. Specifications

3.5.7. Building Rendering

3.5.8. Interim Building Design Contents

3.6. FINAL DESIGN REVIEWS AND CONFERENCES

3.7. FINAL DESIGN REQUIREMENTS

3.7.1. Drawings

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 V8i and the USACE Bentley BIM Workspace 09Q4B or current as of RFP Issue

(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) **Full 24x34** Full Sets/ *Partial Sets	Design Analyses & Specs Full Sets/ *Partial Sets	Drawing Size (Half Size) **Half 11x17** 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 **Fort Worth District**	17/1	1/1	1/1	1	1	1	1
Commander, U.S.Army Engineer District, Center of Standardization **Louisville District**	0/0	2/2	2/2	3	0	1	1
Installation	0/0	2/2	4/4	4	2	1	0
U.S.Army Corps of Engineers Construction Area Office	2/2	2/2	2/2	2	1	1	0

Activity and Address	Drawing Size (Full Size) **Full 24x34** Full Sets/ *Partial Sets	Design Analyses & Specs Full Sets/ *Partial Sets	Drawing Size (Half Size) **Half 11x17** 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)
Information Systems Engineering Command (ISEC)	0/0	0/1	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	4/4	4/4	4/4	4	N/A	4	1

***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

Except for full or half-sized drawings for Installation personnel, as designated in the Table above, 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 seven (7) 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 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.

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.

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

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**
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

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**
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

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**
			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							

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**
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

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**
			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

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**
			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

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**
			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

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**
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

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**
			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

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**
			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 Full 24x34 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 V8i. 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 09Q4B or current as of RFP Issue 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 Fort Worth District 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 01.10
QUALITY CONTROL SYSTEM (QCS)

1.0 GENERAL

1.1. CORRESPONDENCE AND ELECTRONIC COMMUNICATIONS

1.2. QCS SOFTWARE

1.3. SYSTEM REQUIREMENTS

1.4. RELATED INFORMATION

1.5. CONTRACT DATABASE

1.6. DATABASE MAINTENANCE

1.7. IMPLEMENTATION

1.8. DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

1.9. MONTHLY COORDINATION MEETING

1.10. NOTIFICATION OF NONCOMPLIANCE

1.0 GENERAL

The Government will use the Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS, referred to as QCS, to record, maintain, and submit various information throughout the contract period. The Contractor module, user manuals, updates, and training information can be downloaded from the RMS web site. This joint Government-Contractor use of RMS and QCS will facilitate electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data
- Request for Information
- Accident Reporting
- Safety Exposure Manhours

1.1. CORRESPONDENCE AND ELECTRONIC COMMUNICATIONS

For ease and speed of communications, both Government and Contractor will exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

1.2. OTHER FACTORS

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01 32 01.00 10, PROJECT SCHEDULE, Section 01 33 00, SUBMITTAL PROCEDURES, and Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through QCS. Also, there is no separate payment for establishing and maintaining the QCS database; all costs associated therewith shall be included in the contract pricing for the work.

1.3. QCS SOFTWARE

QCS is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the QCS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the QCS software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide QCS on CD-ROM. Any program updates of QCS will be made available to the Contractor via the Government RMS Website as they become available.

1.4. SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run QCS:

(a) Hardware

- IBM-compatible PC with 1000 MHz Pentium or higher processor
- 256 MB RAM for workstation / 512+ MB RAM for server

- 1 GB hard drive disk space for sole use by the QCS system
- Compact disk (CD) Reader, 8x speed or higher
- SVGA or higher resolution monitor (1024 x 768, 256 colors)
- Mouse or other pointing devise
- Windows compatible printer (Laser printer must have 4+ MB of RAM)
- Connection to the Internet, minimum 56K BPS

(b) Software

- MS Windows 2000 or higher
- MS Word 2000 or newer
- Latest version of : Netscape Navigator, Microsoft Internet Explorer, or other browser that supports HTML 4.0 or higher
- Electronic mail (E-mail), MAPI compatible
- Virus protection software that is regularly upgraded with all issued manufacturer's updates

1.5. RELATED INFORMATION

1.5.1. QCS USER GUIDE

After contract award, the Contractor shall download instructions for the installation and use of QCS from the Government RMS Internet Website. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

1.5.2. CONTRACTOR QUALITY CONTROL (CQC) TRAINING

The use of QCS will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class.

1.6. CONTRACT DATABASE

Prior to the pre-construction conference, the Government will provide the Contractor with basic contract award data to use for QCS. The Government will provide data updates to the Contractor as needed, generally by using the government's SFTP repository built into QCS import/export function. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

1.7. DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the QCS database throughout the duration of the contract. The Contractor shall establish and maintain the QCS database at the Contractor's site office. Data updates to the Government, e.g., daily reports, submittals, RFI's, schedule updates, payment requests, etc. shall be submitted using the government's SFTP repository built into QCS export function. If permitted by the Contracting Officer, email or CD-ROM may be used instead (see Paragraph DATA SUBMISSION VIA CD-ROM). The QCS database typically shall include current data on the following items:

1.7.1. ADMINISTRATION

1.7.1.1. Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver Contractor administrative data in electronic format.

1.7.1.2. Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in QCS. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format.

1.7.1.3. Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

All Requests For Information (RFI) shall be exchanged using the Built-in RFI generator and tracker in QCS.

1.7.1.4. Equipment

The Contractor's QCS database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

1.7.1.5. Management Reporting

QCS includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of QCS. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

1.7.2. FINANCES

1.7.2.1. Pay Activity Data

The QCS database shall include a list of pay activities that the Contractor shall develop in conjunction with the design and construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

1.7.2.2. Payment Requests

All progress payment requests shall be prepared using QCS. The Contractor shall complete the payment request worksheet prompt payment certification, and payment invoice in QCS. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using QCS. The Contractor shall submit the payment request, prompt payment certification, and payment invoice with supporting data by using the government's SFTP repository built into QCS export function. If permitted by the Contracting Officer, E-mail or a CD-ROM may be used. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

1.7.3. Quality Control (QC)

QCS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the QCS generated daily report. The Contractor shall provide the Government a Contractor

Quality Control (CQC) Plan within the time required in Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a QCS update reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.7.3.1. Daily Contractor Quality Control (CQC) Reports

QCS includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by QCS shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the QCS-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government within 24 hours after the date covered by the report. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

1.7.3.2. Deficiency Tracking

The Contractor shall use QCS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC punch list items. The Contractor shall maintain a current log of its QC punch list items in the QCS database. The Government will log the deficiencies it has identified using its QA punch list items. The Government's QA punch list items will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA punch list items.

1.7.3.3. QC Requirements

The Contractor shall develop and maintain a complete list of QC testing and required structural and life safety special inspections required by the International Code Council (ICC), transferred and installed property, and user training requirements in QCS. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via QCS.

1.7.3.4. Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in QCS.

1.7.3.5. Labor and Equipment Hours

The Contractor shall log labor and equipment exposure hours on a daily basis. This data will be rolled up into a monthly exposure report.

1.7.3.6. Accident/Safety Tracking Reporting

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize QCS to advise the Government of any accidents occurring on the jobsite. This supplemental entry is not to be considered as a substitute for completion of mandatory notification and reports, e.g., ENG Form 3394 and OSHA Form 300.

1.7.3.7. Features of Work

The Contractor shall include a complete list of the features of work in the QCS database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

1.7.3.8. Hazard Analysis

The Contractor shall use QCS to develop a hazard analysis for each feature of work included in its CQC Plan. The hazard analysis shall address any hazards, or potential hazards, that may be associated with the work

1.7.4. Submittal Management

The Government will provide the submittal register form, ENG Form 4288, SUBMITTAL REGISTER, in electronic format. The Contractor and Designer of Record (DOR) shall develop and maintain a complete list of all submittals, including completion of all data columns and shall manage all submittals. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use QCS to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using QCS. QCS and RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

1.7.5. Schedule

The Contractor shall develop a design and construction schedule consisting of pay activities, in accordance with Section 01 32 01.00 10, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the QCS database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01 32 01.00 10 PROJECT SCHEDULE). The updated schedule data shall be included with each pay request submitted by the Contractor.

1.7.5.1. Import/Export of Data

QCS includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data from RMS, and schedule data using SDEF.

1.8. IMPLEMENTATION

Contractor use of QCS as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its QCS database, and to provide the Government with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

1.9. DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of QCS data is by using the government's SFTP repository built into QCS export function.. Other data should be submitted using E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of CD-ROM for data transfer. Data on CDs shall be exported using the QCS built-in export function. If used, CD-ROMs will be submitted in accordance with the following:

1.9.1. File Medium

The Contractor shall submit required data on CD-ROMs. They shall conform to industry standards used in the United States. All data shall be provided in English.

1.9.2. Disk Or Cd-Rom Labels

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the QCS file name, full contract number, contract name, project location, data date, name and telephone number of person responsible for the data.

1.9.3. File Names

The files will be automatically named by the QCS software. The naming convention established by the QCS software shall not be altered in any way by the Contractor.

1.10. MONTHLY COORDINATION MEETING

The Contractor shall update the QCS database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the Contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions.

The Contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable QCS export file is received.

1.11. NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. 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.

End of Section 01 45 01.10

SECTION 01 45 04.00 10
CONTRACTOR QUALITY CONTROL

1.0 GENERAL

1.1. REFERENCES

1.2. PAYMENT

2.0 PRODUCTS (NOT APPLICABLE)

3.0 EXECUTION

3.1. GENERAL REQUIREMENTS

3.2. QUALITY CONTROL PLAN

3.3. COORDINATION MEETING

3.4. QUALITY CONTROL ORGANIZATION

3.5. SUBMITTALS AND DELIVERABLES

3.6. CONTROL

3.7. TESTS

3.8. COMPLETION INSPECTION

3.9. DOCUMENTATION

3.10. NOTIFICATION OF NONCOMPLIANCE

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 http://www.usace.army.mil/CECW/Pages/cecwe_index.aspx. 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:

  US Army Corps of Engineers

  Materials Testing Center

3909 Halls Ferry Road

Vicksburg, MS 39180 - 61333

- For other deliveries:

TBD

TBD

TBD

TBD

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
TEMPORARY CONSTRUCTION FACILITIES

1.0 OVERVIEW

1.1. GENERAL REQUIREMENTS

1.2. AVAILABILITY AND USE OF UTILITY SERVICES

1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.4. PROTECTION AND MAINTENANCE OF TRAFFIC

1.5. MAINTENANCE OF CONSTRUCTION SITE

1.6. GOVERNMENT FIELD OFFICE

1.0 OVERVIEW

1.1. GENERAL REQUIREMENTS

1.1.1. Site Plan

Prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Also indicate if the use of a supplemental or other staging area is desired.

1.2. AVAILABILITY AND USE OF UTILITY SERVICES

1.2.1. See Section 00 72 00, Contract Clauses and Section 00 73 00, Special Contract Requirements, for Utility Availability requirements.

1.2.2. Sanitation

Provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

1.2.3. Telephone

Make arrangements and pay all costs for desired telephone facilities.

1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.3.1. Bulletin Board

Immediately upon beginning of onsite work, provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Display legible copies of the aforementioned data until work is completed. Remove the bulletin board from the site upon completion of the project.

1.3.2. Project and Safety Signs

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 the US Army Corps of Engineers Techinfo Website at http://www.hnd.usace.army.mil/techinfo/. Click on Publications then go to Engineer Pamphlets and select EP 310-1-6a.

1.4. PROTECTION AND MAINTENANCE OF TRAFFIC

Provide access and temporary relocated roads as necessary to maintain traffic. Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Take measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, as required by the State and local authorities having jurisdiction. Protect the traveling public from damage to person and property.

The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. Investigate the adequacy of existing roads and the allowable load limit on these roads. Repair any damage to roads caused by construction operations.

1.4.1. Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Construct haul roads with suitable grades and widths. Avoid sharp curves, blind corners, and dangerous cross traffic. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Provide adequate lighting to assure full and clear visibility for full width of haul road and work areas during any night work operations. Remove haul roads designated by the Contracting Officer upon completion of the work and restore those areas.

1.4.2. Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.5. MAINTENANCE OF CONSTRUCTION SITE

Mow grass and vegetation located within the boundaries of the construction site for the duration of the project, from NTP to contract completion. Edge or neatly trim grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers from NTP to contract completion.

1.6. GOVERNMENT FIELD OFFICE

1.6.1. Resident Engineer's Office

Provide the Government Resident Engineer with an office, approximately 560 square feet in floor area, co-located on the project site with the Contractor’s office and providing space heat, air conditioning, electric light and power, power and communications outlets and toilet facilities consisting of at least one lavatory and at least one water closet complete with connections to water and sewer mains. Provide a mail slot in the door or a lockable mail box mounted on the surface of the door. Provide outlets for 14 government phones and same number of LAN connections for Government computers. Coordinate with the Resident Engineer for locations. Provide a conference room with space large enough for 10 personnel to hold meetings. Provide a minimum of two outlets per government work station and at least one outlet per 10 feet of wall space for other government equipment. Provide at least twice weekly janitorial service. Remove the office facilities upon completion of the work and restore those areas. Connect and disconnect utilities in accordance with local codes and to the satisfaction of the Contracting Officer.

1.6.2. Trailer-Type Mobile Office

The Contractor may, at its option, furnish and maintain a trailer-type mobile office acceptable to the Contracting Officer and providing as a minimum the facilities specified above Securely anchor the trailer to the ground at all four corners to guard against movement during high winds, per EM 385-1-1.

End of Section 01 50 02

SECTION 01 57 20.00 10
ENVIRONMENTAL PROTECTION

1.0 GENERAL REQUIREMENTS

1.1. SUBCONTRACTORS

1.2. ENVIRONMENTAL PROTECTION PLAN

1.3. PROTECTION FEATURES

1.4. ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

1.5. NOTIFICATION

2.0 PRODUCTS (NOT USED)

3.0 EXECUTION

3.1. LAND RESOURCES

3.2. WATER RESOURCES

3.3. AIR RESOURCES

3.4. CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

3.5. RECYCLING AND WASTE MINIMIZATION

3.6. HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

3.7. BIOLOGICAL RESOURCES

3.8. INTEGRATED PEST MANAGEMENT

3.9. PREVIOUSLY USED EQUIPMENT

3.10. MILITARY MUNITIONS

3.11. TRAINING OF CONTRACTOR PERSONNEL

3.12. POST CONSTRUCTION CLEANUP

1.0 GENERAL REQUIREMENTS

Minimize environmental pollution and damage that may occur as the result of construction operations. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this contract. Comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations

1.1. SUBCONTRACTORS

Ensure compliance with this section by subcontractors.

1.2. ENVIRONMENTAL PROTECTION PLAN

1.2.1. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Define issues of concern within the Environmental Protection Plan as outlined in this section. Address each topic in the plan at a level of detail commensurate with the environmental issue and required construction task(s). Identify and discuss topics or issues which are not identified in this section, but which the Contractor considers necessary, after those items formally identified in this section. Prior to commencing construction activities or delivery of materials to the site, submit the Plan for review and Government approval. The Contractor shall meet with the Government prior to implementation of the Environmental Protection Plan, for the purpose of discussing the implementation of the initial plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. Maintain and keep the Environmental Protection Plan current onsite.

1.2.2. Compliance

No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor shall be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

1.2.3. Contents

The plan shall include, but shall not be limited to, the following:

1.2.3.1. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.

1.2.3.2. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable

1.2.3.3. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel

1.2.3.4. Description of the Contractor's environmental protection personnel training program

1.2.3.5. An erosion and sediment control plan which identifies the type and location of the erosion and sediment controls to be provided. Include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.

1.2.3.6. Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site

1.2.3.7. Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Include measures to minimize the amount of mud transported onto paved public roads by vehicles or runoff.

1.2.3.8. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.

1.2.3.9. Drawing showing the location of on-installation borrow areas.

1.2.3.10. A spill control plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The spill control plan supplements the requirements of EM 385-1-1. This plan shall include as a minimum:

(a) The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Government and the local Fire Department in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.

(b) The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup

(c) Training requirements for Contractor's personnel and methods of accomplishing the training

(d) A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.

(e) The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency

(f) The methods and procedures to be used for expeditious contaminant cleanup

1.2.3.11. A solid waste management plan identifying waste minimization, collection, and disposals methods, waste streams (type and quantity), and locations for solid waste diversion/disposal including clearing debris and C&D waste that is diverted (salvaged, reused, or recycled). Detail the contractor's actions to comply with, and to participate in, Federal, state, regional, local government, and installation sponsored recycling programs to reduce the volume of solid waste at the source. Identify any subcontractors responsible for the transportation, salvage and disposal of solid waste. Submit licenses or permits for solid waste disposal sites that are not a commercial operating facility. Attach evidence of the facility's ability to accept the solid waste to this plan. A construction and demolition waste management plan, similar to the plan specified in the UFGS 01 74 19 (formerly 01572) may be used as the non-hazardous solid waste management plan. Provide a Non-Hazardous Solid Waste Diversion Report. Submit the report on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted and each quarter thereafter (e.g. the first working day of January, April, July, and October) until the end of the project. Additionally, a summary report, with all data fields, is required at the end of the project. The report shall indicate the total type and amount of waste generated, total type and amount of waste diverted, type and amount of waste sent to waste-to-energy facility and alternative daily cover, in tons along with the percent that was diverted. Maintain, track and report construction and demolition waste data in a manner such that the installation can enter the data into the Army SWAR database, which separates data by type of material. A cumulative report in LEED Letter Template format may be used but must be modified to include the date disposed of/diverted and include

the above stated diversion data. NOTE: The Solid Waste Diversion Reports are separate documentation than the LEED documentation.

1.2.3.12. DELETED.

1.2.3.13. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.

1.2.3.14. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In accordance with EM 385-1-1, include a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time in the contaminant prevention plan. Update the plan as new hazardous materials are brought on site or removed from the site. Reference this plan in the storm water pollution prevention plan, as applicable.

1.2.3.15. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the waste water, include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented and any required permits. If surface discharge will be the method of disposal, include a copy of the permit and associated documents as an attachment prior to discharging the waste water. If disposal is to a sanitary sewer, include documentation that the waste water treatment plant Operator has approved the flow rate, volume, and type of discharge.

1.2.3.16. A historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on the project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in the area are discovered during construction. Include methods to assure the protection of known or discovered resources and shall identify lines of communication between Contractor personnel and the Government.

1.2.3.17. A pesticide treatment plan, updated, as information becomes available. Include: sequence of treatment, dates, times, locations, pesticide trade name, EPA registration numbers, authorized uses, chemical composition, formulation, original and applied concentration, application rates of active ingredient (i.e. pounds of active ingredient applied), equipment used for application and calibration of equipment. The Contractor is responsible for Federal, State, Regional and Local pest management record keeping and reporting requirements as well as any additional Installation specific requirements. Follow AR 200-1, Chapter 5, Pest Management, Section 5-4, “Program Requirements” for data required to be reported to the Installation.

1.3. PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Government shall make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. Both the Contractor and the Government will

sign this survey, upon mutual agreement as to its accuracy and completeness. The Contractor develop a plan that depicts how it will protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference which their preservation may cause to the Contractor's work under the contract.

1.4. ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations, requested by the Contractor, from the drawings, plans and specifications which may have an environmental impact will be subject to approval by the Government and may require an extended review, processing, and approval time. The Government reserves the right to disapprove alternate methods, even if they are more cost effective, if the Government determines that the proposed alternate method will have an adverse environmental impact.

1.5. NOTIFICATION

The Government will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. The Contractor shall, after receipt of such notice, inform the Government of the proposed corrective action and take such action when approved by the Government. The Government may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Government may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

2.0 PRODUCTS (NOT USED)

3.0 EXECUTION

3.1. LAND RESOURCES

Confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. Do not attach or fasten any ropes, cables, or guys to any trees for anchorage unless specifically authorized. Provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Remove all stone, soil, or other materials displaced into uncleared areas..

3.1.1. Work Area Limits

Prior to commencing construction activities, mark the areas that need not be disturbed under this contract. Mark or fence isolated areas within the general work area which are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. Personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

3.1.2. Landscape

Clearly identify trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved by marking, fencing, or wrapping with boards, or any other approved techniques. Restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

3.1.3. Erosion and Sediment Controls

Provide erosion and sediment control measures in accordance with Federal, State, and local laws and regulations. Coordinate with approving authorities (federal, state, etc.) for specific requirements to be included in the plan. The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's construction activities. Keep the area of bare soil exposed at any one time by construction operations to a minimum necessary. Construct or install temporary and permanent erosion and sediment control best management practices (BMPs). BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope stabilization, silt fences, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. Remove any temporary measures after the area has been stabilized.

3.1.4. Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Government. Make only approved temporary movement or relocation of Contractor facilities. Provide erosion and sediment controls for on-site borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant and/or work areas to protect adjacent areas.

3.2. WATER RESOURCES

Monitor construction activities to prevent pollution of surface and ground waters. Do not apply toxic or hazardous chemicals to soil or vegetation unless otherwise indicated. Monitor all water areas affected by construction activities. For construction activities immediately adjacent to impaired surface waters, the Contractor shall be capable of quantifying sediment or pollutant loading to that surface water when required by state or federally issued Clean Water Act permits.

3.2.1. Stream Crossings

Stream crossings shall allow movement of materials or equipment without violating water pollution control standards of the Federal, State, and local governments or impede state-designated flows.

3.2.2. Wetlands

Do not enter, disturb, destroy, or allow discharge of contaminants into any wetlands.

3.3. AIR RESOURCES

Comply with all Federal and State air emission and performance laws and standards for equipment operation, activities, or processes.

3.3.1. Particulates

Control dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, such as from asphaltic batch plants, including weekends, holidays and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators or other methods are permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with all State and local visibility regulations.

3.3.2. Odors

Control odors from construction activities at all times. Odors shall not cause a health hazard and shall be in compliance with State regulations and/or local ordinances.

3.3.3. Sound Intrusions

Keep construction activities under surveillance and control to minimize environment damage by noise. Comply with the provisions of the state and Installation rules.

3.3.4. Burning

Burning is not allowed on the project site unless specified in other sections of the specifications or by written authorization. Specific times, locations, and manners of burning shall be subject to approval.

3.4. CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

3.4.1. Solid Wastes

Place solid wastes (excluding clearing debris) in containers which are emptied on a regular schedule. Conduct handling, storage, and disposal to prevent contamination. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with solid waste. Transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. The minimum acceptable off-site solid waste disposal option is a Subtitle D RCRA permitted landfill. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. Comply with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

3.4.2. Chemicals and Chemical Wastes

Dispense chemicals, ensuring no spillage to the ground or water. Perform and document periodic inspections of dispensing areas to identify leakage and initiate corrective action. The Government may periodically review this documentation. Collect chemical waste in corrosion resistant, compatible containers. Monitor and remove collection drums to a staging or storage area when contents are within 6 inches of the top. Classify, manage, store, and dispose of wastes in accordance with Federal, State, and local laws and regulations.

3.4.3. Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable state and local regulations. Hazardous materials are defined in 49 CFR 171 - 178. At a minimum, manage and store hazardous waste in compliance with 40 CFR 262. Take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. Segregate hazardous waste from other materials and wastes; protect it from the weather by placing it in a safe covered location and take precautionary measures, such as berming or other appropriate measures, against accidental spillage. Store, describe, package, label, mark, and placard hazardous waste and hazardous material in accordance with 49 CFR 171 - 178, state, and local laws and regulations. Transport Contractor generated hazardous waste off Government property in accordance with the Environmental Protection Agency and the Department of Transportation laws and regulations. Dispose of hazardous waste in compliance with Federal, State and local laws and regulations. Immediately report spills of hazardous or toxic materials to the Government and the Facility Environmental Office. Contractor will be responsible for cleanup and cleanup costs due to spills.

Contractor is responsible for the disposition of Contractor generated hazardous waste and excess hazardous materials.

3.4.4. Fuel and Lubricants

Conduct storage, fueling and lubrication of equipment and motor vehicles in a manner that affords the maximum protection against spill and evaporation. Manage and store fuel, lubricants and oil in accordance with all Federal, State, Regional, and local laws and regulations.

3.5. RECYCLING AND WASTE MINIMIZATION

Participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project. Line and berm fueling areas and establish storm water control structures at discharge points for site run-off. Keep a liquid containment clean-up kit available at the fueling area.

3.6. HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Existing historical, archaeological, and cultural resources within the Contractor's work area are shown on the drawings. Protect and preserve these resources during the life of the Contract. Temporarily suspend all activities that may damage or alter such resources, if any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found during excavation or other construction activities. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, notify the Government so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. Cease all activities that may result in impact to or the destruction of these resources. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

3.7. BIOLOGICAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitat. Protect threatened and endangered animal and plant species including their habitat in accordance with Federal, State, Regional, and local laws and regulations.

3.8. INTEGRATED PEST MANAGEMENT

Coordinate, through the Government, with the Installation Pest Management Coordinator (IPMC) at the earliest possible time prior to pesticide application, in order to minimize impacts to existing fauna and flora. Discuss integrated pest management strategies with the IPMC and receive concurrence from the IPMC, through the COR, prior to the application of any pesticide associated with these specifications. Give IMPC personnel the opportunity to be present at all meetings concerning treatment measures for pest or disease control and during application of the pesticide. The use and management of pesticides are regulated under 40 CFR 152 - 186.

3.8.1. Pesticide Delivery and Storage

Deliver pesticides, approved for use on the Installation, to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses.

3.8.2. Qualifications

Use the services of a subcontractor for pesticide application whose principal business is pest control. The subcontractor shall be licensed and certified in the state where the work is to be performed.

3.8.3. Pesticide Handling Requirements

Formulate, treat with, and dispose of pesticides and associated containers in accordance with label directions.

3.8.4. Application

A state certified pesticide applicator shall apply pesticides in accordance with EPA label restrictions and recommendations.

3.9. PREVIOUSLY USED EQUIPMENT

Clean all previously used construction equipment prior to bringing it onto the project site. Ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the USDA jurisdictional office for additional cleaning requirements.

3.10. MILITARY MUNITIONS

Immediately stop work in that area and immediately inform the Government, in the event military munitions, as defined in 40 CFR 260, are discovered or uncovered.

3.11. TRAINING OF CONTRACTOR PERSONNEL

Train personnel in all phases of environmental protection and pollution control. Conduct environmental protection/pollution control meetings for all Contractor personnel prior to commencing construction activities. Conduct additional meetings for new personnel and when site conditions change. The training and meeting agenda shall include methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

3.12. POST CONSTRUCTION CLEANUP

Clean up all areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing , obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Grade, fill and seed the entire disturbed area, unless otherwise indicated.

SECTION 01 62 35
RECYCLED/RECOVERED MATERIAL

1.0 GENERAL

1.1. REFERENCES

1.2. OBJECTIVES

1.3. EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

1.4. EPA PROPOSED ITEMS INCORPORATED IN THE WORK

1.5. EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

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.

- U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
- 40 CFR 247 Comprehensive Procurement Guideline for Products Containing Recovered Materials

1.2. OBJECTIVES

Government procurement policy is to acquire, in a cost effective manner, items containing the highest percentage of recycled and recovered materials practicable consistent with maintaining a satisfactory level of competition without adversely affecting performance requirements or exposing suppliers' employees to undue hazards from the recovered materials. The Environmental Protection Agency (EPA) has designated certain items which must contain a specified percent range of recovered or recycled materials. The Contractor shall make all reasonable efforts to use recycled and recovered materials in providing the EPA designated products and in otherwise utilizing recycled and recovered materials in the execution of the work.

1.3. EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

Materials that have been designated by EPA as being products which are or can be made with recovered or recycled materials, when incorporated into the work under this contract, shall contain at least the minimum percentage of recycled or recovered materials indicated by EPA unless adequate justification (non-availability) for non-use is provided. When a designated item is specified as an option to a non-designated item, the designated item requirements apply only if the designated item is used in the work.

1.4. EPA PROPOSED ITEMS INCORPORATED IN THE WORK

Products other than those designated by EPA are still being researched and are being considered for future Comprehensive Procurement Guideline (CPG) designation. It is recommended that these items, when incorporated in the work under this contract, contain the highest practicable percentage of recycled or recovered materials, provided specified requirements are also met.

1.5. EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

There are many products listed in 40 CFR 247 which have been designated or proposed by EPA to include recycled or recovered materials that may be use by the Contractor in performing the work but will not be incorporated into the work. These products include office products, temporary traffic control products, and pallets. It is recommended that these non-construction products, when used in the conduct of the work, contain the highest practicable percentage of recycled or recovered materials and that these products be recycled when no longer needed.

End of Section 01 62 35

SECTION 01 78 02.00 10
CLOSEOUT SUBMITTALS

1.0 OVERVIEW

1.1. SUBMITTALS

1.2. PROJECT RECORD DOCUMENTS

1.3. EQUIPMENT DATA

1.4. CONSTRUCTION WARRANTY MANAGEMENT

1.5. MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING

1.6. OPERATION AND MAINTENANCE MANUALS

1.7. FIELD TRAINING

1.8. PRICING OF CONTRACTOR-FURNISHED AND INSTALLED PROPERTY AND GOVERNMENT-FURNISHED CONTRACTOR-INSTALLED PROPERTY

1.9. LEED REVIEW MEETINGS

1.10. RED ZONE MEETING

1.11. FINAL CLEANING

1.12. INTERIM FORM DD1354 "TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

EXHIBIT 1 SAMPLE RED ZONE MEETING CHECKLIST

1.0 OVERVIEW

1.1. SUBMITTALS

Government approval is required for any submittals with a "G" designation; submittals not having a "G" designation are for Designer of Record approval or for information only. Submit the following in accordance with Section 01 33 00 submittals*:*

SD-02 Shop Drawings

– As-Built Drawings - G

▪ Drawings showing final as-built conditions of the project. Provide electronic drawing files as specified in Section 01 33 16, 3 sets of blue-line prints and one set of the approved working as-built drawings.

SD-03 Product Data

– As-Built Record of Equipment and Materials

▪ Two copies of the record listing the as-built materials and equipment incorporated into the construction of the project.

– Construction Warranty Management Plan

▪ Three sets of the construction warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. Furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

– Warranty Tags

▪ Two record copies of the warranty tags showing the layout and design.

– Final Cleaning

▪ Two copies of the listing of completed final clean-up items.

1.2. PROJECT RECORD DOCUMENTS

1.2.1. As-Built Drawings – G

An as-built drawing is a construction drawing revised to reflect the final as-built conditions of the project as a result of modifications and corrections to the project design required during construction. The final as-built drawings shall not have the appearance of marked up drawings, but that of professionally prepared drawings as if they were the "as designed" drawings.

1.2.2. Maintenance of As-Built Drawings

1.2.2.1. The Configuration Management Plan shall describe how the Contractor will maintain up-to-date drawings, how it will control and designate revisions to the drawings and specifications (In accordance with Special Contract Requirement: ***Deviating from the Accepted Design*** and Section 01 33 16: ***Design after Award***, the Designer of Record's approval is necessary for any revisions to the accepted design).

1.2.2.2. Make timely updates, carefully maintaining a record set of working as-built drawings at the job site, marked in red, of all changes and corrections from the construction drawings. Enter changes and corrections on drawings promptly to reflect "Current Construction". Perform this update no less frequently

than weekly for the blue line drawings and update no less frequently than quarterly for the CADD/CAD and BIM files, which were prepared previously in accordance with Section 01 33 16. Include a confirmation that the as-builts are up to date with the submission of the monthly project schedule.

1.2.2.3. If the DB Contractor fails to maintain the as-built drawings as required herein, the Government will retain from the monthly progress payment, an amount representing the estimated monthly cost of maintaining the as-built drawings. Final payment with respect to separately priced facilities or the contract as a whole will be withheld until the Contractor submits acceptable as-built drawings and the Government approves them.

1.2.2.4. The marked-up set of drawings shall reflect any changes, alterations, adjustments or modifications. Changes must be reflected on all sheets affected by the change. Changes shall include marking the drawings to reflect structural details, foundation layouts, equipment sizes, and other extensions of design.

1.2.2.5. Typically, room numbers shown on the drawings are selected for design convenience and do not represent the actual numbers intended for use by the end user. Final as-built drawings shall reflect actual room numbers adopted by the end user.

1.2.2.6. If there is no separate contract line item (CLIN) for as-built drawings, the Government will withhold the amount of $35,000, or 1% of the present construction value, whichever is the greater, until the final as-built drawing submittal has been approved by the Government.

1.2.3. Underground Utilities

The drawings shall indicate, in addition to all changes and corrections, the actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Locate Valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Record average elevation of the top of each run or underground structure..

1.2.4. Partial Occupancy

For projects where portions of construction are to be occupied or activated before overall project completion, including portions of utility systems, supply as-built drawings for those portions of the facility being occupied or activated at the time the facility is occupied or activated. Show this same as-built information previously furnished on the final set of as-built drawings.

1.2.5. As-Built Conditions That are Different From the construction Drawings

Accurately reflect all as-built conditions that are different, such as dimensions, road alignments and grades, and drainage and elevations, from the construction drawings on each drawing. If the as-built condition is accurately reflected on a shop drawing, then furnish that shop drawing in CADD format. Reference the final as-built construction drawing the shop drawing file that includes the as-built information. In turn, the shop drawing shall reference the applicable construction as-built drawing. Delete any options shown on drawings and not selected clearly reflect options selected on final as-built drawings.

1.2.6. Additional As-Built Information that Exceeds the Detail Shown on the construction Drawings:

These as-built conditions include those that reflect structural details, foundation layouts, equipment, sizes, mechanical and electrical room layouts and other extensions of design, that were not shown in the project design documents because the exact details were not known until after the time of approved shop

drawings. It is recognized that these shop drawing submittals (revised showing as-built conditions) will serve as the as-built record without actual incorporation into the construction drawings, piping, and equipment drawings. Include locations of all explorations, logs of all explorations, and results of all laboratory testing, including those provided by the Government. Furnish all such shop drawings in CADD /CADformat. Include fire protection details, such as wiring, performed for the design of the project.

1.2.7. Final As-Built Drawings

Submit final as-built CADD/CAD and BIM Model(s) and Facility Data files at the time of Beneficial Occupancy of the project or at a designated phase of the project. In the event the Contractor accomplishes additional work after this submittal, which changes the as-built conditions, submit a new DVD with all drawing sheets and three blue-line copies of affected sheets which depict additional changes.

1.2.8. Title Blocks

In accordance with the configuration management plan, clearly mark title blocks to indicate final as-built drawings.

1.2.9. Other As-Built Documents

Provide scans of all other documents such as design analysis, catalog cuts, certification documents that are not available in native electronic format in an organized manner in Adobe.pdf format.

1.2.9.1. LEED Documentation

Update LEED documentation on at least a monthly basis and have it available for review by the Government on the jobsite at all times during construction. Submit the final LEED Project Checklist(s), final LEED submittals checklist and complete project documentation, verifying the final LEED score and establishing the final rating. Provide full support to the validation review process, including credit audits. See also the LEED documentation requirements in Section 01 33 16, DESIGN AFTER AWARD.

1.2.9.2. GIS Documentation

Provide final geo-referenced GIS database of the new building footprint along with any changes made to exterior of the building. The intent of capturing the final building footprint and exterior modifications in a GIS database is to provide the installation with a data set of the comprehensive changes made to the landscape as a result of the construction project. The Government will incorporate this data set into the installations existing GIS MasterPlan or Enterprise GIS system. The GIS database deliverable shall follow a standard template provided to the Contractor by the Government, adhere to detailed specifications outlined in ECB No 2006-15, and be documented using the Federal Geographic Data Committee (FGDC) metadata standard.

1.3. EQUIPMENT DATA

1.3.1. Real Property Equipment

Provide an Equipment-in-Place list of all installed equipment furnished under this contract. Include all information usually listed on manufacturer's name plate. Include the cost of each piece of installed property F.O.B. construction site. For each of the items which is specified herein to be guaranteed for a specified period from the date of acceptance thereof, provide the following information: The name, serial and model number address of equipment supplier, or manufacturer originating the guaranteed item. The Contractor's guarantee to the Government of these items will not be limited by the terms of any manufacturer's guarantee to the Contractor. Furnish the list as one (1) reproducible and three (3) copies

thirty (30) calendar days before completion of any segment of the contract work which has an incremental completion date.

1.3.2. Maintenance and Parts Data

Furnish a brochure, catalog cut, parts list, manufacturer's data sheet or other publication showing detailed parts data on all other equipment subject to repair and maintenance procedures not otherwise required in Operations and Maintenance Manuals specified elsewhere in this contract. Distribution of directives shall follow the same requirements as listed in paragraph above.

1.3.3. Construction Specifications

Furnish permanent electronic files of final as-built construction specifications, including modifications thereto, with the as-built drawings.

1.4. CONSTRUCTION WARRANTY MANAGEMENT

1.4.1. Prior to the end of the one year warranty, the Government may conduct an infrared roof survey on any project involving a membrane roofing system. This survey will be conducted in accordance with ASTM C1153-90, "Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging". The Contractor shall replace all damaged materials and locate and repair sources of moisture penetration.

1.4.2. Management

1.4.2.1. Warranty Management Plan

Develop a warranty management plan containing information relevant to the clause ***Warranty of Construction*** in FAR 52.246-21. Submit the warranty management plan for Government approval at least 30 days before the planned pre-warranty conference. In the event of phased turn-over of the contract, update the Warranty Management Plan as necessary to include latest information required. Include all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below shall include due date and whether item has been submitted or was accomplished. Submit warranty information made available during the construction phase prior to each monthly pay estimate. Assemble information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period shall begin on the date of project acceptance and shall continue for the full product warranty period. The Contractor, Government, including the Customer Representative shall jointly conduct warranty inspections, 4 months and 9 months, after acceptance. The warranty management plan shall include, but shall not be limited to, the following information:

(1) Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the contractors, subcontractors, manufacturers or suppliers involved.

(2) Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.

(3) A list for each warranted equipment, item, feature of construction or system indicating:

(i) Name of item.

(ii) Model and serial numbers.

(iii) Location where installed.

(iv) Name and phone numbers of manufacturers or suppliers.

(v) Names, addresses and telephone numbers of sources of spare parts.

(vi) Warranties and terms of warranty. Include one-year overall warranty of construction. Indicate those items, which have extended warranties with separate warranty expiration dates.

(vii) Cross-reference to warranty certificates as applicable.

(viii) Starting point and duration of warranty period.

(ix) Summary of maintenance procedures required to continue the warranty in force.

(x) Cross-reference to specific pertinent Operation and Maintenance manuals.

(xi) Organization, names and phone numbers of persons to call for warranty service.

(xii) Typical response time and repair time expected for various warranted equipment.

(4) The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.

(5) Procedure and status of tagging of all equipment covered by extended warranties.

(6) Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

1.4.3. Performance Bond

1.4.3.1. The Contractor's Performance Bond will remain effective throughout the construction warranty period.

1.4.3.2. In the event the Contractor or his designated representative(s) fails to commence and diligently pursue any work required under this clause, and in a manner pursuant to the requirements thereof, the Government shall have a right to demand that said work be performed under the Performance Bond by making written notice on the surety. If the surety fails or refuses to perform the obligation it assumed under the Performance Bond, the Government shall have the work performed by others, and after completion of the work, may make demand for reimbursement of any or all expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

1.4.3.3. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Government will have the right to recoup expenses from the bonding company.

1.4.3.4. Following oral or written notification of required warranty repair work, the Contractor will respond as dictated by para. 1.4.5. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Government to proceed against the Contractor as outlined in the paragraph 1.4.5.5 and/or above.

1.4.4. Pre-Warranty Conference

Prior to contract completion, or completion of any phase or portion of contract to be turned over, and at a time designated by the Contracting Officer, the Contractor shall meet with the Government to develop a mutual understanding with respect to the requirements of this clause. Communication procedures for Contractor notification of warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Government for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor will furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warrantied construction, will be continuously

available, and will be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of his responsibilities in connection with other portions of this provision.

1.4.5. Contractor's Response to Warranty Service Requirements.

Following Government oral or written notification, which may include authorized installation maintenance personnel, the Contractor shall respond to warranty service requirements in accordance with the "Warranty Service Priority List" and the three categories of priorities listed below. Submit a report on any warranty item that has been repaired during the warranty period. The report shall include the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframe specified, the Government will perform the work and backcharge the construction warranty payment item established.

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

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

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

1.4.5.4. The "Warranty Service Priority List" is as follows:

- Code 1 - Air Conditioning System

(a) Buildings with computer equipment.

(b) Barracks, mess halls (entire building down).

- Code 2 - Air Conditioning Systems

(a) Recreational support.

(b) Air conditioning leak in part of building, if causing damage.

(c) Air conditioning system not cooling properly

(d) Admin buildings with Automated Data Processing (ADP) equipment not on priority list.

- Code 1 - Doors

(a) Overhead doors not operational.

- Code 1 - Electrical

(a) Power failure (entire area or any building operational after 1600 hours).

(b) Traffic control devices.

(c) Security lights.

(d) Smoke detectors and fire alarm systems

(e) Power or lighting failure to an area, facility, portion of a facility, which may adversely impact health, safety, security, or the installation's mission requirement, or which may result in damage to property.

- Code 2 - Electrical

(a) Power failure (no power) for unoccupied buildings or portions thereof or branch circuits within occupied buildings, not listed as Code 1.

(a) Receptacle and lights, not listed as code 1.

- Code 3 - Electrical

(a) Street, parking area lights

- Code 1 - Gas

(a) Leaks and breaks.

(b) No gas to cantonment area.

- Code 1 - Heat

(a) Area power failure affecting heat.

(b) Heater in unit not working.

- Code 2 Heat

(a) All heating system failures not listed as Code 1.

- Code 3 - Interior

(a) Floor damage

(b) Paint chipping or peeling

- Code 1 - Intrusion Detection Systems - N/A.
- Code 2 - Intrusion Detection Systems other than those listed under Code 1
- Code 1 - Kitchen Equipment

(a) Dishwasher.

(b) All other equipment hampering preparation of a meal.

- Code 2 - Kitchen Equipment

(a) All other equipment not listed under Code 1.

- Code 2 - Plumbing

(a) Flush valves not operating properly

(b) Fixture drain, supply line commode, or water pipe leaking.

(c) Commode leaking at base.

- Code 3 - Plumbing

(a) Leaking faucets

- Code 1 - Refrigeration

(a) Mess Hall.

(b) Medical storage.

- Code 2 - Refrigeration

(a) Mess hall - other than walk-in refrigerators and freezers.

- Code 1 - Roof Leaks

(a) Temporary repairs will be made where major damage to property is occurring.

- Code 2 - Roof Leaks

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

- Code 1 - Sprinkler System

(a) All sprinkler systems, valves, manholes, deluge systems, and air systems to sprinklers.

- Code 1 - Tank Wash Racks (Bird Baths)

(a) All systems which prevent tank wash.

- Code 1 - Water (Exterior)

(a) Normal operation of water pump station.

- Code 2 - Water (Exterior)

(a) No water to facility.

- Code 1 - Water, Hot (and Steam)

(a) Barracks (entire building).

- Code 2 - Water, Hot

(a) No hot water in portion of building listed under Code 1

1.4.5.5. Should parts be required to complete the work and the parts are not immediately available, the Contractor shall have a maximum of 12 hours after arrival at the job site to provide the Government, with firm written proposals for emergency alternatives and temporary repairs for Government participation with the Contractor to provide emergency relief until the required parts are available on site for the Contractor to perform permanent warranty repair. The Contractors proposals shall include a firm date and time that the required parts shall be available on site to complete the permanent warranty repair. The Government will evaluate the proposed alternatives and negotiate the alternative considered to be in the best interest of the Government to reduce the impact of the emergency condition. Alternatives considered by the Government will include the alternative for the Contractor to "Do Nothing" while waiting until the required parts are available to perform permanent warranty repair. Negotiating a proposal which will require Government participation and the expenditure of Government funds shall constitute a separate procurement action by the using service.

1.4.6. Equipment Warranty Identification Tags

1.4.6.1. Provide warranty identification tags at the time of installation and prior to substantial completion shall provide warranty identification tags on all Contractor and Government furnished equipment which the Contractor has installed.

(a) The tags shall be suitable for interior and exterior locations, resistant to solvents, abrasion, and to fading caused by sunlight, precipitation, etc. These tags shall have a permanent pressure-sensitive adhesive back, and they shall be installed in a position that is easily (or most easily) noticeable. Tag each component of contractor furnished equipment that has differing warranties on its components.

(b) Submit sample tags, representing how the other tags will look, for Government review and approval.

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

EQUIPMENT WARRANTY - CONTRACTOR FURNISHED EQUIPMENT

MFG NAME MODEL NO.

SERIAL NO.

CONTRACT NO.

CONTRACTOR NAME

CONTRACTOR WARRANTY EXPIRES

MFG WARRANTY(IES) EXPIRE

EQUIPMENT WARRANTY - GOVERNMENT FURNISHED EQUIPMENT

MFG NAME MODEL NO.

SERIAL NO.

CONTRACT NO.

DATE EQUIP PLACED IN SERVICE

MFG WARRANTY(IES) EXPIRE

(d) If the manufacturer's name (MFG), model number and serial number are on the manufacturer's equipment data plate and this data plate is easily found and fully legible, this information need not be duplicated on the equipment warranty tag

1.4.6.2. Execution: Complete the required information on each tag and install these tags on the equipment by the time of and as a condition of final acceptance of the equipment.

1.5. MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING

Submit; all reports, statements, certificates, and completed checklists for testing, adjusting, balancing, and commissioning of mechanical systems prior to final inspection and transfer of the completed facility for approval, as specified in applicable technical specification sections.

1.6. OPERATION AND MAINTENANCE MANUALS

1.6.1. General Requirements

1.6.1.1. Inasmuch as the operations and maintenance manuals are required to operate and maintain the facility, the operations and maintenance (O&M) manuals will be considered a requirement prior to substantial completion of any facility to be turned over to the Government. Beneficial occupancy of all or portions of a facility prior to substantial completion will not relieve the Contractor of liquidated damages, if substantial completion exceeds the required completion date.

1.6.1.2. Provide one permanent electronic copy on CD-ROM and 2 hard copies of the Equipment Operating, Maintenance, and Repair Manuals. Provide separate manuals for each utility system as defined hereinafter. Submit Operations and Maintenance manuals for approval before field training or 90 days before substantial completion (whichever occurs earlier). If there is no separate CLIN for O&M Manuals, the Government will withhold an amount representing $20,000, as non-progressed work, until submittal and approval of all O&M manuals are complete.

1.6.2. Definitions

1.6.2.1. Equipment

A single piece of equipment operating alone or in conjunction with other equipment to accomplish a system function.

1.6.2.2. System

A combination of one or more pieces of equipment which function together to accomplish an intended purpose (i.e. HVAC system is composed of many individual pieces of equipment such as fans, motors, compressors, valves, sensors, relays, etc.)

1.6.3. Hard Cover Binders

The manuals shall be hard cover with posts, or 3-ring binders, so sheets may be easily substituted. Print the following identification on the cover: the words "EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUALS," the project name, building number, and an indication of utility or systems covered, the name of the Contractor, and the Contract number. Manuals shall be approximately 8-1/2 by 11-inches with large sheets folded in and capable of being easily pulled out for reference. All manuals for the project must be similar in appearance, and be of professional quality.

1.6.4. Warning Page

Provide a warning page to warn of potential dangers (if they exist, such as high voltage, toxic chemicals, flammable liquids, explosive materials, carcinogens, high pressures, etc.). Place the warning page inside the front cover and in front of the title page. Include any necessary Material Safety Data Sheets (MDSD) here.

1.6.5. Title Page

The title page shall include the same information shown on the cover and show the name of the preparing firm and the date of publication.

1.6.6. Table of Contents

Each volume of the set of manuals for this project shall include a table of contents, for the entire set, broken down by volume.

1.6.7. GENERAL

Organize manuals according to the following format, and include information for each item of equipment Submit a draft outline and table of contents for approval at 50% contract completion.

TABLE OF CONTENTS

PART I: Introduction

- Equipment Description
- Functional Description
- Installation Description

PART II: Operating Principles

PART III: Safety

PART IV: Preventive Maintenance

- Preventive Maintenance Checklist, Lubrication
- Charts and Diagrams

PART V: Spare Parts Lists

- Troubleshooting Guide
- Adjustments
- Common Repairs and Parts Replacement

PART VI: Illustrations

1.6.7.1. Part I-Introduction

Part I shall provide an introduction, equipment or system description, functional description and theory of operation, and installation instructions for each piece of equipment. Include complete instructions for uncrating, assembly, connection to the power source and pre-operating lubrication in the installation instructions as applicable. Illustrations, including wiring and cabling diagrams, are required as appropriate in this section. Include halftone pictures of the equipment in the introduction and equipment description, as well as system layout drawings with each item of equipment located and marked. Do not use copies of previously submitted shop drawings in these manuals.

1.6.7.2. Part II-Operating Principles

Part II shall provide complete instructions for operating the system, and each piece of equipment. Illustrations, halftone pictures, tables, charts, procedures, and diagrams are required when applicable. This will include step-by-step procedures for start-up and shutdown of both the system and each component piece of equipments, as well as adjustments required to obtain optimum equipment performance, and corrective actions for malfunctions. Show performance sheets and graphs showing capacity data, efficiencies, electrical characteristics, pressure drops, and flow rates here, also. Marked-up catalogs or catalog pages do not satisfy this requirement. Present performance information as concisely as possible with only data pertaining to equipment actually installed. Include actual test data collected for Contractor performance here.

1.6.7.3. Part III-Safety

Part III shall contain the general and specific safety requirements peculiar to each item of equipment. Repeat safety information as notes cautions and warnings in other sections where appropriate to operations described.

1.6.7.4. Part IV-Preventive Maintenance

Part IV shall contain a troubleshooting guide, including detailed instructions for all common adjustments and alignment procedures, including a detailed maintenance schedule. Also include a diagnostic chart showing symptoms and solutions to problems. Include test hookups to determine the cause, special tools and test equipment, and methods for returning the equipment to operating conditions. Information may be in chart form or in tabular format with appropriate headings. Include instructions for the removal, disassembly, repair, reassembly, and replacement of parts and assemblies where applicable and the task is not obvious.

1.6.7.5. Part V-Spare Parts List

Part V shall contain a tabulation of description data and parts location illustrations for all mechanical and electrical parts. The heading of the parts list shall clearly identify the supplier, purchase order number, and equipment. Include the unit price for each part. List parts by major assemblies, and arrange the listing in columnar form. Include names and addresses of the nearest manufacturer's representatives, as well as any special warranty information. Provide a list of spare parts that are recommended to be kept in stock by the Government installation.

1.6.7.6. Part VI-Illustrations

Part VI shall contain assembly drawings for the complete equipment or system and for all major components. Include complete wiring diagrams and schematics. Other illustrations, such as exploded views, block diagrams, and cutaway drawings, are required as appropriate.

1.6.8. Framed Instructions

Post framed instructions are required for substantial completion. Post framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, including equipment, ductwork, piping valves, dampers, and control sequence at a location near the equipment described. Prepare condensed operating instructions explaining preventive maintenance procedures methods of checking the system for normal safe operation, valve schedule and procedures for safely starting and stopping the system in type form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. Submit proposed diagrams, instructions, and other sheets prior to posting. Post the framed instructions before field training.

1.6.9. (Reserved. See 1.7 for Field Training)

1.6.10. System/Equipment Requirements

1.6.10.1. Facility Heating System

Provide information on the following equipment: boilers, water treatment, chemical feed pumps and tanks, converters, heat exchangers, pumps, unit heaters, fin-tube radiation, air handling units (both heating only and heating and cooling), and valves (associated with heating systems).

1.6.10.2. Air-Conditioning Systems

Provide information in chillers, packaged air-conditioning equipment, towers, water treatment, chemical feed pumps and tanks, air-cooled condensers, pumps, compressors, air handling units, and valves (associated with air-conditioning systems).

1.6.10.3. Temperature Control and HVAC Distribution Systems

Provide all information described for the following equipment: valves, fans, air handling units, pumps, boilers, converters and heat exchangers, chillers, water cooled condensers, cooling towers, and fin-tube radiation, control air compressors, control components (sensors, controllers, adapters and actuators), and flow measuring equipment.

1.6.10.4. Central Heating Plants

Provide the information described for the following equipment: boilers, converters, heat exchangers, pumps, fans, steam traps, pollution control equipment, chemical feed equipment, control systems, fuel handling equipment, de-aerators, tanks (flash, expansion, return waters, etc.), water softeners, and valves.

1.6.10.5. Heating Distribution Systems

Provide the information described for the following equipment: valves, fans, pumps, converters and heat exchangers, steam traps, tanks (expansion, flash, etc.), and piping systems.

1.6.10.6. Exterior Electrical Systems

Provide information on the following equipment: power transformers, relays, reclosers, breakers, and capacitor bank controls.

1.6.10.7. Interior Electrical Systems

Provide information on the following equipment: relays, motor control centers, switchgear, solid state circuit breakers, motor controller, EPS lighting systems, wiring diagrams and troubleshooting flow chart on control systems, and special grounding systems.

1.6.10.8. Energy Monitoring and Control Systems

The maintenance manual shall include descriptions of maintenance for all equipment, including inspection, periodic preventative maintenance, fault diagnosis, and repair or replacement of defective components.

1.6.10.9. Domestic Water Systems

Provide the identified information on the following equipment: tanks, unit process equipment, pumps, motors, control and monitoring instrumentation, laboratory test equipment, chemical feeders, valves, switching gear, and automatic controls.

1.6.10.10. Wastewater Treatment Systems

Provide the identified information on the following equipment: tanks, unit process equipment, pumps, motors, control and monitoring instrumentations, laboratory test equipment chemical feeders, valves, scrapers, skimmers, comminutors, blowers, switching gear, and automatic controls.

1.6.10.11. Fire Protection Systems

Provide information on the following equipment: alarm valves, manual valves, regulators, foam and gas storage tanks, piping materials, sprinkler heads, nozzles, pumps, and pump drivers.

1.6.10.12. Fire Alarm and Detection Systems

(1) The maintenance manual shall include description of maintenance for all equipment, including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

(2) Provide all software; database with complete identification of programmable portions of system equipment and devices, and all other system programming data on all modes of the system; connecting cables; and proprietary equipment necessary for the operation, maintenance, testing, repair and programming, etc. of the system and that may be required for implementation of future changes to the fire system (additional and/or relocated initiating devices, notification devices, etc.

(3) Provide all system and equipment technical data and computer software with the requisite rights to Government use, in accordance with the applicable contract clauses.

(4) Training shall include software and programming required for the effective operation, maintenance, testing, diagnostics and expansion of the system.

1.6.10.13. Plumbing Systems

Provide information on the following equipment: water heaters, valves, pressure regulators backflow preventors, piping materials, and plumbing fixtures.

1.6.10.14. Liquid Fuels Systems

Provide information on the following equipment: tanks, automatic valves manual valves, filter separators, pumps, mechanical loading arms, nozzles, meters, electronic controls, electrical switch gear, and fluidic controls.

1.6.10.15. Cathodic Protection Systems

Provide information on the following material and equipment: rectifiers, meters, anodes, anode backfill, anode lead wire, insulation material and wire size, automatic controls (if any), rheostats, switches, fuses and circuit breakers, type and size of rectifying elements, type of oil in oil-immersed rectifiers, and rating of shunts.

1.6.10.16. Generator Installations

Provide information on the following equipment: generator sets, automatic transfer panels, governors, exciters, regulators starting systems, switchgear, and protective devices.

1.6.10.17. Miscellaneous Systems

Provide information on the following: communication and ADP systems, security and intrusion alarm, elevators, material handling, active solar, photovoltaic, nurse call, paging, intercom, closed circuit TV, irrigation, sound and material delivery systems, kitchen, refrigeration, disposal, ice making equipment, and other similar type special systems not otherwise specified.

1.6.10.18. Laboratory, Environmental and Pollution Control Systems

Provide information on the following equipment: wet scrubbers, quench chambers, scrub tanks, liquid oil separators, and fume hoods.

1.7. FIELD TRAINING

Field Training is a requirement for substantial completion. Conduct a training course for the operating staff for each particular system. Conduct the training is to be conducted during hours of normal working time after the system is functionally complete. The field instructions shall cover all of the items contained in the Equipment Operating, Maintenance and Repair Manuals. The training will include both classroom and "hands-on" training. Submit a lesson plan outlining the information to be discussed during training periods. Submit this lesson plan for approval 90 days before contract completion before the field training occurs. Record training on DVD and furnish to the Government within ten (10) days following training. Document all training and furnish a list of all attendees.

1.8. PRICING OF CONTRACTOR-FURNISHED AND INSTALLED PROPERTY AND GOVERNMENT-FURNISHED CONTRACTOR-INSTALLED PROPERTY

Promptly furnish and require any sub-contractor or supplier to furnish, in like manner, unit prices and descriptive data required by the Government for Property Record purposes of fixtures and equipment furnished and/or installed by the Contractor or sub-contractor, except prices do not need to be provided for Government-Furnished Property.

1.9. LEED REVIEW MEETINGS

1.9.1. Pre-Closeout Meeting. Approximately 30 days before submittal of LEED closeout documentation, the Contractor and the Government's project delivery team (including Installation representative) will meet to review the documentation, determine which, if any, credits will be audited and identify any corrections/missing items prior to the closeout LEED documentation submittal.

1.9.2. Approximately 14 days after submittal of LEED closeout documentation, the Contractor and the Government's project delivery team (including Installation representative) will meet to review the LEED closeout documentation. The review conference will include discussion of and resolution of all review comments to ensure consensus on achievement of credits and satisfactory documentation. At the review conference a final score will be determined and endorsed in writing by all parties.

1.10. RED ZONE MEETING

At approximately 80% of contract completion or 60 days before the anticipated Beneficial Occupancy Date (BOD), whichever occurs first, the Contractor and the Government's project delivery team will conduct what is known as the Red Zone Meeting to discuss the close-out process, to schedule the events and review responsibilities for actions necessary to produce a timely physical, as well as fiscal, project close-out. The Red Zone meeting derives its name from the football term used to describe the team effort to move the ball the last 20 yards into the end zone. The close-out of a construction project sometimes can be equally as hard and most definitely requires the whole team’s efforts. The ACO will chair the meeting. If not already provided, shortly before the meeting, the Contractor shall provide an electronic copy or access to the CADD as-built drawings, completed commensurate with the amount of work completed at the time of the Red Zone Meeting, as an indicator of the Contractors’ understanding of and ability to meet the USACE CADD Standards and to ensure that the Contractor is making progress with CADD As-Built requirements. EXHIBIT 1 is a generic meeting checklist.

1.11. FINAL CLEANING

Clean the premises in accordance with FAR clause 52.236-12 and additional requirements stated here. Remove stains, foreign substances, and temporary labels from surfaces. Vacuum carpet and soft surfaces. Clean equipment and fixtures to a sanitary condition. Clean or replace filters of operating equipment if cleaning isn't possible or practicable. Remove debris from roofs, drainage systems, gutters, and downspouts. Sweep paved areas and rake clean landscaped areas. Remove waste, surplus materials, and rubbish from the site. Remove all temporary structures, barricades, project signs, fences and construction facilities. Submit a list of completed clean-up items on the day of final inspection.

1.12. INTERIM FORM DD1354 "TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

Near the completion of Project, but a minimum of 60 days prior to final acceptance of the work, complete, update draft provided with the final design package(s) (see Section 01 33 16, paragraph 3.7.5) and submit an accounting of all installed property on Interim Form DD1354 "Transfer and Acceptance of Military Real Property." Include any additional assets/improvements/alterations and cost updates from the Draft DD Form 1354. Contact the COR for any project specific information necessary to complete the DD Form 1354. This form will be a topic for the Red Zone Meeting discussed above. For information purposes, a blank DD Form 1354 (fill-able) in ADOBE (PDF) may be obtained at the following web site: http://www.dtic.mil/whs/directives/infomgt/forms/eforms/dd1354.pdf Submit the completed Checklist for Form DD1354 of Government-Furnished and Contractor-Furnished/Contractor Installed items. Attach this list to the updated DD Form 1354. Instructions for completing the form may be obtained through the US Army Corps of Engineers TECHINFO Website at http://www.hnd.usace.army.mil/techinfo/ under publications, in Unified Facilities Criteria UFC 1-300-08.

EXHIBIT 1

SAMPLE

Red Zone Meeting Checklist

Date:_____

Contract No.	
Description / Location	
Contractor	
Contracting Officer	

Action	**Completion Milestone**	√
Inspections		
Fire		
Safety		
Pre-final		
Mechanical Test & Balance		
Commissioning		
Landscaping Complete		
Erosion Control		
Beneficial Occupancy Date (BOD)		
Furniture Installation		
Comm Installation		
As-Built Drawings		
Provide all O&M manuals, tools, shop drawings, spare parts, etc. to customer		
Training of O&M Personnel		
Provide Warranty documents to Customer		
Contract completion		
Final Inspection		

User move-in		
DD Form 1354, Transfer of Real Property completed & signed		
Ribbon cutting		
Payroll Clearances		
DD Form 2626 - Construction Contractor Performance Evaluation		
DD Form 2631 – A-E Performance Rated after Construction		
Status of Pending Mods and REA's/Claims		
Final Payment Completed		
Release of Claims		
Return of Unobligated Funds		
Move Project from CIP to General Ledger		
Financial completion		

End of Section 01 78 02.00 10

APPENDIX A:

Geotechnical Information

FORT HOOD, TEXAS

OPERATIONAL READINESS TRAINING COMPLEX (FY12)

GOVERNMENT GEOTECHNICAL REPORT

FOR DESIGN-BUILD PROJECT RFP

PREPARED BY

U.S. ARMY CORPS OF ENGINEERS

FORT WORTH DISTRICT

ENGINEERING AND CONSTRUCTION DIVISION
ENGINEERING BRANCH

GEOTECHNICAL SECTION

CESWF-EC-DG

OCTOBER 2011

FORT HOOD, TEXAS
OPERATIONAL READINESS TRAINING COMPLEX (FY12)

GOVERNMENT GEOTECHNICAL REPORT

1. General. The purpose of this report is to provide subsurface information, and foundation and pavement design considerations, guidance, and requirements for a new Operational Readiness Training Complex (ORTC) (FY12) at Fort Hood, Texas. The entirety of the facilities for the Operational Readiness Training Complex (FY12) will be distributed among Design-Bid-Build and Design-Build modes of design and construction execution. Design and construction of the new Barracks buildings, the Officers Quarters, and the Battalion Headquarters will be accomplished under a Design-Build contract. The descriptions of those project facilities presented herein are based upon information available at the time of the report. The bidders should refer to the Design-Build Request for Proposal (RFP) document for specific facility descriptions. The ORTC (FY12) Dining Facility and the site infrastructure (to include pavement structures and the elevated water storage tank) will be designed and constructed as Design-Bid-Build projects (i.e., the design will be furnished by the Government and their associated design firms, and the D-B-B construction contractor will be responsible for construction only). Although this report provides requirements for the foundation designs and construction of the building facilities which will be administered by a Design-Build contract, it also includes design and construction recommendations, requirements, and parameters, as well as subsurface information and laboratory testing data for the associated ORTC (FY12) infrastructure facility features (including pavements and the elevated water storage tank). This information is provided to the Design-Build Contractor to assist in the development and coordination of their bids and designs, in accordance with the requirements specified herein.

Based upon the original project facility requirements, the proposed complex included four new two-story Barracks buildings (each approximately 31,170 GSF in size), a two-story Officers Quarters (approximately 23,031 GSF in size), and a single-story Battalion Headquarters (approximately 11,462 GSF in size). However, the project was subsequently reconfigured to consolidate the Barracks from four to two buildings (four stories each instead

of the original two stories, with approximately the same total combined gross square footage divided among the two buildings). The Operational Readiness Training Complex (FY12) will also include the aforementioned Dining Facility, elevated water storage tank (250,000 gallon capacity), and privately-owned vehicle (POV) parking areas, and other pavement structures (anticipated to include fire/emergency medical vehicle access lanes, service drives, and aprons in front of trash dumpster pads). The Battalion Headquarters, Officers Quarters and Barracks were originally sited north and west of the Dining Facility; however, as noted above, these buildings were subsequently re-sited (to their current proposed locations) north and east of the Dining Facility. Since the facilities were re-sited subsequent to the original geotechnical site investigation, additional borings were drilled, as described herein, at the proposed re-sited building locations.

It is anticipated that the new Barracks will include sleeping bays to accommodate approximately 320 personnel (per each Barracks) (plus separate sleeping modules to accommodate senior enlisted personnel), as well as break and common areas, latrines, showers, laundry facilities, a reading lounge, storage rooms, and mechanical/electrical/communications equipment rooms. The Officers Quarters will include living modules to accommodate approximately 80 visiting officers, and will also include break and common areas, latrines, showers, laundry facilities, storage rooms, and mechanical/electrical/communications equipment rooms. The Battalion Headquarters will include a classroom areas (a flexible design that will accommodate a single large area that can be subdivided through partitions into three classrooms), administrative areas, break areas, restrooms, storage rooms, and mechanical/electrical/communications equipment rooms. Although details of the structural framing system(s), and other facility construction details, have not been established at the time of this report, it is anticipated that the new building construction will match existing building architectural styles of the surrounding area; refer to other sections of the RFP package for additional details concerning requirements for the facility design and construction.

The Operational Readiness Training Complex (FY12) project site is located in the

central part of the North Fort Hood cantonment. Specifically, the project site is located on a parcel that is bounded to the northeast by Headquarters Avenue, to the southeast by 18th Street, to the southwest by Central Avenue, and to the northwest by 22nd Street. Based on available information, the Operational Readiness Training Complex (FY12) site has been previously developed, although above-ground features have generally been demolished. The previous site facilities appear to have consisted of numerous small buildings which are anticipated to have utilized shallow foundations. Currently, concrete slabs-on-grade remain, as do remnants of access drive pavement connecting between 18th and 19th Street, 19th Street and 20th Street, 20th Street and 21st Street, and 21st Street and 22nd Street. **The Design-Build Contractor shall coordinate with the Fort Hood Directorate of Public Works (DPW) to verify details of the existing building foundations at the site in order to avoid conflicts and impacts to the new facility foundation, floor slabs, and other new construction items.** Based on a recent topographic survey, the Operational Readiness Training Complex (FY12) site is relatively flat, sloping toward the east-northeast at gradients ranging from less than 1 percent to approximately 2 percent. Existing grades across the entire Operational Readiness Training Complex (FY12) site range from approximately 753.0 feet to 762.0 feet National Geodetic Vertical Datum (NGVD). Existing grades within the respective building footprints are presented below (NOTE: These topographic ranges are approximate and are interpretations based on information presented on the topographic survey, to which the bidders (and ultimately the Design-Build Contractor) should refer).

Building	Approx. Range of Existing Grades w/-in Proposed Bldg. Footprint, feet (NGVD)
Battalion Headquarters	754.0 to 755.1
Officers Quarters	753.3 to 754.6
North Barracks	754.4 to 756.8
South Barracks	756.1 to 759.2

Finish floor elevations for the project buildings were not known at the time of this report.

2. <u>Subsurface Investigation.</u> The U.S. Army Corps of Engineers (USACE), Fort Worth District drilled seventeen (17) test holes, 8A4C-5732 through 8A4C-5748, at the Operational Readiness Training Complex (FY12) site in January and February 2011, and four (4) test holes, 8A4C-5816 through 8A4C-5819, at the locations of the re-sited buildings in June and July 2011. USACE, Fort Worth District drilled six (6) test holes, 8A4C-5810 through 8A4C-5815, at the proposed Water Tower site in June 2011. Also, USACE, Fort Worth District drilled five (5) test holes, 8A4C-5731 and borings 8A4C-5749 through 8A4C-5752, at the ORTC (FY12) Dining Facility project site in December 2010 and January 2011. The borings were drilled to determine subsurface conditions and to obtain representative soil and rock samples for laboratory testing. Test hole advancement and sample recovery was performed using 6-, 7 $^{7}/_{8}$-, and 10-inch diameter solid stem short flight augers, a 4-inch carboloy bit core barrel sampler, and a nominal 3-inch diameter shelby tube sampler. Borings 8A4C-5732 through 8A4C-5748 (exclusive of the Dining Facility) were drilled to total depths ranging from 10.0 feet to 41.5 feet. Borings 8A4C-5816 through 8A4C-5819 (re-sited buildings) were drilled to depths ranging from 49.5 feet to 50.0 feet. Borings 8A4C-5810 through 8A4C-5815 (Water Tower site) were drilled to depths ranging from 30.0 feet to 50.0 feet. Test hole advancement and sample recovery for the Dining Facility borings was performed using 7 $^{7}/_{8}$- and 10-inch diameter solid stem short flight augers, a 4-inch carboloy bit core barrel sampler, and a nominal 3-inch diameter shelby tube sampler. Borings 8A4C-5731 and 8A4C-5749 through 8A4C-5752 (Dining Facility borings) were drilled to total depths ranging from 40.0 feet to 49.0 feet below existing grade. Samples recovered from the borings were sealed in airtight containers and taken to the laboratory of TEAM Consultants, Incorporated (Arlington, Texas) for testing.

The field investigation was performed using a Failing 1500 truck-mounted drill rig and conventional drilling attachments. Results of the field investigation for the Operational Readiness Training Complex (FY12) are shown on Sheet B101 (Boring Locations) and Sheets B201 through B205 (Logs of Borings) (Appendix A). The results of the field investigation

(boring locations and logs of borings) for the ORTC (FY12) Water Tower are shown on Sheet B102 (Boring Locations) and Sheets B206 and B207 (Logs of Borings).

a. Groundwater Conditions.

(1) ORTC (FY12) Site (Excluding Dining Facility). Groundwater conditions were monitored during drilling operations, immediately upon completion of the test holes, and after observation periods of up to 48 hours. Static water levels were measured in ten of the twenty-one borings drilled at the Operational Readiness Training Complex (FY12) site (total of the original seventeen borings and the four supplemental borings drilled for the re-sited buildings, and exclusive of the borings drilled for the Dining Facility, which are discussed below), with depths ranging from 9.0 feet to 44.2 feet below existing grade. Tabulated below are the static levels measured at the time of the field investigation.

Boring	Static Level, feet
8A4C-5732	9.0
8A4C-5733	16.7
8A4C-5734	11.7
8A4C-5735	13.5
8A4C-5736	23.5
8A4C-5748	32.9
8A4C-5816	10.5
8A4C-5817	43.0
8A4C-5818	16.4
8A4C-5819	44.2

(2) ORTC (FY12) Dining Facility. Groundwater conditions for the Dining Facility geotechnical field investigation were monitored during drilling operations, immediately upon completion of the test holes, and after observation periods of up to 21 hours. Static water levels were measured in four of the five borings drilled at the Dining Facility site, with depths ranging from 12.4 feet to 14.7 feet below existing grade. Tabulated below are the static levels measured at the time of the field investigation.

Boring	Static Level, feet
8A4C-5749	12.5
8A4C-5750	12.4
8A4C-5751	14.7
8A4C-5752	14.4

(3) Water Tower Site. Groundwater conditions for the ORTC (FY12) Water Tower geotechnical field investigation were monitored during drilling operations, immediately upon completion of the test holes, and after observation periods of up to 124 hours. Static water levels were measured in all six borings drilled at the Water Tower site, with depths ranging from 27.5 feet to 46.0 feet below existing grade. Tabulated below are the static levels measured at the time of the field investigation.

Boring	Static Level, feet
8A4C-5810	45.4
8A4C-5811	46.0
8A4C-5812	41.7
8A4C-5813	31.4
8A4C-5814	46.0
8A4C-5815	27.5

It should be noted that groundwater conditions are relative to the time of drilling, annual precipitation, and drainage conditions at the site.

b. Dynamic Cone Penetrometer Testing. Dynamic Cone Penetrometer testing (DCP) was performed at the Operational Readiness Training Complex site for pavement design considerations in borings 8A4C-5734, 10A-5737, 10A-5739, 10A-5742, 10A-5744, and 10A-5746. Dynamic Cone Penetrometer testing was performed at the Dining Facility site for pavement design considerations in borings 8A4C-5749, 8A4C-5750, 8A4C-5751, and 8A4C-5752. Results of DCP testing are presented in Appendix D and discussed in Sections 4 and 5.

c. Soil Resistivity Testing. Soil resistivity testing was performed at the Operational Readiness Training Facility (FY12) project site at the approximate locations of boring 8A4C-5732, 8A4C-5733, 8A4C-5734, 8A4C-5735, 8A4C-5736, and boring 8A4C-5748 during the original site investigation, and at the approximate locations of the re-sited buildings, borings

8A4C-5816 through 8A4C-5819, during the supplemental geotechnical field investigation. The resistivity tests were conducted using a diode spacing of 2.5 feet. Tabulated below are the results of soil resistivity testing at each of the respective boring locations.

Boring	Resistivity, ohm-cm
8A4C-5732	1,580
8A4C-5733	958
8A4C-5734	1,197
8A4C-5735	2,107
8A4C-5736	2,394
8A4C-5748	1,101
8A4C-5816	958
8A4C-5817	4,788
8A4C-5818	862
8A4C-5819	4,788

Soil resistivity testing was performed at the Dining Facility project site at the approximate location of boring 8A4C-5731. The resistivity value measured in the field at this location is 1,197 ohm-cm (using a diode spacing of 2.5 feet). Soil resistivity testing also was performed at the proposed Water Tower site at the approximate location of boring 8A4C-5815. The resistivity value measured in the field at this location is 14,841 ohm-cm. Soil resistivity test results are provided in the 'Remarks' column of the aforementioned logs of borings (Appendix A).

3. Subsurface Conditions.

a. General Geology. Fort Hood lies within the Central Texas Section of the Great Plains physiographic province. The topographic features of the area are those of a dissected plateau characterized by buttes and mesas. Approximately 30 miles southeast of Fort Hood, the dissected plateau topography gives way to the moderate or rolling relief of the Gulf Coastal Plain. The Balcones fault zone is, roughly, the dividing line of the two physiographic provinces. The uppermost primary stratum underlying Fort Hood is the Walnut Formation of the Comanche Series, Cretaceous age. The Walnut Formation is composed of gray-black, calcareous clay shales alternating with beds of chalky, nodular limestone and shell conglomerates. The entire Walnut Formation was not penetrated by borings drilled at the site.

Overburden soils within the area vary from a knife edge to greater than 30 feet in thickness, and consist of clays of low to high plasticity, clayey gravels and/or clay choked limestone nodules. The overburden soils are residual soils derived from the underlying parent material.

b. Site Conditions. Based on available information, the Operational Readiness Training Complex (FY12) site has been previously developed, although above-ground features have generally been demolished. The previous site facilities appear to have consisted of numerous small buildings which are anticipated to have utilized shallow foundations. Currently, concrete slabs-on-grade remain, as do remnants of access drive pavement connecting between 19th Street and 20th Street, 20th Street and 21st Street, and 21st Street and 22nd Street. Based on a recent topographic survey, the Operational Readiness Training Complex (FY12) site is relatively flat, sloping toward the east-northeast at gradients ranging from less than 1 percent to approximately 2 percent. Existing grades across the entire Operational Readiness Training Complex (FY12) site range from approximately 753.0 feet to 762.0 feet National Geodetic Vertical Datum (NGVD). Approximate existing grades across the respective proposed building footprints are provided in Section 1. Finish floor elevations for the project buildings were not known at the time of this report.

Presented below are descriptions of the subsurface conditions encountered across the entire Operational Readiness Training Complex (FY12) project site. The subsurface conditions encountered within the area of the area of the ORTC (FY12) Dining Facility are discussed separately from the conditions encountered within the borings drilled within the project features specifically included in this Request for Proposal. NOTE: Stratigraphic contact depths referenced herein are measured with respect to the original (pre-site construction) existing grades (i.e., the grades existing at the time of the respective geotechnical field investigations).

(1) Operational Readiness Training Complex (FY12) Site (Including Re-Sited Buildings, but Excluding the Dining Facility Site Subarea). Stratigraphically, the Operational

Readiness Training Complex (FY12) site is characterized by typically high plasticity clay (CH), sand, and gravel overburden strata, underlain by strata of weathered interbedded marl/shale and limestone, and by a deeper formation of unweathered interbedded marl/shale and limestone primary. Based upon the information provided on the logs of borings, the results of laboratory testing, and experience with the subsurface materials at Fort Hood, the typically high plasticity clay, sand, and gravel overburden is a weathering product of the limestone and marl/shale primary (and some of the materials identified and classified as overburden soils may be highly weathered marl/shale and limestone primary, disturbed and reworked by auger drilling action). The typically high plasticity clay overburden is usually stiff to hard, dry to slightly moist, black to dark gray, typically transitioning to yellow brown and light yellow brown at depths between approximately 3.7 feet to 8.5 feet below existing grade, silty, with gravel and sand (limestone fragments). Liquid limits measured from representative samples of the high plasticity clay overburden collected from the site range from 53 to 100 percent, plastic limits vary from 17 to 30 percent (with plasticity indices ranging from 36 to 70 percent), and in situ moisture contents vary between 14 and 25 percent. It should be noted that a specimen of material described on the logs of borings and laboratory classification as a light gray and yellow brown clay (see note above regarding stratigraphic interpretations) collected at a depth of between 10.1 and 11.9 feet below existing grade within boring 8A4C-1135 has a liquid limit of 34 percent, a plastic limit of 14 percent (PI = 20 percent), and an in situ moisture content of 15 percent.

A stratum of material described as a coarse to fine, medium dense, damp to moist, light gray to yellow red to pale brown clayey and gravelly sand was encountered below the high plasticity clays at depths ranging from 5.6 feet to 11.9 feet within borings 8A4C-5732, 8A4C-5733, 8A4C-5735, and 10A-5739. Liquid limits measured from representative samples of the plastic sandy materials collected from these borings range from 30 to 68 percent, plastic limits vary from 13 to 23 percent (with plasticity indices ranging from 17 to 45 percent), and in situ moisture contents vary between 9 and 18 percent.

A stratum of gravel was identified between the overburden clays (and sands) and underlying marl/shale and limestone primary at depths ranging from 3.7 feet to 16.2 feet within borings 8A4C-5734, 8A4C-5735, 8A4C-5736, 10A-5743, 8A4C-5816, 8A4C-5817, 8A4C-5818, and 8A4C-5819. The gravel is coarse to fine grained, medium dense, moist to wet, yellow red (matrix soils), clayey, sandy, with cobbles up to at least 6 inches in diameter recovered during drilling. The clayey and sandy gravel stratum has a thickness ranging from 4.4 feet to 6.5 feet at the test hole locations in which the underlying stratum was penetrated.

A stratum of weathered interbedded marl/shale and limestone primary underlies the overburden clays and gravel. The marl/shale and limestone primary materials were encountered at depths of 10.2 feet to 22.6 feet below existing grade. The weathered marl/shale primary is very soft to moderately hard (Rock Classification), dry, yellow brown to light gray to white, silty, calcareous, argillaceous, and fossiliferous, with blocky structure, and iron oxide staining. The interbedded limestone is moderately hard to hard (Rock Classification), fossiliferous, with sparry calcite and gypsum seams noted. It should be noted that the primary stratum encountered within boring 8A4C-5748 is predominantly a shale/marl that is weathered throughout the total depth drilled (39.5 feet).

The overburden soils and weathered interbedded marl/shale primary strata are underlain by a stratum of dark gray, unweathered interbedded marl/shale and limestone that is similar to the overlying weathered formation, except without oxidation staining and gypsum seams. The unweathered interbedded marl/shale and limestone was encountered at depths ranging from 34.4 feet to 39.9 feet below existing grade within the borings drilled during the original site investigation (with the exception of borings 8A4C-5733 and 8A4C 5748, wherein the unweathered primary was not encountered to the total depths drilled, 40.0 feet and 39.5 feet, respectively). The unweathered marl/shale and limestone primary was encountered at the following depths below existing grade, by boring location and project facility, for borings drilled during the supplemental site investigation for the re-sited buildings.

Boring	Building	Approx. Depth to Contact with Dark Gray Unweathered Limestone & Shale, feet
8A4C-5816	Battalion Headquarters	31.5
8A4C-5817	Officers Quarters	28.3
8A4C-5818	North Barracks	31.0
8A4C-5819	South Barracks	35.7

The unweathered primary becomes more predominantly limestone (with fewer marl/shale seams) within borings 8A4C-5816, 8A4C-5817, 8A4C-5818, and 8A4C-5819 at depths of 41.3 feet, 39.4 feet, 42.3 feet, and 44.6 feet below existing grade, respectively.

Specimens of the weathered and unweathered marl/shale primary (and seams of marl/shale within the limestone primary) subjected to Atterberg limits testing were found to have liquid limits ranging from 20 to 84 percent, plastic limits ranging from 13 to 32 percent (with plasticity indices ranging from 7 to 56 percent), and in situ moisture contents varying from about 4 to 29 percent.

(2) ORTC (FY12) Dining Facility Site Subarea. Stratigraphically, the ORTC (FY12) Dining Facility site is characterized by medium to high plasticity clay (CL to CH, respectively) and gravel overburden strata, underlain by strata of weathered interbedded marl/shale and limestone, and by a deeper formation of unweathered interbedded marl/shale and limestone primary. Based upon the information provided on the logs of borings, the results of laboratory testing, and experience with the subsurface materials at Fort Hood, the medium to high plasticity clay and gravel overburden is a weathering product of the limestone and marl/shale primary (and some of the materials identified and classified as overburden soils may be highly weathered marl/shale and limestone primary, disturbed and reworked by auger drilling action). The medium to high plasticity clay overburden is typically stiff to hard, dry to slightly moist, black to dark gray, typically transitioning to yellow brown and light yellow brown at depths between approximately 5.0 feet to 6.5 feet below existing grade, silty, with gravel and sand (limestone fragments). Liquid limits measured from representative samples of the medium to high plasticity clay overburden collected from the site range from 44 to 64

percent, plastic limits vary from 16 to 23 percent (with plasticity indices ranging from 28 to 46 percent), and in situ moisture contents vary between 10 and 20 percent.

A stratum of gravel was identified between the overburden clays and underlying marl/shale and limestone primary. The gravel is coarse to fine grained, medium dense, moist to wet, yellow red (matrix soils), clayey, sandy, with cobbles up to at least 4 inches in diameter recovered during drilling. The clayey and sandy gravel stratum is present at depths ranging from 8.5 feet to 9.5 feet below existing grade, and has a thickness ranging from 4.5 feet to 6.9 feet at the test hole locations.

A stratum of weathered interbedded marl/shale and limestone primary underlies the overburden clays and gravel. The marl/shale and limestone primary materials were encountered at depths of 13.6 feet to 16.4 feet below existing grade. The weathered marl/shale primary is very soft to moderately hard (Rock Classification), dry, yellow brown to light gray to white, silty, calcareous, argillaceous, and fossiliferous, with blocky structure, and iron oxide staining. The interbedded limestone is moderately hard to hard (Rock Classification), fossiliferous, with sparry calcite and gypsum seams noted. Specimens of the marl/shale primary (and seams of marl/shale within the limestone primary) subjected to Atterberg limits testing were found to have liquid limits ranging from 37 to 78 percent, plastic limits ranging from 16 to 28 percent (with plasticity indices ranging from 21 to 50 percent), and in situ moisture contents varying from about 11 to 26 percent.

The overburden soils and weathered interbedded marl/shale primary strata are underlain by a stratum of dark gray, unweathered interbedded marl/shale and limestone that is similar to the overlying weathered formation, except without oxidation staining and gypsum seams. The unweathered interbedded marl/shale and limestone was encountered at depths ranging from 36.6 feet to 37.3 feet below existing grade within the Dining Facility building footprint area.

(3) Operational Readiness Training Complex (FY12) – Water Tower Site. Stratigraphically, the Operational Readiness Training Complex (FY12) Water Tower site is characterized by a thin gravel overburden strata (which may be either a weathering product of

the underlying marl/shale and limestone primary, or may be highly weathered primary, disturbed and reworked by auger drilling action) at the locations of borings 8A4C-5810, 8A4C-5813, and 8A4C-5815 (with weathered marl/shale primary present at the surface at the remaining boring locations). The gravel is coarse to fine grained, medium dense, dry, very pale brown to very pale yellow (matrix soils), sandy, and limy. Where present, sandy gravel stratum has a thickness (from the surface to the contact with the underlying primary materials) ranging from 0.5 feet to 0.6 feet.

A stratum of weathered interbedded marl/shale and limestone primary underlies the overburden clays and gravel. The marl/shale and limestone primary materials were encountered at the surface at the locations of borings 8A4C-5811, 8A4C-5812, and 8A4C-5814, and depths of 0.5 feet, 0.6 feet, and 0.6 feet below existing grade at the locations of borings 8A4C-5810, 8A4C-5813, and 8A4C-5815, respectively. The weathered marl/shale primary is very soft to moderately hard (Rock Classification), dry, yellow brown to light gray to white, silty, calcareous, argillaceous, and fossiliferous, with blocky structure, and iron oxide staining. The interbedded limestone is moderately hard to hard (Rock Classification), fossiliferous, with well-healed fractures and sparry calcite and gypsum seams noted.

The overburden soils and weathered interbedded marl/shale and limestone primary strata are underlain by a stratum of dark gray, unweathered limestone that is similar to the overlying weathered formation, except without oxidation staining and gypsum seams. The unweathered limestone was encountered at depths ranging from 31.9 feet to 36.7 feet below existing grade at the Water Tower site.

Specimens of the weathered and unweathered marl/shale primary (and seams of marl/shale within the limestone primary) subjected to Atterberg limits testing were found to have liquid limits ranging from 21 to 39 percent, plastic limits ranging from 14 to 25 percent (with plasticity indices ranging from 5 to 17 percent), and in situ moisture contents varying from about 8 to 28 percent.

Subsurface conditions representative of the Operational Readiness Training Complex

(FY12) project site are shown on the logs of borings in Appendix A, Sheets B201 through B205 (Appendix A). Subsurface conditions representative of the ORTC (FY12) Water Tower Site are shown on the logs of borings on Sheets B206 and B207 (Appendix A). The legend on the individual boring logs show overburden materials as classified in the laboratory using procedures presented in ASTM D 2488. It should be noted that the actual interface between material types may be far more gradual or abrupt than presented; therefore, actual subsurface conditions in areas not sampled may differ from those predicted. The nature and extent of variations across the sites may not become evident until construction commences, and the actual construction process may alter subsurface conditions as well. If variations become evident at the time of construction, CESWF-EC-DG should be contacted to determine if the recommendations presented in this report need to be reevaluated.

4. Testing.

a. Laboratory Testing. Representative soil and rock samples recovered from selective test holes were subjected to laboratory testing for identification, moisture content, grain-size distribution, Atterberg limits, permeability (Dining Facility site subarea), density, strength, and controlled expansion-consolidation. The accumulative test results are tabulated and presented in Appendix C. Results of identification and moisture content testing are shown on the boring log, Appendix A.

Results of laboratory testing performed on samples obtained from the Operational Readiness Training Complex (FY12) site are presented graphically in Appendix B as follows: Plasticity characteristics are shown on Plate 1, Plasticity Chart. Moisture content values of representative samples are shown with respect to depth on Plate 2. Atterberg limits test results are shown with respect to depth on Plate 3. Dry density values of representative undisturbed samples and their corresponding moisture contents are shown with respect to depth on Plate 4. Ultimate compressive strengths of the marl/shale and limestone primary are shown with respect to depth on Plates 5a and 5b. Laboratory testing data plots for the re-sited buildings, the ORTC (12) Dining Facility, and the Water Tower site are presented in separate sections in

Appendix B following the data plots for the ORTC (FY12) facilities (original site investigation). Likewise, the tabulated laboratory testing data for the re-sited buildings, ORTC (FY12) Dining Facility, and Water Tower site are presented separately in Appendix C following the tabulated laboratory testing data for the ORTC (FY12) facilities (original site investigation).

(1) Shear Strength Testing. Shear strength characteristics of the marl/shale and limestone (LS) primary were analyzed in the laboratory using unconfined compression (UC) testing, or using one-point unconsolidated-undrained triaxial compression testing, confining the specimens to overburden pressure and then loading to failure (specimens subjected to one-point UU triaxial compression testing are denoted below with a "UU"). Tabulated below are the ultimate compressive strengths and respective dry densities. Shear strength test results are presented in Appendix C at the end of this report.

Operational Readiness Training Complex (FY12) Site (Original Site Investigation)

Boring	Depth, feet	γ_d, pcf	Q_u, tsf		Material Type
8A4C-5732	14.6	121.6	2.69	(UU)	Weathered LS w/ Marl/Shale Seams
8A4C-5732	16.7	104.2	1.69	(UU)	Weathered Marl/Shale
8A4C-5732	20.5	107.5	2.31	(UU)	Weathered Marl/Shale
8A4C-5732	22.5	125.0	1.36	(UU)	Weath. Marl/Shale w/ Limestone Seams
8A4C-5732	24.7	96.5	1.42	(UU)	Weathered Marl/Shale
8A4C-5732	26.5	118.8	3.54		Weath. Marl/Shale w/ Limestone Seams
8A4C-5732	28.0	111.0	1.57	(UU)	Weath. Marl/Shale w/ Limestone Seams
8A4C-5732	33.7	139.9	12.56	(UU)	Weathered LS w/ Marl/Shale Seams
8A4C-5732	35.8	153.0	215.10		Unweathered Limestone
8A4C-5732	37.5	156.1	356.80		Unweathered Limestone
8A4C-5732	39.8	144.3	19.24		Unweath. LS w/ Marl/Shale Seams
8A4C-5733	35.1	112.4	0.89		Weath. Marl/Shale w/ Limestone Seams
8A4C-5733	36.3	152.4	228.60		Weathered Limestone
8A4C-5733	36.9	115.3	0.84		Weath. Marl/Shale w/ Limestone Seams
8A4C-5733	37.7	96.7	2.38	(UU)	Weathered Marl/Shale
8A4C-5734	32.4	116.0	3.22	(UU)	Weath. Marl/Shale w/ Limestone Seams
8A4C-5734	33.3	109.0	2.66	(UU)	Weath. Marl/Shale w/ Limestone Seams
8A4C-5734	36.4	102.1	2.60	(UU)	Weath. Marl/Shale w/ Limestone Seams
8A4C-5734	37.7	136.1	2.35	(UU)	Unweath. LS w/ Marl/Shale Seams
8A4C-5734	38.7	101.8	3.41	(UU)	Unweathered Marl/Shale
8A4C-5735	31.7	103.9	2.47	(UU)	Weath. Marl/Shale w/ Limestone Seams
8A4C-5735	36.4	83.5	1.40	(UU)	Weath. Marl/Shale w/ Gypsum Seams
8A4C-5735	37.3	152.1	451.10		Weathered Limestone
8A4C-5735	39.6	147.8	123.40		Unweathered Limestone

Operational Readiness Training Complex (FY12) Site (Original Site Investigation) (Cont.)

Boring	Depth, feet	γ_d, pcf	Q_u, tsf	Material Type
8A4C-5736	19.0	109.5	2.35 (UU)	Weath. Marl/Shale w/ Limestone Seams
8A4C-5736	20.7	127.4	6.05 (UU)	Weathered LS w/ Marl/Shale Seams
8A4C-5736	22.5	128.0	6.67 (UU)	Weathered LS w/ Marl/Shale Seams
8A4C-5736	24.6	111.4	2.20 (UU)	Weath. Marl/Shale w/ Limestone Seams
8A4C-5736	26.9	111.0	3.13 (UU)	Weath. Marl/Shale w/ Limestone Seams
8A4C-5736	31.3	108.7	2.67 (UU)	Weath. Marl/Shale w/ Limestone Seams
8A4C-5736	37.8	100.7	2.07 (UU)	Weath. Marl/Shale w/ Limestone Seams
8A4C-5748	27.7	112.9	4.19 (UU)	Weathered Marl/Shale
8A4C-5748	29.8	114.2	4.82 (UU)	Weathered Marl/Shale
8A4C-5748	31.9	114.1	4.64 (UU)	Weathered Marl/Shale
8A4C-5748	34.2	117.4	3.18 (UU)	Weathered Marl/Shale
8A4C-5748	36.4	117.3	3.94 (UU)	Weathered Marl/Shale
8A4C-5748	38.7	120.1	6.31 (UU)	Weath. Marl/Shale w/ Limestone Seams

Operational Readiness Training Complex (FY12) Site (Re-Sited Buildings)

Boring	Depth, feet	γ_d, pcf	Q_u, tsf	Material Type
8A4C-5816	26.6	122.1	2.46 (UU)	Weath. Marl/Shale w/ LS Seams
8A4C-5816	28.4	112.0	4.53 (UU)	Weathered Marl/Shale
8A4C-5816	38.9	136.0	386.48	Weathered Limestone
8A4C-5816	41.5	154.0	221.28	Unweathered Limestone
8A4C-5816	44.1	136.3	97.91	Unweath. LS w/ Marl/Shale Seams
8A4C-5816	45.3	132.6	148.50	Unweathered Limestone
8A4C-5816	48.8	132.1	140.57	Unweathered Limestone
8A4C-5817	26.8	129.3	2.91 (UU)	Weathered LS w/ Marl/Shale Seams
8A4C-5817	28.8	116.0	4.63 (UU)	Weathered Marl/Shale
8A4C-5817	34.9	150.4	469.08	Unweathered Limestone
8A4C-5817	42.3	135.5	73.71	Unweath. LS w/ Marl/Shale Seams
8A4C-5817	44.9	136.3	157.92	Unweath. LS w/ Marl/Shale Seams
8A4C-5817	47.1	134.7	140.96	Unweath. LS w/ Marl/Shale Seams
8A4C-5818	12.6	99.9	0.58 (UU)	Weathered Marl/Shale
8A4C-5818	14.4	111.4	1.37 (UU)	Weath. Marl/Shale w/ LS Seams
8A4C-5818	16.5	126.9	3.80 (UU)	Weath. Marl/Shale w/ LS Seams
8A4C-5818	18.0	123.4	7.10 (UU)	Weath. Marl/Shale w/ LS Seams
8A4C-5818	21.3	108.6	1.60 (UU)	Weathered Marl/Shale
8A4C-5818	24.3	100.8	1.22 (UU)	Weathered Marl/Shale
8A4C-5818	26.4	104.8	3.93 (UU)	Weathered LS w/ Marl/Shale Seams
8A4C-5818	29.5	118.2	3.62 (UU)	Weathered LS w/ Marl/Shale Seams
8A4C-5818	33.9	144.0	33.13 (UU)	Unweath. LS w/ Marl/Shale Seams
8A4C-5818	35.2	138.6	7.38 (UU)	Unweath. LS w/ Marl/Shale Seams
8A4C-5818	37.7	126.2	3.14 (UU)	Unweath. Marl/Shale w/ LS Seams
8A4C-5818	41.9	149.6	97.26	Unweath. LS w/ Marl/Shale Seams
8A4C-5818	43.7	136.6	112.02	Unweath. LS w/ Marl/Shale Seams
8A4C-5818	45.5	139.1	167.04	Unweath. LS w/ Marl/Shale Seams
8A4C-5818	46.7	137.4	154.67	Unweath. LS w/ Marl/Shale Seams
8A4C-5818	48.7	137.1	160.40	Unweathered Limestone
8A4C-5819	25.8	107.3	2.07 (UU)	Weathered Marl/Shale

Operational Readiness Training Complex (FY12) Site (Re-Sited Buildings) (Cont.)

Boring	Depth, feet	γ_d, pcf	Q_u, tsf	Material Type
8A4C-5819	29.6	116.6	4.37 (UU)	Weath. Marl/Shale w/ LS Seams
8A4C-5819	33.2	129.9	3.25 (UU)	Weath. Marl/Shale w/ LS Seams
8A4C-5819	38.3	148.5	390.50	Unweath. LS w/ Marl/Shale Seams
8A4C-5819	39.4	146.6	274.12	Unweathered Limestone
8A4C-5819	42.7	133.3	5.01 (UU)	Unweath. Marl/Shale w/ LS Seams
8A4C-5819	47.2	132.5	121.86	Unweathered Limestone

ORTC (FY12) – Dining Facility Site Subarea

Boring	Depth, feet	γ_d, pcf	Q_u, tsf	Material Type
8A4C-5731	22.8	115.0	1.353	Weathered Marl/Shale
8A4C-5731	29.3	100.9	2.103	Weathered Marl/Shale
8A4C-5731	35.2	113.3	2.867	Weathered Marl/Shale
8A4C-5731	44.2	153.1	415.0	Unweathered Limestone
8A4C-5749	24.3	105.2	1.229	Weathered Marl/Shale
8A4C-5750	19.4	129.1	2.131	Weath. Marl/Shale w/ Limestone Seams
8A4C-5750	30.3	94.4	1.331	Weathered Marl/Shale
8A4C-5750	33.6	112.4	2.448	Weath. Marl/Shale w/ Limestone Seams
8A4C-5750	37.1	158.5	436.0	Unweathered Limestone
8A4C-5751	20.4	108.3	1.135	Weathered Marl/Shale
8A4C-5751	25.5	111.1	1.557	Weathered Marl/Shale
8A4C-5751	31.5	125.2	3.292	Weath. Marl/Shale w/ Limestone Seams
8A4C-5751	36.5	115.5	3.547	Weathered Marl/Shale
8A4C-5751	41.2	128.7	3.372	Unweath. Marl/Shale w/ LS Seams
8A4C-5751	41.8	151.0	377.0	Unweathered Limestone
8A4C-5751	48.2	115.3	2.108	Unweathered Marl/Shale
8A4C-5752	19.1	104.5	1.331	Weathered Marl/Shale
8A4C-5752	23.5	112.6	1.024	Weathered Marl/Shale
8A4C-5752	27.1	108.9	1.575	Weathered Marl/Shale
8A4C-5752	30.6	94.7	1.692	Weathered Marl/Shale
8A4C-5752	33.2	112.7	2.071	Weathered Marl/Shale
8A4C-5752	37.5	155.2	353.0	Unweathered Limestone

Operational Readiness Training Complex (FY12) – Water Tower Site

Boring	Depth, feet	γ_d, pcf	Q_u, tsf	Material Type
8A4C-5810	18.4	127.3	5.77 (UU)	Weathered LS w/ Marl/Shale Seams
8A4C-5810	25.8	124.2	32.52 (UU)	Weathered Limestone
8A4C-5810	36.5	125.8	60.77	Unweathered Limestone
8A4C-5810	42.5	133.6	63.25 (UU)	Unweathered Limestone
8A4C-5810	47.8	142.8	96.30	Unweathered Limestone
8A4C-5811	11.7	128.5	49.71 (UU)	Weathered Limestone
8A4C-5811	23.5	117.3	45.97 (UU)	Weathered LS w/ Marl/Shale Seams
8A4C-5811	36.9	131.8	88.70	Unweath. LS w/ Marl/Shale Seams
8A4C-5811	42.8	137.4	97.29	Unweathered Limestone

Operational Readiness Training Complex (FY12) – Water Tower Site (Cont.)

Boring	Depth, feet	γ_d, pcf	Q_u, tsf	Material Type
8A4C-5811	48.0	138.5	94.88	Unweathered Limestone
8A4C-5812	20.5	128.8	2.68 (UU)	Weathered LS w/ Marl/Shale Seams
8A4C-5812	28.1	116.1	42.60 (UU)	Weathered Limestone
8A4C-5812	34.0	121.0	65.40 (UU)	Weathered Limestone
8A4C-5812	37.3	133.0	52.01	Unweathered Limestone
8A4C-5812	43.5	140.6	90.91	Unweathered Limestone
8A4C-5812	48.6	139.1	59.70 (UU)	Unweathered Limestone
8A4C-5813	14.6	128.4	76.68	Weathered Limestone
8A4C-5813	20.7	128.2	3.25 (UU)	Weathered LS w/ Marl/Shale Seams
8A4C-5813	36.6	132.2	18.37 (UU)	Unweathered Limestone
8A4C-5813	41.8	133.1	85.57	Unweathered Limestone
8A4C-5813	46.0	139.6	82.81	Unweathered Limestone
8A4C-5814	9.5	125.8	87.50	Weathered Limestone
8A4C-5814	22.8	119.9	48.55 (UU)	Weathered Limestone
8A4C-5814	33.0	118.7	48.00 (UU)	Unweathered Limestone
8A4C-5814	38.9	131.6	66.06 (UU)	Unweathered Limestone
8A4C-5814	45.1	142.6	50.95	Unweathered Limestone
8A4C-5814	48.9	140.7	72.24	Unweathered Limestone
8A4C-5815	8.1	140.5	276.88	Weathered Limestone
8A4C-5815	10.7	123.4	41.60 (UU)	Weathered Limestone
8A4C-5815	16.4	124.2	33.65 (UU)	Weathered Limestone
8A4C-5815	21.9	122.5	28.20 (UU)	Weathered LS w/ Marl/Shale Seams
8A4C-5815	27.2	119.0	49.42 (UU)	Weathered LS w/ Marl/Shale Seams

(2) Controlled Expansion-Consolidation Testing and Swell Pressure Testing. Controlled expansion-consolidation (CEC) testing was performed on one specimen of high plasticity (CH) clay overburden collected at the Dining Facility site. The high plasticity (CH) clay overburden specimen was collected at a depth of 3.0 feet within boring 8A4C-5731. This high plasticity clay specimen has a liquid limit of 54 percent, a plastic limit of 20 percent (PI = 34 percent), and natural moisture content of approximately 12 percent. An expansion pressure (p_{exp}) of approximately 4.25 tsf was recorded during CEC testing of the high plasticity clay specimen. Based on CEC test results, and the considerations discussed above, the high plasticity clay specimen collected at a depth of 3.0 feet within boring 8A4C-5731 has a high to very high expansion potential (C_s = 0.050; p_{exp}/p_0 = 21.6) and a moderate consolidation potential (C_c = 0.149). Controlled expansion-consolidation test results are summarized in the table below and presented in Appendix C at the end of this report.

Controlled Expansion-Consolidation Tests

Boring	Depth, feet	LL	PI	P_{exp}/P_o	C_s	C_c	Material Type
8A4C-5731	3.0	54	34	21.6	0.050	0.149	CH Clay Overburden

(3) Permeability Testing. Laboratory permeability testing was performed on two undisturbed specimens of the high plasticity clay (CH) overburden soil collected within boring 8A4C-5731 at the Dining Facility site. A coefficient of permeability (k) of 3.78 x 10^{-8} cm/sec (approximately 7.44 x 10^{-8} ft/min) was measured for a CH clay specimen collected at an approximate depth of 3.0 feet within boring 8A4C-5731. A coefficient of permeability (k) of 2.25 x 10^{-8} cm/sec (approximately 4.43 x 10^{-8} ft/min) was measured for a CH clay specimen collected at an approximate depth of 8.0 feet within boring 8A4C-5731.

b. Field Testing. Dynamic Cone Penetrometer testing (DCP) was performed at the Operational Readiness Training Complex (FY12) site for pavement design considerations in borings 8A4C-5734, 10A-5737, 10A-5739, 10A-5742, 10A-5744, 10A-5746, 8A4C-5816, 8A4C-5817, 8A4C-5818, and 8A4C-5819. Dynamic Cone Penetrometer testing was performed at the Dining Facility site for pavement design considerations in borings 8A4C-5749, 8A4C-5750, 8A4C-5751, and 8A4C-5752. Dynamic Cone Penetrometer testing was performed at the Water Tower site at the approximate locations of borings 8A4C-5810 and 8A4C-5815. A DCP consists of a steel rod with a steel cone attached to one end and a sliding single-mass hammer. For this project, the DCP test was performed by driving the steel cone into the soil using a 10.1-pound sliding hammer dropped from a height of 22.6 inches (574 millimeters). The number of blows required for each 0.4 inch (10-mm) or higher of penetration was recorded as the "penetration per blow set"; therefore, the more penetration achieved per blow indicates that a "weaker" soil layer was encountered. Typically, penetration measurements are taken to a depth of 39.4 inches (1,000 millimeters) or when refusal is achieved. Refusal is defined as the point when the cone cannot penetrate the soil more than 0.4 inches (10 millimeters). Presented below are the average in situ strength parameters derived from the DCP tests.

DCP test results are also presented in Appendix D at the end of this report.

Operational Readiness Training Complex (FY12) Site

Depth, in	CBR, %	k, pci
0 – 6	3 - 60	97 - 404
6 – 12	3 - 76	102 - 462
>12	3 - 61	99 - 419

ORTC (FY12) Dining Facility Site Subarea

Depth, in	CBR, %	k, pci
0 – 6	2 - 9	88 - 186
6 – 12	3 - 11	93 - 200
>12	3 - 5	108 – 139

ORTC (FY12) Water Tower Site

Depth, in	CBR, %	k, pci
0 – 6	16 - 58	224 - 364
6 – 12	50	386
>12	n/a	n/a

5. Discussions. The following discussions are provided in support of the foundation and pavement design recommendations and requirements made herein for the proposed Operational Readiness Training Complex (FY12) and appurtenant pavement structures. It should be noted that the discussions presented herein are based on the results of the Government geotechnical field investigation and laboratory testing program conducted at the site, as described previously in this report, as well as engineering studies, and previous engineering experience with similar structures at Fort Hood. The Design-Build Contractor shall heed the information provided in this report and comply with the requirements and recommendations presented herein when developing his/her foundation and pavement designs. **The Design-Build Contractor's foundation and pavement designs are required to comply with and to meet or exceed the minimum foundation and pavement design requirements and recommendations presented herein.** The bidders for this design-build contract project may

use the subsurface boring log and lab testing data presented herein as the sole basis to formulate his/her foundation and pavement designs, or, at his/her option, the Design-Build Contractor may supplement the information provided herein by his/her own geotechnical field investigation and laboratory testing program. **Supplemental geotechnical field investigations conducted by the Design-Build Contractor shall be ONLY for the purpose of supplementing the data regarding the subsurface conditions provided by the Government geotechnical field investigation**. These supplemental efforts shall include conducting testing on soil and rock specimens as described in Section 4 (Testing). A minimum of **four (4)** additional test holes shall be drilled within the proposed footprint area (**foundation design borings**) for EACH of the following structures: the Officers Quarters, the four Barracks buildings, and the Battalion Headquarters, for a total of twenty-four (minimum) additional test holes (six structures x 4 supplemental test holes per structure = twenty-four additional test holes) to supplement the data for the foundation design. Additional test holes for the foundation design shall each be drilled to a minimum depth of 50.0 feet below existing grade, with the exception of the supplemental borings drilled for the Battalion Headquarters, which shall be drilled to a minimum depth of 30.0 feet below existing grade. As previously stated, it is the understanding of CESWF-EC-DG that the new pavement structures for the project will be designed and constructed separately from the Design-Build contract efforts. However, if there are any pavement features which the Design-Build Contractor may be responsible for furnishing the final design, the subsurface conditions in these pavement areas shall be investigated by drilling borings to a minimum depth of 10.0 feet below existing grade. Tests on disturbed specimens of overburden soils shall include classification (ASTM D 2488), moisture content (ASTM D 2216), grain size analysis (ASTM D 422), and Atterberg limits (ASTM D 4318). Undisturbed (shelby tube) specimens of the overburden soils shall also be collected in any supplemental geotechnical field investigations; tests on undisturbed specimens of the overburden soil shall include the tests listed for disturbed specimens, as well as controlled expansion-consolidation testing (ASTM D 2435 and ASTM D 4546 (Method C)),

density (Corps of Engineers Engineer Manual (EM) 1110-2-1906, Appendix II, Par. 4, Displacement Method), and strength testing (ASTM D 2850). Core specimens of at least 4-inch diameter of the weathered marl/shale and limestone primary shall be collected and subjected to testing to include moisture content (ASTM D 2216), Atterberg limits (ASTM D 4318), density (Corps of Engineers EM 1110-2-1906, Appendix II, Par. 4, Displacement Method), controlled expansion-consolidation (for marl/shale core specimens) (ASTM D 2435 and ASTM D 4546 (Method C)), and strength (ASTM D 2464 for marl/shale core specimens; ASTM D 2938 for limestone core specimens).

Development of the final foundation designs (and pavement designs if required) is the responsibility of the Design-Build Contractor; however, the Design-Build Contractor's final foundation and pavement designs shall be in full compliance with the requirements prescribed herein (including foundation type, foundation design parameters, and minimum pavement sections and pavement design criteria and parameters).

THE DESIGN-BUILD CONTRACTOR IS NOT PERMITTED TO UTILIZE FINAL FOUNDATION AND PAVEMENT DESIGNS THAT ARE LESS RIGOROUS AND STRINGENT THAN THE MINIMUM DESIGNS SPECIFIED HEREIN (I.E., THAT DO NOT MEET OR EXCEED THE MINIMUM REQUIREMENTS SPECIFIED HEREIN). IF THE DESIGN-BUILD CONTRACTOR'S ADDITIONAL SOILS INVESTIGATIONS, LABORATORY TESTING, AND ENGINEERING ANALYSES SHOW THAT A MORE STRINGENT AND RIGOROUS DESIGN IS REQUIRED ABOVE THE MINIMUM FOUNDATION AND PAVEMENT DESIGN REQUIREMENTS SPECIFIED HEREIN, IT IS THE RESPONSIBILITY OF THE DESIGN-BUILD CONTRACTOR TO ENSURE THEIR FINAL DESIGNS MEET THE MORE STRINGENT REQUIREMENT.

The Design-Build Contractor shall provide to the Government engineering studies and design calculations that support the foundation and pavement design recommendations they or their associates propose. The Design-Build Contractor's foundation and pavement design

recommendations shall be reviewed for technical adequacy and compliance with the requirements and criteria established herein and in the Request for Proposal (RFP). Specific requirements for the Design-Build Contractor's foundation and pavement design analysis are provided in section 6.c.

a. Soil Activity Considerations. The Operational Readiness Training Complex (FY12) site is characterized by typically high plasticity clay, clayey and gravelly sand, and clayey and sandy gravel overburden strata that are underlain by weathered and unweathered interbedded marl/shale and limestone primary strata. Liquid limits measured from representative specimens of the residual clayey overburden soils and marl/shale primary within the upper 25 feet range from 30 to 100 percent, plastic limits vary from 13 to 32 percent (with plasticity indices ranging from 13 to 70 percent), and in situ moisture contents vary between 10 and 28 percent. These strata are considered to be moisture deficient to a depth of at least 25 feet below existing grade. Based on the results of controlled expansion-consolidation testing, the high plasticity clay overburden has a high to very high expansion potential and a moderate consolidation potential. Based on controlled expansion consolidation testing performed for previous USACE geotechnical studies at Fort Hood, the weathered marl/shale primary typically has a high expansion potential and a moderate to high consolidation potential. Based on the results of controlled expansion-consolidation testing performed on the CH clay specimen, and on the results of controlled expansion-consolidation testing previously performed on specimens of the high plasticity clayey overburden soils and the weathered marl/shale, and engineering judgment, the heave potential of the highly plastic clayey overburden soils and the weathered marl/shale primary is anticipated to be between approximately 4 and 6 inches at this site. The settlement potential of the highly plastic clayey overburden soils and the weathered marl/shale primary is anticipated to be between approximately 1 and 3 inches, based on settlement calculations considering placement of up to 5 feet of fill. Considering a mat foundation with an allowable bearing capacity of 2.0 ksf (net) bearing approximately 2 feet below existing grade, and a mat foundation bearing in fill placed up to 3 feet above existing grade, the

settlement potential of the overburden clay and marl/shale primary is anticipated to be between approximately 3 and 4 inches. Special foundation and subgrade preparation requirements for Operational Readiness Training Complex (FY12) facilities are provided herein to ensure the structure(s) withstand the effects of the high shrink-swell subsurface conditions.

b. Foundation Design Considerations. The foundation design recommendations and requirements presented in this report are based on criteria contained in *UFC 3-220-03FA, UFC 3-220-07*, and engineering judgment.

The proposed Barracks buildings are anticipated to be four-story structures, while the proposed Officers Quarters and Battalion Headquarters are anticipated to be two-story and single-story structures, respectively. Column loads for the Officers Quarters and Barracks are anticipated to be moderate (generally between 100 and 200 kips, although column loads for the Barracks may exceed 200 kips), while column loads for the Battalion Headquarters are anticipated to be low to moderate (generally between 25 and 150 kips). Based on the anticipated size, layout, and functional requirements of the new facilities, as well as the site-specific subsurface conditions present, a reinforced concrete straight-shaft drilled pier foundation system is considered the best-suited foundation system for the proposed Officers Quarters and Barracks buildings. Reinforced concrete straight-shaft piers have proven to be a highly successful foundation system at Fort Hood. Reinforced concrete underreamed piers, however, are not considered to be a viable deep foundation system. This is due to the difficulty in constructing the underream within the hard limestone primary. Also, the limestone primary can be assigned an allowable bearing capacity large enough that pier underreams are not considered warranted to support the anticipated magnitude of column loads distributed to the pier foundations.

Due to its relatively small size and rectangular building footprint, a reinforced concrete straight-shaft drilled pier foundation system is not considered necessary to support the anticipated structural loads for the Battalion Headquarters. In addition, the subsurface materials at the location of the Battalion Headquarters appear to consist of high plasticity clays

and highly plastic marl/shale primary (with relatively minor interbedded limestone seams). Therefore, the uplift potential at the location of the Battalion Headquarters is considered high. Based on the extensive experience of the Fort Worth District with facility design and construction in the highly expansive subsurface conditions present at Fort Hood and other regional military reservations with similar high plasticity subsurface conditions, specific factors must be implemented to counteract uplift forces on pier foundations. The load on the piers must be maximized and adequate reinforcing steel must be included in the piers to prevent failure due to tensile stress induced by heave forces. Based on the relatively low column loads for the Battalion Headquarters, it is anticipated that a properly designed monolithic shallow foundation system consisting of either a reinforced concrete ribbed mat or flat mat slab can be constructed as or more economically than a properly designed deep pier foundation, and provide equal or superior life-cycle performance for this facility compared to a deep pier foundation. Reinforced concrete ribbed mat slab and flat mat slab foundation systems have demonstrated good performance for similar structures at Fort Hood. These two shallow foundation systems, when properly designed and constructed, will act monolithically when subjected to shrink-swell movements of the subsurface materials, in contrast to other, unsuitable shallow foundation systems such as spot and continuous spread footings. A disadvantage of slab foundations is that to incorporate adequate monolithical behavior, yet minimize stress concentrations induced by irregular building geometries, additional stiffness at corners and isolation of slab units is needed to limit deflections to tolerable limits not affecting the facade and interior wall/ceiling finishes. Such irregular geometries often yield stress induced cracks in gypboard and CMU walls and create separations at wallbond ceiling joints. Therefore, slab designs should incorporate appropriate stiffness and isolation measures. A reinforced concrete ribbed mat or flat mat slab foundation system may also be considered for the Officers Quarters and the Barracks.

Therefore, the foundation system used for the proposed Officers Quarters and Barracks buildings shall be limited to a deep foundation system consisting of reinforced concrete

straight-shaft piers or a shallow foundation system consisting of either a monolithic reinforced concrete ribbed mat or flat mat slab. The foundation system used for the proposed Battalion Headquarters shall be limited to a shallow foundation system consisting of either a monolithic ribbed mat or flat mat slab, designed in accordance with the criteria and minimum requirements specified herein. ***IT IS REQUIRED THAT ALL FOUNDATION, FLOOR SLAB, AND EARTHWORK DESIGNS AND CONSTRUCTION BY THE DESIGN-BUILD CONTRACTOR AND THEIR ASSOCIATES SHALL COMPLY WITH THE CRITERIA AND MINIMUM REQUIREMENTS SPECIFIED HEREIN.***

c. Pavement Design Considerations. The pavement designs presented in this report are based on criteria contained in *UFC 3-250-01FA, UFC 3-250-18FA*, and engineering judgment.

(1) Traffic Types and Conditions. It is anticipated that new pavement structures required for the Operational Readiness Training Complex (FY12) will include primary access drives, service drives, fire/emergency medical vehicle access lanes, service drives, concrete aprons in front of trash dumpster pads, concrete aprons in front of loading docks, and privately-owned vehicle (POV) parking areas. Although it is the understanding of CESWF-EC-DG that design and construction of the new pavement structures will be accomplished through a Design-Build-Build (D-B-B) construction mode (separately from the scope of work for the Design-Build Contractor for the building structures addressed herein), these minimum pavement sections are also provided herein for the Design-Build Contractor to ensure uniformity between this project and the D-B-B ORTC (FY12) Dining Facility project, which will require similar new pavement features. The Design-Build Contractor shall utilize and comply with these minimum pavement sections for any pavement structures which they may be required to either construct or perform reconstruction for due to construction activities. It is assumed that fire/emergency access lanes, and aprons in front of loading docks and trash dumpster pads will be rigid pavement structures. The primary access lanes, service drives, and POV parking areas are anticipated to be flexible pavement structures. However, alternative rigid and flexible pavement designs are provided for these pavement structures, if needed. The

governing vehicle type (Traffic Category) for the primary access drive, fire/emergency medical vehicle access lanes, service drives, and aprons in front of loading docks and trash dumpster pads is anticipated to be large multi-axle trucks (including fire fighting vehicles, trash trucks, tractor trailers, etc.) (Category IVA Traffic). The types of vehicles to occupy the POV parking areas are anticipated to be limited to passenger cars and trucks. The primary access lanes are anticipated to experience between more than 25 but fewer than 250 vehicular traffic passes per hour of Category IVA traffic (for a Street Class of E and a pavement Design Index equal to 5). Fire/emergency medical vehicle access lanes, service drives, and aprons in front of loading docks and trash dumpster pads are anticipated to experience fewer than 25 passes per hour of Category IVA traffic (for a Street Class of F and a pavement Design Index equal to 4). The POV parking areas are anticipated to experience at least 25 and potentially greater than 250 (but fewer than 750) vehicular passes per hour, depending on the size of the parking area (for a Street Class of E or D and a pavement Design Index equal to 2). Based on criteria contained in the aforementioned United Facilities Criteria, the following traffic conditions were assigned:

Pavement Structure	Traffic Category	Street Class	Design Index
Primary Access Drives	IVA	E	5
Emergency Access Lanes	IVA	F	4
Service Drives	IVA	F	4
Apron (Trash)	IVA	F	4
Apron (Trash)	IVA	F	4
POV Parking Areas	II	E/D	2

(2) Pavement Design Parameters. California Bearing Ratio (CBR) and plate bearing tests were not performed for this project. Instead, dynamic cone penetrometer (DCP) testing was conducted to evaluate the raw subgrade for pavement design considerations. The penetration resistance obtained from the DCP test is a measure of the soil's relative density, which in turn is used to derive "in situ" CBR and modulus of subgrade reaction values.

The average in situ CBR values measured within the upper 12 inches of soils tested across the entire Operational Readiness Training Complex (FY12) site (including the boring/DCP test locations specified for the ORTC (FY12) Dining Facility site) range from

approximately 2 to 76 percent, and below this depth, CBR values ranging from 3 to 61 percent were recorded. Modulus of subgrade reaction values measured within the upper 12 inches of soils tested across the entire Operational Readiness Training Complex (FY12) site (including the boring/DCP test locations specified for the ORTC (FY12) Dining Facility site) range from 88 to 462 pci, and below this depth, modulus of subgrade reaction values ranging from 99 to 419 were recorded. The average in situ CBR values measured within the upper 12 inches of soils tested at the ORTC (12) Water Tower site range from approximately 16 to 58 percent. Modulus of subgrade reaction values measured within the upper 12 inches of soils tested at the ORTC (FY12) Water Tower site range from approximately 224 to 386 pci. DCP testing at the ORTC (FY12) Water Tower site met 'refusal' at depths of between 6 inches and 12 inches below existing grade. In the past, the clayey subgrade at Fort Hood has been assigned CBR values ranging from 4 to 6 percent when compacted to 90 percent of laboratory maximum density. Previously conducted plate-bearing tests indicate that modulus of subgrade reaction values on the order of 100 pci to 150 pci can be assigned to the in situ soils when compacted to 90 percent of laboratory maximum density. The CBR and subgrade modulus values determined from in situ DCP testing are variable but in the range of the historical CBR and subgrade modulus values described above. The higher CBR and subgrade modulus values determined at the re-sited building locations during the subsequent geotechnical field investigation are attributed to the presence of gravel and/or weathered primary materials and to the more desiccated state of the in situ soils during the supplemental geotechnical site investigation (conducted in June and July 2011). Based on these considerations, and the potential that some pavement sections may be built in fill sections, design CBR and modulus of subgrade reaction values of 4 percent and 100 pci, respectively, are assigned to the raw subgrade when compacted to 90 percent of laboratory maximum density (ASTM D 1557).

(3) Material Sources. Material sources in central Texas are capable of producing a high quality crushed aggregate for concrete mixes to meet strength requirements. For this reason, a concrete flexural strength of 650 psi at 28 days was considered in the design

of rigid pavements. To date, Alkali/Silica Reaction with Portland Cement Concrete has never been a problem when using local aggregate sources.

6. Recommendations and Requirements. The following foundation and pavement design recommendations are based on the results of the field investigation, laboratory testing, engineering studies.

As previously stated, the Design-Build Contractor is not permitted to utilize final foundation and pavement designs that are less rigorous and stringent than the minimum designs specified herein (i.e., that do not meet or exceed the minimum requirements specified herein). If the design-build contractor's additional soils investigations, laboratory testing, and engineering analyses show that a more stringent and rigorous design is required above the minimum foundation and pavement design requirements specified herein, it is the responsibility of the design-build contractor to ensure their final designs meet the more stringent requirement.

a. Foundation Design Recommendations and Requirements.

(1) Foundation System. Only the following foundation systems shall be allowed for the proposed Officers Quarters and Barracks buildings: 1) reinforced concrete straight-shaft piers; 2) a reinforced concrete ribbed mat slab, or 3) a reinforced concrete flat mat slab. Only the following foundation systems shall be allowed for the proposed Battalion Headquarters: 1) a reinforced concrete ribbed mat slab, or 2) a reinforced concrete flat mat slab. ***The proposed Water Tower should be supported on a reinforced concrete straight-shaft drilled pier foundation system.*** All foundation systems shall be designed in accordance with the criteria and minimum requirements specified hererin. **NO OTHER FOUNDATION SYSTEMS SHALL BE ALLOWED.** ***THE FOLLOWING FOUNDATION SYSTEMS ARE SPECIFICALLY PROHIBITED: SPOT AND/OR CONTINUOUS SPREAD FOOTINGS, REINFORCED CONCRETE DRILLED AND UNDERREAMED PIERS, AND AUGER CAST PILES.***

(a) Reinforced Concrete Straight-Shaft Drilled Piers. The following foundation system design requirements are provided for reinforced concrete straight-shaft drilled piers. The bearing stratum for straight-shaft pier foundations for the Officers Quarters and the Barracks buildings shall be the dark gray unweathered limestone primary. The reinforced concrete straight-shaft drilled piers for these three facilities shall be founded at least 3.0 feet or one pier shaft diameter, whichever is greater, within the dark gray unweathered limestone primary, and NO SHALLOWER than elevation 715.0 feet (NGVD). ***Piers for the Water Tower shall be founded at least 3.0 feet or one pier diameter, whichever is greater, within the dark gray unweathered limestone primary, and NO SHALLOWER than elevation 860.0 feet (NGVD).*** Piers for the Officers Quarters and the Barracks buildings, and the Water Tower, founded within the dark gray unweathered limestone primary at these respective elevations shall be sized for an allowable end-bearing capacity that shall not exceed 20.0 ksf (net), based on a factor of safety that exceeds 3. ***Due to the interbedded nature of the limestone and marl/shale formation, and to ensure sound end-bearing material and minimize pier settlement potential, the Contractor shall be required to found the piers (i.e., finalize pier drilling operations) on a hard limestone seam/layer rather than a soft marl/shale layer – even if that means the piers must be drilled slightly deeper than the minimum pier depths/elevations required herein.*** **If a marl/shale seam is present at the specified minimum founding depth during drilling operations, the pier shall be extended deeper to be founded on competent limestone.** Sizing the piers for these allowable bearing capacities, by material, will ensure that post-construction movements in the form of settlement will be negligible. The piers can be designed for both end bearing and skin friction if additional load-carrying capacity is required. An allowable side shear value of 750 psf (net) (per foot) shall be used for that portion of the pier shaft embedded within the limestone and marl/shale primary. For this design condition, the effective length (L_{eff}) shall start 10 feet below existing grade or 5 feet below top of pier, whichever is deeper, and extend to within one shaft diameter of the final bearing depth. Individual piers can be extended if additional load-carrying capacity in side

shear is required. Based on structural requirements, the load used to size the piers shall consist of full dead load plus that portion of the live load that acts more or less continuously, usually 50 percent. ***If the piers are designed for both end bearing and skin friction, the foundation notes need to reflect this condition.***

All pier shafts shall be a minimum of 18 inches in diameter to facilitate clean out and inspection of the pier holes during construction. Piers drilled deeper than 40.0 feet shall be a minimum of 24 inches in diameter. **A minimum of 1.0 percent reinforcing steel shall be placed in each pier shaft, based on the cross-sectional area of the pier to resist heave induced by the high plasticity overburden soils and weathered marl/shale primary.** A clear distance of at least three shaft diameters shall be maintained between individual piers. The larger size shall be used for this condition when shaft sizes differ. A minimum **12-inch** void shall be maintained beneath all grade beams, and the void area shall be protected with concrete retainer blocks.

Concrete slump for piers shall be from 6 to 8 inches.

The typical pier detail shall require the upper 5 feet of the pier shaft to be formed with a wax impregnated sonotube to eliminate a mushroom shaped pier top. The detail shall also show a wedge-shaped mound of Select Clay Backfill placed around the pier top that is 1 foot high and sloped at a 1V-on-2H slope. This will prevent water from ponding directly around the top of the pier. These requirements are illustrated on Sheet B102.

The new construction may be in areas that will require the demolition of some existing facilities and their structural elements. The foundation systems used by these buildings are unknown at the time of this report. However, smaller buildings are anticipated to utilize a reinforced concrete ribbed or flat mat foundation system, or possibly a shallow spread footing foundation, whereas larger buildings are anticipated to utilize a reinforced concrete drilled pier foundation system (with either straight-shaft or underreamed piers potentially used). Shallow mat slab foundations (or footing foundations, if used by the existing buildings) can be demolished and removed from the site, and the excavation backfilled with engineered fill, as

specified below. ***However, existing pier foundations affected by these demolition activities shall be abandoned <u>in-place</u> – extraction of these piers <u>SHALL NOT</u> be allowed.*** Abandoned piers shall be cut off at least 3 feet below the top of the fill surface in the crawl space (i.e., below the fill surface beneath the minimum 12-inch void space/crawl space). **Compacted select clay material shall be used to backfill excavations to cut off abandoned piers and excavations for shallow foundation system demolition/removal with the following exception: excavation for demolition/removal of existing foundations within areas of new slab-on-grade construction shall be backfilled with compacted nonexpansive fill, in accordance with the requirements specified in Paragraph 6.a.(3), below.** Select clay backfill for used for this purpose shall be compacted to at least 90 percent of laboratory maximum density as determined in accordance with ASTM D 1557. The following requirements for minimum separation between existing and proposed piers are provided for the structural designer:

- For proposed piers adjacent to existing straight-shaft piers, a **4-foot** minimum separation distance between the ***outside walls*** (i.e., ***not*** center-to-center spacing) of the proposed and existing piers shall be used.
- For proposed piers adjacent to existing underreamed piers, a **6-foot** minimum separation distance between the ***outside tip*** of the existing belled pier and the ***outside wall*** of the proposed straight-shaft pier shall be used.

The contractor shall have temporary steel casing and pumps at the job site prior to construction of drilled piers. Groundwater should be anticipated during drilling operations; therefore, the above information should be provided in the contract documents as foundation notes. ***It should be assumed that approximately 100 percent of all piers will have to be cased to at least 40 feet below existing grade. Individual bid items should be provided in the contract bid schedule for each shaft and casing size. Final pier depths shall be determined in the field by the Contracting Officer's representative.***

Drilling equipment shall be of suitable type and of sufficient size to satisfactorily

perform the required drilling for the soil conditions identified. To this end, all drill rigs shall have a 6-inch Kelly bar and be capable of producing minimum torque and crowd capacities of 50,000 lb-ft and 30,000 lb-ft, respectively.

The above criteria for drilled pier construction should be included in guide specification UFGS-31 63 26 DRILLEDCAISSONS.

(b) Reinforced Concrete Ribbed Mat or Flat Mat Slab. The proposed Battalion Headquarters shall be supported on either a reinforced concrete ribbed mat slab or flat mat slab foundation system. A monolithic reinforced concrete ribbed mat slab or flat mat slab are also approved foundation systems for the Officers Quarters and the Barracks buildings. ***The mat slabs shall be conventionally reinforced – POST-TENSIONED SLABS ARE NOT ALLOWED.*** Based on the plasticity level of the near surface clayey and gravelly soils, the mat slabs shall be analyzed and designed for 1.0 inch of long-term differential movement. For this reason, interior ribs for ribbed mat slabs shall be spaced no further than 20 feet center-to-center, and diagonal stiffener ribs shall be placed at each corner of the mat slab. Additional stiffness may be needed for irregular slab geometries. Design of the mat slabs shall meet the minimum requirements as presented in ***CESWD-ED-TS/G Criteria Letter, dated 29 January 1988 – Design Criteria for Ribbed Mat Foundations, SWDED-G Criteria Letter, dated 16 April 1987 – Criteria for Developing Geotechnical Design Parameters for SWD Ribbed Mat Design Methodology***, and the recommendations and requirements provided herein.

Interior and exterior beams for ribbed mat slabs shall bottom a minimum of 24 inches below outside finished grade. An allowable bearing capacity of 2.0 ksf (net) shall be used to size the beams. For this phase of design, it should be noted that (1) the structural load is supported solely on the beam and the beam intersections, (2) load transfer occurs over the effective beam width, and (3) the beam and soil remain in contact. Beam intersections should be widened at column locations to accommodate the above allowable bearing value for the anticipated load condition. The load used to size the beams shall consist of full dead load plus that portion of the live load that acts more or less continuously, usually 50 percent.

The ribbed mat slab foundations shall incorporate adequate stiffness such that the deformations do not exceed the structural tolerance of any elements in the foundation or superstructure. Analyses shall consider a minimum vertical separation of the foundation slab and beams from the subgrade of 1.0 inch at the outside of all perimeter beams, with loss of support beneath the foundation over a horizontal distance of not less than 6.5 feet. This loss of support condition corresponds to the **center lift mode**. Additionally, **edge lift analyses** shall consider a minimum edge moisture variation distance equal to 3.0 feet, and an edge lift heave of 1.0 inch should be used in the design of the ribbed mat slab. This edge lift heave corresponds to an applied structural pressure of 100 psf. For edge lift considerations, two additional combinations of pressure and swell are required. For an allowable bearing capacity of 2.0 ksf, an edge lift heave of 0.75-inch can be expected to occur. At an ultimate bearing capacity of 6.0 ksf, 0.50-inch of heave should be anticipated. It should be noted that these anticipated heave amounts are based on the removal of 5.0 feet of existing materials under building floor slabs and replacement with compacted nonexpansive fill, as required herein. If additional soils investigations, testing, and analyses show that a more stringent design is required to successfully mitigate total and differential movements due to settlement and/or heave, the foundation shall be designed accordingly.

A modulus of subgrade reaction equal to 200 psi/inch shall be used when analyzing the ribbed mat slabs to determine in-service deformations. This value, however, shall be factored to account for width effects such that $k_{design}=k_1/(B_{eff})$, where B_{eff} is the effective beam width in feet. Design of the ribbed mat slabs may use the *SWD-AEIM* sections as a minimum stiffness "first approximation".

If a reinforced concrete flat mat slab foundation system is used for the Battalion Headquarters or other project buildings, the flat mat shall have a uniform thickness of not less than 2.0 feet. An allowable bearing capacity of 2.0 ksf (net) shall be used to size the mat foundation. The mat should be tapered as required to ensure the perimeter of the slab extends to a constant elevation and is at least 24 inches below outside finish grade. Flat mat slabs also

shall incorporate adequate stiffness such that the deformations do not exceed the structural tolerance of any element of the foundations or superstructures nor cosmetic cracking of interior and exterior finishes. Control joints/panels shall be incorporated within interior finishes and exterior facades to help control potential cracking due to slab movements. The load used to size the flat mat slab shall consist of full dead load plus that portion of the live load that acts more or less continuously, usually 50 percent.

If additional investigations and/or analyses by the Design-Build Contractor's geotechnical firm indicate greater movements or more stringent requirements of mat stiffness are warranted, the mat shall be designed accordingly.

The mat slabs will, by design, be supported on-grade. A polyethylene vapor barrier (10-mil minimum thickness) and a minimum 6-inch capillary water barrier shall be placed beneath the mat slab. The following requirements concerning demolition of existing building foundations and slabs shall apply for areas of new mat slab or slab-on-grade construction.

As previously discussed, the new construction may be in areas that will require the demolition of some existing facilities and their structural elements. **If the existing buildings/structures are determined to have a reinforced concrete drilled pier foundation:** ***existing piers shall be abandoned in-place – extraction of these piers SHALL NOT be allowed.*** Abandoned piers shall be cut off AT LEAST 3 FEET below the top of the base of the excavation (cut) for the new building construction (per requirements for existing soil removal and replacement with compacted nonexpansive fill specified herein). **Compacted select clay material shall be used to backfill excavations to cut off abandoned piers.** Select clay backfill for used for this purpose shall be compacted to at least 92 percent of laboratory maximum density as determined in accordance with ASTM D 1557. **If the existing buildings/structures are determined to have a shallow foundation system:** t***he existing shallow foundation system within the proposed building footprint shall be removed in its entirety, and the excavation backfilled with compacted nonexpansive fill in accordance with the requirements specified herein for compacted nonexpansive fill placed below mat floor***

slab and foundations.

(c) Small Support-type Structures. Covered pavilions and any other small (≤500 GSF) support-type structures, if applicable, can be supported on a reinforced concrete slab-on-grade with turned-down edge beam foundation. The turned-down edge beam shall extend a minimum of 12 inches below outside finished grade, and shall be sized for a safe bearing pressure of 2,000 psf (net). Subgrade preparation shall be in accordance with the requirements specified below for floor slabs founded on-grade.

(2) Ground-Level Floor Slab System(s).

(a) Structurally-Supported Floor Slabs. For new facilities utilizing a reinforced concrete straight-shaft drilled pier foundation system, ground-level floor slabs in deformation-sensitive areas of the new facilities that cannot tolerate 1 inch of differential movement shall be supported above a minimum **12-inch** void. At a minimum, this would include kitchen/food preparation areas, restrooms, and other sensitive areas. Stoops, porches, approaches, etc. shall also be structurally-supported to compensate for the active subgrade. If the design requires the incorporation of a crawl space beneath the building, the underfloor area shall be sloped to collection points and drained using sumps and pumps. Swales shall drain away from pier column locations such that ponded water never occurs adjacent to piers.

(b) Slab-On-Grade. For new facilities utilizing a reinforced concrete straight –shaft drilled pier foundation system, floor slabs within the proposed structure in areas that can tolerate up to 1 inch of differential movement can be supported on-grade. The mat slab systems will, by design, be supported on-grade.

(3) Subgrade Preparation and Fill Requirements.

(a) Structurally-Supported Floor Slabs. Subgrade preparation under structurally-supported floor slabs and grade beams shall consist of removing the upper 12 inches of existing materials and replacing with a compacted select backfill. Any additional fill required to raise the subgrade to the final elevation(s) below the building floor slab and grade beam shall be select material as well. Select fill should be placed in controlled lifts not

exceeding 8 inches in loose thickness and compacted to at least 90 percent of laboratory maximum density as determined in accordance with ASTM D 1557. For portions of the building pad that will be a cut section, subgrade preparation should consist of removing all existing materials to a depth that allows a minimum **12-inch** void to be formed below the floor slab and grade beam. The upper 6 inches of existing subgrade exposed after cut and/or fill operations shall be scarified, moistened, and recompacted to the same density required for select fill.

(b) Slab-On-Grade. For mat slab foundations and for floor slabs placed on-grade (if used in conjunction with a straight-shaft drilled pier foundation), the upper 5.0 feet (minimum) of existing soils within the proposed building footprint shall be removed and replaced with compacted nonexpansive backfill, which should limit the magnitude of predicted movement to approximately 1 inch or less. Any additional fill required to achieve the final subgrade elevation below the floor slab system shall be nonexpansive material as well. The upper 6 inches of existing subgrade exposed after excavation operations, or cleared prior to fill placement shall be scarified, moistened, manipulated, and recompacted to the same density required for nonexpansive fill materials. Nonexpansive fill shall be placed in controlled lifts not exceeding 8 inches in loose thickness and compacted to at least 95 percent of laboratory maximum density (in accordance with ASTM D 1557).

If additional investigations and/or analyses by the Design-Build Contractor's geotechnical firm indicate greater movements or more stringent requirements of mat stiffness are warranted, the mat shall be designed accordingly.

Soil-supported floor slabs (if used) shall be isolated from any portion of the building structure and foundations using ½-inch (minimum) expansion joints. Transitional areas, such as door openings, shall be articulated to prevent offsets from occurring. A polyethylene vapor barrier (10-mil minimum thickness) and a minimum 6-inch capillary water barrier shall be provided beneath floor slabs supported on-grade. NOTE: The vapor barrier and capillary water barrier are not required for exterior mat slabs-on-grade that are open/exposed to the

elements (e.g. mechanical equipment pads) and not connected to the building.

Based on previous experience, if nonexpansive fill is placed outside the limits of the building footprint, the relatively higher permeability of the nonexpansive fill will allow moisture to infiltrate to the highly expansive soils adjacent to and beneath the foundation, potentially resulting in heave of the foundation. To limit moisture penetration to the area around and beneath the foundation, excavated areas beyond the limits of the building footprint shall be backfilled with select clay backfill materials. This select clay cap shall be a minimum of 2 feet in thickness and shall extend from the building perimeter to the limits of the excavation (completely capping/covering the compacted nonexpansive fill). Select clay backfill materials should be compacted to at least 92 percent of laboratory maximum density (with all other subgrade preparation and fill placement requirements being the same as those for nonexpansive fill).

(4) Material Testing Requirements. Testing shall be the responsibility of the contractor to ensure that the subgrade, fill, and backfill materials are properly compacted. To this end, the Design-Build Contractor shall comply with the minimum testing frequencies specified in the RFP. The following minimum testing frequencies should be included in the contract specifications:

- In-place density of the subgrade, fills, and backfills shall be performed for every 2,500 square feet per lift in accordance with ASTM D 1556 or ASTM D 6938.
- Optimum Moisture and Laboratory Maximum Density of nonexpansive fill and backfill shall be performed for every 500 cubic yards or when any change in material occurs.

(5) Below-Grade Structures (Including Retaining Walls) (If Applicable). The following information is provided for the design of all below-grade structures, if applicable. An at-rest lateral earth pressure coefficient (k_o) of 0.7, an angle of internal friction (ϕ) of 28°, a cohesion value (c) of 100 psf, and an allowable bearing capacity of 2,000 psf shall be used. The backfill material shall be assumed to have a moist unit weight of 125 lb/ft^3 and all backfill

shall be nonexpansive or select material, as specified herein. The retaining wall analyses and designs shall also account for surcharge loadings (e.g., due to vehicular traffic) where applicable. Drainage and backfill zoning details for basement/below grade wall construction are shown on Sheet B102.

(6) Drainage Conditions. Proper site drainage is imperative to ensure satisfactory long-term foundation performance. Exterior grading adjacent to the buildings shall be sloped away from the structures a minimum of 5 percent for the first 10 feet. Runoff from the roofs shall be adequately discharged away from foundation edges. In no case should water be allowed to pond adjacent to or beneath the buildings, both during and after construction.

(7) Care of Water. Drainage of ground and surface water from the project site continually throughout the construction contract is essential. The contractor shall be required to protect the excavation and all constructed work throughout the life of the contract by means of ditches, berms, sumps with pumps, and any other means required to continually and effectively remove water from the site at all times. **Ponding of water in the excavation or around the piers is unacceptable at any time.** In addition, site excavations to include the crawl space excavation, utility trenching, grading, and retention basins shall be constructed so as not to supply water directly or indirectly to the building or underlying active clayey soils and marl/shale. Such exposure of the underlying active clayey soils and marl/shale to surface runoff during construction could extend the active zone (via fractures) to much greater depths within the marl/shale. This would activate these highly expansive materials and result in expansion pressures on the foundation elements that could create distress on the structural system of the facility. ***These requirements shall be reflected in the specifications and in the structural notes.***

The designer shall grade the site to ensure positive drainage of all water away from the structure. Crawl spaces will be graded to collect water and carry it to sumps. The sumps will

drain by gravity or be equipped with automatic pumps to direct the water to the storm drainage system. Sumps will be located at least 10 feet away from any pier in the crawlspace.

(8) Mechanical Connections. All exterior mechanical connections shall be of the flexible type. Flexible connections shall be capable of resisting a minimum of 1 inch of both vertical and horizontal movement. All mechanical/structural connections between slabs on grade and structurally supported units or building perimeter entry/exit points must be designed and constructed to handle up to 1 inches of vertical movement. All condensate lines shall drain away from foundation edges. It is recommended that below-grade utility lines connecting to the buildings be aligned under the centerline of the respective building footprint. The use of exterior lines connecting to the buildings by numerous utility trenches is discouraged, as this would create high permeability pathways for moisture to gain access to, and activate, the expansive clay and marl/shale materials within the building footprint.

(9) Backfill Adjacent to Exterior Grade Beam Excavation. Use ***select clay backfill*** adjacent to exterior grade beam excavation to minimize water penetration to expansive subsoils.

(10) Foundation Material Definitions.

(a) Satisfactory Materials. Satisfactory materials include materials classified in ASTM D 2487 as GW, GM, GC, GP, SW, SP, SM, SC, CL, and CH and shall be free of trash, debris, roots or other organic matter, or stones larger than 3 inches in any dimension.

(b) Unsatisfactory Materials. Unsatisfactory materials include materials classified in ASTM D 2487 as Pt, OH, OL, ML, MH and any other materials not defined as satisfactory.

(c) Nonexpansive Soils. Nonexpansive soils shall meet the requirements of Texas Department of Transportation Standard Specification for Base Course, Item 247, Type A, Grade 1 or 2, with plasticity index of not less than 4 percent nor greater than 12 percent when tested in accordance with ASTM D 4318.

(d) Select Soils. Select soils are satisfactory material having a liquid limit of 35 percent or less and a plasticity index not less than 8 nor greater than 18 when tested in accordance with ASTM D 4318.

(e) Select Clay Backfill. Select clay backfill shall be a satisfactory material having a liquid limit of 35 percent or less, and a plasticity index of not less than 8 nor greater than 20 when tested in accordance with ASTM D 4318, and classifying as a CL in accordance with ASTM D 2487.

(f) Cohesionless and Cohesive Materials. Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

(g) Capillary Water Barrier. Capillary Water Barrier shall consist of clean, crushed, nonporous rock, crushed gravel, or uncrushed gravel. The maximum particle size shall be 1.5 inches and no more than 2 percent by weight shall pass the 3/16-inch size (No. 4) sieve.

The Design-Build Contractor shall utilize and comply with the above material definitions, subgrade preparation procedures, and material testing requirements.

(11) Instrumentation. Perimeter grade beam benchmarks, as shown in the SWD-AEIM, Chapter IV (Plate S53), shall be installed around the perimeter of the Officers Quarters, Barracks buildings, and Battalion Headquarters at select grade beam locations. Additional benchmarks similar in design shall be installed on select interior columns. ***Final location of the benchmarks shall be determined by CESWF-EC-DG when the 65% design is complete.*** The benchmarks should be surveyed to the nearest 1/100th of a foot from a permanent benchmark as soon as the forms are stripped and shall be surveyed monthly throughout the remainder of the construction contract from a permanent deep benchmark. Elevations for the benchmarks shall be supplied to the contracting officer for forwarding to CESWF-EC-DG within 7 days of completing the survey. ***A typical construction detail for the***

***benchmarks and the benchmark installation locations shall be presented in the construction drawings*.**

b. Pavement Design Recommendations and Requirements. The pavement sections presented below are based on criteria contained in *UFC 3-250-01FA, UFC 3-250-18FA*, and engineering judgment. The Design-Build Contractor is responsible for developing the final pavement designs for any new pavement structures (or pavement repairs/reconstructions due to impacts of their construction activities) which may be required under their contract. The Design-Build Contractor shall use the subsurface conditions and laboratory and in situ testing data provided in this report, as well as any supplemental subsurface investigations and testing performed by them or their associates, and any supplemental information regarding traffic loading conditions and requirements (beyond that provided herein) to develop the final pavement designs. The Design-Build Contractor shall use the United Facilities Criteria (UFCs) cited herein as well as Pavement-Transportation Computer Assisted Structural Engineering (PCASE) software (available at ***https://transportation.wes.army.mil/triservice/pcase/*** as a free download) to develop the final pavement designs. However, **it is required that the Design-Build Contractor's final pavement sections meet (or exceed) the minimum pavement sections specified herein**.

(1) Rigid Pavement. The following pavement sections shall be used for fire/emergency medical vehicle access lanes, aprons for a minimum distance of 15 feet in front of trash dumpster pads, and aprons in front of loading docks. As previously stated, alternative minimum rigid pavement sections are also provided for service drives and privately-owned vehicle (POV) parking areas and primary access drives (if required). The rigid pavement designs consider a modulus of subgrade reaction equal to 100 pci for the raw subgrade when compacted to 90 percent of laboratory maximum density, and a concrete flexural strength of 650 pci at 28 days.

(a) Fire/Emergency Medical Vehicle Access Lanes. The pavement section is based on Category IVA Traffic and a Class F Street (Design Index = 4). This

pavement section also shall be used for service drives and any sections of the POV parking areas that may experience trash truck and/or fire/emergency medical vehicle traffic if rigid pavement is used for these areas.

7” Portland Cement Concrete (nonreinforced)

6” Aggregate Base Course compacted to at least 95 percent of maximum laboratory density (ASTM D 1557)

6” Raw Subgrade compacted to at least 90 percent of maximum laboratory density (ASTM D 1557)

(b) Aprons in Front of Trash Dumpster Pads and Loading Dock Aprons. The pavement section is based on Category IVA Traffic and a Class F Street (Design Index = 4).

6” Portland Cement Concrete reinforced with No. 4 bars spaced 16 inches o.c.e.w.

6” Aggregate Base Course compacted to at least 95 percent of maximum laboratory density (ASTM D 1557)

6” Raw Subgrade compacted to at least 90 percent of maximum laboratory density (ASTM D 1557)

(c) POV Parking Areas and POV Access Drives (Minimum Rigid Pavement Section, If Required). The pavement section is based on Category II Traffic and a Class E to Class D Street (Design Index = 2).

6” Portland Cement Concrete (nonreinforced)

6” Aggregate Base Course compacted to at least 95 percent of maximum laboratory density (ASTM D 1557)

6” Raw Subgrade compacted to at least 90 percent of maximum laboratory density (ASTM D 1557)

(d) Primary Access Drives (Minimum Rigid Pavement Section, If Required). The pavement section is based on Category IVA Traffic and a Class E Street

(Design Index = 5).

7.5” Portland Cement Concrete (nonreinforced)

6” Aggregate Base Course compacted to at least 95 percent of maximum laboratory density (ASTM D 1557)

6” Raw Subgrade compacted to at least 90 percent of maximum laboratory density (ASTM D 1557)

Reinforcement for odd-shaped slabs, joint design, joint spacing, and other details shall be in accordance with the latest edition of the *SWD-AEIM* and *UFC 3-250-01FA*, where applicable. The reinforcement bars shall be placed a minimum of 1.5 inches clear distance from the surface of the pavement.

(2) Flexible Pavement. The following pavement sections shall be used for service drives and privately owned vehicle (POV) parking areas. Minimum flexible pavement sections are also provided for primary access drives and for fire/emergency medical vehicle access drives, if a flexible pavement section is used for these pavement structures. The flexible pavement designs consider a CBR value of 4 percent for the raw subgrade when compacted to 90 percent of laboratory maximum density.

(a) Service Drives. The pavement section is based on Category IVA Traffic and a Class F Street (Design Index = 4). This pavement section also shall be used for fire/emergency medical vehicle access lanes and for any sections of the POV parking areas that may experience trash truck and/or fire/emergency medical vehicle traffic if flexible pavement is used for these areas.

2” Hot-Mix Surface Course

6” Aggregate-Base Course compacted to at least 100 percent of maximum laboratory density (ASTM D 1557)

6” Subbase Course compacted to at least 95 percent of maximum laboratory density (ASTM D 1557)

6” Subbase Course compacted to at least 95 percent of maximum laboratory density (ASTM D 1557)

6” Raw Subgrade compacted to at least 90 percent of maximum laboratory density (ASTM D 1557)

(b) POV Parking Areas and POV Access Drives. The pavement section is based on Category II Traffic and a Class E to Class D Street (Design Index = 2).

1.5” Hot-Mix Surface Course

7” Aggregate-Base Course compacted to at least 100 percent of maximum laboratory density (ASTM D 1557)

6” Subbase Course compacted to at least 95 percent of maximum laboratory density (ASTM D 1557)

6” Raw Subgrade compacted to at least 90 percent of maximum laboratory density (ASTM D 1557)

(c) Primary Access Drives (If Required). The pavement section is based on Category IVA Traffic and a Class E Street (Design Index = 5).

2.5” Hot-Mix Surface Course

7” Aggregate-Base Course compacted to at least 100 percent of maximum laboratory density (ASTM D 1557)

6” Subbase Course compacted to at least 95 percent of maximum laboratory density (ASTM D 1557)

6” Subbase Course compacted to at least 95 percent of maximum laboratory density (ASTM D 1557)

6” Raw Subgrade compacted to at least 90 percent of maximum laboratory density (ASTM D 1557)

The following note shall be incorporated as part of the pavement details shown on the contract drawings.

“1. The moisture content shall be at least 1 percent above optimum during compaction of the raw subgrade.

2. The compacted subbase course in all of the paving sections can be replaced with aggregate base course using the same thickness and compaction requirements.

3. A minimum 4-inch layer of Aggregate Base Course shall be provided below rigid pavement sections when limestone is

exposed at the surface."

(3) Pavement Material Definitions.

(a) Hot-Mix Surface Course (50 Blow Mix). Aggregates and asphaltic materials shall conform to the requirements of the Texas Department of Transportation, Standard Specifications for Construction of Highways, Streets and Bridges, (TXDOT, Std Spec), Items 300 and 340. The paving mixture shall conform to the requirements for Type "D" (Fine-Graded surface course) grading. Asphaltic material for the paving mixture should be asphaltic cement, viscosity grade AC-20, or performance grade PG 64-22 (for POV Parking Areas ONLY), or performance grade PG 70-22 (minimum) or PG 76-22 (recommended) (for Fire/Crash Emergency Vehicle Access Lanes/Service Drives flexible pavement structures (if used)). The specifications shall incorporate the above requirements for Hot-Mix Surface Course**.** Edit guide specification ***UFGS-32 12 16 HOT-MIX ASPHALT (HMA) FOR ROADS*** to the above requirements**.**

(b) Prime and Tack Coats. Asphaltic material for the prime coat shall be cut-back asphalt, grade MC-30, conforming to the requirements of TXDOT, Std Spec, Item 300, Asphalts, Oils, Emulsions. Prime coat shall be applied to the surface of the aggregate base coarse. Asphaltic material for the tack coat shall be cut-back asphalt, grade RC-250, or emulsified asphalt, grade SS-1, conforming to the requirements of TXDOT, Std Spec, Item 300, Asphalts, Oils, Emulsions. Tack coat shall be applied to all surfaces that contact new asphalt pavement. The specifications shall incorporate the above requirements for Prime and Tack Coats. Edit guide specification ***UFGS-32 12 10 BITUMINOUS TACK AND PRIME COATS*** to the above requirements.

(c) Aggregate Base Course. Aggregates shall conform to the requirements of the ***UFGS-32 11 23 AGGREGATE BASE COURSE***. The gradation should conform to the requirements of TXDOT, Std Spec, Item 247, for Type "A", Grade 1 Material with a plasticity index not greater than 10. Aggregates shall not show more than 50 percent

loss when subjected to the Los Angeles abrasion test in accordance with ASTM C 131. The amount of flat and elongated particles shall not exceed 30 percent. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. In the portion retained on each sieve specified, the crushed aggregates shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured faces. Crushed gravel shall be manufactured from gravel particles 50 percent of which, by weight, are retained on the maximum size sieve.

(d) Subbase Course. The material shall meet the requirements of ***UFGS-32 11 16 SUBBASE COURSES*** and shall have a CBR value of 20 percent. Aggregates shall consist of crushed stone, gravel, sand, or other sound, durable, approved materials processed and blended or naturally combined. Aggregates shall be durable and sound, free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material. Aggregates shall be reasonably uniform in density and quality. Aggregates shall have a maximum size of 2 inches and shall be within the limits specified as follows:

Maximum Allowable Percentage by Weight
Passing Square-Mesh Sieve

Sieve Designation	No. 1
No. 10	--
No. 200	15

The portion of any blended component and of the completed course passing the No. 40 sieve shall be either nonplastic or shall have a liquid limit not greater than 25 and a plasticity index not greater than 5. Or, at the contractor's option, the contractor may use material conforming to Texas Department of Transportation Standard Specification, Item 247, Type A, Grade 1.

(e) Raw Subgrade. Material should conform to the requirements of

UFGS-31 00 00 EARTHWORK (Satisfactory Materials, as specified herein).

(f) Portland Cement Concrete. The material shall conform to the requirements of ***UFGS-32 13 11 CONCRETE PAVEMENT FOR AIRFIELDS AND OTHER HEAVY-DUTY PAVEMENT***. The maximum nominal size coarse aggregate shall be 1.5 inches, and the mixture shall be designed to attain a flexural strength of 650 psi at 28 days, as determined by tests made in accordance with ASTM C 78 of beams fabricated and cured in accordance with ASTM C 192/C 192M. Cementitious admixtures shall be limited to Class F fly ash; Class C fly ash shall not be used.

(4) Vehicular Pavement Material Testing Requirements. Testing shall be the responsibility of the contractor to ensure that the subgrade, aggregate base course, subbase course, hot-mix surface course, and Portland cement concrete are properly constructed. To this end, the following testing requirements shall be included in the contract specifications as a minimum:

- In-place density testing of the subgrade, aggregate base course, and subbase course shall be performed, at a minimum, every 600 square yards per lift in accordance with ASTM D 1556 and ASTM D 6938. ASTM D 1556 shall be used as a check at least once per lift for each 3,000 square yards of completed subgrade, aggregate base course, and subbase course.

- Before starting work, at least one sample of aggregate base course, and subbase course material shall be tested in accordance with ASTM C 136. After the initial test, a minimum of one sieve analysis (ASTM C 136 and ASTM D 422) shall be performed for each 1,000 tons of aggregate base course, and subbase course placed, with a minimum of one analysis performed for each day's run until the course is completed. One liquid limit and plasticity index shall be performed for each sieve analysis per ASTM D 4318

- Wear tests shall be performed in accordance with ASTM C 131. A minimum of one test per aggregate base course material source shall be run.

- Thickness of the aggregate base course, and subbase course shall be measured for each 600 square yards of material placed. Compacted thickness of the aggregate base, and subbase courses shall be as presented in this report and the completed section shall be within 3/8-inch of the thickness presented.

- Hot Bin gradations for the asphalt wearing course shall be tested in accordance with ASTM C 136 and ASTM C 117. A minimum of one test shall be conducted. Marshall specimens shall be taken in accordance with methods described in AI MS-2. At least two sets of specimens shall be taken. Asphalt

extractions shall be performed in accordance with ASTM D 2172, Method A or B. At least one asphalt extraction shall be conducted. Field density tests shall be conducted in accordance with ASTM D 2950. One test shall be conducted for each 300 square yards of pavement placed. The mat density shall be 97.5 to 100.5 percent and the joint density shall be 95.5 to 100.5 percent of the density obtained from laboratory-compacted specimens. Thickness measurements shall be taken at a minimum of one measurement for each 1,000 square yards of pavement placed.

- The Job Mix Formula for the bituminous mixture shall be furnished to the Contraction Officer for approval. The formula will indicate the percentage of each stockpile and mineral filler, the percentage of each size aggregate, the percentage of bitumen, and the temperature of the completed mixture when discharged from the mixer. The Contractor shall file with the Contracting Officer certified delivery tickets for all aggregates and bituminous materials actually used in construction. The finished mixture shall be designed using procedures contained in AI MS-2 and the criteria shown below.

Test Property	50 Blows
Stability (minimum), lbs	1,000
Flow (maximum), 1/100-inch	8-18
Air Voids, percent	3% to 5%
Percent Voids in mineral aggregate	14
TSR, minimum percent	75

- The contractor shall be responsible for the development of the mixture proportion study for cementitious materials and chemical admixtures. The concrete mix design shall include a statement giving the maximum nominal coarse aggregate size and the proportions of all ingredients that will be used in the manufacture of concrete at least 60 days prior to commencing concrete operations. Trial design batches, mixture proportioning studies, and testing requirements shall be the responsibility of the Contractor. Strength requirements shall be based on flexural strength. Trial mixtures having proportions, slumps, and air content suitable for the work shall be based on methodology described in ACI 211.1, modified as necessary to accommodate flexural strength. The maximum water-cementitious material ratio is 0.45. Coarse and fine aggregates shall have a satisfactory service record of at least 5 years successful service in three paving projects, or if a new source is used, shall meet the requirements when tested for resistance to freezing and thawing. Coarse and fine aggregates not having a satisfactory demonstrable service record shall have a durability factor of 50 when subjected to freezing and thawing in concrete in accordance with COE CRD-C 114 (Test Method for Soundness of Aggregates by Freezing and Thawing of Concrete Specimens).

- Smoothness measurements shall be taken in successive positions parallel to the pavement (flexible and rigid) centerline with a 12-foot straightedge. Measurements shall be taken perpendicular to the pavement (flexible and rigid) centerline at 15-foot intervals. Surface smoothness shall not exceed 3/8-inch.

c. Requirements for the Design-Build Contractor's Foundation and Pavement Design

Analysis. The successful proposer shall provide a Foundation and Pavement Design Analysis after contract award. ***The geotechnical firm responsible for the geotechnical design shall have demonstrated successful performance in design of at least five (5) projects of similar type and scope in expansive soil environments in Texas.*** The Foundation and Pavement Design Analysis (Report) shall include a description of the project, including a discussion of any unusual features of the project, a discussion for each structure that requires a foundation system, and a discussion of each pavement type.

Development of the final foundation and pavement designs is the responsibility of the Design-Build Contractor; however, the Design-Build Contractor's final foundation and pavement designs shall be in full compliance with the requirements prescribed herein (including foundation type, foundation design parameters, and minimum pavement sections and pavement design criteria and parameters).

THE DESIGN-BUILD CONTRACTOR IS NOT PERMITTED TO UTILIZE FINAL FOUNDATION AND PAVEMENT DESIGNS THAT ARE LESS RIGOROUS AND STRINGENT THAN THE MINIMUM DESIGNS SPECIFIED HEREIN (I.E., THAT DO NOT MEET OR EXCEED THE MINIMUM REQUIREMENTS SPECIFIED HEREIN). IF THE DESIGN-BUILD CONTRACTOR'S ADDITIONAL SOILS INVESTIGATIONS, LABORATORY TESTING, AND ENGINEERING ANALYSES SHOW THAT A MORE STRINGENT AND RIGOROUS DESIGN IS REQUIRED ABOVE THE MINIMUM FOUNDATION AND PAVEMENT DESIGN REQUIREMENTS SPECIFIED HEREIN, IT IS THE RESPONSIBILITY OF THE DESIGN-BUILD CONTRACTOR TO ENSURE THEIR FINAL DESIGNS MEET THE MORE STRINGENT REQUIREMENT.

(1) **Foundation System.** ***The foundation system used for the proposed Officers Quarters and Barracks buildings shall be limited to a deep foundation system consisting of reinforced concrete straight-shaft piers or a shallow foundation system consisting of either a monolithic reinforced concrete ribbed mat or flat mat slab. The***

foundation system used for the proposed Battalion Headquarters shall be limited to a shallow foundation system consisting of either a monolithic ribbed mat or flat mat slab. The selected foundation system(s) shall be designed and constructed in accordance with the requirements, recommendations, and design parameters provided in this report.

(2) **Floor Slab System and Subgrade Preparation.** ***The Design-Build Contractor shall comply with the floor slab system, subgrade preparation, and fill requirements specified in this report. The mat slab foundations will, by design, be supported on-grade. Excavation/removal of existing soil, compaction requirements for the raw subgrade, fill, and backfill materials, and foundation and pavement material definitions shall be as specified herein. Compaction shall be in accordance with the modified Proctor method (ASTM D 1557).***

(3) **Pavement Sections.** The Design-Build Contractor shall provide separate subparagraphs for each pavement structure included in the project, ***using the pavement sections provided in this report as minimum sections***. The Design-Build Contractor shall use the UFCs cited herein and PCASE pavement design software to develop the final pavement designs, and shall present PCASE design output data tables in their report documentation for review by the Government. Each pavement design shall include as a minimum the following items: traffic types, road classifications and design indexes; subgrade strength values (CBR and modulus of subgrade reaction values for the specified compactive effort); pavement material thicknesses and compaction requirements; and concrete flexural strength for designated time frame. ***Compaction of pavement course layers and natural subgrade below the surface course layer shall be in accordance with the modified Proctor method (ASTM D 1557).***

(4) Exhibits to be Included in the Design-Build Contractor's Foundation and Pavement Design Analysis. The following exhibits shall be included in the Design-Build contractor's Foundation and Pavement Design Analysis. The Design-Build contractor may use the information provided in this report to partially satisfy these requirements, but shall

supplement the information provided herein with additional subsurface drilling and testing, as described in the first paragraph of Section 5 of this report. Required exhibits to be included with the Design-Build contractor's Foundation and Pavement Design Analysis include:

- Site Plan with Boring Locations and Legend;
- Boring Logs;
- Plasticity Chart;
- Standard Penetration Tests versus Depth of Boring (if applicable);
- Moisture Content versus Depth (Chart);
- Moisture Content-Liquid Limit-Plastic Limit versus Depth (Chart);
- Strength Tests Results versus Depth (Chart);
- Tabulation of Laboratory Test Results (to include Boring Number, Sample Number, Depth, Laboratory Classification, Visual Descriptions, Grain Size Analysis (%Gravel, %Sand, %Fines), LL, PL, PI, MC, Unit Weight, and Strength Test Data;
- Consolidation-Expansion Tests/Swell Pressure Tests (if applicable).

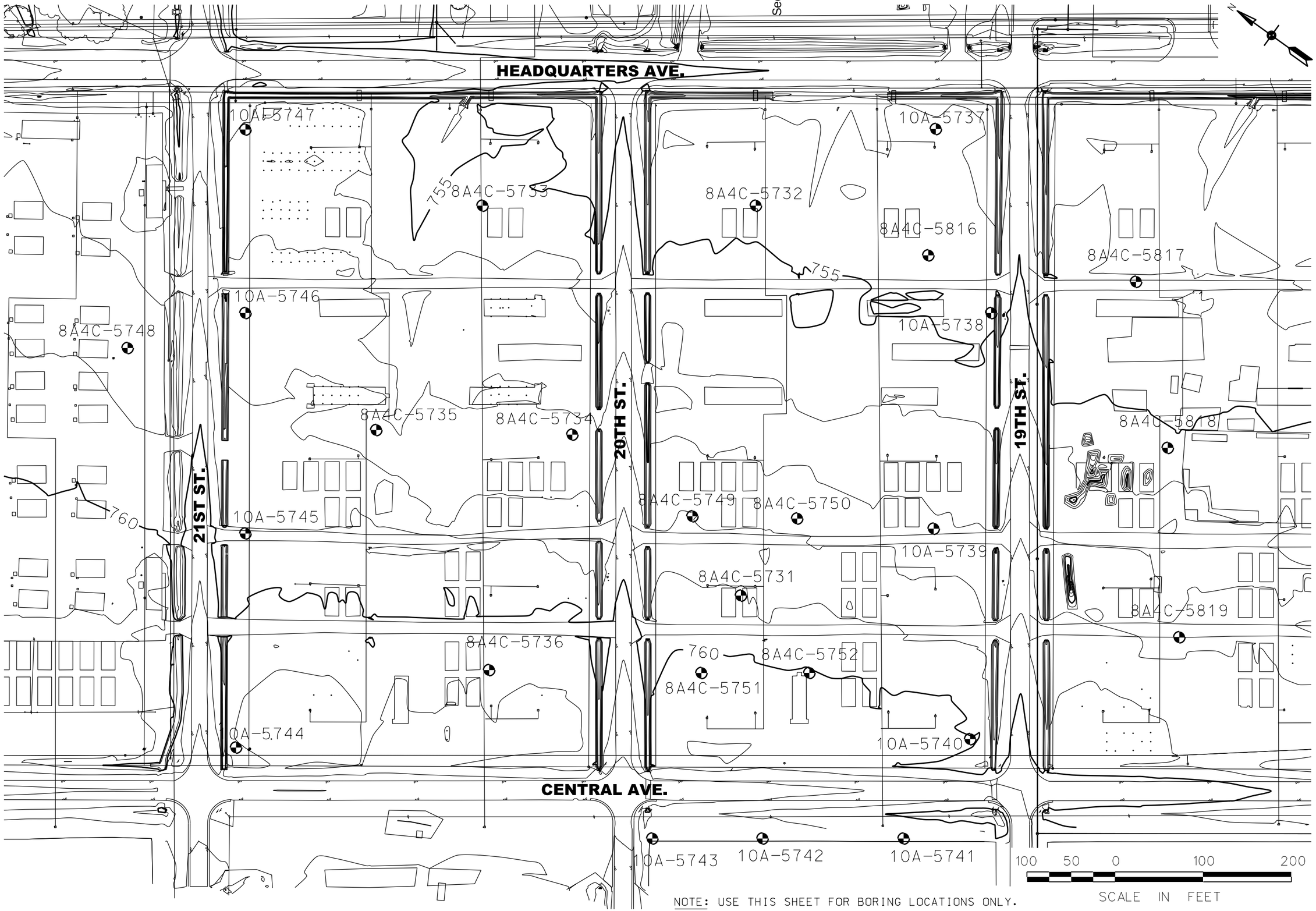
References:

- TEAM Consultants, Incorporated Report No. 102102 (ORTC (FY12) Dining Facility Site)
- TEAM Consultants, Incorporated Report No. 112008 (ORTC (FY12) Facilities and Infrastructure Site (Exclusive of the Dining Facility Site))
- TEAM Consultants, Incorporated Report No. 112039 (ORTC (FY12) Re-Sited Buildings)
- TEAM Consultants, Incorporated Report No. 112052 (ORTC (FY12) Water Tower Site)
- UFC 3-220-03FA – Soils and Geology Procedures for Foundation Design of Buildings and Other Structures (Except Hydraulic Structures)
- UFC 3-220-07 – Foundations in Expansive Soils
- UFC 3-250-01FA – Pavement Design for Roads, Streets, Walks, and Open Storage Areas
- UFC 3-250-18FA – General Provisions and Geometric Design For Roads, Streets, Walks, and Open Storage Areas
- UFC 3-320-06A – Concrete Floor Slabs On Grade Subjected to Heavy Loads
- CESWD-ED-TS/G Criteria Letter, dated 29 January 1988 – Design Criteria for Ribbed Mat Foundations
- SWDED-G Criteria Letter, dated 16 April 1987 – Criteria for Developing Geotechnical Design Parameters for SWD Ribbed Mat Design Methodology
- Texas Department of Transportation - Standard Specifications For Construction of Highways, Streets and Bridges
- SWD-AEIM Architectural-Engineering Manual
- UFGS Guide Specifications For Construction

FORT WORTH DISTRICT
OCTOBER 2011

APPENDIX A

BORING LOCATIONS & LOGS OF BORINGS



NOTE: USE THIS SHEET FOR BORING LOCATIONS ONLY.

US Army Corps of Engineers
Fort Worth District

Symbol	Description	Transmittal No.	Action	Date

Date:
Sol No.
Contr No.
Rev.

Designed by: JOSH PICKERING
Dwn by: JOSH PICKERING
Reviewed by: KEN McCLESKEY
Submitted by: KEN McCLESKEY CHIEF, GEOTECHNICAL SECTION
File name:
Plot date: 10/5/2011
Plot scale:

U.S. ARMY ENGINEER DISTRICT, CORPS OF ENGINEERS FORT WORTH, TEXAS

ENGINEERING/ CONSTRUCTION DIVISION ENGINEERING BRANCH

FORT HOOD, TEXAS
ORTC (FY12)
PN: 065374

BORING LOCATIONS PRIMARY SITE

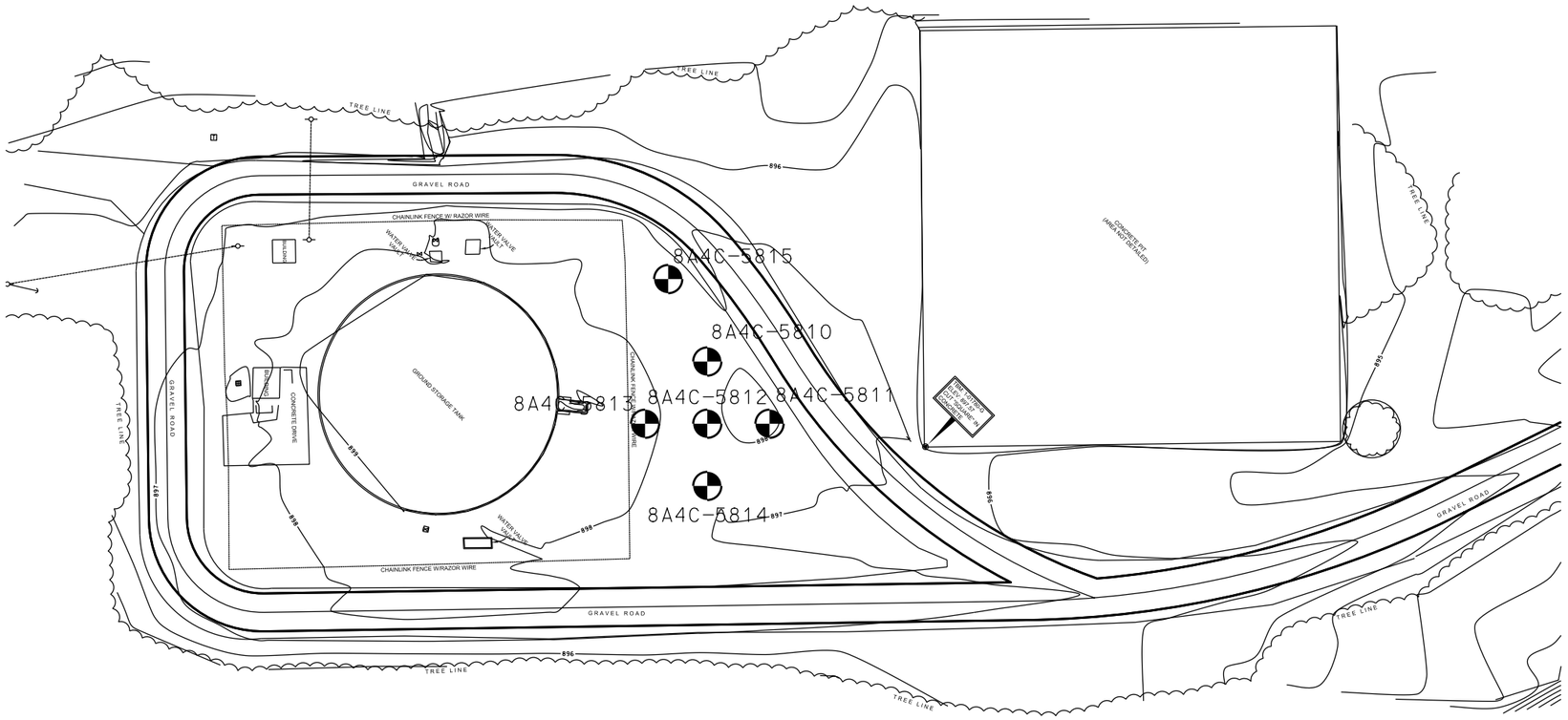
Sheet reference number: B101

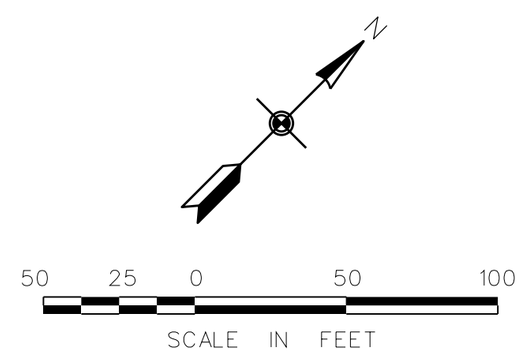
DESIGN FILE: fh-ORTC-B101.dgn

Contr No.

REFERENCE FILES:

fh-ORTC-B101.dgn 10/5/2011 4:07:33 PM





NOTE: USE THIS SHEET FOR BORING LOCATIONS ONLY.

US Army Corps of Engineers
Fort Worth District

Symbol	Description	Transmtal No.	Action	Date

Designed by: JOSH PICKERING
Date: ---
Rev.
Dwn by: JOSH PICKERING
Sol No.
Contr No.
Reviewed by: KEN McCLESKEY
File name:
Submitted by: KEN McCLESKEY, P.G., CHIEF, GEOTECHNICAL SECTION
Plot date: 10/5/2011
Plot scale:

U.S. ARMY ENGINEER DISTRICT, CORPS OF ENGINEERS FORT WORTH, TEXAS

ENGINEERING/ CONSTRUCTION DIVISION ENGINEERING BRANCH

FORT HOOD, TEXAS
ORTC (FY12)
PN: 065374

BORING LOCATIONS
WATER TOWER SITE

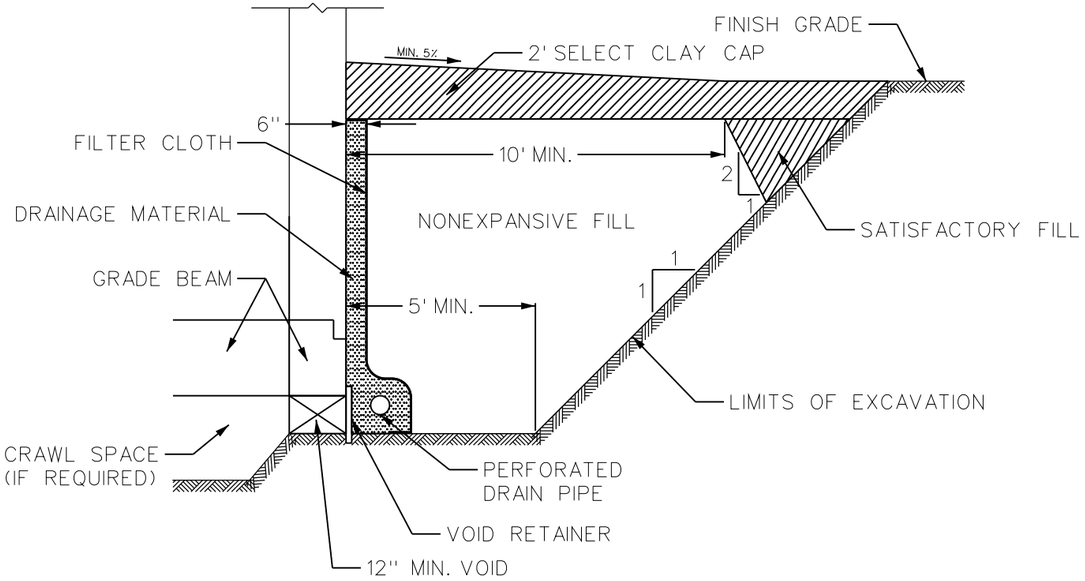
Sheet reference number:
B102

Contr No.

DESIGN FILE: fn-ORTC-B102.dgn

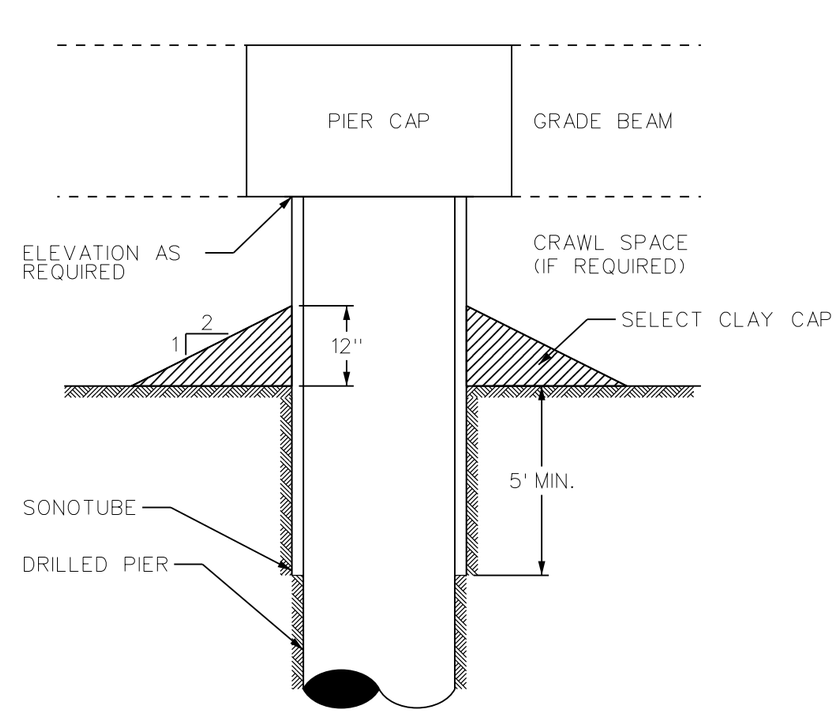
REFERENCE FILES:
K:\GEOTECHNICAL SECTION\McCleskey_K\Military Jobs\FDAs - Backup Copy\F & P DAs\Army\Fort Hood\ORTC (FY12)\ORTC - SITE RELOC\CAD\fn-ORTC-B102.dgn

fn-ORTC-B102.dgn 10/5/2011 4:05:53 PM



BASEMENT/BELOW-GRADE WALL BACKFILL DETAIL

NOT TO SCALE



SONOTUBE FORMING AND
CLAY CAP DETAILS

NOT TO SCALE

NOTES:

1. NONEXPANSIVE FILL SHALL BE PLACED IN CONTROLLED LIFTS NOT EXCEEDING 8 INCHES IN LOOSE THICKNESS AND COMPACTED TO AT LEAST 95 PERCENT OF LABORATORY MAXIMUM DENSITY AS DETERMINED IN ACCORDANCE WITH ASTM D 1557.

2. SELECT FILL AND SELECT CLAY FILL SHALL BE PLACED IN CONTROLLED LIFTS NOT EXCEEDING 8 INCHES IN LOOSE THICKNESS AND COMPACTED TO AT LEAST 90 PERCENT OF LABORATORY MAXIMUM DENSITY AS DETERMINED IN ACCORDANCE WITH ASTM D 1557.

3. REFER TO THE GOVERNMENT GEOTECHNICAL REPORT FOR NONEXPANSIVE FILL, SELECT FILL, AND SELECT CLAY FILL MATERIAL DEFINITIONS AND REQUIREMENTS, AND FOR COMPLETE FILL AND SUBGRADE PREPARATION MINIMUM REQUIREMENTS.

US Army Corps of Engineers
Fort Worth District

Symbol	Description	Transmittal No.	Action	Date

Rev.
Date:
Sol No.
Contr No.
File name:
Plot date: 10/5/2011
Plot scale:

Designed by: JOSH PICKERING
Dwn by: JOSH PICKERING
Reviewed by: KEN McCLESKEY
Submitted by: KEN McCLESKEY, P.G. CHIEF, GEOTECHNICAL SECTION

U.S. ARMY ENGINEER DISTRICT, CORPS OF ENGINEERS FORT WORTH, TEXAS

ENGINEERING/ CONSTRUCTION DIVISION ENGINEERING BRANCH

FORT HOOD, TEXAS
ORTC (FY12)
PN: 065374
BASEMENT/BELOW-GRADE WALL BACKFILL DETAIL & SONOTUBE FORMING AND CLAY CAP DETAILS

Sheet reference number:
B103

Section:

DESIGN FILE: fh-ORTC-B103.dgn

Contr No.

REFERENCE FILES:

10/5/2011 4:08:29 PM

fh-ORTC-B103.dgn

Section:

Hole No. 8A4C-5732

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5732		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 3 / UNDISTURBED 1
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE	STARTED 7 FEB 11 / COMPLETED 7 FEB 11
7. THICKNESS OF OVERBURDEN 11.6'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 29.4'		18. TOTAL CORE RECOVERY FOR BORING 97 %	
9. TOTAL DEPTH OF HOLE 41.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
		VISUAL	0.0' TO 7.8' CLAY 0.0' TO 0.5' - HIGH PLASTICITY, VERY STIFF TO HARD, SLIGHTLY MOIST, LIGHT YELLOW BROWN, GRAVELLY AND SANDY. 0.5' TO 7.8' - HIGH PLASTICITY, VERY STIFF TO HARD, SLIGHTLY MOIST, VERY DARK GRAY, SOME CALICHE AT TOP OF SECTION, SILTY, SLIGHTLY SANDY AND GRAVELLY, LIME NODULES UP TO 0.25"; AFTER 4.2' - GRAY, SLIGHTLY LIMY, INCREASED SILT AND LIME NODULE PERCENTAGE, LIME NODULES UP TO 1".			DRILLING 0.0' TO 13.5' - 10" AUGER AND 3" SHELBY TUBE. SET 14' OF 8" CASING AND CIRCULATION PAN; CLEANOUT TO 14.7' WITH 7-7/8" AUGER. 14.7' TO 41.0' - 4" CARBOLOY BIT CORE; BAILED TO 24.3' WITH HOLE OPEN TO 38'; BACKFILLED TO SURFACE AFTER FINAL WATER LEVEL CHECK.
18.0					ST-1 A	
18.7					B	
11.1	10				C	
26.0					D	WATER LEVEL 30-HR CHECK AT 9.0'
15.5			7.8' TO 11.6'	C-1		JAR SAMPLES A. 0.5' TO 6.0' B. 6.0' TO 7.8' C. 7.8' TO 11.6' D. 11.6' TO 12.0'
26.0				C-2		
24.0	20		SAND - COARSE TO FINE, MEDIUM DENSE, MOIST AT 10.4', LIGHT GRAY, YELLOW RED AND PALE BROWN, GRAVELLY, CLAYEY, SOME CALICHE, LIME NODULES UP TO 0.25".	C-3		SHELBY TUBE SAMPLE ST-1. 2.0' TO 4.0' (PENETROMETER GREATER THAN 4.5)
16.2				C-4		
28.1			11.6' TO 41.0'	C-5		CARTON SAMPLES C-1. 14.9' TO 15.8' C-2. 17.0' TO 17.9' C-3. 20.1' TO 21.0' C-4. 22.2' TO 22.9' C-5. 24.3' TO 25.2' C-6. 26.1' TO 27.0' C-7. 27.7' TO 28.4' C-8. 33.3' TO 34.2' C-9. 35.6' TO 36.1' C-10. 36.1' TO 36.8' C-11. 37.2' TO 37.9' C-12. 39.4' TO 40.3'
18.9			SHALE AND LIMESTONE (INTERBEDDED)	C-6		
20.2			11.6' TO 34.4' - WEATHERED, EXTREMELY THIN SEAMS TO MEDIUM LAYERS, GREEN GRAY AND OLIVE YELLOW WITH WHITE CALICHE AT TOP OF SECTION, BECOMING LIGHT GREEN GRAY AND OLIVE YELLOW SHALE WITH DEPTH; SHALE IS SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), MARLY, ARGILLACEOUS, SILTY, SLIGHTLY FISSILE, WITH BLACK STAINING. ROOTS AT 15.9', HIGH AND LOW ANGLE FRACTURES AFTER 30', EXTREMELY THIN GYPSUM SEAMS AFTER 30.6'; WEATHERED AND UNWEATHERED SHALE FORMS A 45-DEGREE CONTACT AT 34.4'; LIMESTONE IS PALE BROWN, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), FOSSILIFEROUS, SOME SPARRY CALCITE, IRON STAINING,	C-7		
8.8	30			C-8		SOIL RESISTIVITY TEST
3.5				C-9		
23.3				C-10		2.5' PIN SPACING x 191.5 x 1 MULTIPLIER x 3.3 (ZERO DIAL RDG) = 1.580 OHM-CM
3.5				C-11		
5.5	40			C12		--- 34.4' TO 41.0' - AS ABOVE, EXCEPT UNWEATHERED, DARK GRAY AND GRAY, NO STAINING, VISIBLE FRACTURES, OR GYPSUM SEAMS, SOME SLIGHTLY SHALY DENSE FOSSIL OYSTER SHELL LIMESTONE LAYERS.
	50					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 8A4C-5732

Hole No. 8A4C-5733

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5733		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 5 / UNDISTURBED 0
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE	STARTED 26 JAN 11 / COMPLETED 27 JAN 11
7. THICKNESS OF OVERBURDEN 22.6'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 17.4'		18. TOTAL CORE RECOVERY FOR BORING 86 %	
9. TOTAL DEPTH OF HOLE 40.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
			0.0' TO 8.9' CLAY - HIGH PLASTICITY, VERY STIFF TO HARD, SLIGHTLY MOIST, BROWN TO DARK GRAY BROWN, SILTY, TRACE LIME NODULES UP TO 1/8", MINOR LIME NODULES AND INCREASING SILT WITH DEPTH.			DRILLING 0.0' TO 23.5' - 10" AUGER. SET 23' OF 8" CASING AND CIRCULATION PAN; CLEANOUT TO 25.4' WITH 7-7/8" AUGER. 24.5' TO 40.0' - 4" CARBOLOY BIT CORE; BAILED TO 25.8' WITH HOLE OPEN TO 38'; PULLED CASING AND WATER TRAPPED BETWEEN CASING AND ANNULUS CHANGED WATER LEVEL TO 17.5' WITH HOLE OPEN TO 27'. BACKFILLED TO SURFACE AFTER FINAL WATER LEVEL CHECK.
25.2					A	
24.5					B	
17.7	10		8.9' TO 22.6' SAND - FINE QUARTZ, MEDIUM DENSE, DAMP TO SLIGHTLY MOIST, LIGHT GRAY TO PALE BROWN TO YELLOW BROWN, CLAYEY, SOME CALICHE AND MINOR CEMENTATION, IRON STAINING, YELLOW TO RED YELLOW AND NO CALICHE OR CLAY AFTER 19.1', GRAY, PALE BROWN AND YELLOW BROWN AND CLAYEY AFTER 21'.		C	
12.5					D	WATER LEVEL 19-HR CHECK AT 16.7', HOLE OPEN TO 25.7'
8.9	20		22.6' TO 40.0' SHALE AND LIMESTONE (INTERBEDDED) - WEATHERED, GREEN GRAY AND OLIVE YELLOW TO PALE YELLOW WITH SOME WHITE CALICHE AT TOP OF SECTION, MARLY, FOSSILIFEROUS, IRON STAINING, SOFT TO MODERATELY HARD (ROCK CLASSIFICATION) ARGILLACEOUS SHALE; MODERATELY HARD TO HARD (ROCK CLASSIFICATION) WELL CEMENTED LIMESTONE WITH SOME SPARRY CALCITE.		E	JAR SAMPLES A. 0.0' TO 5.0' B. 5.0' TO 8.9' C. 8.9' TO 14.0' D. 14.0' TO 19.1' E. 19.1' TO 22.6' F. 22.6' TO 24.5'
15.4					F	
				C-1		CARTON SAMPLES C-1. 25.6' TO 26.5' C-2. 27.0' TO 27.7' C-3. 29.9' TO 30.7' C-4. 34.7' TO 35.5' C-5. 36.0' TO 36.6' C-6. 36.6' TO 37.3' C-7. 37.3' TO 38.2'
				C-2		
	30			C-3		
18.6				C-4		SOIL RESISTIVITY TEST
4.0				C-5		2.5' PIN SPACING x 191.5 x 1 MULTIPLIER x 2 (ZERO DIAL RDG) = 958 OHM-CM
29.4				C-6		
26.6				C-7		
	40					
	50					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 8A4C-5733

Hole No. 8A4C-5734

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5734		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 2 / UNDISTURBED 0
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE	STARTED 22 JAN 11 / COMPLETED 23 JAN 11
7. THICKNESS OF OVERBURDEN 15.2'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 26.3'		18. TOTAL CORE RECOVERY FOR BORING 97 %	
9. TOTAL DEPTH OF HOLE 41.5'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
		VISUAL	0.0' TO 10.7' CLAY 0.0' TO 0.3' - HIGH PLASTICITY, VERY STIFF TO HARD, SLIGHTLY MOIST, LIGHT YELLOW BROWN, FOSSILIFEROUS, LIME NODULES UP TO 0.25". 0.3' TO 1.5' - HIGH PLASTICITY, VERY STIFF TO HARD, SLIGHTLY MOIST, RED, SANDY (COARSE TO FINE), GRAVELLY; POSSIBLE FILL. 1.5' TO 6.4' - HIGH PLASTICITY, VERY STIFF TO HARD, SLIGHTLY MOIST, BROWN, SANDY, MINOR FINE SUBROUNDED TO SUBANGULAR GRAVEL, LIME NODULES UP TO 0.25". 6.4' TO 10.7' - HIGH PLASTICITY, VERY STIFF TO HARD, SLIGHTLY MOIST, STRONG BROWN, SANDY (COARSE TO FINE, SUBANGULAR TO ROUNDED), GRAVELLY, LIMY, SOME CALICHE.			DRILLING 0.0' TO 18.0' - 10" AUGER. WATER LEVEL DURING DRILLING AT 11.8' 15 MINUTES AFTER AUGERING TO 16'. SET 18' OF 8" CASING AND CIRCULATION PAN; CLEANOUT TO 18.0' WITH 7-7/8" AUGER. 18.0' TO 41.5' - 4" CARBOLOY BIT CORE; BAILED TO 37' WITH HOLE OPEN TO 40'; BACKFILLED TO SURFACE AFTER FINAL WATER LEVEL CHECK.
17.6					A	
16.1	10				B	
		VISUAL				WATER LEVEL 25-HR AND 48-HR CHECKS BOTH AT 11.7', WITH HOLE OPEN TO 12'.
	20		10.7' TO 15.2' GRAVEL - COARSE TO FINE, MEDIUM DENSE, WET AT 13.2', STRONG BROWN TO RED TO LIGHT GRAY, ROUNDED TO SUBANGULAR, CLAYEY, SANDY, SOME CALICHE CEMENTATION.			JAR SAMPLES A. 1.5' TO 6.4' B. 6.4' TO 10.7'
				C-1		CARTON SAMPLES C-1. 22.2' TO 23.1' C-2. 24.3' TO 25.2' C-3. 26.7' TO 27.6' C-4. 28.8' TO 29.7' C-5. 32.0' TO 32.9' C-6. 32.9' TO 33.8' C-7. 36.0' TO 36.9' C-8. 37.3' TO 38.2' C-9. 38.2' TO 39.3' C-10. 40.8' TO 41.5'
				C-2		
				C-3		
				C-4		
	30		15.2' TO 41.5' SHALE AND LIMESTONE (INTERBEDDED)			
16.1				C-5		
23.9				C-6		
			15.2' TO 36.9' - WEATHERED, GREEN GRAY TO OLIVE YELLOW TO LIGHT GRAY; SHALE IS SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), MARLY, BLOCKY, ARGILLACEOUS, CALCAREOUS, AND FOSSILIFEROUS; LIMESTONE IS MODERATELY HARD TO HARD (ROCK CLASSIFICATION), FOSSILIFEROUS, WELL CEMENTED, BLACK AND IRON STAINING, SOME CHALKY AND MARLY LIMESTONE, SOME SPARRY CALCITE, GYPSUM SEAMS AFTER 30.5'.			SOIL RESISTIVITY TEST 2.5' PIN SPACING x 191.5 x 1 MULTIPLIER x 2.5 (ZERO DIAL RDG) = 1.197 OHM-CM
24.5				C-7		
7.9				C-8		
23.5				C-9		
	40					
2.9				C10		--- 36.9' TO 41.5' - AS ABOVE, EXCEPT UNWEATHERED, GRAY TO DARK GRAY, SOME SHALY LIMESTONE, NO STAINING OR GYPSUM SEAMS.
	50					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 8A4C-5734

Hole No. 8A4C-5735

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5735		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 4 / UNDISTURBED 0
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE	STARTED 5 FEB 11 / COMPLETED 6 FEB 11
7. THICKNESS OF OVERBURDEN 20.8'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 19.2'		18. TOTAL CORE RECOVERY FOR BORING 77 %	
9. TOTAL DEPTH OF HOLE 40.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
		VISUAL	0.0' TO 0.6' GRAVEL, SAND, AND CLAY - MEDIUM DENSE, MOIST, LIGHT YELLOW BROWN; POSSIBLE FILL. 0.6' TO 11.9' CLAY 0.6' TO 6.4' - HIGH PLASTICITY, VERY STIFF TO HARD, DAMP, DARK GRAY, SILTY, SLIGHTLY SANDY AND GRAVELLY, SOME PLANT ROOTS, LIME NODULES UP TO 1/8".			DRILLING 0.0' TO 21.5' - 10" AUGER. SET 22' OF 8" CASING AND CIRCULATION PAN; CLEANOUT TO 22' WITH 7-7/8" AUGER. 22.0' TO 40.0' - 4" CARBOLOY BIT CORE; BAILED TO 37.7' WITH HOLE OPEN TO 39.4'; PULLED CASING AFTER WHICH WATER LEVEL AT 14.2' WITH HOLE OPEN TO 17'; BACKFILLED TO SURFACE AFTER FINAL WATER LEVEL CHECK.
18.4					A	
18.7					B	
14.6	10				C	
13.4			6.4' TO 10.1' - HIGH PLASTICITY, VERY STIFF TO HARD, DAMP, PALE BROWN TO WHITE (CALICHE), TRACE OF SAND AND GRAVEL, LIME NODULES UP TO 0.25".		D	WATER LEVEL 16-HR CHECK AT 13.5', HOLE OPEN TO 16.6'
		VISUAL				JAR SAMPLES A. 0.6' TO 6.4' B. 6.4' TO 10.1' C. 10.1' TO 11.9' D. 11.9' TO 16.2'
	20		10.1' TO 11.9' - LOW PLASTICITY, STIFF, DAMP, WHITE, MINOR SAND AND GRAVEL, CALICHED.			CARTON SAMPLES C-1. 27.1' TO 27.8' C-2. 28.5' TO 29.4' C-3. 31.3' TO 32.2' C-4. 36.1' TO 36.8' C-5. 37.0' TO 37.55 C-6. 39.3' TO 40.0'
			11.9' TO 16.2' SAND - COARSE TO FINE, MEDIUM DENSE, SLIGHTLY MOIST TO MOIST AT 15.3', LIGHT GRAY TO YELLOW BROWN (STAINING), CLAYEY, SOME SUBROUNDED TO SUBANGULAR GRAVEL, GRADING INTO SANDY GRAVEL AT 16.2'.	C-1		
				C-2		
23.0				C-3		
	30		16.2' TO 20.8' GRAVEL - COARSE TO FINE, SUBROUNDED TO ROUNDED CHERT, WET AT 17.2', LIGHT GRAY TO YELLOW BROWN (AT 18.3'), SANDY.			SOIL RESISTIVITY TEST 2.5' PIN SPACING x 191.5 x 1 MULTIPLIER x 4.4 (ZERO DIAL RDG) = 2.107 OHM-CM
27.9				C-4		
3.4				C-5		
4.6				C-6		--- 20.8' TO 39.1' (CONT.) - ARGILLACEOUS, MARLY, FOSSILIFEROUS, WITH BLACK STAINING; LIMESTONE IS PALE BROWN, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), WELL CEMENTED, SOME SPARRY CALCITE, FOSSILIFEROUS, WITH IRON STAINING. 39.1' TO 40.0' - AS ABOVE, EXCEPT UNWEATHERED, DARK GRAY TO GRAY, NO STAINING.
	40		20.8' TO 40.0' SHALE AND LIMESTONE (INTERBEDDED) 20.8' TO 39.1' - WEATHERED; THIN TO MEDIUM INTERBEDDED LAYERS; SHALE IS OLIVE YELLOW TO LIGHT GREEN GRAY, SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), FISSILE, SILTY.			
	50					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 8A4C-5735

ADDITIONAL NOTE: SOME OF THE MATERIALS IDENTIFIED AND CLASSIFIED AS OVERBURDEN SOILS MAY BE HIGHLY WEATHERED MARL/SHALE AND LIMESTONE PRIMARY. DISTURBED AND REWORKED BY AUGER DRILLING ACTION.

NOTES:

1. USE THIS SHEET FOR BORING LOGS ONLY.
2. MOISTURE CONTENT, WHERE SHOWN, IS EXPRESSED AS PERCENT DRY WEIGHT AT TIME OF LABORATORY CLASSIFICATION.
3. LEGEND SHOWS OVERBURDEN MATERIALS CLASSIFIED ACCORDING TO ASTM D 2487 AND ASTM D 2488.
4. DESCRIPTION OF OVERBURDEN MATERIALS CHANGED TO CORRESPOND WITH LABORATORY CLASSIFICATION AS NECESSARY.
5. ORIGINAL DRILLING LOGS AVAILABLE AT CORPS OF ENGINEERS FORT WORTH DISTRICT OFFICE.

US Army Corps of Engineers
Fort Worth District

Symbol	Description	Tracking No.	Action	Note

Date: | Rev.
Sol No.
Contr No.
File name:
Plot date: 10/5/2011
Plot scale:

Designed by: K. McCLESKEY
Dwn by: K. McCLESKEY
Reviewed by: J. HERNANDEZ
Submitted by: JOSE HERNANDEZ, P.E. CHIEF, GEOTECHNICAL SECTION

U.S. ARMY ENGINEER DISTRICT, CORPS OF ENGINEERS FORT WORTH, TEXAS

ENGINEERING/ CONSTRUCTION DIVISION ENGINEERING BRANCH

FORT HOOD, TEXAS
ORTC (FY12)
PN: 065374

LOGS OF BORINGS
PRIMARY SITE 1 OF 5

Sheet reference number: B201

DESIGN FILE: fn-ORTC-B201.dgn

REFERENCE FILES:

Contr No.

Section:

Hole No. 8A4C-5736

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5736		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 2 / UNDISTURBED 2
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE	STARTED 24 JAN 11 / COMPLETED 25 JAN 11
7. THICKNESS OF OVERBURDEN 16.1'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 24.9'		18. TOTAL CORE RECOVERY FOR BORING 93 %	
9. TOTAL DEPTH OF HOLE 41.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
18.4	10	VISUAL	0.0' TO 0.5' SAND - COARSE TO FINE, MEDIUM DENSE, SLIGHTLY MOIST, BROWN, CLAYEY, GRAVELLY, SOME FOSSIL OYSTER SHELLS; POSSIBLE FILL. 0.5' TO 10.9' CLAY 0.5' TO 6.1' - HIGH PLASTICITY, VERY STIFF TO HARD, SLIGHTLY MOIST, DARK GRAY, SANDY AND SILTY, MINOR GRAVEL, LIME NODULES UP TO 1/8". 6.1' TO 10.9' - HIGH PLASTICITY, VERY STIFF TO HARD, DRY, PALE BROWN TO WHITE (CALICHE), SILTY, LIMY WITH LIME NODULES UP TO 0.5".		ST-1 A, ST-1 B, C	DRILLING 0.0' TO 17.0' - 10" AUGER AND 3" SHELBY TUBE. SET 18' OF 8" CASING AND CIRCULATION PAN; CLEANOUT TO 18' WITH 7-7/8" AUGER. 18.0' TO 41.0' - 4" CARBOLOY BIT CORE; BAILED TO 27' WITH HOLE OPEN TO 38'; BACKFILLED TO SURFACE AFTER FINAL WATER LEVEL CHECK. WATER LEVEL 45-HR CHECK AT 23.5', HOLE OPEN TO 37' JAR SAMPLES A. 0.5' TO 6.1' B. 6.1' TO 10.9' C. 16.1' TO 17.2'
19.4						
10.2						
20.9	20		10.9' TO 16.1' GRAVEL - COARSE TO FINE, MEDIUM DENSE, SLIGHTLY MOIST, STRONG BROWN, SUBROUNDED TO SUBANGULAR, COBBLES TO 6" DIA. AT 13', CLAYEY, SANDY, SOME CALICHE CEMENTATION.		C-1	SHELBY TUBE SAMPLES ST-1. 2.0' TO 4.0' (PENETROMETER GREATER THAN 4.5) ST-2. 6.5' TO 8.5' (PENETROMETER GREATER THAN 4.5)
9.7					C-2	
11.5					C-3	CARTON SAMPLES C-1. 18.6' TO 19.5' C-2. 20.3' TO 21.2' C-3. 22.6' TO 23.5' C-4. 24.2' TO 25.1' C-5. 26.5' TO 27.4' C-6. 30.9' TO 31.8' C-7. 37.5' TO 38.2'
16.9					C-4	
20.3			16.1' TO 17.2' MARL - WEATHERED, YELLOW BROWN TO PALE YELLOW TO LIGHT GRAY, VERY SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), SOME CALICHE, HARD (ROCK CLASSIFICATION) LIMESTONE SEAM AT 16.6'.		C-5	
25.8	30				C-6	SOIL RESISTIVITY TEST 2.5' PIN SPACING x 191.5 x 1 MULTIPLIER x 5 (ZERO DIAL RDG) = 2.394 OHM-CM
25.8	40		17.2' TO 41.0' LIMESTONE AND SHALE (INTERBEDDED) 17.2' TO 39.4' - WEATHERED; SHALE IS GREEN GRAY TO OLIVE YELLOW, SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), MARLY, ARGILLACEOUS, CALCAREOUS, FOSSILIFEROUS, WITH BLOCKY STRUCTURE AND IRON STAINING; LIMESTONE IS LIGHT GRAY TO PALE YELLOW, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), WELL CEMENTED, MARLY, FOSSILIFEROUS, SOME SPARRY CALCITE.		C-7	17.2' TO 39.4' (CONT.) - IRON STAINING; MEDIUM LAYERS OF SHALE AND LIMESTONE INTERBEDDED; SOME EXTREMELY THIN SEAMS OF GYPSUM AFTER 29.9'. 39.9' TO 41.0' - AS ABOVE, EXCEPT UNWEATHERED, GRAY TO DARK GRAY, SOME SHALY LIMESTONE, NO STAINING OR GYPSUM SEAMS.
	50					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 8A4C-5736

Hole No. 10A-5737

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT 6" AUGER	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 10A-5737		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 3 / UNDISTURBED 0
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER DRY	
		16. DATE HOLE	STARTED 8 FEB 11 / COMPLETED 8 FEB 11
7. THICKNESS OF OVERBURDEN --		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK --		18. TOTAL CORE RECOVERY FOR BORING N/A %	
9. TOTAL DEPTH OF HOLE 10.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	10	VISUAL	0.0' TO 10.0' CLAY 0.0' TO 2.8' - HIGH PLASTICITY, VERY STIFF, LIGHT YELLOW BROWN TO BROWN, SANDY AND GRAVELLY, LIME NODULES TO 0.25". 2.8' TO 10.0' - HIGH PLASTICITY, VERY STIFF TO HARD, DAMP, DARK GRAY BROWN, SLIGHTLY SANDY AND GRAVELLY, LIME NODULES UP TO 0.25"; AFTER 5.4' - GRAY, INCREASED SILT AND LIME NODULE CONTENT, SLIGHTLY LIMY, LIME NODULES UP TO 1", INCREASED GRAVEL CONTENT AT 9.7'.		A, B, C	JAR SAMPLES A. 0.0' TO 2.8' B. 2.8' TO 7.0' C. 7.0' TO 10.0'
	20					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 10A-5737

Hole No. 10A-5738

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT 6" AUGER	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 10A-5738		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 3 / UNDISTURBED 0
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER DRY	
		16. DATE HOLE	STARTED 10 FEB 11 / COMPLETED 10 FEB 11
7. THICKNESS OF OVERBURDEN --		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK --		18. TOTAL CORE RECOVERY FOR BORING N/A %	
9. TOTAL DEPTH OF HOLE 10.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	10	VISUAL	0.0' TO 7.8' CLAY 0.0' TO 0.2' - HIGH PLASTICITY, STIFF, PALE YELLOW, SANDY. 0.2' TO 7.8' - HIGH PLASTICITY, VERY STIFF TO HARD, DAMP, DARK GRAY BROWN, SILTY, SLIGHTLY SANDY, TRACE OF GRAVEL, LIME NODULES UP TO 1/8"; GRAY, SANDY, AND GRAVELLY AFTER 5.4'. 7.8' TO 10.0' SAND - COARSE TO FINE, MEDIUM DENSE, DAMP, YELLOW RED, CLAYEY, SANDY, SOME CALICHE; GRAY AND INCREASED CLAY CONTENT AFTER 9.2'.		A, B, C	JAR SAMPLES A. 0.2' TO 5.0' B. 5.0' TO 7.8' C. 7.8' TO 10.0'
	20					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 10A-5738

Hole No. 10A-5739

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT 6" AUGER	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 10A-5739		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 3 / UNDISTURBED 0
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER DRY	
		16. DATE HOLE	STARTED 10 FEB 11 / COMPLETED 10 FEB 11
7. THICKNESS OF OVERBURDEN --		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK --		18. TOTAL CORE RECOVERY FOR BORING N/A %	
9. TOTAL DEPTH OF HOLE 10.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
15.6	10	VISUAL	0.0' TO 0.9' GRAVEL - COARSE TO FINE, MEDIUM DENSE, DAMP, BROWN, CLAYEY, SANDY. 0.9' TO 5.6' CLAY - HIGH PLASTICITY, VERY STIFF TO HARD, DRY, DARK GRAY BROWN, SANDY, SLIGHTLY GRAVELLY. 5.6' TO 10.0' SAND 5.6' TO 8.1' - COARSE TO FINE, MEDIUM DENSE, DAMP, RED TO YELLOW RED, CLAYEY, SOME CALICHE CEMENTATION.		A, B, C	JAR SAMPLES A. 0.9' TO 5.6' B. 5.6' TO 8.1' C. 8.1' TO 10.0' 8.1' TO 10.0' - FINE, MEDIUM DENSE, SLIGHTLY MOIST, RED TO YELLOW, CLAYEY, SLIGHTLY GRAVELLY, SOME CALICHE CEMENTATION (NOTABLE AFTER 9.4').
10.1						
15.7						
	20					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 10A-5739

Hole No. 10A-5740

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT 6" AUGER	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 10A-5740		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 2 / UNDISTURBED 0
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER DRY	
		16. DATE HOLE	STARTED 8 FEB 11 / COMPLETED 8 FEB 11
7. THICKNESS OF OVERBURDEN --		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK --		18. TOTAL CORE RECOVERY FOR BORING N/A %	
9. TOTAL DEPTH OF HOLE 10.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	10	VISUAL	0.0' TO 10.0' CLAY 0.0' TO 6.4' - HIGH PLASTICITY, VERY STIFF TO HARD, DRY, DARK GRAY BROWN, SANDY AND GRAVELLY, LIME NODULES UP TO 1/8"; AFTER 5' - INCREASED SILTY CONTENT AND LIME NODULE CONTENT AND SIZE, LIME NODULES UP TO 0.25". 6.4' TO 10.0' - HIGH PLASTICITY, VERY STIFF TO HARD, DRY, PALE BROWN TO WHITE (CALICHE), SILTY, SLIGHTLY SANDY, LIMY WITH LIME NODULES UP TO 1/8".		A, B	JAR SAMPLES A. 0.0' TO 6.4' B. 6.4' TO 10.0'
	20					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 10A-5740

Hole No. 10A-5741

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT 6" AUGER	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 10A-5741		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 2 / UNDISTURBED 0
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER DRY	
		16. DATE HOLE	STARTED 27 JAN 11 / COMPLETED 27 JAN 11
7. THICKNESS OF OVERBURDEN --		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK --		18. TOTAL CORE RECOVERY FOR BORING N/A %	
9. TOTAL DEPTH OF HOLE 10.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	10	VISUAL	0.0' TO 10.0' CLAY 0.0' TO 6.4' - HIGH PLASTICITY, VERY STIFF TO HARD, DRY TO DAMP, VERY DARK GRAY TO DARK GRAY, SILTY, SLIGHTLY SANDY, LIME NODULES UP TO 1/8". 6.4' TO 10.0' - HIGH PLASTICITY, VERY STIFF TO HARD, DRY, PALE BROWN TO WHITE (CALICHE), SLIGHTLY SILTY, TRACE OF FINE GRAVEL, LIMY WITH LIME NODULES UP TO 0.25".		A, B	JAR SAMPLES A. 0.0' TO 6.4' B. 6.4' TO 10.0'
	20					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 10A-5741

Hole No. 10A-5742

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT 6" AUGER	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 10A-5742		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 2 / UNDISTURBED 0
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER DRY	
		16. DATE HOLE	STARTED 27 JAN 11 / COMPLETED 27 JAN 11
7. THICKNESS OF OVERBURDEN --		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK --		18. TOTAL CORE RECOVERY FOR BORING N/A %	
9. TOTAL DEPTH OF HOLE 10.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
16.0	10	VISUAL	0.0' TO 1.7' GRAVEL - COARSE TO FINE, MEDIUM DENSE, DAMP, YELLOW RED; POSSIBLE FILL. 1.7' TO 10.0' CLAY 1.7' TO 6.4' - HIGH PLASTICITY, VERY STIFF TO HARD, DAMP, BROWN TO DARK GRAY BROWN, SILTY, SANDY, SLIGHTLY CALICHED, LIME NODULES UP TO 0.25". 6.4' TO 10.0' - HIGH PLASTICITY, VERY STIFF TO HARD, DRY, PALE BROWN TO WHITE (CALICHE), SLIGHTLY SILTY, LIMY, LIME NODULES UP TO 0.25".		A, B	JAR SAMPLES A. 1.7' TO 6.4' B. 6.4' TO 10.0'
15.2						
	20					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 10A-5742

ADDITIONAL NOTE: SOME OF THE MATERIALS IDENTIFIED AND CLASSIFIED AS OVERBURDEN SOILS MAY BE HIGHLY WEATHERED MARL/SHALE AND LIMESTONE PRIMARY. DISTURBED AND REWORKED BY AUGER DRILLING ACTION.

NOTES:

1. USE THIS SHEET FOR BORING LOGS ONLY.
2. MOISTURE CONTENT, WHERE SHOWN, IS EXPRESSED AS PERCENT DRY WEIGHT AT TIME OF LABORATORY CLASSIFICATION.
3. LEGEND SHOWS OVERBURDEN MATERIALS CLASSIFIED ACCORDING TO ASTM D 2487 AND ASTM D 2488.
4. DESCRIPTION OF OVERBURDEN MATERIALS CHANGED TO CORRESPOND WITH LABORATORY CLASSIFICATION AS NECESSARY.
5. ORIGINAL DRILLING LOGS AVAILABLE AT CORPS OF ENGINEERS FORT WORTH DISTRICT OFFICE.

US Army Corps of Engineers
Fort Worth District

Symbol	Description	Tracking No.	Action	Note

Date: | Rev.
Sol No.
Contr No.

Designed by: K. McCLESKEY
Dwn by: K. McCLESKEY
Reviewed by: J. HERNANDEZ
Submitted by: JOSE HERNANDEZ, P.E. CHIEF, GEOTECHNICAL SECTION

File name:
Plot date: 10/5/2011
Plot scale:

U.S. ARMY ENGINEER DISTRICT, CORPS OF ENGINEERS FORT WORTH, TEXAS

ENGINEERING/ CONSTRUCTION DIVISION ENGINEERING BRANCH

FORT HOOD, TEXAS
ORTC (FY12)
PN: 065374

LOGS OF BORINGS
PRIMARY SITE 2 OF 5

Sheet reference number: B202

DESIGN FILE: fh-ORTC-B202.dgn

Contr No.

fh-ORTC-B202.dgn 10/5/2011 4:13:44 PM

REFERENCE FILES:

Section:

Hole No. 10A-5743

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT 6" AUGER	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 10A-5743		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3, UNDISTURBED 0	
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER DRY	
		16. DATE HOLE: STARTED 27 JAN 11, COMPLETED 27 JAN 11	
7. THICKNESS OF OVERBURDEN --		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK --		18. TOTAL CORE RECOVERY FOR BORING N/A %	
9. TOTAL DEPTH OF HOLE 10.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	10 20	VISUAL	0.0' TO 9.7' CLAY 0.0' TO 6.5' - HIGH PLASTICITY, VERY STIFF TO HARD, DAMP, DARK GRAY BROWN TO BROWN, SILTY, SLIGHTLY SANDY, TRACE OF FINE GRAVEL AT 4.8', LIME NODULES UP TO 0.25". 6.5' TO 9.7' - HIGH PLASTICITY, VERY STIFF TO HARD, DRY, PALE BROWN TO WHITE (CALICHE), SLIGHTLY SILTY, LIMY, LIME NODULES UP TO 3/8". 9.7' TO 10.0' GRAVEL - DETERMINED BY DRILLING ACTION.		A B C	JAR SAMPLES A. 0.0' TO 5.0' B. 5.0' TO 6.5' C. 6.5' TO 9.7'

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 10A-5743

Hole No. 10A-5744

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT 6" AUGER	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 10A-5744		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3, UNDISTURBED 0	
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER DRY	
		16. DATE HOLE: STARTED 8 FEB 11, COMPLETED 8 FEB 11	
7. THICKNESS OF OVERBURDEN --		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK --		18. TOTAL CORE RECOVERY FOR BORING N/A %	
9. TOTAL DEPTH OF HOLE 10.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	10 20	VISUAL	0.0' TO 10.0' CLAY 0.0' TO 7.0' - HIGH PLASTICITY, VERY STIFF TO HARD, DAMP, DARK GRAY BROWN, SILTY, LIME NODULES UP TO 0.5". 7.0' TO 10.0' - HIGH PLASTICITY, VERY STIFF TO HARD, DRY, PALE BROWN TO WHITE (CALICHE), SLIGHTLY SILTY, LIMY, LIME NODULES UP TO 0.5".		A B C	JAR SAMPLES A. 0.0' TO 5.0' B. 5.0' TO 7.0' C. 7.0' TO 10.0'

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 10A-5744

Hole No. 10A-5745

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT 6" AUGER	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 10A-5745		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2, UNDISTURBED 0	
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER DRY	
		16. DATE HOLE: STARTED 10 FEB 11, COMPLETED 10 FEB 11	
7. THICKNESS OF OVERBURDEN --		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK --		18. TOTAL CORE RECOVERY FOR BORING N/A %	
9. TOTAL DEPTH OF HOLE 10.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
24.7 20.6	10 20		0.0' TO 10.0' CLAY - HIGH PLASTICITY, VERY STIFF, DAMP, DARK GRAY BROWN TO 6.5', SILTY, SLIGHTLY SANDY, LIME NODULES TO 0.25". ROOTS NOTED AT 2.3'; INCREASING LIME NODULE CONTENT AFTER 5.4'; LIGHT YELLOW BROWN AFTER 6.5' WITH WHITE CALICHE AFTER 7.6'.		A B	JAR SAMPLES A. 0.0' TO 5.0' B. 5.0' TO 10.0'

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 10A-5745

Hole No. 8A4C-5748

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5748		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 4, UNDISTURBED 0	
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE: STARTED 2 FEB 11, COMPLETED 5 FEB 11	
7. THICKNESS OF OVERBURDEN 21.0'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 18.5'		18. TOTAL CORE RECOVERY FOR BORING 98 %	
9. TOTAL DEPTH OF HOLE 39.5'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
24.5 23.5 21.0 18.2 17.3 19.6 16.9 17.2 15.1 16.2 14.0	10 20 30 40 50	VISUAL	0.0' TO 0.9' GRAVEL - COARSE TO FINE, LIMESTONE CLASTS, DENSE, DRY, PALE YELLOW TO VERY PALE BROWN, SANDY. 0.9' TO 21.0' CLAY - HIGH PLASTICITY, VERY STIFF TO HARD, DAMP, VERY DARK GRAY TO 6', SILTY, WITH A TRACE OF FINE GRAVEL, LIME NODULES UP TO 0.25"; DARK GRAY BROWN TO OLIVE BROWN TO LIGHT OLIVE BROWN AFTER 6' WITH INCREASING PERCENTAGE OF LIME NODULES, NO GRAVEL; SOME CALICHE AFTER 7.3'; LIGHT YELLOW BROWN TO LIGHT GRAY TO WHITE (CALICHE), LIME NODULES UP TO 0.75" AFTER 11'; ROOTS AT 17.6', SOME LIGHT GREEN GRAY AFTER 16'. 21.0' TO 39.5' SHALE - WEATHERED, LIGHT GREEN GRAY AND PALE BROWN, SOFT (ROCK CLASSIFICATION) BLOCKY STRUCTURE, ARGILLACEOUS, BLACK STAINING, CALCAREOUS, TRACE OF CALICHE, SLIGHTLY MARLY AFTER 33.7', MARL IS MODERATELY HARD (ROCK CLASSIFICATION).		ST-1 A ST-2 B C D E C-1 C-2 C-3 C-4 C-5 C-6	DRILLING 0.0' TO 25.0' - 10" AUGER AND 3" SHELBY TUBE. SET 25' OF 8" CASING AND CIRCULATION PAN; CLEANOUT TO 27' WITH 7-7/8" AUGER. 27.0' TO 39.5' - 4" CARBOLOY BIT CORE; BAILED TO 37.0' WITH HOLE OPEN TO 38'; AFTER PULLING CASING, WATER LEVEL AT 32.0' WITH HOLE OPEN TO 34.6'; BACKFILLED TO SURFACE AFTER FINAL WATER LEVEL CHECK. WATER LEVEL 24-HR CHECK AT 32.9', HOLE OPEN TO 33.3' JAR SAMPLES A. 0.9' TO 6.0' B. 6.0' TO 11.0' C. 11.0' TO 16.0' D. 16.0' TO 21.0' E. 21.0' TO 25.0' SHELBY TUBE SAMPLE ST-1. 2.0' TO 4.0' (PENETROMETER = 4.25) ST-2. 8.0' TO 10.0' (PENETROMETER = 4.25) CARTON SAMPLES C-1. 27.3' TO 28.2' C-2. 29.4' TO 30.3' C-3. 31.5' TO 32.4' C-4. 33.8' TO 34.7' C-5. 36.0' TO 36.9' C-6. 38.3' TO 39.2' SOIL RESISTIVITY TEST 2.5' PIN SPACING x 191.5 x 1 MULTIPLIER x 2.3 (ZERO DIAL RDG) = 1,101 OHM-CM

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 8A4C-5748

Hole No. 10A-5746

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT 6" AUGER	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 10A-5746		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2, UNDISTURBED 0	
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER DRY	
		16. DATE HOLE: STARTED 10 FEB 11, COMPLETED 10 FEB 11	
7. THICKNESS OF OVERBURDEN --		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK --		18. TOTAL CORE RECOVERY FOR BORING N/A %	
9. TOTAL DEPTH OF HOLE 10.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	10 20	VISUAL	0.0' TO 10.0' CLAY - HIGH PLASTICITY, VERY STIFF TO HARD, DRY, DARK GRAY BROWN, SILTY, SLIGHTLY SANDY, PLANT ROOTS NOTED TO 2', SLIGHTLY LIMY, LIME NODULES UP TO 0.25"; INCREASING LIME NODULE CONTENT AFTER 7'; PALE BROWN AFTER 8.5'; PALE BROWN WITH WHITE CALICHE AFTER 9.4'.		A B	JAR SAMPLES A. 0.0' TO 5.0' B. 5.0' TO 10.0'

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 10A-5746

Hole No. 10A-5747

DRILLING LOG	DIVISION SWD	INSTALLATION FORT WORTH DISTRICT	SHEET 1 OF 1 SHEETS
1. PROJECT ORTC (FY12)		10. SIZE AND TYPE OF BIT 6" AUGER	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 10A-5747		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3, UNDISTURBED 0	
5. NAME OF DRILLER NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER DRY	
		16. DATE HOLE: STARTED 8 FEB 11, COMPLETED 8 FEB 11	
7. THICKNESS OF OVERBURDEN --		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK --		18. TOTAL CORE RECOVERY FOR BORING N/A %	
9. TOTAL DEPTH OF HOLE 10.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	10 20	VISUAL	0.0' TO 10.0' CLAY 0.0' TO 7.4' - HIGH PLASTICITY, VERY STIFF TO HARD, DAMP, DARK GRAY BROWN, SILTY, SLIGHTLY SANDY, PLANT ROOTS NOTED TO 4'. LIME NODULES UP TO 0.5"; OLIVE BROWN WITH INCREASING LIME NODULE CONTENT AFTER 5.4'. 7.4' TO 10.0' - HIGH PLASTICITY, VERY STIFF TO HARD, DRY, PALE BROWN TO WHITE (CALICHE), SILTY, LIME NODULES UP TO 0.5".		A B C	JAR SAMPLES A. 0.0' TO 5.0' B. 5.0' TO 7.4' C. 7.4' TO 10.0'

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT FH-ORTC (FY12) HOLE NO. 10A-5747

ADDITIONAL NOTE: SOME OF THE MATERIALS IDENTIFIED AND CLASSIFIED AS OVERBURDEN SOILS MAY BE HIGHLY WEATHERED MARL/SHALE AND LIMESTONE PRIMARY. DISTURBED AND REWORKED BY AUGER DRILLING ACTION.

NOTES:

1. USE THIS SHEET FOR BORING LOGS ONLY.
2. MOISTURE CONTENT, WHERE SHOWN, IS EXPRESSED AS PERCENT DRY WEIGHT AT TIME OF LABORATORY CLASSIFICATION.
3. LEGEND SHOWS OVERBURDEN MATERIALS CLASSIFIED ACCORDING TO ASTM D 2487 AND ASTM D 2488.
4. DESCRIPTION OF OVERBURDEN MATERIALS CHANGED TO CORRESPOND WITH LABORATORY CLASSIFICATION AS NECESSARY.
5. ORIGINAL DRILLING LOGS AVAILABLE AT CORPS OF ENGINEERS FORT WORTH DISTRICT OFFICE.

US Army Corps of Engineers
Fort Worth District

Symbol	Description	Initials No.	Action	Date

Date: | Rev.
Sol No.
Contr No.
File name:
Plot date: 10/5/2011
Plot scale:

Designed by: K. McCLESKEY
Dwn by: K. McCLESKEY
Reviewed by: J. HERNANDEZ
Submitted by: JOSE HERNANDEZ, P.E. CHIEF, GEOTECHNICAL SECTION

U.S. ARMY ENGINEER DISTRICT, CORPS OF ENGINEERS FORT WORTH, TEXAS

ENGINEERING/ CONSTRUCTION DIVISION ENGINEERING BRANCH

FORT HOOD, TEXAS
ORTC (FY12)
PN: 065374

LOGS OF BORINGS
PRIMARY SITE 3 OF 5

Sheet reference number: B203

DESIGN FILE: fh-ORTC-B203.dgn

Contr No.

REFERENCE FILES:

fh-ORTC-B203.dgn 10/5/2011 4:15:05 PM

Section:

DRILLING LOG — Hole No. 8A4C-5816 (Sheet 1 of 2 sheets)

DIVISION	SWD
INSTALLATION	FT. WORTH
1. PROJECT	ORTC (FY12) RELOCATE
2. LOCATION (Coordinates or Station)	FORT HOOD, TEXAS
3. DRILLING AGENCY	USACE
4. HOLE NO. (As shown on drawing title and file number)	8A4C-5816
5. NAME OF DRILLER	R. NETHERLAND
6. DIRECTION OF HOLE	[X] VERTICAL [ ] INCLINED ___ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	12.9'
8. DEPTH DRILLED INTO ROCK	36.6'
9. TOTAL DEPTH OF HOLE	49.5'
10. SIZE AND TYPE OF BIT	SEE REMARKS
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
12. MANUFACTURER'S DESIGNATION OF DRILL	FAILING 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 1; UNDISTURBED 11
14. TOTAL NUMBER CORE BOXES	0
15. ELEVATION GROUND WATER	SEE REMARKS
16. DATE HOLE	STARTED 26 JUL 11; COMPLETED 27 JUL 11
17. ELEVATION TOP OF HOLE	
18. TOTAL CORE RECOVERY FOR BORING	96%
19. SIGNATURE OF INSPECTOR	JOEL WEBSTER

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
16.7 11.4 19.5 8.5 5.7 8.4 9.4 8.5	10 20 30 40 50	VISUAL	0.0' TO 2.2' SANDY GRAVEL - COARSE TO FINE, MOSTLY OYSTER SHELL FRAGMENTS, PALE BROWN, MEDIUM DENSE TO DENSE, DRY, SOME CLAY, LIMY. 2.2' TO 8.1' GRAVELLY CLAY - DARK GRAY, BECOMING GRAY WITH DEPTH, HARD TO VERY STIFF, HIGH PLASTICITY, DRY, SOME SAND. 8.1' TO 12.9' SANDY GRAVEL - COARSE TO FINE, SUBROUNDED TO SUBANGULAR, MEDIUM DENSE TO DENSE, MOIST, WET AFTER 10.7', SOME CLAY, SOME CALICHE CEMENTATION AT GRAVEL FACIES CONTACTS. 12.9' TO 41.3' SHALE AND LIMESTONE INTERBEDDED 12.9' TO 31.5' - SHALE - WEATHERED GREENISH GRAY AND YELLOWISH BROWN, SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), SLIGHTLY BLOCKY, JOINTED, ARGILLACEOUS, THIN TO MEDIUM BEDDED, CALCAREOUS, MINOR ROOTS AND BLACK STAINING AT TOP OF SECTION, SLIGHTLY FOSSILIFEROUS; LIMESTONE - WEATHERED LIGHT GRAY AND PALE YELLOW, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), JOINTED, WELL CEMENTED, THIN TO MEDIUM BEDDED, GRANULAR TO ARGILLACEOUS, FOSSILIFEROUS WITH SOME SPARRY CALCITE, MINOR IRON STAINING. 31.5' TO 41.3' - AS ABOVE, UNWEATHERED, VERY DARK GRAY SHALE AND GRAY LIMESTONE.		A C-1 C-2 C-3 C-4 C-5 C-6 C-7 C-8 C-9 C-10	DRILLING 0.0' TO 13.0' - WITH 10" AUGER, COLLECT 3" SHELBY TUBE SAMPLE ST-1 FROM 2.4' TO 4.5', PENETROMETER GREATER THAN 4.5. SET 13.5' OF 8" CASING AND CIRCULATION PAN. CLEAN OUT OF 14' WITH 7 7/8" AUGER. 14.0' TO 19.5' - WITH 4" CARBOLOY CORE BIT. CORE RUNS BROKEN INTO ≈6" SEGMENTS MOSTLY. WATER LEVEL BAILED TO 46.8' WITH HOLE OPEN TO 48.2'; PULL CASING UP 2', REMEASURE AT 40.0'. AT 17 HOURS - 10.5' WITH HOLE OPEN TO 41.0'. SOIL RESISTIVITY TEST 191.5 X 2.5' X 1(MULTIPLIER) X 2.0 (ZERO) = 957.5 OHMS.CM JAR SAMPLES A: 2.2' TO 8.1' SHELBY TUBES C-1: 14.3' TO 15.0' C-2: 15.5' TO 16.2' C-3: 17.0' TO 17.9' C-4: 26.2' TO 27.1' C-5: 28.1' TO 28.8' C-6: 38.6' TO 39.3' C-7: 41.1' TO 42.0' C-8: 43.7' TO 44.6' C-9: 44.8' TO 45.8' C-10: 48.5' TO 49.2'

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT: ORTC (FY12) RELOCATE HOLE NO. 8A4C-5816

DRILLING LOG — Hole No. 8A4C-5816 (Sheet 2 of 2 sheets)

DIVISION	SWD
INSTALLATION	FT. WORTH
1. PROJECT	ORTC (FY12) RELOCATE
2. LOCATION (Coordinates or Station)	FORT HOOD, TEXAS
3. DRILLING AGENCY	USACE
4. HOLE NO. (As shown on drawing title and file number)	8A4C-5816
5. NAME OF DRILLER	R. NETHERLAND
6. DIRECTION OF HOLE	[X] VERTICAL [ ] INCLINED ___ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	12.9'
8. DEPTH DRILLED INTO ROCK	36.6'
9. TOTAL DEPTH OF HOLE	49.5'
10. SIZE AND TYPE OF BIT	SEE REMARKS
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
12. MANUFACTURER'S DESIGNATION OF DRILL	FAILING 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 1; UNDISTURBED 11
14. TOTAL NUMBER CORE BOXES	0
15. ELEVATION GROUND WATER	SEE REMARKS
16. DATE HOLE	STARTED 26 JUL 11; COMPLETED 27 JUL 11
17. ELEVATION TOP OF HOLE	
18. TOTAL CORE RECOVERY FOR BORING	96%
19. SIGNATURE OF INSPECTOR	JOEL WEBSTER

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	10 20 30 40 50		(CONTINUED) 41.3' TO 49.2' LIMESTONE - UNWEATHERED GRAY AND DARK GRAY, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), SLIGHTLY JOINTED, MASSIVE BEDDING, WELL CEMENETED, GRANULAR, FOSSILIFEROUS, MINOR SPARRY CALCITE, MINOR SHALE PARTINGS.			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT: ORTC (FY12) RELOCATE HOLE NO. 8A4C-5816

DRILLING LOG — Hole No. 8A4C-5817 (Sheet 1 of 2 sheets)

DIVISION	SWD
INSTALLATION	FT. WORTH
1. PROJECT	ORTC (FY12) RELOCATE
2. LOCATION (Coordinates or Station)	FORT HOOD, TEXAS
3. DRILLING AGENCY	USACE
4. HOLE NO. (As shown on drawing title and file number)	8A4C-5817
5. NAME OF DRILLER	R. NETHERLAND
6. DIRECTION OF HOLE	[X] VERTICAL [ ] INCLINED ___ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	10.7'
8. DEPTH DRILLED INTO ROCK	38.8'
9. TOTAL DEPTH OF HOLE	49.5'
10. SIZE AND TYPE OF BIT	SEE REMARKS
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
12. MANUFACTURER'S DESIGNATION OF DRILL	FAILING 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 2; UNDISTURBED 10
14. TOTAL NUMBER CORE BOXES	0
15. ELEVATION GROUND WATER	SEE REMARKS
16. DATE HOLE	STARTED 21 JUL 11; COMPLETED 26 JUL 11
17. ELEVATION TOP OF HOLE	
18. TOTAL CORE RECOVERY FOR BORING	95%
19. SIGNATURE OF INSPECTOR	JOEL WEBSTER

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
19.1 18.5 9.1 18.5 3.2 20.5 8.5 8.1 9.5	10 20 30 40 50	VISUAL	0.0' TO 1.1' ROAD BASE - COARSE TO FINE GRAVEL, SAND, SILT, AND CLAY, PALE BROWN, MEDIUM DENSE TO DENSE, DRY. 1.1' TO 6.3' SILTY CLAY - DARK GRAY TO VERY DARK GRAY, HIGH PLASTICITY, HARD TO VERY STIFF, DRY, COARSE SUBROUNDED SAND, MINOR FINE GRAVEL, LIME GRANULES AND VERY SILTY WITH DEPTH. 6.3' TO 10.7' SANDY GRAVEL - COARSE TO FINE, SUBROUNDED TO SUBANGULAR, YELLOWISH RED, MEDIUM DENSE TO DENSE, MOIST, SOME CALICHE CEMENTATION, CLAYEY. 10.7' TO 14.8' SHALE AND MARL SHALE - WEATHERED, GREENISH GRAY AND YELLOWISH BROWN, SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), CALCAREOUS, ARGILLACEOUS; MARL - WEATHERED, PALE BROWN, SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), LIME NODULES, SLIGHTLY FOSSILIFEROUS. 14.8' TO 39.4' SHALE AND LIMESTONE INTERBEDDED 14.8' TO 28.3' - WEATHERED, GREENISH GRAY, AND YELLOWISH BROWN; SHALE - SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), MARLY AT TOP OF SECTION, SLIGHTLY BLOCKY, MEDIUM BEDDED, ARGILLACEOUS TO SILTY, CALCAREOUS, SLIGHTLY FOSSILIFEROUS, JOINTED, BLACK STAINING AND ROOTS AT TOP OF SECTION IN JOINTS, WEATHERED LIGHT GRAY AND VERY PALE BROWN; LIMESTONE - MODERATELY HARD TO HARD (ROCK CLASSIFICATION)...		A B C-1 C-2 C-3 C-4 C-5 C-6 C-7 C-8 C-9 C-10	DRILLING 0.0' TO 13.3' WITH 10" AUGER, SET 13.5' OF 8" METAL CASING AND CLEANOUT TO 14.0' WITH 7 7/8" AUGER. SET CIRCULATION PAN. 14.0' TO 49.5' WITH 4" CARBOLOY CORE BIT. WATER LEVEL BAILED TO 46.1' WITH HOLE OPEN TO 46.5'; PULL CASING AND REMEASURE AT 44.7' WITH HOLE OPEN TO 46.0'. AT 43.0' WITH HOLE OPEN TO 47.0' AFTER 22 HOURS. SOIL RESISTIVITY TEST 191.5 X 2.5' X 10(MULTIPLIER) X 1.0 (ZERO) = 4.787.5 OHMS.CM JAR SAMPLES A: 1.1' TO 6.3' B: 10.7' TO 13.5' CARTON SAMPLES C-1: 14.9' TO 15.9' C-2: 16.4' TO 17.4' C-3: 19.2' TO 20.1' C-4: 26.4' TO 27.3' C-5: 28.3' TO 29.0' C-6: 34.6' TO 35.3' C-7: 36.2' TO 37.2' C-8: 41.8' TO 42.9' C-9: 44.4' TO 45.4' C-10: 46.7' TO 47.6'

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT: ORTC (FY12) RELOCATE HOLE NO. 8A4C-5817

DRILLING LOG — Hole No. 8A4C-5817 (Sheet 2 of 2 sheets)

DIVISION	SWD
INSTALLATION	FT. WORTH
1. PROJECT	ORTC (FY12) RELOCATE
2. LOCATION (Coordinates or Station)	FORT HOOD, TEXAS
3. DRILLING AGENCY	USACE
4. HOLE NO. (As shown on drawing title and file number)	8A4C-5817
5. NAME OF DRILLER	R. NETHERLAND
6. DIRECTION OF HOLE	[X] VERTICAL [ ] INCLINED ___ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	10.7'
8. DEPTH DRILLED INTO ROCK	38.8'
9. TOTAL DEPTH OF HOLE	49.5'
10. SIZE AND TYPE OF BIT	SEE REMARKS
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
12. MANUFACTURER'S DESIGNATION OF DRILL	FAILING 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 2; UNDISTURBED 10
14. TOTAL NUMBER CORE BOXES	0
15. ELEVATION GROUND WATER	SEE REMARKS
16. DATE HOLE	STARTED 21 JUL 11; COMPLETED 26 JUL 11
17. ELEVATION TOP OF HOLE	
18. TOTAL CORE RECOVERY FOR BORING	95%
19. SIGNATURE OF INSPECTOR	JOEL WEBSTER

% MOISTURE CONTENT (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	10 20 30 40 50		(CONTINUED) 14.8' TO 39.4' SHALE AND LIMESTONE INTERBEDDED 14.8' TO 28.3' - WEATHERED, GREENISH GRAY, AND YELLOWISH BROWN; SHALE - SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), MARLY AT TOP OF SECTION, SLIGHTLY BLOCKY, MEDIUM BEDDED, ARGILLACEOUS TO SILTY, CALCAREOUS, SLIGHTLY FOSSILIFEROUS, JOINTED, BLACK STAINING AND ROOTS AT TOP OF SECTION IN JOINTS, WEATHERED LIGHT GRAY AND VERY PALE BROWN; LIMESTONE - MODERATELY HARD TO HARD (ROCK CLASSIFICATION), GRANULAR TO ARGILLACEOUS, JOINTED, WELL CEMENTED, THIN TO MEDIUM BEDDED, FOSSILIFEROUS WITH SOME SPARRY CALCITE, GYPSUM FILLED JOINT AT 24.9', SOME DARK GRAY SHALE AFTER 28.1'. 28.3' TO 39.4' - AS ABOVE, UNWEATHERED, VERY DARK GRAY SHALE, GRAY AND DARK GRAY LIMESTONE. 39.4' TO 47.6' LIMESTONE - UNWEATHERED, VERY DARK GRAY, DARK GRAY, AND GRAY, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), WELL CEMENTED, JOINTED, GRANULAR, FOSSILIFEROUS WITH SOME SPARRY CALCITE, SHALY, LESS SHALY WITH DEPTH.			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT: ORTC (FY12) RELOCATE HOLE NO. 8A4C-5817

NOTES:

1. USE THIS SHEET FOR BORING LOGS ONLY.
2. MOISTURE CONTENT, WHERE SHOWN, IS EXPRESSED AS PERCENT DRY WEIGHT AT TIME OF LABORATORY CLASSIFICATION.
3. LEGEND SHOWS OVERBURDEN MATERIALS CLASSIFIED ACCORDING TO ASTM D 2487 AND ASTM D 2488.
4. DESCRIPTION OF OVERBURDEN MATERIALS CHANGED TO CORRESPOND WITH LABORATORY CLASSIFICATION AS NECESSARY.
5. ORIGINAL DRILLING LOGS AVAILABLE AT CORPS OF ENGINEERS FORT WORTH DISTRICT OFFICE.

US Army Corps of Engineers
Fort Worth District

Symbol	Description	Initials	No.	Action	Date

Date: Rev.
Sol No.
Contr No.
File name:
Plot date: 10/5/2011
Plot scale:

Designed by: JOSH PICKERING
Dwn by: JOSH PICKERING
Reviewed by: KEN McCLESKEY
Submitted by: KEN McCLESKEY, P.G. CHIEF, GEOTECHNICAL SECTION

U.S. ARMY ENGINEER DISTRICT, CORPS OF ENGINEERS FORT WORTH, TEXAS

ENGINEERING/ CONSTRUCTION DIVISION ENGINEERING BRANCH

FORT HOOD, TEXAS
ORTC (FY12)
PN: 065374

LOGS OF BORINGS
PRIMARY SITE 4 OF 5

Sheet reference number: B204

DESIGN FILE: fh-ORTC-B204.dgn

Contr No.

REFERENCE FILES:

Section:

DRILLING LOG — Hole No. 8A4C-5818

DRILLING LOG	DIVISION SWD	INSTALLATION FT. WORTH	SHEET 1 OF 2 SHEETS
1. PROJECT ORTC (FY12) RELOCATE		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5818		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 2 / UNDISTURBED 17
5. NAME OF DRILLER R. NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE	STARTED 29 JUNE 11 / COMPLETED 30 JUNE 11
7. THICKNESS OF OVERBURDEN 10.2'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 39.8'		18. TOTAL CORE RECOVERY FOR BORING 97%	
9. TOTAL DEPTH OF HOLE 50.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (c)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
16.7		VISUAL	0.0' TO 3.7' GRAVELLY CLAY - REDDISH BROWN TO 1.1', OLIVE BROWN AND 1.1', MEDIUM PLASTICITY, HARD, DRY, SANDY.		A	DRILLING 0.0' TO 12.0' WITH 10" AUGER; 3" SHELBY TUBE SAMPLE FROM 3.0' TO 4.0' (TUBE BENT CLOSED AT BOTTOM); WATER ADDED TO GRAVEL FROM 4.0' TO 5.0'. SET 12' OF 8" METAL CASING AND CIRCULATION PAN. CLEANOUT TO 12.0' WITH 7 7/8" AUGER.
21.4	10		3.7' TO 10.2' SANDY GRAVEL - FINE TO COARSE, ROUNDED TO SUBANGULAR CHERT, YELLOWISH RED, MEDIUM DENSE, MOIST AFTER 5.8', WET AFTER 9.7', CLAYEY.		B	12.0' TO 50.0' WITH 4" CARBOLOY CORE BIT.
26.7			10.2' TO 12.3' SHALE AND MARL - WEATHERED OLIVE BROWN AND PALE GREEN SHALE AND PALE YELLOW AND WHITE MARL; SOFT TO MODERATELY HARD (ROCK CLASSIFICATION).		C-1	WATER LEVEL
20.3					C-2	BAILED TO 46.3' WITH HOLE OPEN TO 49.0'; PULLED CASING. AT 42.1' WITH HOLE OPEN TO 45.1'.
11.7					C-3	
14.9			12.3' TO 42.3' SHALE AND LIMESTONE INTERBEDDED		C-4	AT 16.4' WITH HOLE OPEN TO 44.4' AFTER 20 HOURS.
22.7	20		12.3' TO 31.0' - SHALE - WEATHERED GREENISH GRAY AND LIGHT YELLOWISH BROWN, SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), JOINTED, BLOCKY, ARGILLACEOUS, CALCAREOUS, SLIGHTLY FOSSILIFEROUS, ROOTS; LIMESTONE - WEATHERED PALE BROWN, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), SLIGHTLY JOINTED, WELL CEMENTED, FOSSILIFEROUS WITH SOME SPARRY CALCITE; SOME BLACK STAINING, SOME DARK GRAY SHALE AFTER 29.4', WELL-HEALED FRACTURES AFTER 21.2'.		C-5	SOIL RESISTIVITY TEST 191.5 X 2.5' X 1.0 (MULTIPLIER) X 1.8 (ZERO) = 861.75 OHMS.CM
27.6					C-6	
16.8					C-7	JAR SAMPLES A: 0.0' TO 3.0' B: 10.2' TO 12.0'
15.0	30				C-8	SHELBY TUBE SAMPLES ST-1: 3.0' TO 4.0' NO PENETROMETER READING
6.5					C-9	
4.6					C-10	CARTON SAMPLES C-1: 12.3' TO 13.0' C-2: 14.1' TO 14.8' C-3: 16.3' TO 16.8' C-4: 17.7' TO 18.4' C-5: 20.9' TO 21.8' C-6: 23.9' TO 24.8' C-7: 26.1' TO 26.7' C-8: 29.2' TO 29.9' C-9: 33.6' TO 34.3' C-10: 34.7' TO 35.7' C-11: 37.5' TO 38.3' C-12: 41.5' TO 42.3' C-13: 43.1' TO 44.3' C-14: 45.0' TO 46.1' C-15: 46.3' TO 47.2' C-16: 48.4' TO 49.1'
5.5			31.0' TO 42.3' - AS ABOVE, UNWEATHERED DARK GRAY SHALE AND GRAY LIMESTONE.		C-11	
5.4	40				C-12	
7.2					C-13	
8.7					C-14	
8.5					C-15	
8.7	50				C-16	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT ORTC (FY12) RELOCATE HOLE NO. 8A4C-5818

DRILLING LOG — Hole No. 8A4C-5818 (CONTINUED)

% MOISTURE CONTENT (c)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	10		(CONTINUED) 42.3' TO 49.1' LIMESTONE - UNWEATHERED DARK GRAY AND GRAY, HARD (ROCK CLASSIFICATION), JOINTED, ANGULAR, WELL CEMENTED, FOSSILIFEROUS WITH SOME SPARRY CALCITE, SOME MODERATELY HARD (ROCK CLASSIFICATION) DARK GRAY PARTINGS.			
	20					
	30					
	40					
	50					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT ORTC (FY12) RELOCATE HOLE NO. 8A4C-5818

DRILLING LOG — Hole No. 8A4C-5819

DRILLING LOG	DIVISION SWD	INSTALLATION FT. WORTH	SHEET 1 OF 2 SHEETS
1. PROJECT ORTC (FY12) RELOCATE		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5819		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 2 / UNDISTURBED 11
5. NAME OF DRILLER R. NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE	STARTED 19 JUL 11 / COMPLETED 20 JUL 11
7. THICKNESS OF OVERBURDEN 11.8'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 38.2'		18. TOTAL CORE RECOVERY FOR BORING 96%	
9. TOTAL DEPTH OF HOLE 50.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (c)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
14.5		VISUAL	0.0' TO 2.2' SANDY GRAVEL - COARSE TO FINE, BROWN, MEDIUM DENSE TO DENSE, DRY, SUBROUNDED TO SUBANGULAR GRAVEL, CLAYEY.		A	DRILLING 0.0' TO 12.0' WITH 10" AUGER; SET 12' OF 8" METAL CASING AND CLEANOUT TO 12.5' WITH 7 7/8" AUGER; SET CIRCULATION PAN.
11.0	10		2.2' TO 4.2' CLAYEY SAND - FINE TO COARSE, SUBROUNDED TO SUBANGULAR, DARK GRAYISH BROWN, MEDIUM DENSE TO DENSE, DRY, SOME GRAVEL.		B	12.5' TO 50.0' WITH 4" CARBOLOY CORE BIT. CORE RUNS BROKEN INTO * 6" SEGMENTS MOSTLY IN UNWEATHERED MATERIAL.
			4.2' TO 7.1' GRAVELLY SAND - COARSE TO FINE, SUBROUNDED TO SUBANGULAR, YELLOWISH BROWN, MEDIUM DENSE TO DENSE, DRY, SOME CLAY AND CALICHE.			WATER LEVEL
					C-1	BAILED TO 47.0' WITH HOLE OPEN TO 47.9'; PULLED CASING UP 1.5' - WATER LEVEL AT 46.3'.
			7.1' TO 11.8' SANDY GRAVEL - FINE TO COARSE, SUBROUNDED TO SUBANGULAR, YELLOWISH RED, MEDIUM DENSE TO DENSE, MOIST, MINOR CLAY.		C-2	AT 44.7' WITH HOLE OPEN TO 46.7' AFTER 16 HOURS.
	20				C-3	AT 44.2' WITH HOLE OPEN TO 46.2' AFTER 23.5 HOURS.
			11.8' TO 44.6' SHALE AND LIMESTONE INTERBEDDED		C-4	SOIL RESISTIVITY TEST 191.5 X 2.5' X 10 (MULTIPLIER) X 1.0 (ZERO) = 4.787.5 OHMS.CM
22.5			11.8' TO 35.7' - SHALE WEATHERED GREENISH GRAY AND YELLOWISH BROWN, SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), SOME CALICHE AT TOP OF SECTION, SILTY, CALCAREOUS, SLIGHTLY FOSSILIFEROUS, SCATTERED HIGH ANGLE CLAY FILLED WELL HEALED FRACTURES, ROOTS IN CLAY FILLED FRACTURE FROM 17.9' TO 18.4', BLACK OXIDATION STAINING, WEATHERED LIGHT OLIVE BROWN AND LIGHT GRAY AFTER 19.7'; LIMESTONE WEATHERED VERY PALE BROWN AND LIGHT GRAY, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), WELL CEMENTED, FOSSILIFEROUS WITH SOME SPARRY CALCITE, ARGILLACEOUS TO GRANULAR; SHALE AND LIMESTONE ARE THIN TO MEDIUM BEDDED.		C-5	
17.5	30				C-6	JAR SAMPLES A: 2.2' TO 4.2' B: 4.2' TO 7.1'
6.6					C-7	CARTON SAMPLES C-1: 14.9' TO 15.8' C-2: 16.8' TO 17.7' C-3: 19.0' TO 19.7' C-4: 21.3' TO 22.2' C-5: 25.4' TO 26.3' C-6: 29.2' TO 30.1' C-7: 32.9' TO 33.6' C-8: 38.0' TO 38.7' C-9: 39.1' TO 39.8' C-10: 42.3' TO 43.2' C-11: 46.7' TO 47.7'
3.7					C-8	
4.4	40				C-9	
8.2					C-10	
9.3	50				C-11	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT ORTC (FY12) RELOCATE HOLE NO. 8A4C-5819

DRILLING LOG — Hole No. 8A4C-5819 (CONTINUED)

% MOISTURE CONTENT (c)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	10		(CONTINUED) 35.7' TO 44.6' - AS ABOVE, WEATHERED VERY DARK GRAY SHALE AND GRAY LIMESTONE, JOINTED; NO STAINING OR HIGH ANGLE FRACTURES.			
	20		44.6' TO 48.3' LIMESTONE - UNWEATHERED, DARK GRAY TO GRAY, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), JOINTED, WELL CEMENTED, FOSSILIFEROUS WITH SOME SPARRY CALCITE, GRANULAR, DARK GRAY CARBONACEOUS SHALE PARTINGS.			
	30					
	40					
	50					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT ORTC (FY12) RELOCATE HOLE NO. 8A4C-5819

NOTES:

1. USE THIS SHEET FOR BORING LOGS ONLY.
2. MOISTURE CONTENT, WHERE SHOWN, IS EXPRESSED AS PERCENT DRY WEIGHT AT TIME OF LABORATORY CLASSIFICATION.
3. LEGEND SHOWS OVERBURDEN MATERIALS CLASSIFIED ACCORDING TO ASTM D 2487 AND ASTM D 2488.
4. DESCRIPTION OF OVERBURDEN MATERIALS CHANGED TO CORRESPOND WITH LABORATORY CLASSIFICATION AS NECESSARY.
5. ORIGINAL DRILLING LOGS AVAILABLE AT CORPS OF ENGINEERS FORT WORTH DISTRICT OFFICE.

US Army Corps of Engineers
Fort Worth District

Symbol	Description	Tracking No.	Action	Date

Designed by: JOSH PICKERING
Dwn by: JOSH PICKERING
Reviewed by: KEN McCLESKEY
Submitted by: KEN McCLESKEY, P.G. CHIEF, GEOTECHNICAL SECTION
Date: _____ Rev.
Sol No.
Contr No.
File name:
Plot date: 10/5/2011
Plot scale:

U.S. ARMY ENGINEER DISTRICT, CORPS OF ENGINEERS FORT WORTH, TEXAS

ENGINEERING/ CONSTRUCTION DIVISION ENGINEERING BRANCH

FORT HOOD, TEXAS
ORTC (FY12) RESITE
PN: 065374

LOGS OF BORINGS
PRIMARY SITE 5 OF 5

Sheet reference number: B205

DESIGN FILE: fh-ORTC-B205.dgn

Contr No.

fh-ORTC-B205.dgn 10/5/2011 4:19:26 PM

REFERENCE FILES:

Section:

Hole No. 8A4C-5810

DRILLING LOG	DIVISION SWD	INSTALLATION FT. WORTH	SHEET 1 of 1 SHEETS
1. PROJECT ORTC WATER TOWER		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5810		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 1 / UNDISTURBED 8
5. NAME OF DRILLER R. NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE	STARTED 22 JUNE 11 / COMPLETED 23 JUNE 11
7. THICKNESS OF OVERBURDEN 0.5'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 48.5'		18. TOTAL CORE RECOVERY FOR BORING 98%	
9. TOTAL DEPTH OF HOLE 49.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (c)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (a)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (d)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (e)
20.0			0.0' TO 0.5' GRAVEL - COARSE TO FINE, PALE YELLOW, MEDIUM DENSE, DRY, LIMY, SANDY.		A	DRILLING 0.0' TO 3.0' WITH 10" AUGER. SET 3' OF 8" METAL CASING AND CIRCULATION PAN. USE DRAGBIT TO 6.0'.
9.3			0.5' TO 2.9' MARL - PALE YELLOW, SOFT TO MODERATELY HARD (ROCK CLASSIFICATION).		C-1	6.0' TO 49.0' WITH 4" CARBOLOY CORE BIT.
	10		2.9' TO 48.3' - LIMESTONE 2.9' TO 18.0' - WEATHERED, PALE YELLOW AND YELLOW, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), JOINTED, GRANULAR, CHALKY, FOSSILIFEROUS, SOME SPARRY CALCITE.		C-2	WATER LEVEL BAILED TO 46.8' WITH HOLE OPEN TO 47.1' AFTER PULLING CASING AT COMPLETION. AT 45.4' WITH HOLE OPEN TO 47.1' AFTER 20 HOURS.
15.9			35.1' TO 48.3' - UNWEATHERED, LIGHT GRAY TO GRAY, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), JOINTED WITH DARK GRAY STAINING IN WELL-HEALED JOINTS, CHALKY, FOSSILIFEROUS, SOME SPARRY CALCITE.		C-3	JAR SAMPLES A: 0.5' TO 2.9'
	20					CARTON SAMPLES C-1: 6.3' TO 7.2' C-2: 12.1' TO 13.0' C-3: 18.0' TO 18.9' C-4: 25.3' TO 26.3' C-5: 31.9' TO 32.8' C-6: 36.1' TO 36.9'
15.7					C-4	C-7: 42.1' TO 43.0' C-8: 47.4' TO 48.3'
	30				C-5	
13.4					C-6	
	40					
10.1					C-7	
7.6					C-8	
	50					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT ORTC WATER TOWER HOLE NO. 8A4C-5810

Hole No. 8A4C-5811

DRILLING LOG	DIVISION SWD	INSTALLATION FT. WORTH	SHEET 1 of 1 SHEETS
1. PROJECT ORTC WATER TOWER		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5811		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 2 / UNDISTURBED 17
5. NAME OF DRILLER R. NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE	STARTED 7 JUNE 11 / COMPLETED 8 JUNE 11
7. THICKNESS OF OVERBURDEN 0.0'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 48.5'		18. TOTAL CORE RECOVERY FOR BORING 100%	
9. TOTAL DEPTH OF HOLE 48.5'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (c)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (a)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (d)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (e)
12.1			0.0' TO 3.4' MARL - VERY PALE BROWN, SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), SOME MARL GRAVELS.		A	DRILLING 0.0' TO 3.5' WITH 10" AUGER: SET 3' OF 8" METAL CASING AND CIRCULATION PAN. USE ROLLERBIT FROM 3.5' TO 5.5'.
8.0			3.4' TO 48.5' - LIMESTONE		C-1	5.5' TO 48.5' WITH 4" CARBOLOY CORE BIT.
	10		3.4' TO 11.4' - WEATHERED, PALE YELLOW AND YELLOW, HARD (ROCK CLASSIFICATION), WITH SCATTERED MODERATELY HARD SEAMS, GRANULAR, CHALKY, FOSSILIFEROUS, SOME SPARRY CALCITE, MASSIVE BEDDED.		C-2	WATER LEVEL BAILED DRY. PULLED CASING. AT 46.0' WITH HOLE OPEN TO 47.0'. NO CHANGE AFTER 24 HOURS.
12.0			11.4' TO 18.1' - LIMESTONE AS ABOVE; WEATHERED, VERY PALE BROWN AND GRAY, SCATTERED SHALY SEAMS, SOFT TO MODERATELY HARD (ROCK CLASSIFICATION) SHALE. LIMESTONE IS THIN BEDDED.		C-3	JAR SAMPLES A: 0.0' TO 3.4'
	20		21.3' TO 35.9' - WEATHERED LIGHT GRAY, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), MINOR DARK GRAY SHALE LENSES, BLACK STAINING IN WELL-HEALED FRACTURES, MASSIVE BEDDED.			CARTON SAMPLES C-1: 5.5' TO 6.4' C-2: 11.3' TO 12.2' C-3: 17.1' TO 18.0' C-4: 23.1' TO 24.0' C-5: 29.2' TO 30.0' C-6: 36.4' TO 37.4' C-7: 42.4' TO 43.3' C-8: 47.6' TO 48.5'
15.0					C-4	
	30		35.9' TO 48.5' - UNWEATHERED, GRAY WITH DARK GRAY SHALY LENSES, HARD (ROCK CLASSIFICATION), MASSIVE BEDDED, GRANULAR, CHALKY, FOSSILIFEROUS, SOME SPARRY CALCITE, BLACK STAINING IN WELL HEALED FRACTURES.		C-5	
10.9					C-6	
	40					
8.3					C-7	
7.6					C-8	
	50					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT ORTC WATER TOWER HOLE NO. 8A4C-5811

Hole No. 8A4C-5812

DRILLING LOG	DIVISION SWD	INSTALLATION FT. WORTH	SHEET 1 of 1 SHEETS
1. PROJECT ORTC WATER TOWER		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5812		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 1 / UNDISTURBED 8
5. NAME OF DRILLER R. NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE	STARTED 1 JUNE 11 / COMPLETED 2 JUNE 11
7. THICKNESS OF OVERBURDEN 0.0'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 50.0'		18. TOTAL CORE RECOVERY FOR BORING 98%	
9. TOTAL DEPTH OF HOLE 50.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (c)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (a)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (d)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (e)
16.9			0.0' TO 3.1' MARL - PALE BROWN AND WHITE, SOFT TO MODERATELY HARD (ROCK CLASSIFICATION), SOME LIMESTONE GRAVELS.		A	DRILLING 0.0' TO 4.0' WITH 10" AUGER: USE DRAGBIT FROM 3.1' TO 4.5', SET 4' OF 8" METAL CASING AND CIRCULATION PAN: CLEANOUT TO 4.5'
10.4			3.1' TO 49.1' - LIMESTONE		C-1	WITH 6" AUGER. 4.5' TO 50.0' WITH 4" CARBOLOY CORE BIT.
	10		3.1' TO 18.0' - WEATHERED PALE AND YELLOW, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), GRANULAR, CHALKY, FOSSILIFEROUS, SOME SPARRY CALCITE.		C-2	WATER LEVEL BAILED TO 42.0' WITH HOLE OPEN TO 48.6' AT 41.7' WITH HOLE OPEN TO 48.4' AFTER 17 HOURS.
10.3			18.0' TO 21.4' - AS ABOVE SCATTERED SHALE SEAMS, VERY PALE BROWN AND GRAY, MINOR IRON STAINING.			JAR SAMPLES A: 0.0' TO 3.1'
	20		21.4' TO 36.7' - AS ABOVE NO SHALE SEAMS, LIGHT GRAY WITH YELLOW STAINING IN WELL HEALED FRACTURES SCATTERED THROUGHOUT.		C-3	CARTON SAMPLES C-1: 6.6' TO 7.5' C-2: 13.5' TO 14.4' C-3: 20.2' TO 20.9' C-4: 27.7' TO 28.6' C-5: 33.6' TO 34.5' C-6: 36.9' TO 37.8' C-7: 43.1' TO 44.0' C-8: 48.2' TO 49.1'
16.3			36.7' TO 49.1' - UNWEATHERED, GRAY, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), FOSSILIFEROUS, GRANULAR, SOME SPARRY CALCITE, BLACK STAINING IN WELL HEALED FRACTURES.		C-4	
	30				C-5	
14.5					C-6	
10.8						
	40					
8.4					C-7	
7.9					C-8	
	50					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT ORTC WATER TOWER HOLE NO. 8A4C-5812

Hole No. 8A4C-5813

DRILLING LOG	DIVISION SWD	INSTALLATION FT. WORTH	SHEET 1 of 1 SHEETS
1. PROJECT ORTC WATER TOWER		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5813		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 1 / UNDISTURBED 8
5. NAME OF DRILLER R. NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE	STARTED 11 JUNE 11 / COMPLETED 15 JUNE 11
7. THICKNESS OF OVERBURDEN 0.6'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 49.4'		18. TOTAL CORE RECOVERY FOR BORING 98%	
9. TOTAL DEPTH OF HOLE 50.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (c)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (a)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (d)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (e)
19.6			0.0' TO 0.6' GRAVEL - COARSE TO FINE, VERY PALE BROWN, MEDIUM DENSE, DRY, LIMY, SANDY.		A	DRILLING 0.0' TO 3.3' WITH 10" AUGER: SET 8' OF 8" METAL CASING AND CIRCULATION PAN. USE DRAGBIT TO 6.0'.
			0.6' TO 3.3' MARL - VERY PALE BROWN, SOFT TO MODERATELY HARD (ROCK CLASSIFICATION).			3.3' TO 50.0' WITH 4" CARBOLOY CORE BIT.
			3.3' TO 49.3' - LIMESTONE		C-1	WATER LEVEL
	10		3.3' TO 18.3' - WEATHERED PALE YELLOW AND YELLOW, HARD (ROCK CLASSIFICATION) WITH SCATTERED MODERATELY HARD (ROCK CLASSIFICATION) SEAMS, JOINTED, GRANULAR, CHALKY, FOSSILIFEROUS, SOME SPARRY CALCITE.		C-2	BAILED TO 35.5' WITH HOLE OPEN TO 48.7'; AT 31.4' WITH HOLE OPEN TO 48.7' AFTER 23 HOURS. JAR SAMPLES A: 0.0' TO 3.0'
10.5						
	20		18.3' TO 21.7' - AS ABOVE SOFT TO HARD (ROCK CLASSIFICATION), VERY SHALY SEAMS THROUGHOUT.		C-3	CARTON SAMPLES C-1: 7.3' TO 8.2' C-2: 14.2' TO 15.0' C-3: 20.3' TO 21.2' C-4: 26.0' TO 26.8' C-5: 31.5' TO 32.4' C-6: 36.2' TO 37.1' C-7: 41.4' TO 42.3' C-8: 45.6' TO 46.5'
10.8			21.7' TO 35.5' - WEATHERED, PALE YELLOW, MODERATELY HARD TO HARD (ROCK CLASSIFICATION), JOINTED, YELLOW AND DARK GRAY STAINING IN FRACTURES, CHALKY, FOSSILIFEROUS, SOME SPARRY CALCITE, 60° CONTACT ANGLE WITH UNWEATHERED LIMESTONE.		C-4	
	30		35.5' TO 49.3' - AS ABOVE UNWEATHERED, LIGHT GRAY AND GRAY, WITH DARK GRAY STAINING IN FRACTURES, GRAY AND DARK GRAY AFTER 41.4'.		C-5	
10.5					C-6	
	40					
8.2					C-7	
					C-8	
	50					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT ORTC WATER TOWER HOLE NO. 8A4C-5813

NOTES:

1. USE THIS SHEET FOR BORING LOGS ONLY.
2. MOISTURE CONTENT, WHERE SHOWN, IS EXPRESSED AS PERCENT DRY WEIGHT AT TIME OF LABORATORY CLASSIFICATION.
3. LEGEND SHOWS OVERBURDEN MATERIALS CLASSIFIED ACCORDING TO ASTM D 2487 AND ASTM D 2488.
4. DESCRIPTION OF OVERBURDEN MATERIALS CHANGED TO CORRESPOND WITH LABORATORY CLASSIFICATION AS NECESSARY.
5. ORIGINAL DRILLING LOGS AVAILABLE AT CORPS OF ENGINEERS FORT WORTH DISTRICT OFFICE.

US Army Corps of Engineers
Fort Worth District

Symbol	Description	Tracking No.	Action	Date

Date: Rev.
Sol No.
Contr No.
Designed by: JOSH PICKERING
Dwn by: JOSH PICKERING
Reviewed by: KEN McCLESKEY
Submitted by: KEN McCLESKEY, P.G. CHIEF, GEOTECHNICAL SECTION
File name:
Plot date: 10/5/2011
Plot scale:

U.S. ARMY ENGINEER DISTRICT, CORPS OF ENGINEERS FORT WORTH, TEXAS

ENGINEERING/ CONSTRUCTION DIVISION ENGINEERING BRANCH

FORT HOOD, TEXAS
ORTC (FY12)
PN: 065374

LOGS OF BORINGS
WATER TOWER SITE 1 OF 2

Sheet reference number: B206

DESIGN FILE: fn-ORTC-B206.dgn

Contr No.

REFERENCE FILES:

Hole No. 8A4C-5814

DRILLING LOG	DIVISION SWD	INSTALLATION FT. WORTH	SHEET 1 of 1 SHEETS
1. PROJECT ORTC WATER TOWER		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5814		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 1, UNDISTURBED 8	
5. NAME OF DRILLER R. NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE: STARTED 8 JUNE 11, COMPLETED 9 JUNE 11	
7. THICKNESS OF OVERBURDEN 0.0'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 50.0'		18. TOTAL CORE RECOVERY FOR BORING 99%	
9. TOTAL DEPTH OF HOLE 50.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (c)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
16.5			0.0' TO 2.7' MARL - PALE YELLOW AND WHITE. SOFT TO MODERATELY HARD (ROCK CLASSIFICATION).		A	DRILLING 0.0' TO 2.7' WITH 10" AUGER; USE DRAGBIT TO 3.0' SET 3' OF 8" METAL CASING AND CIRCULATION PAN. USE DRAGBIT TO 5.5'. 5.5' TO 50.0' WITH 4" CARBOLOY CORE BIT.
			2.7' TO 49.4' - LIMESTONE			
13.3	10		2.7' TO 17.9' - WEATHERED. PALE YELLOW AND YELLOW. HARD (ROCK CLASSIFICATION) WITH HARD SEAMS SLIGHTLY JOINTED. GRANULAR. CHALKY. FOSSILIFEROUS. SOME SPARRY CALCITE.		C-1	WATER LEVEL BAILED DRY. PULLED CASING. AT 48.6' WITH HOLE OPEN TO 48.6' AT COMPLETION. AT 46.0' WITH HOLE OPEN TO 48.5' AFTER 90 HOURS.
			17.9' TO 21.4' - AS ABOVE. VERY PALE BROWN AND YELLOW. AND SOFT TO MODERATELY HARD (ROCK CLASSIFICATION). VERY SHALY LAYERS.		C-2	JAR SAMPLES A: 0.0' TO 2.7'
14.2	20		21.4' TO 31.9' - WEATHERED PALE YELLOW WITH YELLOW STAINING. HARD (ROCK CLASSIFICATION). WITH SCATTERED MODERATELY HARD (ROCK CLASSIFICATION) SEAMS. SLIGHTLY JOINTED WITH BROWN OR YELLOW STAINING IN WELL HEALED JOINTS AND FRACTURES. CHALKY. SOME SPARRY CALCITE.		C-3	CARTON SAMPLES C-1: 9.0' TO 10.0' C-2: 15.4' TO 16.3' C-3: 22.4' TO 23.3' C-4: 28.4' TO 29.1' C-5: 32.6' TO 33.4' C-6: 38.5' TO 39.4' C-7: 44.7' TO 45.6' C-8: 48.5' TO 49.4'
16.3	30		31.9' TO 49.4' - UNWEATHERED. LIGHT GRAY AND GRAY. HARD (ROCK CLASSIFICATION). CHALKY. BLACK STATINING IN WELL HEALED FRACTURES. SOME SPARRY CALCITE. FOSSILIFEROUS. JOINTED. 60° CONTACT ANGLE WITH WEATHERED AND UNWEATHERED.		C-4	
10.5	40				C-5	
8.0					C-6	
7.5	50				C-7	
					C-8	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT ORTC WATER TOWER HOLE NO. 8A4C-5814

Hole No. 8A4C-5815

DRILLING LOG	DIVISION SWD	INSTALLATION FT. WORTH	SHEET 1 of 1 SHEETS
1. PROJECT ORTC WATER TOWER		10. SIZE AND TYPE OF BIT SEE REMARKS	
2. LOCATION (Coordinates or Station) FORT HOOD, TEXAS		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USACE		12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500	
4. HOLE NO. (As shown on drawing title and file number) 8A4C-5815		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 1, UNDISTURBED 5	
5. NAME OF DRILLER R. NETHERLAND		14. TOTAL NUMBER CORE BOXES 0	
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED ___ DEG. FROM VERT.		15. ELEVATION GROUND WATER SEE REMARKS	
		16. DATE HOLE: STARTED 15 JUNE 11, COMPLETED 16 JUNE 11	
7. THICKNESS OF OVERBURDEN 0.6'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK 29.4'		18. TOTAL CORE RECOVERY FOR BORING 98%	
9. TOTAL DEPTH OF HOLE 30.0'		19. SIGNATURE OF INSPECTOR JOEL WEBSTER	

% MOISTURE CONTENT (c)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
11.2			0.0' TO 0.6' GRAVEL - COARSE TO FINE. PALE YELLOW AND VERY PALE BROWN. MEDIUM DENSE. DRY. LIMY. SANDY.		A	DRILLING 0.0' TO 2.8' WITH 10" AUGER; SET 2.8' OF 8" METAL CASING AND CIRCULATION PAN. USE DRAGBIT TO 5.0'. 5.0' TO 30.0' WITH 4" CARBOLOY CORE BIT.
			0.6' TO 2.8' MARL - VERY PALE BROWN AND PALE YELLOW. SOFT TO MODERATELY HARD (ROCK CLASSIFICATION).			
7.8					C-1	WATER LEVEL BAILED TO 26.4' WITH HOLE OPEN TO 28.8'. AT 27.5' WITH HOLE OPEN TO 28.7' AFTER 124 HOURS.
13.0	10		2.8' TO 29.6' - LIMESTONE 2.8' TO 17.1' - WEATHERED. PALE YELLOW AND YELLOW. HARD (ROCK CLASSIFICATION) WITH SCATTERED MODERATELY HARD (ROCK CLASSIFICATION) SEAMS. JOINTED. GRANULAR. CHALKY. FOSSILIFEROUS. SOME SPARRY CALCITE.		C-2	JAR SAMPLES A: 0.6' TO 2.8'
12.6					C-3	CARTON SAMPLES C-1: 7.7' TO 8.6' C-2: 10.3' TO 11.2' C-3: 16.0' TO 16.8' C-4: 21.4' TO 22.4' C-5: 26.8' TO 27.6'
13.7	20		17.1' TO 21.1' - AS ABOVE. WITH SOFT TO MODERATELY HARD (ROCK CLASSIFICATION). VERY SHALY SEAMS.		C-4	
16.4	30		21.1' TO 29.6' - WEATHERED. PALE YELLOW. MODERATELY HARD TO HARD (ROCK CLASSIFICATION). JOINTED. MINOR OLIVE YELLOW STAINING. OLIVE YELLOW STAINING IN FRACTURES. CHALKY. FOSSILIFEROUS. SOME SPARRY CALCITE.		C-5	
	40					
	50					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT ORTC WATER TOWER HOLE NO. 8A4C-5815

NOTES:

1. USE THIS SHEET FOR BORING LOGS ONLY.
2. MOISTURE CONTENT, WHERE SHOWN, IS EXPRESSED AS PERCENT DRY WEIGHT AT TIME OF LABORATORY CLASSIFICATION.
3. LEGEND SHOWS OVERBURDEN MATERIALS CLASSIFIED ACCORDING TO ASTM D 2487 AND ASTM D 2488.
4. DESCRIPTION OF OVERBURDEN MATERIALS CHANGED TO CORRESPOND WITH LABORATORY CLASSIFICATION AS NECESSARY.
5. ORIGINAL DRILLING LOGS AVAILABLE AT CORPS OF ENGINEERS FORT WORTH DISTRICT OFFICE.

US Army Corps of Engineers
Fort Worth District

Symbol	Description	Initials No.	Action	Date

Designed by: JOSH PICKERING
Dwn by: JOSH PICKERING
Reviewed by: KEN McCLESKEY
Submitted by: KEN McCLESKEY, P.G. CHIEF, GEOTECHNICAL SECTION
Date: _____
Sol No.
Contr No.
File name:
Plot date: 10/5/2011
Plot scale:
Rev.

U.S. ARMY ENGINEER DISTRICT, CORPS OF ENGINEERS FORT WORTH, TEXAS

ENGINEERING/ CONSTRUCTION DIVISION ENGINEERING BRANCH

FORT HOOD, TEXAS
ORTC (FY12)
PN: 065374

LOGS OF BORINGS
WATER TOWER SITE 2 OF 2

Sheet reference number: B207

DESIGN FILE: fh-ORTC-B207.dgn

Contr No.

Section:

10/5/2011 4:27:27 PM

fh-ORTC-B207.dgn

REFERENCE FILES:

APPENDIX B

LABORATORY TESTING DATA PLOTS

ORTC (FY12) SITE – ORIGINAL PROJECT AREA

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
PLASTICITY CHART

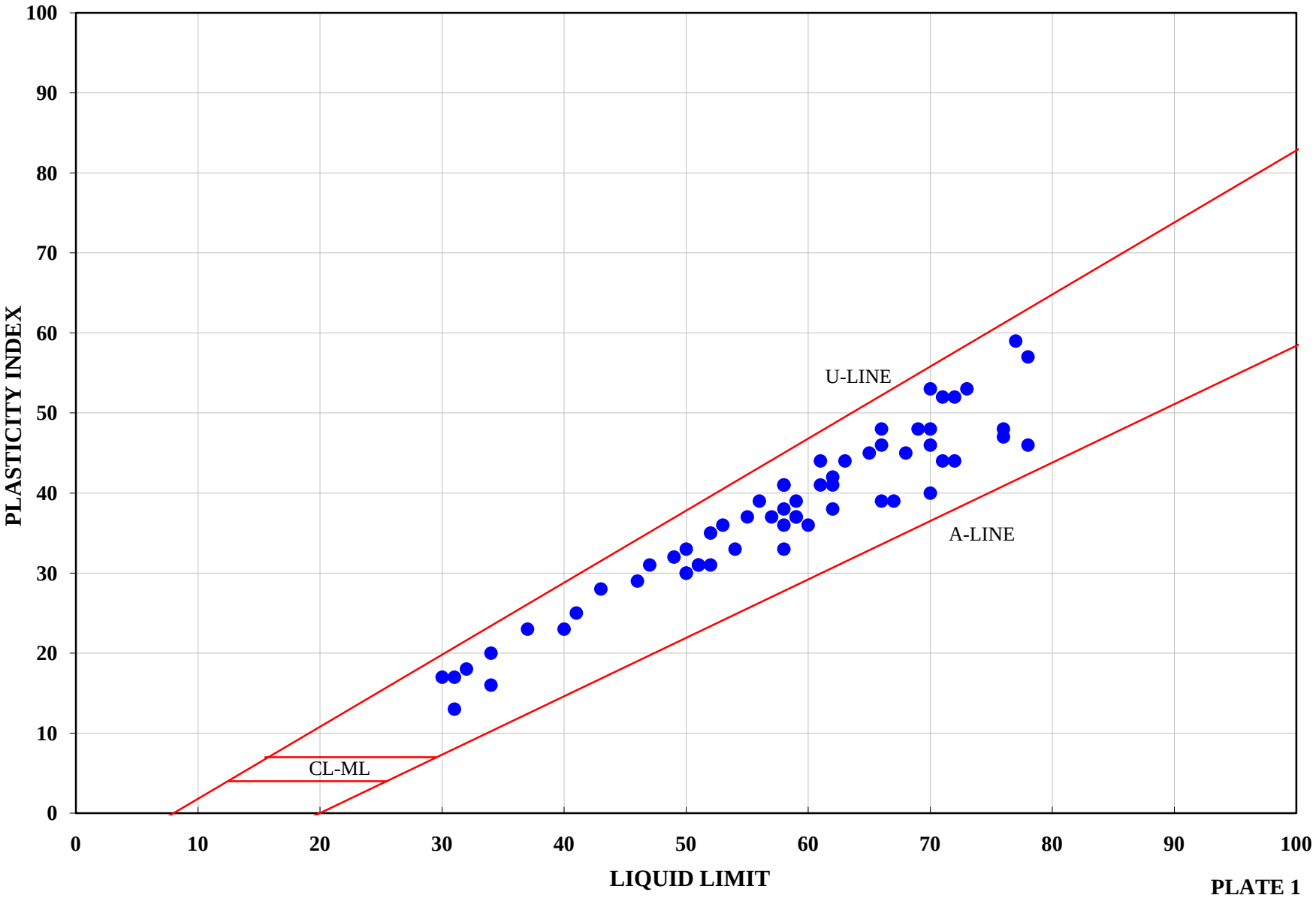


PLATE 1

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
MOISTURE CONTENT VS DEPTH

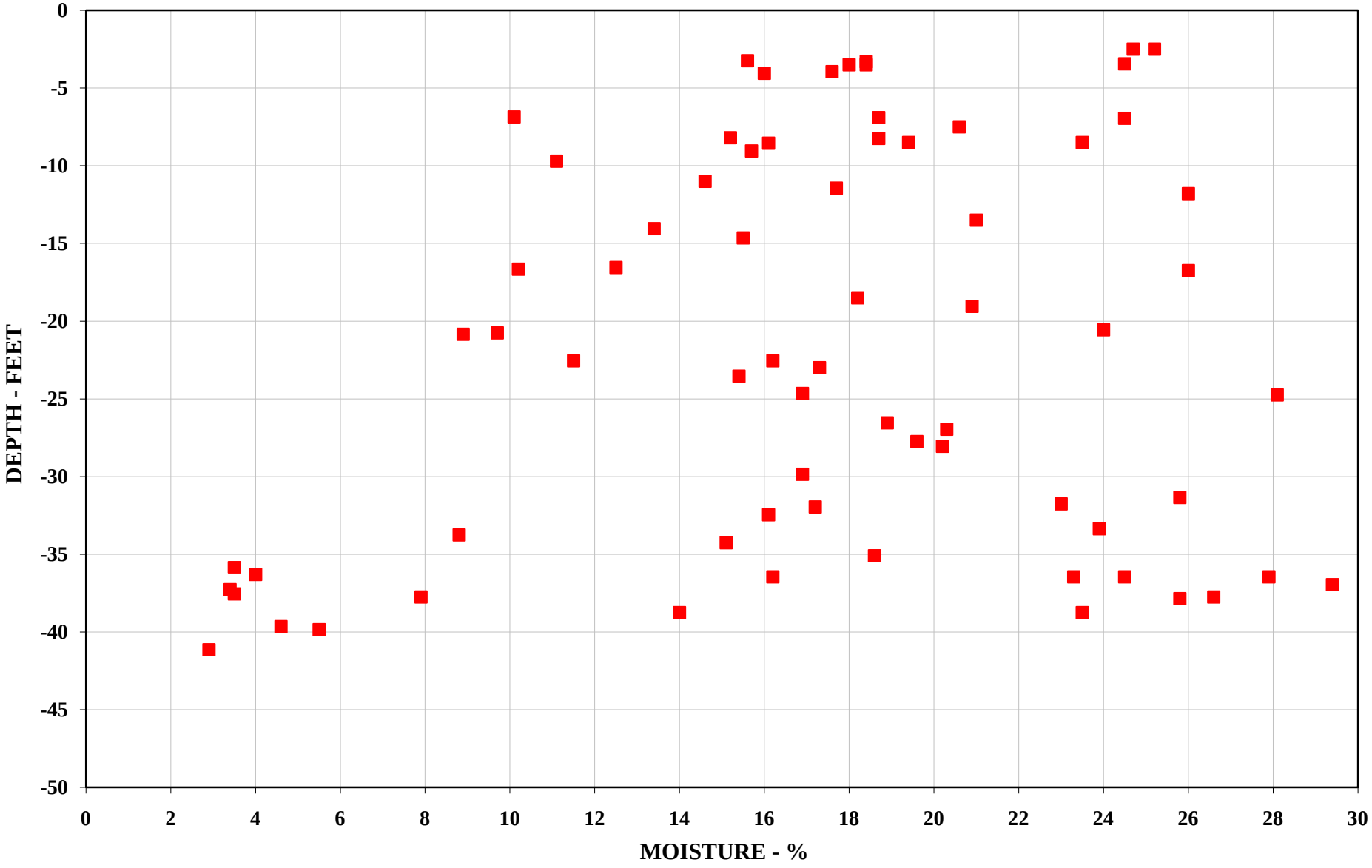


PLATE 2

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
ATTERBERG LIMITS VS DEPTH

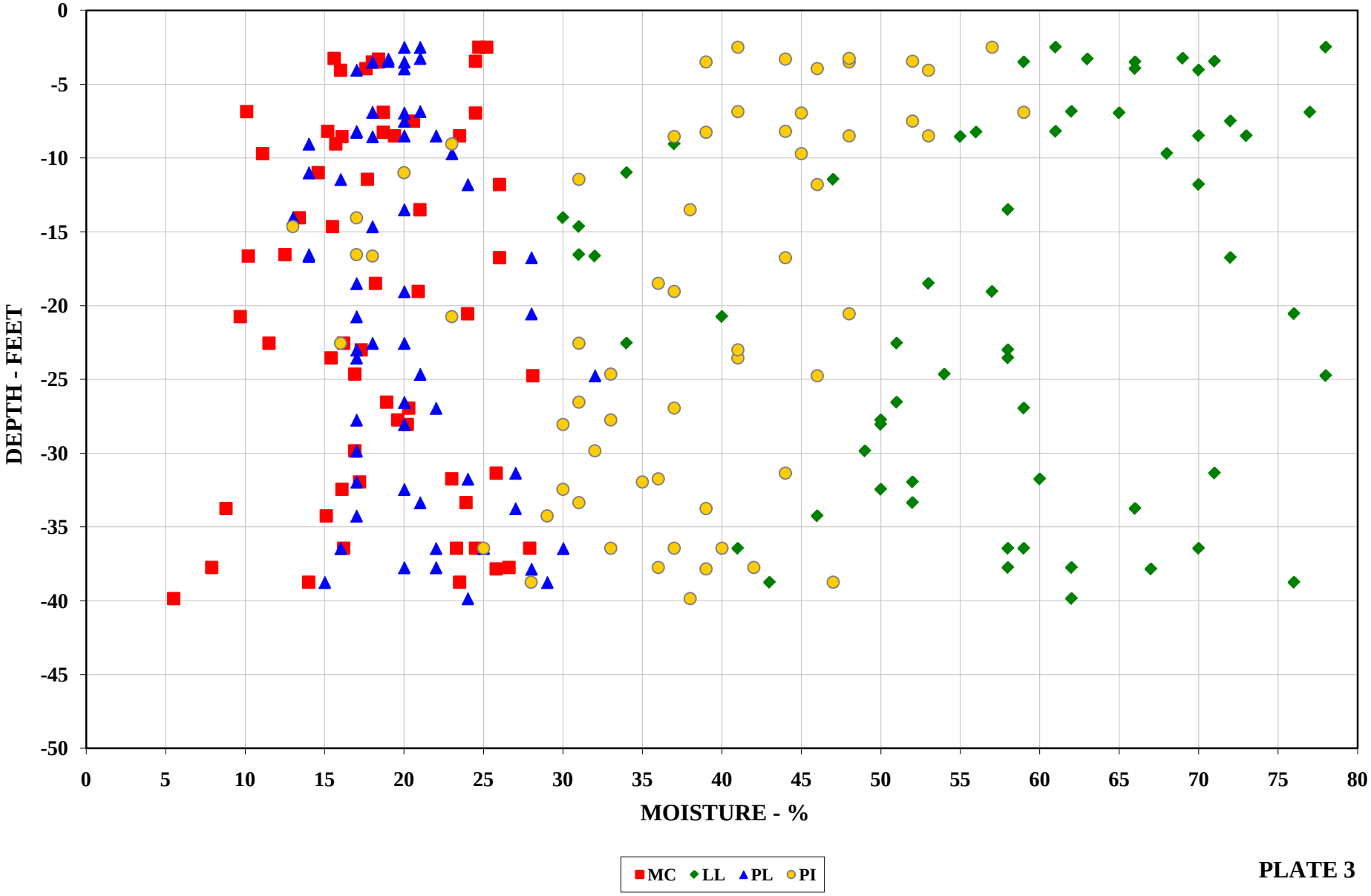


PLATE 3

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
MOISTURE CONTENT - DRY DENSITY VS DEPTH

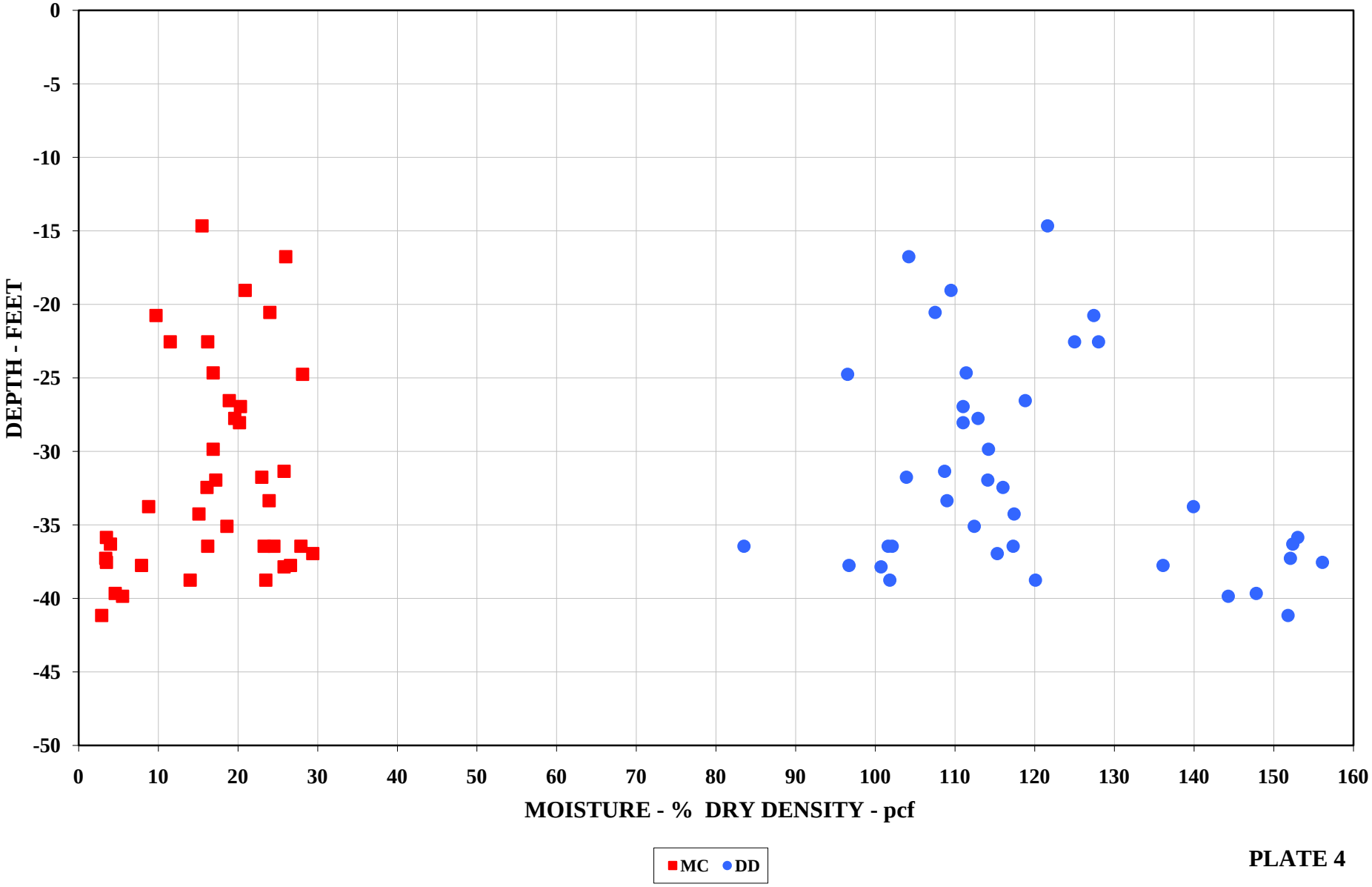


PLATE 4

Friday, March 30, 2012

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
ULTIMATE COMPRESSIVE STRENGTH VS DEPTH

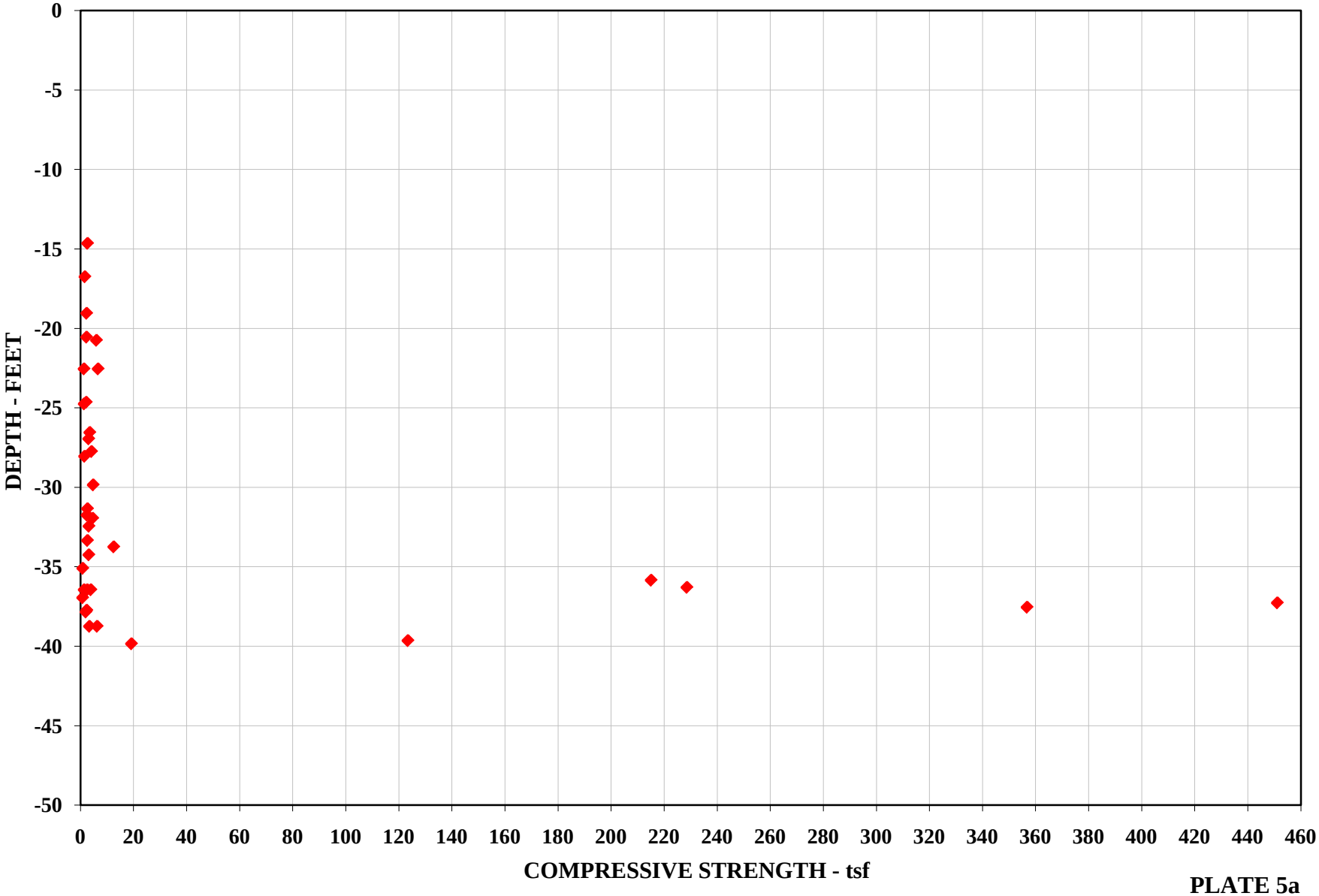


PLATE 5a

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
ULTIMATE COMPRESSIVE STRENGTH VS DEPTH
(EXCLUDING HIGH-END STRENGTH SPECIMENS)

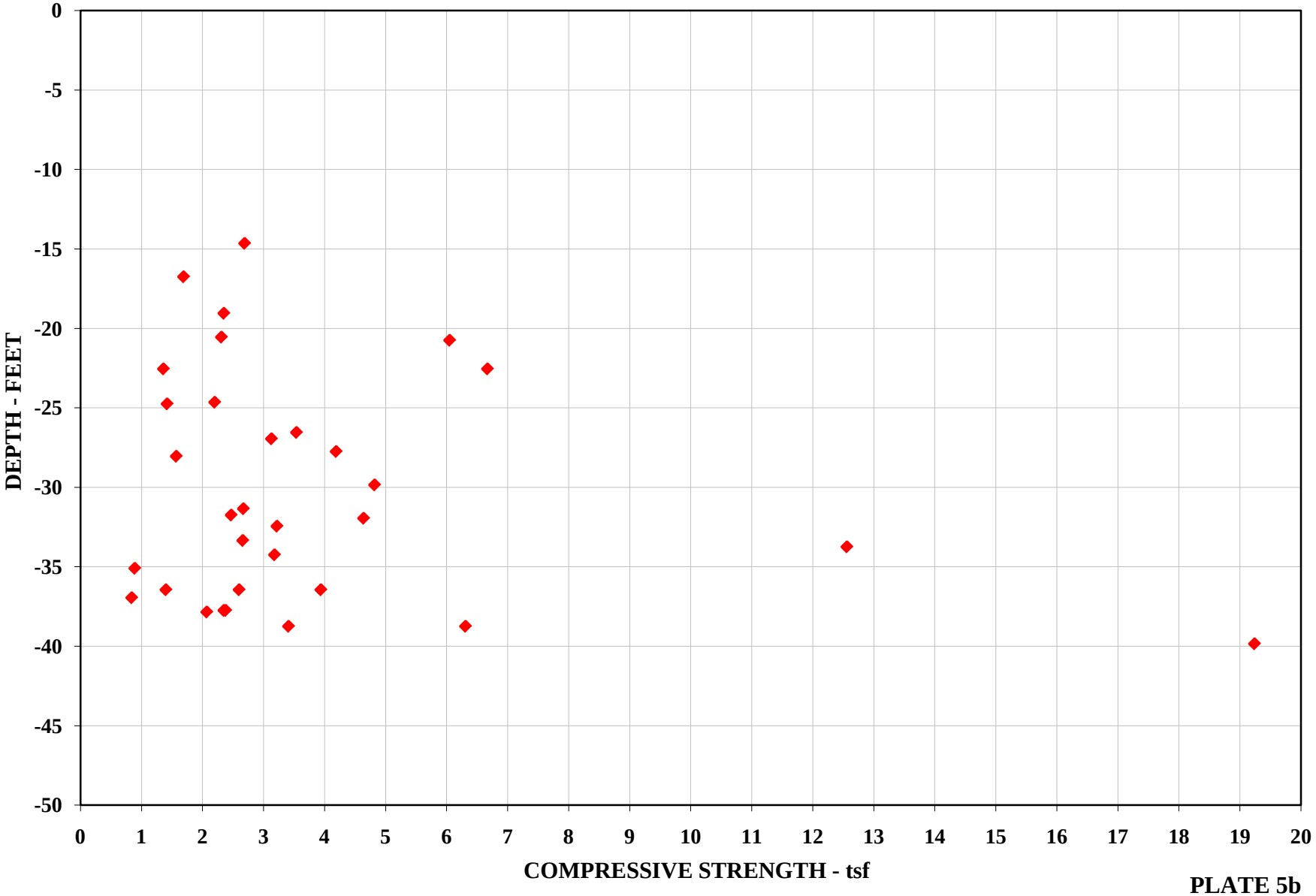


PLATE 5b

ORTC (FY12) SITE – RE-SITED BUILDINGS AREA

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
(RE-SITED BUILDINGS)
PLASTICITY CHART

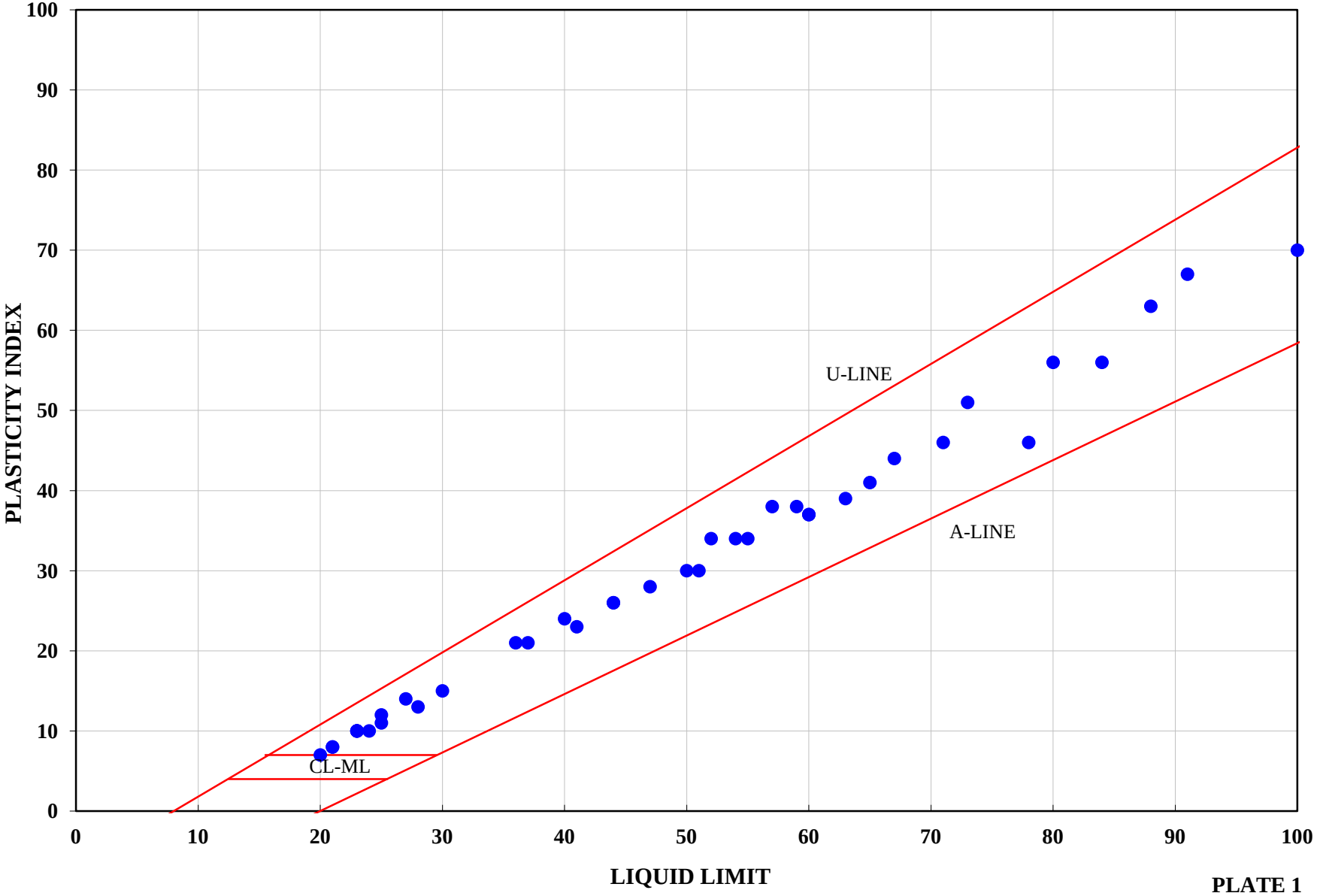


PLATE 1

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
(RE-SITED BUILDINGS)
MOISTURE CONTENT VS DEPTH

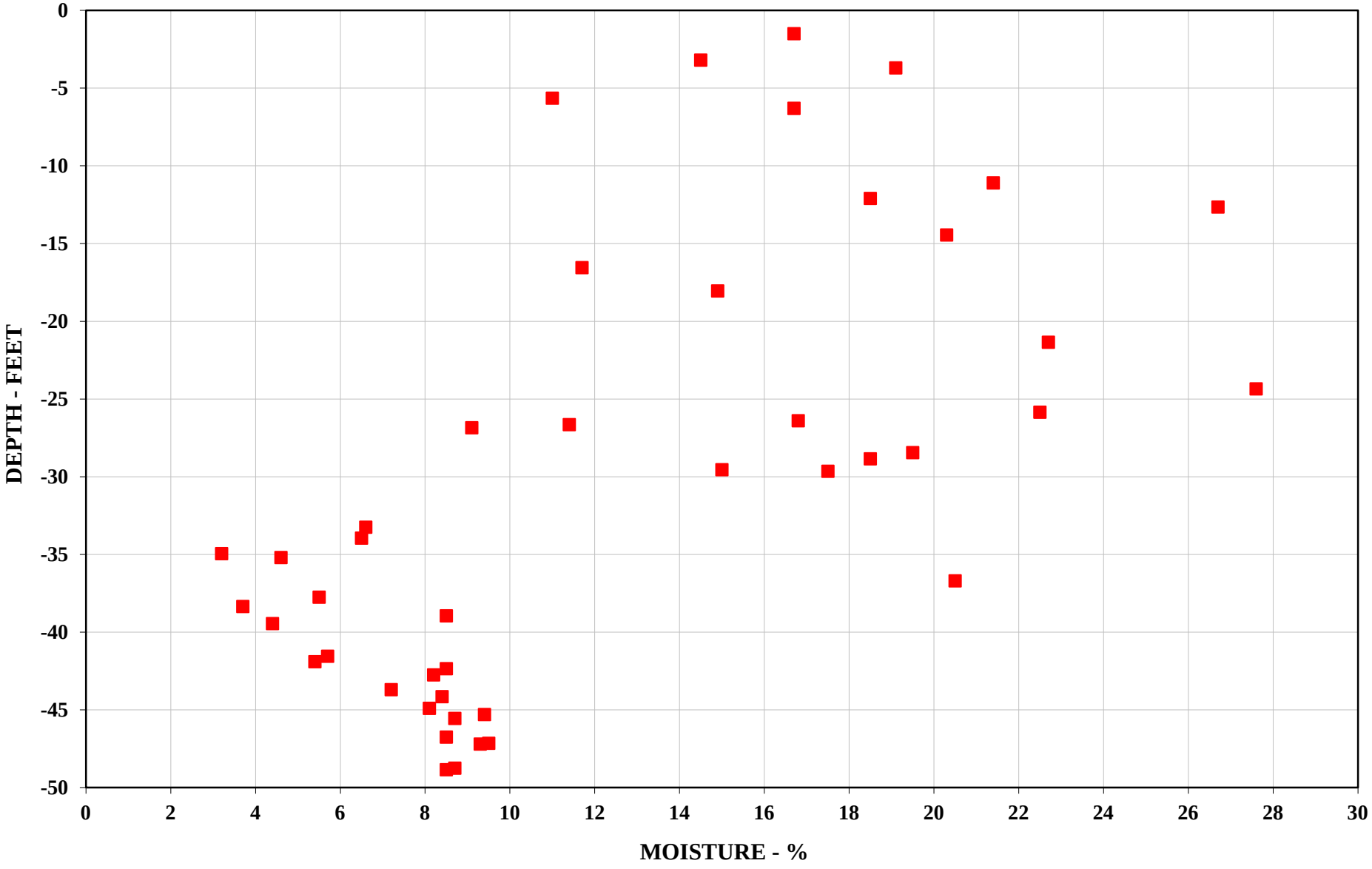


PLATE 2

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
(RE-SITED BUILDINGS)
ATTERBERG LIMITS VS DEPTH

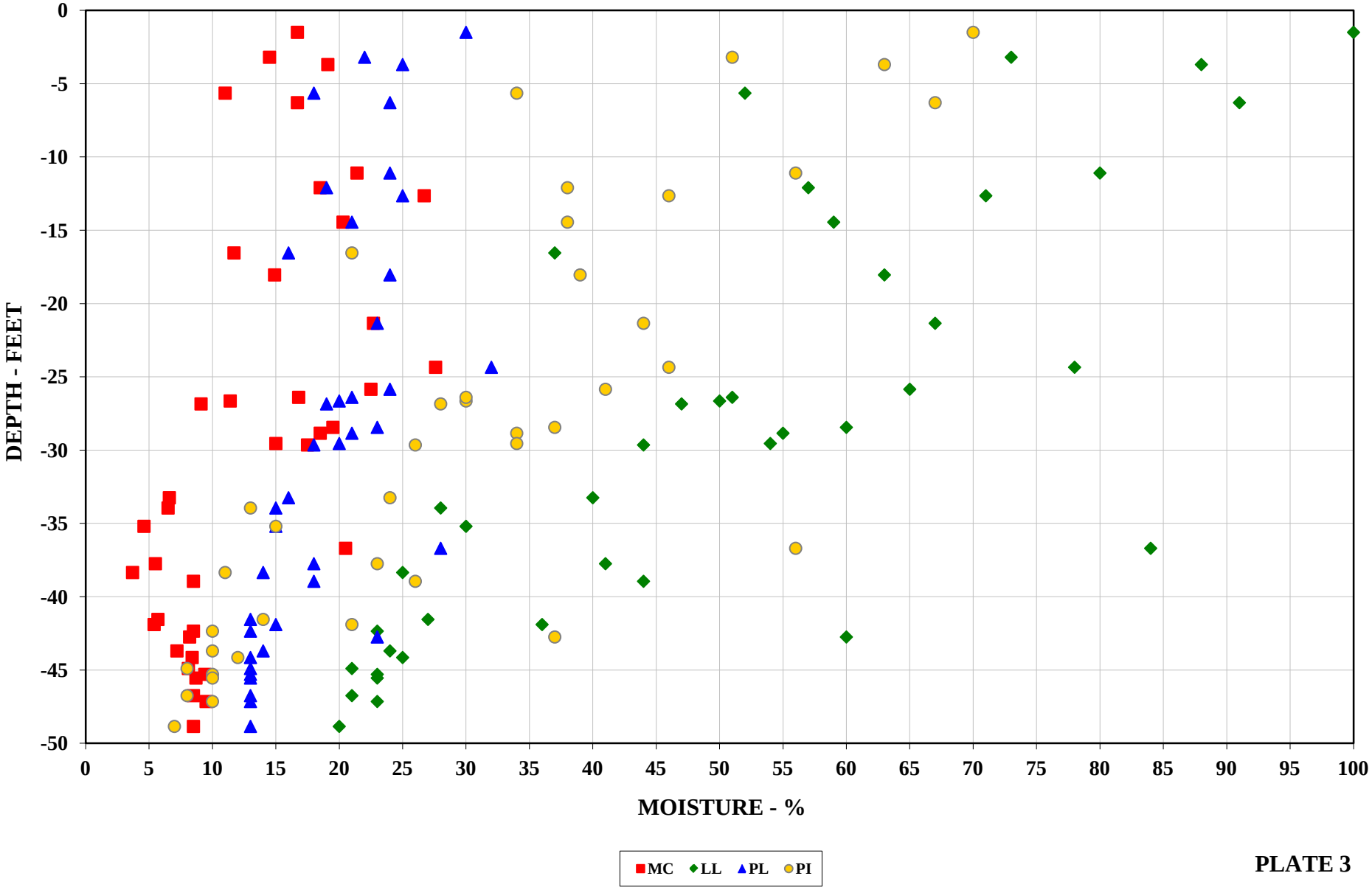


PLATE 3

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
(RE-SITED BUILDINGS)
MOISTURE CONTENT - DRY DENSITY VS DEPTH

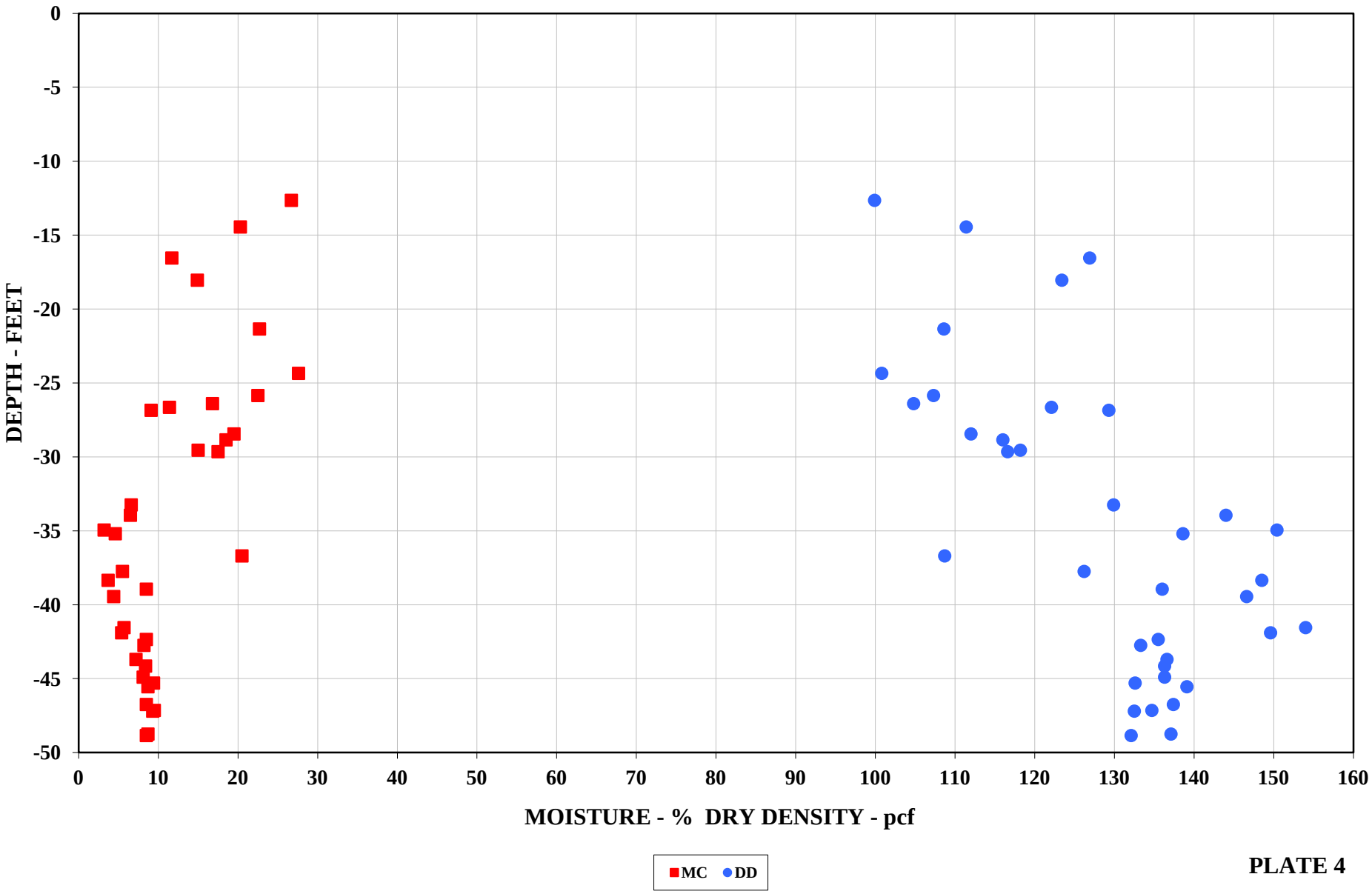


PLATE 4

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
(RE-SITED BUILDINGS)
ULTIMATE COMPRESSIVE STRENGTH VS DEPTH

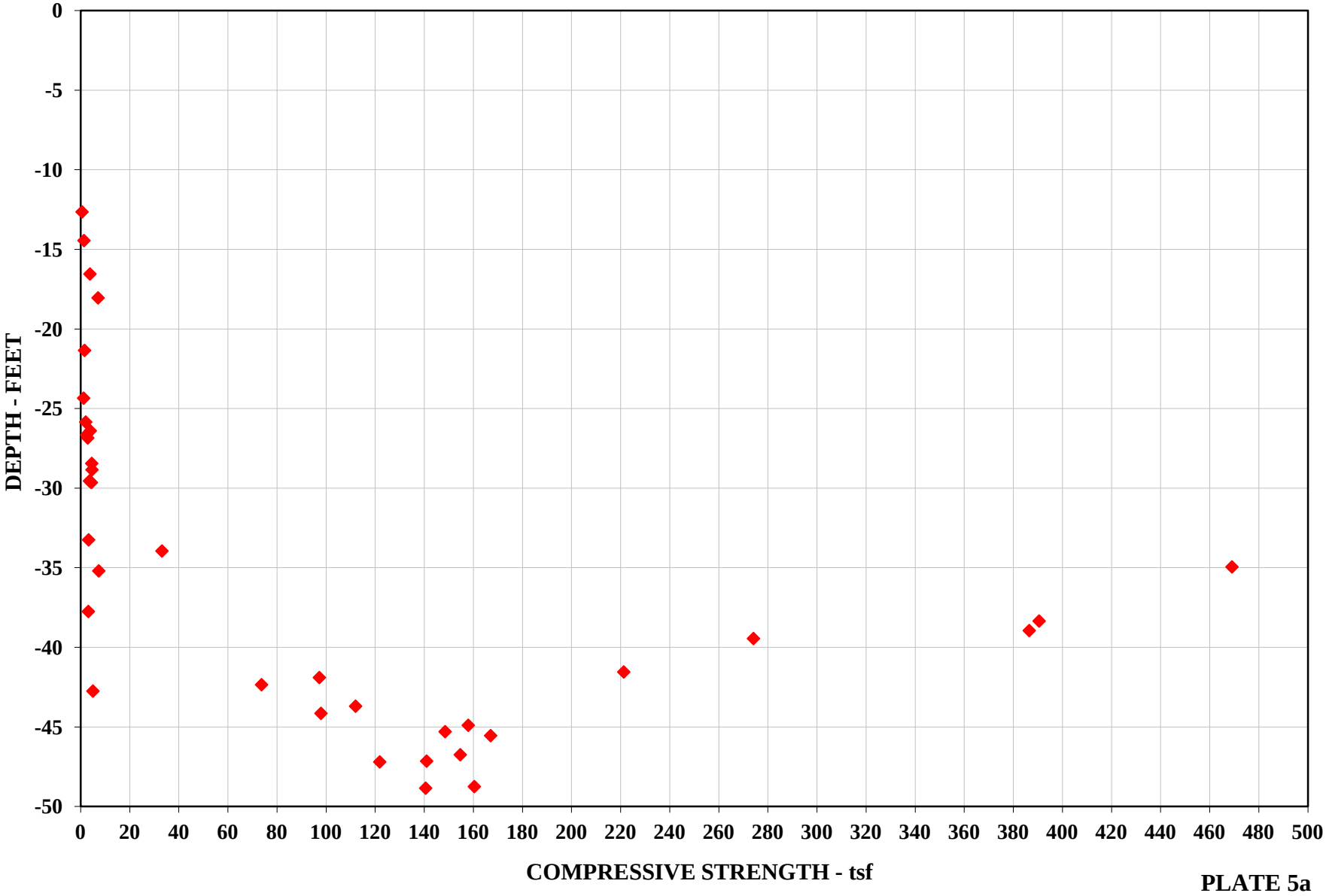


PLATE 5a

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
(RE-SITED BUILDINGS)
ULTIMATE COMPRESSIVE STRENGTH VS DEPTH
(EXCLUDING HIGH-END STRENGTH SPECIMENS)

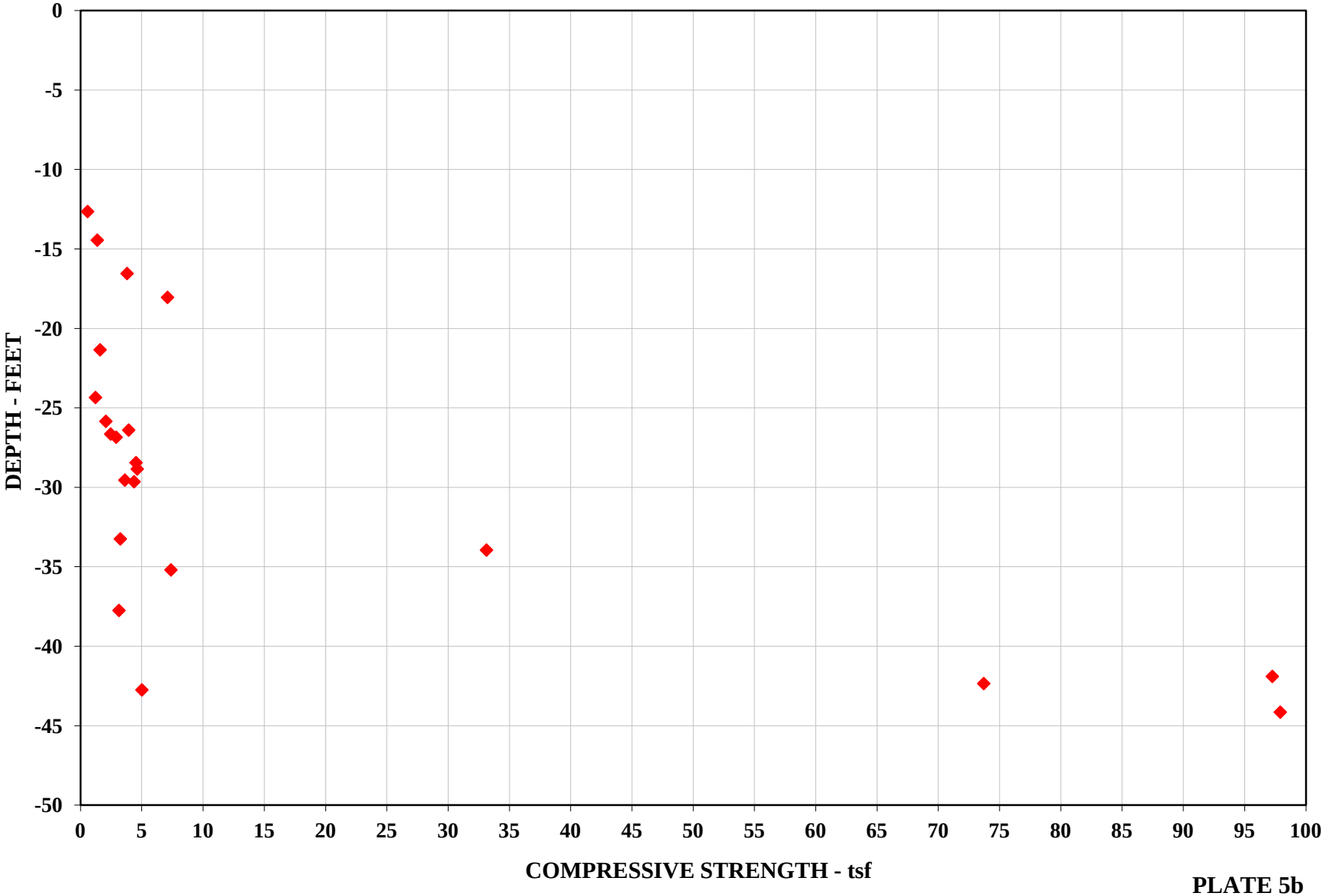


PLATE 5b

ORTC (FY12) – DINING FACILITY SITE

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
DINING FACILITY
PLASTICITY CHART

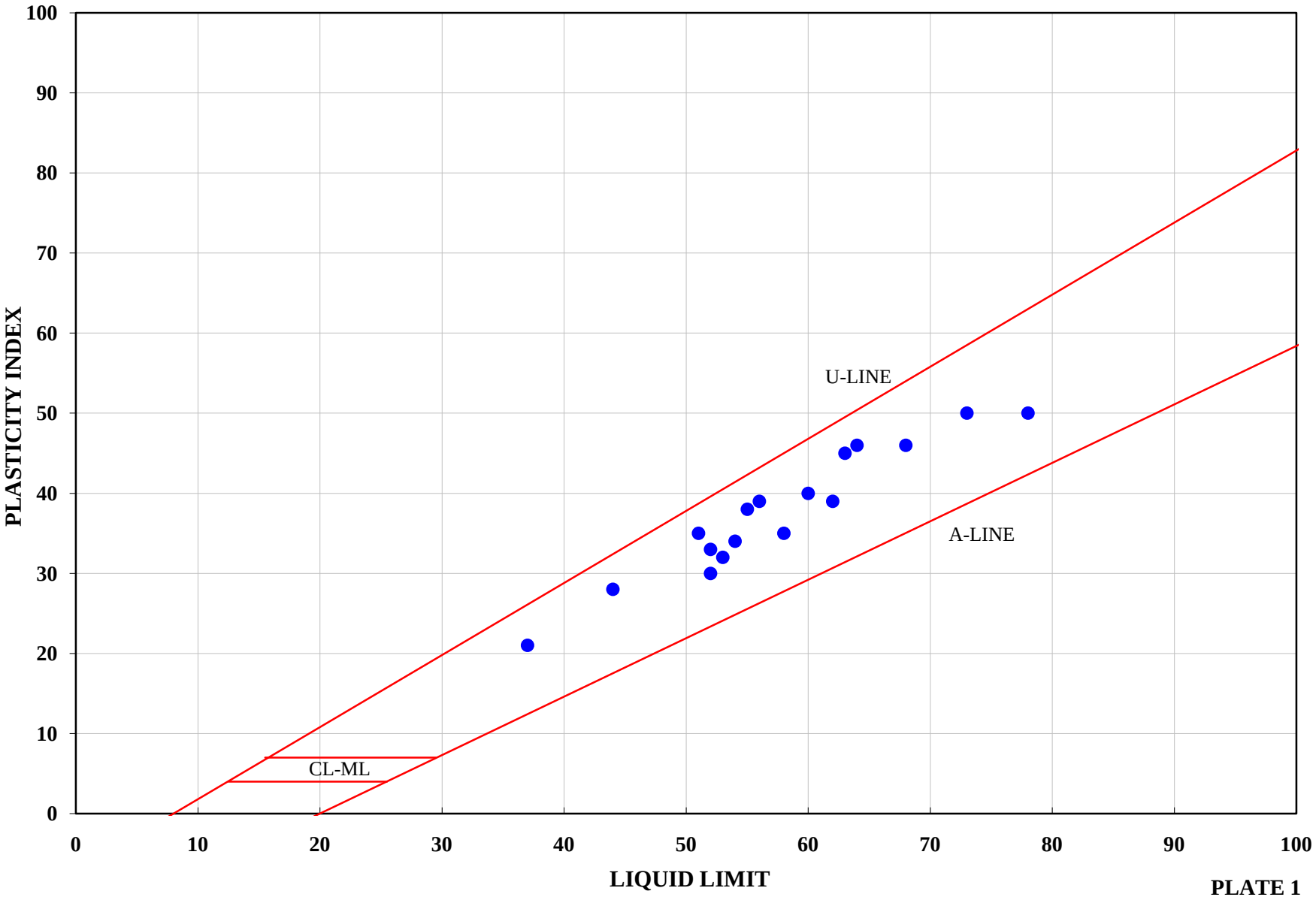


PLATE 1

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
DINING FACILITY
MOISTURE CONTENT VS DEPTH

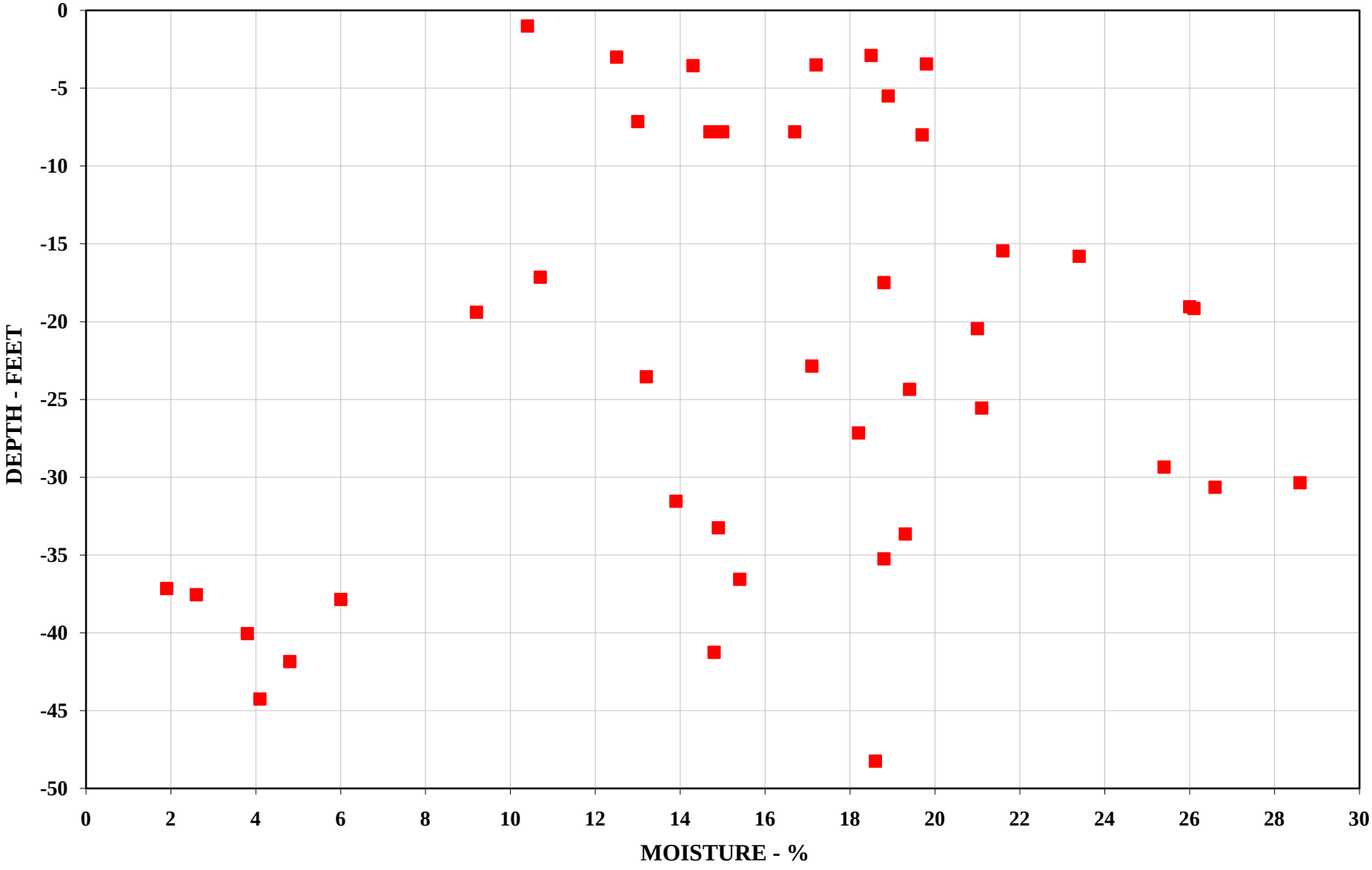


PLATE 2

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
DINING FACILITY
ATTERBERG LIMITS VS DEPTH

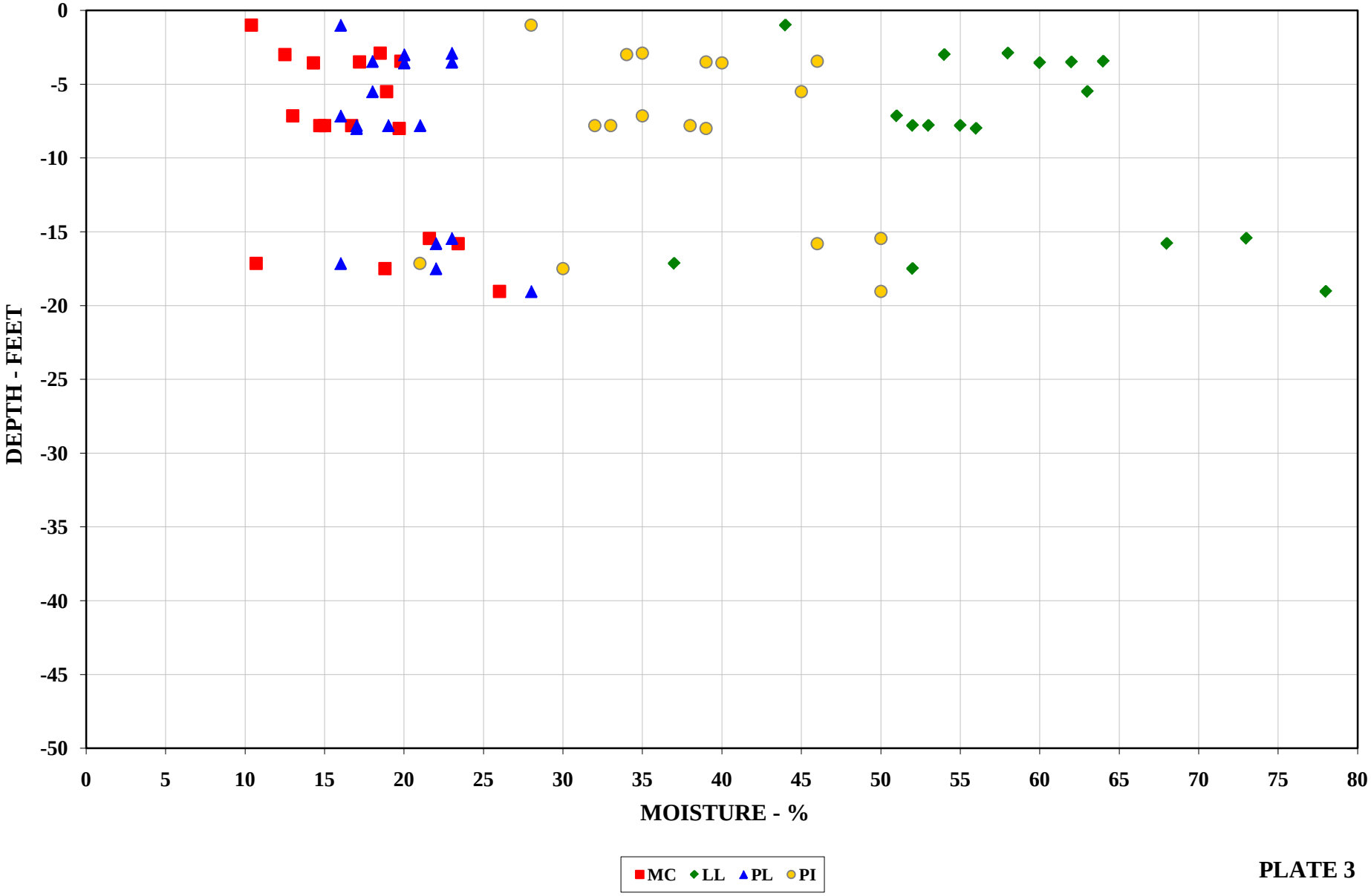


PLATE 3

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
DINING FACILITY
MOISTURE CONTENT - DRY DENSITY VS DEPTH

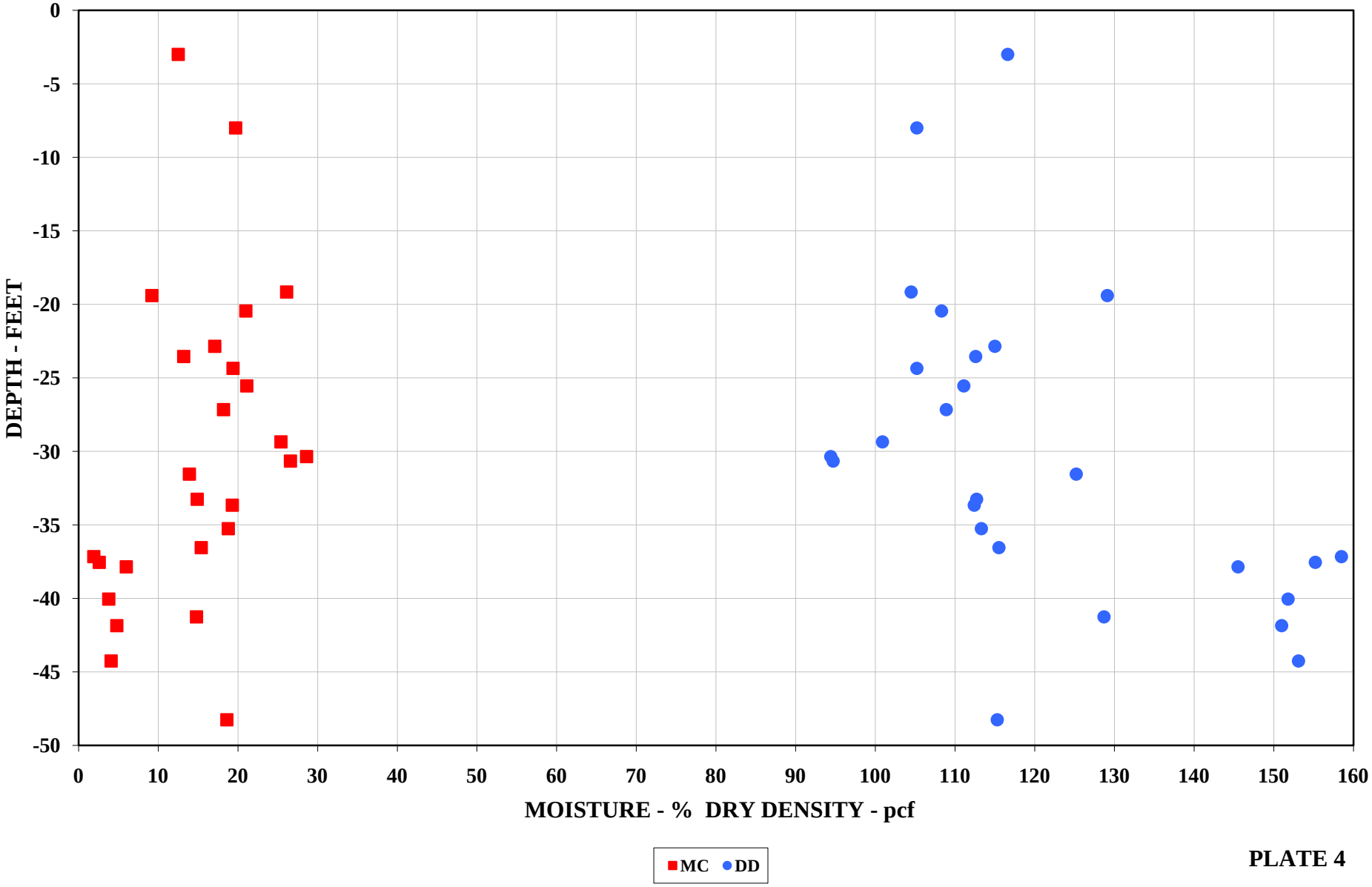


PLATE 4

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
DINING FACILITY
ULTIMATE COMPRESSIVE STRENGTH VS DEPTH

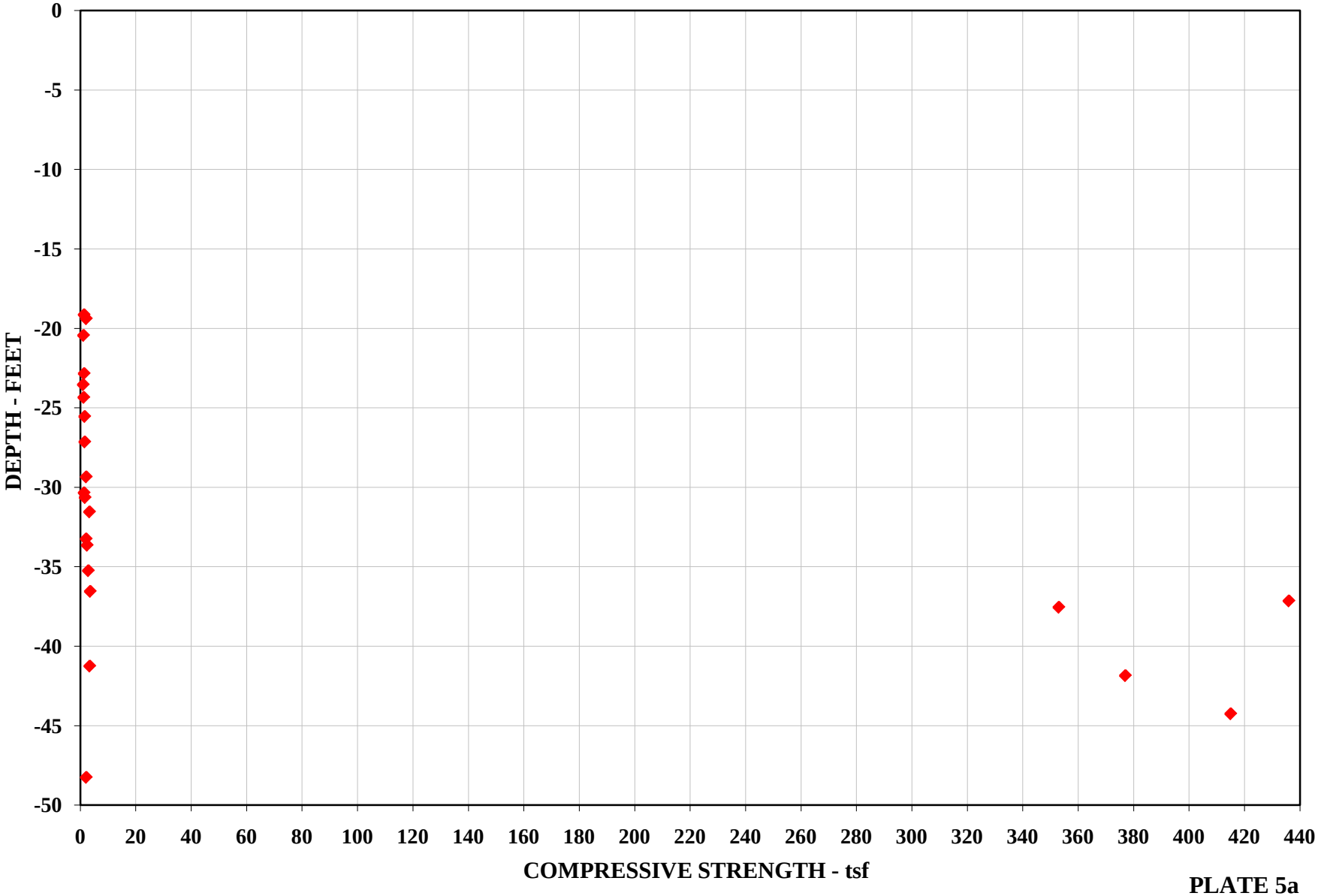


PLATE 5a

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
DINING FACILITY
ULTIMATE COMPRESSIVE STRENGTH VS DEPTH
(EXCLUDING HIGH-END STRENGTH SPECIMENS)

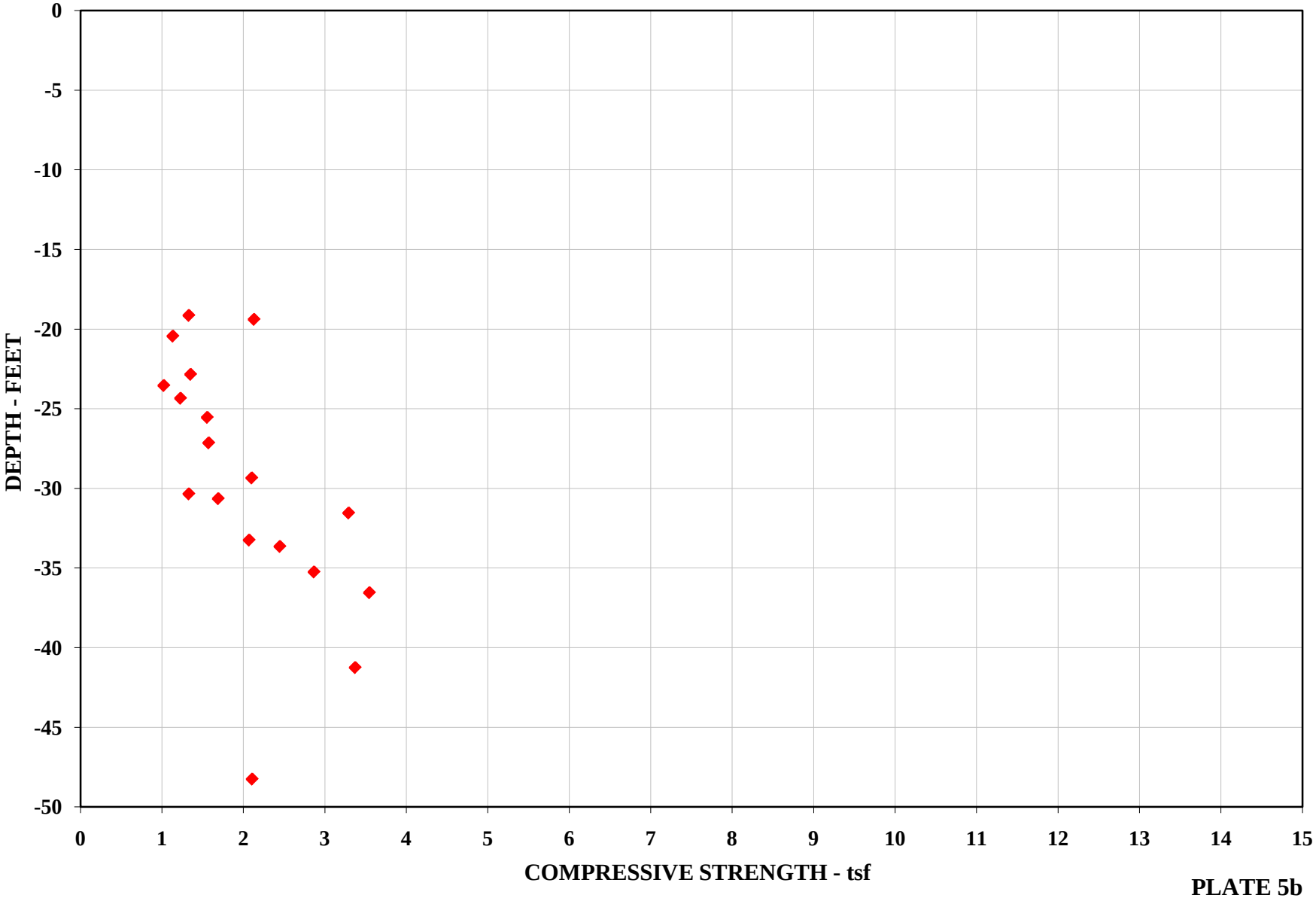


PLATE 5b

ORTC (FY12) WATER TOWER SITE

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
WATER TOWER SITE
PLASTICITY CHART

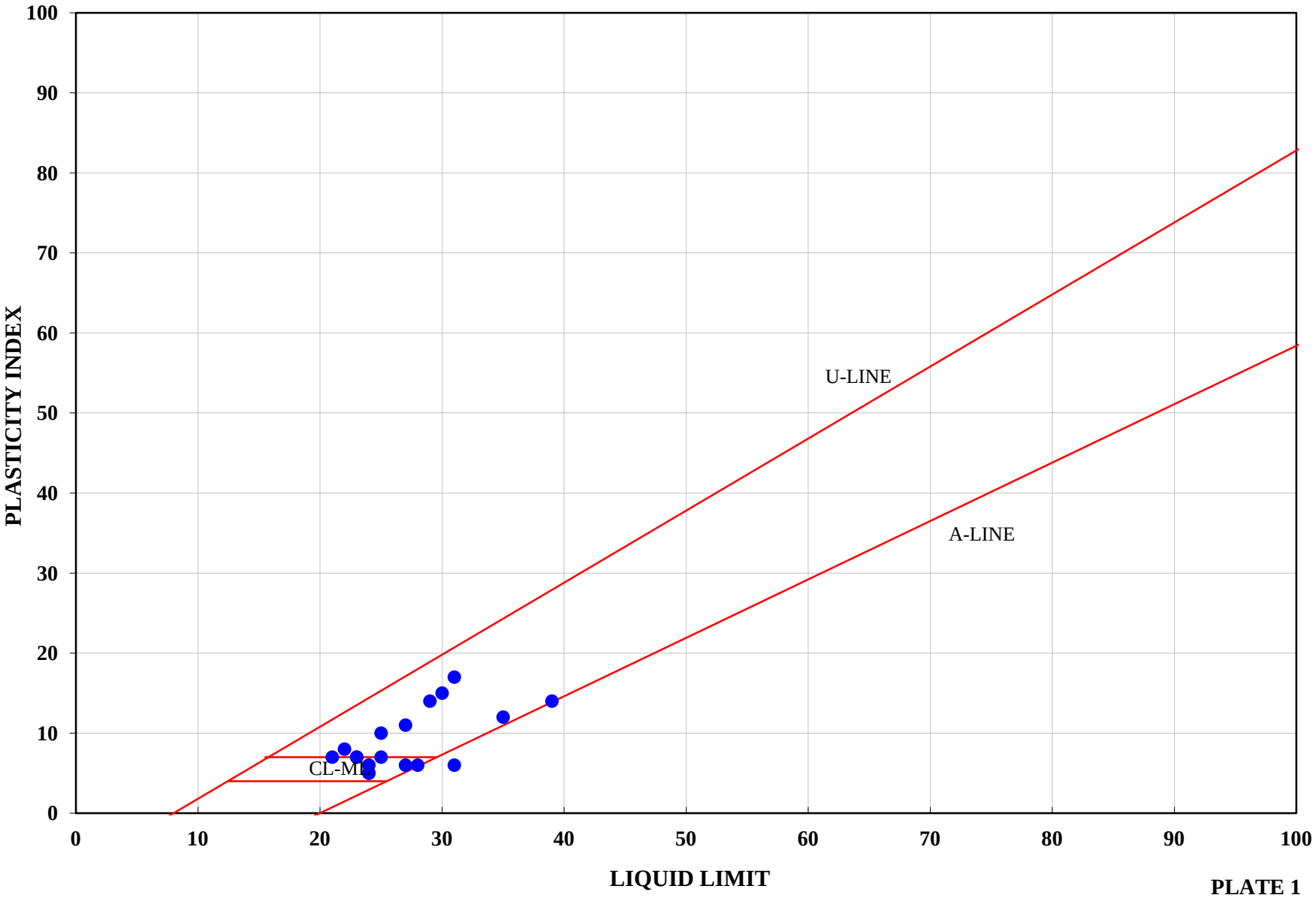


PLATE 1

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
WATER TOWER SITE
MOISTURE CONTENT VS DEPTH

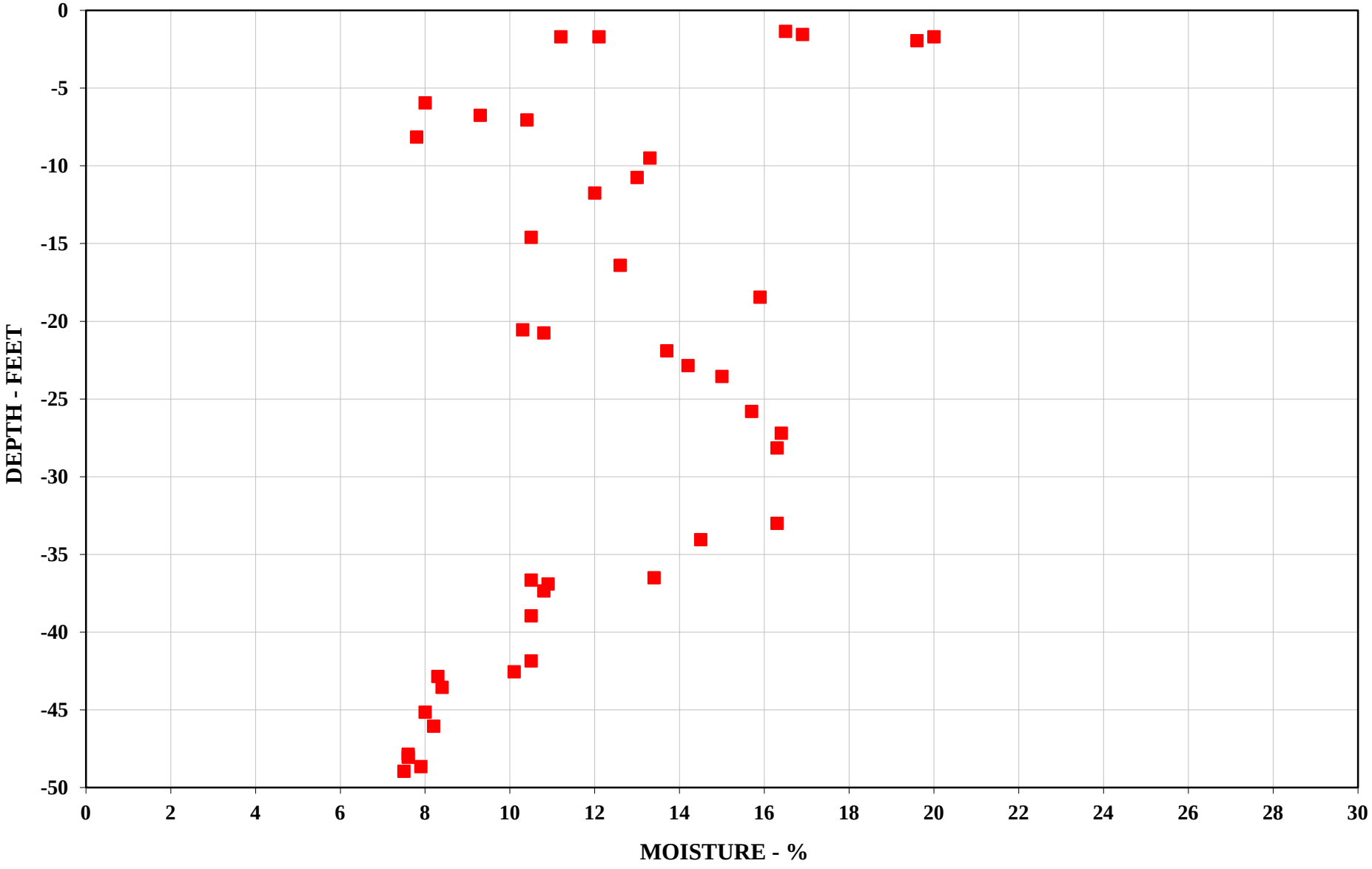


PLATE 2

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
WATER TOWER SITE
ATTERBERG LIMITS VS DEPTH

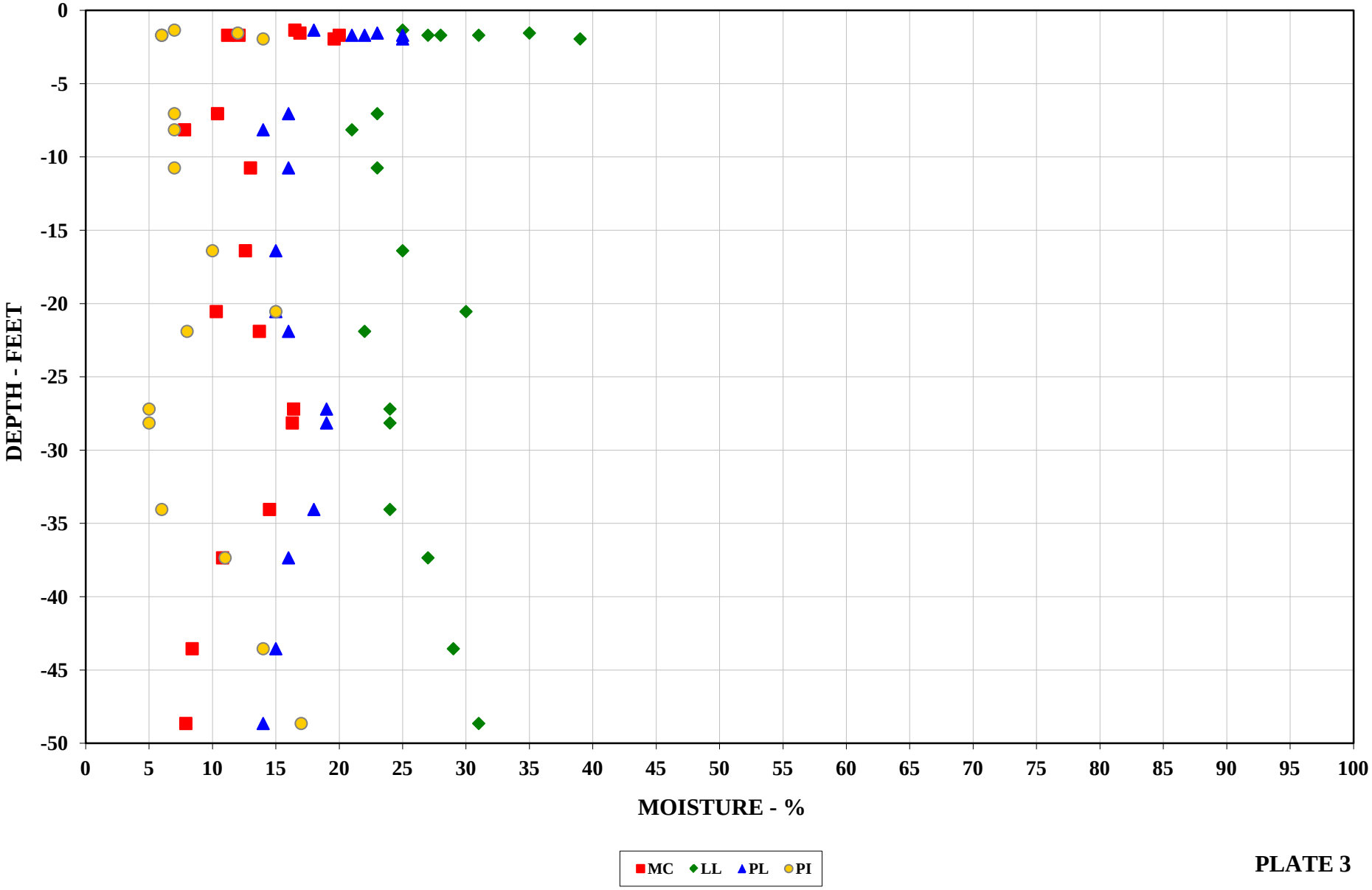


PLATE 3

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
WATER TOWER SITE
MOISTURE CONTENT - DRY DENSITY VS DEPTH

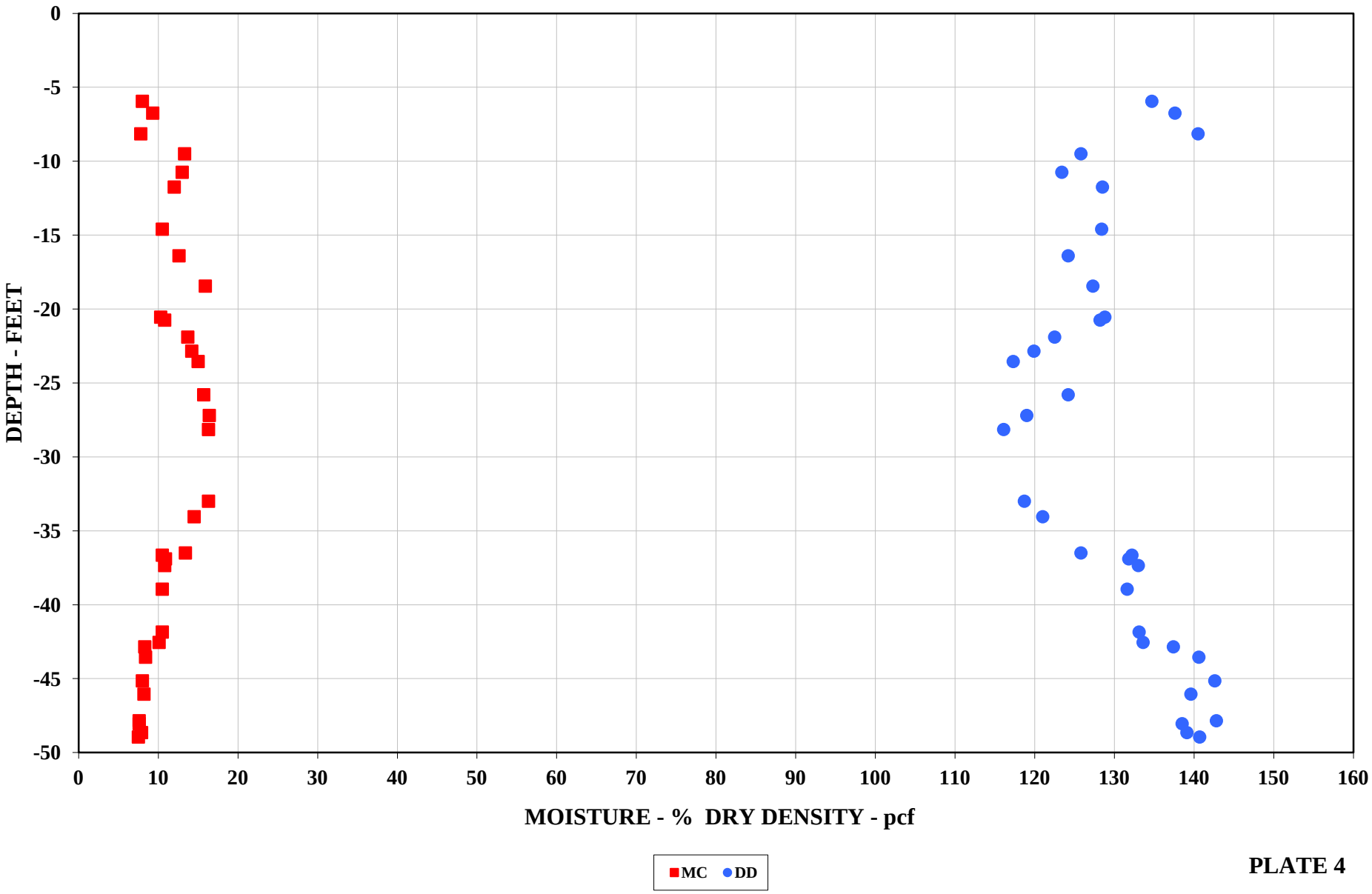


PLATE 4

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
WATER TOWER SITE
ULTIMATE COMPRESSIVE STRENGTH VS DEPTH

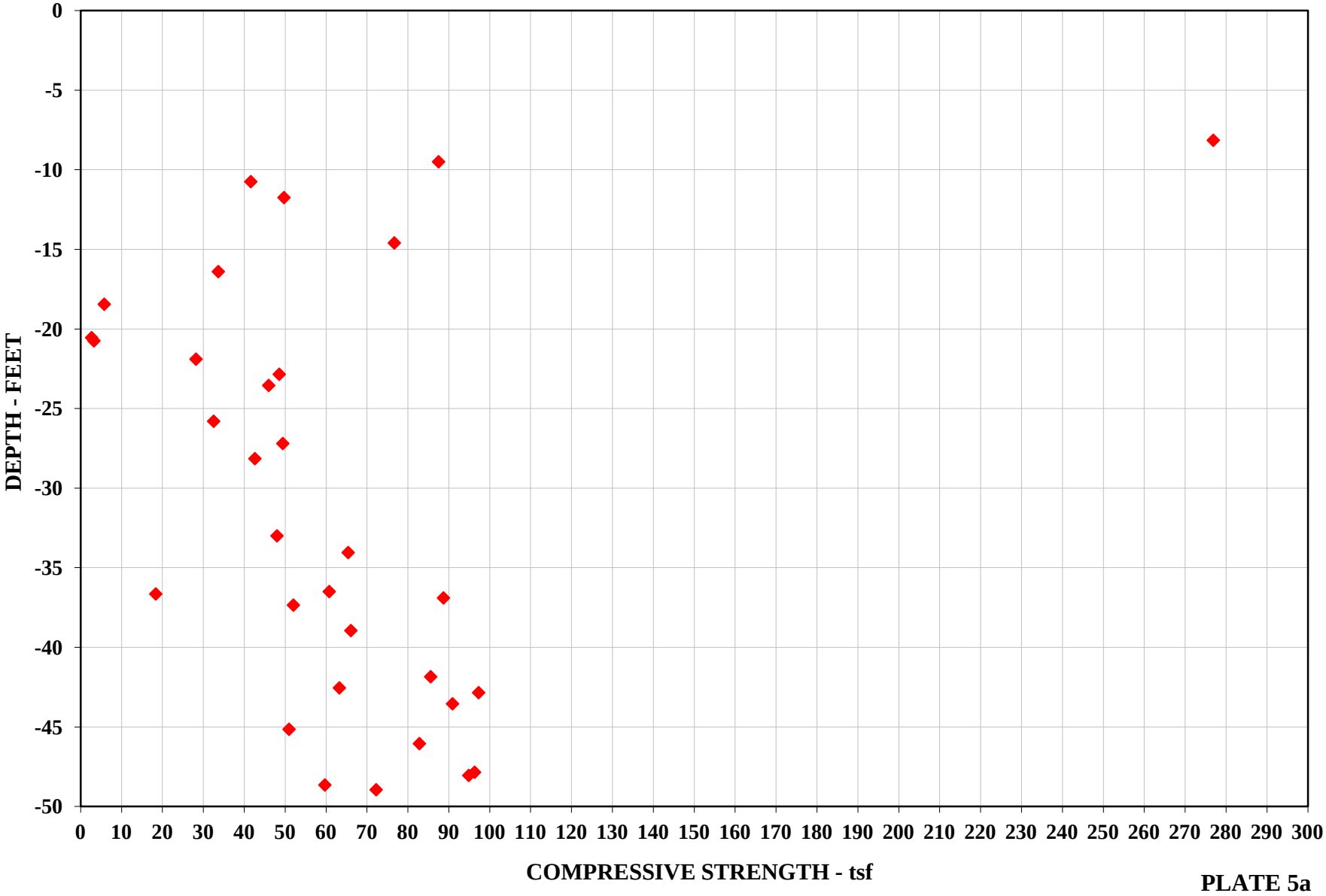


PLATE 5a

OPERATIONAL READINESS TRAINING COMPLEX (FY12)
WATER TOWER SITE
ULTIMATE COMPRESSIVE STRENGTH VS DEPTH
(EXCLUDING HIGH-END STRENGTH SPECIMENS)

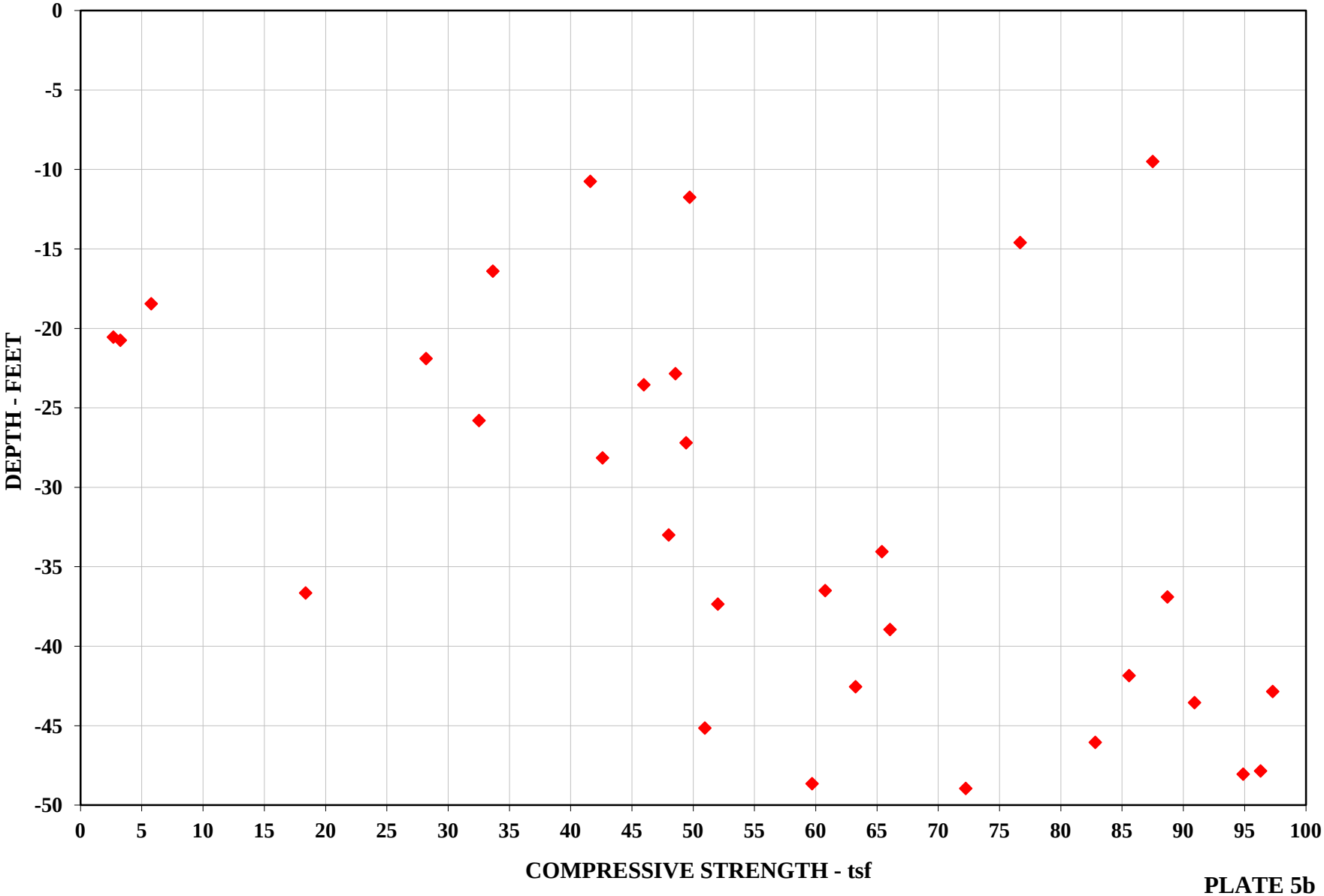


PLATE 5b

APPENDIX C

LABORATORY TESTING DATA

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC) (FY12)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Percent Passing Sieve #4	#10	#20	#40	#60	#80	#100	#200
8A4C-5732	A	0.5-6	Dark gray sandy clay	CH	94.6	89.4	84.3	80.6	77.3	73.2	71.5	66.7
	B	6-7.8	Gray sandy clay with limestone fragments	CH	77.6	76.4	70.4	66.3	63.2	60.3	59.1	55.5
	C	7.8-11.6	Light gray and reddish brown clayey sand with gravel	SC	80.6	61.7	45.5	33.7	23.9	21.5	20.8	19.3
	D	11.6-12	Tan and light gray shaley clay	CH	---	---	---	---	---	---	---	---
	C-1	14.2-15.1	Tan and gray weathered limestone with shale seams	N/A	---	---	---	---	---	---	---	---
	C-2	16.3-17.2	Tan and gray weathered shale	N/A	---	---	---	---	---	---	---	---
	C-3	20.1-21	Tan and gray weathered shale	N/A	---	---	---	---	---	---	---	---
	C-4	22.2-22.9	Tan and gray weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-5	24.3-25.2	Tan and light brown weathered shale	N/A	---	---	---	---	---	---	---	---
	C-6	26.1-27	Tan and gray weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-7	27.7-28.4	Tan and gray weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-8	33.3-34.2	Tan and gray weathered limestone with shale seams	N/A	---	---	---	---	---	---	---	---
	C-9	35.6-36.1	Gray limestone	N/A	---	---	---	---	---	---	---	---
	C-10	36.1-36.8	Gray shale with limestone	N/A	---	---	---	---	---	---	---	---
	C-11	37.2-37.9	Gray limestone	N/A	---	---	---	---	---	---	---	---
	C-12	39.4-40.3	Gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
8A4C-5733	A	0-5	Dark gray clay with sand	CH	99.0	97.7	96.0	94.1	91.4	85.3	82.3	74.0
	B	5-8.9	Dark gray clay with sand	CH	99.1	98.2	96.7	94.9	92.1	86.0	82.9	75.7
	C	8.9-14	Light gray and tan clayey sand	SC	97.1	95.7	94.3	92.5	87.5	68.1	59.8	47.0
	D	14-19.1	Light gray and reddish brown clayey sand	SC	99.5	99.2	98.6	97.6	93.2	55.6	46.0	31.5
	E	19.1-22.6	Light reddish brown silty sand	SM	100.0	99.9	99.6	99.1	95.2	40.2	28.4	15.7
	F	22.6-24.5	Light reddish brown clayey sand	SC	---	---	---	---	---	---	---	---
	C-4	34.7-35.5	Tan weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-5	36-36.6	Tan weathered limestone	N/A	---	---	---	---	---	---	---	---
	C-6	36.6-37.3	Tan and gray weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-7	37.3-38.2	Tan and gray weathered shale	N/A	---	---	---	---	---	---	---	---
8A4C-5734	A	1.5-6.4	Dark gray sandy clay	CH	97.2	94.0	89.0	84.7	80.2	73.3	70.0	60.9
	B	6.4-10.7	Brown clay with sand	CH	93.3	97.1	94.9	92.5	88.9	81.9	78.8	70.9
	C-5	32-32.9	Tan and gray weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-6	32.9-33.8	Tan and gray weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-7	36-36.9	Tan and gray weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-8	37.3-38.2	Gray limestone interbedded with gray shale	N/A	---	---	---	---	---	---	---	---
	C-9	38.2-39.3	Gray shale	N/A	---	---	---	---	---	---	---	---
	C-10	40.8-41.5	Gray fossiliferous limestone	N/A	---	---	---	---	---	---	---	---
8A4C-5735	A	0.6-6.4	Dark gray clay with sand	CH	98.5	97.0	94.8	92.3	88.7	81.6	78.3	70.3
	B	6.4-10.1	Brown clay with sand	CH	99.4	98.2	96.6	95.0	92.7	86.9	84.8	78.9
	C	10.1-11.9	Light gray and tan sandy clay	CL	99.0	97.8	95.7	93.3	87.9	74.3	67.7	56.1
	D	11.9-16.2	Light brown and tan clayey sand	SC	97.3	93.4	87.8	84.3	78.5	58.1	50.5	35.4
	C-3	31.3-32.2	Tan and gray weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-4	36.1-36.8	Tan weathered shale with gypsum seams	N/A	---	---	---	---	---	---	---	---
	C-5	37-37.55	Light gray fossiliferous limestone	N/A	---	---	---	---	---	---	---	---
	C-6	39.3-40	Gray limestone	N/A	---	---	---	---	---	---	---	---

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC) (FY12)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Percent Passing Sieve #4	#10	#20	#40	#60	#80	#100	#200
8A4C-5736	A	0.5-6.1	Dark gray sandy clay	CH	97.8	96.8	94.6	91.9	88.2	80.5	77.5	69.5
	B	6.1-10.9	Brown clay with sand	CH	99.7	97.6	94.7	92.9	91.1	87.5	85.6	81.5
	C	16.1-17.2	Light gray and tan sandy clay	CL	---	---	---	---	---	---	---	---
	C-1	18.6-19.5	Tan and gray weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-2	20.3-21.2	Tan and gray weathered limestone with shale seams	N/A	---	---	---	---	---	---	---	---
	C-3	22.1-23	Tan and gray weathered limestone with shale seams	N/A	---	---	---	---	---	---	---	---
	C-4	24.2-25.1	Tan and gray weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-5	26.5-27.4	Tan weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-6	30.9-31.8	Tan and gray weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-7	37.5-38.2	Tan and gray weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
10A-5739	A	0.9-5.6	Dark gray sandy clay	CH	97.9	93.0	86.0	79.5	74.7	68.3	65.3	58.3
	B	5.6-8.1	Tan and reddish brown clayey sand	SC	86.0	68.3	53.6	42.8	38.1	33.1	30.8	25.4
	C	8.1-10	Tan and reddish brown clayey sand	SC	94.4	89.9	87.1	85.0	80.9	66.6	56.8	39.7
10A-5742	A	1.7-6.4	Dark gray sandy clay	CH	99.0	97.4	94.7	91.2	86.2	77.2	72.4	64.2
	B	6.4-10	Light brown clay with sand	CH	99.4	96.9	92.3	88.6	85.1	79.3	76.8	70.9
10A-5745	A	0-5	Dark gray clay with sand	CH	99.3	98.2	96.8	95.2	93.2	89.9	88.3	83.2
	B	5.0-10.0	Light brown clay with sand	CH	99.2	97.0	95.1	93.6	92.0	89.0	87.6	83.5
8A4C-5748	A	0.9-6	Dark gray clay with sand	CH	99.8	98.8	97.6	96.1	93.6	89.3	87.5	81.9
	B	6.0-11	Grayish brown and tan clay	CH	99.0	97.7	96.3	95.0	93.3	90.5	89.3	85.5
	C	11.0-16	Light gray and tan clay	CH	99.5	98.3	97.1	96.2	94.9	92.6	91.8	89.4
	D	16.0-21	Light gray and tan clay	CH	100.0	99.5	98.4	97.7	96.8	95.4	94.6	92.1
	E	21.0-25	Gray and light brown shaley clay	CH	100.0	99.7	99.5	99.2	98.8	98.0	97.5	95.6
	C-1	27.3-28.2	Tan and gray weathered shale	N/A	---	---	---	---	---	---	---	---
	C-2	29.4-30.3	Tan and gray weathered shale	N/A	---	---	---	---	---	---	---	---
	C-3	31.5-32.4	Tan and gray weathered shale	N/A	---	---	---	---	---	---	---	---
	C-4	33.8-34.7	Tan and gray weathered shale	N/A	---	---	---	---	---	---	---	---
	C-5	36-36.9	Gray shale	N/A	---	---	---	---	---	---	---	---
	C-6	38.3-39.2	Tan and gray weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC) (FY12)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Atterberg Limits LL	PL	PI	Notes
8A4C-5732	A	0.5-6	Dark gray sandy clay	CH	18.0	---	66	18	48	
	B	6-7.8	Gray sandy clay with limestone fragments	CH	18.7	---	77	18	59	
	C	7.8-11.6	Light gray and reddish brown clayey sand with gravel	SC	11.1	---	68	23	45	
	D	11.6-12	Tan and light gray shaley clay	CH	26.0	---	70	24	46	
	C-1	14.2-15.1	Tan and gray weathered limestone with shale seams	N/A	15.5	121.6	31	18	13	
	C-2	16.3-17.2	Tan and gray weathered shale	N/A	26.0	104.2	72	28	44	
	C-3	20.1-21	Tan and gray weathered shale	N/A	24.0	107.5	76	28	48	
	C-4	22.2-22.9	Tan and gray weathered shale with limestone inclusions	N/A	16.2	125.0	51	20	31	
	C-5	24.3-25.2	Tan and light brown weathered shale	N/A	28.1	96.5	78	32	46	
	C-6	26.1-27	Tan and gray weathered shale with limestone inclusions	N/A	18.9	118.8	51	20	31	
	C-7	27.7-28.4	Tan and gray weathered shale with limestone inclusions	N/A	20.2	111.0	50	20	30	
	C-8	33.3-34.2	Tan and gray weathered limestone with shale seams	N/A	8.8	139.9	66	27	39	
	C-9	35.6-36.1	Gray limestone	N/A	3.5	153.0		Non-Plastic		
	C-10	36.1-36.8	Gray shale with limestone	N/A	23.3	101.6	58	25	33	
	C-11	37.2-37.9	Gray limestone	N/A	3.5	156.1		Non-Plastic		
	C-12	39.4-40.3	Gray limestone with shale lenses	N/A	5.5	144.3	62	24	38	
8A4C-5733	A	0-5	Dark gray clay with sand	CH	25.2	---	61	20	41	
	B	5-8.9	Dark gray clay with sand	CH	24.5	---	65	20	45	
	C	8.9-14	Light gray and tan clayey sand	SC	17.7	---	47	16	31	
	D	14-19.1	Light gray and reddish brown clayey sand	SC	12.5	---	31	14	17	
	E	19.1-22.6	Light reddish brown silty sand	SM	8.9	---		Non-Plastic		
	F	22.6-24.5	Light reddish brown clayey sand	SC	15.4	---	58	17	41	
	C-4	34.7-35.5	Tan weathered shale with limestone inclusions	N/A	18.6	112.4	---	---	---	
	C-5	36-36.6	Tan weathered limestone	N/A	4.0	152.4	---	---	---	
	C-6	36.6-37.3	Tan and gray weathered shale with limestone inclusions	N/A	29.4	115.3	---	---	---	
	C-7	37.3-38.2	Tan and gray weathered shale	N/A	26.6	96.7	58	22	36	
8A4C-5734	A	1.5-6.4	Dark gray sandy clay	CH	17.6	---	66	20	46	
	B	6.4-10.7	Brown clay with sand	CH	16.1	---	55	18	37	
	C-5	32-32.9	Tan and gray weathered shale with limestone inclusions	N/A	16.1	116.0	50	20	30	
	C-6	32.9-33.8	Tan and gray weathered shale with limestone inclusions	N/A	23.9	109.0	52	21	31	
	C-7	36-36.9	Tan and gray weathered shale with limestone inclusions	N/A	24.5	102.1	70	30	40	
	C-8	37.3-38.2	Gray limestone interbedded with gray shale	N/A	7.9	136.1	62	20	42	
	C-9	38.2-39.3	Gray shale	N/A	23.5	101.8	76	29	47	
	C-10	40.8-41.5	Gray fossiliferous limestone	N/A	2.9	151.8	---	---	---	
8A4C-5735	A	0.6-6.4	Dark gray clay with sand	CH	18.4	---	59	20	39	
	B	6.4-10.1	Brown clay with sand	CH	18.7	---	56	17	39	
	C	10.1-11.9	Light gray and tan sandy clay	CL	14.6	---	34	14	20	
	D	11.9-16.2	Light brown and tan clayey sand	SC	13.4	---	30	13	17	
	C-3	31.3-32.2	Tan and gray weathered shale with limestone inclusions	N/A	23.0	103.9	60	24	36	
	C-4	36.1-36.8	Tan weathered shale with gypsum seams	N/A	27.9	83.5	59	22	37	
	C-5	37-37.55	Light gray fossiliferous limestone	N/A	3.4	152.1	---	---	---	
	C-6	39.3-40	Gray limestone	N/A	4.6	147.8	---	---	---	

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC) (FY12)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Atterberg Limits LL	PL	PI	Notes
8A4C-5736	A	0.5-6.1	Dark gray sandy clay	CH	18.4	---	63	19	44	
	B	6.1-10.9	Brown clay with sand	CH	19.4	---	70	22	48	
	C	16.1-17.2	Light gray and tan sandy clay	CL	10.2	---	32	14	18	
	C-1	18.6-19.5	Tan and gray weathered shale with limestone inclusions	N/A	20.9	109.5	57	20	37	
	C-2	20.3-21.2	Tan and gray weathered limestone with shale seams	N/A	9.7	127.4	40	17	23	
	C-3	22.1-23	Tan and gray weathered limestone with shale seams	N/A	11.5	128.0	34	18	16	
	C-4	24.2-25.1	Tan and gray weathered shale with limestone inclusions	N/A	16.9	111.4	54	21	33	
	C-5	26.5-27.4	Tan weathered shale with limestone inclusions	N/A	20.3	111.0	59	22	37	
	C-6	30.9-31.8	Tan and gray weathered shale with limestone inclusions	N/A	25.8	108.7	71	27	44	
	C-7	37.5-38.2	Tan and gray weathered shale with limestone inclusions	N/A	25.8	100.7	67	28	39	
10A-5739	A	0.9-5.6	Dark gray sandy clay	CH	15.6	---	69	21	48	
	B	5.6-8.1	Tan and reddish brown clayey sand	SC	10.1	---	62	21	41	
	C	8.1-10	Tan and reddish brown clayey sand	SC	15.7	---	37	14	23	
10A-5742	A	1.7-6.4	Dark gray sandy clay	CH	16.0	---	70	17	53	
	B	6.4-10	Light brown clay with sand	CH	15.2	---	61	17	44	
10A-5745	A	0-5	Dark gray clay with sand	CH	24.7	---	78	21	57	
	B	5.0-10.0	Light brown clay with sand	CH	20.6	---	72	20	52	
8A4C-5748	A	0.9-6	Dark gray clay with sand	CH	24.5	---	71	19	52	
	B	6.0-11	Grayish brown and tan clay	CH	23.5	---	73	20	53	
	C	11.0-16	Light gray and tan clay	CH	21.0	---	58	20	38	
	D	16.0-21	Light gray and tan clay	CH	18.2	---	53	17	36	
	E	21.0-25	Gray and light brown shaley clay	CH	17.3	---	58	17	41	
	C-1	27.3-28.2	Tan and gray weathered shale	N/A	19.6	112.9	50	17	33	
	C-2	29.4-30.3	Tan and gray weathered shale	N/A	16.9	114.2	49	17	32	
	C-3	31.5-32.4	Tan and gray weathered shale	N/A	17.2	114.1	52	17	35	
	C-4	33.8-34.7	Tan and gray weathered shale	N/A	15.1	117.4	46	17	29	
	C-5	36-36.9	Gray shale	N/A	16.2	117.3	41	16	25	
	C-6	38.3-39.2	Tan and gray weathered shale with limestone inclusions	N/A	14.0	120.1	43	15	28	

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC) (FY12)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Confining Pressure (tsf)	Q (tsf)	Strain @ Failure (%)	Type Failure
8A4C-5732	A	0.5-6	Dark gray sandy clay	CH	18.0	---	---	---	---	
	B	6-7.8	Gray sandy clay with limestone fragments	CH	18.7	---	---	---	---	
	C	7.8-11.6	Light gray and reddish brown clayey sand with gravel	SC	11.1	---	---	---	---	
	D	11.6-12	Tan and light gray shaley clay	CH	26.0	---	---	---	---	
	C-1	14.2-15.1	Tan and gray weathered limestone with shale seams	N/A	15.5	121.6	0.916	2.69	9.4	Internal
	C-2	16.3-17.2	Tan and gray weathered shale	N/A	26.0	104.2	1.047	1.69	8.6	Internal
	C-3	20.1-21	Tan and gray weathered shale	N/A	24.0	107.5	1.284	2.31	5.7	Internal
	C-4	22.2-22.9	Tan and gray weathered shale with limestone inclusions	N/A	16.2	125.0	1.415	1.36	2.4	Angular (50°)
	C-5	24.3-25.2	Tan and light brown weathered shale	N/A	28.1	96.5	1.547	1.42	5.3	Angular (60°)
	C-6	26.1-27	Tan and gray weathered shale with limestone inclusions	N/A	18.9	118.8	0	3.54	3.9	Angular (45°)
	C-7	27.7-28.4	Tan and gray weathered shale with limestone inclusions	N/A	20.2	111.0	1.753	1.57	1.7	Angular (70°)
	C-8	33.3-34.2	Tan and gray weathered limestone with shale seams	N/A	8.8	139.9	2.109	12.56	4.9	Internal
	C-9	35.6-36.1	Gray limestone	N/A	3.5	153.0	0	215	**	Vertical
	C-10	36.1-36.8	Gray shale with limestone	N/A	23.3	101.6	---	*	*	
	C-11	37.2-37.9	Gray limestone	N/A	3.5	156.1	0	357	**	Vertical
	C-12	39.4-40.3	Gray limestone with shale lenses	N/A	5.5	144.3	0	19.24	1.7	Angular (50°)
8A4C-5733	A	0-5	Dark gray clay with sand	CH	25.2	---	---	---	---	
	B	5-8.9	Dark gray clay with sand	CH	24.5	---	---	---	---	
	C	8.9-14	Light gray and tan clayey sand	SC	17.7	---	---	---	---	
	D	14-19.1	Light gray and reddish brown clayey sand	SC	12.5	---	---	---	---	
	E	19.1-22.6	Light reddish brown silty sand	SM	8.9	---	---	---	---	
	F	22.6-24.5	Light reddish brown clayey sand	SC	15.4	---	---	---	---	
	C-4	34.7-35.5	Tan weathered shale with limestone inclusions	N/A	18.6	112.4	0	0.89	1.3	Angular (60°)
	C-5	36-36.6	Tan weathered limestone	N/A	4.0	152.4	0	229	**	Vertical
	C-6	36.6-37.3	Tan and gray weathered shale with limestone inclusions	N/A	29.4	115.3	0	0.84	3.9	Internal
	C-7	37.3-38.2	Tan and gray weathered shale	N/A	26.6	96.7	2.359	2.38	2.2	Angular (35°)
8A4C-5734	A	1.5-6.4	Dark gray sandy clay	CH	17.6	---	---	---	---	
	B	6.4-10.7	Brown clay with sand	CH	16.1	---	---	---	---	
	C-5	32-32.9	Tan and gray weathered shale with limestone inclusions	N/A	16.1	116.0	2.028	3.22	3.5	Angular (45°)
	C-6	32.9-33.8	Tan and gray weathered shale with limestone inclusions	N/A	23.9	109.0	2.084	2.66	3.0	Angular (50°)
	C-7	36-36.9	Tan and gray weathered shale with limestone inclusions	N/A	24.5	102.1	2.278	2.60	2.1	Angular (45°)
	C-8	37.3-38.2	Gray limestone interbedded with gray shale	N/A	7.9	136.1	2.359	2.35	3.2	Internal
	C-9	38.2-39.3	Gray shale	N/A	23.5	101.8	2.416	3.41	5.2	Angular (55°)
	C-10	40.8-41.5	Gray fossiliferous limestone	N/A	2.9	151.8	---	*	*	
8A4C-5735	A	0.6-6.4	Dark gray clay with sand	CH	18.4	---	---	---	---	
	B	6.4-10.1	Brown clay with sand	CH	18.7	---	---	---	---	
	C	10.1-11.9	Light gray and tan sandy clay	CL	14.6	---	---	---	---	
	D	11.9-16.2	Light brown and tan clayey sand	SC	13.4	---	---	---	---	
	C-3	31.3-32.2	Tan and gray weathered shale with limestone inclusions	N/A	23.0	103.9	1.984	2.47	1.2	Angular (60°)
	C-4	36.1-36.8	Tan weathered shale with gypsum seams	N/A	27.9	83.5	2.278	1.40	7.4	Angular (50°)
	C-5	37-37.55	Light gray fossiliferous limestone	N/A	3.4	152.1	0	451	**	Vertical
	C-6	39.3-40	Gray limestone	N/A	4.6	147.8	0	123	**	Vertical

Notes *This sample was fractured and not suitable for representative strength testing. **Strain measurements were not recorded for this test as this sample was trimmed square, ends capped with high-strength gypsum, and tested in accordance with ASTM D-2938 "Unconfined Compressive Strength of Intact Rock Core Specimens".

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC) (FY12)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Confining Pressure (tsf)	Q (tsf)	Strain @ Failure (%)	Type Failure
8A4C-5736	A	0.5-6.1	Dark gray sandy clay	CH	18.4	---	---	---	---	
	B	6.1-10.9	Brown clay with sand	CH	19.4	---	---	---	---	
	C	16.1-17.2	Light gray and tan sandy clay	CL	10.2	---	---	---	---	
	C-1	18.6-19.5	Tan and gray weathered shale with limestone inclusions	N/A	20.9	109.5	1.134	2.35	10.3	Internal
	C-2	20.3-21.2	Tan and gray weathered limestone with shale seams	N/A	9.7	127.4	1.297	6.05	14.7	Internal
	C-3	22.1-23	Tan and gray weathered limestone with shale seams	N/A	11.5	128.0	1.409	6.67	14.8	Internal
	C-4	24.2-25.1	Tan and gray weathered shale with limestone inclusions	N/A	16.9	111.4	1.541	2.20	5.2	Angular (45°)
	C-5	26.5-27.4	Tan weathered shale with limestone inclusions	N/A	20.3	111.0	1.684	3.13	5.4	Angular (50°)
	C-6	30.9-31.8	Tan and gray weathered shale with limestone inclusions	N/A	25.8	108.7	1.959	2.67	1.3	Angular (45°)
	C-7	37.5-38.2	Tan and gray weathered shale with limestone inclusions	N/A	25.8	100.7	2.366	2.07	7.4	Angular (55°)
10A-5739	A	0.9-5.6	Dark gray sandy clay	CH	15.6	---	---	---	---	
	B	5.6-8.1	Tan and reddish brown clayey sand	SC	10.1	---	---	---	---	
	C	8.1-10	Tan and reddish brown clayey sand	SC	15.7	---	---	---	---	
10A-5742	A	1.7-6.4	Dark gray sandy clay	CH	16.0	---	---	---	---	
	B	6.4-10	Light brown clay with sand	CH	15.2	---	---	---	---	
10A-5745	A	0-5	Dark gray clay with sand	CH	24.7	---	---	---	---	
	B	5.0-10.0	Light brown clay with sand	CH	20.6	---	---	---	---	
8A4C-5748	A	0.9-6	Dark gray clay with sand	CH	24.5	---	---	---	---	
	B	6.0-11	Grayish brown and tan clay	CH	23.5	---	---	---	---	
	C	11.0-16	Light gray and tan clay	CH	21.0	---	---	---	---	
	D	16.0-21	Light gray and tan clay	CH	18.2	---	---	---	---	
	E	21.0-25	Gray and light brown shaley clay	CH	17.3	---	---	---	---	
	C-1	27.3-28.2	Tan and gray weathered shale	N/A	19.6	112.9	1.734	4.19	14.5	Internal
	C-2	29.4-30.3	Tan and gray weathered shale	N/A	16.9	114.2	1.866	4.82	14.5	Angular (50°)
	C-3	31.5-32.4	Tan and gray weathered shale	N/A	17.2	114.1	1.997	4.64	14.9	Angular (45°)
	C-4	33.8-34.7	Tan and gray weathered shale	N/A	15.1	117.4	2.141	3.18	2.4	Internal
	C-5	36-36.9	Gray shale	N/A	16.2	117.3	2.278	3.94	9.9	Internal
	C-6	38.3-39.2	Tan and gray weathered shale with limestone inclusions	N/A	14.0	120.1	2.422	6.31	9.9	Internal

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC)(FY12) (FACILITY RELOCATION)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Percent Passing Sieve #4	#10	#20	#40	#60	#80	#100	#200
8A4C-5816	A	4.5-8.1	Gray sandy clay with occasional gravel	CH	88.7	89.4	73.7	70.5	68.4	66.3	65.0	61.6
	C-4	26.2-27.1	Tan weathered shale with limestone lenses	N/A	---	---	---	---	---	---	---	---
	C-5	28.1-28.8	Tan and light gray shale	N/A	---	---	---	---	---	---	---	---
	C-6	38.6-39.3	Dark gray shaley limestone	N/A	---	---	---	---	---	---	---	---
	C-7	41.1-42	Gray and dark gray shaley limestone	N/A	---	---	---	---	---	---	---	---
	C-8	43.7-44.6	Gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-9	44.8-45.8	Gray limestone	N/A	---	---	---	---	---	---	---	---
	C-10	48.5-49.2	Gray limestone	N/A	---	---	---	---	---	---	---	---
8A4C-5817	A	1.1-6.3	Dark gray clay with sand	CH	92.3	85.9	81.6	79.2	77.4	75.9	75.0	72.0
	B	10.7-13.5	Tan and light gray shaley clay	CH	100.0	99.3	98.6	98.0	97.5	97.0	96.6	95.1
	C-4	26.4-27.3	Tan shaley limestone	N/A	---	---	---	---	---	---	---	---
	C-5	28.3-29	Gray and tan shale	N/A	---	---	---	---	---	---	---	---
	C-6	34.6-35.3	Gray limestone	N/A	---	---	---	---	---	---	---	---
	C-7	36.2-37.2	Dark gray shale (interbedded with gray limestone)	N/A	---	---	---	---	---	---	---	---
	C-8	41.8-42.9	Gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-9	44.4-45.4	Gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-10	46.7-47.6	Gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
8A4C-5818	A	0-3	Reddish brown and tan sandy clay	CH	92.2	83.4	75.0	69.5	97.1	64.5	62.9	59.0
	B	10.2-12	Tan and light gray shaley clay	CH	99.8	98.5	97.5	96.5	95.8	95.2	94.9	93.4
	C-1	12.3-13	Tan weathered shale	N/A	---	---	---	---	---	---	---	---
	C-2	14.1-14.8	Tan and gray weathered shale with limestone lenses	N/A	---	---	---	---	---	---	---	---
	C-3	16.3-16.8	Tan weathered shale with limestone lenses	N/A	---	---	---	---	---	---	---	---
	C-4	17.7-18.4	Tan weathered shale with limestone lenses	N/A	---	---	---	---	---	---	---	---
	C-5	20.9-21.8	Tan weathered shale	N/A	---	---	---	---	---	---	---	---
	C-6	23.9-24.8	Tan weathered shale	N/A	---	---	---	---	---	---	---	---
	C-7	26.1-26.7	Tan and gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-8	29.2-29.9	Tan and dark gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-9	33.6-34.3	Dark gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-10	34.7-35.7	Dark gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-11	37.5-38.3	Dark gray shale with some limestone lenses	N/A	---	---	---	---	---	---	---	---
	C-12	41.5-42.3	Gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-13	43.1-44.3	Gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-14	45-46.1	Gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-15	46.3-47.2	Gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-16	48.4-49.1	Gray limestone	N/A	---	---	---	---	---	---	---	---

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC)(FY12) (FACILITY RELOCATION)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Percent Passing Sieve #4	#10	#20	#40	#60	#80	#100	#200
8A4C-5819	A	2.2-4.2	Dark gray sandy clay	CH	96.6	91.5	87.2	83.0	78.4	72.6	69.2	61.6
	B	4.2-7.1	Brown clayey sand with occasional gravel	SC	89.6	77.1	66.3	60.8	56.7	53.0	50.8	45.8
	C-5	25.4-26.3	Tan weathered shale	N/A	---	---	---	---	---	---	---	---
	C-6	29.2-30.1	Tan weathered shale with some limestone lenses	N/A	---	---	---	---	---	---	---	---
	C-7	32.9-33.6	Tan weathered shale with some limestone lenses	N/A	---	---	---	---	---	---	---	---
	C-8	38-38.7	Gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-9	39.1-39.8	Gray limestone	N/A	---	---	---	---	---	---	---	---
	C-10	42.3-43.2	Dark gray shale with some limestone lenses	N/A	---	---	---	---	---	---	---	---
	C-11	46.7-47.7	Dark gray limestone	N/A	---	---	---	---	---	---	---	---

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC)(FY12) (FACILITY RELOCATION)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Atterberg Limits LL	PL	PI	Notes
8A4C-5816	A	4.5-8.1	Gray sandy clay with occasional gravel	CH	16.7	---	91	24	67	
	C-4	26.2-27.1	Tan weathered shale with limestone lenses	N/A	11.4	122.1	50	20	30	
	C-5	28.1-28.8	Tan and light gray shale	N/A	19.5	112.0	60	23	37	
	C-6	38.6-39.3	Dark gray shaley limestone	N/A	8.5	136.0	44	18	26	
	C-7	41.1-42	Gray and dark gray shaley limestone	N/A	5.7	154.0	27	13	14	
	C-8	43.7-44.6	Gray limestone with shale lenses	N/A	8.4	136.3	25	13	12	
	C-9	44.8-45.8	Gray limestone	N/A	9.4	132.6	23	13	10	
	C-10	48.5-49.2	Gray limestone	N/A	8.5	132.1	20	13	7	
8A4C-5817	A	1.1-6.3	Dark gray clay with sand	CH	19.1	---	88	25	63	
	B	10.7-13.5	Tan and light gray shaley clay	CH	18.5	---	57	19	38	
	C-4	26.4-27.3	Tan shaley limestone	N/A	9.1	129.3	47	19	28	
	C-5	28.3-29	Gray and tan shale	N/A	18.5	116.0	55	21	34	
	C-6	34.6-35.3	Gray limestone	N/A	3.2	150.4	Non-Plastic			
	C-7	36.2-37.2	Dark gray shale (interbedded with gray limestone)	N/A	20.5	108.7	84	28	56	
	C-8	41.8-42.9	Gray limestone with shale lenses	N/A	8.5	135.5	23	13	10	
	C-9	44.4-45.4	Gray limestone with shale lenses	N/A	8.1	136.3	21	13	8	
	C-10	46.7-47.6	Gray limestone with shale lenses	N/A	9.5	134.7	23	13	10	
8A4C-5818	A	0-3	Reddish brown and tan sandy clay	CH	16.7	---	100	30	70	
	B	10.2-12	Tan and light gray shaley clay	CH	21.4	---	80	24	56	
	C-1	12.3-13	Tan weathered shale	N/A	26.7	99.9	71	25	46	
	C-2	14.1-14.8	Tan and gray weathered shale with limestone lenses	N/A	20.3	111.4	59	21	38	
	C-3	16.3-16.8	Tan weathered shale with limestone lenses	N/A	11.7	126.9	37	16	21	
	C-4	17.7-18.4	Tan weathered shale with limestone lenses	N/A	14.9	123.4	63	24	39	
	C-5	20.9-21.8	Tan weathered shale	N/A	22.7	108.6	67	23	44	
	C-6	23.9-24.8	Tan weathered shale	N/A	27.6	100.8	78	32	46	
	C-7	26.1-26.7	Tan and gray limestone with shale lenses	N/A	16.8	104.8	51	21	30	
	C-8	29.2-29.9	Tan and dark gray limestone with shale lenses	N/A	15.0	118.2	54	20	34	
	C-9	33.6-34.3	Dark gray limestone with shale lenses	N/A	6.5	144.0	28	15	13	
	C-10	34.7-35.7	Dark gray limestone with shale lenses	N/A	4.6	138.6	30	15	15	
	C-11	37.5-38.3	Dark gray shale with some limestone lenses	N/A	5.5	126.2	41	18	23	
	C-12	41.5-42.3	Gray limestone with shale lenses	N/A	5.4	149.6	36	15	21	
	C-13	43.1-44.3	Gray limestone with shale lenses	N/A	7.2	136.6	24	14	10	
	C-14	45-46.1	Gray limestone with shale lenses	N/A	8.7	139.1	23	13	10	
	C-15	46.3-47.2	Gray limestone with shale lenses	N/A	8.5	137.4	21	13	8	
	C-16	48.4-49.1	Gray limestone	N/A	8.7	137.1	Non-Plastic			

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC)(FY12) (FACILITY RELOCATION)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Atterberg Limits LL	PL	PI	Notes
8A4C-5819	A	2.2-4.2	Dark gray sandy clay	CH	14.5	---	73	22	51	
	B	4.2-7.1	Brown clayey sand with occasional gravel	SC	11.0	---	52	18	34	
	C-5	25.4-26.3	Tan weathered shale	N/A	22.5	107.3	65	24	41	
	C-6	29.2-30.1	Tan weathered shale with some limestone lenses	N/A	17.5	116.6	44	18	26	
	C-7	32.9-33.6	Tan weathered shale with some limestone lenses	N/A	6.6	129.9	40	16	24	
	C-8	38-38.7	Gray limestone with shale lenses	N/A	3.7	148.5	25	14	11	
	C-9	39.1-39.8	Gray limestone	N/A	4.4	146.6	Non-Plastic			
	C-10	42.3-43.2	Dark gray shale with some limestone lenses	N/A	8.2	133.3	60	23	37	
	C-11	46.7-47.7	Dark gray limestone	N/A	9.3	132.5	Non-Plastic			

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC)(FY12) (FACILITY RELOCATION)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Confining Pressure (tsf)	Q (tsf)	Strain @ Failure (%)	Type Failure
8A4C-5816	A	4.5-8.1	Gray sandy clay with occasional gravel	CH	16.7	---	---	---	---	
	C-4	26.2-27.1	Tan weathered shale with limestone lenses	N/A	11.4	122.1	1.666	2.46	3.7	Internal
	C-5	28.1-28.8	Tan and light gray shale	N/A	19.5	112.0	1.778	4.53	3.7	Vertical
	C-6	38.6-39.3	Dark gray shaley limestone	N/A	8.5	136.0	0	386	*	Vertical
	C-7	41.1-42	Gray and dark gray shaley limestone	N/A	5.7	154.0	0	221	*	Vertical
	C-8	43.7-44.6	Gray limestone with shale lenses	N/A	8.4	136.3	0	97.9	*	Vertical
	C-9	44.8-45.8	Gray limestone	N/A	9.4	132.6	0	148.5	*	Vertical
	C-10	48.5-49.2	Gray limestone	N/A	8.5	132.1	0	140.6	*	Vertical
8A4C-5817	A	1.1-6.3	Dark gray clay with sand	CH	19.1	---	---	---	---	
	B	10.7-13.5	Tan and light gray shaley clay	CH	18.5	---	---	---	---	
	C-4	26.4-27.3	Tan shaley limestone	N/A	9.1	129.3	1.678	2.91	5.9	Internal
	C-5	28.3-29	Gray and tan shale	N/A	18.5	116.0	1.791	4.63	2.6	Internal
	C-6	34.6-35.3	Gray limestone	N/A	3.2	150.4	0	469	*	Vertical
	C-7	36.2-37.2	Dark gray shale (interbedded with gray limestone)	N/A	20.5	108.7	**	**	**	
	C-8	41.8-42.9	Gray limestone with shale lenses	N/A	8.5	135.5	0	73.7	*	Vertical
	C-9	44.4-45.4	Gray limestone with shale lenses	N/A	8.1	136.3	0	157.9	*	Vertical
	C-10	46.7-47.6	Gray limestone with shale lenses	N/A	9.5	134.7	0	141.0	*	Vertical
8A4C-5818	A	0-3	Reddish brown and tan sandy clay	CH	16.7	---	---	---	---	
	B	10.2-12	Tan and light gray shaley clay	CH	21.4	---	---	---	---	
	C-1	12.3-13	Tan weathered shale	N/A	26.7	99.9	0.791	0.580	3.9	Internal
	C-2	14.1-14.8	Tan and gray weathered shale with limestone lenses	N/A	20.3	111.4	0.903	1.37	7.1	Angular 45°
	C-3	16.3-16.8	Tan weathered shale with limestone lenses	N/A	11.7	126.9	1.034	3.80	6.8	Internal
	C-4	17.7-18.4	Tan weathered shale with limestone lenses	N/A	14.9	123.4	1.128	7.10	6.8	Vertical
	C-5	20.9-21.8	Tan weathered shale	N/A	22.7	108.6	1.334	1.60	1.7	Angular 45°
	C-6	23.9-24.8	Tan weathered shale	N/A	27.6	100.8	1.522	1.22	1.1	Angular 30°
	C-7	26.1-26.7	Tan and gray limestone with shale lenses	N/A	16.8	104.8	1.650	3.93	1.9	Vertical
	C-8	29.2-29.9	Tan and dark gray limestone with shale lenses	N/A	15.0	118.2	1.847	3.62	2.5	Internal
	C-9	33.6-34.3	Dark gray limestone with shale lenses	N/A	6.5	144.0	2.122	33.1	2.0	Vertical
	C-10	34.7-35.7	Dark gray limestone with shale lenses	N/A	4.6	138.6	2.200	7.38	1.9	Angular 60°
	C-11	37.5-38.3	Dark gray shale with some limestone lenses	N/A	5.5	126.2	2.369	3.14	3.1	Angular 30°
	C-12	41.5-42.3	Gray limestone with shale lenses	N/A	5.4	149.6	0	97.3	*	Vertical
	C-13	43.1-44.3	Gray limestone with shale lenses	N/A	7.2	136.6	0	112.0	*	Vertical
	C-14	45-46.1	Gray limestone with shale lenses	N/A	8.7	139.1	0	167.0	*	Vertical
	C-15	46.3-47.2	Gray limestone with shale lenses	N/A	8.5	137.4	0	154.7	*	Vertical
	C-16	48.4-49.1	Gray limestone	N/A	8.7	137.1	0	160.4	*	Vertical

* Tested in accordance with ASTM D-7012 (Method C) Unconfined Compression of Intact Rock Core Specimens.

** This core sample consisted of 3 distinct and small pieces (2 limestone and 1 dark gray shale). Unit Weight and Moisture Test results represent the shale portion.

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC)(FY12) (FACILITY RELOCATION)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Confining Pressure (tsf)	Q (tsf)	Strain @ Failure (%)	Type Failure
8A4C-5819	A	2.2-4.2	Dark gray sandy clay	CH	14.5	---	---	---	---	
	B	4.2-7.1	Brown clayey sand with occasional gravel	SC	11.0	---	---	---	---	
	C-5	25.4-26.3	Tan weathered shale	N/A	22.5	107.3	1.616	2.07	8.0	Internal
	C-6	29.2-30.1	Tan weathered shale with some limestone lenses	N/A	17.5	116.6	1.853	4.37	4.9	Internal
	C-7	32.9-33.6	Tan weathered shale with some limestone lenses	N/A	6.6	129.9	2.078	3.25	3.7	Internal
	C-8	38-38.7	Gray limestone with shale lenses	N/A	3.7	148.5	0	391	*	Vertical
	C-9	39.1-39.8	Gray limestone	N/A	4.4	146.6	0	274	*	Vertical
	C-10	42.3-43.2	Dark gray shale with some limestone lenses	N/A	8.2	133.3	2.672	5.01	5.2	Internal
	C-11	46.7-47.7	Dark gray limestone	N/A	9.3	132.5	0	121.9	*	Vertical

* Tested in accordance with ASTM D-7012 (Method C) Unconfined Compression of Intact Rock Core Specimens.

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC)-DINING FACILITY (DFAC)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Percent Passing Sieve #4	#10	#20	#40	#60	#80	#100	#200
8A4C-5731	A	0-2	Brown sandy clay	CL	99.4	98.5	95.2	89.8	83.1	72.6	66.6	55.2
	ST-1	2-4	Brown sandy clay	CH	98.6	95.8	90.9	85.7	80.1	72.1	68.1	59.5
	B	4-7	Brown and light brown sandy clay	CH	99.8	98.2	93.7	89.5	85.1	78.2	75.3	68.9
	ST-2	7-9	Light brown clay with sand	CH	99.7	98.2	93.7	90.4	86.7	81.6	78.8	72.2
	C	13.7-17.9	Tan and gray clay	CH	---	---	---	---	---	---	---	---
	D	17.9-20.2	Tan and gray clay with limestone fragments	CH	---	---	---	---	---	---	---	---
	C-1	22.4-23.3	Tan weathered shale	N/A	---	---	---	---	---	---	---	---
	C-2	28.9-29.8	Tan weathered shale	N/A	---	---	---	---	---	---	---	---
	C-3	34.8-35.7	Tan weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-4	43.9-44.6	Gray limestone	N/A	---	---	---	---	---	---	---	---
8A4C-5749	A	0.9-6.1	Brown sandy clay	CH	98.7	94.9	90.9	86.6	79.4	70.0	66.6	58.4
	B	6.1-9.5	Light brown sandy clay	CH	97.4	92.8	86.7	82.8	79.1	74.3	71.5	65.0
	C	16-19	Tan clay with limestone fragments	CH	---	---	---	---	---	---	---	---
	C-1	23.9-24.8	Tan weathered shale	N/A	---	---	---	---	---	---	---	---
	C-2	37.5-38.2	Light gray limestone interbedded with dark gray shale lenses	N/A	---	---	---	---	---	---	---	---
	C-3	39.6-40.5	Light gray limestone interbedded with dark gray shale lenses	N/A	---	---	---	---	---	---	---	---
8A4C-5750	A	0-5.8	Brown sandy clay	CH	95.8	93.0	88.3	83.8	79.1	71.9	68.5	58.2
	B	5.8-8.5	Light brown sandy clay	CH	90.8	84.4	76.8	72.3	68.4	63.4	60.6	53.7
	C-1	19-19.8	Tan weathered shale interbedded with light gray limestone	N/A	---	---	---	---	---	---	---	---
	C-2	29.9-30.8	Tan weathered shale	N/A	---	---	---	---	---	---	---	---
	C-3	33.2-34.1	Tan weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-4	36.8-37.5	Gray limestone	N/A	---	---	---	---	---	---	---	---
8A4C-5751	A	.8-6.1	Dark gray sandy clay	CH	99.5	97.5	93.5	89.0	83.4	76.9	74.4	67.7
	B	6.1-9.5	Light brown clay with sand	CH	98.2	94.6	88.8	85.5	82.2	76.0	74.6	70.3
	C	16.4-17.9	Tan sandy clay with limestone fragments	CL	---	---	---	---	---	---	---	---
	C-1	20-20.9	Tan and light gray weathered shale	N/A	---	---	---	---	---	---	---	---
	C-2	25.1-26	Tan and light gray weathered shale	N/A	---	---	---	---	---	---	---	---
	C-3	31-31.9	Tan weathered shale interbedded with light gray limestone	N/A	---	---	---	---	---	---	---	---
	C-4	36.1-37	Tan weathered shale	N/A	---	---	---	---	---	---	---	---
	C-5	41-41.5	Dark gray shale interbedded with gray limestone	N/A	---	---	---	---	---	---	---	---
	C-6	41.5-42.2	Gray limestone	N/A	---	---	---	---	---	---	---	---
	C-7	47.8-48.7	Dark gray shale	N/A	---	---	---	---	---	---	---	---

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC)-DINING FACILITY (DFAC)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Percent Passing Sieve #4	#10	#20	#40	#60	#80	#100	#200
8A4C-5752	A	1.1-6	Brown sandy clay	CH	98.1	93.6	88.3	83.8	78.6	70.9	65.9	59.0
	B	6-9.6	Light brown sandy clay	CH	98.4	94.4	87.7	83.4	80.0	75.5	73.7	68.4
	C	14.1-16.8	Tan and light gray clay with limestone fragments	CH	---	---	---	---	---	---	---	---
	C-1	18.7-19.6	Tan weathered shale	N/A	---	---	---	---	---	---	---	---
	C-2	23.1-24	Tan weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-3	26.7-27.6	Tan weathered shale	N/A	---	---	---	---	---	---	---	---
	C-4	30.2-31.1	Tan and light gray weathered shale	N/A	---	---	---	---	---	---	---	---
	C-5	32.8-33.7	Tan weathered shale with limestone inclusions	N/A	---	---	---	---	---	---	---	---
	C-6	37.2-37.9	Gray limestone	N/A	---	---	---	---	---	---	---	---

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC)-DINING FACILITY (DFAC)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Atterberg Limits LL	PL	PI	Notes
8A4C-5731	A	0-2	Brown sandy clay	CL	10.4	---	44	16	28	
	ST-1	2-4	Brown sandy clay	CH	12.5	116.6	54	20	34	(1) (2)
	B	4-7	Brown and light brown sandy clay	CH	18.9	---	63	18	45	
	ST-2	7-9	Light brown clay with sand	CH	19.7	105.2	56	17	39	(1)
	C	13.7-17.9	Tan and gray clay	CH	23.4	---	68	22	46	
	D	17.9-20.2	Tan and gray clay with limestone fragments	CH	26.0	---	78	28	50	
	C-1	22.4-23.3	Tan weathered shale	N/A	17.1	115.0	---	---	---	
	C-2	28.9-29.8	Tan weathered shale	N/A	25.4	100.9	---	---	---	
	C-3	34.8-35.7	Tan weathered shale with limestone inclusions	N/A	18.8	113.3	---	---	---	
	C-4	43.9-44.6	Gray limestone	N/A	4.1	153.1	---	---	---	
8A4C-5749	A	0.9-6.1	Brown sandy clay	CH	17.2	---	62	23	39	
	B	6.1-9.5	Light brown sandy clay	CH	16.7	---	53	21	32	
	C	16-19	Tan clay with limestone fragments	CH	18.8	---	52	22	30	
	C-1	23.9-24.8	Tan weathered shale	N/A	19.4	105.2	---	---	---	
	C-2	37.5-38.2	Light gray limestone interbedded with dark gray shale lenses	N/A	6.0	145.5	---	---	---	
	C-3	39.6-40.5	Light gray limestone interbedded with dark gray shale lenses	N/A	3.8	151.8	---	---	---	
8A4C-5750	A	0-5.8	Brown sandy clay	CH	18.5	---	58	23	35	
	B	5.8-8.5	Light brown sandy clay	CH	13.0	---	51	16	35	
	C-1	19-19.8	Tan weathered shale interbedded with light gray limestone	N/A	9.2	129.1	---	---	---	
	C-2	29.9-30.8	Tan weathered shale	N/A	28.6	94.4	---	---	---	
	C-3	33.2-34.1	Tan weathered shale with limestone inclusions	N/A	19.3	112.4	---	---	---	
	C-4	36.8-37.5	Gray limestone	N/A	1.9	158.5	---	---	---	
8A4C-5751	A	.8-6.1	Dark gray sandy clay	CH	19.8	---	64	18	46	
	B	6.1-9.5	Light brown clay with sand	CH	14.7	---	52	19	33	
	C	16.4-17.9	Tan sandy clay with limestone fragments	CL	10.7	---	37	16	21	
	C-1	20-20.9	Tan and light gray weathered shale	N/A	21.0	108.3	---	---	---	
	C-2	25.1-26	Tan and light gray weathered shale	N/A	21.1	111.1	---	---	---	
	C-3	31-31.9	Tan weathered shale interbedded with light gray limestone	N/A	13.9	125.2	---	---	---	
	C-4	36.1-37	Tan weathered shale	N/A	15.4	115.5	---	---	---	
	C-5	41-41.5	Dark gray shale interbedded with gray limestone	N/A	14.8	128.7	---	---	---	
	C-6	41.5-42.2	Gray limestone	N/A	4.8	151.0	---	---	---	
	C-7	47.8-48.7	Dark gray shale	N/A	18.6	115.3	---	---	---	

(1) See attached Summary Page for Permeability Test results.
(2) See attached "Laboratory Test Data Sheets" for Consolidation Test results.

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC)-DINING FACILITY (DFAC)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Atterberg Limits LL	PL	PI	Notes
8A4C-5752	A	1.1-6	Brown sandy clay	CH	14.3	---	60	20	40	
	B	6-9.6	Light brown sandy clay	CH	15.0	---	55	17	38	
	C	14.1-16.8	Tan and light gray clay with limestone fragments	CH	21.6	---	73	23	50	
	C-1	18.7-19.6	Tan weathered shale	N/A	26.1	104.5	---	---	---	
	C-2	23.1-24	Tan weathered shale with limestone inclusions	N/A	13.2	112.6	---	---	---	
	C-3	26.7-27.6	Tan weathered shale	N/A	18.2	108.9	---	---	---	
	C-4	30.2-31.1	Tan and light gray weathered shale	N/A	26.6	94.7	---	---	---	
	C-5	32.8-33.7	Tan weathered shale with limestone inclusions	N/A	14.9	112.7	---	---	---	
	C-6	37.2-37.9	Gray limestone	N/A	2.6	155.2	---	---	---	

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC)-DINING FACILITY (DFAC)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Confining Pressure (tsf)	Q (tsf)	Strain @ Failure (%)	Type Failure
8A4C-5731	A	0-2	Brown sandy clay	CL	10.4	---	---	---	---	
	ST-1	2-4	Brown sandy clay	CH	12.5	116.6	---	---	---	
	B	4-7	Brown and light brown sandy clay	CH	18.9	---	---	---	---	
	ST-2	7-9	Light brown clay with sand	CH	19.7	105.2	---	---	---	
	C	13.7-17.9	Tan and gray clay	CH	23.4	---	---	---	---	
	D	17.9-20.2	Tan and gray clay with limestone fragments	CH	26.0	---	---	---	---	
	C-1	22.4-23.3	Tan weathered shale	N/A	17.1	115.0	0	1.353	1.4	Angular (55^0)
	C-2	28.9-29.8	Tan weathered shale	N/A	25.4	100.9	0	2.103	1.0	Angular (75^0)
	C-3	34.8-35.7	Tan weathered shale with limestone inclusions	N/A	18.8	113.3	0	2.867	1.5	Vertical
	C-4	43.9-44.6	Gray limestone	N/A	4.1	153.1	0	415	*	Vertical
8A4C-5749	A	0.9-6.1	Brown sandy clay	CH	17.2	---	---	---	---	
	B	6.1-9.5	Light brown sandy clay	CH	16.7	---	---	---	---	
	C	16-19	Tan clay with limestone fragments	CH	18.8	---	---	---	---	
	C-1	23.9-24.8	Tan weathered shale	N/A	19.4	105.2	0	1.229	5.4	Angular (55^0)
	C-2	37.5-38.2	Light gray limestone interbedded with dark gray shale lenses	N/A	6.0	145.5	---	---	---	Note (1)
	C-3	39.6-40.5	Light gray limestone interbedded with dark gray shale lenses	N/A	3.8	151.8	---	---	---	Note (1)
8A4C-5750	A	0-5.8	Brown sandy clay	CH	18.5	---	---	---	---	
	B	5.8-8.5	Light brown sandy clay	CH	13.0	---	---	---	---	
	C-1	19-19.8	Tan weathered shale interbedded with light gray limestone	N/A	9.2	129.1	0	2.131	2.1	Vertical
	C-2	29.9-30.8	Tan weathered shale	N/A	28.6	94.4	0	1.331	1.1	Vertical
	C-3	33.2-34.1	Tan weathered shale with limestone inclusions	N/A	19.3	112.4	0	2.448	1.0	Angular (65^0)
	C-4	36.8-37.5	Gray limestone	N/A	1.9	158.5	0	436	*	Vertical
8A4C-5751	A	.8-6.1	Dark gray sandy clay	CH	19.8	---	---	---	---	
	B	6.1-9.5	Light brown clay with sand	CH	14.7	---	---	---	---	
	C	16.4-17.9	Tan sandy clay with limestone fragments	CL	10.7	---	---	---	---	
	C-1	20-20.9	Tan and light gray weathered shale	N/A	21.0	108.3	0	1.135	4.1	Angular (20^0)
	C-2	25.1-26	Tan and light gray weathered shale	N/A	21.1	111.1	0	1.557	1.6	Angular (30^0)
	C-3	31-31.9	Tan weathered shale interbedded with light gray limestone	N/A	13.9	125.2	0	3.292	2.3	Internal
	C-4	36.1-37	Tan weathered shale	N/A	15.4	115.5	0	3.547	1.1	Angular (35^0)
	C-5	41-41.5	Dark gray shale interbedded with gray limestone	N/A	14.8	128.7	0	3.372	1.6	Angular (30^0)
	C-6	41.5-42.2	Gray limestone	N/A	4.8	151.0	0	377	*	Vertical
	C-7	47.8-48.7	Dark gray shale	N/A	18.6	115.3	0	2.108	2.5	Angular (30^0)

Note (1) This limestone sample was found separated at interbedded shale lenses and therefore not suitable for representative strength testing,
* Strain measurements were not recorded for this test. This sample was trimmed square, ends capped with high-strength gypsum, and tested in accordance with ASTM D-2938 "Unconfined Compressive Strength of Intact Rock Core Specimens".

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC)-DINING FACILITY (DFAC)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Confining Pressure (tsf)	Q (tsf)	Strain @ Failure (%)	Type Failure
8A4C-5752	A	1.1-6	Brown sandy clay	CH	14.3	---	---	---	---	
	B	6-9.6	Light brown sandy clay	CH	15.0	---	---	---	---	
	C	14.1-16.8	Tan and light gray clay with limestone fragments	CH	21.6	---	---	---	---	
	C-1	18.7-19.6	Tan weathered shale	N/A	26.1	104.5	0	1.331	3.1	Angular (20^0)
	C-2	23.1-24	Tan weathered shale with limestone inclusions	N/A	13.2	112.6	0	1.024	1.7	Vertical and Horizontal
	C-3	26.7-27.6	Tan weathered shale	N/A	18.2	108.9	0	1.575	1.8	Angular (20^0)
	C-4	30.2-31.1	Tan and light gray weathered shale	N/A	26.6	94.7	0	1.692	1.0	Angular (35^0)
	C-5	32.8-33.7	Tan weathered shale with limestone inclusions	N/A	14.9	112.7	0	2.071	2.1	Vertical
	C-6	37.2-37.9	Gray limestone	N/A	2.6	155.2	0	353	*	Vertical

* Strain measurements were not recorded for this test. This sample was trimmed square, ends capped with high-strength gypsum, and tested in accordance with ASTM D-2938 "Unconfined Compressive Strength of Intact Rock Core Specimens".

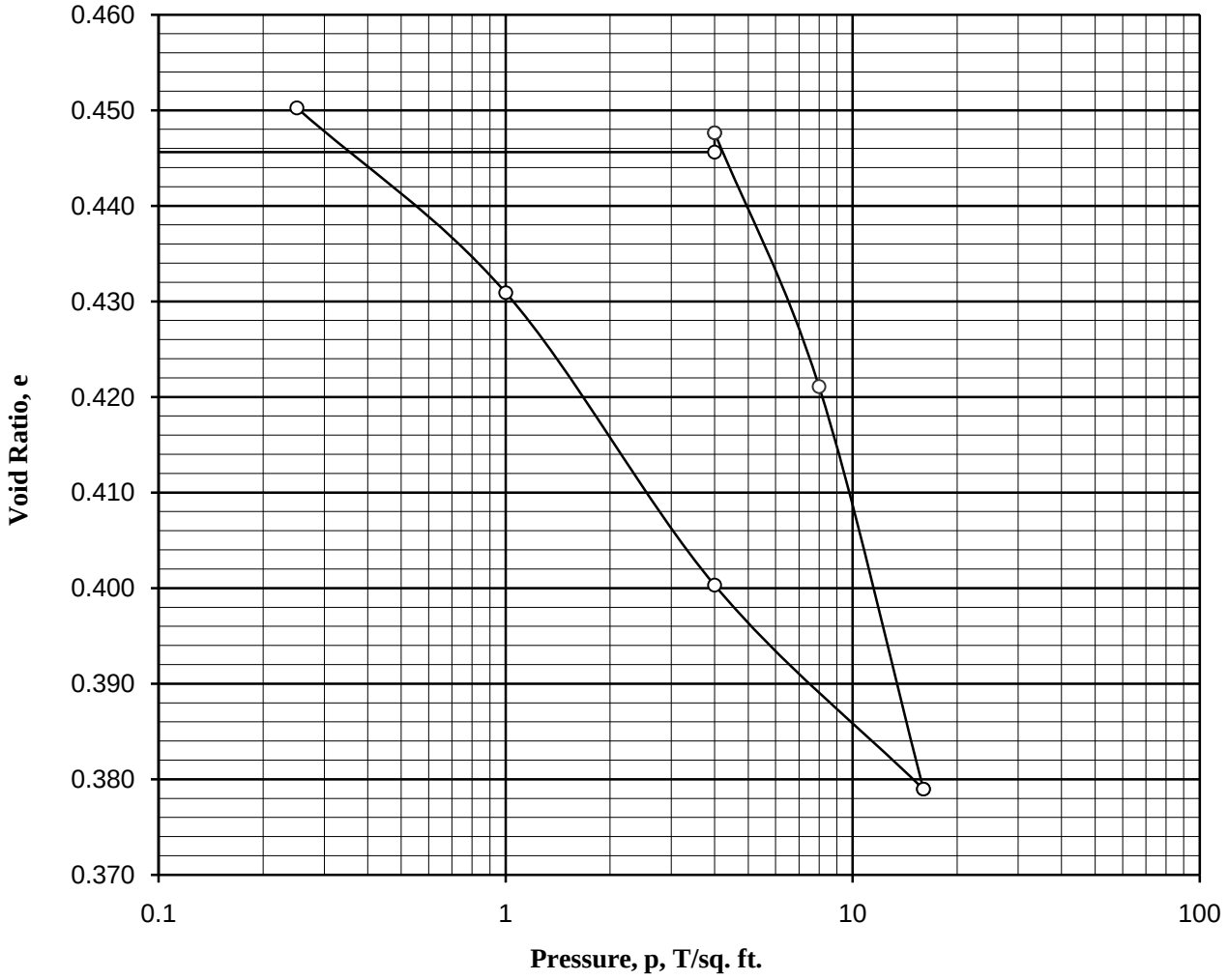
SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPERATIONAL READINESS TRAINING COMPLEX (ORTC)-DINING FACILITY (DFAC)
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Atterberg Limits LL	PL	PI	Coefficient of Permeability (k) cm/sec
8A4C-5731	ST-1	2-4	Brown sandy clay	CH	12.5	116.6	54	20	34	3.78×10^{-8}
8A4C-5731	ST-2	7-9	Light brown clay with sand	CH	19.7	105.2	56	17	39	2.25×10^{-8}

TEAM Consultants, Inc.

Geotechnical, Environmental, Construction Materials Testing



Type of specimen: Undisturbed		Before Test		After Test	
Diam. 2.50 in.	Ht. 0.501 in.	Water Content, w_o	12.48%	W_f	16.65%
Overburden Pressure, P_o T/sq. ft.		Void Ratio, e_o	0.4456	e_f	0.4502
Preconsol. Pressure, P_c T/sq. ft.		Saturation, S_o	75.7%	S_f	99.9%
Compression Index, C_c		Dry Density, γd	116.6 lb/ft^3		
Classification Brown sandy clay					
LL 54	G_s 2.702	Project	Fort Hood ORTC DFAC		
PL 20			Team Project No.: 102102		
Remarks		Boring No: 8A4C-5731		Sample No.: ST-1	
		Depth: 2-4'		Date: 1/29/11	
		CONSOLIDATION TEST REPORT			

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPPERATIONAL READINESS TRAINING COMPLEX (ORTC)(FY12) WATER TOWER
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Percent Passing Sieve #4	#10	#20	#40	#60	#80	#100	#200
8A4C-5810	A	0.5-2.9	Tan clay with silt	CL-ML	---	---	---	---	---	---	---	---
	C-1	6.3-7.2	Tan weathered limestone	N/A	---	---	---	---	---	---	---	---
	C-3	18-18.9	Tan weathered limestone with shale seams	N/A	---	---	---	---	---	---	---	---
	C-4	25.3-26.3	Tan weathered limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-6	36.1-36.9	Gray limestone, fossliferous	N/A	---	---	---	---	---	---	---	---
	C-7	42.1-43	Gray and light gray limestone, fossliferous	N/A	---	---	---	---	---	---	---	---
	C-8	47.4-48.3	Gray limestone, fossliferous	N/A	---	---	---	---	---	---	---	---
8A4C-5811	A	0-3.4	Tan clay with silt	CL-ML	---	---	---	---	---	---	---	---
	C-1	5.5-6.4	Tan weathered limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-2	11.3-12.2	Tan and light gray weathered limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-4	23.1-24	Light gray weathered limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-6	36.4-37.4	Gray limestone with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-7	42.4-43.3	Light gray limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-8	47.6-48.5	Gray limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
8A4C-5812	A	0-3.1	Brown and tan clay	CL	---	---	---	---	---	---	---	---
	C-1	6.6-7.5	Tan weathered limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-3	20.2-20.9	Tan weathered limestone with shale seams	N/A	---	---	---	---	---	---	---	---
	C-4	27.7-28.6	Tan and light gray weathered limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-5	33.6-34.5	Light gray limestone	N/A	---	---	---	---	---	---	---	---
	C-6	36.9-37.8	Light gray limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-7	43.1-44	Gray limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-8	48.2-49.1	Gray limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
8A4C-5813	A	0.6-3.3	Brown and tan clay	CL	---	---	---	---	---	---	---	---
	C-2	14.2-15	Tan weathered limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-3	20.3-21.2	Tan weathered limestone with shale seams	N/A	---	---	---	---	---	---	---	---
	C-6	36.2-37.1	Gray limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-7	41.4-42.3	Dark gray limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-8	45.6-46.5	Dark gray limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
8A4C-5814	A	0-2.7	Tan and gray clay with silt	CL-ML	---	---	---	---	---	---	---	---
	C-1	9-10	Tan weathered limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-3	22.4-23.3	Tan and light gray weathered limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-5	32.6-33.4	Light gray limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-6	38.5-39.4	Gray limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-7	44.7-45.6	Gray limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-8	48.5-49.4	Gray limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
8A4C-5815	A	0.6-2.8	Tan clay with silt	CL-ML	---	---	---	---	---	---	---	---
	C-1	7.7-8.6	Tan weathered limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-2	10.3-11.2	Tan weathered limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-3	16-16.8	Tan weathered limestone, fossiliferous	N/A	---	---	---	---	---	---	---	---
	C-4	21.4-22.4	Tan and gray weathered limestone, fossiliferous with shale lenses	N/A	---	---	---	---	---	---	---	---
	C-5	26.8-27.6	Tan and gray weathered limestone, fossiliferous with shale lenses	N/A	---	---	---	---	---	---	---	---

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPPERATIONAL READINESS TRAINING COMPLEX (ORTC)(FY12) WATER TOWER
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Atterberg Limits LL	PL	PI	Notes
8A4C-5810	A	0.5-2.9	Tan clay with silt	CL-ML	20.0	---	31	25	6	
	C-1	6.3-7.2	Tan weathered limestone	N/A	9.3	137.6	---	---	---	
	C-3	18-18.9	Tan weathered limestone with shale seams	N/A	15.9	127.3	---	---	---	
	C-4	25.3-26.3	Tan weathered limestone, fossiliferous	N/A	15.7	124.2	---	---	---	
	C-6	36.1-36.9	Gray limestone, fossliferous	N/A	13.4	125.8	---	---	---	
	C-7	42.1-43	Gray and light gray limestone, fossliferous	N/A	10.1	133.6	---	---	---	
	C-8	47.4-48.3	Gray limestone, fossliferous	N/A	7.6	142.8	---	---	---	
8A4C-5811	A	0-3.4	Tan clay with silt	CL-ML	12.1	---	27	21	6	
	C-1	5.5-6.4	Tan weathered limestone, fossiliferous	N/A	8.0	134.7	---	---	---	
	C-2	11.3-12.2	Tan and light gray weathered limestone, fossiliferous	N/A	12.0	128.5	---	---	---	
	C-4	23.1-24	Light gray weathered limestone with shale lenses	N/A	15.0	117.3	---	---	---	
	C-6	36.4-37.4	Gray limestone with shale lenses	N/A	10.9	131.8	---	---	---	
	C-7	42.4-43.3	Light gray limestone, fossiliferous	N/A	8.3	137.4	---	---	---	
	C-8	47.6-48.5	Gray limestone, fossiliferous	N/A	7.6	138.5	---	---	---	
8A4C-5812	A	0-3.1	Brown and tan clay	CL	16.9	---	35	23	12	
	C-1	6.6-7.5	Tan weathered limestone, fossiliferous	N/A	10.4	---	23	16	7	
	C-3	20.2-20.9	Tan weathered limestone with shale seams	N/A	10.3	128.8	30	15	15	
	C-4	27.7-28.6	Tan and light gray weathered limestone, fossiliferous	N/A	16.3	116.1	24	19	5	
	C-5	33.6-34.5	Light gray limestone	N/A	14.5	121.0	24	18	6	
	C-6	36.9-37.8	Light gray limestone, fossiliferous	N/A	10.8	133.0	27	16	11	
	C-7	43.1-44	Gray limestone, fossiliferous	N/A	8.4	140.6	29	15	14	
	C-8	48.2-49.1	Gray limestone, fossiliferous	N/A	7.9	139.1	31	14	17	
8A4C-5813	A	0.6-3.3	Brown and tan clay	CL	19.6	---	39	25	14	
	C-2	14.2-15	Tan weathered limestone, fossiliferous	N/A	10.5	128.4	---	---	---	
	C-3	20.3-21.2	Tan weathered limestone with shale seams	N/A	10.8	128.2	---	---	---	
	C-6	36.2-37.1	Gray limestone, fossiliferous	N/A	10.5	132.2	---	---	---	
	C-7	41.4-42.3	Dark gray limestone, fossiliferous	N/A	10.5	133.1	---	---	---	
	C-8	45.6-46.5	Dark gray limestone, fossiliferous	N/A	8.2	139.6	---	---	---	
8A4C-5814	A	0-2.7	Tan and gray clay with silt	CL-ML	16.5	---	25	18	7	
	C-1	9-10	Tan weathered limestone, fossiliferous	N/A	13.3	125.8	---	---	---	
	C-3	22.4-23.3	Tan and light gray weathered limestone, fossiliferous	N/A	14.2	119.9	---	---	---	
	C-5	32.6-33.4	Light gray limestone, fossiliferous	N/A	16.3	118.7	---	---	---	
	C-6	38.5-39.4	Gray limestone, fossiliferous	N/A	10.5	131.6	---	---	---	
	C-7	44.7-45.6	Gray limestone, fossiliferous	N/A	8.0	142.6	---	---	---	
	C-8	48.5-49.4	Gray limestone, fossiliferous	N/A	7.5	140.7	---	---	---	
8A4C-5815	A	0.6-2.8	Tan clay with silt	CL-ML	11.2	---	28	22	6	
	C-1	7.7-8.6	Tan weathered limestone, fossiliferous	N/A	7.8	140.5	21	14	7	
	C-2	10.3-11.2	Tan weathered limestone, fossiliferous	N/A	13.0	123.4	23	16	7	
	C-3	16-16.8	Tan weathered limestone, fossiliferous	N/A	12.6	124.2	25	15	10	
	C-4	21.4-22.4	Tan and gray weathered limestone, fossiliferous with shale lenses	N/A	13.7	122.5	22	16	8	
	C-5	26.8-27.6	Tan and gray weathered limestone, fossiliferous with shale lenses	N/A	16.4	119.0	24	19	5	

SUMMARY OF LABORATORY TEST RESULTS

LABORATORY TESTING SERVICES
OPPERATIONAL READINESS TRAINING COMPLEX (ORTC)(FY12) WATER TOWER
FORT HOOD, TEXAS

Boring No.	Sample No.	Sample Depth (ft.)	Visual Description & Unified Soil Classification (ASTM D-2487)		Moisture Content (%)	Unit Dry Weight (pcf)	Confining Pressure (tsf)	Q (tsf)	Strain @ Failure (%)	Type Failure
8A4C-5810	A	0.5-2.9	Tan clay with silt	CL-ML	20.0	---	---	---	---	
	C-1	6.3-7.2	Tan weathered limestone	N/A	9.3	137.6	---	---	---	
	C-3	18-18.9	Tan weathered limestone with shale seams	N/A	15.9	127.3	1.153	5.77	1.2	Vertical
	C-4	25.3-26.3	Tan weathered limestone, fossiliferous	N/A	15.7	124.2	1.612	32.5	0.6	Vertical
	C-6	36.1-36.9	Gray limestone, fossliferous	N/A	13.4	125.8	0	60.8	*	Vertical
	C-7	42.1-43	Gray and light gray limestone, fossliferous	N/A	10.1	133.6	2.659	63.3	1.1	Vertical
	C-8	47.4-48.3	Gray limestone, fossliferous	N/A	7.6	142.8	0	96.3	*	Vertical
8A4C-5811	A	0-3.4	Tan clay with silt	CL-ML	12.1	---	---	---	---	
	C-1	5.5-6.4	Tan weathered limestone, fossiliferous	N/A	8.0	134.7	---	---	---	
	C-2	11.3-12.2	Tan and light gray weathered limestone, fossiliferous	N/A	12.0	128.5	0.734	49.7	1.0	Vertical
	C-4	23.1-24	Light gray weathered limestone with shale lenses	N/A	15.0	117.3	1.472	46.0	0.6	Vertical
	C-6	36.4-37.4	Gray limestone with shale lenses	N/A	10.9	131.8	0	88.7	*	Vertical
	C-7	42.4-43.3	Light gray limestone, fossiliferous	N/A	8.3	137.4	0	97.3	*	Vertical
	C-8	47.6-48.5	Gray limestone, fossiliferous	N/A	7.6	138.5	0	94.9	*	Vertical
8A4C-5812	A	0-3.1	Brown and tan clay	CL	16.9	---	---	---	---	
	C-1	6.6-7.5	Tan weathered limestone, fossiliferous	N/A	10.4	---	---	---	---	
	C-3	20.2-20.9	Tan weathered limestone with shale seams	N/A	10.3	128.8	1.284	2.68	3.7	Vertical and Horizontal
	C-4	27.7-28.6	Tan and light gray weathered limestone, fossiliferous	N/A	16.3	116.1	1.759	42.6	0.5	Vertical
	C-5	33.6-34.5	Light gray limestone	N/A	14.5	121.0	2.128	65.4	0.6	Vertical
	C-6	36.9-37.8	Light gray limestone, fossiliferous	N/A	10.8	133.0	0	52.0	*	Vertical
	C-7	43.1-44	Gray limestone, fossiliferous	N/A	8.4	140.6	0	90.9	*	Vertical
	C-8	48.2-49.1	Gray limestone, fossiliferous	N/A	7.9	139.1	2.334	59.7	1.4	Vertical
8A4C-5813	A	0.6-3.3	Brown and tan clay	CL	19.6	---	---	---	---	
	C-2	14.2-15	Tan weathered limestone, fossiliferous	N/A	10.5	128.4	0	76.7	*	Vertical
	C-3	20.3-21.2	Tan weathered limestone with shale seams	N/A	10.8	128.2	1.297	3.25	1.4	Internal
	C-6	36.2-37.1	Gray limestone, fossiliferous	N/A	10.5	132.2	2.291	18.37	1.8	Vertical
	C-7	41.4-42.3	Dark gray limestone, fossiliferous	N/A	10.5	133.1	0	85.6	*	Vertical
	C-8	45.6-46.5	Dark gray limestone, fossiliferous	N/A	8.2	139.6	0	82.8	*	Vertical
8A4C-5814	A	0-2.7	Tan and gray clay with silt	CL-ML	16.5	---	---	---	---	
	C-1	9-10	Tan weathered limestone, fossiliferous	N/A	13.3	125.8	0	87.5	*	Vertical
	C-3	22.4-23.3	Tan and light gray weathered limestone, fossiliferous	N/A	14.2	119.9	1.428	48.6	0.7	Vertical
	C-5	32.6-33.4	Light gray limestone, fossiliferous	N/A	16.3	118.7	2.062	48.0	0.6	Vertical
	C-6	38.5-39.4	Gray limestone, fossiliferous	N/A	10.5	131.6	2.434	66.1	0.9	Vertical
	C-7	44.7-45.6	Gray limestone, fossiliferous	N/A	8.0	142.6	0	51.0	*	Vertical
	C-8	48.5-49.4	Gray limestone, fossiliferous	N/A	7.5	140.7	0	72.2	*	Vertical
8A4C-5815	A	0.6-2.8	Tan clay with silt	CL-ML	11.2	---	---	---	---	
	C-1	7.7-8.6	Tan weathered limestone, fossiliferous	N/A	7.8	140.5	0	277	*	Vertical
	C-2	10.3-11.2	Tan weathered limestone, fossiliferous	N/A	13.0	123.4	0.672	41.6	0.9	Vertical
	C-3	16-16.8	Tan weathered limestone, fossiliferous	N/A	12.6	124.2	1.025	33.7	0.8	Vertical
	C-4	21.4-22.4	Tan and gray weathered limestone, fossiliferous with shale lenses	N/A	13.7	122.5	1.369	28.2	1.7	Vertical
	C-5	26.8-27.6	Tan and gray weathered limestone, fossiliferous with shale lenses	N/A	16.4	119.0	1.700	49.4	0.7	Vertical

* Tested in accordance with ASTM D-2938, Unconfined Compression of Intact Rock Core Specimens.

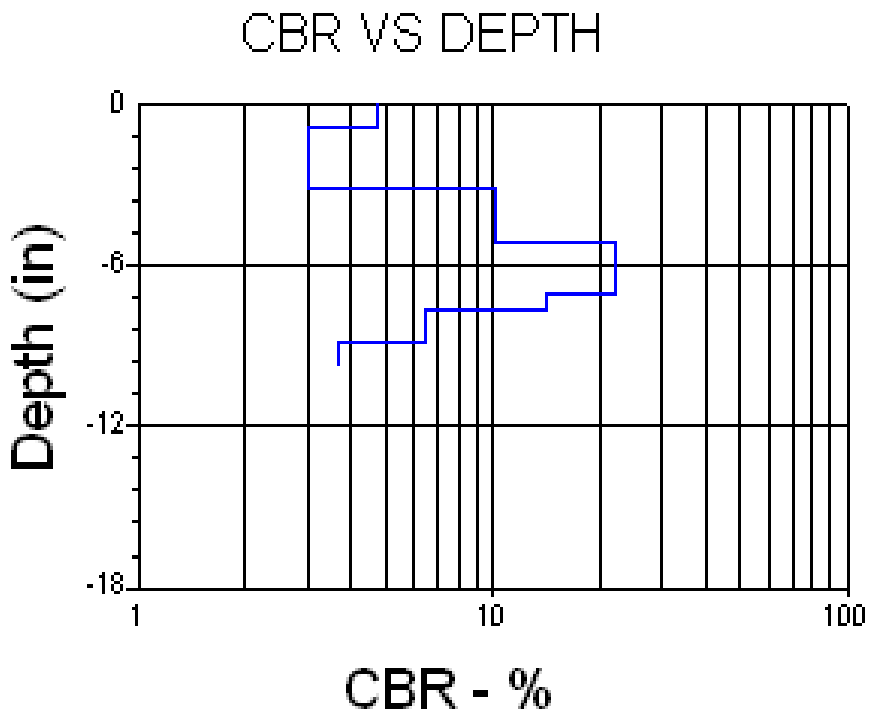
APPENDIX D

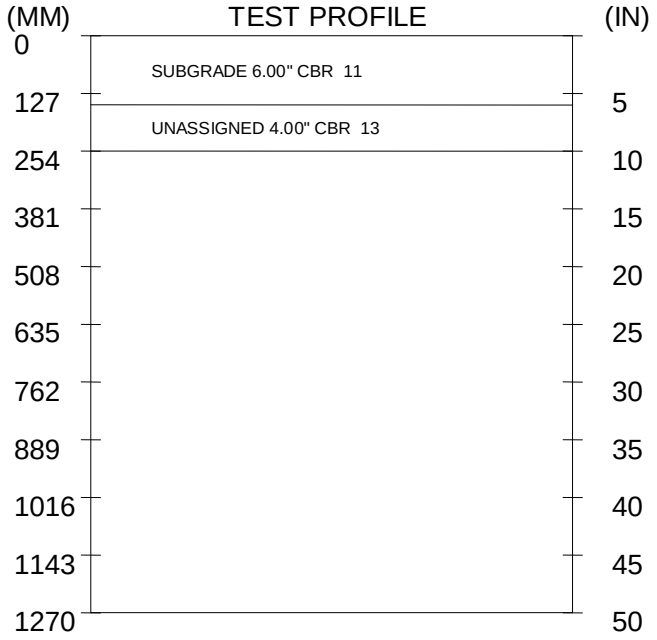
DYNAMIC CONE PENETROMETER (DCP) TESTING DATA PLOTS

DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 10 February 2011

Feature: 8A4C-5734 Station: 8A4C-5734

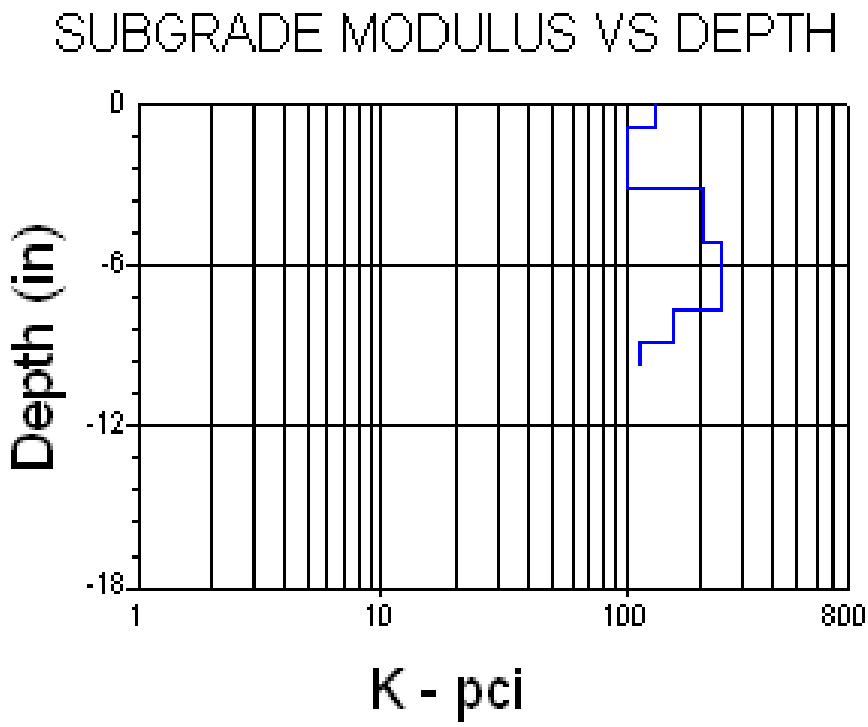


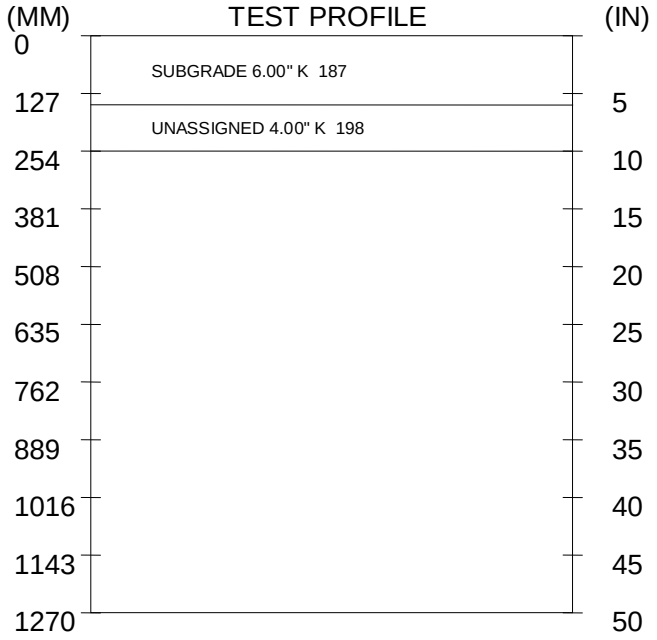


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 10 February 2011

Feature: 8A4C-5734 Station: 8A4C-5734



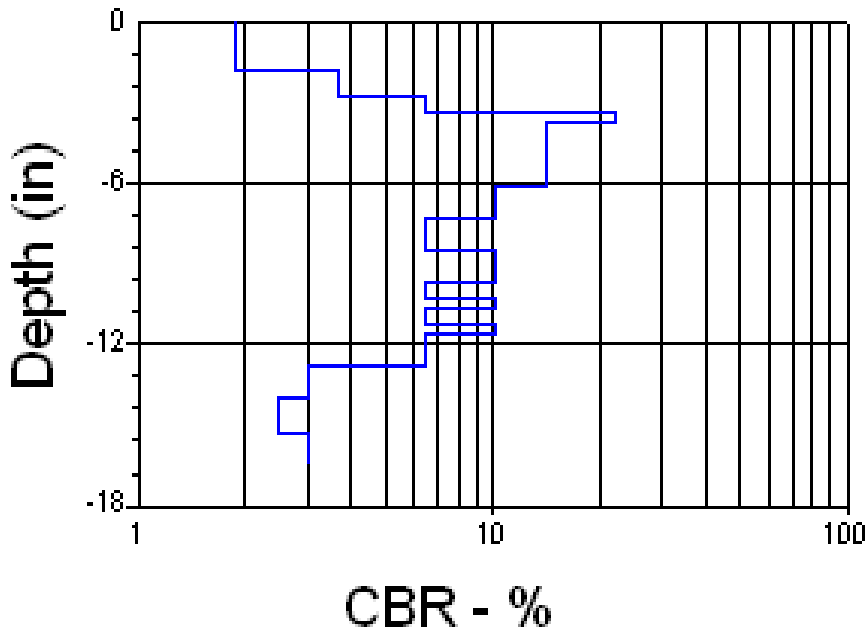


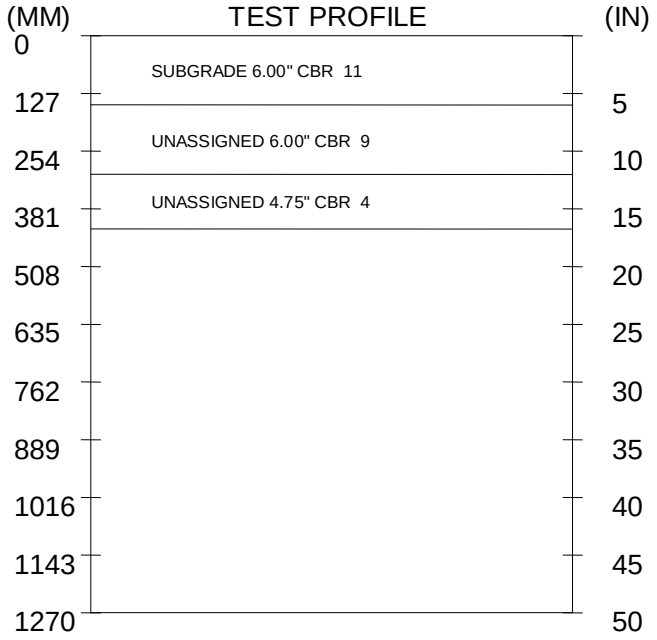
DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 10 February 2011

Feature: 10A-5737 Station: 10A-5737

CBR VS DEPTH

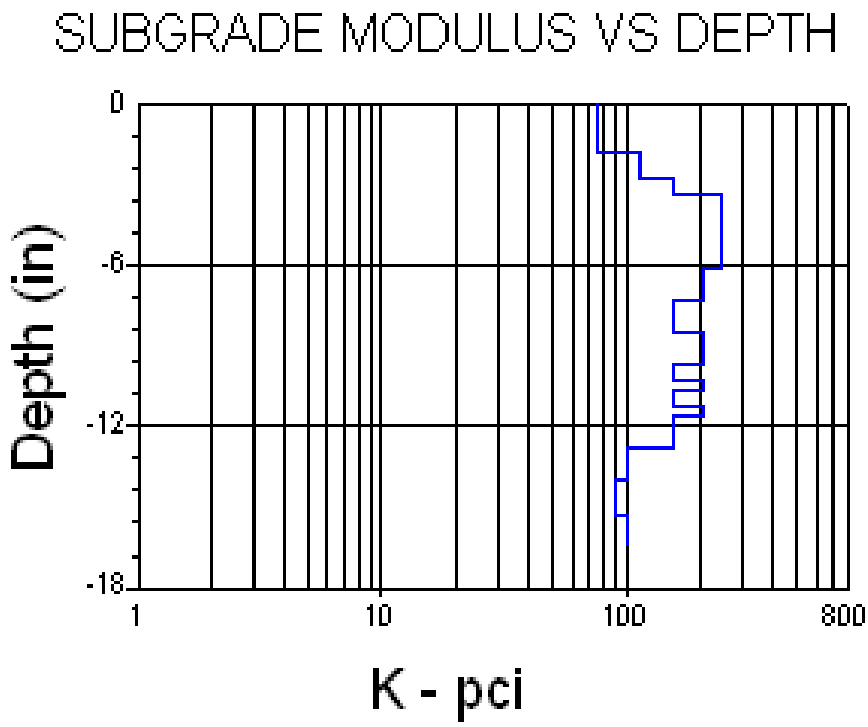


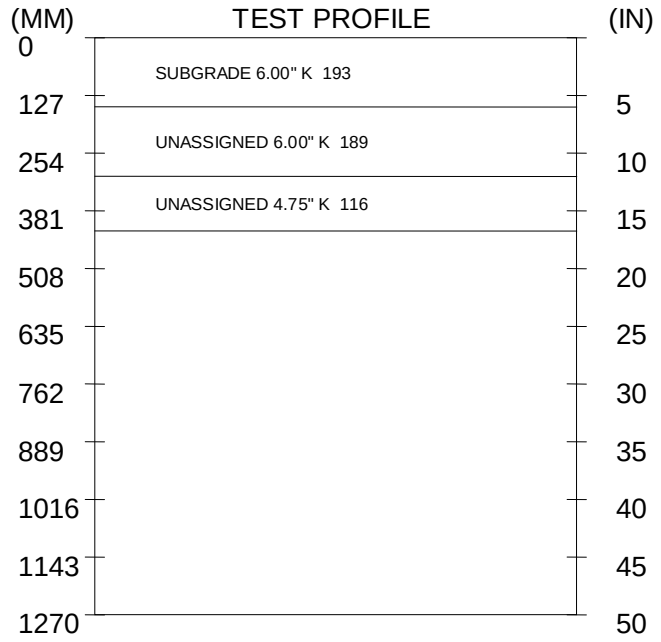


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 10 February 2011

Feature: 10A-5737 Station: 10A-5737

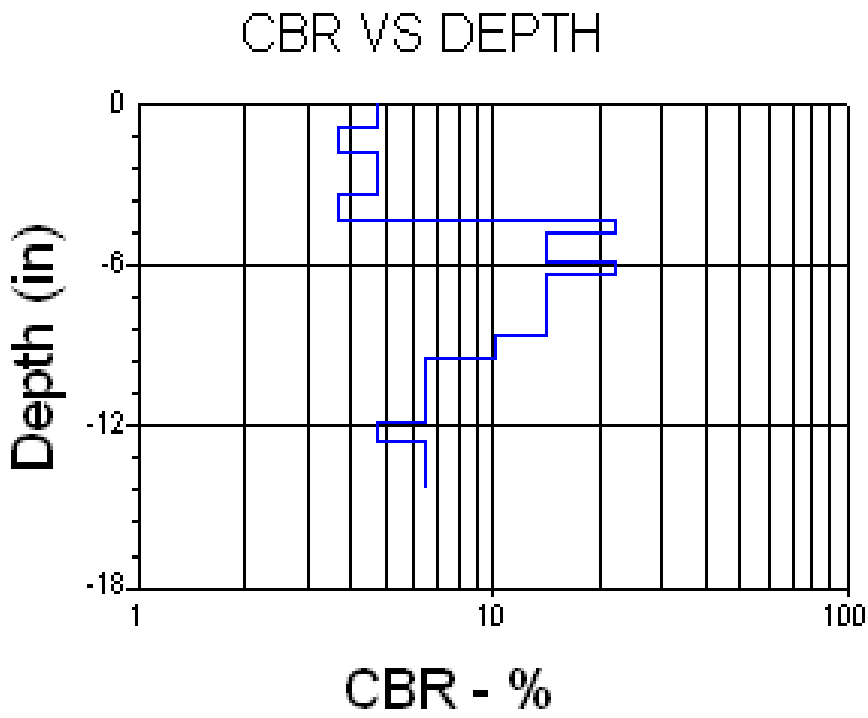


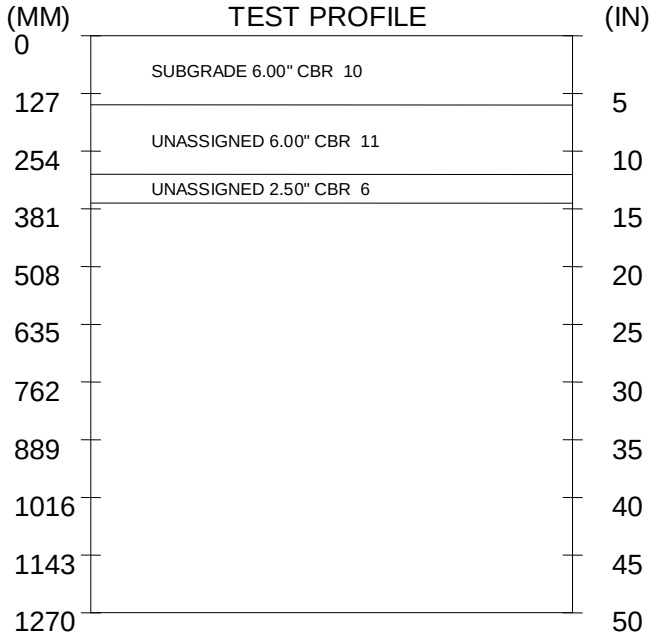


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 10 February 2011

Feature: 10A-5739 Station: 10A-5739

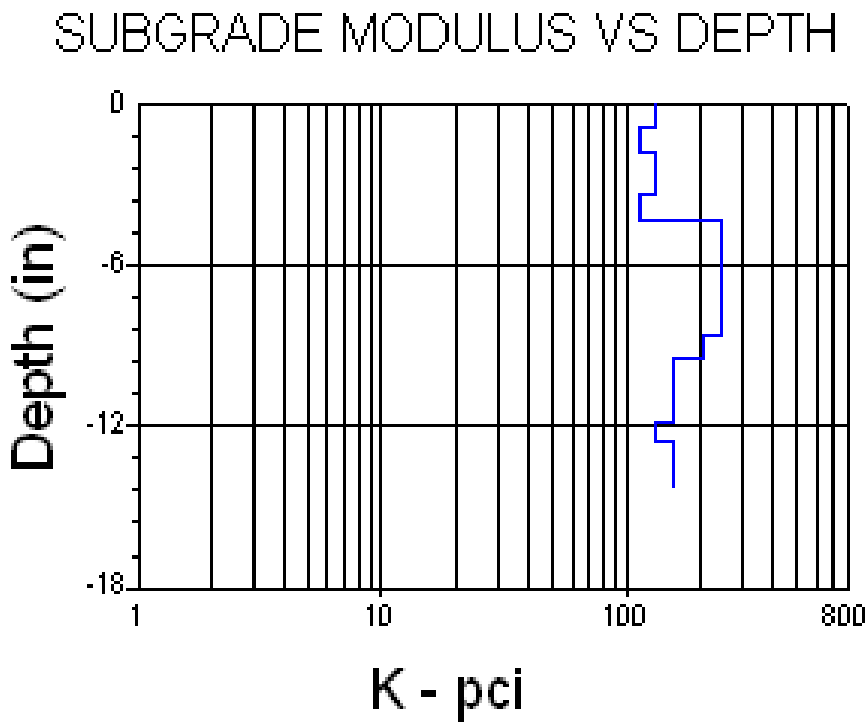


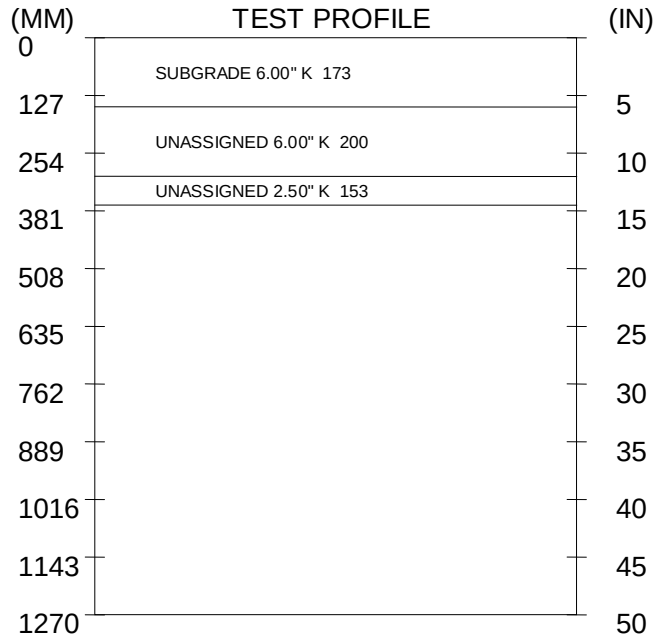


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 10 February 2011

Feature: 10A-5739 Station: 10A-5739

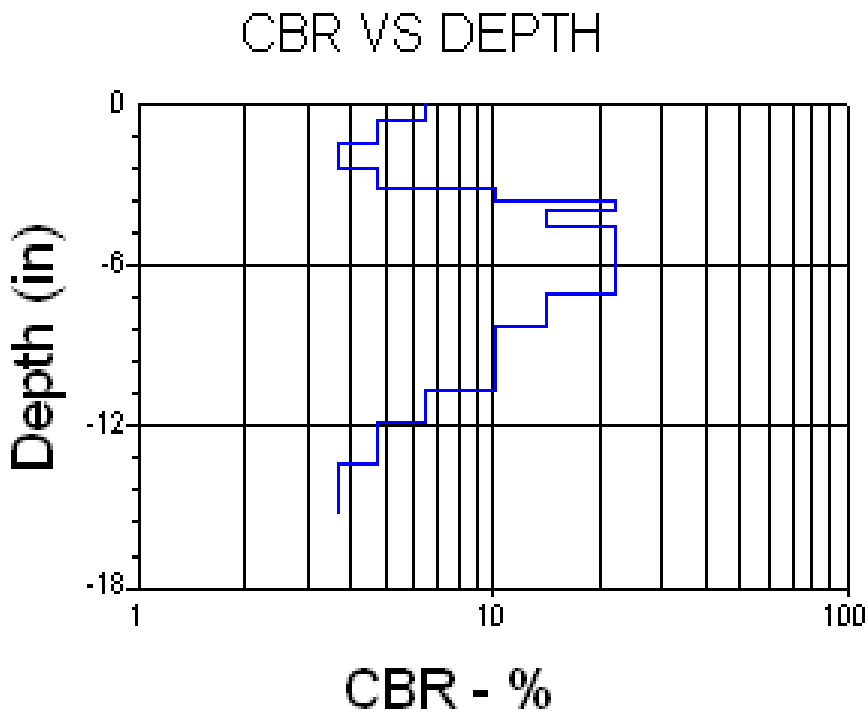


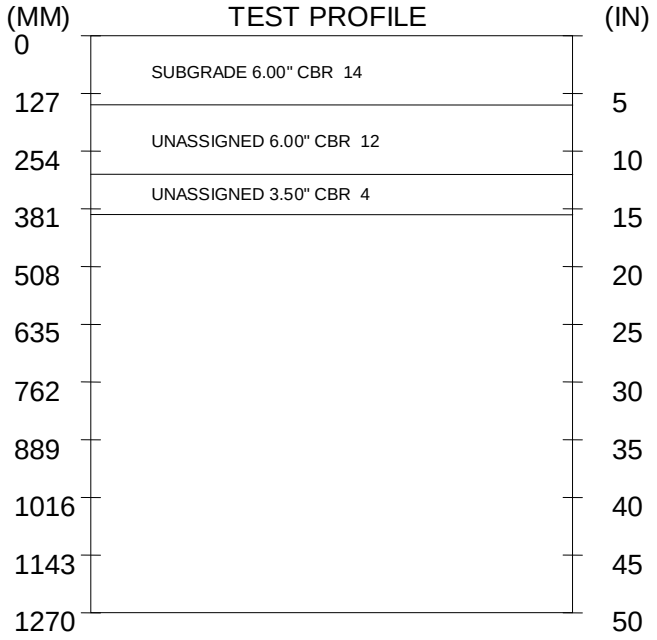


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 10 February 2011

Feature: 10A-5742 Station: 10A-5742

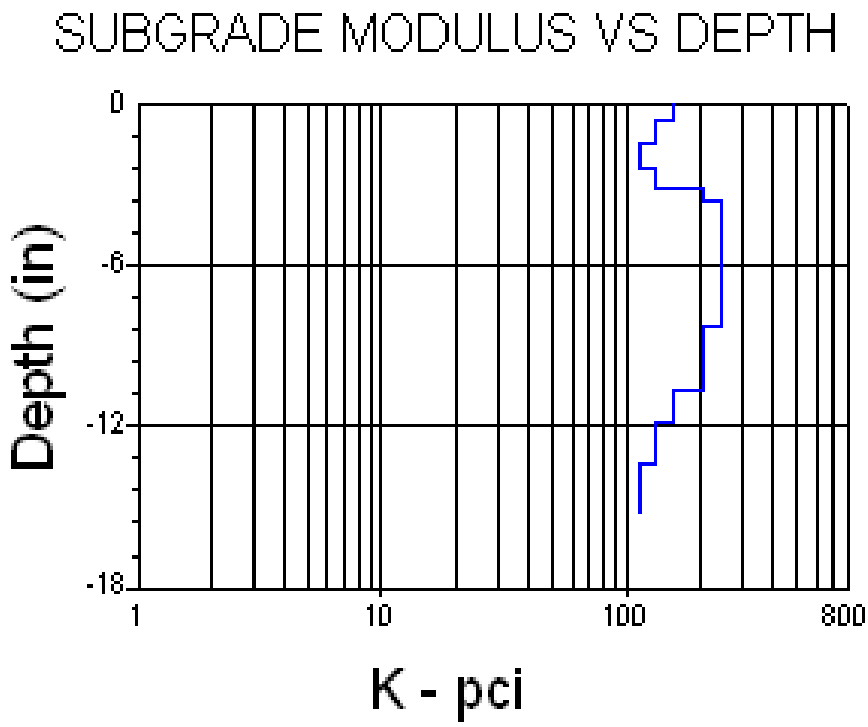


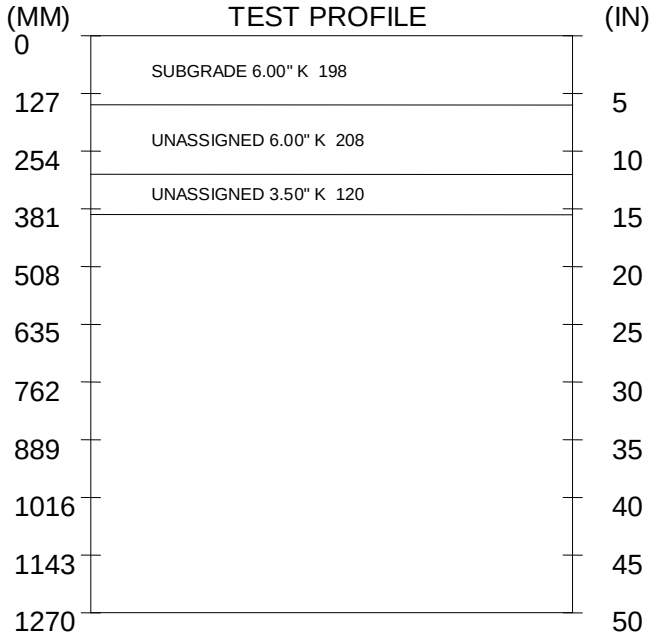


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 10 February 2011

Feature: 10A-5742 Station: 10A-5742

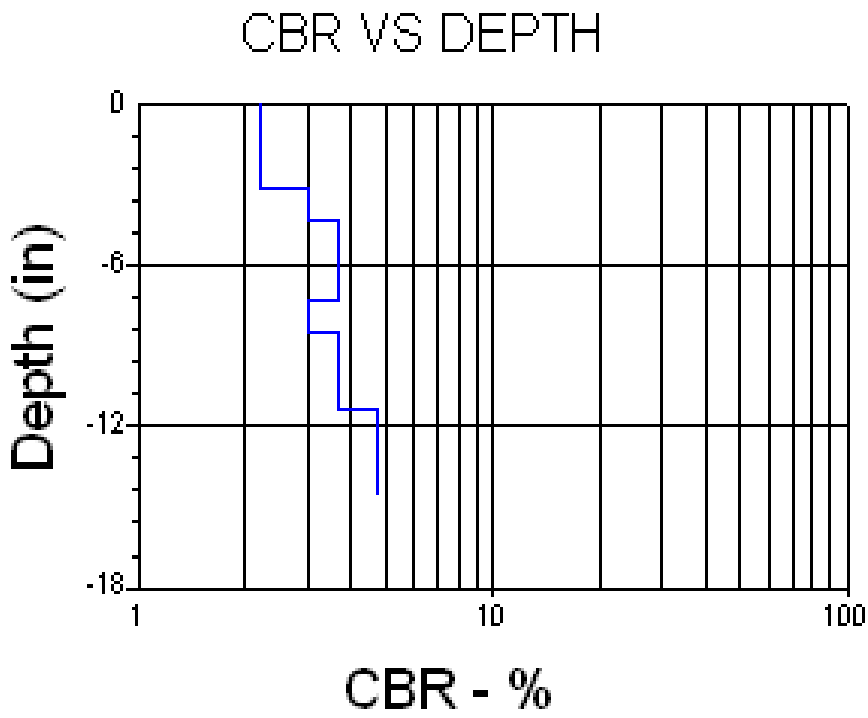


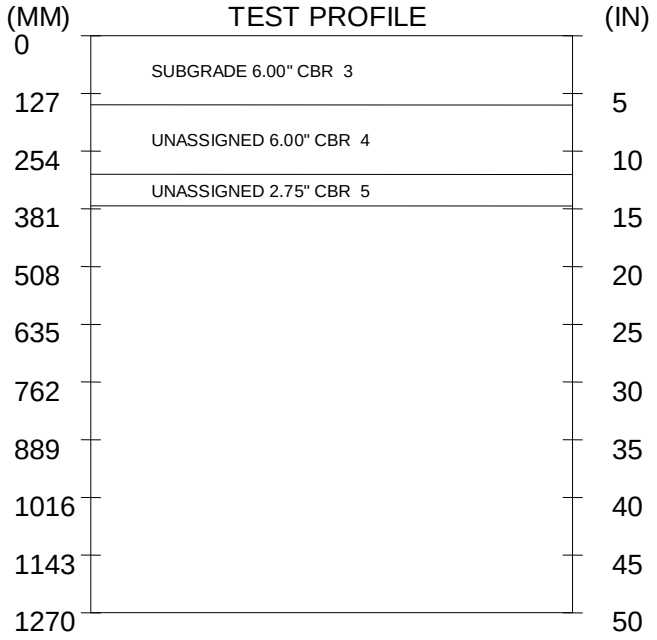


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 10 February 2011

Feature: 10A-5744 Station: 10A-5744

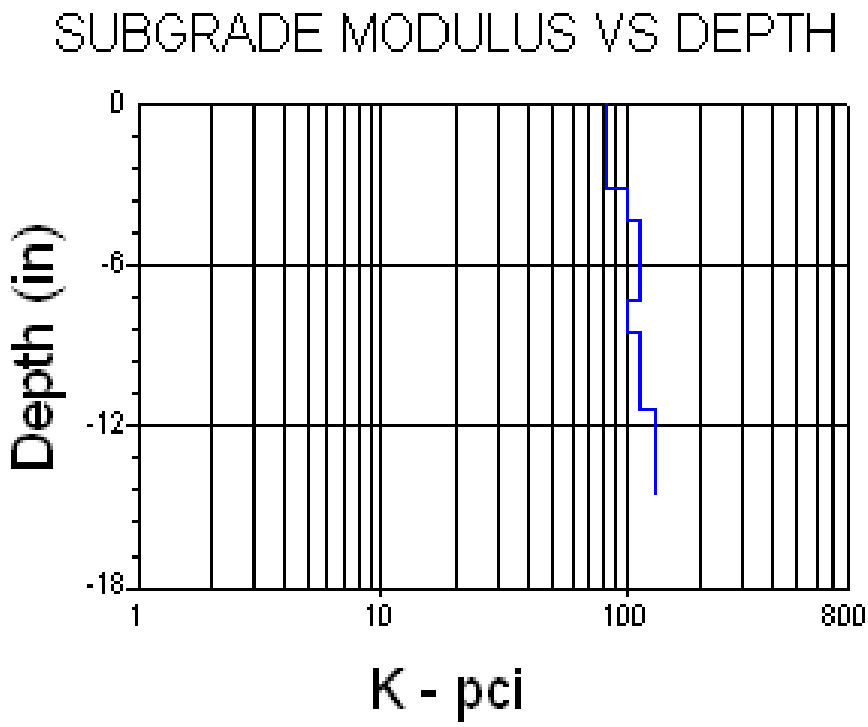


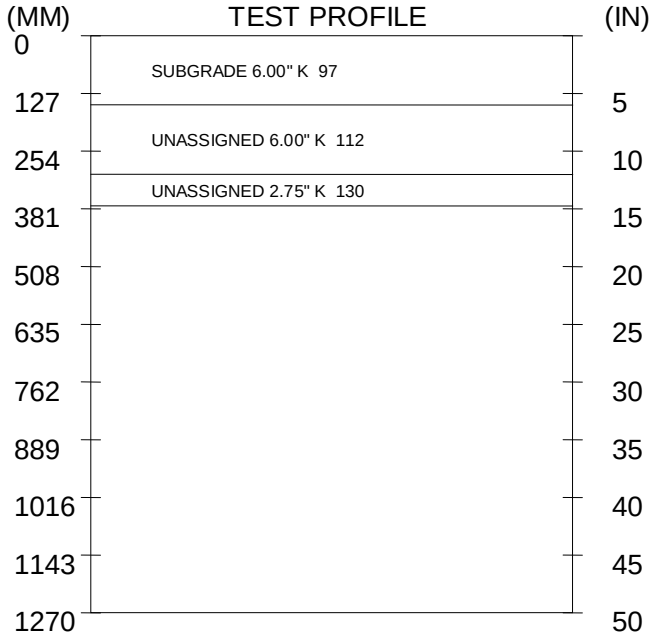


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 10 February 2011

Feature: 10A-5744 Station: 10A-5744

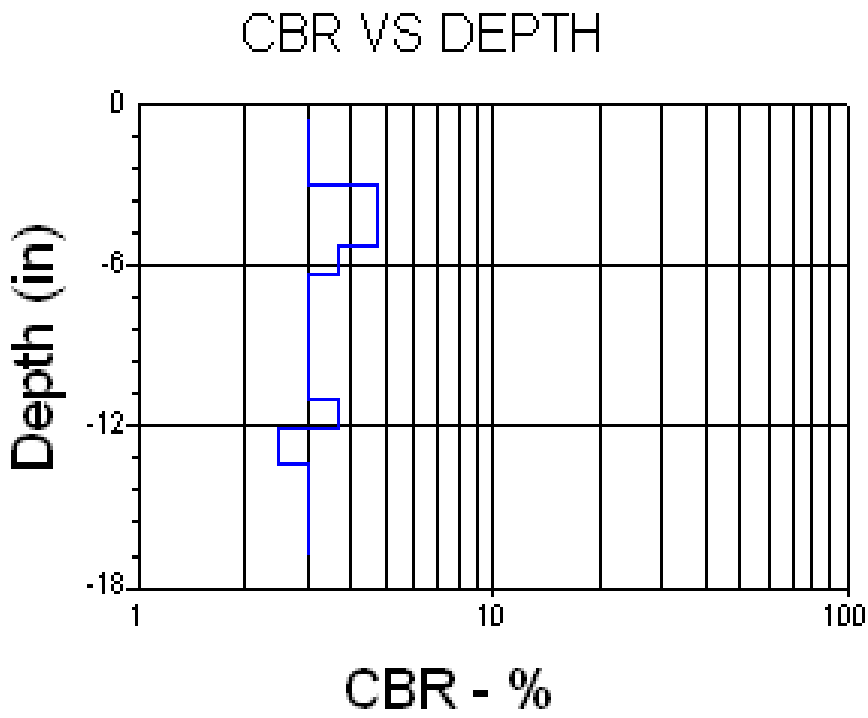


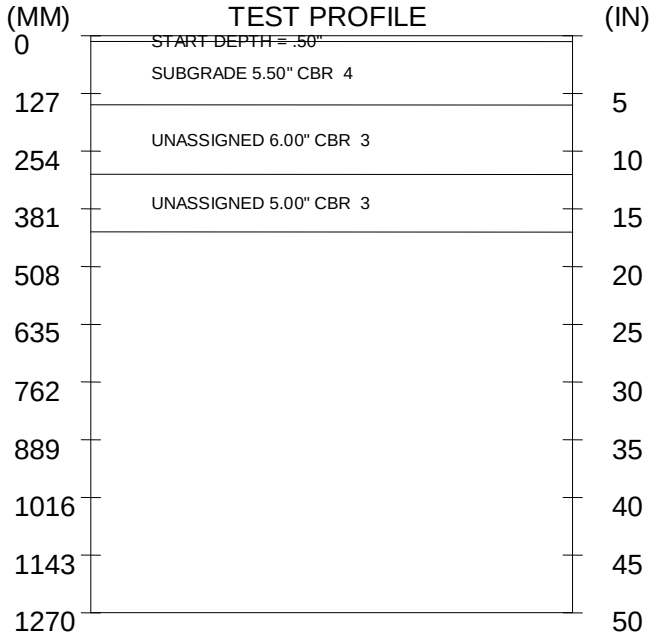


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 10 February 2011

Feature: 10A-5746 Station: 10A-5746

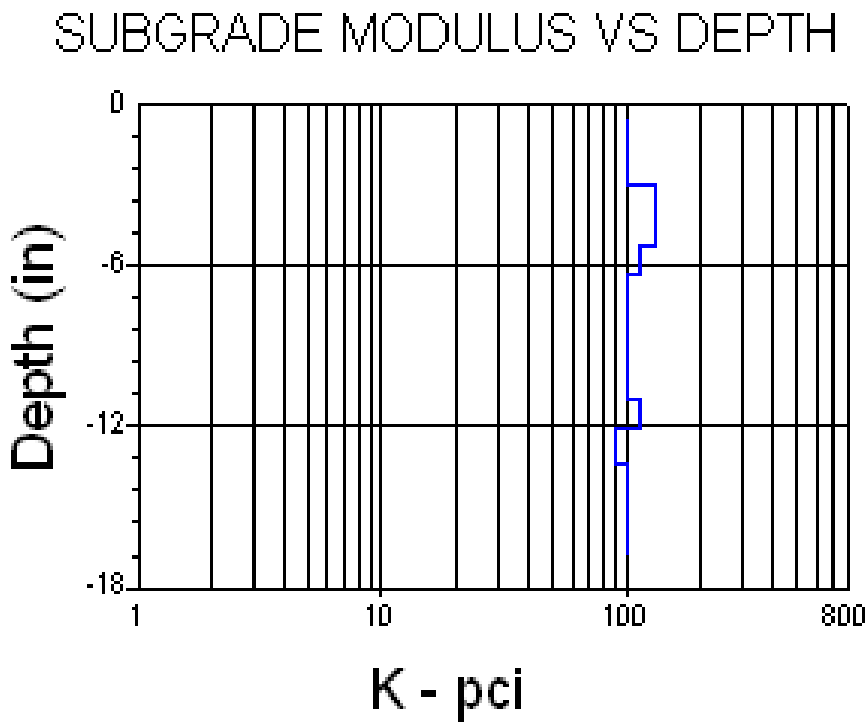


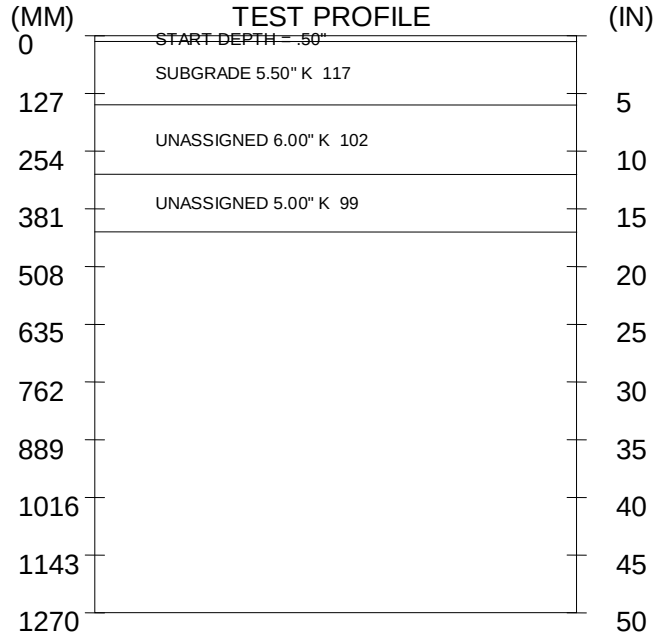


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 10 February 2011

Feature: 10A-5746 Station: 10A-5746





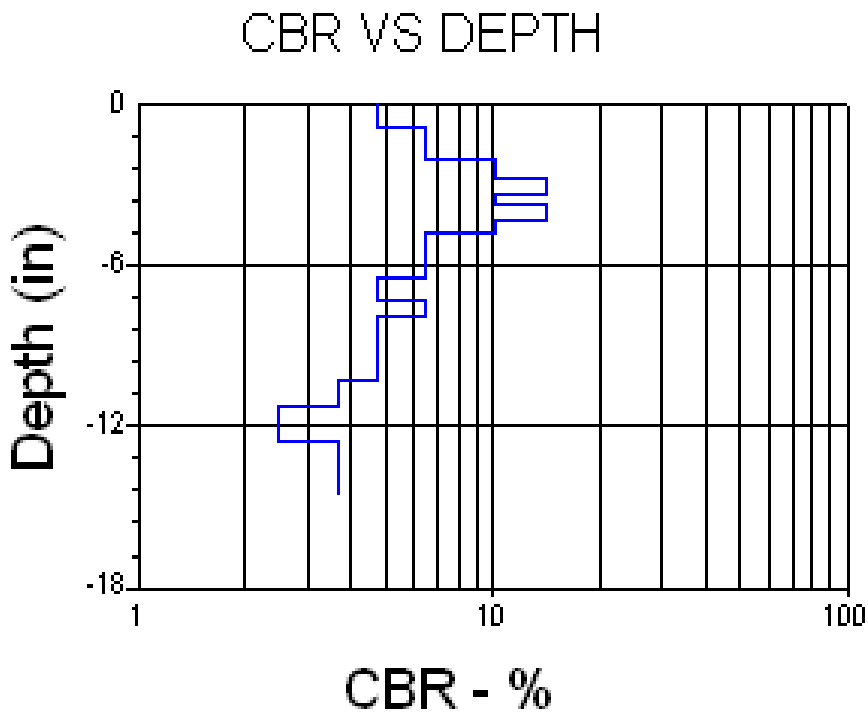
DCP TEST DATA

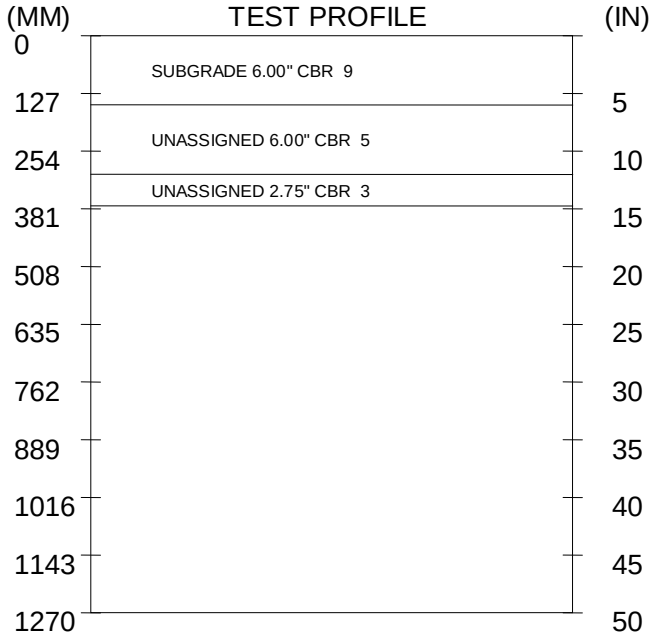
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5749

Station: 8A4C-5749





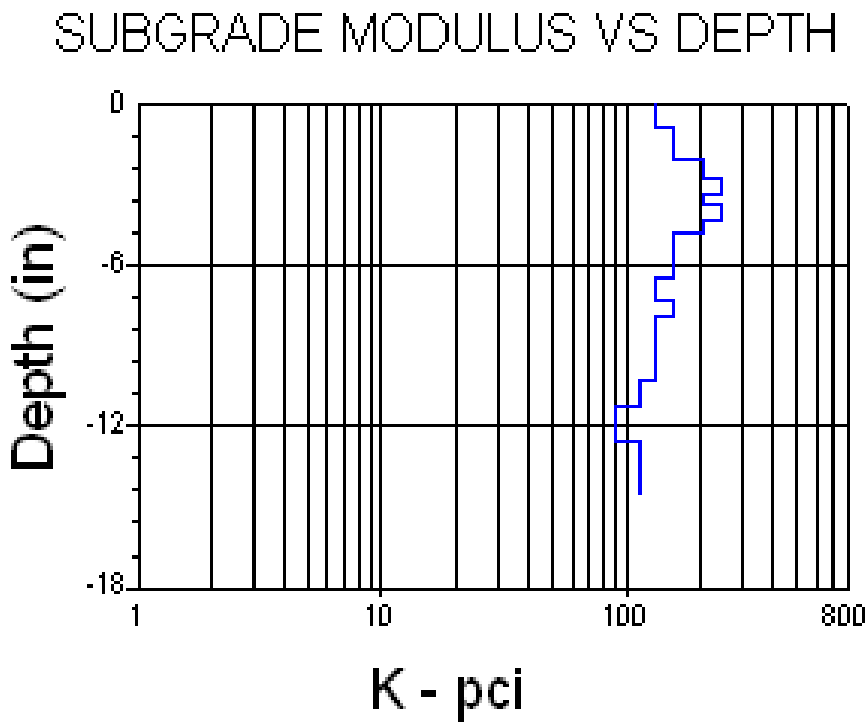
DCP TEST DATA

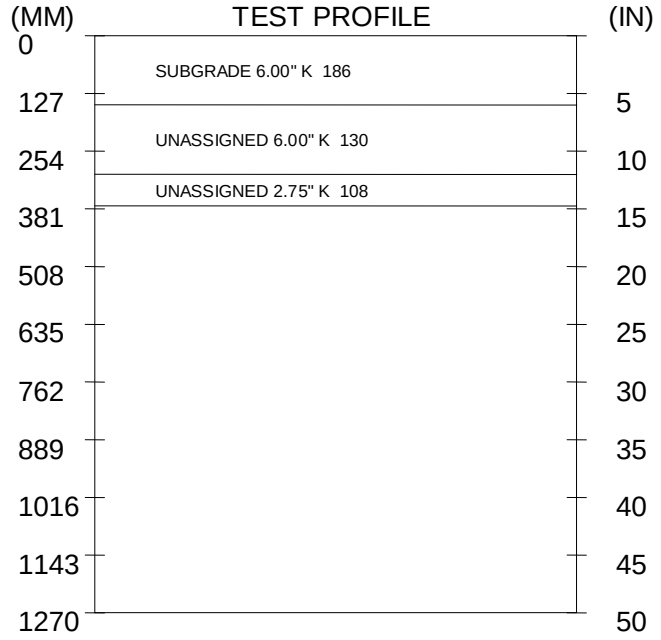
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5749

Station: 8A4C-5749





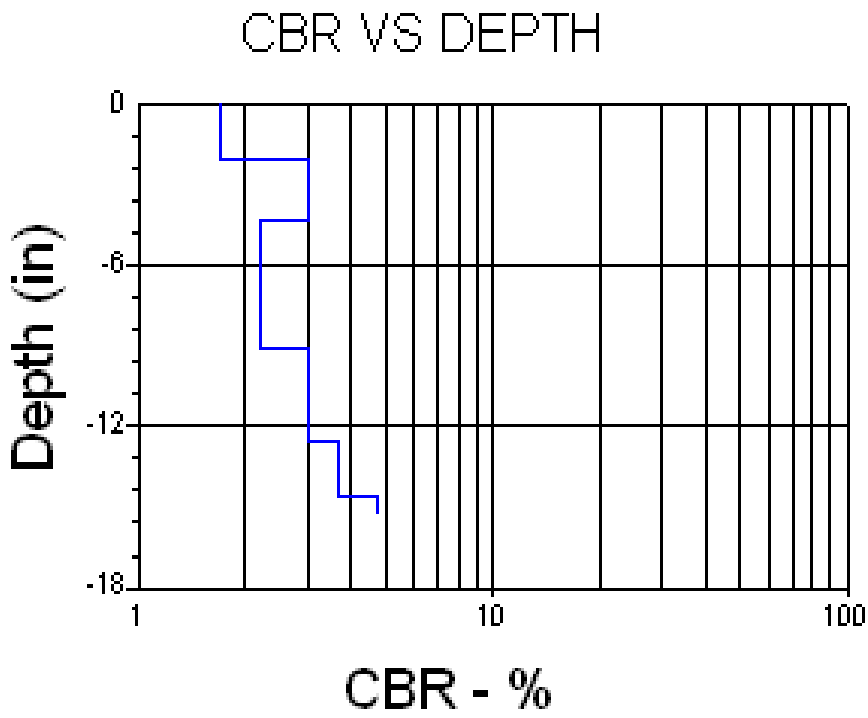
DCP TEST DATA

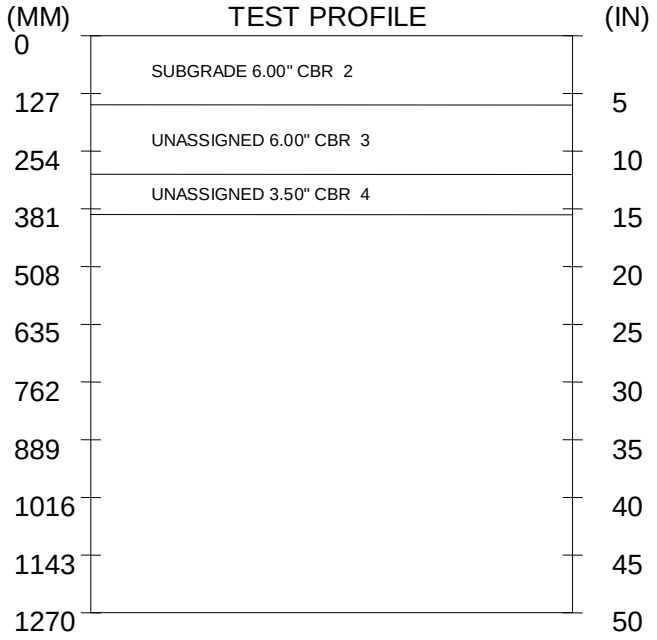
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5750

Station: 8A4C-5750





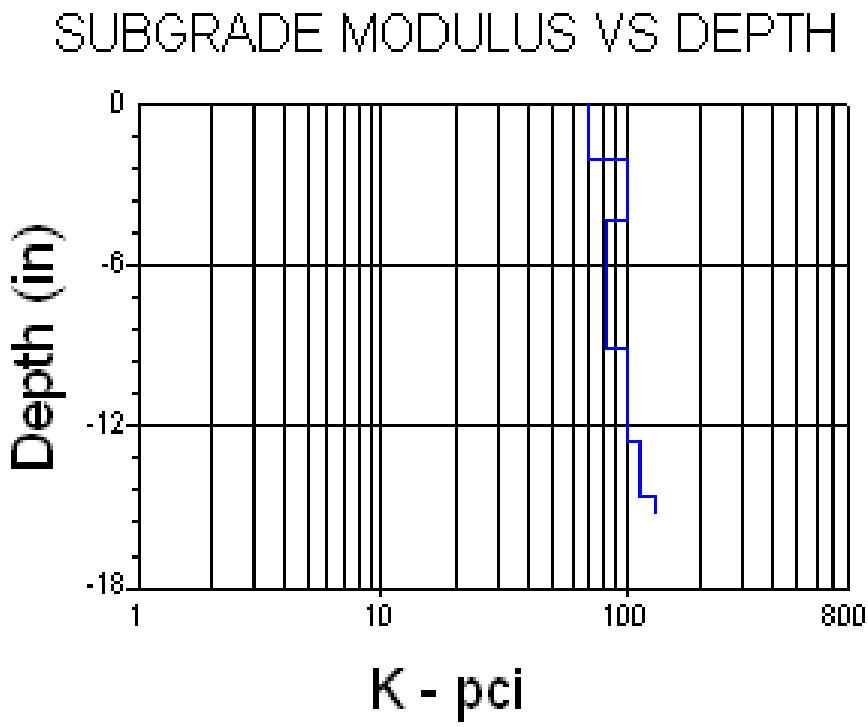
DCP TEST DATA

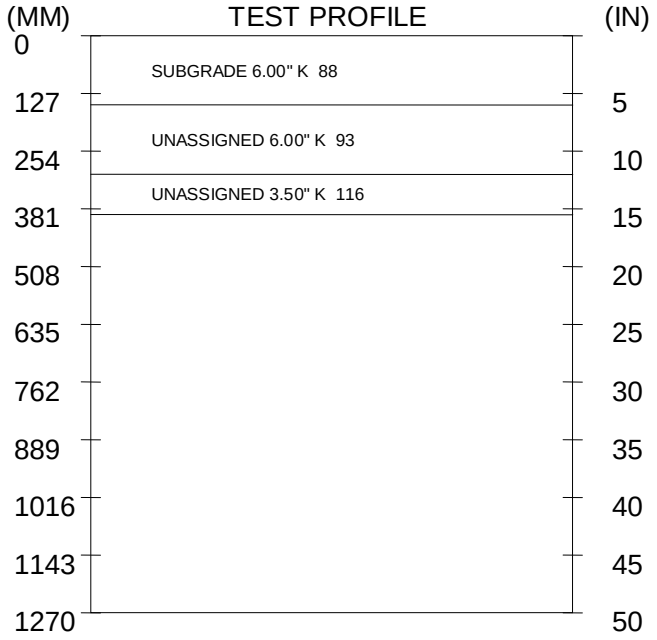
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5750

Station: 8A4C-5750





DCP TEST DATA

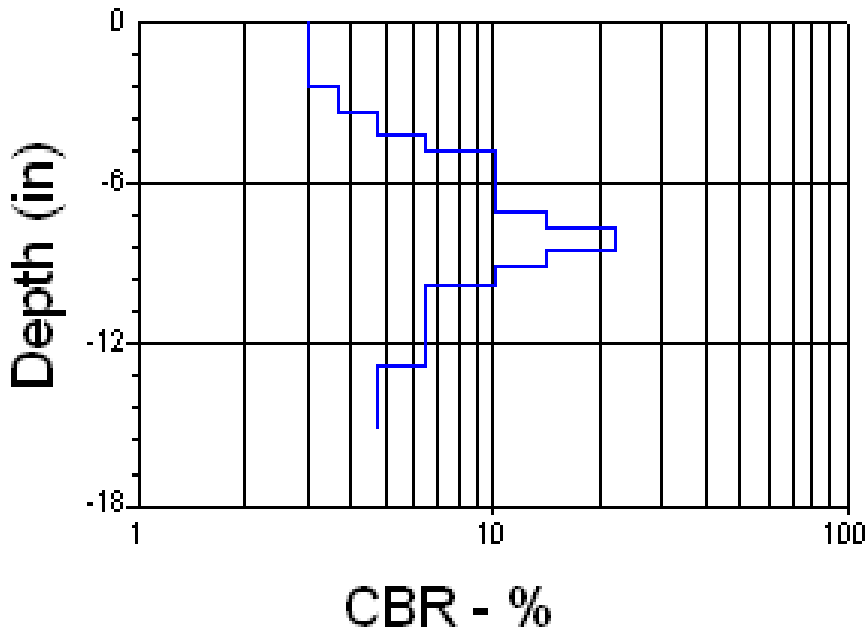
Project: ORTC (FY12) – Dining Facility

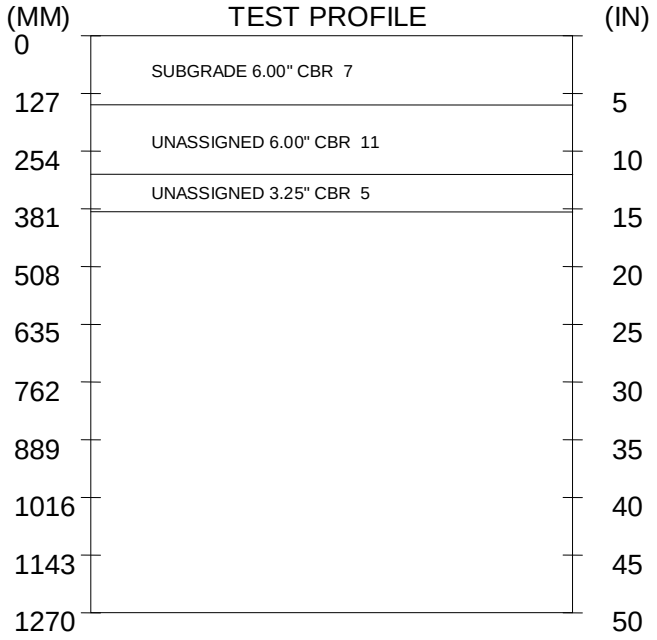
Date: 24 January 2011

Feature: 8A4C-5751

Station: 8A4C-5751

CBR VS DEPTH





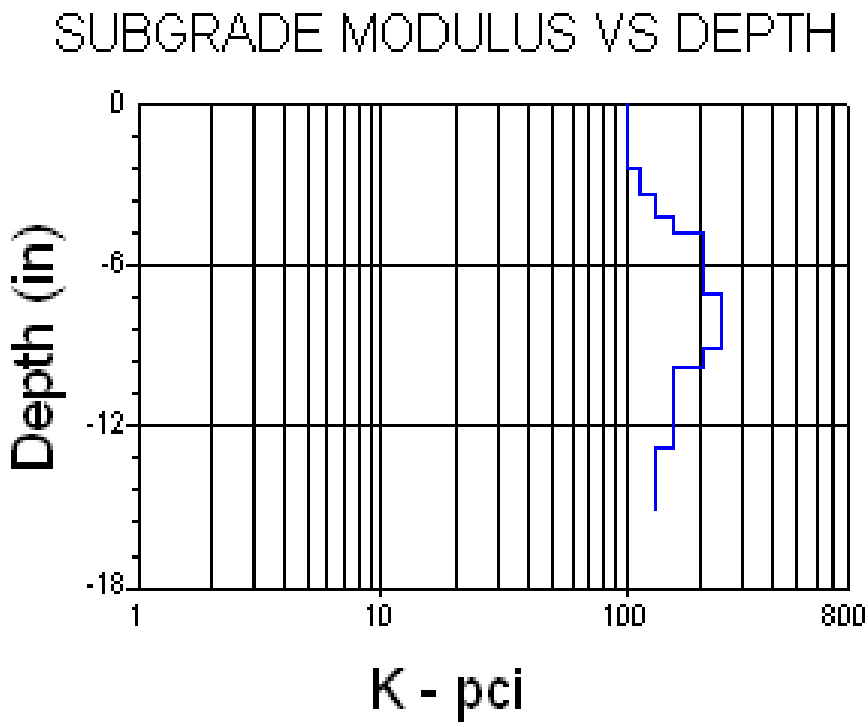
DCP TEST DATA

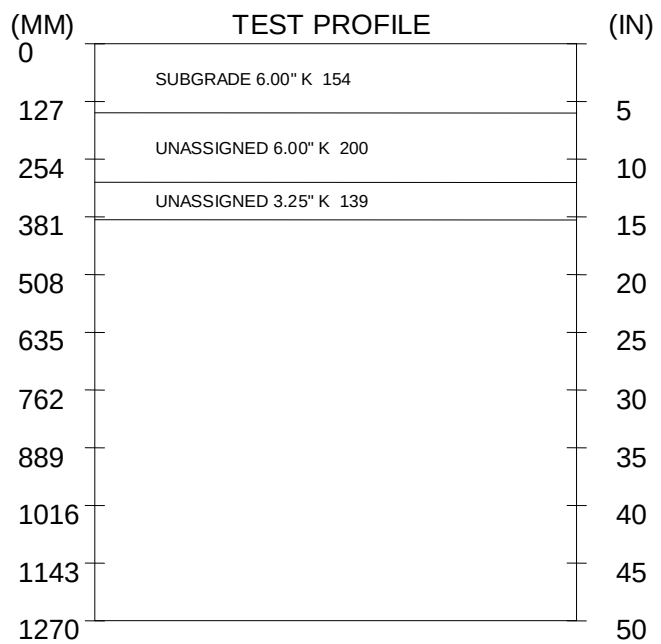
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5751

Station: 8A4C-5751





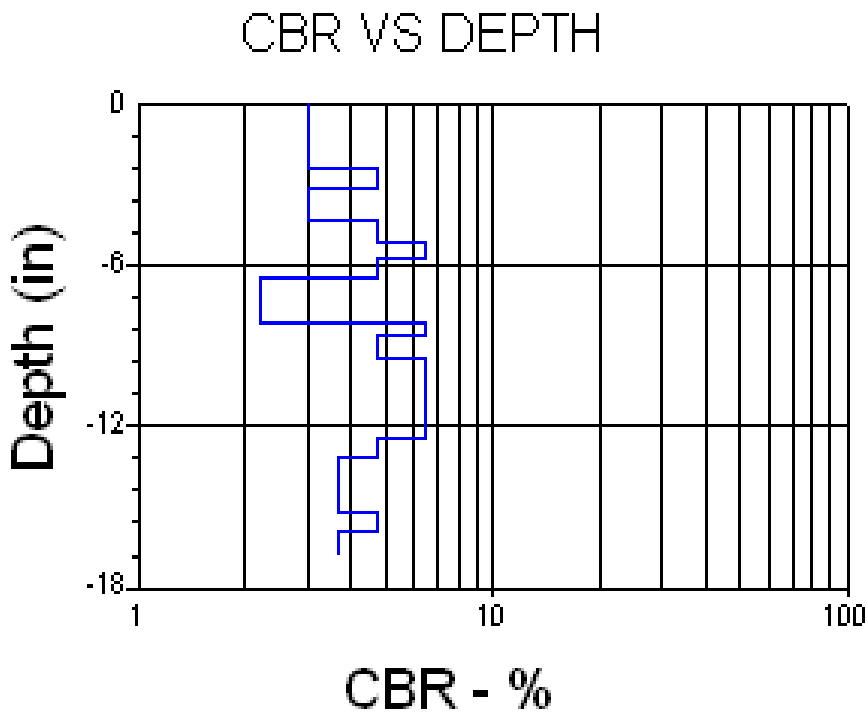
DCP TEST DATA

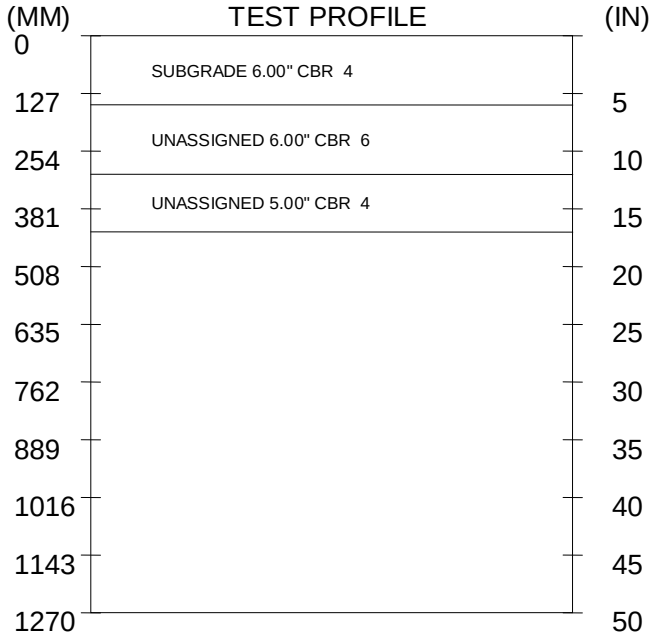
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5752

Station: 8A4C-5752





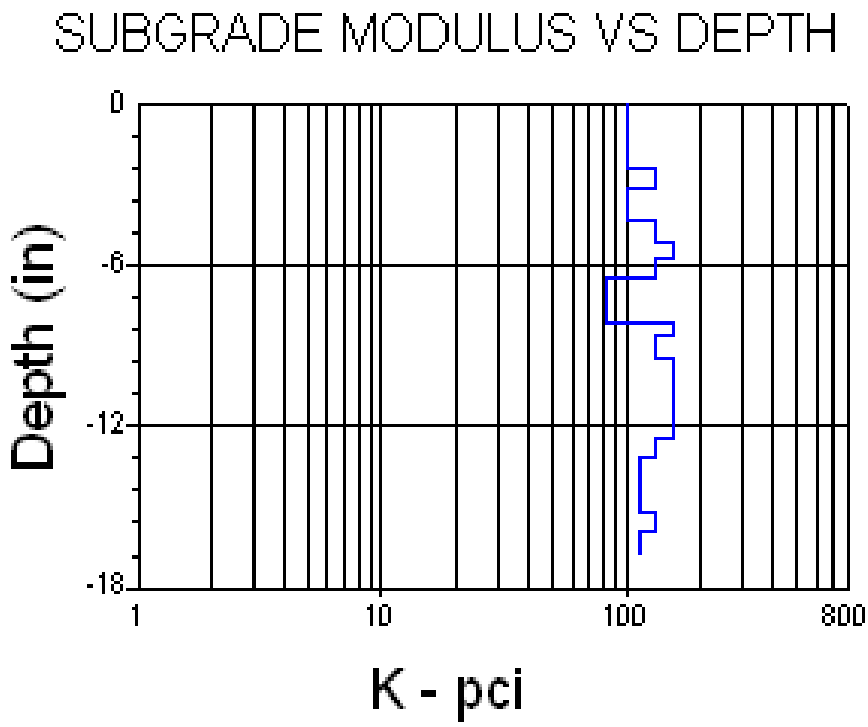
DCP TEST DATA

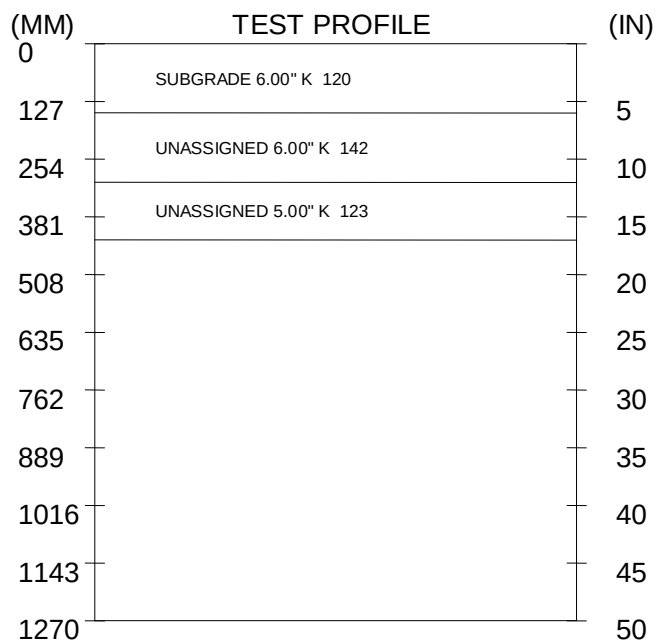
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5752

Station: 8A4C-5752





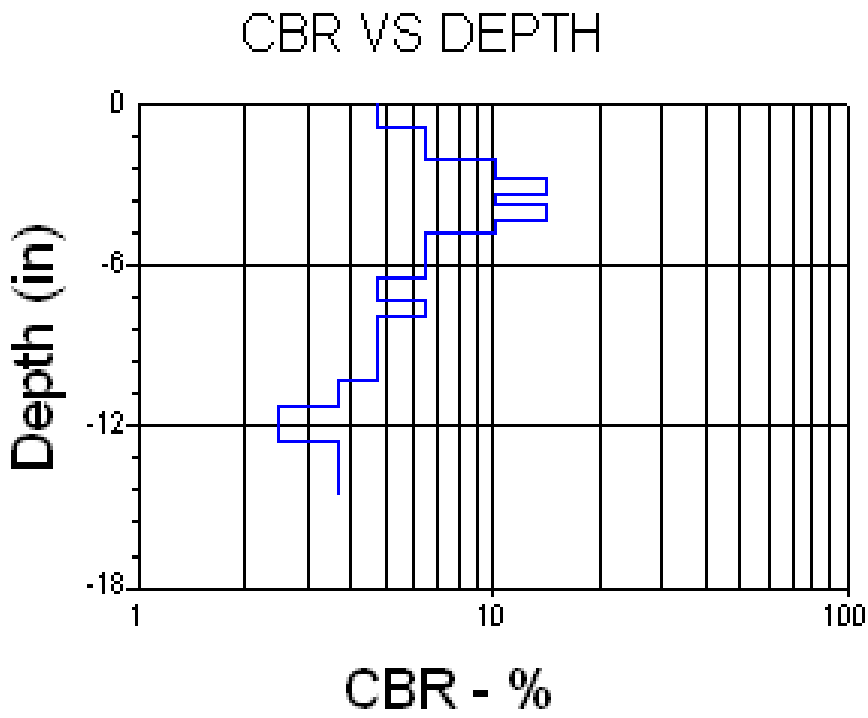
DCP TEST DATA

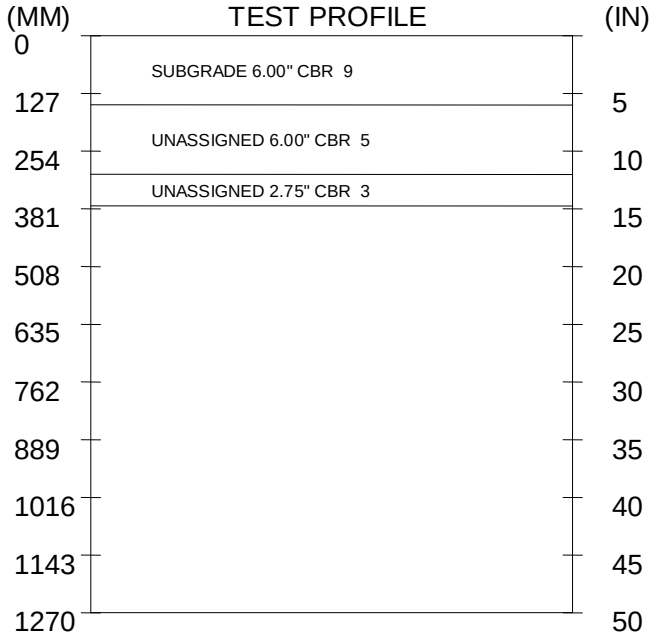
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5749

Station: 8A4C-5749





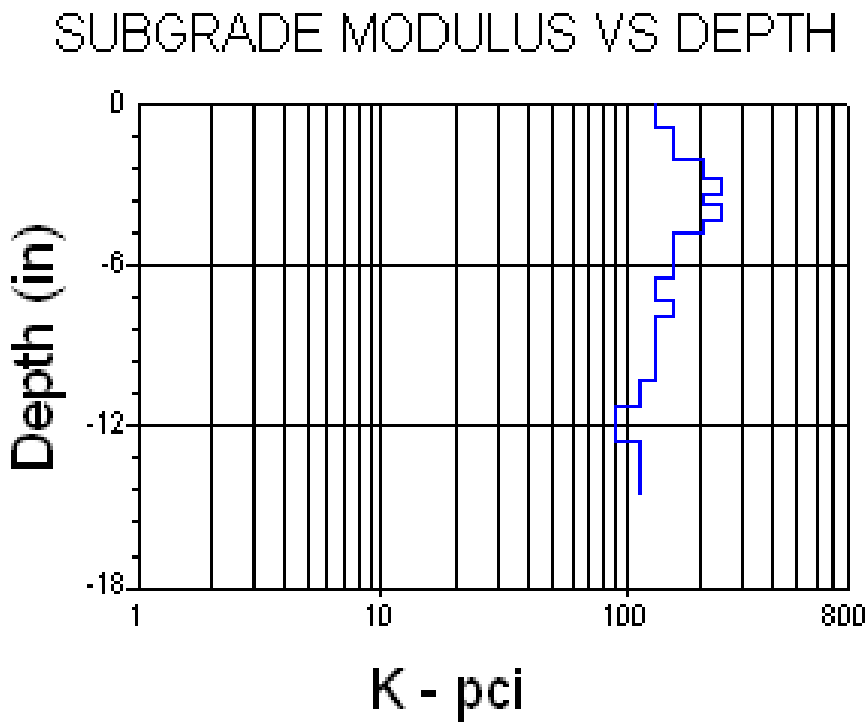
DCP TEST DATA

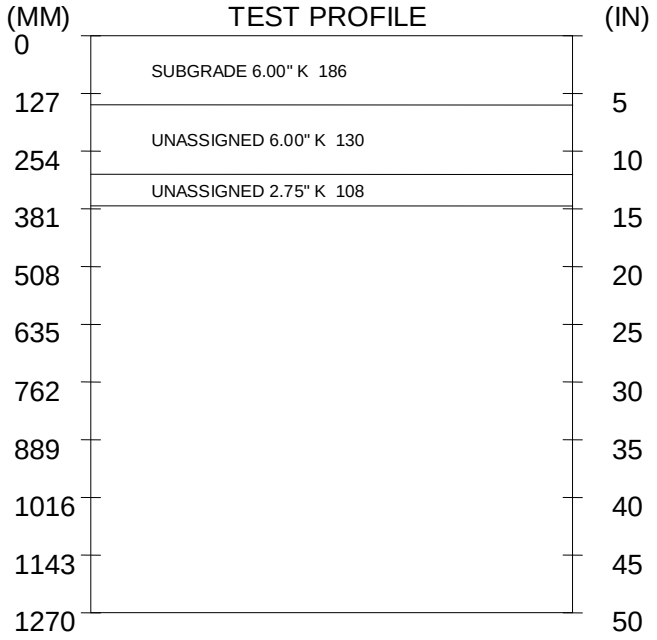
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5749

Station: 8A4C-5749





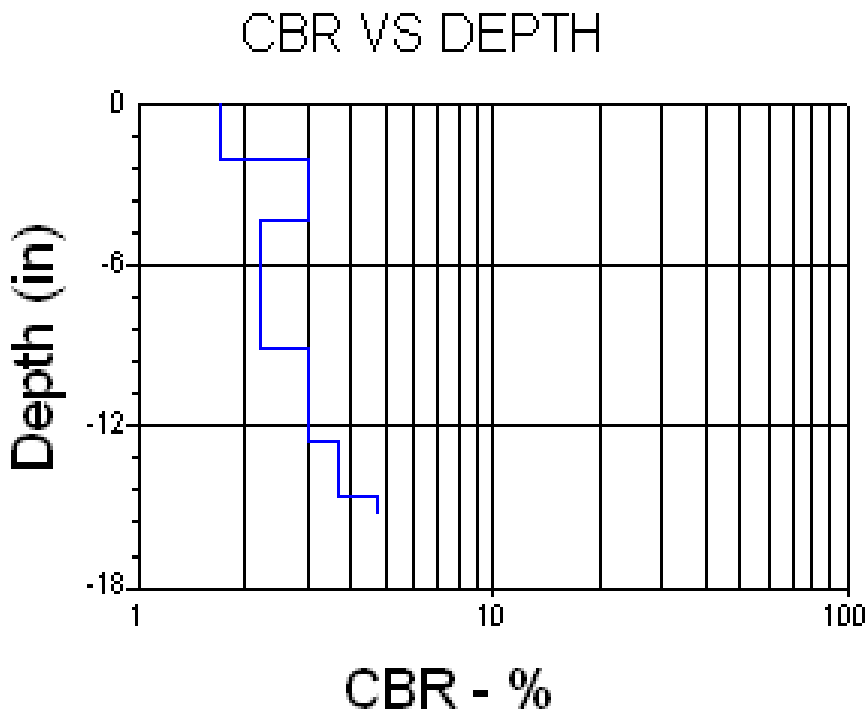
DCP TEST DATA

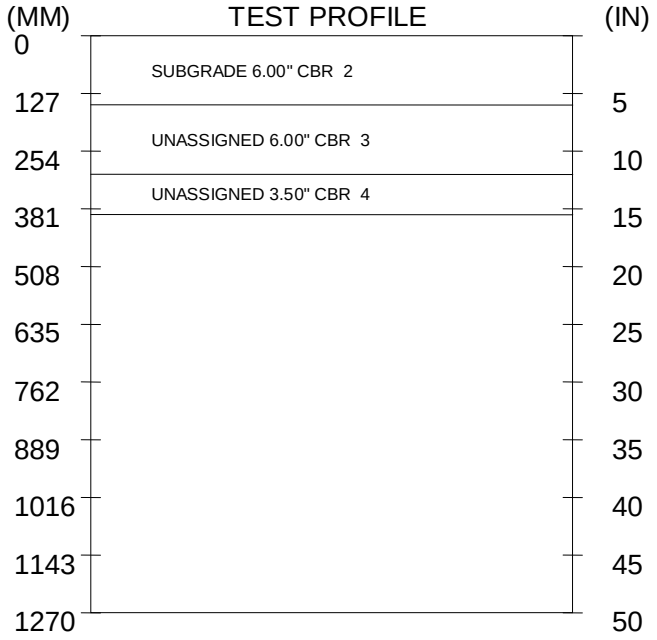
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5750

Station: 8A4C-5750





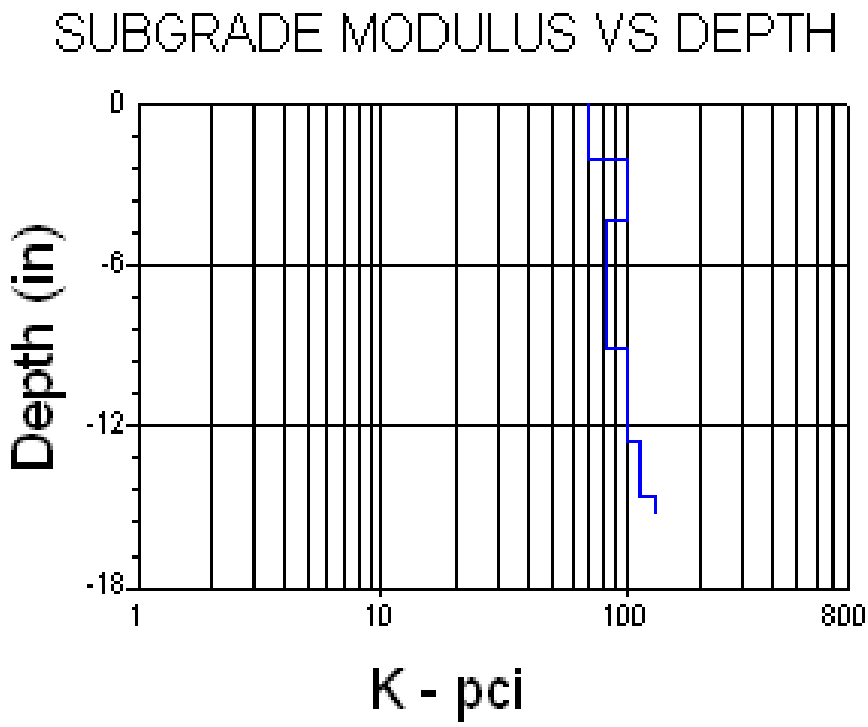
DCP TEST DATA

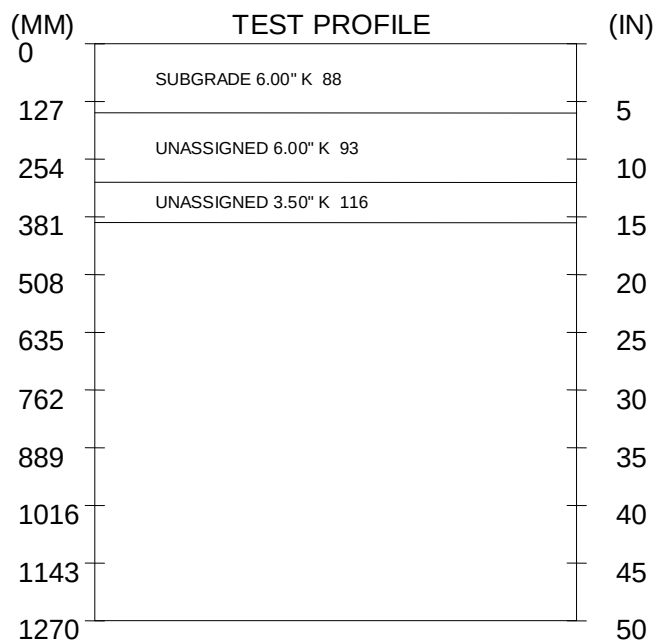
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5750

Station: 8A4C-5750





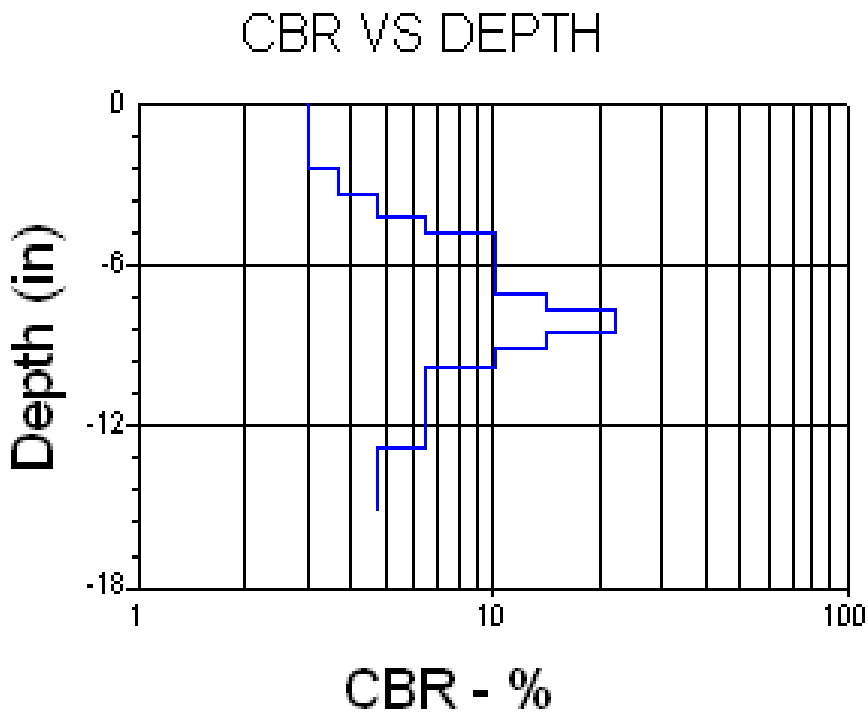
DCP TEST DATA

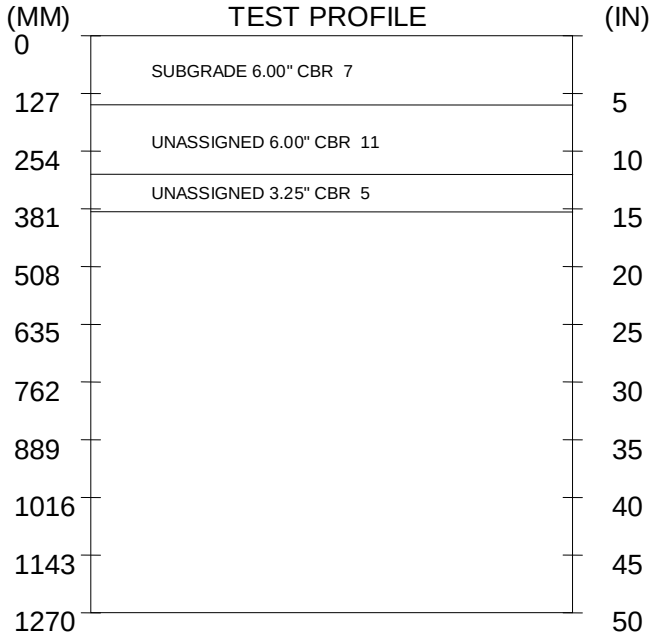
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5751

Station: 8A4C-5751





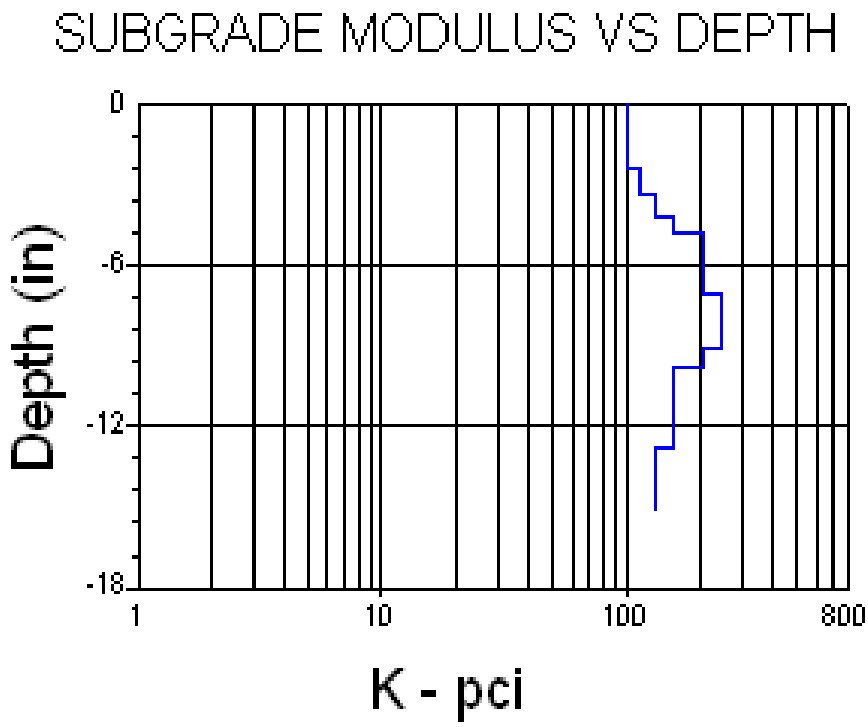
DCP TEST DATA

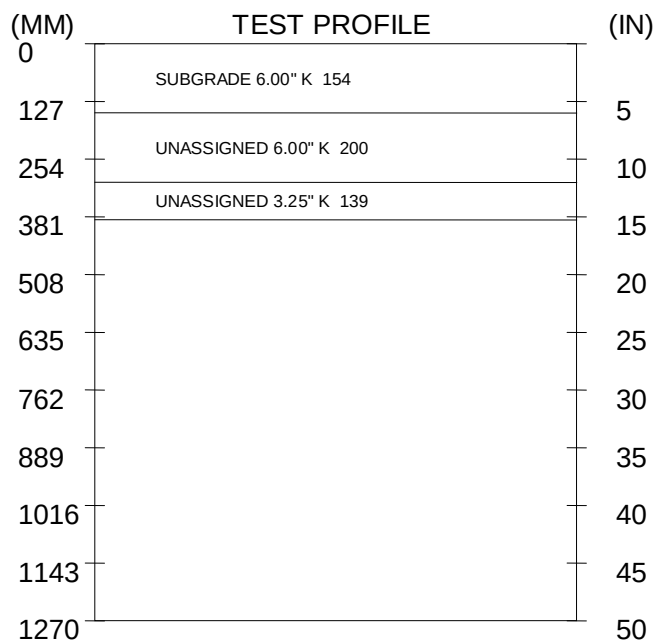
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5751

Station: 8A4C-5751





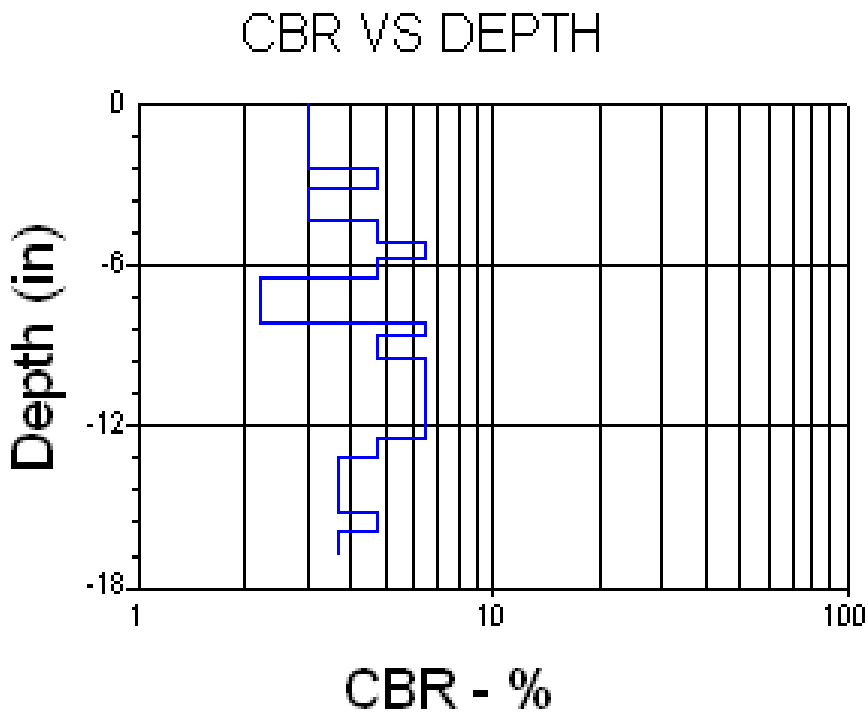
DCP TEST DATA

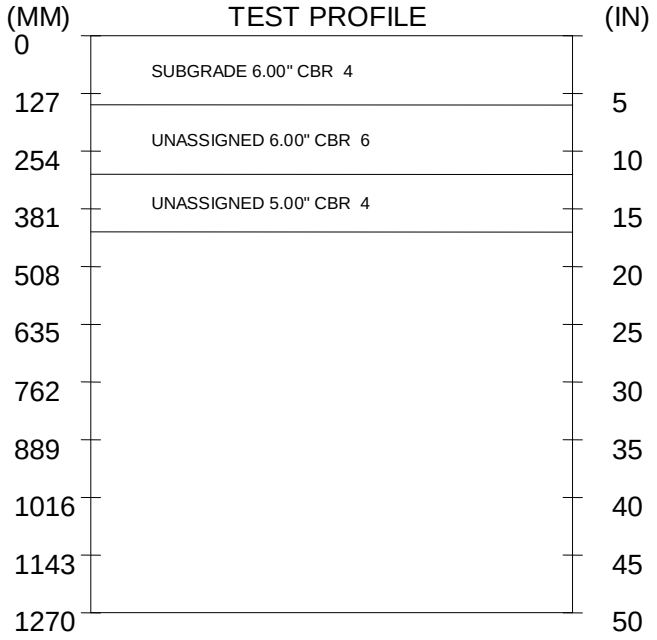
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5752

Station: 8A4C-5752





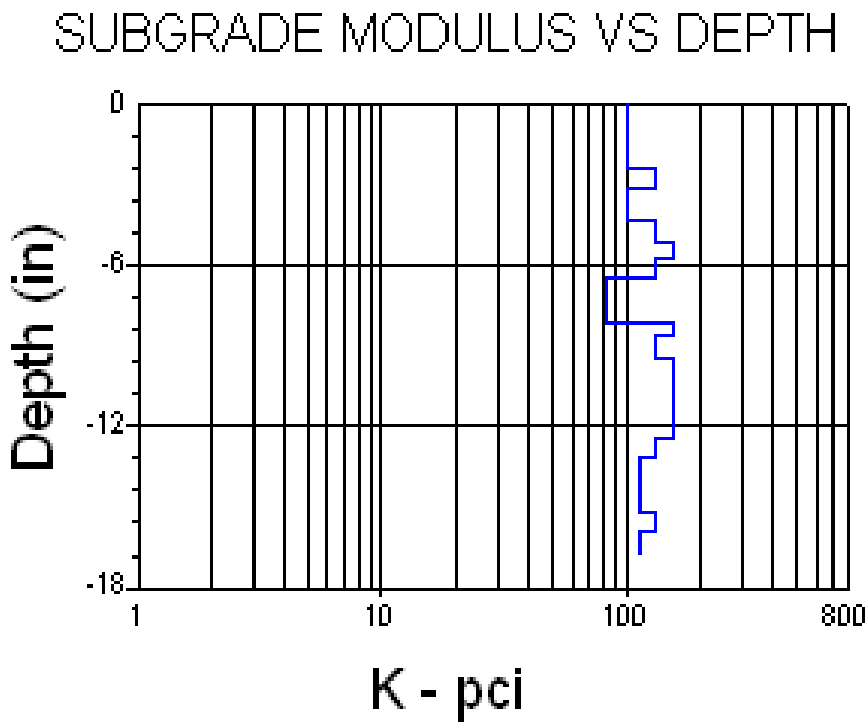
DCP TEST DATA

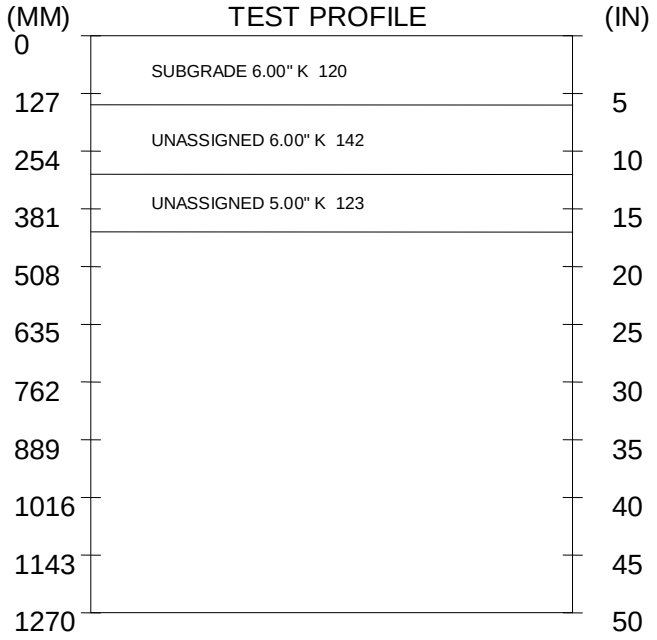
Project: ORTC (FY12) – Dining Facility

Date: 24 January 2011

Feature: 8A4C-5752

Station: 8A4C-5752

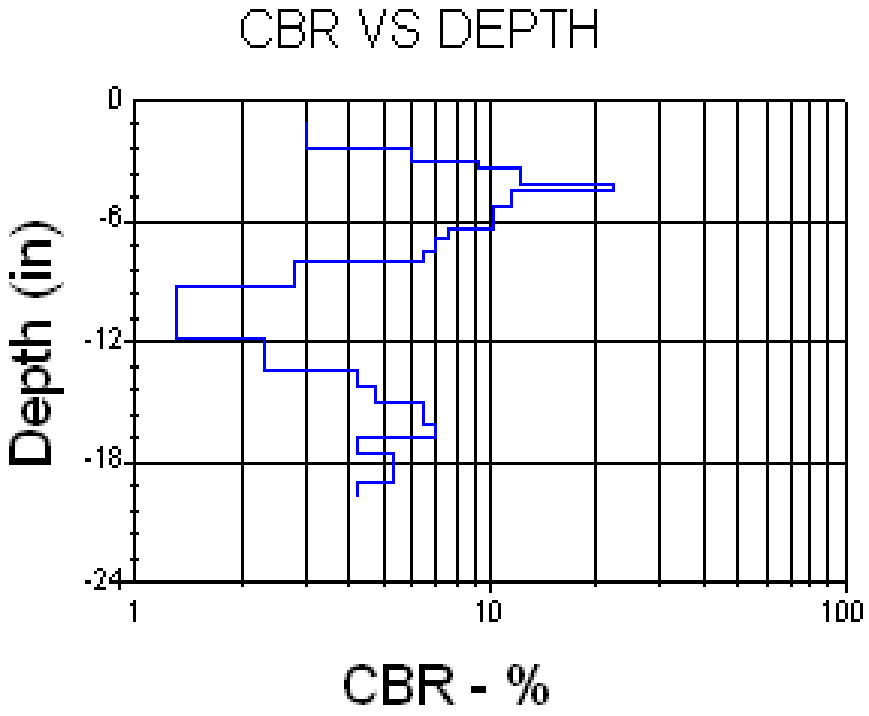


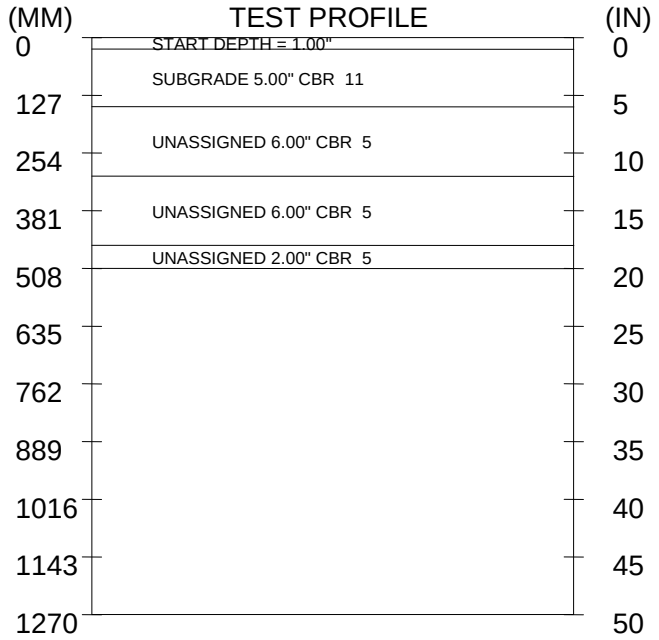


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 28 July 2011

Feature: 8A4C-5816 Station: 8A4C-5816

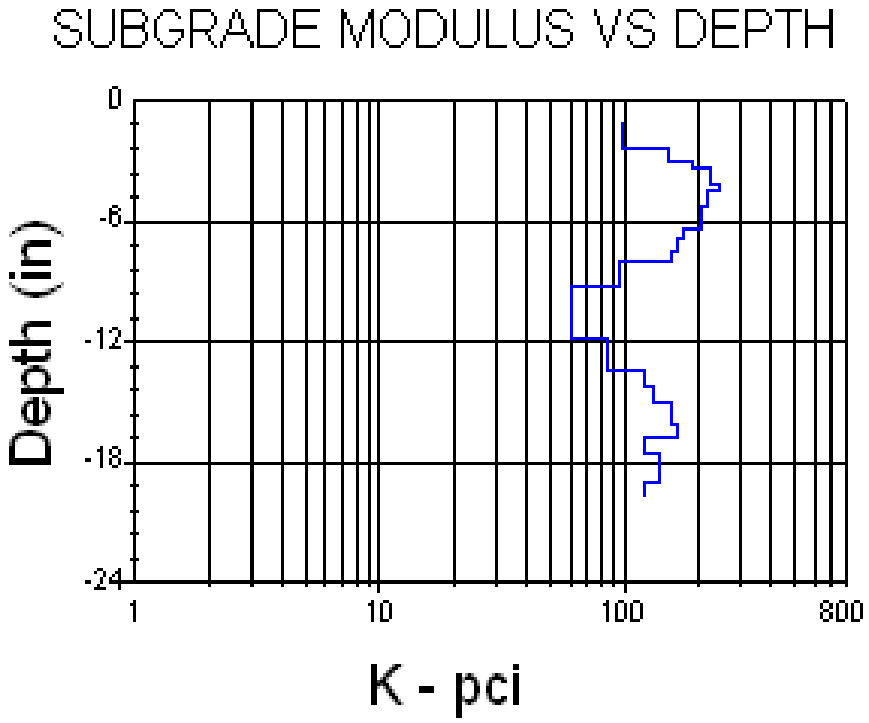


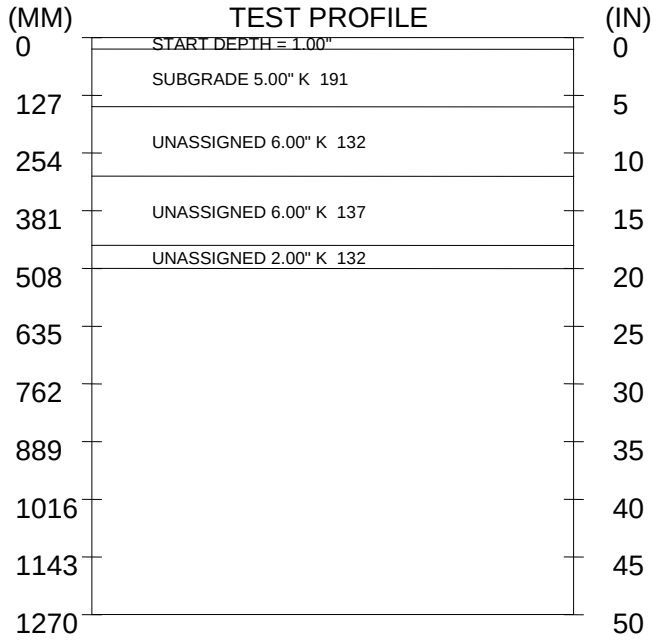


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 28 July 2011

Feature: 8A4C-5816 Station: 8A4C-5816

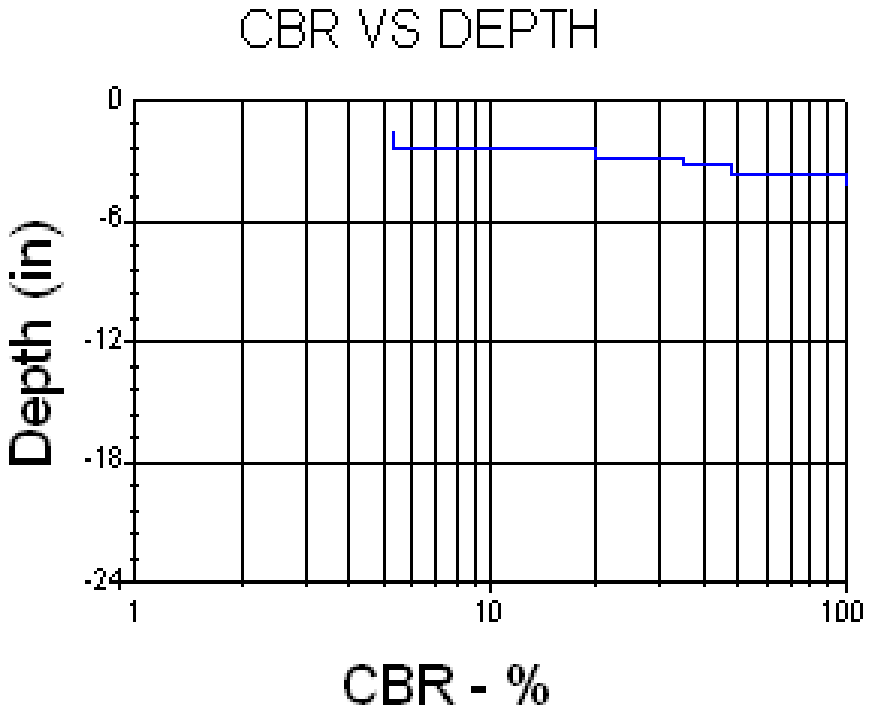


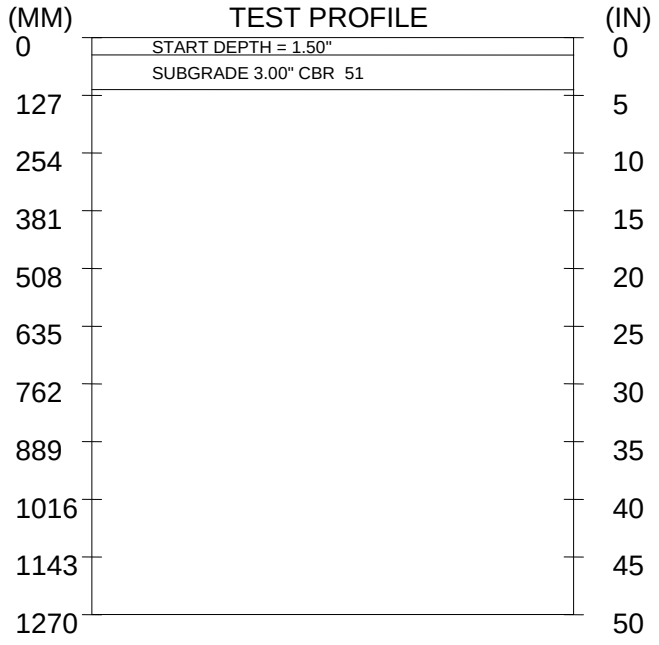


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 28 July 2011

Feature: 8A4C-5817 Station: 8A4C-8517

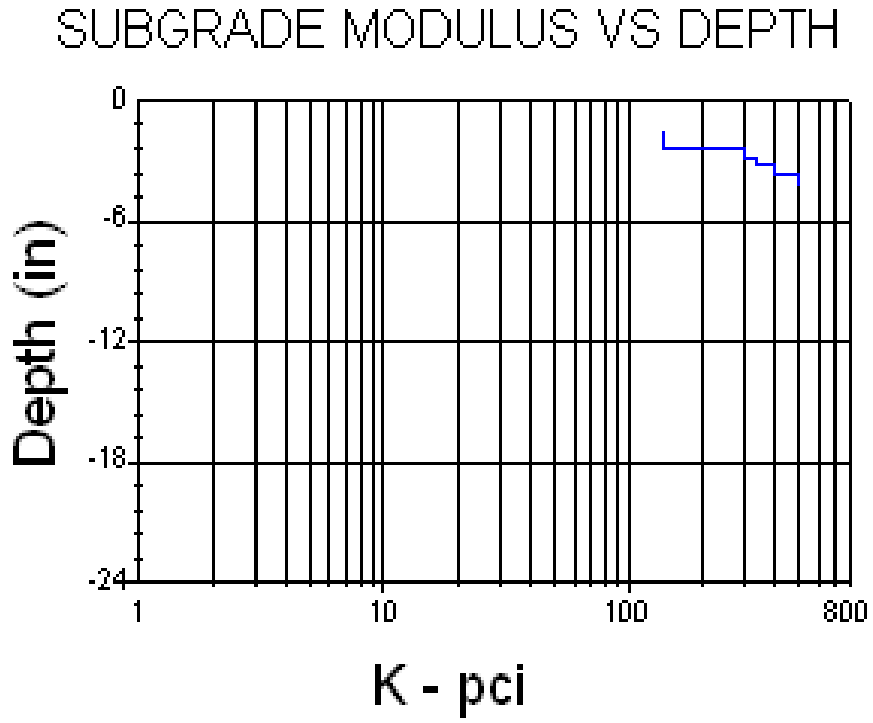


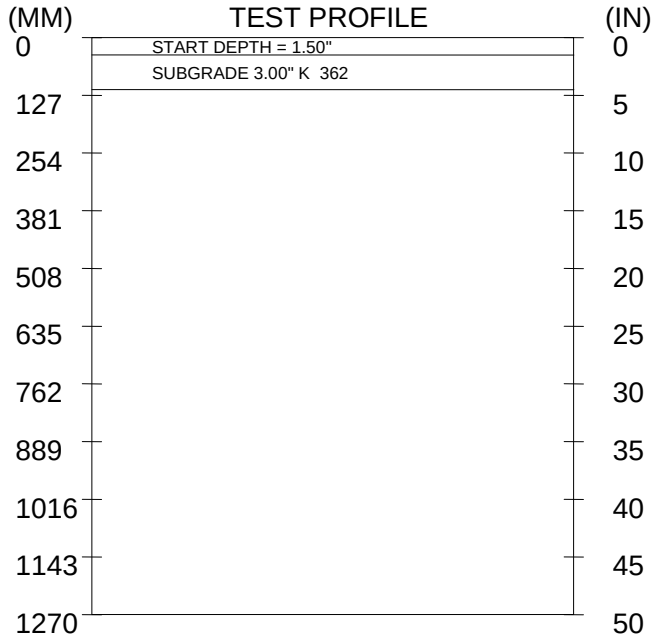


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 28 July 2011

Feature: 8A4C-5817 Station: 8A4C-8517

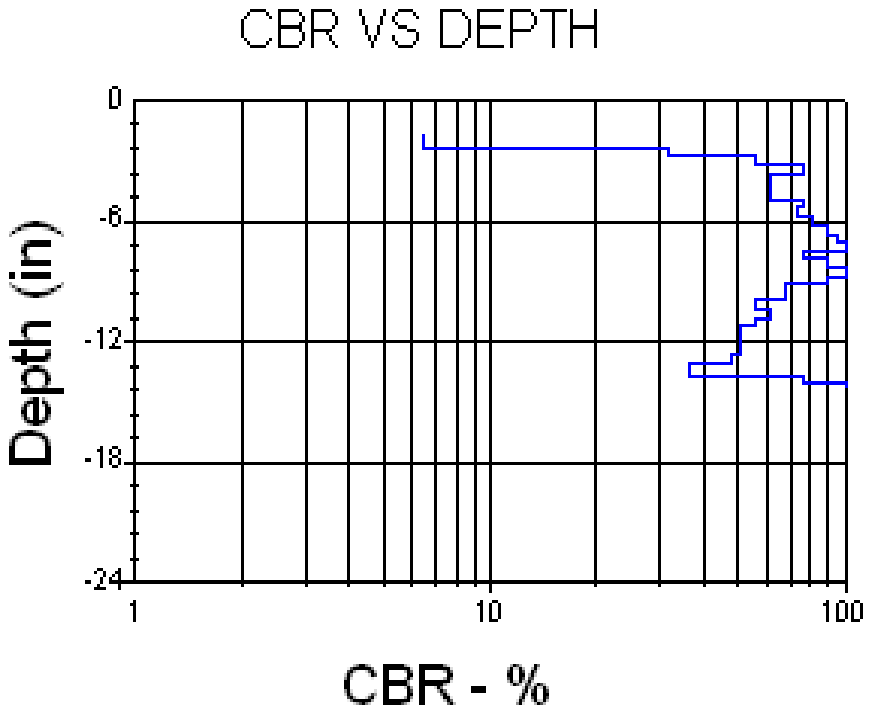


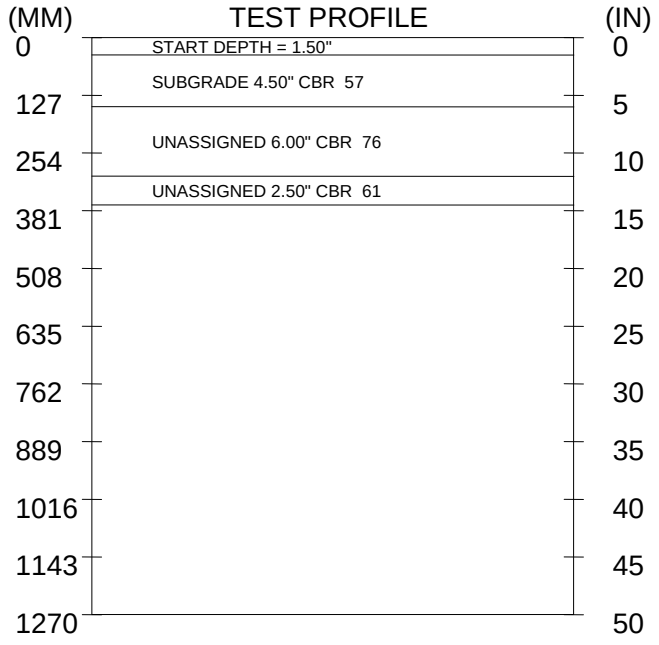


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 28 July 2011

Feature: 8A4C-5818 Station: 8A4C-5818

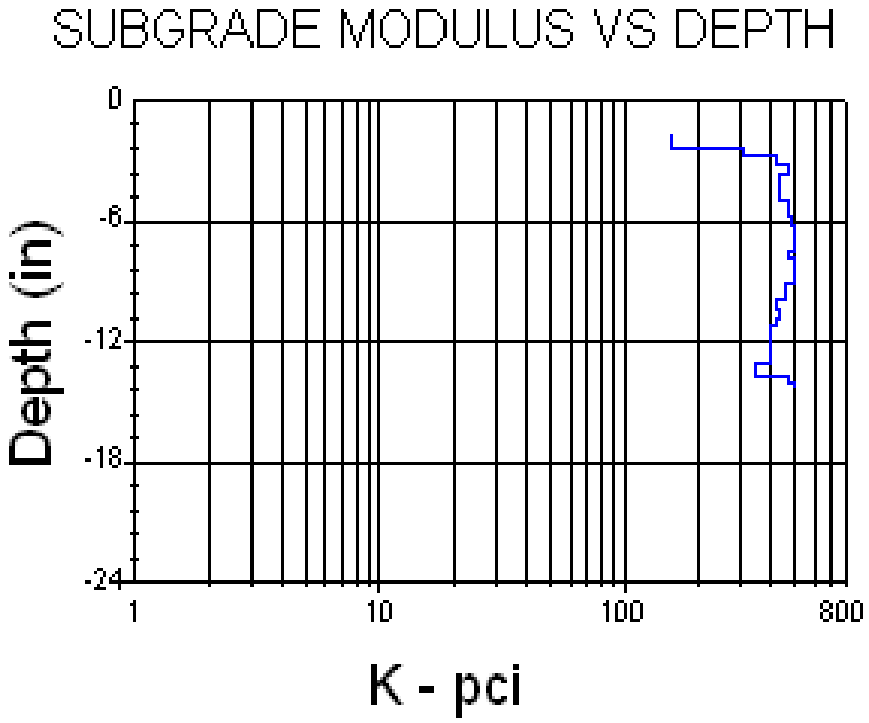


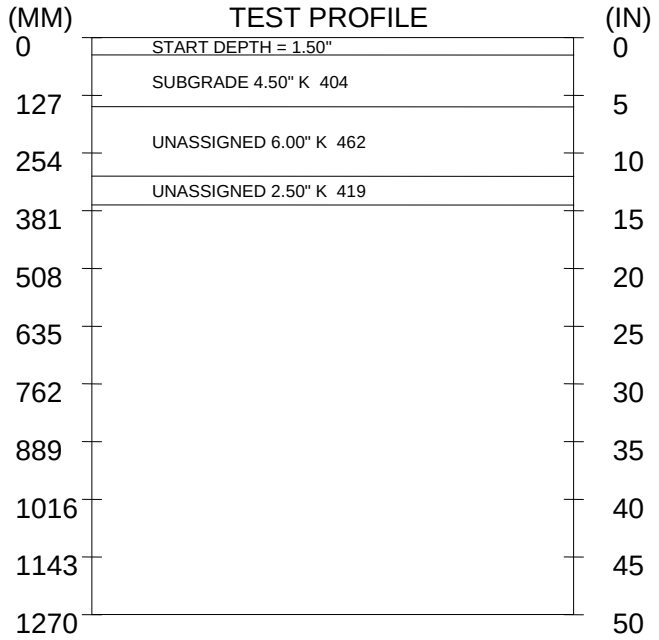


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 28 July 2011

Feature: 8A4C-5818 Station: 8A4C-5818

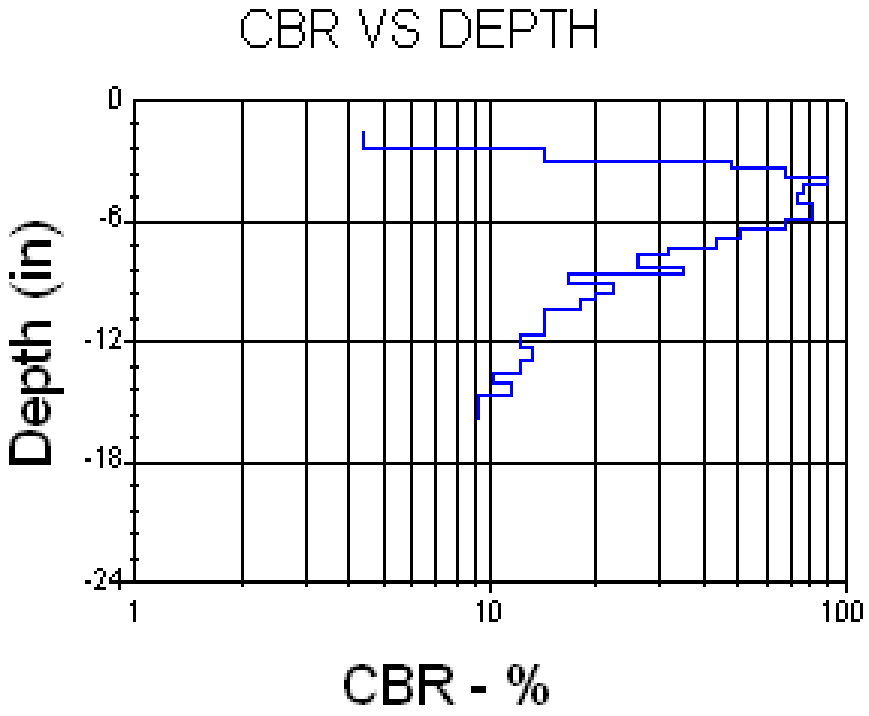


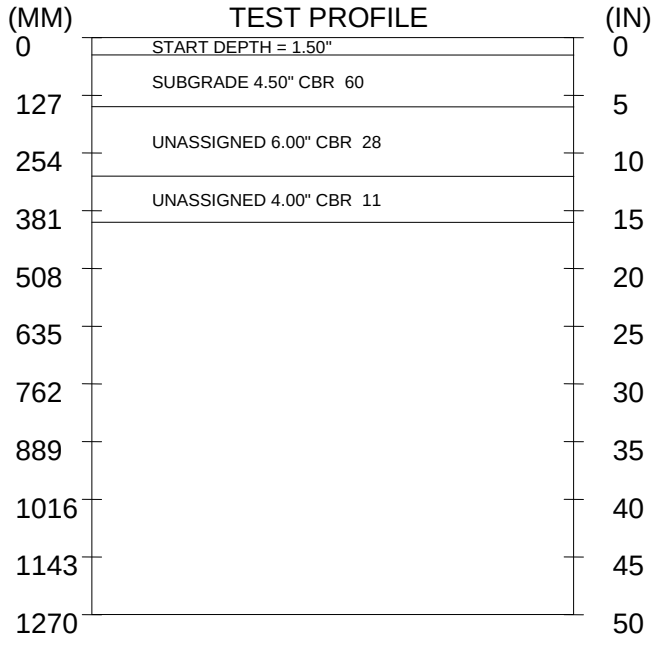


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 28 July 2011

Feature: 8A4C-5819 Station: 8A4C-5819

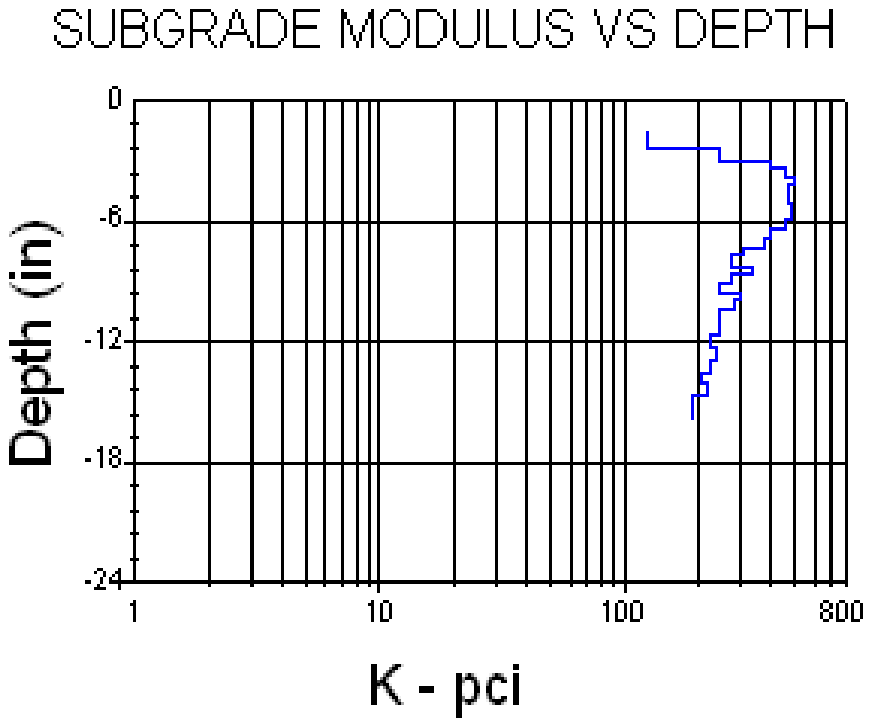


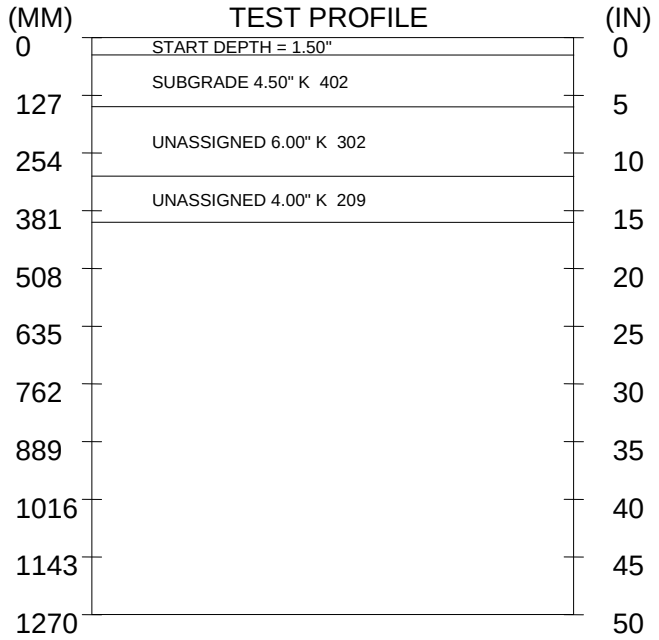


DCP TEST DATA

Project: Operational Readiness Training Complex (FY12) Date: 28 July 2011

Feature: 8A4C-5819 Station: 8A4C-5819





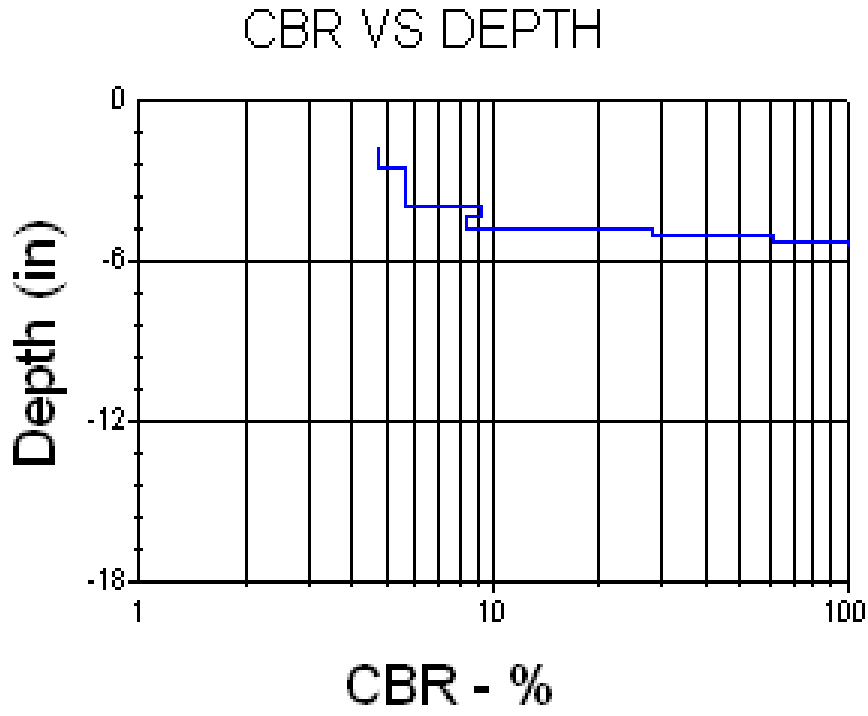
DCP TEST DATA

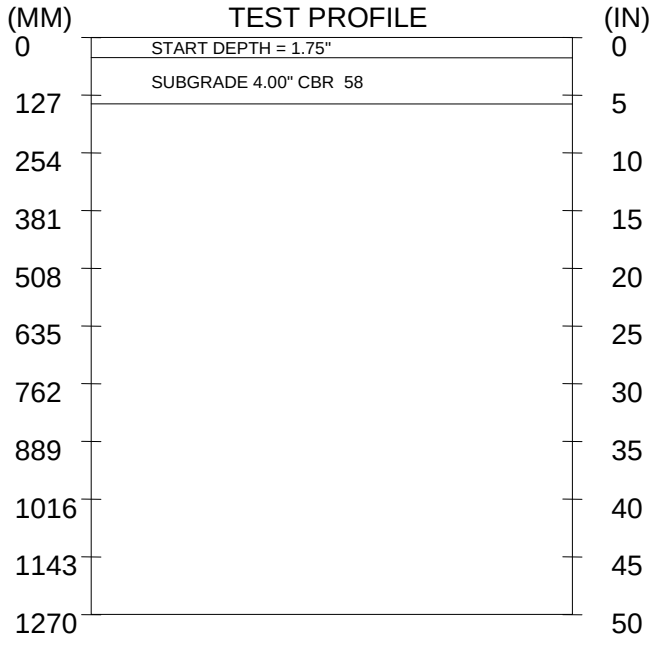
Project: ORTC (FY12) – Water Tower Site

Date: 22 June 2011

Feature: 8A4C-5810

Station: 8A4C-5810



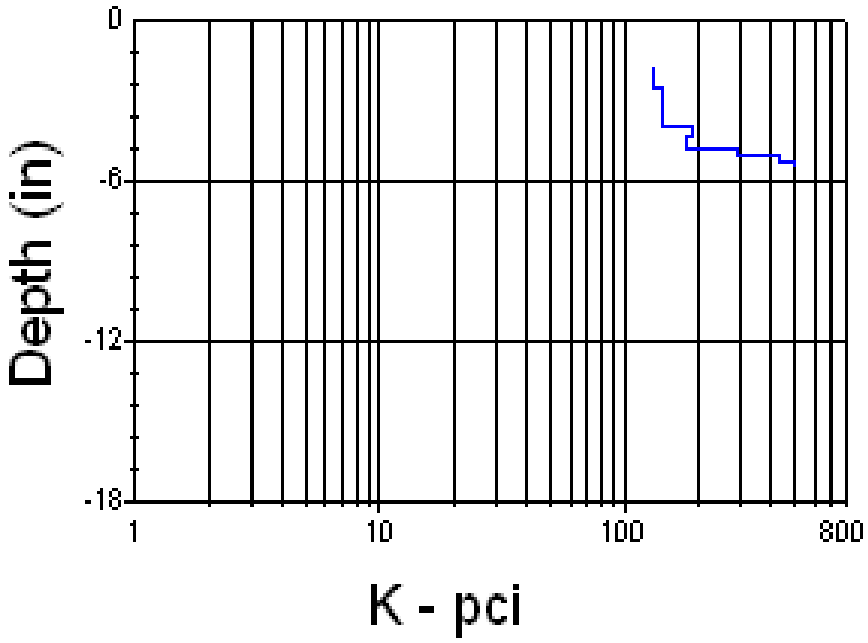


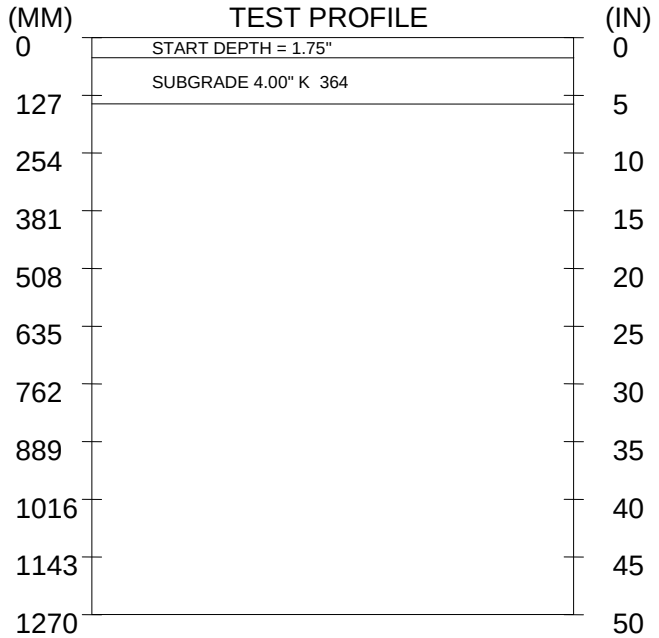
DCP TEST DATA

Project: ORTC (FY12) – Water Tower Site
Date: 22 June 2011

Feature: 8A4C-5810
Station: 8A4C-5810

SUBGRADE MODULUS VS DEPTH





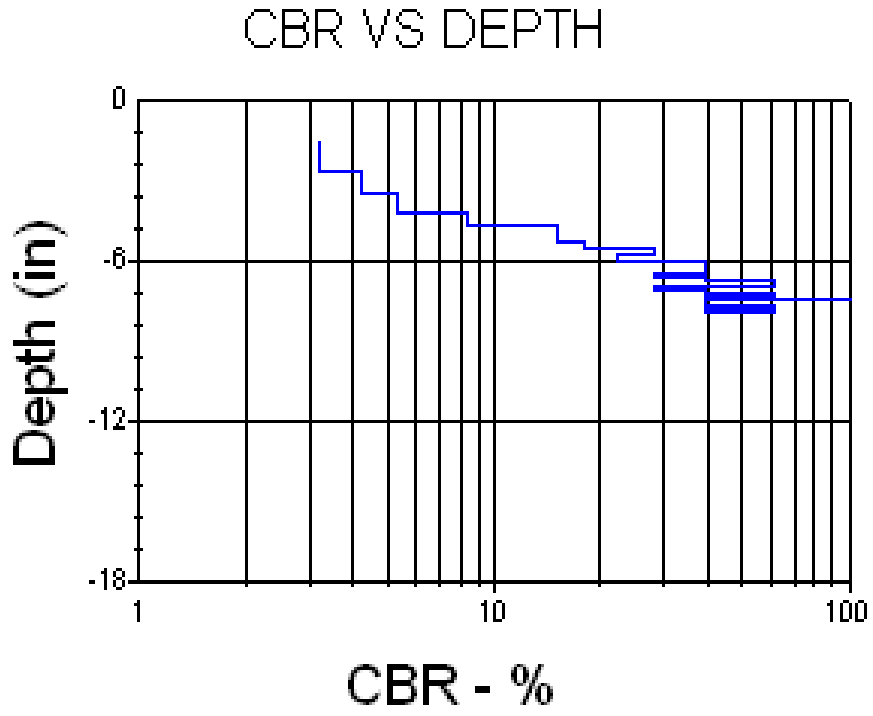
DCP TEST DATA

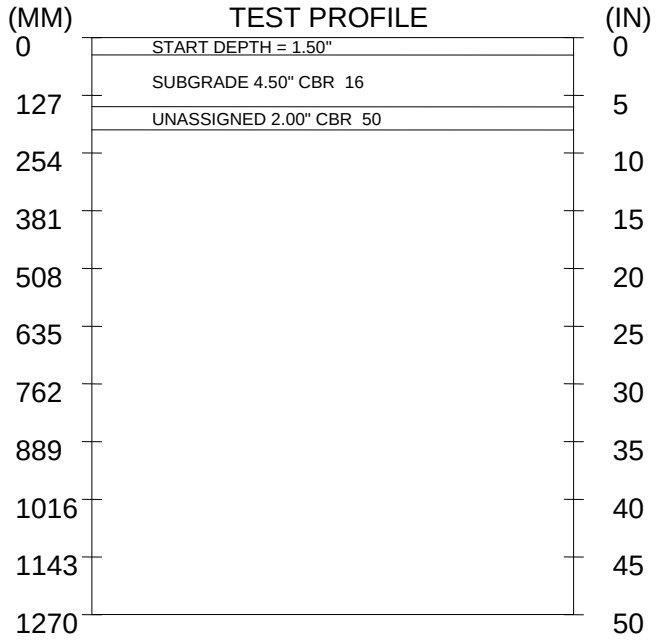
Project: ORTC (FY12) – Water Tower Site

Date: 22 June 2011

Feature: 8A4C-5815

Station: 8A4C-5815



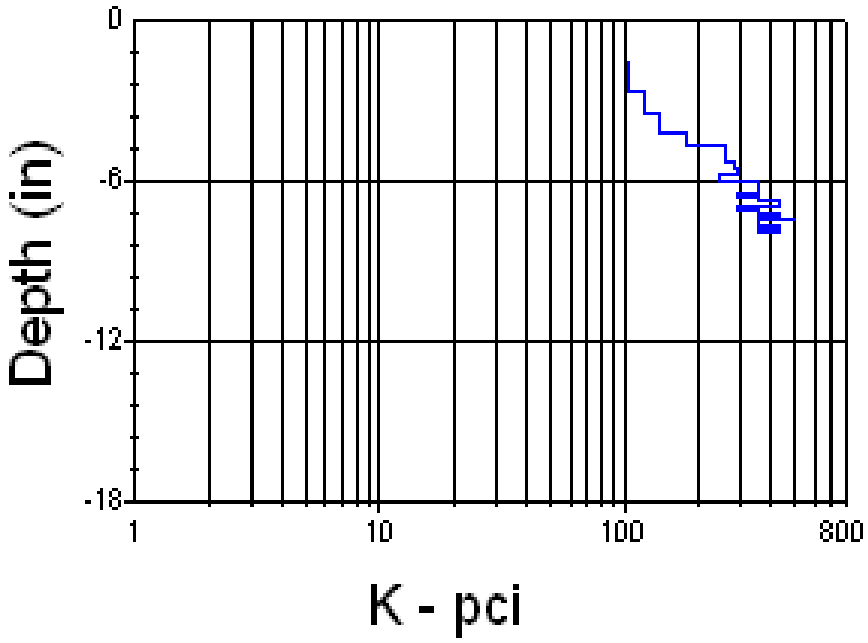


DCP TEST DATA

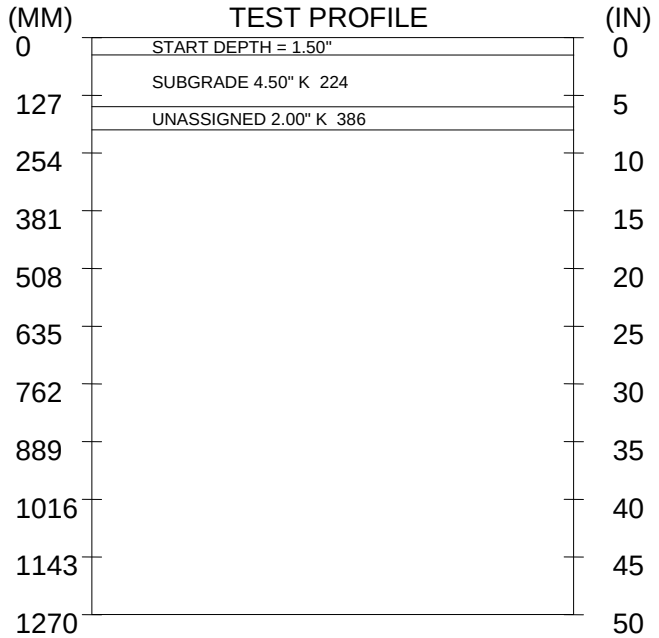
Project: ORTC (FY12) – Water Tower Site
Date: 22 June 2011

Feature: 8A4C-5815
Station: 8A4C-5815

SUBGRADE MODULUS VS DEPTH



TEST PROFILE



APPENDIX E

MAT FOUNDATION DESIGN CRITERIA

WALLACE

DEPARTMENT OF THE ARMY
SOUTHWESTERN DIVISION, CORPS OF ENGINEERS
1114 COMMERCE STREET
DALLAS, TEXAS 75242-0216

REPLY TO
ATTENTION OF

CESWD-ED-TS/G (415a)

29 JAN 1989

MEMORANDUM FOR:

Commander, Albuquerque District, ATTN: CESWA-ED
Commander, Fort Worth District, ATTN: CESWF-ED-DT
Commander, Galveston District, ATTN: CESWG-ED
Commander, Little Rock District, ATTN: CESWL-ED
Commander, Tulsa District, ATTN: CESWT-ED

SUBJECT: Design Criteria for Ribbed Mat Foundations

1. This letter supersedes criteria letter, SWDED-TS/G, 23 Dec 1986, SAB.

2. The enclosed criteria shall be used for design of all ribbed mat foundations. This criteria has been revised to conform with the definition of swell pressure (soil-beam interface pressure) as presented in criteria letter, SWDED-G, 16 Apr 1987, subject: Criteria for Developing Geotechnical Design Parameters for SWD Ribbed Mat Design Methodology. Also, clarification has been provided for application of the PTI design method to family housing.

3. This criteria is furnished to addressees only.

FOR THE COMMANDER:

ARTHUR D. DENYS, P.E.
Chief, Engineering Division

Encl

DESIGN OF RIBBED MAT FOUNDATIONS

BY

JOSEPH P. HARTMAN

AND

B. H. JAMES

U.S. ARMY CORPS OF ENGINEERS

SOUTHWESTERN DIVISION

DALLAS, TEXAS

REVISED

JANUARY 1988

CONTENTS

PART I - GENERAL REQUIREMENTS FOR RIBBED MATS

1. References
2. Background
3. Design Methods
   3.1 Expansive Soils
      3.1.1 Behavior
      3.1.2 SWD Method
      3.1.3 PTI Method
      3.1.4 BRAB Method
      3.1.5 Computer Method
      3.1.6 Load Factors
   3.2 Non-Expansive Soils
   3.3 Soil Properties
4. Minimum Requirements
   4.1 Subgrade Preparation
   4.2 Slab
   4.3 Grid Geometry
   4.4 Rib Size
   4.5 Rib Capacity
   4.6 Prestressed Mats
   4.7 Construction Details

PART II - ANALYSIS OF RIBBED MAT FOUNDATIONS ON EXPANSIVE SOILS

1. Scope
2. General Information
   2.1 Notation
   2.2 Units
   2.3 Rib Definitions
   2.4 Strip Analysis
   2.5 Soil Edge Profile
3. Analysis Method
   3.1 Transverse Rib - Center Lift
   3.2 Transverse Rib - Edge Lift
   3.3 Perimeter Rib
   3.4 Diagonal Rib
   3.5 Interior Rib

APPENDIX A - COMMENTARY ON PART II

APPENDIX B - DESIGN EXAMPLE

PART I - GENERAL REQUIREMENTS FOR RIBBED MATS

1. REFERENCES.

1.1 Engineering Instruction Manual, Corps of Engineers, Southwestern Division, (latest edition).

1.2 "Criteria for Selection and Design of Residential Slabs-on-Ground," Building Research Advisory Board (BRAB), Report No. 33 to the Federal Housing Administration, 1968.

1.3 "Design and Construction of Post-Tensioned Slabs-on-Ground," Post Tensioning Institute (PTI), 1980.

1.4 TM 5-818-7, Foundations in Expansive Soils, Corps of Engineers, 1983.

1.5 Letter, SWDED-G, 16 April 1987, Criteria for Developing Geotechnical Design Parameters for Ribbed Mat Design Methodology (Criteria Letter XV 7-12).

2. BACKGROUND.

Ribbed mat foundations consist of a thin slab on grade which acts monolithically with a grid of stiffening beams beneath the slab. The beams (ribs) are cast in trenches dug in the foundation soil. Ribbed mats combine the economic advantages of shallow foundations with the performance advantages of monolithic floors. Ribbed mats are especially useful for minimizing differential foundation movements in areas with expansive soils.

3. DESIGN METHODS.

3.1 EXPANSIVE SOILS.

3.1.1 Behavior.

3.1.1.1 Center Lift. In the center lift condition the soil near the edge of the slab drops in relation to the soil near the center. This is due to moisture retention by the interior soils and the drying and shrinking of perimeter soils. As this occurs, the perimeter soil provides less support for the edge of the slab which then acts as a cantilever. This is illustrated in Figure A1 of Appendix A.

3.1.1.2 Edge Lift. In the edge lift condition the soil near the edge of the slab rises in relation to the soil near the center. This is due to the increasing moisture content and subsequent swelling of soil near the edge. The swelling soil raises the edge of the slab, causing some of the slab to lift off the soil. Interior loads cause the slab to sag and recontact the soil at some interior location. The slab thus tends to act as

a beam, simply supported by the soil at the edge, and by soil towards the center of the slab. The amount of support at the center depends on numerous parameters such as interior loads, rib bending stiffness, soil swell pressures, and the magnitude of soil swelling. Typical edge lift behavior is illustrated in Figure A3 of Appendix A.

3.1.2 SWD Method. All ribbed mats on expansive soils, except for family housing, shall be designed in accordance with the provisions of Part II of this report. Ribbed mats for family housing may be designed in accordance with Part II or paragraphs 3.1.3 or 3.1.4.

3.1.3 PTI Method. The PTI method (reference 1.3) may only be used for design of family housing foundations on expansive soils. Specifically, slab width (short dimension) should not exceed 40 feet, rib depths should not exceed 30 inches, loading should consist only of perimeter loads and light interior distributed loads ($DL+LL \leq 100$ psf), soils should be fairly weak in-situ materials with no extensive substitution of non-expansive fill. When using the PTI method, the following provisions shall apply: Rib spacing shall not exceed 15 feet; concrete tensile stress shall not exceed $4\sqrt{f'c}$; the minimum effective prestress shall be 100 psi.

3.1.4 BRAB Method. The BRAB report (reference 1.2) may only be used for design of foundations for family housing. However, the PTI method is preferred, since the BRAB method may produce unreasonable results for large foundations.

3.1.5 Computer Method. In lieu of paragraph 3.1.2, ribbed mats may be designed using appropriate computer programs. Such programs must be capable of modeling the variable soil swell due to moisture changes, and the non-linear soil-structure interaction near the perimeter of the foundation. One such computer program is CBEAMC, program X0050 in the Corps of Engineers Civil Engineering Library.

3.1.6 Load Factors. When using the above methods to design ribbed mats for center lift and edge lift conditions, load factors may be multiplied by .75 (strength method) or allowable stresses may be increased by one-third (working stress method). This provision does not apply to the allowables given for the PTI method, since those allowables have already been increased from the usual provisions of ACI.

3.2 NON-EXPANSIVE SOILS. Ribbed mat slabs on non-expansive soils need not be designed for bending due to center lift or edge lift conditions. Beam on elastic foundation analyses may be used to determine the effects of concentrated loads on ribs, or ribs may be designed as conventional strip or spot footings.

3.3 SOIL PROPERTIES. Soil properties for design of ribbed mats will be provided in the Foundation Design Analysis by the Corps of Engineers. Criteria for developing these properties is included in reference 1.5. The properties necessary for design in accordance with paragraph 3.1.2 consist of the following, which are defined in Appendix A:

qa - allowable bearing pressure
k - subgrade modulus
Ym - soil heave
Lm - edge moisture variation distance
Psw - pressure of swelling soil acting on perimeter rib

4. MINIMUM REQUIREMENTS.

4.1 SUBGRADE PREPARATION. A vapor barrier, capillary water barrier, and a minimum of 18 inches of non-expansive fill will normally be used beneath ribbed mats. Additional non-expansive fill will often be used to lessen the effects of highly expansive soils. These requirements will be detailed in the Foundation Design Analysis.

4.2 SLAB. For family housing and other small lightly loaded buildings a 4 inch slab may be used. For other buildings the minimum slab thickness will be 5 inches. Minimum slab reinforcing shall be 0.2 percent. Where slabs are subjected to vehicular loading they must be designed for the maximum wheel load, similar to paving. Use 650 psi flexural strength concrete for slabs subject to wheel loads.

4.3 GRID GEOMETRY. Ribs should be located to form a continuous grid. Rib spacing should not exceed 20 feet in expansive soils, or 25 feet in non-expansive soils. Locations of ribs should conform to significant wall and column loads, and may be used to resist thrusts from rigid frame reactions. Ribs should be provided around large openings in the slab. In expansive soils diagonal ribs are required at exterior corners.

Expansion joints should be provided at 250 foot intervals, and should also be used to break irregularly shaped buildings into rectangular segments. Foundations for family housing do not require expansion joints due to irregular shapes.

4.4 RIB SIZE. Minimum rib depth is 20 inches. Rib depths should usually not exceed 3 feet to minimize construction difficulties related to placing reinforcement and maintaining trench walls. If deeper ribs are used, rib width should also be increased. Minimum rib width is 12 inches except for family housing foundations, where 10 inch ribs may be used. Sufficient rib width must also be provided to transfer wall and column loads to the soil as strip footings. The allowable soil bearing capacity may not be exceeded when considering the width of the rib plus an effective slab width on each side of the rib. The

effective slab width for bearing is limited to the thickness of the slab. At column locations an alternate is to provide fillets at rib intersections, sufficient to act as spot footings for column loads.

4.5 RIB CAPACITY. Concrete should have a minimum compressive strength of f'c=3000 psi at 28 days. Reinforcing shall be grade 60, except ties may be grade 40. Minimum reinforcing ratio (As/Ag) shall be .0033 top and .0033 bottom, this may be reduced to .005 total in non-expansive soils. Use #3 ties at 24 inches, minimum. These minimums should be sufficient for shrinkage stresses and for unpredictable soil behavior.

4.6 PRESTRESSED MATS. For prestressed ribbed mats, not designed per PTI, all the above minimum requirements apply except that slab and rib top reinforcement may be deleted and replaced by appropriate post-tensioning strands. Mild steel shall still be provided in the bottom of ribs. Minimum effective prestress shall be 100 psi on the gross area of the slab, including effects of subgrade friction as calculated by the PTI method, reference 1.3. Concrete tensile stress shall be limited to $3\sqrt{f'c}$ and shear stress limited to $1.1\sqrt{f'c}$. A one-third overstress may be allowed per paragraph 3.1.6.

4.7 CONSTRUCTION DETAILS.

4.7.1 Conventionally Reinforced. Construction joint spacing should not exceed 50 feet in either direction. A horizontal construction joint may be provided in the ribs at the base of the capillary water barrier when unstable trench walls may cause construction difficulties. However, this joint is discouraged because of increased potential for shrinkage cracks in the slab.

4.7.2 Prestressed. Construction joint spacing shall not exceed 75 feet in either direction. Tendons within each placement shall be stressed to 15 percent of the final prestress not more than 24 hours after the concrete has attained sufficient strength to withstand the partial prestress. Other construction procedures for prestressed ribbed mats shall conform to reference 1.3.

4.7.3 Contractor Designs. Ribbed mat foundations may be designed as prestressed or conventionally reinforced as selected by the engineer. The plans and specifications shall not include the option of changing the ribbed mat from one type to another. The reason for this prohibition is that design parameters (e.g., moments of inertia) may be dependent on the type of ribbed mat being designed and may affect calculated shears and moments. This does not prohibit revisions of the slab type as a result of contractor value engineering proposals. However, such revisions must include a complete design of the ribbed mat foundation using appropriate design parameters in accordance with this report.

PART II - ANALYSIS OF RIBBED MAT FOUNDATIONS ON EXPANSIVE SOILS

1. SCOPE. This part of the report contains the basic rules for design of ribbed mats in expansive soils. This method may be used to predict shears, moments and deflections in ribs subject to soil movement due to changing moisture content. For a commentary on the design method refer to Appendix A; for example design calculations refer to Appendix B. The design method from Part II should be used in conjunction with the "minimum requirements" for ribbed mats, as presented in Part I.

2. GENERAL

2.1 NOTATION.

- C = Correction factor for equivalent cantilever length
- D = Beam deflection (IN)
- I = Moment of inertia per foot, I=Ir/S (IN^4/FT)
- Ir = Moment of inertia of rib (IN^4)
- * k = Modulus of subgrade reaction (PCI)
- Lo = Basic length of cantilever (FT)
- Lc = Equivalent length of cantilever, center lift (FT)
- Le = Equivalent length of simple beam, edge lift (FT)
- Li = Distance from perimeter to location of interior load (FT)
- * Lm = Edge moisture variation distance (FT)
- Lb = Width of soil bearing at perimeter, edge lift (FT)
- M = Bending moment per foot (FT-LB/FT)
- Mr = Bending moment per rib, Mr=MxS (FT-LB)
- Pi = Interior load (PLF)
- Pp = Perimeter load (PLF)
- * Psw = Pressure of swelling soil on perimeter rib (PSF)
- R = End reaction at perimeter for equivalent simple beam (PLF)
- S = Rib spacing (FT)
- w = Uniform load (PSF)
- V = Shear per foot (LB/FT)
- Vr = Shear per rib, Vr=VxS (LB)
- * Ym = Soil heave (IN)
- θ = Rotation of support of equivalent cantilever (RAD)

* q_a = ALLOWABLE BEARING PRESSURE (PSF)

2.2 UNITS. The equations presented in section 3 are written for units as defined in the above notation. If other units are used the equations must be modified appropriately.

2.3 RIB DEFINITIONS. Ribs are defined as perimeter, transverse or diagonal as shown in Figure 1. Note that transverse refers to ribs parallel to either axis of the building.

* VALUES NEEDED FROM GEOTECH

FIGURE 1 - RIB DEFINITIONS

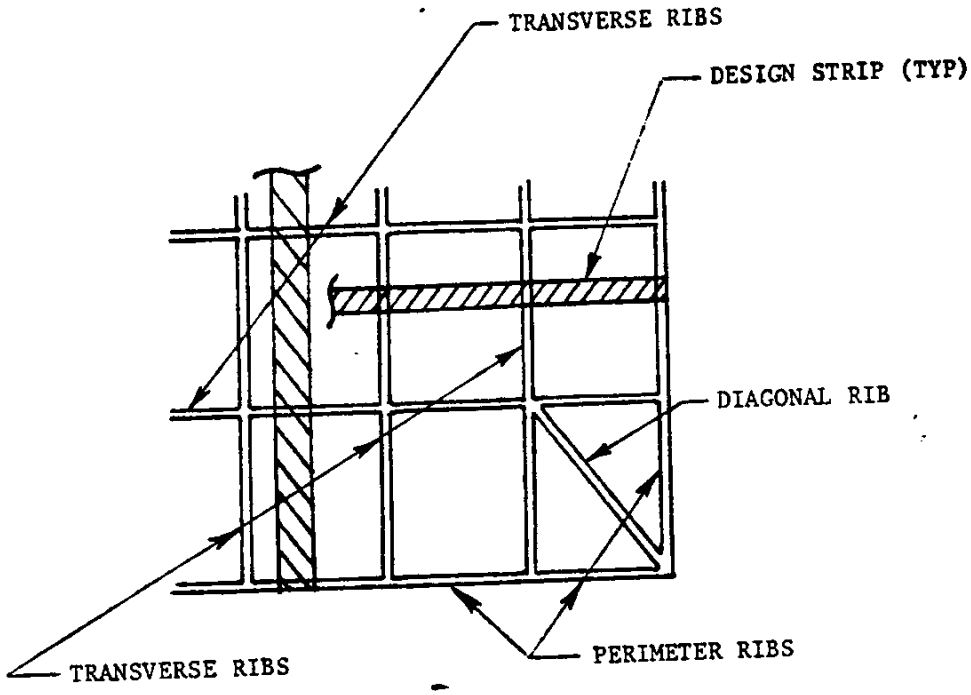
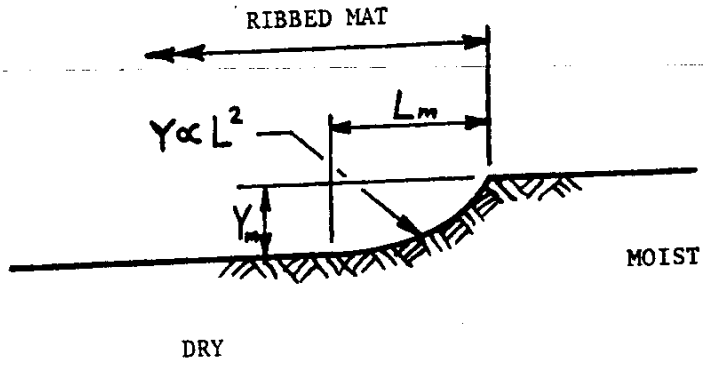


FIGURE 2 - SOIL EDGE PROFILE



2.4 STRIP ANALYSIS. The analysis is based on a strip assumption, ignoring the effects of the grid configuration of the ribs. The formulas and examples presented below are for an equivalent 1-foot strip, using "per foot" values for loads and stiffness.

2.5 SOIL EDGE PROFILE. For edge lift the maximum swell occurs at the perimeter and decreases rapidly toward the interior. The soil profile is assumed to be parabolic (in the unloaded condition) and is illustrated in Figure 2.

3. ANALYSIS METHOD.

3.1 TRANSVERSE RIB - CENTER LIFT.

3.1.1 General. Center lift analysis is based on an equivalent cantilever beam to determine moments, shears and deflections.

3.1.2 Moment. The length of the equivalent cantilever can be calculated as:

$$Lc = C \times Lo$$

where: $Lo = 2.3 + .4\ Lm$

$$C = .8\ Ym^{.12}\ I^{.16} / Pp^{.12}$$

The maximum moment may then be calculated from statics using conventional cantilever formulas such as:

$$M = Pp\ Lc + 1/2\ w\ Lc^2$$

The moment can then be assumed to be constant for a distance Lc/2 and then to decrease linearly to zero at a distance 5Lc from the perimeter. To obtain the design moment for a given rib, multiply the calculated per-foot moment by the appropriate rib spacing ($Mr = M \times S$).

3.1.3 Shear. The maximum shear may be calculated from statics using the same equivalent cantilever as for moment.

$$V = Pp + w\ Lc$$

The shear may then be assumed to decrease linearly from V at the cantilever support, to zero at a distance 5Lc from the perimeter. To obtain the design shear for a given rib, multiply the calculated per-foot shears by the appropriate rib spacing ($Vr = V \times S$).

3.1.4 Deflection. Deflection at the perimeter is the sum of three components: bending deflection of the equivalent cantilever, vertical translation of the cantilever support, and rotation

of the cantilever support. Rotation of the support may be calculated as:

$$\theta = M^{1.4} / 9800\ I\ k^{.5}$$

The perimeter deflection is then:

$$D = .11 + 12\ Lc\ \theta$$

where .11 inches is an approximation for the support translation plus the cantilever bending, and (12 Lc) is the length in inches.

Use the deflection calculated above to compare with allowable deflection. The allowable deflection may be determined by using 4Lc as the length between points of zero and maximum deflection.

3.2 TRANSVERSE RIB - EDGE LIFT.

3.2.1 General. Edge lift analysis is based on an equivalent simple beam, supported at the perimeter and at some interior location.

3.2.2 Deflection. The first step in calculating deflection is to determine the length of the equivalent simple beam. The appropriate length depends on many parameters, including the deflection. Therefore, deflection must first be estimated to determine equivalent length, then a deflection is calculated based on that length. The process is repeated until calculated deflection matches the assumed deflection. The equivalent simple beam length may be calculated as:

$$Le = 7.5\ I^{.17}\ Li^{.37}\ D^{.12} / w^{.07}\ Pi^{.11}$$

The perimeter end reaction for this beam may be calculated from statics. For a given case the reaction may be:

$$R = Pp + 1/2\ w\ Le + Pi(Le-Li)/Le$$

The width of soil bearing at the perimeter can be approximated as:

$$Lb = 1.1\ (R/Psw)$$

where Psw is selected from a curve of heave versus bearing pressure, corresponding to the estimated deflection used during this iteration (see reference 1.5).

The edge deflection is found by determining the soil swell at a distance Lb from the perimeter, based on the parabolic swell profile:

$$D = Ym(Lm-Lb)^2/Lm^2$$

When satisfying deflection criteria, use the calculated deflection and equivalent simple beam length.

3.2.3 Moment. Once the simple beam equivalent length has been determined, the bending moments may be calculated based on statics. To obtain rib design moments, multiply per-foot moments by the rib spacing.

3.2.4 Shear. Once the simple beam equivalent length has been determined, the shears may be calculated based on statics. To obtain rib design shears, multiply per-foot shears by the rib spacing. Near the interior support the design shear need not exceed:

$$V = Pi + w(Le-Li)$$

This is due to the effects of the actual distributed soil support, rather than the point support assumed in the simple beam analysis.

3.2.5 Special Cases. If Pi=0 or if Li>Le make the following substitution in the equation for Le:

$$1.4 = Li^{.37} / Pi^{.11}$$

The equation for the simple beam length then becomes:

$$Le = 10.5\ I^{.17}\ D^{.12} / w^{.07}$$

3.3 PERIMETER RIB.

3.3.1 Center Lift. For center lift the perimeter rib will have no support from the soil and must be designed to span between transverse ribs for the perimeter wall loads.

3.3.2 Edge Lift. For edge lift the soil pressure on the perimeter rib will exceed the applied perimeter loads. The perimeter rib must designed to span between transverse ribs for this net upward force.

3.4 DIAGONAL RIB. Diagonal ribs are used to support exterior corners for center lift conditions, if loss of support occurs under both perimeter ribs. Diagonal ribs must be designed to provide the same moment and shear capacity as the larger of the two adjacent transverse ribs.

3.5 INTERIOR RIB. Interior ribs and rib intersections should be located at significant wall and column loads. The ribs can be designed for these loads as strip or spot footings, using beam-on-elastic-foundation methods. Differential soil movement due to moisture change is assumed not to occur except at the perimeter. However, to account for unpredictable interior soil movements, interior ribs must have the minimum size and capacity as required in Part I.

APPENDIX A - COMMENTARY ON PART II

1. SCOPE. Actual behavior of ribbed mats in expansive soils involves complex, non-linear, soil-structure interaction. The best solution for such behavior is provided by computer programs. The hand design method has been developed to approximate such computer results. Hand solutions have been checked by computer analyses; results have been within acceptable limits of error. However, such checks have been made only for a limited range for each design parameter, as shown in Table A1, corresponding to the usual values for military construction within Southwestern Division. If a wider range of parameters is applied to the hand design formulas, the results may be less accurate.

TABLE A1

Parameter	Units	Minimum	Maximum
k	pci	50	200
Ym	in	0.5	3.0
Lm	ft	2	8
I	in^4/ft	750	6000
Pp	lb/ft	1000	5000
Pi	lb/ft	0	5000
Li	ft	6	20
w	psf	100	250
Psw	psf	2000	8000

2. GENERAL.

2.1 NOTATION.

Ir = moment of inertia of rib. For non-prestressed rib mats Ir should be the effective moment of inertia, calculated per ACI 318, Section 9.5.2.3.

k = Modulus of subgrade reaction. This parameter is the ratio of the soil pressure at the base of the concrete and the corresponding settlement. Since modulus values are typically determined by plate-load test at the ground surface, they should be corrected for depth and for footing size (expected high pressure area between concrete and soil). Analyses have indicated that the high bearing pressure area for center lift conditions will occur in an area several feet long parallel to the transverse rib and several feet on each side of the rib. A crude approximation for this area would be 5 feet square. This approximation should be adequate for design, since calcualations are not sensitive to small changes in the modulus of subgrade reaction.

qa = Allowable bearing pressure. This is the safe bearing capacity of the soil at the base of the ribs. A factor of safety of 3.0 is recommended for computing this value.

Lm = Edge moisture variation distance. This represents the distance, inward from the edge of the slab, over which the moisture content of the soil changes. Much judgement is required in determining this value.

Psw = Pressure of swelling soil on perimeter rib. This is the interface pressure between the soil and the base of the exterior rib, due to an increase in soil moisture content. The pressure which can be exerted by the swelling soil is dependent on the amount the surface of the soil is allowed to rise. Therefore Psw is usually presented as a curve of pressure versus heave, as described in reference 1.5 of Part I. The actual upward deflection of the edge of the slab is a complex interaction between swell potential, structural loads, and mat stiffness, all of which combine to determine the interface pressure near the perimeter.

Ym = Soil heave. This is the differential vertical movement of the soil representing either soil heave (edge lift) or soil shrinkage (center lift). The magnitude of Ym is the computed vertical movement of a particle of soil at the ground surface due to a change in moisture content. This value should be based on the accumulation of potential volume changes for the full thickness of the active zone (Za), with no significant loads applied to the foundation. The value of Ym may differ for edge lift and center lift conditions.

Pi, Pp, w = Applied loads. Loads should consist of full dead plus live loads, including dead load of the slab and ribs.

2.2 UNITS.

2.3 RIB DEFINITIONS.

2.4 STRIP ANALYSIS. The hand solution formulas have been developed for analysis of an equivalent 1 foot strip. This is convenient for uniform loads and for soil properties, but requires some calculations for appropriate concentrated loads and bending stiffness. Rib stiffness must be divided by rib spacing to get the per-foot stiffness. If column loads exist they must also be divided by the rib or column spacing to provide an equivalent load per foot. If interior wall loads are parallel to the transverse rib, they must be divided by the rib spacing. These calculations are illustrated in Appendix B.

2.5 SOIL EDGE PROFILE. The edge lift condition occurs when increased moisture content swells exterior soils, and this effect extends under the edge of the slab. The center lift condition occurs when soils under the slab are generally moist and seasonal drying occurs on the exterior, again extending under the slab. This causes the soil to shrink away from the edge of the slab.

The analysis method is based on an assumed parabolic swell profile which occurs uniformly along the perimeter. This is a convenient idealization of actual soil behavior, which is certainly more erratic. However, the parabolic profile has better correlation with measured swells than do other possible edge profile assumptions. Note that the soil profile is not used in the hand design formulas for center lift. However, a parabolic profile was used in the computer analyses for center lift, which formed the basis for the hand design forumlas.

3. ANALYSIS METHOD. Many of the formulas for shears, moments and reactions are idealized, assuming Pp and R are exactly at the perimeter and that w extends to the perimeter. These approximations should usually be acceptable, but the formulas may be modified to account for actual load patterns.

3.1 TRANSVERSE RIB - CENTER LIFT

3.1.1 General. Typical behavior of a transverse rib for center lift conditions is shown in Figure A1. This illustrates the soil bearing pressure and the shear, moment and deflection. Note that the effects of the soil movement extend much farther than the moisture variation distance. The moment and shear distribution close to the edge resemble cantilever behavior.

3.1.2 Moment. The extent of significant moments is illustrated in Figure A1. The length of the equivalent cantilever can be taken as a basic length (Lo) which is dependent on the moisture variation distance, times a correction factor (C) which accounts for secondary effects of several parameters. The value of the correction factor will usually be slightly greater or less than unity. The correction factor was developed to permit accurate approximations of computer results. It was developed from the ratios of actual values to usual values for significant parameters. For example, the "usual" values are: Ym = 1 in, I = 1500 in^4/ft, Pp = 3000 lb/ft. Thus:

$$C = (Ym/1.0)^{.12} (I/1500)^{.16} (3000/Pp)^{.12}$$

$$C = .8\ Ym^{.12}\ I^{.16}/\ Pp^{.12}$$

A similar approach was used to develop all the formulas in Part II which have an exponential format.

3.1.3 Shear. Maximum shear occurs near the support of the equivalent cantilever. The extent of significant shears is illustrated in Figure A1.

3.1.4 Deflection. Formulas for deflection include an assumed concrete modulus of elasticity Ec = 3,320,000 psi, for both center lift and edge lift.

Vertical movement at the perimeter is much greater than the bending deflection of the equivalent cantilever. To predict the deflection it is necessary to consider translation and rotation at the support of the equivalent beam. The most significant component is due to rotation at the support. These

components of deflection are shown in Figure A2. The sum of the cantilever bending and the support translation are approximated by the value 0.11 inch. The percent error due to this approximation is negligible when total deflections are large. The percent error is greater when total deflections are small, but then the deflections are not significant anyway.

Allowable deflections (see Part I, reference 1.1) are expressed as a ratio of the difference in vertical movement at any two points, compared to the distance between those points. For example: $D \leq L/600$, where D is the differential displacement. In such formulas it is appropriate to use the point of maximum deflection and a point of near-zero deflection as the two measuring points. For center lift behavior the maximum deflection occurs at the perimeter, and deflections tend to die out at approximately 4Lc (four times the equivalent cantilever length) from the perimeter. Therefore, the ratio D/4Lc is appropriate for comparison with allowable deflections.

3.2 TRANSVERSE RIB - EDGE LIFT.

3.2.1 General. Typical behavior of a transverse rib for edge lift conditions is shown in Figure A3. This illustrates the soil bearing pressure and the shear, moment and deflection. Soil swell lifts the edge of the ribbed mat, which actually rises off the soil for some distance from the perimeter. For shear and moment, this portion of the rib acts as a simply supported beam spanning between soil support at the perimeter and at an interior location.

3.2.2 Deflection. Vertical movement at the perimeter is driven by the tendency of the soil to swell, and is resisted by the downward loads applied on the soil. As the soil swells at the perimeter the slab is lifted off the interior soil. This concentrates soil reactions near the edge, causing very high pressures. The pressures rise so high that they limit the capacity of the soil to swell. Thus, the soil cannot swell as much as it would if not loaded. Deflections can be predicted by balancing the upward force of the soil (the swell pressure times the bearing width) with the downward force of applied loads. This downward force can be determined from statics once an equivalent simple beam length is determined. The method for determining the deflection is shown in Figure A4.

Allowable deflections are expressed as ratios, as discussed in the commentary on paragraph 3.1.4. From Figure A3 it can be seen that the appropriate values for this ratio are the edge deflection and the equivalent simple beam length (D/Lc).

Edge lift deflections are mainly a function of soil properties and applied loads, bending stiffness of the ribs has only a secondary effect. Therefore, it may not be possible to control deflections by increasing the rib stiffness. It may be necessary to accommodate calculated deflections by using a less brittle superstructure or by detailing the superstructure to make it less sensitive to deflections. Or it may be necessary to modify soil properties to minimize the edge heave.

3.2.3 Moment. The moments can be calculated by statics, using the equivalent simple beam. The maximum moment will occur at the point of zero shear. Note that the maximum moment is quite sensitive to the beam length, therefore the iterative solution for deflection and appropriate swell pressure must converge accurately before calculating moments.

3.2.4 Shear. Shears can also be calculated by statics from the equivalent simple beam. Note that shears will reduce gradually to near-zero around the interior end of the beam because of the distributed soil support.

3.2.5 Special Cases. If no concentrated interior load exists, or if it is very far from the perimeter, the formula for the simple beam length must be adjusted as shown. This adjusted formula was also developed to duplicate results from computer solutions.

3.3 PERIMETER RIB.

3.4 DIAGONAL RIB.

3.5 INTERIOR RIB. Potential soil heaves in the interior are unpredicatable and are generally due to localized moisture conditions, for example, due to a leaking pipe. Such conditions cannot be accounted for by design forumlas. Adequate strength and stiffness for such unpredictable heaves should be supplied by the minimum requirements listed in Part I of the report. For interior wall or column loads the interior ribs should be designed in accordance with Part I, section 3.2.

FIGURE A1 - CENTER LIFT BEHAVIOR

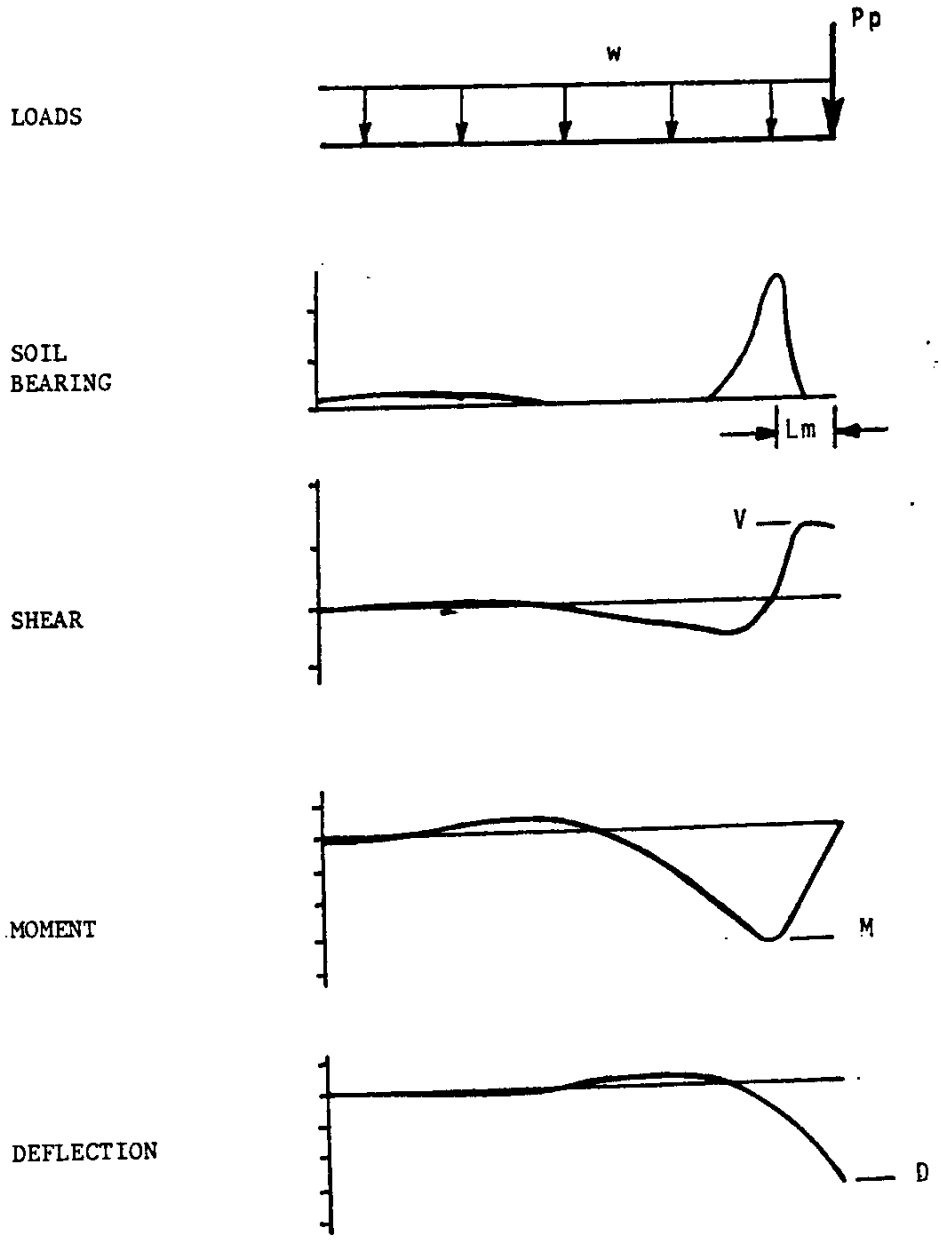
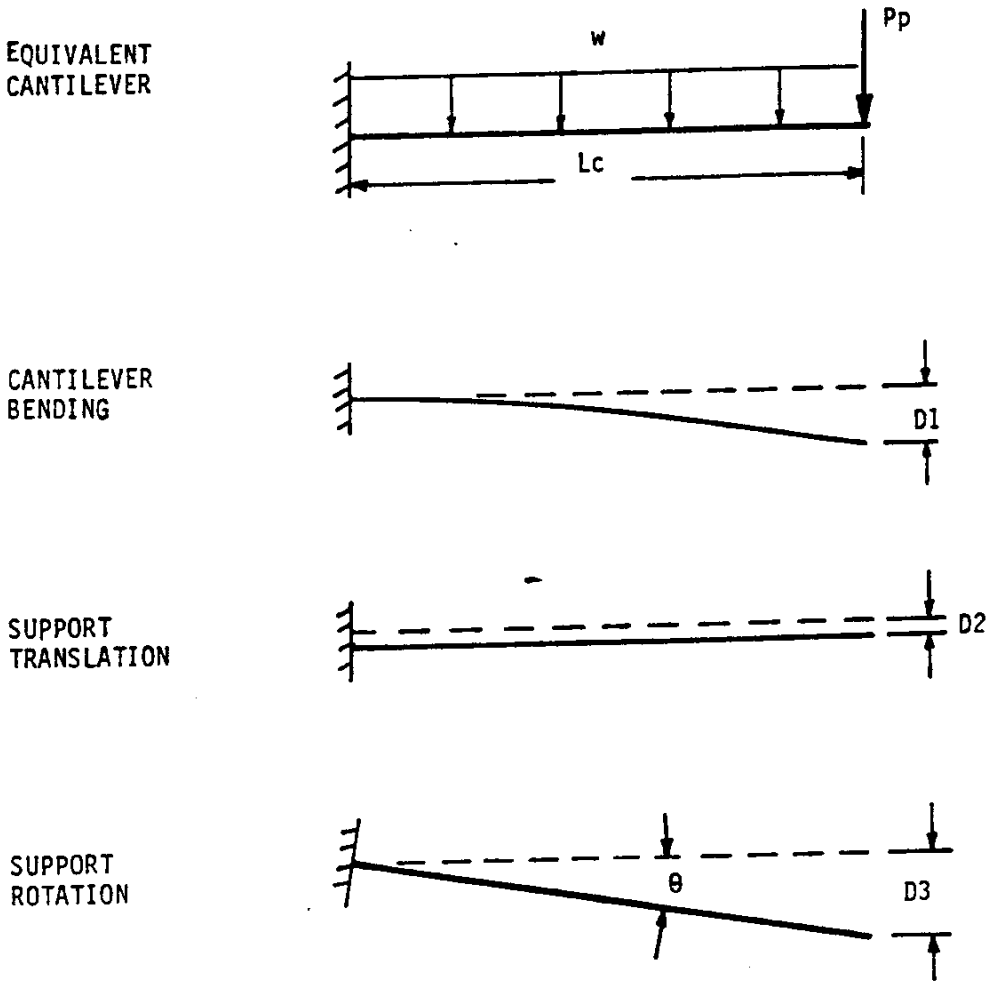


FIGURE A2 - CENTER LIFT DEFLECTION



$$D = D1 + D2 + D3$$

$$D1 + D2 = .11$$

$$D3 = 12\ Lc\ \theta$$

FIGURE A3 - EDGE LIFT BEHAVIOR

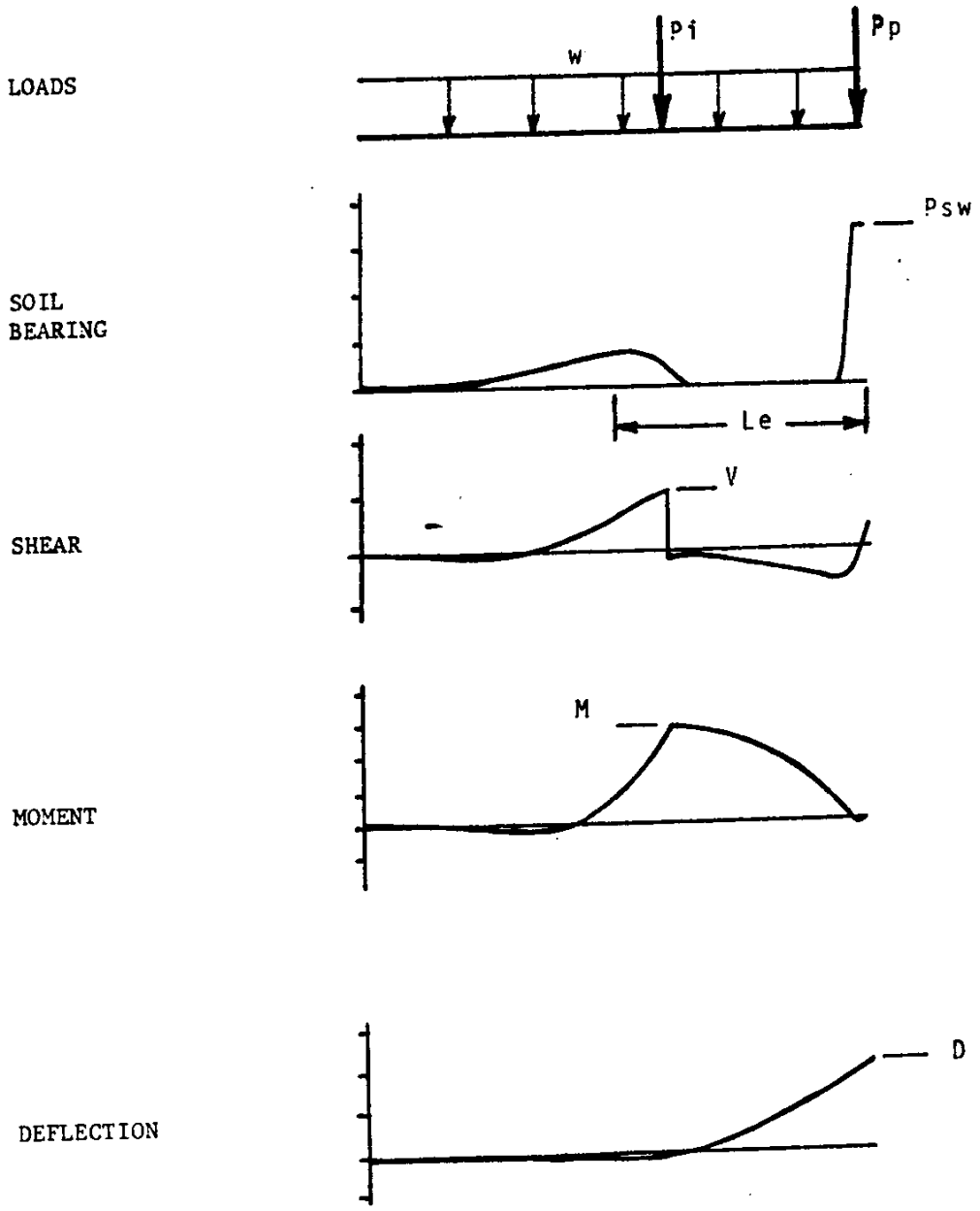
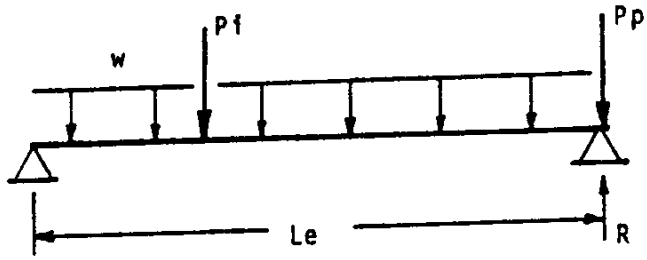
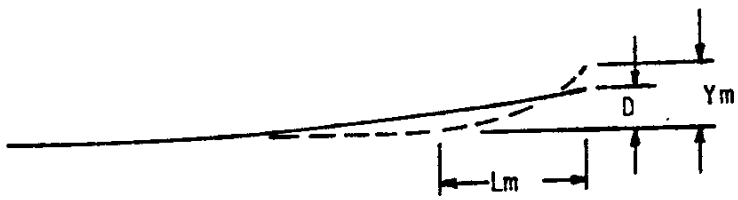


FIGURE A4 - EDGE LIFT DEFLECTION

EQUIVALENT SIMPLE BEAM

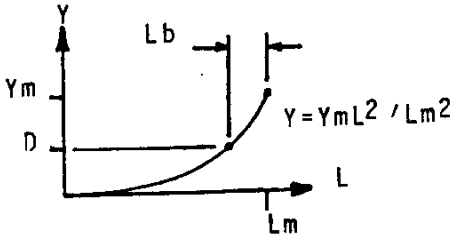


DEFLECTED SHAPE



BEARING PRESSURE

SOIL EDGE PROFILE



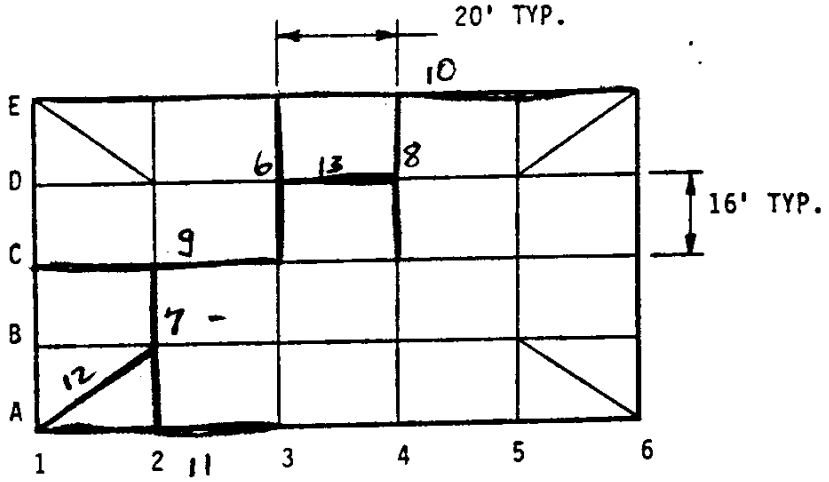
APPENDIX B - DESIGN EXAMPLE

(RIBBED MAT DESIGN IN EXPANSIVE SOIL)

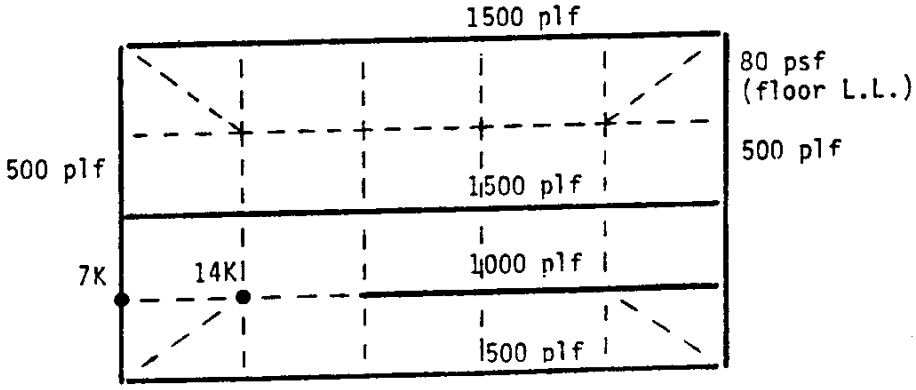
1. SOIL DATA (ref. Part I - 3.3)

qa = 2000 psf
Psw = (see page B9)
k = 100 pci
Lm = 6 ft
Ym = 1.5 in for center lift
Ym = 1.0 in for edge lift

2. FOUNDATION PLAN (ref. Part I - 4.3)



3. LOADS



4. BEARING DESIGN FOR RIBS (ref. Part I - 4.4)

Maximum wall load (P) = 1500 plf

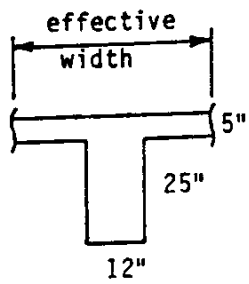
Width $\geq$ P/qa = 1500/2000 = .75 ft

Use 12 inch wide ribs (minimum)

5. INTERIOR RIB PROPERTIES (ref. Appendix A - 2.1)

Ec = 3,320,000 psi

(effective flange width per ACI 318, section 8.10.2 For "span length" use 4Lc for center lift or Le for edge lift)



Let Ir = 36,000 in^4 for center lift
Ir = 24,000 in^4 for edge lift
(ref. ACI 318, section 9.5.2.3, verify Ir after calculating M)

I = Ir/S (in^4/ft):

Rib spacing	16 ft	20 ft
Center lift	2250	1800
Edge lift	1500	1200

6. CENTER LIFT DESIGN - RIB E3/C3

6.1 Loads (ref. Appendix A - 2.1)

slab weight = 150 pcf x 5/12 ft = 62 psf

w = DL + LL = 62 + 80 = 142 psf

rib weight = 150 pcf x 2.5 ft x 1.0 ft = 375 plf

Pp = rib + wall = 375 + 1500 = 1875 plf

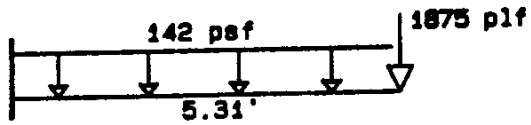
6.2 Equivalent cantilever (ref. Part II - 3.1)

$Lo = 2.3 + .4\ Lm = 2.3 + (.4 \times 6) = 4.7$ ft

$C = .8\ Ym^{.12}\ I^{.16} / Pp^{.12}$

$C = .8 \times 1.5^{.12} \times 1800^{.16} / 1875^{.12} = 1.13$

$Lc = Lo\ C = 4.7 \times 1.13 = 5.31$ ft



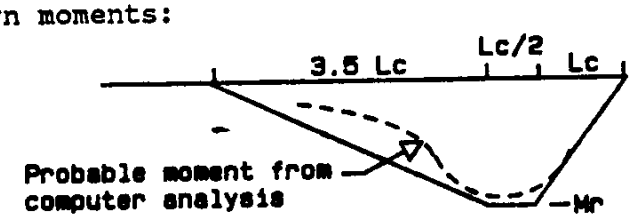
6.3 Moment (ref. Part II - 3.1.2)

$M = Pp\ Lc + 1/2\ w\ Lc^2$

$M = 1875 \times 5.31 + 1/2 \times 142 \times 5.31^2 = 12{,}000$ ft-lb/ft

$Mr = M \times S = 12000 \times 20 = 240{,}000$ ft-lb/rib

Design moments:

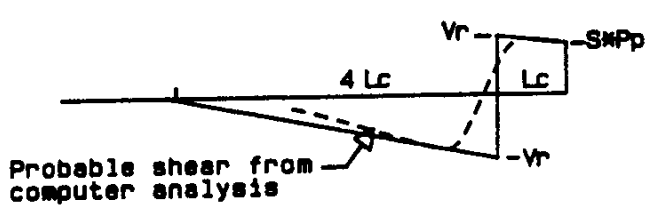


6.4 Shear (ref. Part II - 3.1.3)

$V = Pp + w\ Lc = 1875 + 142 \times 5.31 = 2630$ lb/ft

$Vr = V \times S = 2630 \times 20 = 52{,}600$ lb/rib

Design shears:



6.5 Reinforcing in rib (ref. Part I - 3.1.6 and 4.5)

As = (Mr/ad)/1.33

As = 240 / (1.76 x 28 x 1.33) = 3.66 in^2 (top)

use 3 #10 bars

v = Vr/bd = 52600 / (12 x 28) = 157 psi

vc = $(1.1\sqrt{f'c})1.33$ = 80 psi

Av = (v-vc)b s/(fs 1.33)

Av = (157-80) 12 x 12 / (24000 x 1.33) = .35 in^2/ft

use #4 stirrups @ 12 in

6.6 Deflection (ref. Part II - 3.1.4)

$\theta = M^{1.4} / 9800\ I\ k^{.5}$

$\theta = 12000^{1.4} / (9800 \times 1800 \times 100^{.5})$ = .0029 radians .0021

D = .11 + 12 Lc θ = .11 + 12 x 5.31 x .0029 = .29 in .24

D/4Lc = .29 / (4 x 5.31 x 12) = 1/879 O.K.

1/1062

7. EDGE LIFT DESIGN - RIB A2/C2

7.1 Loads

w = 142 psf (same as above)

Pp = rib + wall = 375 + 500 = 875 plf

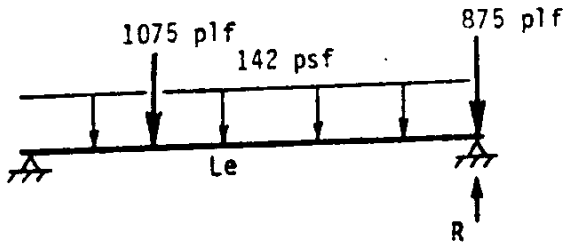
Pi = rib + wall* = 375 + 700 = 1075 plf

* equivalent wall load = column load / rib spacing

14000/20 = 700 plf (ref. Appendix A - 2.4)

Li = 16 ft

7.2 Equivalent simple beam (ref. Appendix A - 3.2.1)



7.3 Deflection (ref. Part II - 3.2.2)

$Le = 7.5\ I^{.17}\ Li^{.37}\ D^{.12} / w^{.07}\ Pi^{.11}$

$Le = 7.5 \times 1200^{.17} \times 16^{.37} \times D^{.12} / 142^{.07} \times 1075^{.11}$

$Le = 22.9\ D^{.12}$

assume D = .50 in (somewhat less than Ym = 1.0 in)

$Le = 22.9 \times .50^{.12} = 21.1$ ft

$R = Pp + 1/2\ w\ Le + Pi(Le-Li)/Le$

$R = 875 + (142 \times 21.1)/2 + 1075(21.1-16.0)/21.1 = 2633$ plf

from heave/pressure curve (p B9), for D=.50 find Psw=2000

$Lb = 1.1(R/Psw) = 1.1(2633/2000) = 1.45$ ft

$D = Ym(Lm-Lb)^2/Lm^2$

$D = 1.0(6.0-1.45)^2/6.0^2 = .575$ in $\neq$ .50 inch assumed!

assume D = .54 in

$Le = 22.9 \times .54^{.12} = 21.3$ ft

$R = Pp + 1/2\ w\ Le + Pi(Le-Li)/Le$

$R = 875 + (142 \times 21.3)/2 + 1075(21.3-16.0)/21.3 = 2655$ plf

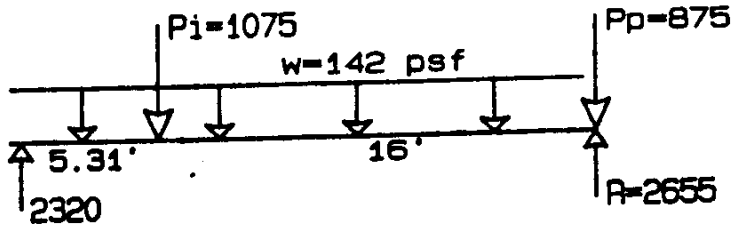
from heave/pressure curve, for D=.54 find Psw=1800 psf

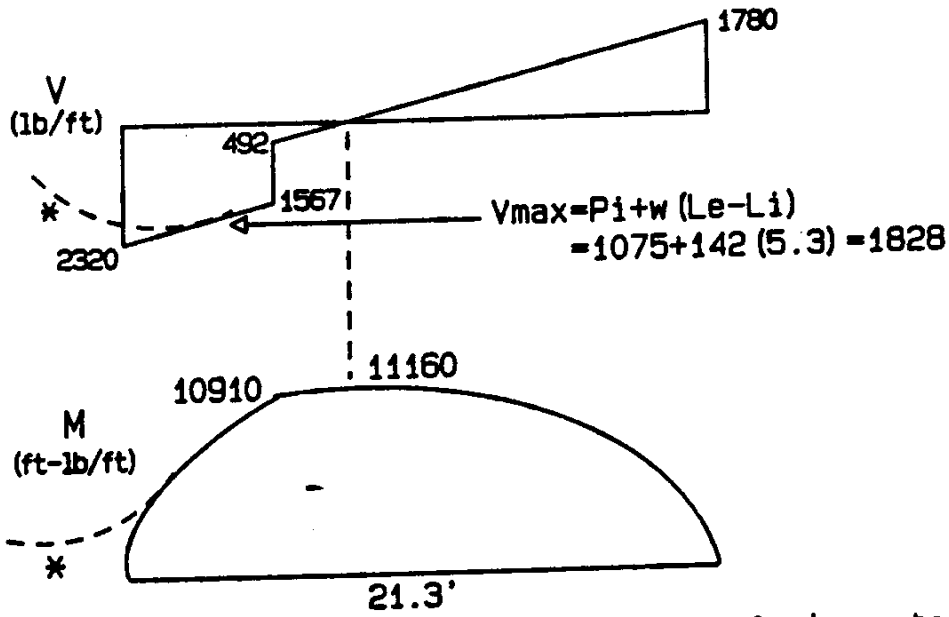
$Lb = 1.1(R/Psw) = 1.1(2655/1800) = 1.62$ ft

$D = 1.0(6.0-1.62)^2/6.0^2 = .533$ in CONVERGED!

$D/Le = .54/(21.3 \times 12) = 1/473$ O.K. for non-brittle walls

7.4 Moment and shear (ref. Part II - 3.2.3 and 3.2.4)





* probable shear and moment from computer analysis, note that calculated V=2320 lb will not occur, due to the effects of distributed support from the soil

8. EDGE LIFT DESIGN - RIB E4/C4

8.1 Loads

w = 142 psf (same as above)

Pp = 1875 plf (same as rib E3/C3)

Li = 32 ft (wall along rib C1/C6)

8.2 Deflection

since Li>Le use:

$Le = 10.5\ I^{.17}\ D^{.12} / w^{.07}$ (ref. Part II - 3.2.5)

$Le = 10.5 x 1200^{.17} x D^{.12} / 142^{.07} = 24.77\ D^{.12}$

assume D = .48 in

then $Le = 24.77 \times .48^{.12} = 22.7$ ft

$R = Pp + 1/2\ w\ Le = 1875 + (142 x 22.7)/2 = 3485$ plf

from heave/pressure curve, for D=.48 find Psw=2100 psf

$Lb = 1.1(R/Psw) = 1.1(3485/2100) = 1.825$ ft

$D = Ym(Lm-Lb)^2/Lm^2$

$D = 1.0(6.0-1.825)^2/6.0^2 = .484$ inch CONVERGED!

8.3 Find shears and moments by statics, similar to rib A2/C2.

9. CENTER LIFT DESIGN - RIB C1/C3

9.1 Loads

w = slab + LL + wall* = 62 + 80 + 94 = 236 psf

* wall = wall load / rib spacing = 1500/16 = 94 psf
(ref. Appendix A - 2.4)

Pp = rib + wall = 375 + 500 = 875 plf

9.2 Equivalent cantilever

$Lo = 2.3 + .4\ Lm = 2.3 + (.4 \times 6) = 4.7$ ft

$C = .8\ Ym^{.12}\ I^{.16} / Pp^{.12}$

$C = .8 \times 1.5^{.12} \times 2250^{.16} / 875^{.12} = 1.28$

$Lc = Lo\ C = 4.7 \times 1.28 = 6.02$ ft

9.3 Moment

$M = Pp\ Lc + 1/2\ w\ Lc^2$

$M = 875 \times 6.02 + (236 \times 6.02^2)/2 = 9544$ ft-lb/ft

$Mr = M \times S = 9544 \times 16 = 153{,}000$ ft-lb/rib

9.4 Shear

$V = Pp + w\ Lc = 875 + (236 \times 6.02) = 2296$ plf

$Vr = V \times S = 2296 \times 16 = 36{,}700$ lb/rib

9.5 Deflection

$\theta = M^{1.4} / 9800\ I\ k^{.5}$

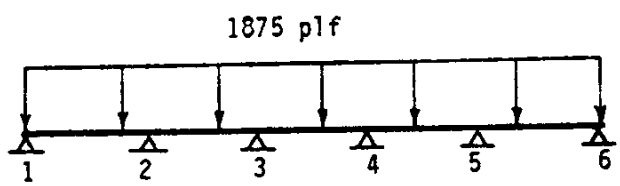
$\theta = 9544^{1.4} / 9800 \times 2250 \times 100^{.5} = .0017$ radian

$D = .11 + 12\ Lc\ \theta = .11 + (12 \times 6.02 \times .0017) = .23$ in

10. CENTER LIFT DESIGN - PERIMETER RIB E1/E6 (ref. Part II-3.3.1)

10.1 Span between transverse ribs

Pp = 1875 plf (from calculations for rib E3/C3)

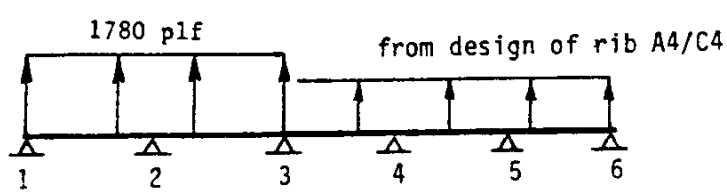


10.2 Analyze by conventional methods

11. EDGE LIFT DESIGN - PERIMETER RIB A1/A3 (ref. Part II - 3.3.2)

11.1 Span between transverse ribs for net upward force (from calculations on rib A2/C2)

R - Pp = 2655 - 875 = 1780 plf (upward)



11.2 Analyze by conventional methods

12. CENTER LIFT DESIGN - DIAGONAL RIB A1/B2 (ref. Part II - 3.4)

12.1 Provide the larger shear and moment capacity of rib B1/B2 or rib A2/B2.

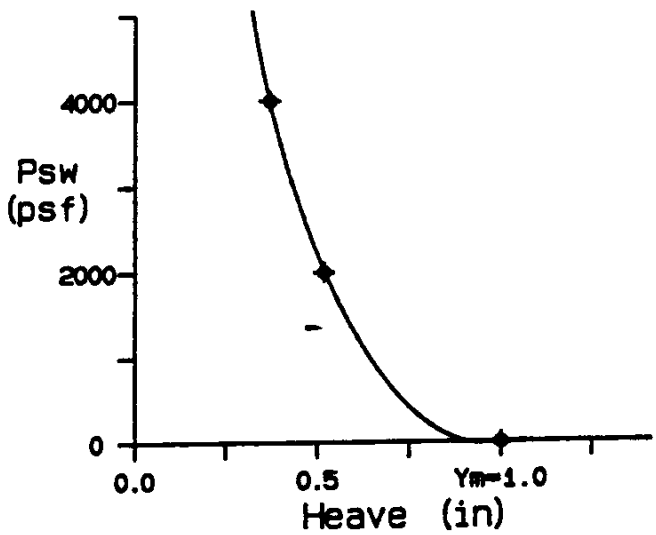
13. RIB D3/D4 (ref. Part I - 4.5)

13.1 Interior rib with no wall or column loads

$As \geq .0033\ Ag = .0033 \times 12 \times 30 = 1.20\ in^2$ (top and bot.)

This is the typical minimum reinforcement for the full length of all ribs.

14. HEAVE VERSUS SWELL PRESSURE CURVE (ref. Appendix A - 2.1)



DEPARTMENT OF THE ARMY
SOUTHWESTERN DIVISION, CORPS OF ENGINEERS
1114 COMMERCE STREET
DALLAS, TEXAS 75242-0216

REPLY TO
ATTENTION OF

16 APR 1987

SWDED-G

SUBJECT: Criteria for Developing Geotechnical Design Parameter for SWD Ribbed Mat Design Methodology

Commander, Albuquerque District, ATTN: SWAED-TA
Commander, Fort Worth District, ATTN: SWFED-F
Commander, Galveston District, ATTN: SWGED-G
Commander, Little Rock District, ATTN: SWLED-G
Commander, Tulsa District, ATTN: SWTED-G

1. Reference is made to criteria letter SWDED-TS/G dated 23 December 1986, subject "Design Criteria for Ribbed Mat Foundation".

2. The above reference criteria letter require certain geotechnical parameters be furnished in the Foundation Design Analysis when a ribbed mat slab foundation is recommended in expansive soil areas. Enclosure 1, for addressees only, provides guidance for development of these parameters. These procedures were developed by the Ft. Worth District with review in the Southwestern Division. Questions and/or comments should be directed to either Mr. A.L. Branch, FTS 334-2117 or Mr. Jack Fletcher, FTS 729-6365.

FOR THE COMMANDER:

William Fisher
for ARTHUR D. DENYS, P.E.
Chief, Engineering Division

Encl

CONTENTS

1. REFERENCES

2. BACKGROUND

3. SOIL-STRUCTURE INTERACTION MODES

3.1. Center Lift

3.2. Edge Lift

4. DETERMINATION OF CENTER LIFT AND EDGE LIFT PARAMETER FOR STRUCTURAL DESIGN

4.1. Center Lift

4.1.1. Modulus of Subgrade Reaction

4.1.2. Design Allowable Bearing Pressure

4.1.3. Center Lift Heave Potential

4.1.4. Loss of Support Distance

4.2. Edge Lift

4.2.1. Modulus of Subgrade Reaction

4.2.2. Soil-Beam Interface Pressure

4.2.3. Edge Moisture Variation Distance

4.3 Summary

5. APPENDIX A

5.1 EXAMPLE PROBLEM

DEVELOPMENT OF GEOTECHNICAL DESIGN PARAMETERS FOR RIBBED MAT FOUNDATIONS

1. REFERENCE.

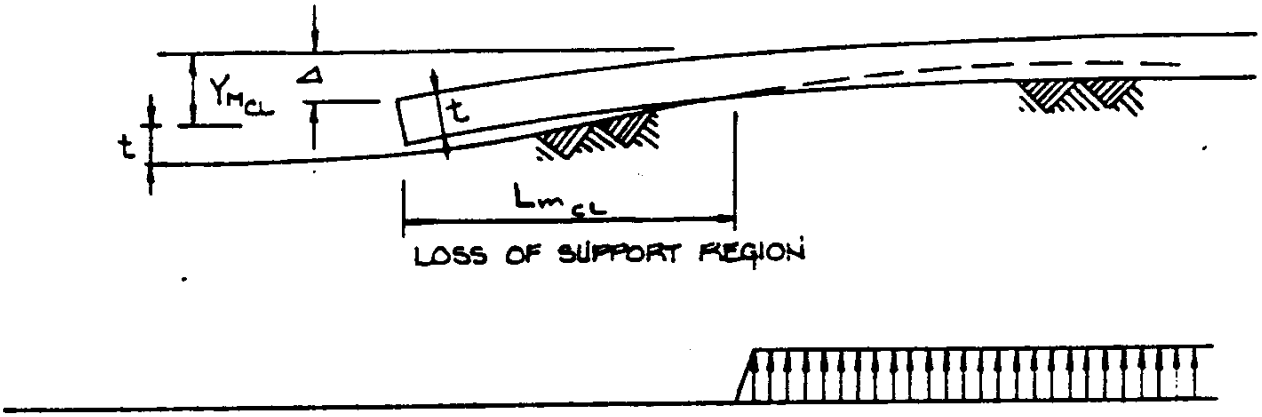
1.1 SWDED-TS/G, Design Criteria for Ribbed Mat Foundations, dated 23 Dec 86.

1.2 TM 5-818-7, Foundations in Expansive Soils, Corps of Engineers, 1983.

2. BACKGROUND. The recently developed structural design methodology (reference 1) models the interaction of a ribbed mat slab on an expansive subgrade for purposes of structural design. This method appears equally suited to stiffened mat systems such as flat mats, modified flat mats and inverted ribbed mats. Utilization of the methodology requires the expansion and refinement of the geotechnical design parameters furnished in the foundation design analysis. The purpose of this report is to (1) identify and (2) provide a rational method of determining these parameters.

3. SOIL-STRUCTURE INTERATION MODES. Two heave induced deformation conditions appropriate for ribbed mat slab structural analysis are (a) center lift and (b) edge lift.

3.1 CENTER LIFT. Center lift considers doming of the foundation in the interior region of a slab on grade differentially to the perimeter region as depicted on figure 1. This may be caused either by drying of the expansive subgrade around the perimeter beam or by wetting of the dry expansive subgrade in the interior region. Perimeter drying results from (1) below average precipitation and/or (2) reduced or no landscape watering and/or

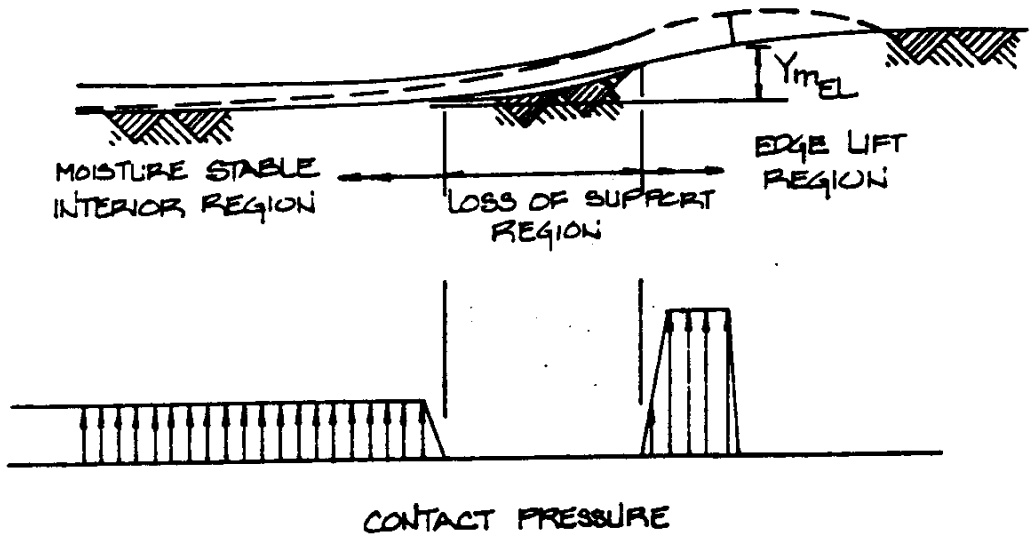


CENTER LIFT
FIGURE 1

(3) removal of old paving or hard stand. Interior wetting results from (1) disruption of the site moisture equilibrium by "capping" the site with the relatively impervious slab or by removal of thick brush or trees from the site (thus eliminating evapo-transportation) and/or (2) leaky inservice or abandoned utilities. Loss of support along perimeter and first interior transverse stiffener beam results if (1) the magnitude of center lift heave is large enough and (2) the beams are sufficiently rigid to cantilever from the supported interior region.

3.2 <u>EDGE LIFT</u>. Edge lift involves more complex soil-structure interactions than does center lift. In edge lift, the structure is supported by heaving subgrade in the perimeter region and in the relatively moisture stable interior region. Loss of support develops when (1) the edge lift heave deformation

is large enough and (2) the spanning beam is sufficiently rigid. Edge lift mode is depicted on figure 2.



EDGE LIFT
FIGURE 2

Soil-structure interaction within the interior supported region is reasonably represented as a beam on non-linear subgrade. Soil-structure interaction in the perimeter region is somewhat more complex because the soil deflects under the structural load as a beam on non-linear subgrade, but also the swelling soil either loads and/or deflects the beam upward. To further complicate matters, the amount of edge lift heave and the soil-beam interface pressure are interrelated and unique for each specific site. Background parameter studies for reference 1 indicate that the structural analyses are particularly sensitive

to edge lift parameters (edge lift heave magnitude and limiting beam-soil interface pressure). For example, large values for these may cause the solution to either fail to converge or indicate that the beam must be very deep and/or very heavily reinforced. While site conditions may sometimes dictate massive, very rigid stiffener beams, this is not generally the case. Generally, edge lift heave of less than 1.0 to 1.5 inches used in the design method given in reference 1 produce reasonable, constructable beams.

4. DETERMINATION OF CENTER LIFT AND EDGE LIFT PARAMETERS FOR STRUCTURAL DESIGN.

4.1 CENTER LIFT - Center lift parameters to be provided in the foundation design analysis includes (1) modulus of subgrade reaction (K_1), (2) design allowable bearing for beams (q_{all}), (3) magnitude of center lift (Y_{mcL}) and (4) loss of support distance around the perimeter (L_{mcL}).

4.1.1 MODULUS OF SUBGRADE REACTION - The modulus of subgrade reaction should be taken as K_1 = 200 pci for beams up to 12 inches wide bearing on compacted, nonexpansive fill. Higher values may be justified for granular nonexpansive fills consisting of gravel, crushed rock or limestone screenings or for cement stabilized materials if these materials extend significantly ($D \geq 3B$) below the stiffener beam of width B. The foundation design analysis should direct that K_1 values be factored to account for width effects such that $K_{design} = K_1/B$, where B is the effective beam width in feet for soil structure interaction. Note that the resultant effective beam width may include a significant width of the slab and is therefore

significantly greater than actual beam width. Studies indicate that significant load distribution occurs over an "effective" width of approximately five. It should be noted that structural design calculations are not sensitive to K value.

4.1.2 DESIGN ALLOWABLE BEARING. A design allowable bearing value (q_{all}) has historically been assigned for sizing of stiffener beams, perimeter beams and enlarged beam intersections beneath columns. Values are typically given considering the beam to be a continuous strip footing or the beam intersection to be a spot footing (carrying either line or concentrated loads, respectively). The allowable bearing value is typically developed based on the average strength of engineered fill at shallow depth with a factor of safety of not less than 3.0. Design loads typically include full dead load plus half live load. The purpose in sizing the beams and beam intersections for this design allowable is to provide uniform contact pressures at the beam-soil interface therefore limiting inservice differential settlement. The assumptions of minimal load sharing between the slab and beams, ample safety factor on the fill strength, and minimum beam widths specified in the SWD EIM combine to limit the mobilized soil strains to low levels. This leads to very small structurally induced deflections given uniform, nominal fill depths. Actual values assigned for design bearing allowables have seldom exceeded q_{all} = 2.0 KSF although values as high as 3.0 KSF have been assigned in limited cases where required and justifiable. Seldom are there structural requirements for larger allowables bearing values since specified minimum beam widths generally govern.

4.1.3 MAGNITUDE OF CENTER LIFT HEAVE POTENTIAL. - The magnitude of center lift heave potential (Y_{mcL}) given in the foundation design analysis should be the residual heave potential at the site. The value of Y_{mcL} should include effects due to subgrade removal and replacement criteria, any surcharge effects due to fill above original subgrade and the weight of the proposed structure. Maximum design value for center lift potential should not exceed 1.5 inches. Where attainable with reasonable removal/replacement depths ($\leq$36 inches), it is desirable to limit Y_{mcL} to not more than 1.0 inch, which is well within the "tolerable" inservice deformation range of most structures. Minimum remove/replace depth should be taken to the bottom elevation of the ribbed mat slab beams.

Function of Anticipated Loads

The heave potential is determined by three soil parameters: the coefficient of swell (C_s), depth of active zone (X_a) and expansion pressure (P_{exp}).

Caution should be used in selecting coefficient of swell (C_s) values for heave analyses since swell pressure test results significantly underestimate C_s values compared to controlled expansion-consolidation-rebound tests. Additionally, both test methods tend to give low C_s values since most rebound time curves are terminated well before primary swell is completed.

An appropriate design value of the depth of the active zone (X_a) typically lies between the present depth to the stable relative moisture content (estimated by observing the relationship of moisture content to the plastic limit) and the maximum depth observed, such as the maximum depth of weathering. Typical X_a values for the central and north Texas regions and

central Oklahoma region appear to vary from about 10 to 15 feet. These values have been estimated for (1) regression heave analyses for distressed structures and (2) depth of moisture variation versus approximate return/duration interval studies. Values smaller than 14 feet may be applicable in specific cases such as where the active zone is the distance between the structural foundation element or slab on grade and a perched water table; a condition common in these regions.

Center lift heave analyses should consider "saturated" conditions to a depth of X_a. If a nominal remove/replace depth and saturated subgrade assumptions indicate unreasonable residual heave potential, consider increasing the depth of remove/replace and/or recommending a more defensive design to prevent saturation of the subgrade.

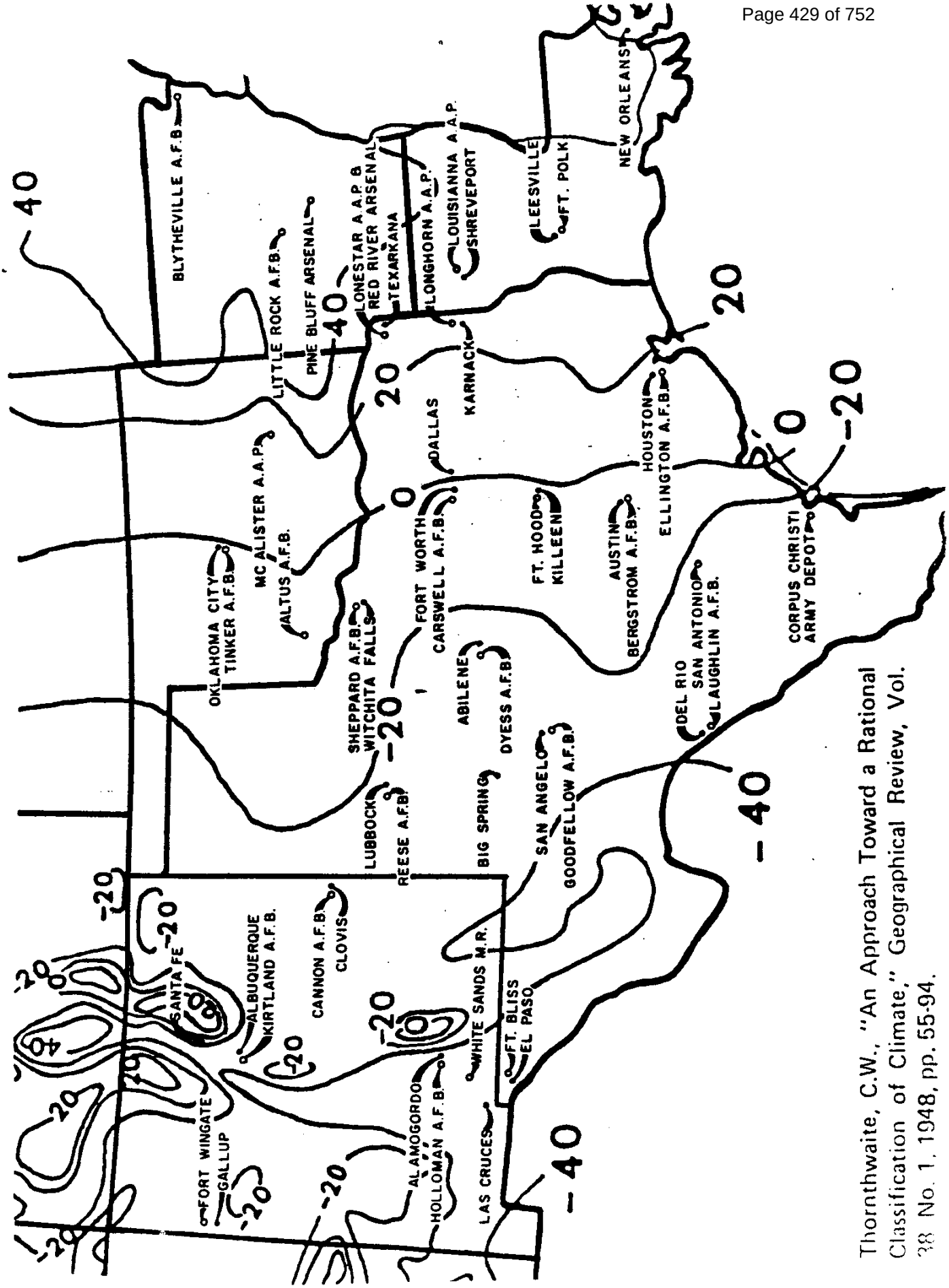
Expansion pressures should be developed versus depth using small depth intervals. These should be developed from laboratory data for the site. Additionally, these may be supplemented using proper correlations with nearby, preferably adjacent sites.

4.1.4 EDGE MOISTURE VARIATION DISTANCE. The edge moisture variation distance (L_{mcL}) may control the design of interior stiffener beams which are adjacent to the perimeter. The maximum moments and shear are induced in the transverse beams when these elements cantilever free of foundation support from the interior supported region to the outside of the perimeter beam. The length of cantilver is largely controlled by the value of L_{mcL}. SWD adopted this concept from Post-Tensioning Institute (PTI) guidelines, originally developed for lightly loaded flexible mats in the late 1970's and early 1980's. Standard practice in the

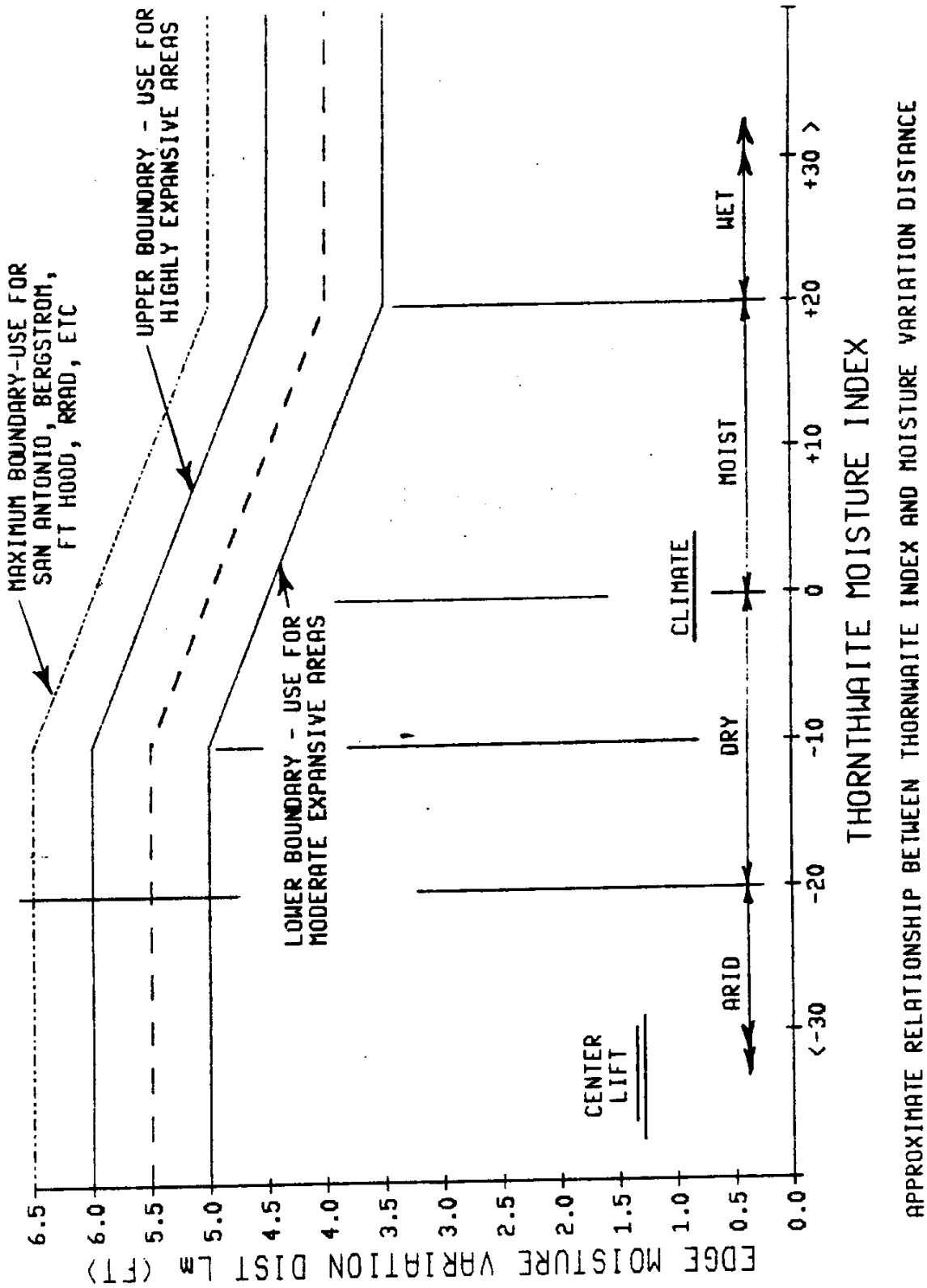
San Antonio area has been to assign upper or near upper bound values from TMI for design L_{mCL} values. At least two aspects of designs probably tend to moderate the actual edge moisture variation distance experienced; these being (1) relatively deep perimeter beams which act as a physical barrier and (2) the non-expansive fill blanket which tends to make changes in moisture content (and therefore any resultant heave or shrinkage) more uniform and provide a surcharge effect as well. Other factors, however, tend to offset these moderating effects. These include very short return interval of edge moisture variation events presented in TMI (reported by some sources to range from 1 to 2 years). Typical project design life of projects exceeds 20 or 30 years and, since we're still using many World War II facilities, it may well exceed 50 years. Estimated edge moisture variation values considering a 100 percent probability of experiencing a 20 to 30-year return interval event may well be twice typical TMI values.

Based on a subjective combination of all factors, it is suggested that L_{mCL} be taken as the edge moisture variation distance determined using figures 3 and 4. These values should be modified, either up or down, based on site secific soils investigations and engineering judgement.

4.2 <u>EDGE LIFT</u> - Edge lift parameters to be provided in the foundation design analysis include (1) modulus of subgrade reaction (K_1), (2) magnitude of edge lift heave (Y_{mEL}), (3) limiting soil-beam interface pressure (P_{SW}) for that portion of the beam being acted on by the heaving subgrade and (4) a value for edge moisture variation distance (L_{mEL}).



Thornthwaite, C.W., "An Approach Toward a Rational Classification of Climate," Geographical Review, Vol. 38 No. 1, 1948, pp. 55-94.



APPROXIMATE RELATIONSHIP BETWEEN THORNWAITE INDEX AND MOISTURE VARIATION DISTANCE

FIGURE 4

4.2.1 MODULUS OF SUBGRADE REACTION. - Values given for center lift are considered appropriate for edge lift also. $K_1 = 200$ pci

4.2.2 SOIL-BEAM INTERFACE PRESSURE. Discussion of both limiting soil-beam interface pressure and magnitude of edge lift heave parameters (P_{SW} and Y_{MEL}) are best handled concurrently since both are intimately related and the analysis necessary for solution determines both simultaneously.

The area of soil-beam contact in the swelling perimeter region involves a somewhat complex soil-structure interaction situation. As edge lift develops and loss of support occurs between the perimeter and interior regions, the heaving soil may well exert a pressure on the stiffener beams well in excess of typical design interface pressures (q_{all}). As the soil column swells and lifts the overlying beam, the soil-beam contact area increases toward the interior region to accommodate the greater structural reaction.

The soil-structure interaction in the edge lift region can be visualized as a three-component system; (1) a structural element (a beam or mat strip), (2) an element of nonexpansive fill beneath the structural element plus that piece of the expansive subgrade restrained against heave by the weight of the overlying fill and the stresses induced beneath the structural element, and (3) the heaving column of soil to a depth of X_a beneath the bottom of the nonexpansive fill blanket (figure 5).

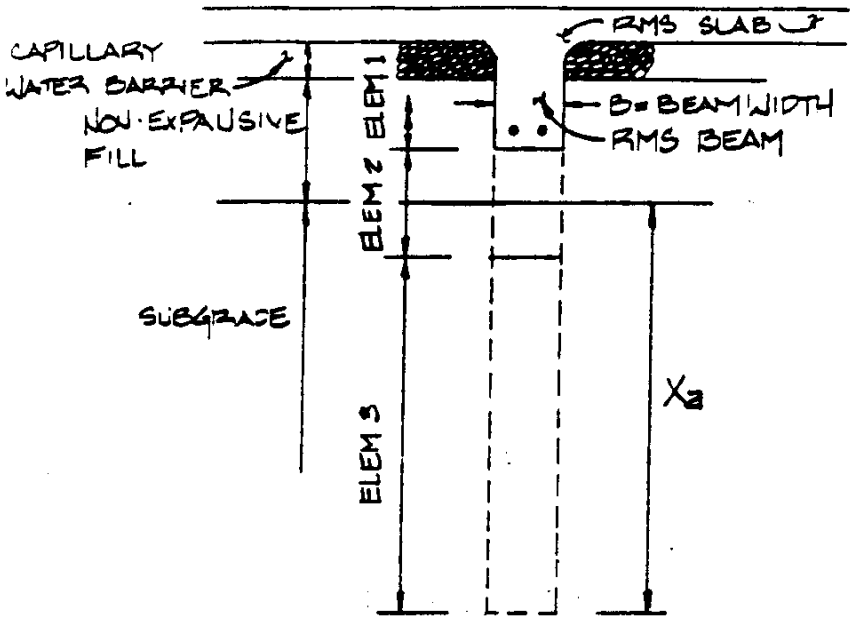


FIGURE 5

The load-deformation relationship of element 1 interacting with element 2 can be represented by a P-Y curve shown in figure 6.

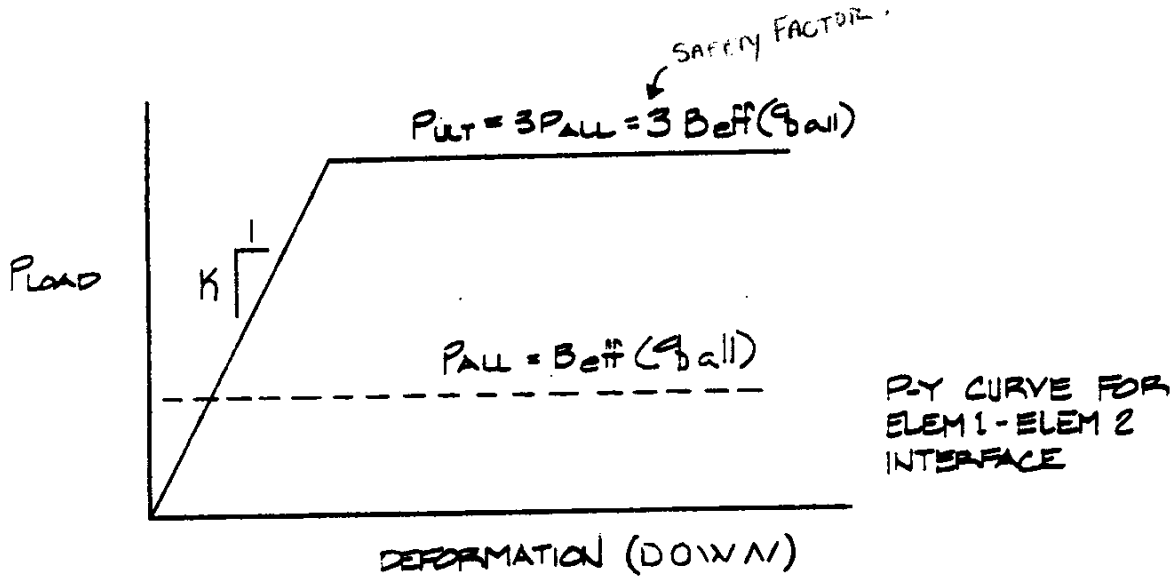


FIGURE 6

The load-deformation relationship of element 3 interacting with elements 1 and 2 in the column immediately below the beam as shown on figure 7. The plot consists of the net heave potential of the swelling soil column versus those forces resisting the tendency to swell, taken at the base of the structural beam.

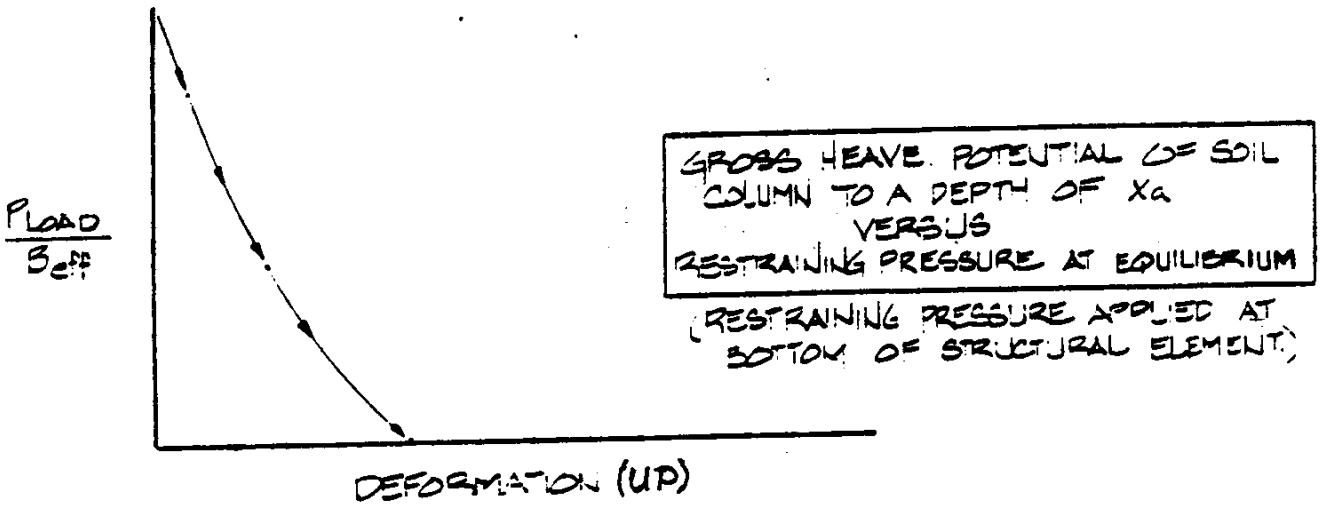
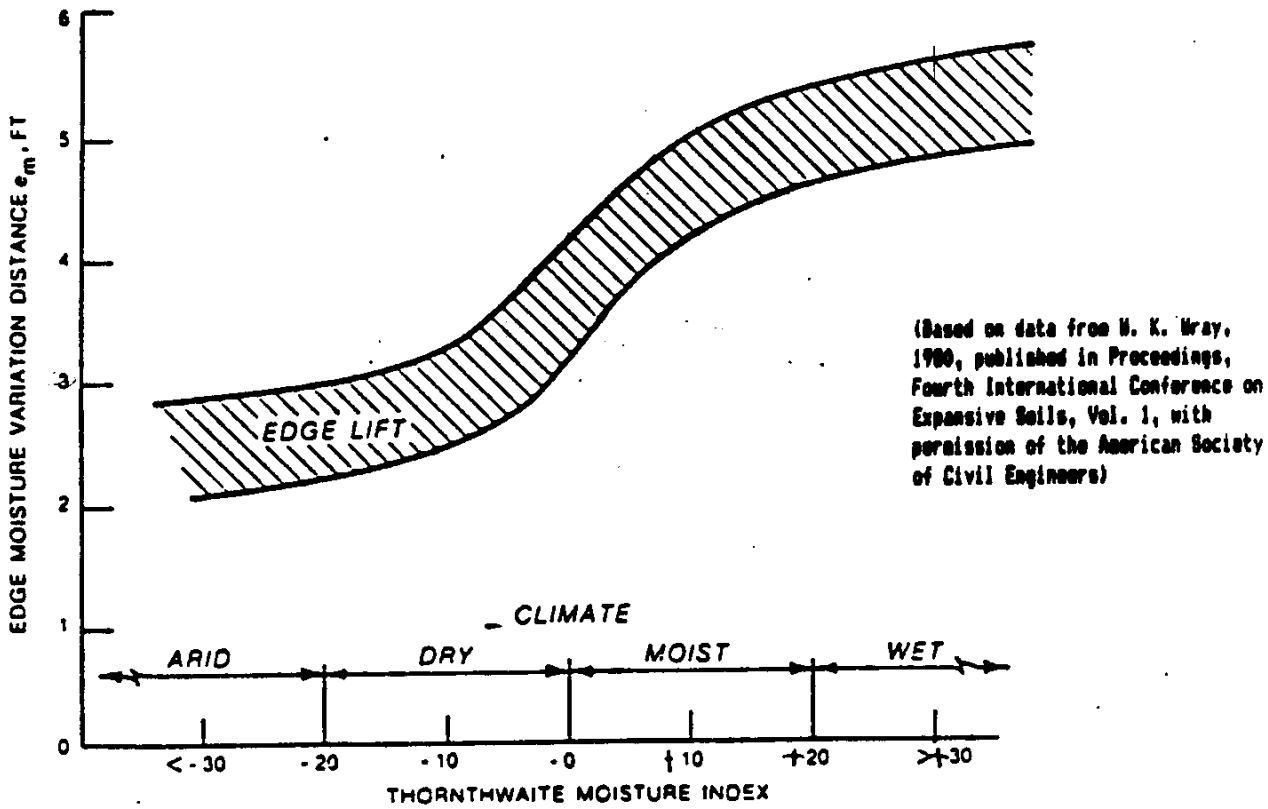


FIGURE 7

These relationships can be added algebracially to produce a composite p-y curve which can be easily utilized by available soil-structure interaction programs for structural analysis. Since such analysis is within the purview of the structural engineer, the geotechnical engineer need only furnish the pressure heave relationship in useable form in the Foundation Design Analysis. It is suggested that this information be provided in a tabulated format giving coordinates for at least three points. These minimum three points should be the Psw and YMBL coordinates for (1) pressure equal to Pult, (2) pressure equal to Pall and (3) pressure equal to zero.

PULT = F.S. X PALLOW

4.2.3 EDGE MOISTURE VARIATION DISTANCE. Edge moisture variation distance (L_{mEL}) appropriate for edge lift analysis may be taken from the TMI chart given in figure 8.



Approximate relationship between the Thornthwaite Moisture Index and the edge lift-off distance.

FIGURE 8

The TMI values represent approximate environmentally induced events. As a result, upper bound values should be selected for design. It is recommended, however, that average values be used for all SWD projects. Additionally, recommendations should be made in the foundation design analysis to limit the potential for developing "hot spots" due to long term sources of free water around the building perimeter.

function of the type of bldg, ie, Brick stucco or Not

4.3 Certain structure-site situations may well warrant deleting edge lift analyses as follows:

4.3.1 Where the proposed structure is a pre-engineered metal building without interior masonry walls or heavy interior dead or permanent live loads.

4.3.2 Where defensive design efforts have been incorporated and reasonable confidence exists that these will be constructed and maintained as intended.

4.3.3 Where minor architectural distress (such as cracking of masonry walls, plaster walls, tiled surfaces) is not likely to cause undue user concern or raise inservice maintenance requirements significantly.

5. APPENDIX A

5.1 EXAMPLE PROBLEM. An example problem is provided in Appendix A.

APPENDIX A

EXAMPLE PROBLEM

1. Required. - Develop geotechnical parameters for the structural design of a ribbed mat slab given the following:

a. Proposed Structure. - Office/Administration type structure located in San Antonio, Texas, 60X150 feet in plan. The structure is to consist of double wythe masonry (face brick over CMU) load bearing exterior walls and isolated interior colums at 20 ft. centers.

b. Proposed Site. - One acre, minimal topographic relief, site covered with mesquite trees.

c. Subsurface Conditions. - Drilling program (5 borings) indicates the foundation materials consist of (1) a surface stratum of high plasticity clay grading into medium plasticity clay with depth to a total thickness of 14 feet, (2) a water bearing sand and gravel stratum from 1 to 7 feet thick overlying, (3) an expansive clay shale formation.

d. Summary Laboratory Test Data. -

Stratum	Depth (ft)	USCS	$\bar{W}_o$ (%)	γ_d (pcf)	LL	PI	P_{exp} (tsf) (net)	C_s	C_c	Cu (ts
1	0-4	CH	25	105	65	45	0.8 -1.0	0.06	0.02	0.
2	4-14	CL	14	108	44	30	0.6	0.06	0.18	0.
3	14-20	GC	6	-	25	12	0	-	-	50 B/
4	20 plus	Wea. Clay Shale	22	110	70	52	2.0	0.09	0.22	1.

2. Determine Parameters Required for Center Lift Analysis:

a. Modulus of Subgrade Reaction (K_1). - Mat slab will be founded on nonexpansive fill, therefore it is reasonable to assign a valve of K_1 = 200 PCI. The structural engineer should factor this value based on effective beam width such that $K_{design} = K_1$ (1ft/Beff, ft).

b. Design Bearing Allowable (q_{all}). - Since beams will be supported on nonexpansive fill and the building loads will range from light to moderate, it appears that a design bearing allowable of q_{all} = 2.0 KSF is appropriate.

c. Magnitude of Center Lift Heave Potential (Y_{mcl}). -

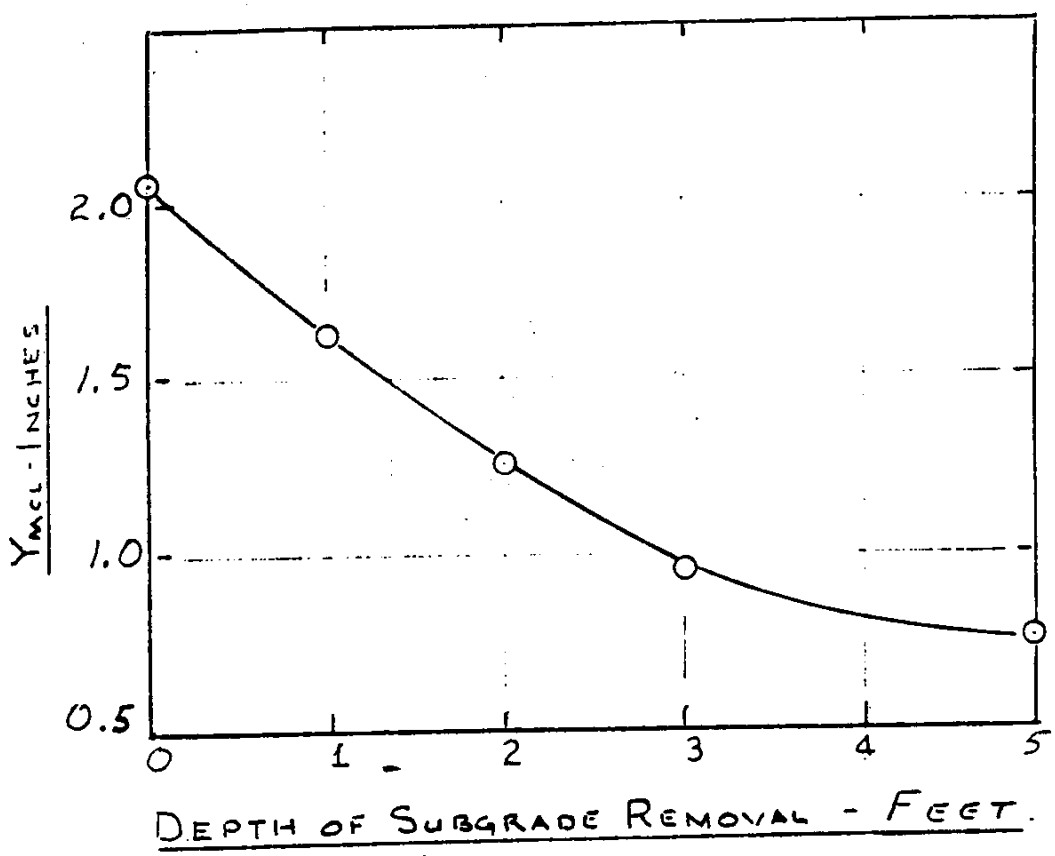
(a) Calculate site heave potential

Given: C_s = 0.06, e_o = 0.60, P_o = effective overburden pressure, P_{sxp} = gross swell pressure, P_f = effective pressure resisting heave beneath mat including P_o, (surcharge due to fill and structural dead load, h_i = heave for soil layer h inches thick, and an X_a = 10 feet.

$C_s = .06$
$e_0 = .60$

z (ft)	z (ft)	Po (tsf)	Pexp (tsf)	Pf (tsf)	h (in)	$h_i = \frac{C_{sh}}{1+e_0} \log_{10} \frac{P_{exp}}{P_f}$ (inches)	h_i (bottom to top) (inches)
0-1	0.5	0.03	1.0	.07+.03 0.1	12	0.45	2.07
1-2	1.5	0.1	1.0	.07+.1 0.17	12	0.35	1.62
2-3	2.5	0.17	1.1	.07+.17 0.24	12	0.30	1.27
3-4	3.5	0.23	0.8	0.3	12	0.19	0.97
4-6	5	0.33	0.9	0.4	24	0.31	0.78
6-8	7	0.46	1.0	0.53	24	0.25	0.47
8-10	9	0.6	1.2	0.67	24	0.22	0.22
10-12	11	0.73	1.35	0.8	24	0.2	N/A
12-14	13	0.86	0.9	0.93	24	N/A	N/A

Determine required depth of subgrade replacement and residual heave potential after replacement with nonexpansive fill. A plot of replacement depth versus residual heave taken from the above table follows:



Removal and replacement to 3.0 feet will reduce the heave potential to approximately 1.0 inch, thus Y_{mcl} = 1.0 inch. Note that significant additional removal would be required to reduce the residual heave potential any sigificant additional amount.

d. Edge Moisture Variation Distance (L_{mcl}) - taken from figures 3 and 4 as L_{mcl} = 6.5 feet.

3. Determine parameters required for Edge Lift analyses:

a. Modulus of Subgrade Reaction (K_1). - Same as for Center Lift.

b. Design Allowable Bearing (q_{all}). - Same as for Center Lift.

c. Soil - Beam Interface Pressure (P_{sw}) and Magnitude of Edge Lift Heave Potential (Y_{mel}). -

Determine the residual heave potential for the soil column beneath a typical beam for a range of assumed interface pressures.

A summary of calulations and results is presented in tabulated form on page 6. A plot of soil-beam interface pressure versus heave potential is shown on page 7. A reasonable bilinear representation of the results, for use by the structural engineer, can be developed assuming a linear relationship between the following points:

P_{sw}, TSF	Y_{mel}, Inches
0.0	Y_{mel} = 1.25
q_{all} = 1.00	Y_{mel} = 1.0
q_{ult} = 3(q_{all}) = 3.00	Y_{mel} = 0.6

d. Edge Moisture Variation Distance. (L_{mel}). The edge moisture variation distance is taken from figure 8 as L_{mel} = 3.0 feet.

Given: D_f = 2.0ft B = 1.0ft

C_s = 0.06 e_o = 0.60

γ_m = 125pcf

								q_{app}											
								0.5tsf			1.0tsf			2.0tsf			4.0tsf		
z ft	$\bar{z}$ ft	h in	$\frac{\bar{z}-D_f}{B}$	I_s	P_o tsf	P_o+P_s tsf	P_{exp} tsf	ΔP tsf	P_f tsf	Δh_i in	ΔP tsf	P_f tsf	Δh_i in	ΔP tsf	P_f tsf	Δh_i in	ΔP tsf	P_f tsf	Δh_i in
0-3	<----------COMPACTED NONEXPANSIVE FILL TO A DEPTH OF 3.0 FT.---------->																		
3-4	3.5	12	1.5B	0.28	0.23	0.30	0.8	0.14	0.37	0.15	0.28	0.51	0.08	0.56	0.79	0	1.12	1.35	0
4-6	5.0	24	3.0B	0.15	0.33	0.40	0.9	0.07	0.40	0.32	0.15	0.48	0.25	0.30	0.63	0.14	0.60	0.93	0
6-8	7.0	24	5.0B	0.09	0.46	0.53	1.0	0.05	0.53	0.25	0.09	0.55	0.23	0.18	0.64	0.17	0.36	0.82	0.09
8-10	9.0	24	7.0B	0.07	0.60	0.67	1.2	0.04	0.67	0.23	0.07	0.67	0.23	0.14	0.74	0.19	0.28	0.88	0.12
10-12	11.0	24	9.0B	0.05	0.73	0.80	1.35	0.03	0.80	0.20	0.05	0.80	0.20	0.1	0.83	0.2	0.20	0.93	0.16
12-14	13.0	24	11.0B	0.04	0.83	0.90	0.9	0.02	0.90	0.0	0.04	0.90	0.0	0.08	0.91	0	0.16	0.99	0
								$\Sigma\Delta h_i$ = 1.15			$\Sigma\Delta h_i$ = 0.99			$\Sigma\Delta h_i$ = 0.7			$\Sigma\Delta h_i$ = 0.38		

Where:

z = depth interval

$\bar{z}$ = mean depth

B = beam width

D_f = beam depth

ΔP = stress with depth

P_o = overburden pressure

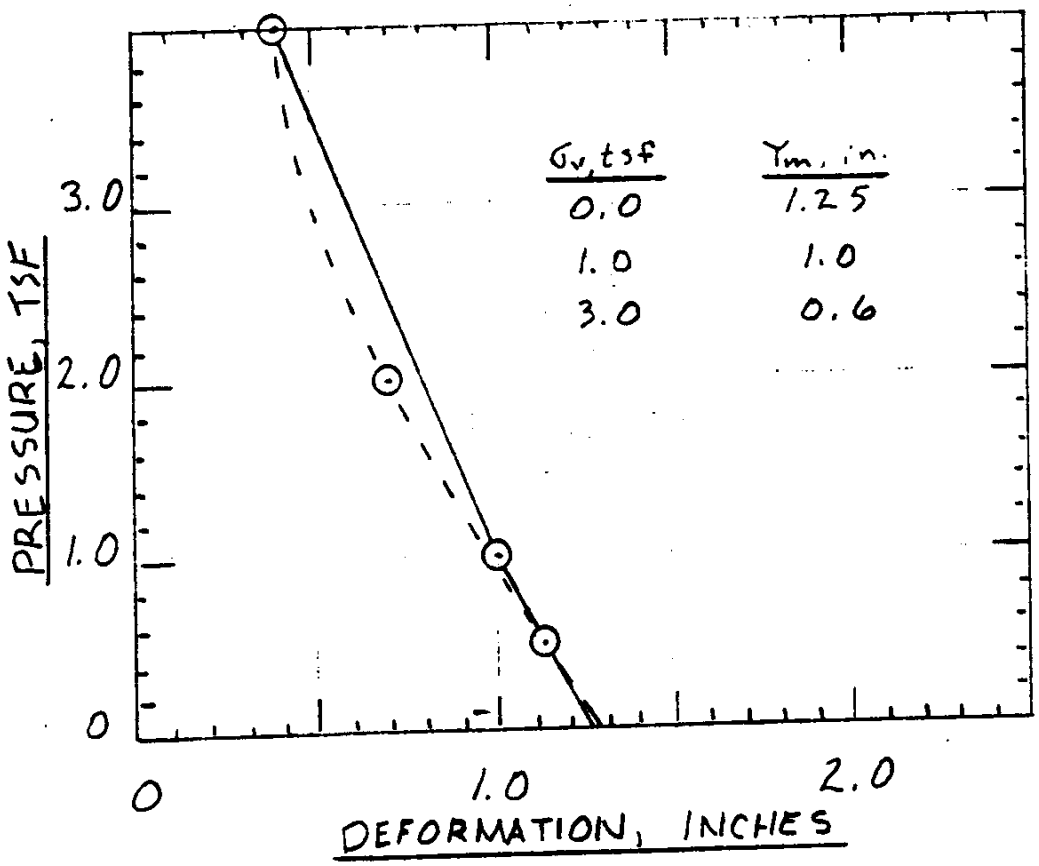
P_s = surcharge pressure next to beam

P_{exp} = expansion pressure

P_f = vertical pressure resisting heave below beam

P = stress @ depth due to to q_{app} $\Delta P = (I_s)(q_{app})$

$P_f = \left\{ \begin{array}{c} \Delta P + P_o \\ \text{or} \\ P_o + P_s \end{array} \right| \begin{array}{c} \text{whichever} \\ \text{is} \\ \text{greater} \end{array}$



EDGE LIFT PARAMETER

EXAMPLE PROBLEM

APPENDIX B:

List of Drawings

(Not Used) - Refer to Appendix J

APPENDIX C:

Utility Connections

(Not Used) - Refer to Appendix J

APPENDIX D:

Results of Fire Flow Tests (n/a)

Water Model Results

Memorandum

Date: October 5, 2011

To: Project File

From: Curt Craigmile

Re: Fort Hood Water Distribution System
Discussion of Water System Improvements

The proposed potable water distribution facilities for the expansion of North Fort Hood include piping additions to the existing water distribution system, an elevated tank, and a booster pump station. The improvements will act together with the existing water distribution system infrastructure to provide a system that will serve the new structures within the area as well as continuing to serve the existing facilities. The addition of the elevated tank and booster pump station will increase water pressures throughout the entire region including the existing service area.

The design of the water system expansion is based upon a computer model of the facilities. The model incorporates the existing service area that is generally southwest of the proposed structures. The size, location, and connectivity of the existing facilities were taken from existing mapping of the area. The condition of the existing pipes was assumed to be serviceable but roughened due to age. The total demands for the existing service area were calculated to be 210 gpm based upon records. It is important to note that the projected demands and required operating pressures for the proposed facilities resulted in a design that will utilize a continuous network of new piping to deliver flows to the new service area and therefore the impact of conditions within existing pipes will have minimal impact upon the performance of the new system.

Base flows for the proposed structures were provided and incorporated in this model. These demands can be seen in Table 2 below. These demands are in addition to the existing peak demand of 210 gpm and are anticipated to be the maximum demand per building for all conditions other than during a fire event.

Table 1: Base Peak Flow Demands

Building Type	Number of Buildings	Flow per Building (gpm)	Total Flow (gpm)
Barrack	24	82	1966
Company Operations Facility (COF)	6	41	246
Tactical Equipment	6	76	455

Maintenance Facility (TEMF)			
Brigade Headquarters	1	17	17
Battalion Headquarters	6	21	123
Officers Quarters	6	62	369
Dining Facility (DFAC)	3	92	274
		Total	**3450**

The TEMF buildings were determined to be the critical fire load because of high sprinkler demands, hydrant demands, and a pressure requirement of 60 psi. Delivering fire flow at acceptable pressures above 60 psi to the TEMF buildings was the driving factor in modeling the design. A fire was modeled at the most critical TEMF building using expected base flows. The model condition that facilities were designed to operate under included the peak flows provided in Table 1 plus a sprinkler demand of 1436 gpm and a fire hydrant flow of 1000 gpm were added at the critical TEMF building.

Proposed Improvements

The proposed improvements raise the operating pressures of the existing system via the use of a new elevated tank and booster station located near the existing water storage tank. The existing elevated tank has an overflow of 919.75 feet. Construction of the new tank with an overflow HGL of 955 feet will provide the needed increase in pressures across the system. The booster pump station will be used to lift water from the existing tank to the new tank in the event the City of Gatesville cannot supply water to the new tank at the specified head.

Items included:

- Construction of an additional 80’ high elevated tank (250,000 gallon minimum recommended) providing an overflow HGL of 955 feet near the existing elevated tank.

- Construction of a pumping station to lift water from the existing tank with an overflow elevation of 919.75 feet to the new tank with an overflow elevation of 955 feet may be required depending on the ability of the source water provider to supply water at the specified head. It is recommended that this pumping station provide 1,500 gpm and be constructed near the existing elevated tank.

- A 50 KVA emergency generator providing backup power to the pump station in the event of a power outage.

- A distribution system consisting of the following pipe sizes and approximate lengths, which can be seen in Table 4 below.

Table 2: Proposed Piping System

Pipe Size	Purpose	Approximate Length (LF)
24”	Running along Central Avenue from 18th to 28th Street.	4,800
24”	From the existing tank along Park Avenue, connecting to the existing system and terminating near 18th Street	10,000
16”	Interconnecting the new loop	9,000
16”	Looping the new development along Headquarters Avenue and 28th Street.	5,500
4”	Services to the proposed buildings	8,400

System Performance

The pressures experienced throughout the system will be dependent upon the water level within the elevated tank, the elevation of the building being served, and friction losses within the system. The initial phase of the project will limit the number of buildings constructed and the amount of friction losses will be minimal without fire demands. The pressures experienced within the area will range from approximately 70 psi to 88 psi under these conditions.

As stated above, the TEMF buildings were determined to be the critical fire load because of high sprinkler demands and a pressure requirement of 60 psi. After further analysis, fire flows were modeled at the TEMF building at Junction 23 (J-23) because the elevation of this point is one of the highest on the entire base, making it a critical point during the event of a fire.

Table 3: Junction 23 Hydraulic Data

Scenario	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
Base	772.67	76	930.42	68.3
Fire Flow	772.67	2547	912.25	60.4

The proposed distribution system will be capable of providing peak demands plus fire flows at the proposed buildings. The residual pressures experienced during these events will depend upon the magnitude of the fire flows and the location and elevation of the specific facility. For example, the DFAC that is proposed for the first phase of improvements has a finished floor elevation of 762.5 and has two separate fire flow design conditions totaling either 790 gpm or

1100 gpm. The modeled pressures for the water main in the street which provides these flows equates to pressures at the finished floor elevation of 73.7 psi at system peak flows, 72.4 psi at the system peak flows plus 790 gpm and 71.6 psi for system peak flows plus 1100 gpm. These pressures are greater than the reported requirements of 64 psi within the building for the demand of 790 gpm and 53 psi within the building with a fire flow of 1100 gpm. Modeling has determined similar surplus pressures available during modeled fires at other structures.

APPENDIX E:

Environmental Information

ENVIRONMENTAL ASSESSMENT FOR CONSTRUCTION AT NORTH FORT HOOD ON FORT HOOD, TEXAS

DIRECTORATE OF PUBLIC WORKS ENVIRONMENTAL DIVISION

JUNE 2010

Printed on 30% Post Consumer Recycled Paper

This Environmental Assessment has been reviewed and approved by the following:

PROPONENT:

EDWARD A. TURNER
Chief, Mobilization
Directorate of Plans, Training, Mobilization, and Security

REVIEWED BY:

LEROY L. DENOOYER
Environmental Law Attorney
Office of the Staff Judge Advocate

STEVEN G. BURROW
Chief, Environmental Programs
Directorate of Public Works

APPROVED BY:

for **NANCY NIEMANN**
Acting Director of Public Works

TABLE OF CONTENTS

1.0. INTRODUCTION 8

1.1. Proposed Action Overview 8

1.2. Purpose and Need 8

1.3. Agency and Public Participation 10

1.4. Project Location 10

2.0. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES ..... - 16 -

2.1. Proposed Action ..... - 16 -

2.2. Alternatives to the Proposed Action ..... - 16 -

2.3. No Action Alternative ..... - 16 -

3.0. AFFECTED ENVIRONMENT ..... - 17 -

3.1. Biological Resources ..... - 17 -

3.1.1. Vegetation ..... - 17 -

3.1.2. Fish and Wildlife ..... - 18 -

3.2. Water Resources ..... - 18 -

3.2.1. Surface Water ..... - 19 -

3.2.2. Waters of the U.S. ..... - 19 -

3.3. Air Quality ..... - 19 -

3.4. Noise ..... - 20 -

3.5. Cultural Resources ..... - 21 -

3.6 Geological Resources ..... - 22 -

3.6.1 Geology ..... - 22 -

3.6.2 Soils ..... - 22 -

3.6.3. Floodplains ..... - 24 -

3.7. Hazardous and Toxic Substances ..... - 24 -

3.8. Solid Waste Management ..... - 25 -

3.8.1. Solid Waste Management Unit (SWMU) ..... - 25 -

3.9 Socioeconomics ..... - 25 -

3.9.1 Environmental Justice ..... - 26 -

3.9.2 Protection of Children ..... - 27 -

3.10. Land and Airspace Use ..... - 27 -

4.0. ENVIRONMENTAL CONSEQUENCES AND CUMULATIVE IMPACTS ..... - 29 -

4.1. Biological Resources ..... - 29 -

4.1.1. Vegetation ..... - 29 -

4.1.2. Fish and Wildlife ..... - 30 -

4.2. Water Resources ..... - 30 -

4.2.1. Surface Water ..... - 30 -

4.2.2. Waters of the U.S. ..... - 31 -

4.3. Geological Resources ..... - 35 -

4.3.1. Soils ..... - 35 -

4.4. Cultural Resources ..... - 35 -

4.5. Solid Waste ..... - 36 -

4.6 Utilities ..... - 38 -

4.6.1 Water Supply ..... - 38 -

4.6.2 Sanitary Sewer ..... - 38 -

4.6.3 Electric Power ..... - 39 -

4.7 Cumulative Impacts ..... - 39 -

10-Year Range Development Plan Projects ..... - 39 -

Tank Trail Maintenance.....- 40 -

Maneuver Access Structure Program .....- 40 -

5.0. CONCLUSION .....- 42 -

6.0. PREPARER .....- 42 -

FINDING OF NO SIGNIFICANT IMPACT FOR CONSTRUCTION AT NORTH FORT HOOD ON FORT HOOD, TEXAS

1.0 Name of the Action

The U.S. Army, Headquarters III Corps, First Army, and Fort Hood propose to complete various construction projects on North Fort Hood in order to accommodate the changing and growing needs of the units stationed at and utilizing the North Fort Hood cantonment and airstrip areas.

2.0 Description of the Proposed Action and Alternatives

The U.S. Army, Headquarters III Corps, First Army, and Fort Hood propose to perform several construction tasks in the North Fort Hood area in order to accommodate growing and changing needs of the installation and the units stationed here. The construction projects that make up the Proposed Action are:

- Clear and grub the Longhorn Airstrip
- Relocate eastern security fence around Longhorn Airstrip
- Construct road along the interior of the Longhorn security fence
- Extend 18th Street to the east
- Construct Contingency Operating Location Longhorn
- Construct a ground support equipment site
- Construct a counter-improvised explosive device marshalling area
- Construct eight buildings in the cantonment area and nine buildings at the Longhorn Airstrip
- Construct a simulation complex
- Construct a weapons maintenance facility
- Construct a perimeter running track
- Construct a Mobilization Training Center

No Action Alternative: Under the No Action Alternative, the construction would not occur and the capabilities of the North Fort Hood area would not grow along with the number and frequency of personnel utilizing the area and their growing training needs. Lack of continuity and adequate training and certification facilities would place the lives of our Soldiers at risk and would be detrimental to the ability to fight and win the Nation's wars.

Alternatives: North Fort Hood has been designated by First Army as an Aviation Training Center of Excellence for Reserve Components of the United States Army. Fifty-four to fifty-eight percent of aviation units that will be deployed will be trained at Longhorn Airstrip. Because of the heavy focus on the training center at North Fort Hood, alternatives that were not within the vicinity of North Fort Hood were not viable considerations. However, alternatives in site and layout for several of the construction projects listed above have and will be considered

during the final site selection and planning process. This Environmental Assessment will identify and analyze feasible alternatives accordingly.

3.0 Summary of Environmental Effect of the Proposed Action

No significant adverse impacts are anticipated to occur to threatened or endangered species, air quality, hazardous material use and disposal, land use, airspace, socioeconomics, environmental justice, or protection of the children.

Short-term minor effects to vegetation, wildlife, soils, surface waters, waters of the U.S., solid waste management units, and utilities are expected as a result of the Proposed Action.

Long-term minor impacts to cultural resources are expected as a result of the Proposed Action.

4.0 Conclusion

On the basis of the findings of this Environmental Assessment (EA), no significant impacts are anticipated from the Proposed Action on human health or the natural environment. A Finding of No Significant Impact (FNSI) is warranted and an Environmental Impact Statement is not required.

for **Nancy Niemann**
Acting Director of Public Works

22 Jan 10
Date

1.0. INTRODUCTION

The U.S. Army, Headquarters III Corps, First Army, and Fort Hood propose to perform a large amount of construction at North Fort Hood.

1.1. Proposed Action Overview

The construction projects that make up the Proposed Action are:

- Clear and grub the Longhorn Airstrip (26 acres)
- Relocate eastern security fence around Longhorn Airstrip (2 to 3 acres)
- Construct road along the interior of the Longhorn security fence (approximately 10 acres)
- Extend 18th Street to the east (approximately 1 acre)
- Construct Contingency Operating Location Longhorn (20 acres)
- Construct a ground support equipment site (approximately 1 acre)
- Construct a counter-improvised explosive device marshalling area (24 acres)
- Construct eight buildings (4 acres) in the cantonment area and nine buildings (5 acres) at the Longhorn Airstrip
- Construct a simulation complex (approximately 5 acres)
- Construct a weapons maintenance facility (1 acre)
- Construct a perimeter running track (1 acre)
- Construct a Mobilization Training Center (211 acres)

1.2. Purpose and Need

The identified construction projects will support North Fort Hood's and First Army Brigades' capability to support the Reserve Component as an operational force. First Army Division West provides mission-tailored support and training to units as they progress through ARFORGEN and deployment. The long-term vision at North Fort Hood is to provide one centralized location for training support and administrative duties. The construction projects listed above, as a whole, will help bring Fort Hood closer to meeting this important need.

Clearing the vegetation that has grown up around the Longhorn Airstrip (both within the fenceline and 25 feet out of the fenceline) is a Directorate of Aviation Operations (DAO) maintenance requirement for active utilization of an airstrip. Clearing the area would reduce vegetation and minimize the prospect of foreign matter being sucked into the blades and engines of rotary wing aircraft. The clearing would occur based on the new fenceline (which would be 300 feet from the centerline of the active runway on the eastern side, and would remain the same on all other sides) and would remove approximately 50 acres worth of vegetation. If clearing occurred based on the existing fenceline (which is highly likely), approximately 25 acres of vegetation would be removed.

Relocating the security fence around the Longhorn Airstrip is a safety recommendation from DAO. The existing fenceline is considered to be too close to the edge of the runway and acts as an obstacle. Moving the fence would free up some room for landing and taking off. The

proposed action is to relocate the eastern part of the fence so that it is 300 feet away from the centerline of the active runway. It is possible that at this time the fenceline will not be relocated. While not relocating the fenceline would not impact the environment, it would affect how many acres would be cleared in the first project discussed in this section.

Constructing a security road made of gravel or similar compacted material within the interior perimeter of the airstrip fence would allow for the provision of security while the area is occupied and being used. Increased security would reduce the risk to the airstrip while aircraft are parked and would provide a roving patrol to ensure security of equipment.

The extension of 18th Street to meet up with Longhorn Road would ease traffic flow off of 16th Street and would provide quicker access for Emergency and Medical Services vehicles and personnel from the North Fort Hood cantonment area to the airstrip.

The Contingency Operating Location – Longhorn would provide an austere Afghan-style defensive position to train units in base defense operations and convoy operations in the type of environment troops find in Afghanistan. It would mainly be used for aviation units, therefore it is important to be located close to an airstrip. It would be part of the Longhorn/Shorthorn training venue, so the most logical choice is to be located close to the Longhorn/Shorthorn airstrips at North Fort Hood. There are two possible site locations for the COL Longhorn, one right off of 18th Street and one just to the northwest of that location.

Construction of a ground support equipment site would provide an area to store equipment and perform maintenance.

The counter-IED marshalling area would provide a safe rehearsal area. Currently, Troops are required to line up along the side of the road when performing counter-IED marshalling at North Fort Hood; the proposed location would provide a location off the road that can be used for rehearsal and pre-combat checks prior to conducting training. In addition, the marshalling area could be expanded to the east to make a storage area once the Operational Readiness Training Center construction begins and displaces existing storage areas.

Eight new buildings in the cantonment area would provide forward command and control of the Training Support Battalions that are being moved to Fort Hood from other installations.

Nine new buildings at Longhorn Airstrip would provide flight operations, general purpose and administration, classrooms and unit training, and ready rooms where aviators can wait when on call.

Construction of a simulation complex would provide the capabililty to conduct satellite simulation for major readiness exercises, as well as provide a starting point for a future Battle Command Training Center (BCTC) at North Fort Hood. The proposed location for the simulation complex is conceptual at this time and has not been approved due to its collocation with the proposed MTC location. The proposed site is on previously disturbed land.

Construction of a weapons maintenance facility would provide a centralized weapons cleaning location within close proximity to portable arms rooms on North Fort Hood. Weapons cleaning would be conducted using standard small-arms weapons cleaning products. The proposed location for the weapons cleaning facility is located in the NFH cantonment area.

The perimeter running track would provide Soldiers with a safe location to conduct physical training exercises and tests within the NFH cantonment area; it would be approximately one mile long and 14 to 18 feet wide made of compacted base or asphalt. It would be located in the main cantonment area and would follow the path of an existing road. The location that is currently being considered may need to be altered and, in that case, appropriate analysis and advanced coordination and planning would ensure that environmental impacts were minimized to the maximum extent practical to ensure that impacts are not significant.

The construction of several Operational Readiness Training Centers at North Fort Hood would ultimately provide the area with a Mobilization Training Center (MTC), which is needed to accommodate mobilization and demobilization activities for the Active Army, Army Reserve, and the Army National Guard. The facilities would also support annual training for Army Reserve and Army National Guard Soldiers. Peak MTC demand could approach up to 4,000 Soldiers. Basic MTC requirements include Brigade headquarters, Battalion headquarters, Officers' quarters, dining facility, vehicle maintenance facility, company operations, enlisted barracks, and storage facility. One set will be completed each year beginning in fiscal year 2009, for a total of six sets. Each set includes two barracks, one NCO and officers quarters, one battalion building, one company operations building, one maintenance facility, one dining facility, and four workshop buildings. The proposed location for the MTC is previously disturbed land that once housed many smaller facilities and associated utilities.

1.3. Agency and Public Participation

III Corps and Fort Hood invite public participation in the National Environmental Policy Act (NEPA) process. Consideration of the views and information of all interested persons promotes open communication and enables better decisions. All agencies, organizations, and members of the public having a potential interest in the Proposed Action are encouraged to participate in the decision-making process. The public is invited to review the EA and provide comments to the Fort Hood Environmental Division. The public comment period will be for 30 days beginning the date that the notice of availability is printed in the *Killeen Daily Herald* and *the Gatesville Messenger*. This EA and draft Finding of No Significant Impact (FNSI) will be available for review at the Killeen Public Library located at 205 E. Church St., Killeen, TX 78544 and through the Environmental Division, Directorate of Public Works, and Fort Hood, TX. The documents also will be available online through the Fort Hood Directorate of Public Works website at http://www.dpw.hood.army.mil ; select "Public Notices."

1.4. Project Location

The proposed projects involve many different locations across North Fort Hood. The proposed locations (and alternatives where applicable) are shown in the figures below.

Figure 1.1 North Fort Hood Overview

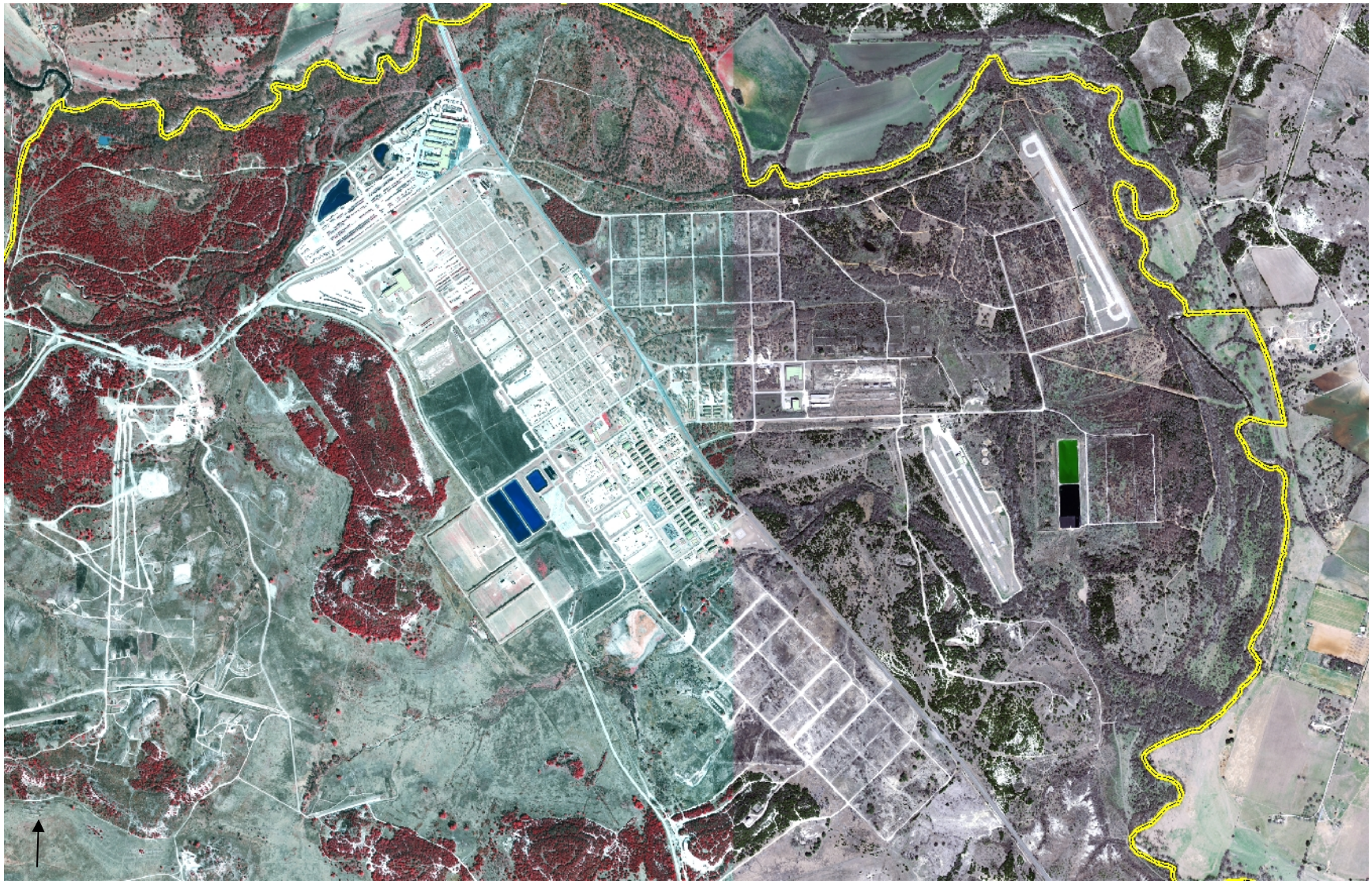


Figure 1.2 Project Locations – Cantonment Construction

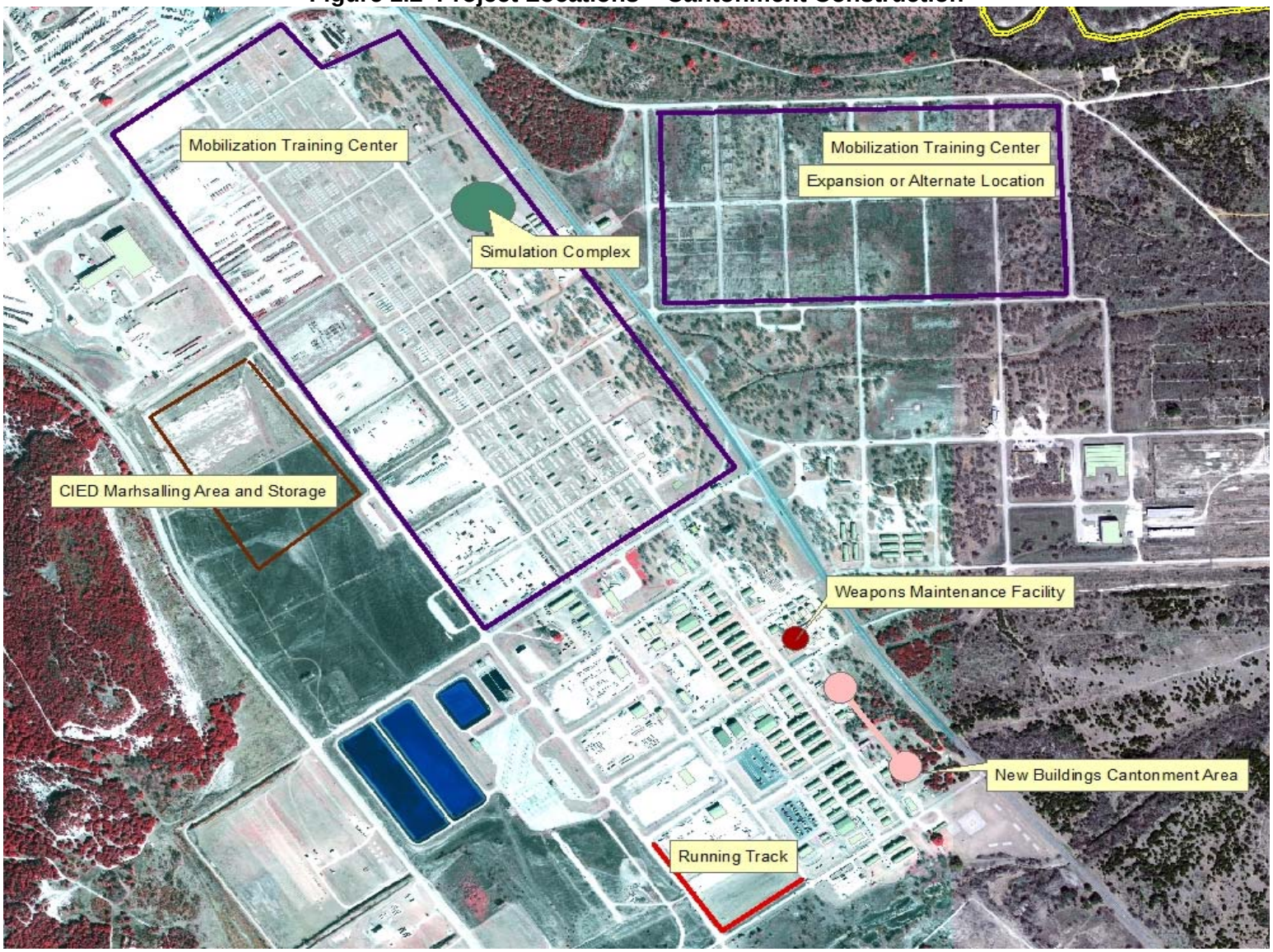


Figure 1.3 Project Locations - Construction Outside of Cantonment

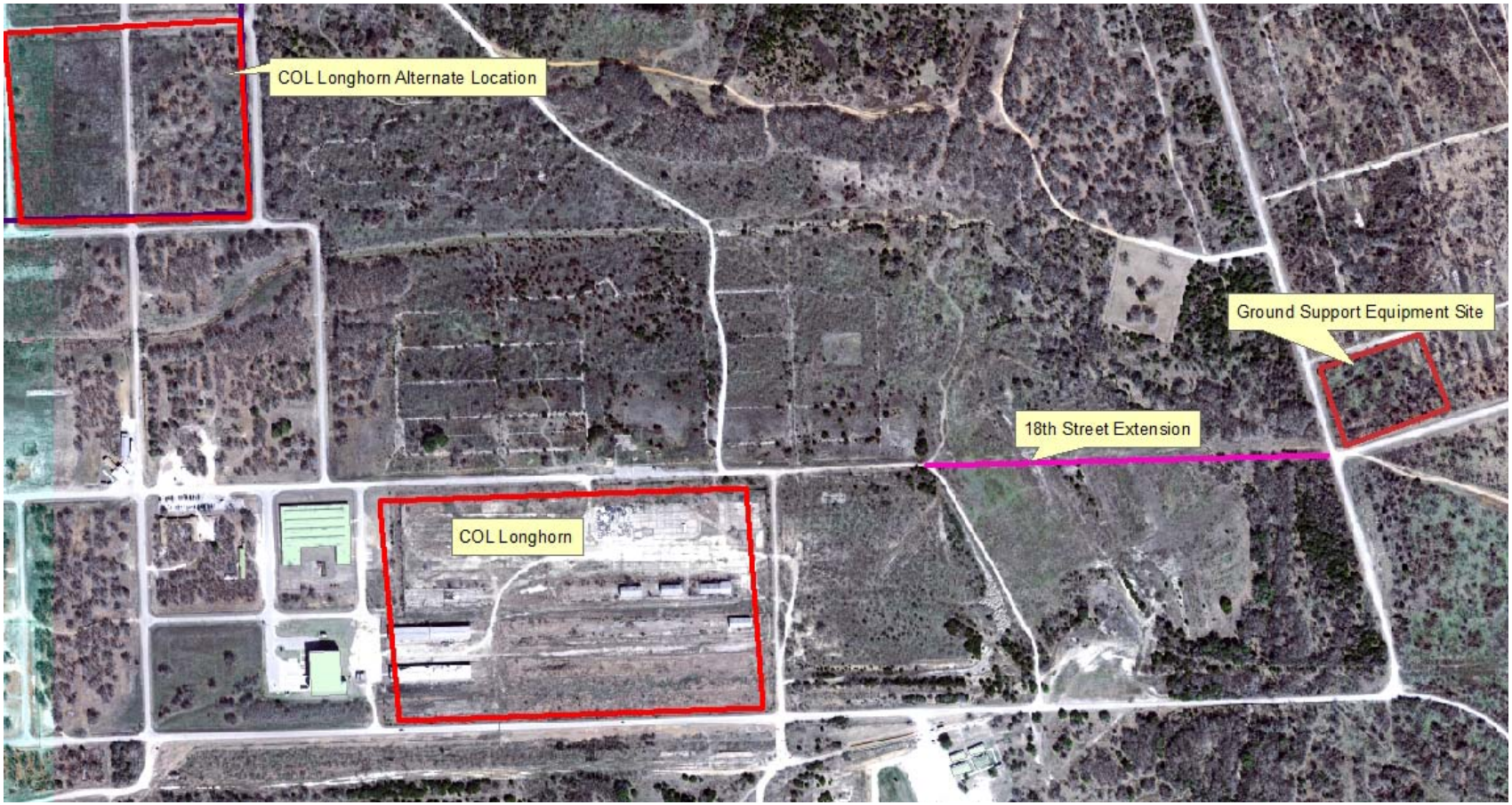
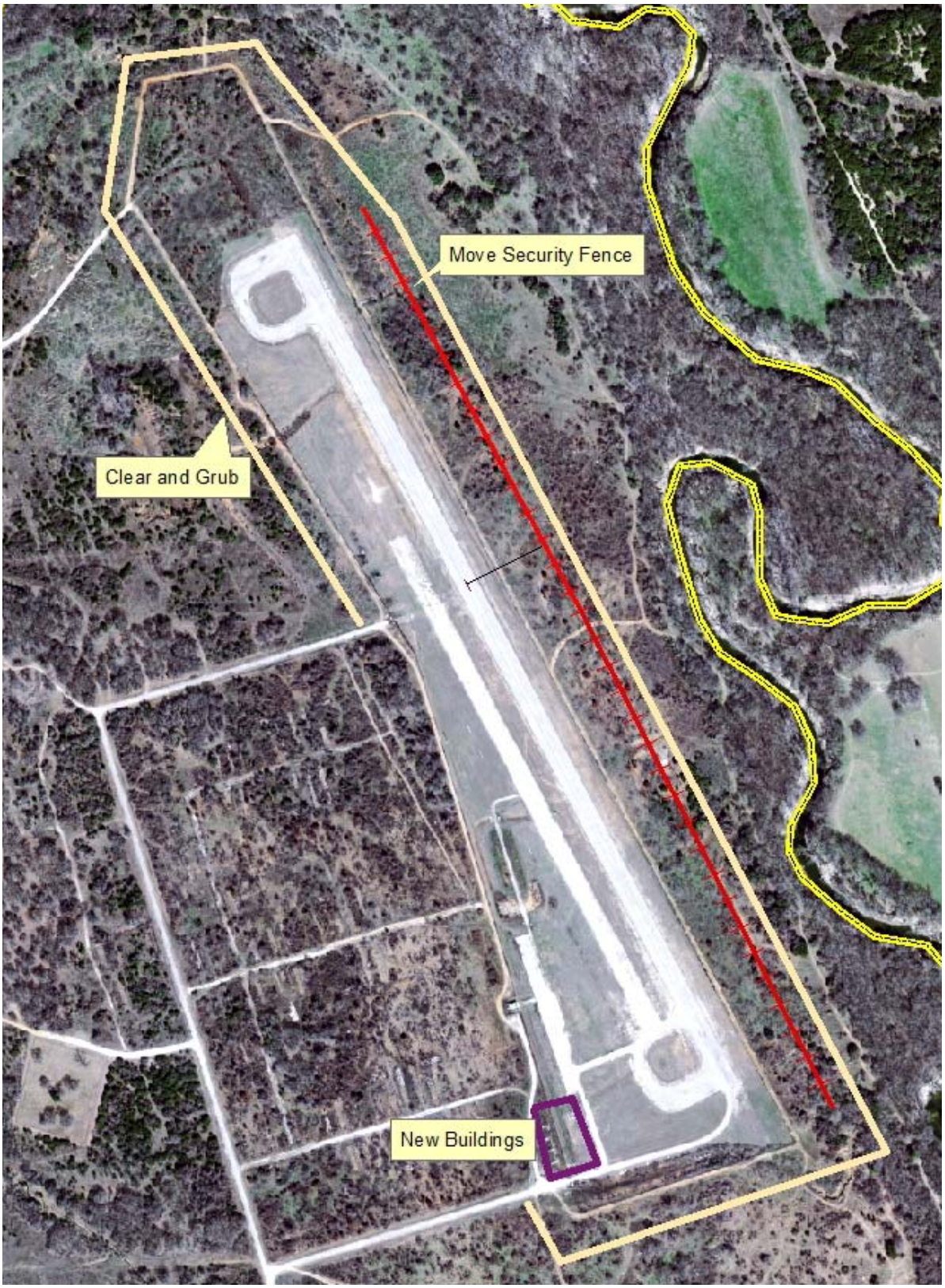


Figure 1.4 Project Locations – Longhorn Airstrip



2.0. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1. Proposed Action

The U.S. Army, Headquarters III Corps, First Army, and Fort Hood propose to complete various construction projects on North Fort Hood in order to accommodate the changing and growing needs of the units stationed at and utilizing the North Fort Hood cantonment and airstrip areas.

The construction projects that make up the Proposed Action are:

- Clear and grub the Longhorn Airstrip
- Relocate eastern security fence around Longhorn Airstrip
- Construct road and perimeter running track alongside the interior of the Longhorn security fence
- Extend 18th Street to the east
- Construct Contingency Operating Location Longhorn
- Construct a ground support equipment site
- Construct a counter-improvised explosive device marshalling area
- Construct eight buildings in the cantonment area and nine buildings at the Longhorn Airstrip
- Construct a simulation complex
- Construct a weapons maintenance facility
- Construct a perimeter running track
- Construct a Mobilization Training Center

2.2. Alternatives to the Proposed Action

North Fort Hood has been designated by First Army as an Aviation Training Center of Excellence for Reserve Components of the United States Army. Fifty-four to fifty-eight percent of aviation units that will be deployed will be trained at Longhorn Airstrip. Because of the heavy focus on the training center at North Fort Hood, alternatives that were not within the vicinity of North Fort Hood were not viable considerations. However, alternatives in site and layout for several of the construction projects listed above have and will be considered during the final site selection and planning process. This Environmental Assessment will identify and analyze feasible alternatives accordingly.

2.3. No Action Alternative

Under the No Action Alternative, the construction would not occur and the capabilities of the North Fort Hood area would not grow along with the number and frequency of personnel utilizing the area and their growing training needs. Lack of continuity and adequate training and certification facilities would place the lives of our Soldiers at risk and would be detrimental to the ability to fight and win the Nation’s wars.

3.0. AFFECTED ENVIRONMENT

This EA evaluates the potential environmental impacts of the Proposed Action; it does not evaluate environmental parameters unaffected by implementation. Further, the affected environment is analyzed according to the current conditions observed at the project site.

Complete preliminary analysis indicated there are no anticipated significant environmental impacts to threatened or endangered species, other wildlife including fish, bats and mammals; air quality; hazardous materials; utilities, land/airspace use therefore they are not analyzed in detail in this EA.

Fort Hood is comprised of approximately 218,502 acres of land located in Bell and Coryell counties in central Texas, approximately 60 miles north of Austin and 50 miles southwest of Waco. The installation is bound on the north by the city of Gatesville, on the east by Belton Lake and the town of Temple, on the south by the city of Killeen, and on the west by the town of Copperas Cove. Fort Hood has a 198,257-acre operational footprint and a 20,245-acre non-tactical area including three cantonment areas and a recreational area.

3.1. Biological Resources

3.1.1. Vegetation

The combination of soils, topography, climate, and human activities has produced a diverse mix of vegetation communities and habitats within the installation. Fort Hood is in the Lampasas Cut Plains physiographic region. Fort Hood is in the southernmost extension of the Cross Timbers and Prairies Eco-region and the northeastern reaches of the Edwards Plateau Eco-region. Woodlands in the area are closely representative of Edwards Plateau vegetative associations. Three types of forest and shrub communities are found on Fort Hood including coniferous (evergreen), deciduous (sheds leaves in fall), and mixed forests and shrub communities. The coniferous woodlands on the installation are dominated by Ashe juniper (*Juniperus ashei*). Deciduous forests and shrubs are generally found in lowlands, slopes and canyons, riparian corridors, and uplands. Historically, both grasslands and woodlands have comprised much of Fort Hood's area. Grasslands are representative primarily of the mid-grass associations of the Cross Timbers and Prairies area, with inclusions of the tall-grass associations of the Blackland Prairie (NRCS, 1998).

As a result of the Proposed Action, there would be clearing of existing vegetation around the Longhorn Airstrip, as well as some incidental clearing of vegetation in the already developed areas in and around the North Fort Hood cantonment area where the majority of the remaining construction would occur. Although within the cantonement area, most sites east/north-east of highway 36 consist of woody vegetation regrowth several decades old. Vegetation debris from the clearing would be arranged in piles and burned by an experienced burn team. Any soil spoils from the clearing and construction would be disposed of in accordance with local, State, and Federal regulation.

3.1.2. Fish and Wildlife

The fish and wildlife populations in the project area and Fort Hood cantonment are characteristic of those found on the Edwards Plateau and Lampasas Cut Plains regions. Comprehensive lists of fish, bird, and cave-dwelling species found on the installation are available in the appendices of the Integrated Natural Resources Management Plan (INRMP). The reader may contact Directorate of Public Works, Natural Resources Management Branch at Fort Hood to obtain a list of the species.

Thirty-two species of fish have been documented from the lakes, ponds, and streams on the installation. The common species are the red shiner (*Cyprinella lutrensis*), the blacktailed shiner (*Notropis venustus*), and the bullhead minnow (*Pimephales vigilax*), and various other species of the minnow (*Cyprinidae*) or sunfish (*Centrarchidae*) families (USACE 1999).

Seven bat species are known to inhabit Fort Hood where they forage and drink along major/minor creeks, tributaries, and ponds. The construction project sites are located near the Leon River where bats frequently forage for food in the evening hours and/or roost in tall tree canopies along the river. However, based on Fort Hood research and observation, the construction and subsequent use of the area for mobilization and aerial gunnery training /certification may not disrupt the bats' ability to forage as long as no direct, frequent helicopter flights occur along stretches of the Leon River.

As part of the clearing and grubbing of the airstrip, trees would be removed between the east/northeast side of the airstrip and the Leon River. Mammals and birds may inhabit the areas that are proposed for clearing and construction. Migratory birds are known to inhabit the area surrounding and at the project location. The riparian zone along the Leon River, where bats and birds concentrate, is not anticipated to be impacted because this area would not be included in the clearing.

There are no threatened or endangered species known to inhabit the areas associated with the Proposed Action.

For a more in-depth list of specific species found on the installation, the reader may refer to a reading list located in Appendix B of this document.

3.2. Water Resources

Water quality data on Fort Hood streams indicates that large portions of the training areas are subject to sheet and gully erosion. One of the most substantial impacts to surface water resources is from siltation caused by runoff. Areas disturbed by construction of ranges as well as vehicle traffic including training maneuvers and directly crossing creek beds are major contributors to erosion and runoff.

3.2.1. Surface Water

Fort Hood is located in the Brazos River Basin. Surface water consists of numerous small to moderate-sized streams, which generally flow in a southeasterly direction. It has approximately 200 miles of named intermittent and perennial streams with numerous additional tributaries of those features. Fort Hood also contains more than 200 water impoundments that equal approximately 692 surface-acres. Most of these are used for flood control, sediment retention, wildlife and livestock water, and fish habitat. A few of the impoundments serve as either wash rack storage facilities or sewage treatment ponds. Additionally, Fort Hood shares 43 miles of shoreline with Belton Lake. Belton Lake is owned and operated by the U.S. Army Corps of Engineers (USACE) for flood control, water supply, and recreation.

North Fort Hood, the location of the Proposed Action, is in the Leon River watershed. The watershed has a drainage area of 3,533 square miles and covers parts of Eastland, Comanche, Mills, Hamilton, Coryell, and Bell counties. The Leon River is formed by the confluence of its north, middle and south forks in Eastland County. The waterway flows about 185 miles southeast, eventually joining the Lampasas River to form the Little River.

The Leon River and Cowhouse Creek form the two arms of Belton Lake, and Owl Creek flows directly into the Leon River arm. Reese Creek and its tributaries flow south toward the Lampasas River. Tributaries of Nolan Creek, including North Nolan Creek, and tributaries of South Nolan Creek, flow southeast and leave the installation. Nolan Creek enters the Leon River below Belton Lake. The Leon River is located to the north and east of both airstrips.

3.2.2. Waters of the U.S.

Waters of the U.S. exist across the installation. These resources range from small emergent wetlands associated with ephemeral streams to large, forested wetland complexes adjacent to perennial channels. Waters of the U.S. are located within proximity to some of the construction associated with the Proposed Action.

3.3. Air Quality

North Fort Hood is located in Coryell County, which is within the Austin-Waco Intrastate Air Quality Control Region (AQCR) (40 CFR 81.175). Ambient air quality for the Austin-Waco Intrastate AQCR is classified as an unclassifiable/attainment area for all criteria pollutants. Unclassifiable areas are those that have not had ambient air monitoring and are assumed to be in attainment with National Ambient Air Quality Standards (NAAQS).

The Proposed Action is not anticipated to significantly impact the air quality on Fort Hood. Temporary, intermittent, short-term effects will occur with particulate matter generated during construction. However, these actions are not significantly different from actions that commonly occur on Fort Hood, and the amount of particulate generated will be negligible in threshold calculations.

Lack of vegetation near the airstrip would increase the probability of creating a "brownout"'; which is the suspension of particulate matter in the air as a result of helicopter take off and landing. BMPs implemented in large part to ensure no interruption in training due to brownouts should ensure this does not become a problem. Because air quality is not anticipated to be significantly impacted as a result of the Proposed Action, it has been eliminated from further study in this EA.

3.4. Noise

The Noise Control Act of 1972 (Public Law 92-574) directs Federal agencies to comply with applicable Federal, state, interstate, and local noise control regulations. The United States Environmental Protection Agency, the U.S. Department of Housing and Urban Development (HUD), and Department of Defense (DoD) have disseminated sound quality criteria that has identified noise levels to protect public health and welfare with an adequate margin of safety. Noise levels below 65 decibels (dB) are considered normally acceptable in suitable living environments.

Responses to noise vary, depending on the type and characteristics of the noise, the expected level of noise, the distance between the noise source and the receptor, the receptor's sensitivity, and the time of day. Table 3.1 lists the sound levels of some familiar sources:

Table 3.1

Sound Levels of Various Sources

Source	Sound Level (dB)
Near jet plane at takeoff	140
Gun muzzle blast	140
Threshold of pain	120
Loud music	115
Car horn	115
Thunder	110
Chainsaw	100
Lawn mower at 50 feet	90
Jack hammer	88
Dozer	85

Backhoe	80
Alarm clock	75
Normal conversation	60
Light traffic	50
Refrigerator	40
Rustle of leaves	20
Normal breathing	10

One significant response to noise is annoyance. The annoyance may be personal or experienced as a group. There are five indicators for estimating community complaint reaction to noise: type of noise, amount of repetition, type of neighborhood, time of day, and amount of previous exposure.

The Proposed Action is located in an area that is already heavily used for training regularly, including an already active airstrip. Noise around the area will increase, both as a result of construction and as a result of increased activity and population in the area, particularly due to the construction of the MTC. However, existing activity at North Fort Hood is consistent with the activities associated with all proposed construction. Therefore, it is is not anticipated that increased noise would be a problem in the future. There are no sensitive areas in close proximity to North Fort Hood cantonment, such as hospitals or residential, non-military housing. The noise level is not anticipated to be significant impacted by the Proposed Action, therefore, it has been eliminated from further study in this EA.

3.5. Cultural Resources

Cultural resources are defined by the National Historic Preservation Act (NHPA) as prehistoric and historic sites, structures, districts, or any other physical evidence of human activity considered important to a culture, a subculture, or a community for scientific, traditional, religious, or any other reason. Depending on the condition and historic use, such resources may provide insight into living conditions in previous civilizations and/or may retain cultural and religious significance to modern groups.

The footprints for the Proposed Action have been inventoried for cultural resources. Identified are two prehistoric archaeological sites (41CV1494 and 41CV1495), remains of a Prisoner of War Camp (POW) and remains of Korean War era “tent city”. All identified resources have been recommended not eligible for listing on the National Register of Historic Places (NRHP) except for the “tent city” that are recommended eligible under the Program Comment for Cold War Era Unaccompanied Personnel Housing (1946-1974).

3.6 Geological Resources

3.6.1 Geology

The strata underlying Fort Hood, with the exception of the recent alluvium and river terrace deposits, are consolidated sedimentary rocks of Cretaceous age and belong to the Comanche Series. The erosion of these Cretaceous rocks over the past 70 million years and the deposition of unconsolidated materials along the major streams have produced the present landscape of Fort Hood (USACE 1987b). The major rock layers beneath Fort Hood are the Glen Rose formation, Paluxy Sand, Walnut Clay, Comanche Peak formation, Edwards Limestone-Kiamichi Clay complex, Denton Clay-Fort Worth Limestone, and Duck Creek Limestone complex. The major floodplains are filled with alluvium and river terrace deposits.

The Balcones Fault Zone passes immediately east of the installation, running north to southwest. The land to the north of this zone, including Fort Hood lands, has risen as much as 500 feet. Erosion of this land over time is what has created the irregular, steep sloping terrain on the installation (USACE 1987b).

Geology is not anticipated to be impacted as a result of the Proposed Action and will be eliminated from further study in this EA.

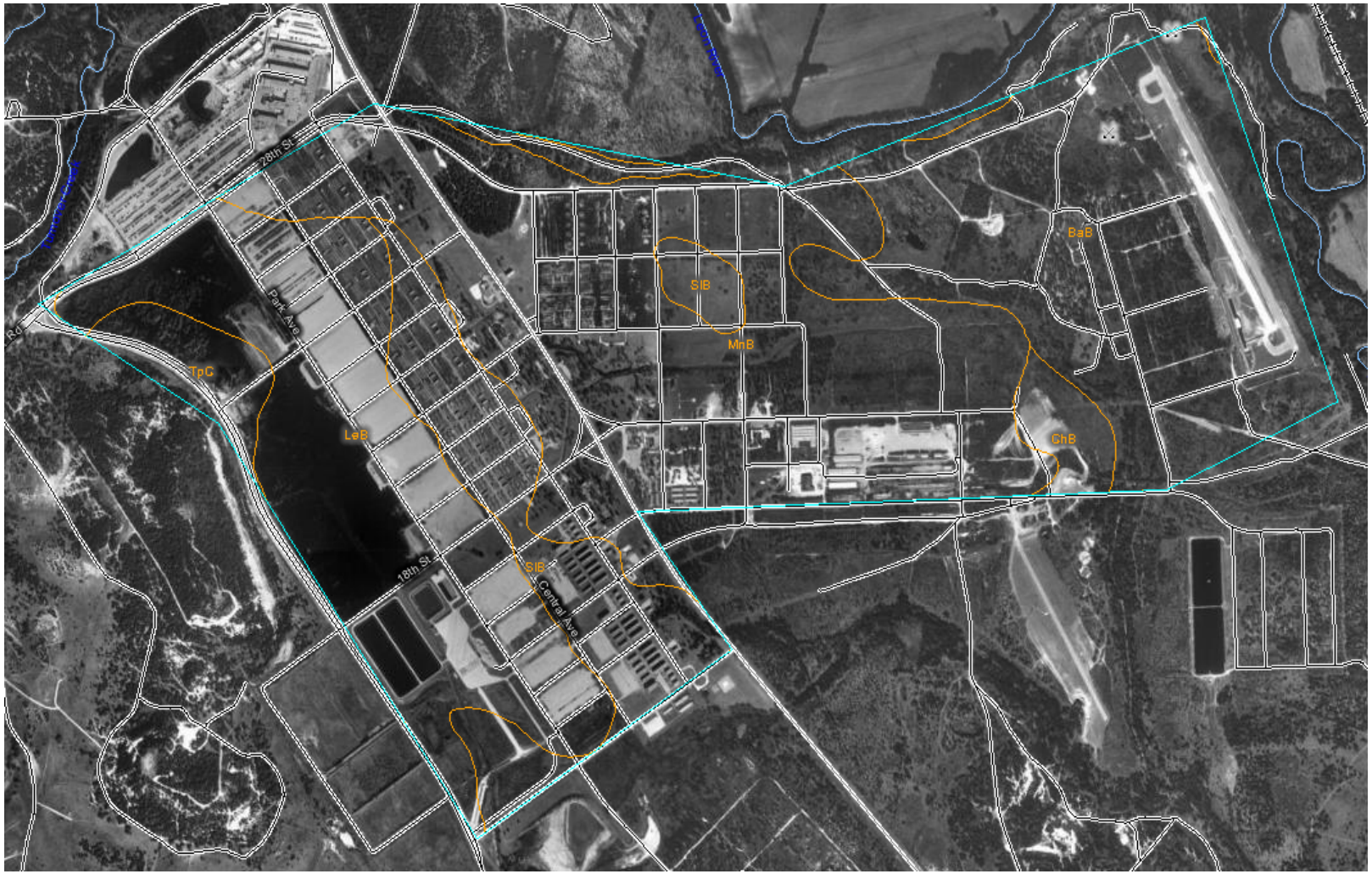
3.6.2 Soils

Soil types within the proposed project area were determined using the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), and Bell County and Coryell County Soil Surveys (USDA 1977 and 1985, respectively).
In 2002, the NRCS assessed soil erosion at Fort Hood as part of the Land Condition and Trend Analysis Program (NRCS 2002). The study concluded that soil erosion was highest in the Western Maneuver Area. Erosion on Fort Hood is a result of drought conditions, military training and continuous grazing without deferment on the soil and vegetation.

The Proposed Action is located in the North Fort Hood area, where erosion is lower in most cases because of the limited vehicle traffic for maneuver and training exercises. However, at the northern end of Longhorn Airstrip, where significant clearing would occur, erosion is known to be a problem.

The specific soil types associated with the Proposed Action are Bastsil fine Sandy Loam (BaB), Bosque clay loam (Bs), Cho clay loam (ChB), Frio silty clay (Fr), Lewisville clay loam (LeB), Minwells fine sandy loam (MnB), Nuff very stony silty clay loam (NuC), Slidell silty clay (SlB), and Topsey-Pidcoke association (TpC). Appendix D provides more detailed information on the soils found in the project area. Figure 3.1 shows a soil map.

Figure 3.1 Soil Map



**The light aqua line indicates the boundaries of the area of interest as used for the soil map.

3.6.3. Floodplains

Executive Order (E.O.) 11988, "Floodplain Management," was signed into law May 24, 1977, in order to set guidelines to avoid the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.

The clearing and grubbing of the airstrip, and the perimeter road along the interior of the security fence at the airstrip would both fall within known floodplains. In addition, North Fort Hood is essentially surrounded by known floodplains, although none of the other proposed construction sites fall within floodplain areas. Because the majority of the work that would occur within the floodplain areas is clearing and non-vertical construction, floodplains are not anticipated to be significantly adversely affected by the Proposed Action. Therefore, floodplains have been eliminated from further study in this EA.

3.7. Hazardous and Toxic Substances

Specific environmental statutes and regulations govern hazardous material and hazardous waste management activities at Fort Hood. For the purpose of this analysis, the terms *hazardous waste*, *hazardous materials*, and *toxic substances* include those substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), or the Toxic Substances Control Act (TSCA). In general, they include substances that, because of their quantity, concentration, or physical, chemical, or toxic characteristics, might present substantial danger to public health or welfare of the environment if released.

Hazardous materials are managed in accordance with AR 200-1, *Environmental Protection and Enhancement* (December 2007), Section 4, for the purpose of minimizing hazards to public health and damage to the environment. Fort Hood policy is to manage hazardous substances (HS), hazardous material (HAZMAT), and hazardous waste (HazWaste) in an environmentally acceptable manner. Fort Hood has developed and implemented a Hazardous Material Management Program (HMMP) which focuses on establishing installation-level, centralized management and visibility of materials containing reportable chemicals or having safety considerations. The concept of centralized management is to monitor the materials "from cradle to grave" and reduce hazardous waste generation. Fort Hood's HMMP is designed as part of an initiative to track the life cycle of all HAZMAT from procurement to ultimate disposition and minimize use of HAZMAT through pollution prevention actions.

Fort Hood's Spill Prevention, Control, and Countermeasures Plan (SPCCP) and Installation Response Plan (IRP) address the prevention of unintentional pollutant discharges from the bulk storage and handling of petroleum products as well as other hazardous materials. The plans detail the specific storage locations, the amount of material at potential spill sites throughout Fort Hood, and spill countermeasures.

All hazardous materials used on-post must be accompanied by a material safety data sheet (MSDS) that details the hazards associated with each specific substance. Contractors working on-post must comply with the Fort Hood HMMP and obtain approval for all hazardous materials brought on post. Material containing polychlorinated biphenyls (PCBs), asbestos, and lead shall not be introduced on military installations.

3.8. Solid Waste Management

The Fort Hood landfill is located in Bell/Coryell Counties. The landfill is a government-owned, contractor-operated Class I municipal solid waste permitted facility, operating under Permit Number 1866. Solid waste collection is accomplished under contract with a private refuse contractor. Fort Hood's Qualified Recycle Program collects and sells paper, plastic, cardboard, metal, used fuel and oil and other recyclables.

3.8.1. Solid Waste Management Unit (SWMU)

Fort Hood SWMU #12 is approximately 120 acres in size and is located adjacent to the Longhorn Landing Strip. The site was originally used during the 1940s and 1950s as a landfill for construction debris and possibly some sanitary landfill material. Rubble concrete from old foundation removals may have been added to the site as late as 1988.

An unnumbered SWMU is located to the west of Longhorn Airstrip directly where the expansion of 18th Street would occur.

3.9 Socioeconomics

Criteria used to determine Fort Hood's region of influence are the residency distribution of Fort Hood employees, commuting distances and times, and the location of businesses providing goods and services to Fort Hood, its personnel, and their dependents. Further, the criteria are based on regional economic activity, population, housing, and schools. Based on these measures, the region of influence for Fort Hood is defined as Bell County and Coryell County, which spans an area of 2,112 square miles.

In 2006, Bell County had a total population of 258,000 - 131,000 (51 percent) females and 127,000 (49 percent) males. The median age was 30.6 years. Thirty-one percent of the population was under 18 years and 9 percent was 65 years and older. In 2006, there were 94,000 households in Bell County. The average household size was 2.7 people. Families made up 71 percent of the households in Bell County. This figure includes both married-couple families (53 percent) and other families (18 percent). Non-family households made up 29 percent of all households in Bell County. Most of the non-family households were people living alone, but some were composed of people living in households in which no one was related to the householder.

The median income of households in Bell County was $43,231. Eighty-four percent of the households received earnings, and 23 percent received retirement income other than Social

Security. Twenty-one percent of the households received Social Security. The average income from Social Security was $12,861. These income sources are not mutually exclusive; that is, some households received income from more than one source.

In 2006, Bell County had a total of 110,000 housing units, 15 percent of which were vacant. Of the total housing units, 63 percent was in single-unit structures, 28 percent was in multi-unit structures, and 9 percent was in mobile homes. Thirty-seven percent of the housing units were built since 1990.

In 2006, Coryell County had a total population of 73,000 - 40,000 (54 percent) females and 33,000 (46 percent) males. The median age was 27.5 years. Thirty-two percent of the population was under 18 years, and 6 percent was 65 years and older. In 2006 there were 20,000 households in Coryell County. The average household size was 3.4 people. Families made up 77 percent of the households in Coryell County. This figure includes both married-couple families (61 percent) and other families (16 percent). Non-family households made up 23 percent of all households in Coryell County. Most of the non-family households were people living alone, but some were composed of people living in households in which no one was related to the householder.

The median income of households in Coryell County was $41,783. Eighty percent of the households received earnings, and 22 percent received retirement income other than Social Security. Nineteen percent of the households received Social Security. The average income from Social Security was $12,440. These income sources are not mutually exclusive; that is, some households received income from more than one source.

In 2006, Coryell County had a total of 23,000 housing units, 14 percent of which were vacant. Of the total housing units, 70 percent was in single-unit structures, 21 percent was in multi-unit structures, and 9 percent was in mobile homes. Thirty-six percent of the housing units were built since 1990.

Currently, 13 Family housing villages are located on the installation and are managed by Fort Hood Family Housing (FHFH). These villages include community facilities such as schools, community centers, swimming pools, and child development centers. In addition, the villages provide community amenities such as community halls, sports facilities, parks, and playgrounds. Retail facilities are located in several of the villages. A Post Exchange and Commissary are located on both Clear Creek Road on the west side of the installation and on Warrior Way Road on the east side of the installation.

No economically sensitive groups are anticipated to be impacted as a result of the Proposed Action; therefore, socioeconomics has been eliminated from further study in this EA.

3.9.1 Environmental Justice

Environmental Justice is mandated by Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, and was signed into law on February 11, 1994. The Executive Order is designed to focus the attention of Federal agencies on the human health and environmental conditions in minority and low-income communities. Environmental justice analyses are performed to identify the disproportionate placement of high

and adverse environmental or health impacts from proposed Federal actions on minority or low-income populations and to identify alternatives that could mitigate these impacts. Because the Proposed Action does not include factors affecting minority and low income populations, Environmental Justice has been eliminated from further study in this EA.

3.9.2 Protection of Children

Executive Order 13045 seeks to protect children from disproportionately incurring environmental health or safety risks that might arise as a result of Army policies, programs, activities, and standards. Historically, children have been present at Fort Hood as residents and visitors (e.g., users of recreational facilities, family housing, schools, etc.). On such occasions, the Army has taken precautions for their safety by a number of means, including, but not limited to, the use of fencing, limitations on access to certain areas, and provision of adult supervision. Because there are no housing areas, daycares, schools, or other facilities in or near the project area where children would live, stay, or play, Protection of Children has been eliminated from further study in this EA.

3.10. Land and Airspace Use

Fort Hood encompasses over 214,000 acres. The installation comprises three cantonment areas, two instrumented airfields, and many maneuver and live-fire training areas. Since the project area would continue to be used for training and mobilization of troops and their aircraft; no impact to land use is anticipated as a result of the Proposed Action.

There is no expected change in airspace expected as a result of the Proposed Action. There would likely be some increased use of the airstrip, however, scheduling of the airstrip and training events would ensure appropriate use of the resources. Airspace will not be impacted by the Proposed Action, and land use is consistent with current uses. Therefore, land and airspace use will not be further analyzed in this EA.

3.11 Utilities

3.11.1 Water Supply

Most of the potable water used on Fort Hood is obtained from the Bell County Water Control & Improvement District #1 (BCWCID#1), which treats surface water from Belton Lake. This purchased water is distributed throughout the main cantonment areas of the southern and western portions of Fort Hood, as well as to the Belton Lake Outdoor Recreation Area. The water infrastructure on Fort Hood is owned, operated, and maintained by a private company.

3.11.2 Sanitary Sewer

The sewer system at North Fort Hood is served by the City of Gatesville. Current reports indicate that the sewer system at North Fort Hood is at capacity.

3.11.3 Electric Power

Electricity is supplied to Fort Hood by the local utility company, Oncor, via two 138 KV transmission lines. Several electric substations on the base are used to step the transmission voltage down and distribute electric power to end users.

3.11.4 Natural Gas

Fort Hood's natural gas supplier, Atmos Energy, provides a guaranteed annual delivery of 1,300,000 cubic feet of natural gas. A natural-gas fired water heater would be used with an estimated annual energy consumption of 450 MBTU. It is not anticipated that the Proposed Action or Alternative 1 would affect natural gas on Fort Hood. With these considerations taken into account, the natural gas supply has been eliminated from further study in this EA.

4.0. ENVIRONMENTAL CONSEQUENCES AND CUMULATIVE IMPACTS

This section will evaluate the impact of the Proposed Action. Because the No Action Alternative is not anticipated to change the existing environmental conditions, only the Proposed Action, along with site alternatives, are analyzed in this section.

Environmental Resources	Timeframe	Impact
Vegetation	Permanent	Minor
Fish and Wildlife	Short-Term	Minor
Surface Water Waters of the U.S.	Short-Term	Minor
Waters of the U.S.	Short-Term	Minor
Soils	Short-Term	Minor
Cultural Resources	Permanent	Minor
Solid Waste	Long-Term	Minor
Utilities	Short-Term	Minor

4.1. Biological Resources

4.1.1. Vegetation

A large amount of vegetation would be removed as a result of the Proposed Action. First, the clearing and grubbing of the Longhorn Airstrip would require that most of the vegetation be removed permanently, ie, grubbed. Most importantly, the northern end of the airstrip would be cleared to accommodate the safety requirements of the activities occurring at the airstrip.
The expected amount of disturbance would include all vegetation on the interior of the fenceline and then 25 feet out from the exterior of the fenceline, totaling approximately 50 acres of vegetation lost. [NOTE: this is measuring the area of disturbance assuming that the fenceline is moving 300 feet to the east of the airstrip first, and then all vegetation within that interior and 25 feet on the outside is removed.] If the fenceline was not moved and the vegetation was cleared on the interior of the existing fenceline plus an additional 25 feet outside, approximately 25 acres of vegetation would be lost. Lack of appropriate vegetation poses a risk and safety hazard to the airstrip due to the increased potential for brownouts.

In addition, vegetation would be removed to accommodate the proposed location for the COL Longhorn, the COL Longhorn alternate location, and the MTC expansion proposed location. These areas include previously developed land but have grown over with vegetation due to lack of use. Loss of trees and shrubs in the area would occur but, as with the clearing at Longhorn Airstrip, appropriate reseeding would occur to minimize erosion.

The implementation of management measures consistent with the Fort Hood Integrated Natural Resources Management Plan (INRMP) would help minimize degradation of natural resources. Areas of disturbance would be reseeded with approved vegetation mixtures. Professional personnel would be charged with reseeding the disturbed area so that, while trees and shrubs would be removed, at least the area would have a groundcover to reduce the potential for erosion

and sedimentation problems. With the implementation of minimization measures, the impact to vegetation as a result of the Proposed Action would be permanent but insignificant. A list of possible minimization and compliance measures can be found in Appendix A of this document.

4.1.2. Fish and Wildlife

Migratory birds and other wildlife are known to inhabit the area associated with the Proposed Action, particularly the locations that are proposed for the COL Longhorn, MTC, and the Longhorn Airstrip work.

Wildlife that inhabit these areas would likely be displaced and could even experience some loss due to construction activities. However, due to the large wildlife populations in the area and the large amount of suitable habitat in the area, the impact to wildlife populations is short-term and not anticipated to be significant. If clearing around the airfield was based on the existing fenceline, impacts to bats that roost in the treeline along the Leon River would be reduced.

Fort Hood recognizes the importance of observing nesting seasons for migratory birds. When appropriate and practical, construction and clearing activities would be restricted to schedules that fall outside of applicable nesting seasons. In addition, appropriate outreach and education (for example, ensuring that contractors and project managers are aware of the importance of stopping work in the event that a bird or nest is encountered) would be taken to ensure that field personnel are aware of the possibility of encountering wildlife in the construction areas and, in the event of such an encounter, the proper measures to take.

4.2. Water Resources

4.2.1. Surface Water

Grading and hardening of surfaces during the construction of hardstands and the compaction of soils in the area associated with increased use and vehicular traffic are anticipated to occur as a result of the Proposed Action. Such increased hardstand would contribute to the increase in stormwater flows in the area. Longhorn Airstrip is adjacent to the Leon River and the North Fort Hood is in the vicinity of the Leon River, which is considered “impaired” due to bacteria. However, the erosion that is anticipated as a result of increased impervious surfaces in the area is not anticipated to significantly impact the impairment status of the river.

Storm water flows are important to the management of surface water. The flows can introduce sediments and other contaminants into lakes, rivers, and streams. Multiple areas of impervious surfaces can overwhelm water bodies within the drainage. Soil erosion on the installation has resulted in decreased water quality and increased sedimentation in portions of Belton Lake as well as smaller water bodies and tributaries, including the Leon River on the installation (USACE 1999). The Blackland Research and Extension Center Water Science Laboratory in Temple, Texas, monitors sediment and other water quality parameters at 13 locations across Fort Hood.

Soil erosion management actions performed in accordance with the Fort Hood INRMP, and adherence to appropriate storm water management engineering practices, applicable regulations, codes, and permit requirements in addition to using low-impact development techniques would reduce storm water runoff-related impacts and help to control the sedimentation loads associated with the construction and clearing related to the Proposed Action.

The Texas Commission on Environmental Quality (TCEQ) issues permits for Water Quality Certification for construction activities, as required by Section 401 of the Clean Water Act (CWA). The construction related to the Proposed Action would require the development of a Storm Water Pollution Prevention Plan (SWPPPP) to meet requirements of the Texas Pollutant Discharge Elimination System (TPDES) program. SWPPPs would need to be completed for most of the projects associated with the Proposed Action. When the area of disturbance is more than five acres, a Notice of Intent (NOI) must be completed by the primary operator and submitted to the TCEQ. A secondary operator construction site notice (CSN) must be completed by the secondary operator. A signed copy of all NOIs and CSNs must be submitted to the Municipal Separate Storm Sewer System (MS4) operator (Fort Hood) at least seven days prior to any construction activity. In addition, a copy of all NOIs and the CSN must be posted at a publically accessible location near the main entrance of the construction site.

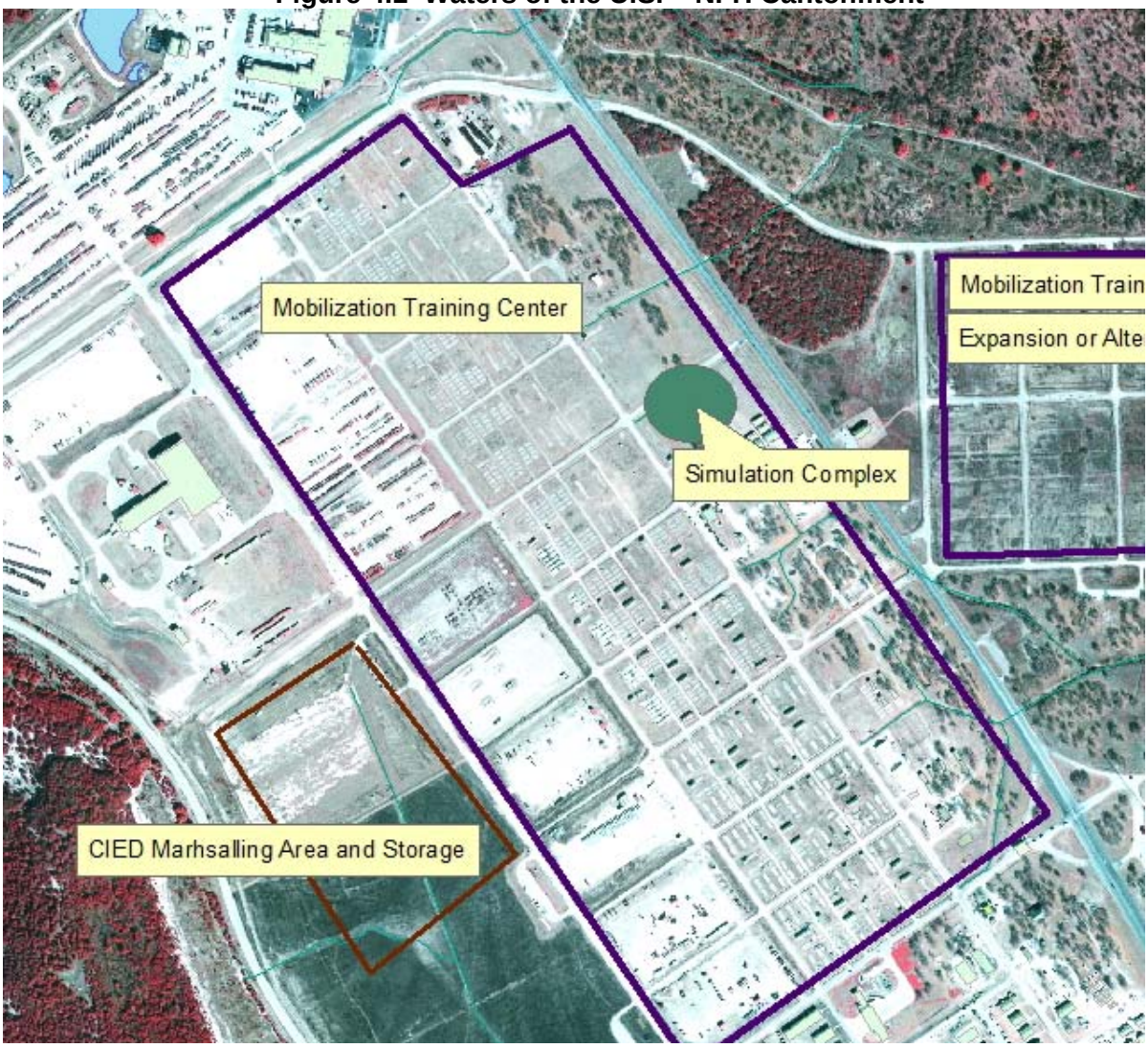
Erosion and sediment controls would be required and would be in place during construction to reduce and control erosion impacts to areas outside the construction site. The use of BMPs such as silt fencing and sediment traps, as well as the stabilization of disturbed soils would help to maintain water runoff quality at levels comparable to existing conditions and would limit potential environmental impacts from construction activities. Therefore, erosion as a result of the construction and clearing is anticipated to be short-term and minor.

4.2.2. Waters of the U.S.

Waters of the U.S. exist in proximity to several of the construction and clearing projects that are associated with the Proposed Action.

First, there is a stream that runs through the location that is proposed for the CIED marshalling area. Secondly, a stream crosses the proposed route for the extension of 18th Street. Third, several streams exist at the edges of the Longhorn Airstrip where the clearing will occur, as well as the construction of new facilities. Finally, the Leon River runs to the east of the North Fort Hood cantonment area. See Figures 4.1, 4.2, and 4.3 for more information.

Figure 4.1 Waters of the U.S. – NFH Cantonment



*Aqua lines represent waters of the U.S.

Waters of the U.S. exist through the NFH cantonment area. Construction of facilities would avoid these waters of the U.S. during site selection. However, the CIED marshalling area and storage yard could potentially impact the waters of the U.S. shown in the figure above.

Avoidance is preferred over impact. During layout and design discussions, permitting requirements and potential solutions were provided by DPW Natural Resources personnel. It would be preferable, if the entire area is required for mission readiness, to develop hardstand on either side of the stream and construct a crossing to access either side of the area, which would fall under Nationwide Permit 14 and would not require further coordination with regulatory agencies. If this sort of avoidance is found to be not feasible during design, filling in the stream to create one complete hardstand area would require a notification to the USACE-Regulatory and potentially a waiver request to fill in approximately 2200 linear feet of the stream, which could take approximately one year to receive approval. Preliminary discussions with First Army

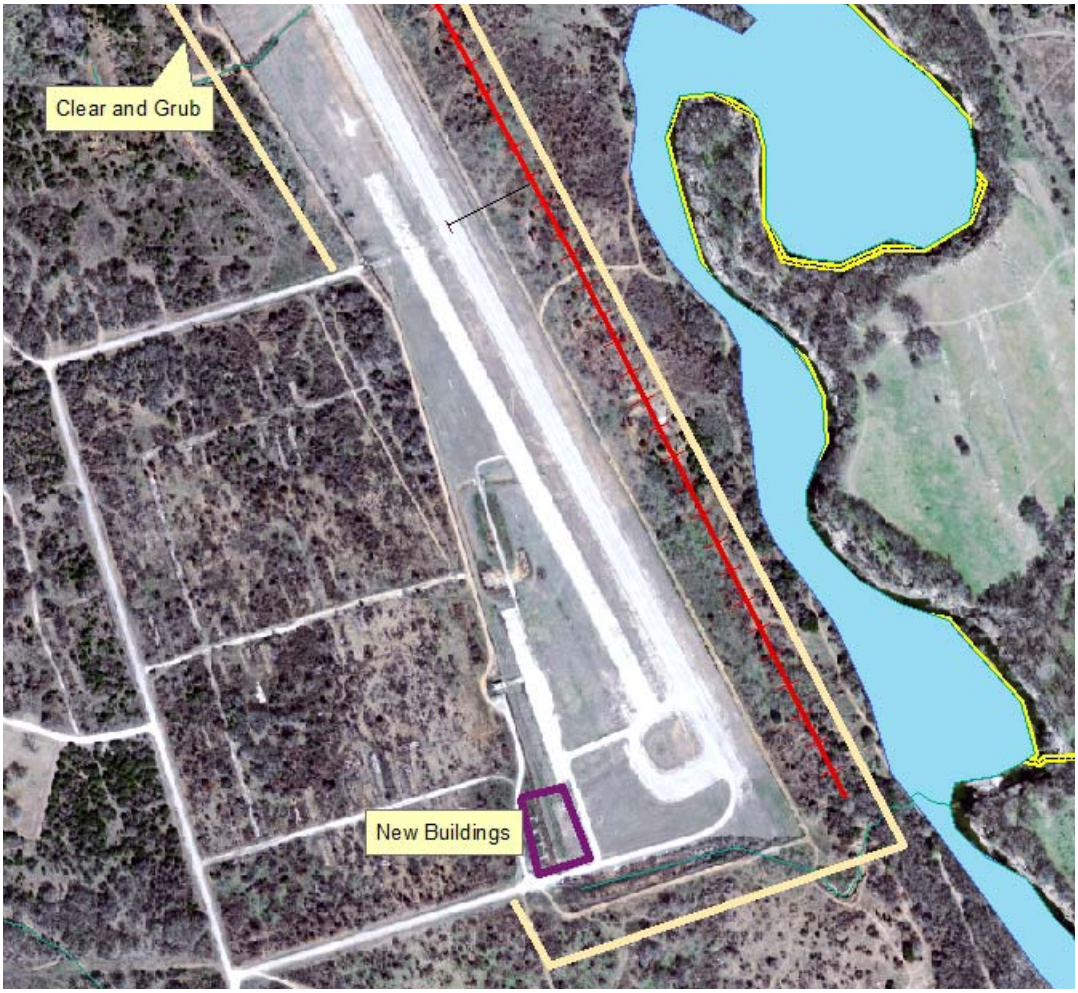
personnel indicate that construction a crossing over the stream would be feasible and preferable to submitting permitting requests and awaiting a response. This is also the environmentally preferred alternative. It is anticipated that if this route were chosen, there would be no significant impact to the waters of the U.S. at this location.

Figure 4.2 Waters of the U.S. – 18th Street Extension

**Aqua line represents waters of the U.S.

A stream crosses from north to south over the proposed route for the extension of 18th Street to connect to Longhorn Road (to the east). Because the proposed project work is simply to create a crossing from the west side of the stream to the east side of the stream, no significant impact is anticipated in relation to this proposed work. Compliance with the USACE Nationwide Permit 14 would be required, as well as proper BMPs and SWPPP measures.

Figure 4.3 Waters of the U.S. – Longhorn Airstrip



**Aqua lines represent streams that are waters of the U.S. Blue polygon represents wetland associated with the Leon River that are waters of the US.

Waters of the U.S. exist along the edges of the Longhorn Airstrip where clearing and grubbing is anticipated to occur as part of the Proposed Action. In areas where these delineated waters of the U.S. and other significant drainage features exist, grubbing must not occur. Instead, these areas should be cleared at the surface, leaving the surface soil intact. Provided this measure is taken to protect the waters of the U.S. in this area, the impact to waters of the U.S. is anticipated to be short-term and minor.

A list of possible minimization and compliance measures is available in Appendix A of this document.

4.3. Geological Resources

4.3.1. Soils

The disturbance of soils is anticipated to occur as a result of the Proposed Action. Erosion is a concern in the Training Areas of Fort Hood. Excessive erosion can result in sedimentation of downstream water bodies. This is a prominent issue for Fort Hood, and minimization practices have been developed to curtail the negative consequences. Possible minimization measures are listed in Appendix A of this document. For example, in areas where the soil is disturbed, construction control measures are put in place to minimize the off-site migration of valuable soil. In addition, disturbed areas that are not developed as hardstand or facilities are reseeded to help ensure that addition soil erosion does not occur. Through the implementation of BMPs, soil erosion has decreased to nearly acceptable loss rates. (Fort Hood's loss rates are approximately 5 tons per acre, per year; the average is 4 tons per acre, per year.) Utilization of these BMPs during construction and subsequent use, would keep the environmental impacts to soil short-term, minor, and insignificant.

4.4. Cultural Resources

Two archaeological sites (41CV1494 and 14CV1495) are located within the footprints of the Proposed Action. Both sites were inventoried in 1990 as lithic scatters (stone chips resulting from the manufacturing of stone tools) located on an intermediate upland remnant of a sandy clay Pleistocene terrace of the Leon River. In 2005 the sites eligibility for listing on the NRHP were assessed and recommended not eligible for listing with no further management (Kleinbach 2005). No intact cultural deposits or features have been observed at the sites and the artifacts are located on the surface of and/or within a shallow sandy mantle that has been mixed and lacks contextual integrity. The impacts from the Proposed Action will be long-terms and minor and not considered an adverse impact because the sites are not managed as historic properties.

The WWII POW camp was inventoried in 2006 and recorded as archaeology site 41CV1638. In 2009 Fort Hood initiated consultation with the State Historic Preservation Officer (SHPO) for comments on the expansion of Longhorn Airstrip. To mitigate the effects from the expansion and any potential future undertaking(s) Fort Hood is funding the completion and publication of research that will document preliminary finding of archaeological excavations at the encampment and detailed archival research. Along with the completion of this publication and the nationwide historic context and inventory of POW encampments, Fort Hood no longer manages this site as potentially eligible for listing on NRHP. The impacts from the Proposed Action will be long-terms and minor and not considered an adverse impact because the site is not managed as an historic property.

The Korean War era "tent city" was inventoried in 2006 (Webster *et al* 2007) and are recommended eligible for listing on NRHP under the Program Comment between the Department of Defense (DOD) and the Advisory council on Historic Preservation (ACHP). This

Program Comment Cold War Era Unaccompanied Personnel Housing (1946-1974) provides an alternative way to comply with the responsibilities under Section 106 of NHPA. The impacts from the Proposed Action would be long-term and all management actions are mitigated and covered by the Program Comments (FR / Vol. 72, No 97 28464).

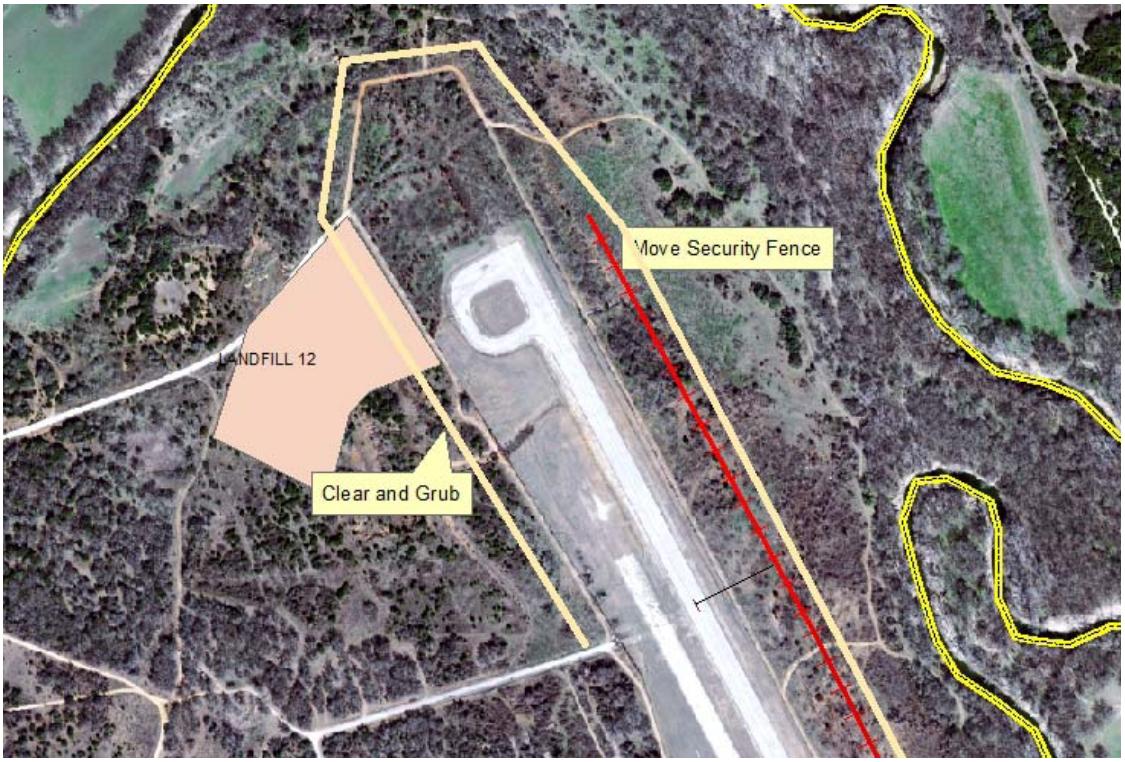
4.5. Solid Waste

There are two solid waste management units (SWMU) in vicinity of the project areas for the Proposed Action (see Figures 4.4 and 4.5).

Fort Hood SWMU #12 is approximately 120 acres in size and is located adjacent to the Longhorn Landing Strip. The site was originally used during the 1940s and 1950s as a landfill for construction debris and possibly some sanitary landfill material. Rubble concrete from old foundation removals may have been added to the site as late as 1988. Clearing and grubbing in the area that is designated as a landfill must be restricted to clearing above the surface or grubbing no deeper than six inches below grade.

An unnumbered SWMU is located to the west of Longhorn Airstrip directly where the expansion of 18th Street would occur. The extension would be constructed of compacted base that would be placed on top of the existing ground surface. Clearing and grubbing that must occur in order to prepare the area for laying the base must be restricted to grubbing no deeper than six inches below grade.

Figure 4.4 SWMU – Longhorn Airstrip



**The salmon-colored polygon represents the SWMU

Figure 4.4 SWMU – 18th Street Extension

**The salmon-colored polygon represents the SWMU.

4.6 Utilities

4.6.1 Water Supply

Fort Hood's water distribution system was privatized on 9 January 2009. Potable water is purchased via a separate contract from the City of Gatesville. Of most importance to the water supply on North Fort Hood is the addition of the Mobilization Training Center – made up of several phases of Operational Readiness Training Centers. The amount and nature of the facilities associated with action would necessitate increased water supply capacity. However, this project would include the upgrade and installation of extra utilities, to include water, as needed. Therefore, it is not anticipated that the impact to water supply associated with the Proposed Action would be significant.

4.6.2 Sanitary Sewer

Fort Hood's wastewater collection system was privatized on 9 January 2009. The sewer system at North Fort Hood is treated via a separate contract by the City of Gatesville. The utility privatization contractor's wastewater model indicates that due to significant infiltration and inflow (I&I) occurring during rain events, the existing sewer collection infrastructure (specifically the 21-inch and 24-inch mains) is currently at capacity. Although the MTC project is expected to provide utility upgrades, this project is not anticipated to occur for several years

(potentially 2012). The addition of facilities on North Fort Hood that use sanitary sewer at this time could result in additional overflows of the sanitary sewer system. Upgrades to the system infrastructure would need to be planned and occur in conjunction with the addition of facilities on North Fort Hood in order to ensure that significant overflows do not occur. The planning stages for such upgrades and evaluation of the system's capacity are currently underway and being closely coordinated with the utility provider. It is not anticipated that impacts to the sanitary sewer system would be significant, provided that proper measures are taken to ensure that additional overflows do not occur. Upgrades to the system could include installing additional sanitary sewer lines, replacing failed lines, grouting of failed manholes, heavy cleaning and scouring, or increasing the size of existing sanitary sewer lines. Upgrade projects must take impacts to our human and natural environment into account during planning and implementation stages and must ensure that minimization and compliance measures are followed to ensure impacts are not significant.

4.6.3 Electric Power

Electricity is supplied to Fort Hood by the local utility company, Oncor, via two 138 KV transmission lines. Several electric substations on the base are used to step the transmission voltage down and distribute electric power to end users. The addition of facilities at NFH could result in the need for upgraded electrical infrastructure. Plans are currently being developed; therefore, it is not anticipated that impacts to the electrical power supply would be significant.

4.7 Cumulative Impacts

The Council on Environmental Quality (CEQ) defines cumulative impact as the "…impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (CEQ 1978, 40 CFR 1508.7).

The following is a list of major projects that are either recently completed, undergoing construction, or are planned for the near future. Although not all of the projects may specifically impact, or be impacted by, the Proposed Action, they are important to note due to their size or effect on Fort Hood.

10-Year Range Development Plan Projects

Fort Hood has proposed to construct or modify 24 ranges and their associated supporting facilities within the restricted live fire area. Under the proposal, all 24 ranges would be constructed or modified to fit the Army's emerging doctrinal training standards.
However, no other major range construction projects are scheduled to be conducted in close proximity to the proposed construction sites until after construction is complete and vegetation re-growth has already occurred. BMPs and appropriate storm water runoff techniques as well as low impact development methods would minimize any temporary impacts to an acceptable level.

Therefore, when evaluated cumulatively, the impacts of range projects are insignificant, short term and minor.

Tank Trail Maintenance

Fort Hood has a tank trail maintenance program which is an ongoing project because there are over 400 miles of tank trails on the Installation. The purpose of the program is to repair and maintain damaged trails to facilitate training. The soil disturbance that results from the grading and hardening of the trail surfaces during maintenance has the potential to increase erosion, sedimentation and runoff to Cowhouse Creek and subsequently Belton Lake and/or the Leon River. This erosion has the potential to impact water quality. However, tank trail maintenance ultimately reduces the amount of sedimentation and runoff and promotes Soldier safety. Tank trails in the area may be scheduled for maintenance at the same time as construction of the Proposed Action. Both actions would employ BMPs, and low impact development techniques to minimize overall impacts. Therefore, cumulative environmental impacts as a result of the tank trail maintenance program and the renovation of the airstrips is insignificant, minor and short term with long term potential positive benefits to water quality.

Maneuver Access Structure Program

Installing maneuver access structures, commonly known as “gully pluging” is an initiative through the Integrated Training Area Management (ITAM) program that reduces sediment to Lake Belton that results from constant tank maneuver training. Gully plugs are rock structures placed across ephemeral drainages throughout the training areas. Runoff during rain events is slowed and reduces sediments in the downstream waterways. The gully plugs also serve as a bridge for tanks and other vehicles in the training area and can be seen easily at night. When vehicles cross the “gullies” by driving across the maneuver access structures, fewer gullies are created as a result of maneuver training. Further, safety for the Soldier increases, and positive impacts for the environment are achieved. The program is now being implemented on the east side of the installation. The Proposed Action is located on the northeastern side of the installation. Installing maneuver access structures disturbs very little soil and is anticipated to improve overall water quality. Therefore, cumulative impacts that would potentially result because of the Proposed Action are insignificant, short term and minor.

West Range Road Widening

Plans are in place to widen West Range Road from the main cantonment area to North Fort Hood. The widening of this road would increase ease of travel from the southern portions of Fort Hood to the northern. With more ease of travel, one can anticipate increased vehicular traffic, both military and private. Increased travel along the roadway could result in more vehicle collisions and the potential for wildlife mortality.

The North Fort Hood Development Plan that is discussed in this EA would change the infrastructure and use of North Fort Hood, as well as increase training capabilities and joint/combined training. Individually, most of these projects would not cause significant adverse

impact to the environment. Collectively, the projects are likely to cause some impact to the environment, though it is not considered to be significant.

Increased construction would temporarily add to the sedimentation concerns addressed in this EA. The use of BMPs would minimize the effects of heavy construction activities at both North Fort Hood and in the live-fire area. The removal of a large amount of vegetation around the airstrip would also contribute to erosion and sedimentation problems in the area. It would be absolutely necessary to ensure that any areas that were cleared and grubbed be immediately and adequately seeded and stabilized.

Additionally, increased hardstand in the area would compound an existing drainage problem and likely impact the floodplain that surrounds the North Fort Hood area. It would be very important to incorporate sustainable design techniques and low impact development techniques, such as vegetated swales and porous pavement, to assist in stormwater management and runoff control.

Collectively, the cumulative impacts of the Proposed Action, paired with the increase in infrastructure and training planned for the NFH area, is not anticipated to have a significant adverse impact on the human or natural environment, provided that sustainable development techniques are incorporated into the planning and design of these projects.

5.0. CONCLUSION

The construction and subsequent use of the North Fort Hood area for the mobilization of Reserve Troops and Army National Guard will ultimately increase security and safety of the Soldiers fighting the Nation's wars. The Proposed Action would provide the continuity, stabilization, and realistic training Soldiers need to be successful on the battlefield.

The conclusion of this Environmental Assessment is that the Proposed Action would not result in significant environmental impacts. A Finding of No Significant Impact (FNSI) is recommended for the Proposed Action, and an Environmental Impact Statement is not required. This EA and supporting documentation have been prepared in accordance with the National Environmental Policy Act of 1969, 42 USC 4321 *et seq.*, and as implemented by Executive Orders 11514 and 119991, Environmental Analysis of Army Actions, 32 CFR Part 651, and the Council on Environmental Quality regulations in 40 CFR Part 6.

6.0. PREPARER

Jill Alexander, *NEPA Specialist*, Fort Hood Directorate of Public Works, Environmental Division.
B.A., English/Technical Writing, West Chester University (2001).
4 years Environmental experience.

7.0 PERSONS AND AGENCIES CONTACTED

7.1 Individuals Contacted

Steve Burrow
Chief, Environmental Programs
Fort Hood, Texas

Riki Young
Chief, Environmental Management Branch
Fort Hood, Texas

Tim Buchanan
Chief, Natural and Cultural Resources Management Branch
Fort Hood, Texas

Vicki Bump
Wetlands Biologist
Fort Hood, Texas

Kevin Cagle
Wildlife Biologist
Fort Hood, Texas

Alex Kachura
Hazardous Waste/Toxics Program Manager
Fort Hood, Texas

Robert Kennedy
Air Quality/Noise Program Manager
Fort Hood, Texas

Malama Chock
Clean Water Program Manager
Fort Hood, Texas

Charles Pekins
Biologist
Fort Hood, Texas

7.2 Reviewing Agencies

Ms. Mary Olivier/Simon Muench
Southwest Region Installation
Management Agency
2450 Stanley Rd, Ste. 101
Fort Sam Houston, TX 78234-7517

CPT Kara Escajeda
Department Preventive Medicine
EHS, Room 114
Bldg 76022
Fort Hood, TX 76544

Allan Posnick
Texas Commission on Environmental Quality
Remediation Division
MC 127
P.O. Box 13087
Austin, TX 78711-3087

Michael P. Jansky
Regional EIS Coordinator, Office of Planning and Coordination
United States Environmental Protection Agency Region 6
1445 Ross Avenue
Dallas, TX 75202

Mr. Mark Wolfe
State Historic Preservation Officer
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711-2276

Ms. Kathy Boydston
Wildlife Habitat Assessment Program, Wildlife Division
Texas Parks and Wildlife
4200 Smith School Road
Austin, TX 78744-3291

Environmental Planning Support Branch
Training Support Division
US Army Environmental Center
Aberdeen Proving Ground, MD 21010

Omar Bocanegra
Wildlife Biologist
US Fish and Wildlife Service
Ecological Services
WinSystems Center Building
711 Stadium Drive, Suite 252
Arlington, TX 76011

8.0 ACRONYMS

ACUB	Army Compatible Use Buffer
AFS	Army Field Support
AQCR	Air Quality Control Region
AR	Army Regulation
BCWCID	Bell County Water Conservation Improvement District
BMP	Best Management Practice
CECOM	Communications Electronics Command
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
COF	Company Operations Facility
COL	Contingency Operating Location
CSN	Construction Site Notice
CWA	Clean Water Act
dB	Decibels
DFAC	Dining Facility
DoD	Department of Defense
DPW	Directorate of Public Works
DRRF	Deployment Readiness and Reaction Facility
EA	Environmental Assessment
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
ESMP	Endangered Species Management Plan
FHFH	Fort Hood Family Housing
FNSI	Finding of No Significant Impact

GWOT	Global War on Terror
HUD	Housing and Urban Development
HAZMAT	Hazardous Materials
HazWaste	Hazardous Waste
HMMP	Hazardous Materials Management Program
HS	Hazardous Substances
ICRMP	Integrated Cultural Resources Management Plan
IDG	Installation Design Guide
IRP	Installation Response Plan
INRMP	Integrated Natural Resources Management Plan
LCMC	Life-Cycle Maintenance Center
MBTA	Migratory Bird Treaty Act
MSA	Metropolitan Statistical Area
MSDS	Material Safety Data Sheet
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NO_x	Nitrogen Oxide
NRCS	Natural Resources Conservation Service
PAL	Privatized Army Lodging
PCB	Polychlorinated Biphenyls
PM_{10}	Particulate Matter 10
PN	Project Number
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
SARA	Superfund Amendments and Reauthorization Act
SO_2	Sulfur Dioxide
SPCCP	Spill Prevention, Countermeasures, and Control Plan

SWPPP	Storm Water Pollution Prevention Plan
TCEQ	Texas Commission on Environmental Quality
TMDL	Total Maximum Daily Load
TPDES	Texas Pollutant Discharge Elimination System
TSCA	Toxic Substances Control Act
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife
VOC	Volatile Organic Compound

9.0 REFERENCES

Department of Defense and Department of the Army. 2003. 40 CFR 81: *Designation of Areas for Air Quality Planning Purposes.*

Department of Defense and Department of the Army. *33 CFR 328: Definition of Waters of the United States.*

Kleinbach, Karl 2006. *North Fort Hood Archaeological Site Assessments.* Technical Report Cultural Resources. Fort Hood, Texas.

FR/ Vol. 72, No 97 288464. *Advisory Council on Historic Preservation Notice of Army Adoption of Program Comments.* Federal Register Volume 72 Number 97 page 28464. Monday, May 21, 2007.

Fort Hood. 2006a. *Installation Design Guide*.

Fort Hood. 2006b. *Integrated Natural Resource Management Plan*. Natural Resources Branch, Environmental Division, Directorate of Public Works, Fort Hood, Texas.

Fort Hood. 2007a. *Endangered Species Management Plan for Fort Hood, Texas*: FY06-10.

Fort Hood. 2007b. *Fort Hood's Title V Federal Operating Permit.*

Natural Resources Conservation Service (NRCS). 1998. *Fort Hood Vegetative Resource Inventory*. U.S. Department of Agriculture.

Texas Commission on Environmental Quality. August 2004. *Atlas of Texas Surface Waters: Maps of the Classified Segments of Texas Rivers and Coastal Basins*. Publication Number GI-316.

The United States Congress. 1972. *The Noise Control Act of 1972.* Public Law 92-574: 86 Stat. 1234; 42 USC 4901 et seq.; Amended by PL 94-301, May 31, 1976; PL 95-609, Nov. 8, 1978; PL 100-418, Aug. 23, 1988.

The United States Congress. 1973. *Endangered Species Act* (ESA) [16 U.S.C. 1532 et. seq.] of 1973, as amended.

U.S. Army Corps of Engineers (USACE). 1987a. *Corps of Engineers Wetlands Delineation Manual*. Environmental Laboratory.

U.S. Army Corps of Engineers (USACE). 1987b. *The Installation Master Plan for Fort Hood, Texas, Master Plan Report, Future Development Plan*, prepared by Nakata Planning Group, Inc.

U.S. Army Corps of Engineers (USACE). 1999. *Department of the Army Headquarters III Corps and Fort Hood Environmental Baseline*, Fort Hood, Texas.

U.S. Army Corps of Engineers (USACE). 2006. *Endangered Species Management Plan for Fort Hood, Texas.* FY01-05.

USCB. 2006. *American FactFinder: Bell and Coryell Counties, Texas.* Internet Website: http://factfinder.census.gov. (Accessed: April 14, 2008.)

U.S. Department of Agriculture (USDA). 1977. *Soil Survey of Bell County, Texas.* U.S. Department of Agriculture, Soil Conservation Service, in cooperation with Texas Agricultural Experiment Station and United States Department of the Army, Fort Hood, Texas.

U.S. Department of Agriculture (USDA). 1985. *Soil Survey of Coryell County, Texas.*

U.S. Department of Agriculture, Soil Conservation Service, in cooperation with Texas Agricultural Experiment Station and United States Department of the Army, Fort Hood, Texas.

Webster, Julie, Megan Tooker, Dawn Morrison, Susan Enscore, Suzan Loechel, and Martin Stupich 2007. *Fort Hood Building and Landscape Inventory with WWII and Cold War Context.* Technical Report Cultural Resources. Fort Hood, Texas.

APPENDIX A: POSSIBLE MINIMIZATION AND COMPLIANCE MEASURES

Minimization measures are expected to reduce, avoid, or compensate for most adverse effects. The following are possible measures to be taken for each affected resource.

Land Use

• Adhere to optimal land use plans outlined in the *Fort Hood Real Property Master Plan* when siting new developments.

• Establish an Army Compatible Use Buffer (ACUB) to promote compatible land use.

Air Quality

• Spray water on construction work sites to reduce fugitive dust emissions.

• Cover open equipment used to convey materials likely to create air pollutants.

• Promptly remove spilled or tracked dirt from streets.

• Maintain equipment and vehicles properly.

Noise

• Limit construction activities to daylight hours.

• Use sound-dampening construction equipment and materials to minimize noise.

Geology and Soils

• Use appropriate BMPs (such as silt fences, straw bale dikes, diversion ditches, riprap channels, water bars, or water spreaders) to reduce soil erosion and sedimentation.

Water Resources

• Contractor to obtain TPDES Construction General Permit with accompanying SWPPP.

• Use appropriate erosion and sediment controls as BMPs to minimize surface erosion and runoff of pollutants.

• Follow protocols outlined in the storm water TPDES permits and state sediment and erosion control guidelines.

• Seed, revegetate and/or stabilize areas following construction activities.

Vegetation

• Limit disturbed areas to the current footprint areas plus a minimal amount of adjacent construction staging area.

• Employ erosion control practices and tree-protection devices at all proposed sites to protect vegetation and habitat.

Wildlife

• Preserve associated blocks of connective native vegetation on each site to act as buffers and wildlife corridors.

• Use tree-protection BMPs during construction of new developments to maintain natural habitat areas.

Waters of the U.S.

• If a delineation has not been done, conduct a wetland delineation to determine exact wetland boundaries and acreage.

• Avoid construction activities within 100 feet of known wetlands and streams.

• Obtain appropriate Section 404 permits from the USACE to dredge and fill waters of the U.S. As appropriate, mitigate for losses of stream and/or wetland acreage.

Cultural Resources

• Follow best management practices as outlined in the Integrated Cultural Resource Management Plan and Historic Properties Component.

• Include clauses in construction contracts with provisions suspending work until a mitigation determination is made in the event that inadvertent discoveries of cultural materials are unearthed during construction.

• In the event of inadvertent discoveries, coordination with State Historic Preservation Office and Federally recognized Indian Tribes must occur.

• In accordance with the National Historic Preservation Act, for known National Register eligible historic properties and archaeological sites, ensure avoidance and protection by using buffer zones.

Socioeconomics Environmental Justice and Protection of Children

• Secure construction vehicles and equipment when not in use.

• Place barriers and “No Trespassing” signs around construction sites where practicable.

• Do not use forbidden hazardous/toxic materials.

Utilities

• Install energy-efficient interior and exterior lighting fixtures and controls in all new units.

• Build new buildings to Leadership in Engineering and Environmental Design (LEED) energy efficiency standards.

Hazardous and Toxic Substances

• Use environmentally friendly adhesives, solvents, greases, and materials during construction.

• Fully comply with all provisions of Fort Hood Regulation 200-1 and the Fort Hood Pollution Prevention Plan.

• Use only hazardous materials which have been approved by the Fort Hood Hazardous Materials Control Group (HMCG) and placed on the installation's Authorized Use List (AUL).

Solid Waste Disposal and Recycling

• Use BMPs to ensure that maximum amounts of materials recycled and that landfill disposal is minimized.

• Comply with local and state source separation laws.

APPENDIX B: FISH AND WILDLIFE SPECIES: READING LIST

The following references contain site-specific information about the fish and wildlife on Fort Hood, Texas. Although some of the below references are unpublished, the data may be obtained by contacting the Fort Hood Natural Resources Office at 254-287-2885.

Mammals:

Carroll, D. S., R. C. Dowler, and C. W. Edwards. 1999. *Estimates of Relative Abundance of the Medium-sized Mammals of Fort Hood, Texas, Using Scent-station Visitation.* Museum of Texas Tech University, 188:1-10.

Hutchins, Jinelle. The Nature Conservancy. *Small Mammals Study*. Unpublished data.

Pekins, Charles. Natural Resources Management Branch, Fort Hood, Texas. *Bat Study.* Unpublished data.

Reptiles/Amphibians:

1997. *Species Composition, Frequency of Encounter, and Distribution of the Herpetofauna on Fort Hood, Texas.* Prepared for Fort Hood Natural Resources Branch and The Nature Conservancy of Texas. Unpublished report, University of Mary-Hardin Baylor, Belton, TX. 243 pp.

Hutchins, Jinelle. The Nature Conservancy. *Snakes Study*. Unpublished data.

Fish:

Johnson, K. W. 1994. *An Ecological Assessment of the Icthyofauna of Selected Stream Systems on Fort Hood, Texas.* Prepared for Fort Hood Natural Resources Branch and The Nature Conservancy of Texas. Unpublished report, University of Mary-Hardin Baylor, Belton, TX. 98 pp.

Birds:

Kostecke, R. M., D. A. Cimprich, and M. Stake. 2008. *Birds of Fort Hood Texas: Checklist and Seasonal Distribution In Endangered species Monitoring and Management at Fort Hood, Texas: 2006 Annual Report.* (Unpublished). Fort Hood Project, The Nature Conservancy, TX.

APPENDIX C POPULATION STATISTICS FOR BELL COUNTY AND CORYELL COUNTY

Population Statistics for Bell County

(U.S. Census Bureau [USCB], 2006)

ACS Demographic Estimates	Estimate	Percent	U.S.	Margin of Error
Total population	257,897			*****
Male	127,063	49.3	49.2%	+/-434
Female	130,834	50.7	50.8%	+/-434
Median age (years)	30.6	(X)	36.4	+/-0.2
Under 5 years	26,406	10.2	6.8%	+/-514
18 years and over	177,593	68.9	75.4%	+/-257
65 years and over	23,998	9.3	12.4%	+/-455
One race	248,986	96.5	98.0%	+/-1,923
White	170,990	66.3	73.9%	+/-3,101
Black or African American	54,511	21.1	12.4%	+/-1,588
American Indian and Alaska Native	846	0.3	0.8%	+/-382
Asian	7,745	3.0	4.4%	+/-867
Native Hawaiian and Other Pacific Islander	154	0.1	0.1%	+/-148
Some other race	14,740	5.7	6.3%	+/-2,783
Two or more races	8,911	3.5	2.0%	+/-1,923
Hispanic or Latino (of any race)	49,008	19.0	14.8%	*****

http://factfinder.census.gov/servlet/ACSSAFFFacts?_event=Search&geo_id=&_geoContext=&_street=&_county=Bell&_cityTown=Bell&_state=04000US48&_zip=&_lang=en&_sse=on&pctxt=fph&pgsl=010

Population Statistics for Coryell County

(USCB, 2006)

ACS Demographic Estimates	Estimate	Percent	U.S.	Margin of Error
Total population	72,667			*****
Male	33,081	45.5	49.2%	+/-881
Female	39,586	54.5	50.8%	+/-881
Median age (years)	27.5	(X)	36.4	+/-1.3
Under 5 years	4,465	6.1	6.8%	+/-401
18 years and over	49,336	67.9	75.4%	+/-1,637
65 years and over	4,531	6.2	12.4%	+/-281
One race	70,008	96.3	98.0%	+/-918
White	51,078	70.3	73.9%	+/-937
Black or African American	14,983	20.6	12.4%	+/-1,429
American Indian and Alaska Native	975	1.3	0.8%	+/-650
Asian	672	0.9	4.4%	+/-211
Native Hawaiian and Other Pacific Islander	425	0.6	0.1%	+/-782
Some other race	1,875	2.6	6.3%	+/-881
Two or more races	2,659	3.7	2.0%	+/-918
Hispanic or Latino (of any race)	9,619	13.2	14.8%	*****

Source: U.S. Census Bureau, 2006 American Community Survey

http://factfinder.census.gov/servlet/ACSSAFFFacts?_event=Search&geo_id=&_geoContext=&_street=&_county=Coryell&_cityTown=Coryell&_state=04000US48&_zip=&_lang=en&_sse=on&pctxt=fph&pgsl=010

APPENDIX D SOIL DATA

BaB—Bastsil fine sandy loam, 1 to 3 percent slopes

Map Unit Setting

- *Elevation:* 600 to 1,000 feet
- *Mean annual precipitation:* 31 to 35 inches
- *Mean annual air temperature:* 64 to 68 degrees F
- *Frost-free period:* 220 to 250 days

Map Unit Composition

- *Bastsil and similar soils:* 90 percent
- *Minor components:* 10 percent

Description of Bastsil

Setting

- *Landform:* Stream terraces
- *Landform position (three-dimensional):* Tread
- *Down-slope shape:* Convex
- *Across-slope shape:* Convex
- *Parent material:* Loamy alluvium of quaternary age derived from mixed sources

Properties and qualities

- *Slope:* 1 to 3 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 2 percent
- *Available water capacity:* Moderate (about 8.2 inches)

Interpretive groups

- *Land capability (nonirrigated):* 2e
- *Ecological site:* Sandy Loam 30-38" PZ (R085XY562TX)

Typical profile

- *0 to 15 inches:* Fine sandy loam
- *15 to 90 inches:* Sandy clay loam

Minor Components

Unnamed, minor components

- *Percent of map unit:* 10 percent

Bs—Bosque clay loam, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

- *Elevation:* 600 to 1,210 feet
- *Mean annual precipitation:* 31 to 35 inches
- *Mean annual air temperature:* 64 to 68 degrees F
- *Frost-free period:* 220 to 275 days

Map Unit Composition

- *Bosque and similar soils:* 80 percent
- *Minor components:* 20 percent

Description of Bosque

Setting

- *Landform:* Flood plains
- *Landform position (two-dimensional):* Shoulder
- *Down-slope shape:* Concave
- *Across-slope shape:* Concave
- *Parent material:* Loamy alluvium

Properties and qualities

- *Slope:* 0 to 1 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* Occasional
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 20 percent
- *Maximum salinity:* Nonsaline (0.0 to 2.0 mmhos/cm)
- *Available water capacity:* High (about 10.6 inches)

Interpretive groups

- *Land capability (nonirrigated):* 2w
- *Ecological site:* Loamy Bottomland 30-38" PZ (R085XY181TX)

Typical profile

- *0 to 54 inches:* Clay loam
- *54 to 80 inches:* Clay loam

Minor Components

Unnamed, minor components

- *Percent of map unit:* 19 percent

Unnamed, hydric minor components

- *Percent of map unit:* 1 percent
- *Landform:* Depressions on flood plains
- *Down-slope shape:* Concave
- *Across-slope shape:* Concave

ChB—Cho clay loam, 1 to 3 percent slopes

Map Unit Setting

- *Elevation:* 820 to 1,210 feet
- *Mean annual precipitation:* 31 to 35 inches
- *Mean annual air temperature:* 64 to 68 degrees F
- *Frost-free period:* 210 to 240 days

Map Unit Composition

- *Cho and similar soils:* 90 percent
- *Minor components:* 10 percent

Description of Cho

Setting

- *Landform:* Ridges
- *Landform position (two-dimensional):* Shoulder, summit
- *Down-slope shape:* Linear
- *Across-slope shape:* Convex
- *Parent material:* Loamy residuum weathered from limestone of cretaceous age

Properties and qualities

- *Slope:* 1 to 3 percent
- *Depth to restrictive feature:* 7 to 20 inches to petrocalcic
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to high (0.06 to 1.98 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 85 percent
- *Available water capacity:* Very low (about 1.4 inches)

Interpretive groups

- *Land capability (nonirrigated):* 4s
- *Ecological site:* Very Shallow 30-38" PZ (R085XY189TX)

Typical profile

- *0 to 11 inches:* Clay loam
- *11 to 22 inches:* Cemented material
- *22 to 59 inches:* Gravelly loam

Minor Components

Unnamed, minor components

- *Percent of map unit:* 10 percent

Fr—Frio silty clay, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

- *Elevation:* 600 to 1,210 feet
- *Mean annual precipitation:* 31 to 35 inches
- *Mean annual air temperature:* 64 to 68 degrees F
- *Frost-free period:* 220 to 260 days

Map Unit Composition

- *Frio and similar soils:* 80 percent
- *Minor components:* 20 percent

Description of Frio

Setting

- *Landform:* Flood plains
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear
- *Parent material:* Loamy alluvium derived from limestone and shale

Properties and qualities

- *Slope:* 0 to 1 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* Occasional
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 40 percent
- *Sodium adsorption ratio, maximum:* 2.0
- *Available water capacity:* High (about 10.2 inches)

Interpretive groups

- *Land capability (nonirrigated):* 2w
- *Ecological site:* Loamy Bottomland 30-38" PZ (R085XY181TX)

Typical profile

- *0 to 8 inches:* Silty clay
- *8 to 40 inches:* Silty clay loam
- *40 to 80 inches:* Silty clay

Minor Components

Unnamed, minor components

- *Percent of map unit:* 19 percent

Unnamed, hydric minor components

- *Percent of map unit:* 1 percent
- *Landform:* Depressions on flood plains
- *Down-slope shape:* Concave
- *Across-slope shape:* Concave

LeB—Lewisville clay loam, 1 to 3 percent slopes

Map Unit Setting

- *Elevation:* 600 to 1,210 feet
- *Mean annual precipitation:* 31 to 35 inches
- *Mean annual air temperature:* 64 to 68 degrees F
- *Frost-free period:* 230 to 240 days

Map Unit Composition

- *Lewisville and similar soils:* 90 percent
- *Minor components:* 10 percent

Description of Lewisville

Setting

- *Landform:* Draws
- *Landform position (two-dimensional):* Toeslope
- *Down-slope shape:* Linear
- *Across-slope shape:* Concave
- *Parent material:* Clayey slope alluvium

Properties and qualities

- *Slope:* 1 to 3 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 40 percent
- *Available water capacity:* High (about 9.8 inches)

Interpretive groups

- *Land capability (nonirrigated):* 2e
- *Ecological site:* Clay Loam 30-38" PZ (R085XY179TX)

Typical profile

- *0 to 12 inches:* Clay loam
- *12 to 77 inches:* Clay loam

Minor Components

Unnamed, minor components

- *Percent of map unit:* 10 percent

MnB—Minwells fine sandy loam, 1 to 3 percent slopes

Map Unit Setting

- *Elevation:* 700 to 1,210 feet
- *Mean annual precipitation:* 31 to 35 inches
- *Mean annual air temperature:* 64 to 68 degrees F
- *Frost-free period:* 218 to 244 days

Map Unit Composition

- *Minwells and similar soils:* 90 percent
- *Minor components:* 10 percent

Description of Minwells

Setting

- *Landform:* Stream terraces
- *Landform position (three-dimensional):* Tread, riser
- *Down-slope shape:* Linear
- *Across-slope shape:* Convex
- *Parent material:* Gravelly sandy alluvium

Properties and qualities

- *Slope:* 1 to 3 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 11 percent
- *Available water capacity:* Moderate (about 8.2 inches)

Interpretive groups

- *Land capability (nonirrigated):* 2e
- *Ecological site:* Sandy Loam 30-38" PZ (R085XY562TX)

Typical profile

- *0 to 6 inches:* Fine sandy loam
- *6 to 52 inches:* Sandy clay
- *52 to 63 inches:* Gravelly clay loam
- *63 to 80 inches:* Gravelly sandy clay loam

Minor Components

Unnamed, minor components

- *Percent of map unit:* 10 percent

NuC—Nuff very stony silty clay loam, 2 to 6 percent slopes

Map Unit Setting

- *Elevation:* 820 to 1,210 feet
- *Mean annual precipitation:* 31 to 35 inches
- *Mean annual air temperature:* 64 to 68 degrees F
- *Frost-free period:* 230 to 250 days

Map Unit Composition

- *Nuff and similar soils:* 90 percent
- *Minor components:* 10 percent

Description of Nuff

Setting

- *Landform:* Ridges
- *Landform position (two-dimensional):* Backslope
- *Down-slope shape:* Linear
- *Across-slope shape:* Convex
- *Parent material:* Clayey residuum weathered from shale in the walnut clay

Properties and qualities

- *Slope:* 2 to 6 percent
- *Surface area covered with cobbles, stones or boulders:* 20.0 percent
- *Depth to restrictive feature:* 20 to 40 inches to densic bedrock
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 80 percent
- *Sodium adsorption ratio, maximum:* 3.0
- *Available water capacity:* Low (about 5.6 inches)

Interpretive groups

- *Land capability (nonirrigated):* 6s
- *Ecological site:* Stony Clay Loam 30-38" PZ (R085XY188TX)

Typical profile

- *0 to 11 inches:* Very stony silty clay loam
- *11 to 30 inches:* Silty clay loam
- *30 to 36 inches:* Stony silty clay loam
- *36 to 80 inches:* Silty clay loam

Minor Components

Unnamed, minor components

- *Percent of map unit:* 10 percent

SlB—Slidell silty clay, 0 to 2 percent slopes

Map Unit Setting

- *Elevation:* 700 to 1,210 feet
- *Mean annual precipitation:* 31 to 35 inches
- *Mean annual air temperature:* 64 to 68 degrees F
- *Frost-free period:* 230 to 250 days

Map Unit Composition

- *Slidell and similar soils:* 90 percent
- *Minor components:* 10 percent

Description of Slidell

Setting

- *Landform:* Ridges
- *Landform position (two-dimensional):* Toeslope
- *Down-slope shape:* Linear
- *Across-slope shape:* Concave
- *Parent material:* Clayey slope alluvium

Properties and qualities

- *Slope:* 0 to 2 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Moderately well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.06 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 60 percent
- *Maximum salinity:* Nonsaline (0.0 to 2.0 mmhos/cm)
- *Sodium adsorption ratio, maximum:* 6.0
- *Available water capacity:* High (about 10.2 inches)

Interpretive groups

- *Land capability (nonirrigated):* 2e

- *Ecological site:* Blackland 30-38" PZ (R085XY177TX)

Typical profile

- *0 to 18 inches:* Silty clay
- *18 to 66 inches:* Silty clay
- *66 to 80 inches:* Clay

Minor Components

Unnamed, minor components

- *Percent of map unit:* 10 percent

TpC—Topsey-Pidcoke association, 2 to 8 percent slopes

Map Unit Setting

- *Elevation:* 820 to 1,210 feet
- *Mean annual precipitation:* 31 to 35 inches
- *Mean annual air temperature:* 64 to 68 degrees F
- *Frost-free period:* 220 to 245 days

Map Unit Composition

- *Topsey and similar soils:* 65 percent
- *Pidcoke and similar soils:* 25 percent
- *Minor components:* 10 percent

Description of Topsey

Setting

- *Landform:* Ridges
- *Landform position (two-dimensional):* Backslope, footslope
- *Down-slope shape:* Linear
- *Across-slope shape:* Convex
- *Parent material:* Loamy residuum weathered from shale and siltstone

Properties and qualities

- *Slope:* 2 to 8 percent
- *Depth to restrictive feature:* 20 to 40 inches to dense material
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 80 percent
- *Sodium adsorption ratio, maximum:* 3.0
- *Available water capacity:* Low (about 3.6 inches)

Interpretive groups

- *Land capability (nonirrigated):* 4e
- *Ecological site:* Clay Loam 30-38" PZ (R085XY179TX)

Typical profile

- *0 to 7 inches:* Clay loam
- *7 to 24 inches:* Silty clay loam
- *24 to 80 inches:* Silty clay loam

Description of Pidcoke

Setting

- *Landform:* Ridges
- *Landform position (two-dimensional):* Shoulder
- *Down-slope shape:* Linear
- *Across-slope shape:* Convex
- *Parent material:* Loamy residuum weathered from fossiliferous limestone of cretaceous age in the walnut formation

Properties and qualities

- *Slope:* 2 to 3 percent
- *Depth to restrictive feature:* 10 to 20 inches to lithic bedrock
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.57 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 60 percent
- *Available water capacity:* Very low (about 1.8 inches)

Interpretive groups

- *Land capability (nonirrigated):* 4s
- *Ecological site:* Shallow 30-38" PZ (R085XY185TX)

Typical profile

- *0 to 8 inches:* Clay loam
- *8 to 13 inches:* Gravelly clay loam
- *13 to 17 inches:* Bedrock

Minor Components

Unnamed, minor components

- *Percent of map unit:* 10 percent

APPENDIX F:

Conceptual Aesthetic Considerations

Conceptual Aesthetic Considerations:
Appendix F provides the Contractor information about the project specific architectural character related to the proposed selected site and associated adjacent building forms for the proposed Operational Readiness Training Complex (ORTC). It is important for the designer to understand the architectural character of the installations built environment and the individual visual themes associated with maintaining scale, while creating a sense of order and place. New design and construction shall contribute to the site and fit into the context of the existing fabric.

Architectural Theme Patterns:
In order to create a sense of place and architectural theme the following photos have been provided to depict the desired architectural theme for the North Fort ORTC.

Recent Construction Trends:
The following photos depict desired adjacent facilities within the immediate vicinity of the proposed site.

Adjacent Architecture – Photo 2:

North Fort Fire Station

Fort Hood Architecture – Photo 2:

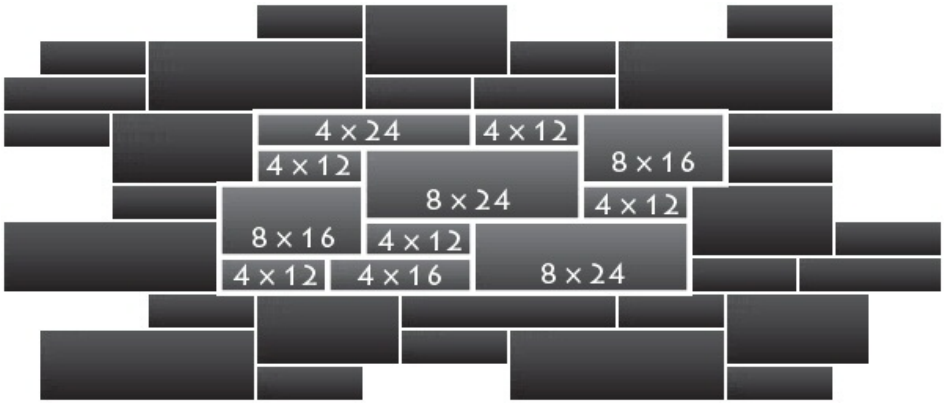
Brigade Headquarters

Fort Hood Architecture – Photo 3:

Texas A&M University, Fort Hood Facility

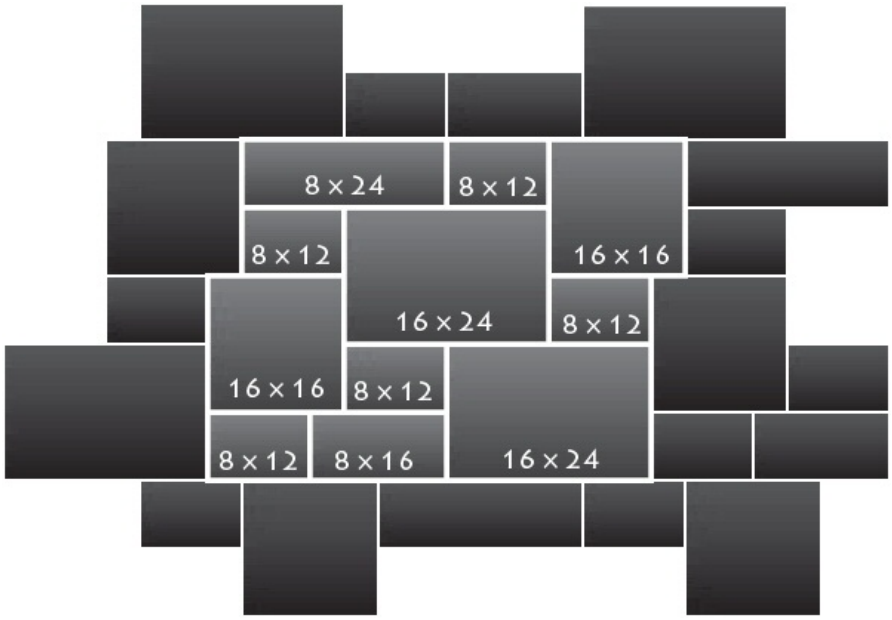
Proposed Material Patterns and Colors:
Masonry preferences are intended to establish color, aesthetics, and material requirements and are not intended to limit pattern design or design.

a. Preferred indigenous Limestone blend is 40% Nicotine, 30@% White, 10% Grey Lueder, 10% Blue, 10% Shell-Cream color or an approved equal. Mortar shall be off-white or similar.
b. Recommended Limestone block sizes are shown below; random length, sawn top, and bottom. Hot hip galvanized ties, 14 gauge, are required.



Preferred Limestone Pattern – Photo 4:

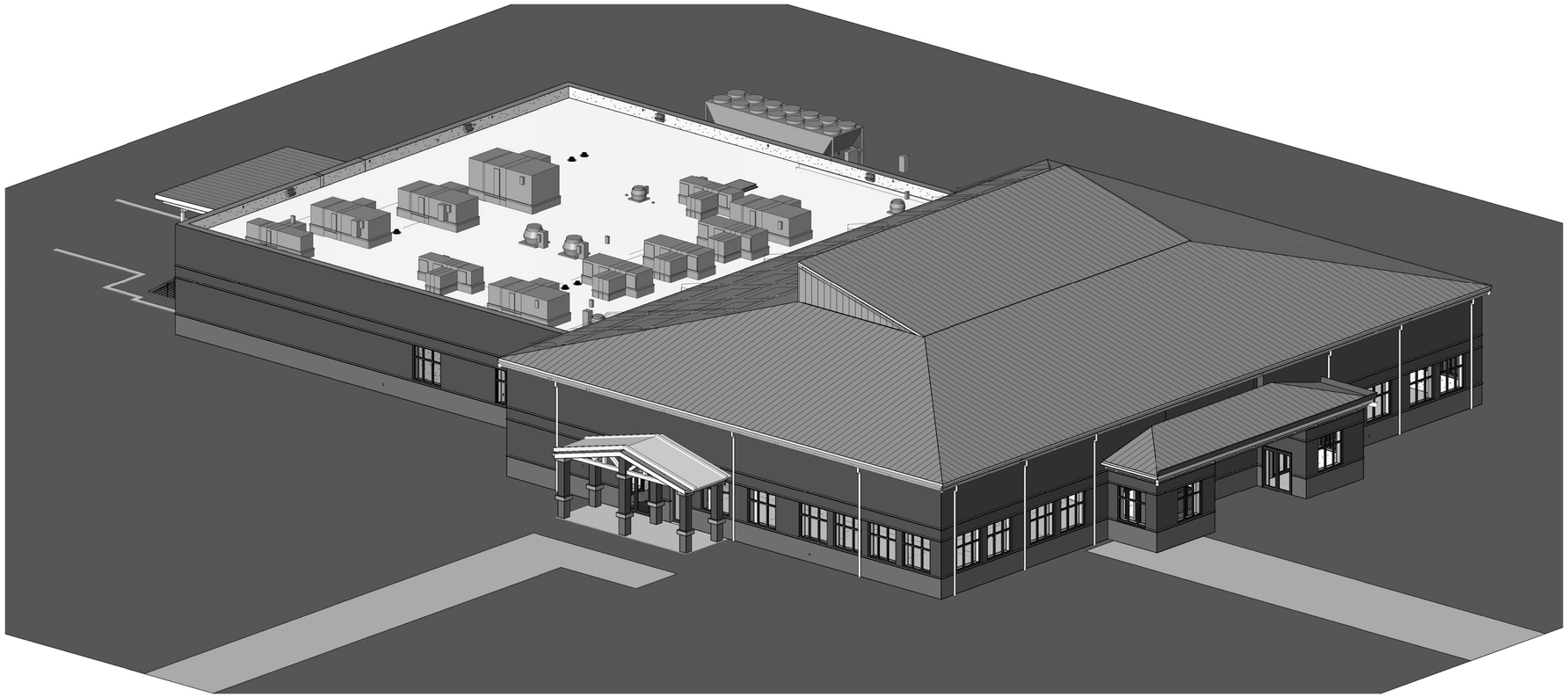
Brigade Headquarters



Preferred Limestone Pattern – Photo 5:

Barracks and Officers Quarters

Proposed Architectural Theme/Character:
In order to create a sense of place and architectural theme the following drawings and renderings for the construction of the ORTC DFAC, Package 2 shall be followed to establish desired architectural theme for Package 1 Facilities. The ORTC DFAC, Package 2 incorporates the architectural scale, stylistic theme, and visual characteristics for the ORTC at North Fort.



OPERATIONAL READINESS TRAINING COMPLEX
DINING FACILITY
FORT HOOD, TEXAS

PROJECT # 65374 P2# 333141

US Army Corps of Engineers
Norfolk District

REV	DATE	DESCRIPTION	BY	APP

DESIGNED: SCF
DRAWN: SCF
CHECKED: NAO
SUBMITTED: NAO
DATE: 31 AUG 11
SCALE: AS SHOWN
NORFOLK DISTRICT FILE NO.
PROJECT NO. PN 065374
SPECIFICATION NO.
DRAWING NO.
B18/2011 2:23:38 PM
C:\Users\Nate.Ogle\Desktop\Hood\065374_Arch5_OCALL LIZZY.rvt

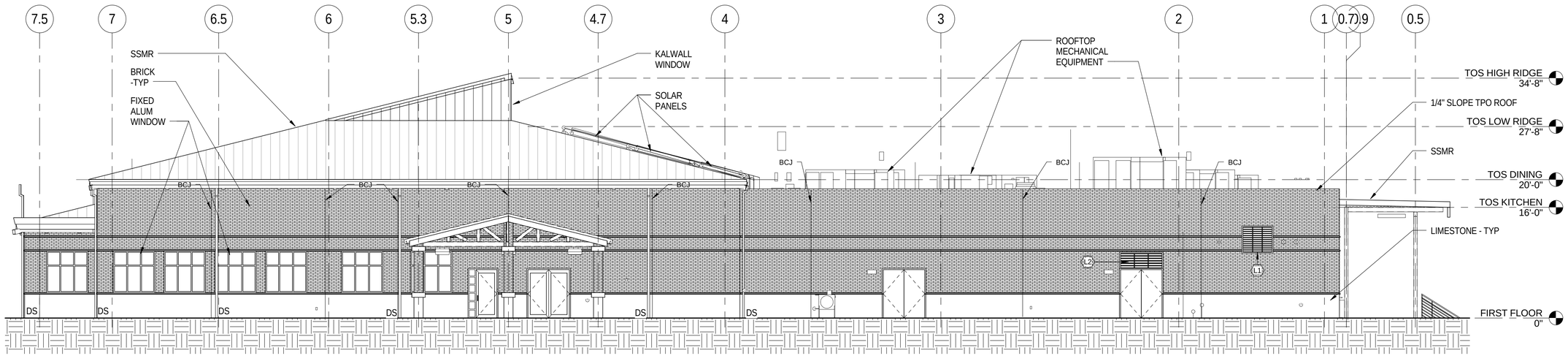
U.S. ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
CENTER FOR MILITARY ARCHITECTURE
803 FRONT STREET
NORFOLK, VA 23510

FINAL SUBMITTAL
AUGUST 31, 2011

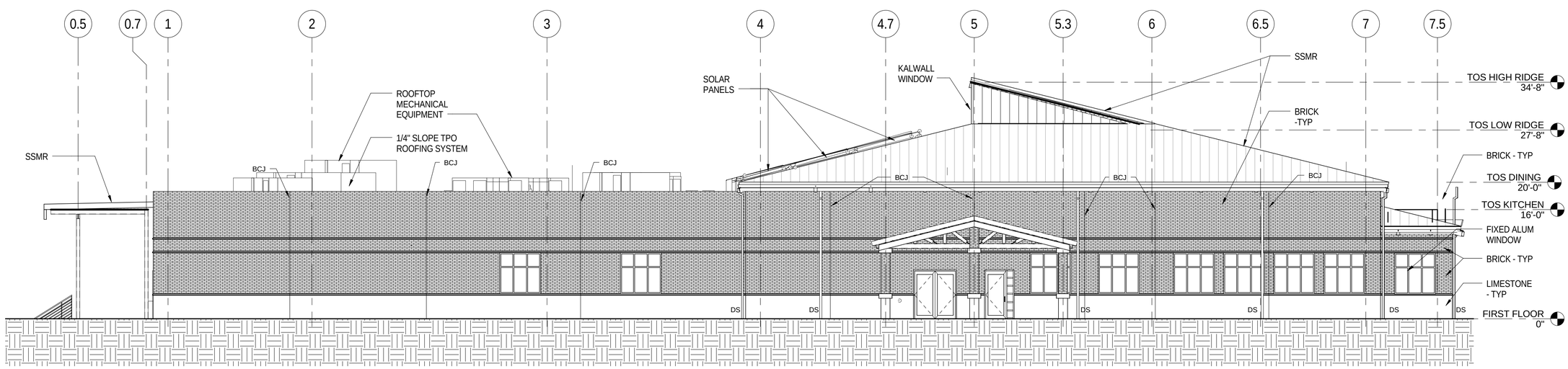
1428 PERSON ORTC DINING FACILITY
FORT HOOD, TEXAS

COVER SHEET

SHEET REFERENCE NUMBER
G-001
SHEET XXX OF 213



1 A-201 NORTHWEST ELEVATION
1/8" = 1'-0"



2 A-201 SOUTHEAST ELEVATION
1/8" = 1'-0"

8 6 4 2 0 8 16
SCALE: 1/8"=1'-0"

US Army Corps of Engineers
Norfolk District

REV.	DATE	DESCRIPTION	BY	APP.

DESIGNED: SCF
DRAWN: KAB
CHECKED: NAO.
SUBMITTED: NAO.
DATE: 31 AUG 11
SCALE: AS SHOWN
PROJECT NO. PN 065374
NORFOLK DISTRICT FILE NO.
DRAWING NO.
SPECIFICATION NO.
B19/2011 1:37:40 PM
C:\JOB\PN065374_H\cd065374_Arch0_OCALL LZZV.rvt

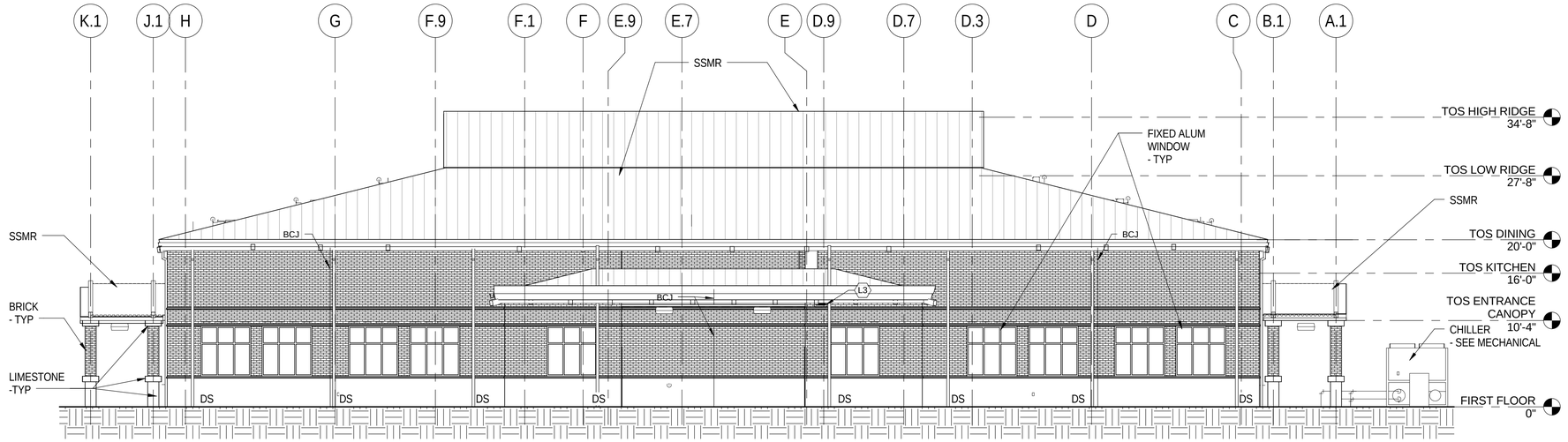
U.S. ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
CENTER FOR STANDARDIZATION
803 FRONT STREET
NORFOLK, VA 23510

FINAL SUBMITTAL
AUGUST 31, 2011

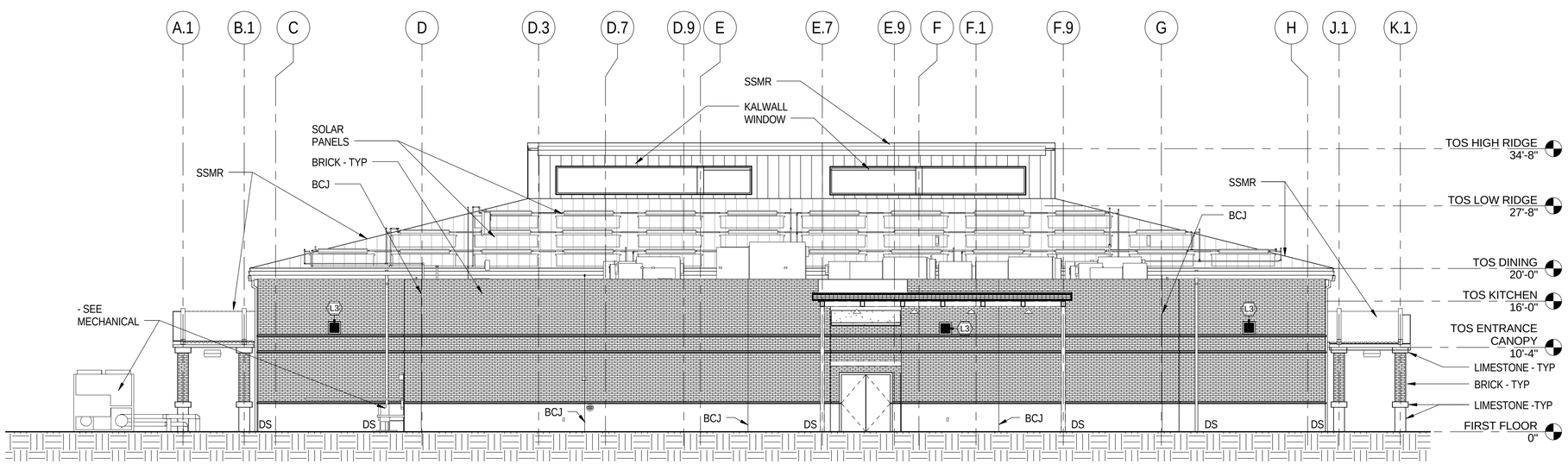
1428 PERSON ORTC DINING FACILITY
FORT HOOD, TEXAS

NORTHWEST AND SOUTHEAST ELEVATIONS

SHEET REFERENCE NUMBER
A-201
SHEET XXX OF 213



1 A-202 NORTHEAST ELEVATION
1/8" = 1'-0"



2 A-202 SOUTHWEST ELEVATION
1/8" = 1'-0"

8 6 4 2 0 8 16
SCALE: 1/8"=1'-0"

US Army Corps of Engineers
Norfolk District

REV.	DATE	DESCRIPTION	BY	APP.

DESIGNED: SCF
DRAWN: KAB
CHECKED: NAO.
SUBMITTED: NAO.
DATE: 31 AUG 11
SCALE: AS SHOWN
PROJECT NO. PN 065374
NORFOLK DISTRICT FILE NO.
DRAWING NO.
SPECIFICATION NO.
B18/2011 1:37:48 PM
C:\Users\Nick.Fiorello\Desktop\Hood065374_Arch5_OCALL LZZY.rvt

U.S. ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
CENTER FOR ENVIRONMENTAL STANDARDIZATION
803 FRONT STREET
NORFOLK, VA 23510

FINAL SUBMITTAL
AUGUST 31, 2011

1428 PERSON ORTC DINING FACILITY
FORT HOOD, TEXAS

NORTHEAST AND SOUTHWEST ELEVATIONS

SHEET REFERENCE NUMBER
A-202
SHEET XXX OF 213

Land Use Development:
The following photos depict existing site character; i.e. pedestrian site access, primary walkways, parking areas, delineation of entrances, and drop-off areas. The desired land use development should be arranged in patterns which create a recognizable and interesting composition. Currently the ORTC Area provides a secure fenced area within the installation boundary; reference Appendix J for the site design. Site improvements consist of relocation of the ORTC Complex fencing to include expansion of pedestrian and vehicle circulation for servicing of the proposed infill ORTC buildings needed to complete a Battalion Level ORTC Complex.

Land Use Development – Photo 1:

From corner of Headquarters Ave & 19th Street

Land Use Development – Photo 2:

From corner of Central Ave & 18th Street

Land Use Development – Photo 3:

From North Fort Fire Station parking lot

APPENDIX G:

GIS Data

(Not Used)

APPENDIX H:

Exterior Signage

DEPARTMENT OF THE ARMY
HEADQUARTERS, III CORPS AND FORT HOOD
FORT HOOD, TEXAS 76544-5016
19 October 2007

***III CORPS & FH REG 420-5**

Facilities Engineering

Standards for Signs and Markings

History. This is a functional revision. This regulation supersedes III Corps and Fort Hood Regulation 420-5 dated 28 February 1989.

Summary. This regulation establishes responsibilities, procedures and standards for fabrication, erection, maintenance and repair of signs, and markings standards.

Applicability. This regulation applies to military units stationed or training at Fort Hood; III Corps and Fort Hood staff and activities, according to specific contract provisions; leases, according to specific provisions of lease agreement; and Partners in Excellence activities.

Supplementation. Local supplementation of this regulations is prohibited except upon approval of IMWE-HOD-PW.

Suggested Improvements. The proponent of this regulation is the Directorate of Public Works (DPW). Send comments and suggested improvements to the Commander, Unites States (US) Army Garrison, ATTN: IMWE-HOD-PW, Fort Hood, Texas 76544-5028.

FOR THE COMMANDER:

PAUL A. JONES
Major, GS
Chief of Staff

Official:

CHARLES E. GREEN, SR.
Director, Human Resources

DISTRIBUTION:
IAW FH FORM 1853, S

Contents

Overview, 1, *page 3*
Purpose, 1a, *page 3*
References, 1b, *page 3*
Abbreviations and terms, 1c, *page 3*
Summary of change, 1d, *page 3*

*Supersedes III Corps and Fort Hood Regulation 420-5 dated 28 February 1989.

Signs and markings, 2, *page 5*
Signs, 2a, *page 5*
Insignias, 2b*, page 6*
Markers, 2c, *page 6*
Area identification signs, 2d, *page 7*
Indoor signs, 2e, *page 7*
Pavement markings, 2f, *page 7*
Directorate of Public Works (DPW) responsibilities, 2g, *page 8*
Units and/or activities responsibilities, 2h, *page 8*
Placement of temporary signs, 2i, *page 9*
Permanent directional signs, 2j, *page 9*
Sign specifications, 2k, *page 10*

Tables
C-1. Typical outdoor sign specifications, *page 15*
C-2. Metric conversion table, *page 18*

Appendices
A. References, *page 12*
B. Telephone numbers, *page 14*
C. Typical outdoor sign specifications, *page 15*

Glossary, *page 18*

OVERVIEW

1

Purpose The purpose of this regulation is to establish responsibility for

- Fabrication.
- Erection.
- Maintenance.
- Repair of signs and markings.

1a

References Appendix A lists required and related references.

1b

Abbreviations and terms The glossary explains abbreviations and terms used in this regulation.

1c

Summary of change Specifically, this revision dated 19 October 2007 –

- It adds:
  - Requests for an exception to policy will be submitted on a memorandum to Directorate of Public Works (DPW), ATTN: Work Reception, with a full justification. DPW maintains the sole authority to authorize exceptions to policy.
  - Unauthorized signs that are not on a DPW approved exception to policy memorandum may be removed at the discretion of DPW.
  - Reference the Fort Hood Installation Design Guide (IDG) for further guidance on the design specifications of indoor signs.
  - Battalion level units and above may request an exception to policy for reserved privately owned vehicle (POV) parking signs for the Soldier of the Month or approved staff parking. These are limited to five percent of the available parking spaces in that lot.

(continued on next page)

Summary of change

- Fonts shall be highway gothic for traffic signs and helvetica for all other signs.
- Building numbers should be placed between 8 to 10 feet (2.5 to 3 meters) high.
- Table C-1 does not assign financial responsibility for the construction, maintenance, or repair of signs.

- It changes:
  - Directorate of Engineering and Housing (DEH) changed to DPW.
  - Darnall Army Hospital changed to Carl R. Darnall Army Medical Center.
  - Request for signs and an exception to policy on a Department of the Army (DA) Form 4283 was changed to a memorandum.
  - Appendix A changes to table C-1 and the sign specifications changed.
  - Street marking changed to pavement markings.
- It deletes:
  - Parking Principles published by the Highway Research Board as a reference.

1d

SIGNS AND MARKINGS

2

Signs

Standardization of signs and markings of all types at Fort Hood is desirable and the number and type are held to the absolute minimum, which include:

- Traffic control signs will be erected and maintained as follows:
  - Only by or under the authority of the DPW.
  - Requests for signs will be submitted on a memorandum with a sketch of the layout or sign required to DPW, ATTN: Work Reception.
  - No other traffic control signs are authorized; battalion size or larger units may request authority to deviate from the prescribed format as an exception to policy.
  - Requests for an exception to policy will be submitted on a memorandum to DPW, ATTN: Work Reception, with a full justification.
- All signs and markings shall conform to the guidelines in Table C-1. Only approved signs will be:
  - Constructed on any building or in any area.
  - Installed on any building or in any area.
  - Signs or markings that affect fire safety standards need to be approved by the Fort Hood Fire and Emergency Services Inspection Section (see appendix B for telephone numbers).
  - Maintained by DPW as the sole authority to approve exceptions to policy. Requests for an exception to policy will be sent on a memorandum to DPW, ATTN: Work Reception, with a full justification.

(continued on next page)

Signs (continued)

- Unapproved signs (those that are not approved by DES or by DPW on an exception to policy memorandum) may be removed at the discretion of DPW.

- All traffic control signs for roads and streets will conform to the provisions of the Manual on Uniform Traffic Control Devices.

2a

Insignias

Reproduction of insignias or symbols on signs is discouraged and prohibited for all units below battalion level, which includes:

- Painting of signs and unit insignia on buildings and other facilities without prior approval of DPW.

- Submit a memorandum to DPW, ATTN: Work Reception, with full justification for requests to obtain an exception to policy.

2b

Markers

Training movements and administrative signs for use in training exercises and training areas are classified as training aids.

Route markers include those identifying:

- Command posts.

- Motor pools and stations.

- Message centers.

- Fire direction centers.

- Observation posts.

- Personnel occupying key positions.

These signs are authorized for fabrication by the III Corps and Fort Hood Training Service Office or may be fabricated by the unit.

Note: Units will remove all training exercise signs within 3 days after exercise is concluded.

2c

Area identification signs

Area identification signs are authorized for battalion size or larger units, which includes:

- One standard sign for each battalion headquarters may be installed at a location that is appropriate to the location of the battalion headquarters.
- Identifying orderly rooms of each company.

Signs are not authorized to identify barracks and company sections.

2d

Indoor signs

Indoor signs may be constructed and installed by and at the discretion of the unit or activity commanders. Reference the Fort Hood IDG, chapters 8.12.5.3 and 11.4, for further guidance on the design specifications of indoor signs. Avoid damage to buildings due to improper installation.

Information regarding the approved mounting method may be obtained by calling DPW, Work Reception (see appendix B for telephone numbers).

2e

Pavement markings

Traffic painting or markings for roads and streets shall conform to the provisions of the manual on Uniform Traffic Control Devices.

Traffic painting or marking of airfields and heliports shall conform to the provisions of Technical Manual (TM) 5-823-4 (Marking of Army Airfield-Heliport Operational and Maintenance Facilities).

Traffic painting or marking of POV parking areas shall conform to:

- US Army Corps of Engineers Technical Instruction 804-11 (Design for Non-organizational or Privately Owned Vehicles [POVs] Site Circulation and Parking).
- The Transportation and Traffic Engineering Handbook.

(continued on next page)

Pavement markings (continued)

- Requests for an exception to policy will be sent on a memorandum to DPW, ATTN: Work Reception, with a full justification.
- Battalion level units and above may request an exception to policy for reserved POV parking signs for the Soldier of the Month or approved staff parking. These are limited to five percent of the available parking spaced in that lot.

All traffic painting or markings shall be done by or under the authority of the DPW. *No* other traffic painting or marking is authorized. Painting or lettering on curbs is prohibited.

Traffic painting of motor pool parking lots and hardstand areas is not authorized.

2f

Directorate of Public Works (DPW) responsibilities

The DPW is responsible for:

- Fabrication.
- Erection.
- Maintenance.
- Repair of signs and markings that are prescribed by this regulation and are essential for functional operation at this installation.
- Approving and/or disapproving requests for exceptions to policy for this regulation.

2g

Units and/or activities responsibilities

The units and/or activities are responsible for:

- Requesting standard signs, such as those listed in table C-1, on a memorandum to DPW, ATTN: Work Reception.
- Construction, approval of location, and installation for each type of sign or marking that is approved as an exception to policy.

(continued on next page)

Units and/or activities responsibi-lities (continued)

Signs are authorized by an approved exception to policy become the responsibility of the requester and shall be removed when the unit and/or activity vacates the facility.

2h

Placement of temporary signs

Placement procedures for temporary signs are:

- Advertisement and directional signs of a temporary nature will be used only after approval is obtained from DPW.
- No signs of any kind will be affixed to utility or telephone poles.
- Once approved, these types of signs will be:
  - Installed no more than three working days before the event or activity.
  - Removed immediately thereafter.

2i

Permanent directional signs

Permanent directional signs are limited to signs that are an integral part of the post information and/or direction system.

Considered as part of this system will be directional signs indicating various routes to the following emergency facilities:

- Carl R. Darnall Army Medical Center.
- Major command areas.
- A minimum number of signs directing vendors to buildings and offices in the post industrial areas.

2j

Sign specifications

See table C-1 for typical outdoor sign specifications.

Table C-1 does not assign financial responsibility for the construction, maintenance, or repair of signs.

Fonts shall be highway gothic for traffic signs and helvetica for all other signs.

Buildings numbers should be placed between 8 to 10 feet (2.5 to 3 meters) high.

The Army Safety Center refers Occupational Safety and Health Administration (OSHA) 1910.144 which specifies colors of safety markings:

- Yellow shall be the basic color for designating caution and physical hazards that one could strike against, stumble over, or get caught in between.
- Red shall be the basic color used to mark fire protection equipment areas and danger areas.
- Black and white shall indicate housekeeping areas.
- Green shall be the basic color for designating safety equipment.

The Army TM 5-807-10 (Signage) specifies use for the following sign colors:

- Standard blue may be used for community signs.

Pursuant to Army Regulation (AR) 385-10, paragraph 3.5, "Commanders may not issue waivers or variances to OSHA standards."

(continued on next page)

Sign specifications (continued)

The colors of safety markings are also found in the Army Safety Centers Information Guide and Federal regulations. Department of Defense (DOD) Instruction 6055.1 (Department of Defense Safety and Occupational Health Program) requires components to comply with the standards promulgated by OSHA.

National Fire Protection Association 291 (Recommended Practice for Fire Flow Testing and Marking of Hydrants) provides guidance on fire hydrant barrel color-coding options.

2k

FH REG 420-5 **19 October 2007**

Appendix A

Section I. Required Publications
This section not used.

Section II. Related Publications

AR 385-10
The Army Safety Program

Army Safety Centers Information Guide

DOD Instruction 6055.1
Department of Defense Safety and Occupational Health Program

FH IDG
Fort Hood Installation Design Guide (Chapters 8.12.5.3 and 11.4)

MUTCD
Manual on Uniform Traffic Control Devices

National Fire Protection Association 291
Recommended Practice for Fire Flow Testing and Marking of Hydrants

Occupational Safety and Health Administration (OSHA) Standard 1910.144
Safety Color Code for Marking Physical Hazards

Transportation and Traffic Engineering Handbook

US Army Corps of Engineers Technical Instruction 804-11
Design for Non-organizational or Privately Owned Vehicles (POV) Site Circulation and Parking

TM 5-807-10
Signage

TM 5-823-4
Marking of Army Airfield-Heliport Operational and Maintenance Facilities

Section III. Prescribed Forms
This section not used.

19 October 2007 **FH REG 420-5**

Section IV. Referenced Forms

DA Form 4283
Facilities Engineering Work Request

FH Form 1853
Distribution Scheme

FH REG 420-5 **19 October 2007**

Appendix B
Telephone numbers

Section	Telephone number
Fire Department	254-288-3327
DPW, Work Reception	254-287-2113

Legend:
DPW – Directorate of Public Works

19 October 2007 **FH REG 420-5**

Appendix C
Typical outdoor sign specifications

Table C-1. Typical outdoor sign specifications

	Type	Sign Size[1]	Face[2]	Color	Letter Size[1]	Lines of Copy
1)	Traffic Control (Standard Signs)	Conform to MUTCD				
	a. Street Names	12" x Variable	S	White on Green	6" / 4"	1
	b. Creek Names	12" x 30"	S	White on Green	3.5"	2
	c. Child at Play (Handicap, Deaf, Blind)	36" x 36"	S	Black on Yellow	5"	3
	d. Open Range Watch for Livestock	36" x 36"	S	Black on Yellow	5"	4
	e. Troop Crossing	36" x 36"	S	Black on Yellow	6"	2
	f. Caution Troop Crossing	36" x 36"	S	Black on Yellow	5"	3
2)	Parking Areas	Conform to MUTCD				
	a. Reserved Parking	12" x 18"	S	Green on White	2"	3 thru 5
	b. Reserved Parking for Bn CDR, CSM	12" x 18"	S	Green on White	2"	4
	c. Restricted Parking Lot	18" x 24"	S	Green on White	Varies	Varies
	d. No Parking	12" x 18"	S	Red on White	3" / 2"	2 thru 4
3)	High Water					
	a. Roadway Subject to Flooding	30" x 30"	S	Black on Yellow	4"	3
	b. Caution	12" x 30"	S	Black on Yellow	6"	1
	c. Stream Crossing Closed	36" x 36"	S	Black on Yellow	5"	3
	d. Seasonal Crossing Site	36" x 36"	S	Black on Yellow	5"	3
	e. Caution Low Water Crossing Ahead	36" x 36"	S	Black on Yellow	5" / 4"	4
4)	Work Related Safety Signs					
	a. Arms Room Fire Symbol	24" x 24"	S	Black on Orange	10"	1
	b. Caution Chlorine Hazard Area	18" x 24"	S	Red/Black on White	2"/1"	8
	c. No Smoking	4.5" x 24"	S	White on Red	2.5"	1
	d. No Smoking Within 50 ft (15.24 meters)	9" x 24"	S	White on Red	2.5"/2"	2
	e. Hearing Protection Required	18" x 24"	S	Black on White	2"	5
	f. Eye Protection Required	18" x 24"	S	Black on White	2"/2.5"	4
	g. Gloves and Goggles	18" x 24"	S	Black on White	2"/2.5"	5
	h. Military Dog Area	24" x 36"	S	Red/Black on White	2"/3"/4"	5
	j. Pesticide Storage Area	18" x 18"	S	Black on Orange	2"/2.5"	4
	k. Weapons Clearing Procedures	36" x 48"	S	Black on White	1"/.75"	14 thru 17
5)	Restricted Access Area Signs					
	a. Danger Impact Area	18" x 24"	S	Red/Black on White	2"/1"	5
	b. Danger Laser Range	18" x 24"	S	Red/Black on White	2"/1"	5
	c. Off Limits Area Keep Out	18" x 24"	S	Black on White	2.5"/3"	3
	d. Subject to Inspection	24" x 36"	S	Black on White	3"/1.5"	4
	e. Consent to Search	24" x 36"	S	Black on White	3"/1.75"	7

Table C-1. Typical outdoor sign specifications (continued)

	Type	Sign Size[1]	Face[2]	Color	Letter Size[1]	Lines of Copy
	f. Off Limits to all POVs	48” x 72”	S	Red on White	5”/2”	6
	g. Military Police Checkpoint Ahead	36” x 36”	S	Black on Yellow	4”/5”	3
6)	Unit Area Identification					
	a. Post Headquarters	4' x 8'	D	Black on Beige	5"	2
	b. Corps/Division Headquarters	4' x 8'	D	Black on Beige	5"	2
	1. Nameplates	5" x 8'	D	Black on Beige	3"	1
	c. Brigade Headquarters	4' x 8'	D	Black on Beige	5"	2 or 3
	1. Nameplates	5" x 8'	D	Black on Beige	3"	1
	d. Battalion Headquarters	4' x 6'	D	Black on Beige	5"/4"	2 or 3
	1. Nameplates	5" x 6'	D	Black on Beige	3"	1
	e. Dining Facilities	4' x 4'	D	Black on Beige	5"/4"	2 thru 4
	f. Corps/Division Staff Section	3' x 4' / 2' x 4'	D	Black on Beige	4"/3"	Varies
	g. Directorate Headquarters	4' x 6'	D	Black on Beige	5"/4"	2 thru 4
	1. Shops/Sections	2' x 4'	S	Black on Beige	4"/3"	2 or 3
	h. Corps/Division Motor Pool	2' x 4'	D	Black on Beige	5"/3"	2
	1. Bn, Regt, Sqdn, etc.	8" x 4'	D	Black on Beige	4"	1
	2. Co, Btry, Det, Plt, etc.	8" x 4'	D	Black on Beige	4"	1
	j. Bn Staff Section					
	1. S-1, S-2, S-3, etc.	2' x 4'	S	Black on Beige	4"/3"	3
	2. Chaplain, Retention, EO, etc.	2' x 4'	S	Black on Beige	4"/3"	3
	3. Family Adv, Financial Adv, etc.	2' x 4'	S	Black on Beige	4"/3"	3
	4. Classroom, Aid Station	2' x 4'	S	Black on Beige	4"/3"	3
	k. Company HQ, Orderly Room	2' x 4'	S	Black on Beige	4"/3"	3
	l. Range Signs	2' x 4'	D	Black on Beige	4"/3"	2 or 3
7)	Religious Activities					
	a. Chapel Sign	4' x 6'	D	Black on Beige	5"/4"	2 or 3
	1. Service Hours	5" x 6'	D	Black on Beige	3"	1
	b. Cemetery Signs	3' x 6'	S	White on Blue	4"/3"	4
	1. Respect Signs	1' x 2'	S	White on Blue	1"	Varies
8)	Special Services					
	a. Physical Fitness Center	3' x 4'	D	Black on Beige	4"	3 or 4
	b. Craft Shops	3' x 4'	D	Black on Beige	4"	3 or 4
	1. Hours of Operation	On door	S	White or Black	1.5"/2"	Varies
9)	Housing					
	a. Village Sign (Main Entrance)	4' x 6'	S	Black on Beige	5"/4"	2 or 3
	1. Other Entrance Sign	3' x 4'	D	Black on Beige	3"/4"	2 thru 4
	2. Sponsor/Mayor	1' x 6'	S	Black on Beige	3"	2
	b. Quarters of the Month/Year	18" x 24"	S	Black on Beige	2"/3"	4

Table C-1. Typical outdoor sign specifications (continued)

	Type	Sign Size[1]	Face[2]	Color	Letter Size[1]	Lines of Copy
	c. Village Mayor – Yard Sign	18” x 24”	S	Black on Beige	2”/3”	2 thru 4
	d. Military Crest/Insignia (For 0-6 and above)	30”	S	Unit Colors	N/A	N/A
10)	Miscellaneous					
	a. Building Numbers	8" x 30"	S	Black on White	6"	1
	1. Contract Owned Facilities	8" x 30"	S	Red on White	6"	1
	b. Adopted School Sign	4' x 8'	D	Black on Beige	5"/4"	3 or 4
	c. Airfield signs					
	1. Airfield Entrance	4' x 8'	D	Black on Beige	5"/4"	3 or 4
	2. Base Operations	4' x 6'	D	Black on Beige	4"/3"	Varies
	a) Nameplates	5" x 6'	D	Black on Beige	3"	1
	d. Construction Projects	4' x 6'	D	Black on Beige	4"/3"	Varies
	e. ACOE Signs	4' x 8'	D	Black on Beige	4"/3"	
	f. Military Crest/Insignia	12" / 16" / 30"	S	Unit Colors	N/A	N/A
	g. Special Event Signs					
	1. CFC, AER, United Fund, etc.	4' x 4'	S	Black on Beige	As Required	As Required
	2. Single Soldiers Day	18" x 24"	S	Black on White	As Required	As Required

Legend:

ACOE – Army Communities of Excellence
ADV – Advisor
AER – Army Emergency Relief
BN – Battalion
BTRY – Battery
CDR – Commander
CFC – Combined Federal Campaign
CO – Company
CSM – Command Sergeant Major
DET – Detachment
EO – Equal Opportunity
ETC – Et Cetera
HQ – Headquarters
MUTCD – Manual on Uniform Traffic Control Devices
N/A – Not applicable
O-6 – Colonel
PLT – Platoon
POV – Privately Owned Vehicles
REGT – Regiment
SQDN – Squadron

Notes:

[1] See Metric Conversion Table
[2] S – Single sided face; D – Double sided face

FH REG 420-5 **19 October 2007**

Table C-2. Metric table conversions

Inches to Centimeters[1]		Inches to Centimeters[1]		Inches to Centimeters[1]		Feet to Meters[2]	
0.75	1.91	4.5	11.43	12	30.48	1	.305
1	2.54	5	12.7	16	40.64	2	.610
1.5	3.81	6	15.24	18	45.72	3	.914
1.75	4.45	7	17.78	24	60.96	4	1.219
2	5.08	8	20.32	30	76.20	5	1.524
2.5	6.35	9	22.86	36	91.44	6	1.829
3	7.62	10	25.4	48	121.92	8	2.438
3.5	8.89	11	27.94	72	182.88		
4	10.16						

Notes:

[1] Rounded to two decimal places
[2] Rounded to three decimal places

Glossary
Section I. Abbreviations

ACOE
Army Communities of Excellence

ADV
Advisor

AER
Army Emergency Relief

AR
Army Regulation

ATTN
Attention

BN
Battalion

BTRY
Battery

CDR
Commander

CFC
Combined Federal Campaign

CO
Company

CSM
Command Sergent Major

DA
Department of the Army

DEH
Directorate of Engineering and Housing

DET
Detachment

DOD
Department of Defense

DPW
Directorate of Public Works

EO
Equal Opportunity

ETC
Et Cetera

FH
Fort Hood

HQ
Headquarters

IAW
In Accordance With

IDG
Installation Design Guide

N/A
Not applicable

O-6
Colonel

OSHA
Occupational Safety and Health Administration

PLT
Platoon

POV
Privately Owned Vehicle

REG
Regulation

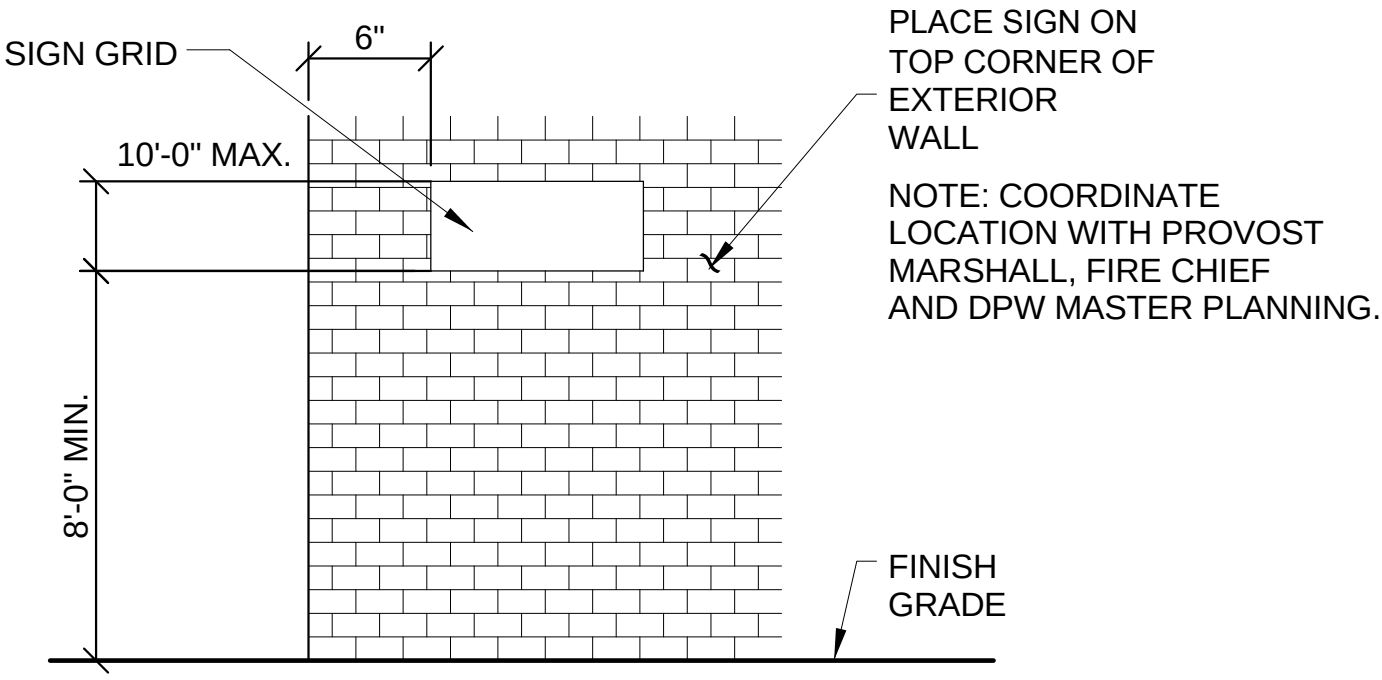
REGT
Regiment

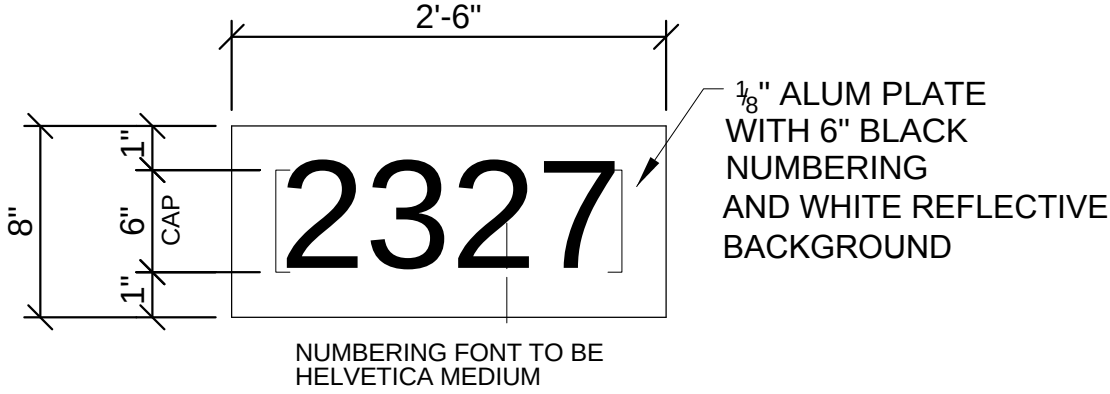
SQDN
Squadron

TM
Technical Manual

US
United States

Section II. Terms
This section not used.





2 / 1A-623 SIGN TYPE "K" DETAIL

NOT TO SCALE

NFH ORTC PROPOSED MONUMENT-TYPE SIGN

Indigenous Limestone shall be chopped, top and bottom edges shall be sawn. Sandstone is not acceptable. Blend shall include 40% Nicotine, 30% White, 10% Grey Lueder, 10% Blue, 10% Shell (cream color). Mortar shall be off-white or similar. Ashlar pattern. Recommended Block size is 4", 6" 8" and 10" height, full veneer 4"-4 1/2" thick.

APPENDIX I:

Acceptable Plant List

APPENDIX I

Plant Palette

Approved Plant List for Landscaping on Fort Hood		
Large Trees		
Big-tooth maple*	*Acer grandidentatum*	interesting leaves; grows 20 to 50 feet; needs very little water; golden to red fall color
Bur oak*	*Quercus macrocarpa*	very large shade tree; grows 60 to 80 feet tall and 50 feet spread; needs deep, rich soil; very large leaves; large interesting acorns
Cedar elm*	*Ulmus crassifolia*	grows up to 70 feet; upright growth form that is good for narrow spaces; yellow-golden fall color
Chinkapin oak*	*Quercus muehlenbergii*	grows up to 50 feet; prefers deeper soil, but will grow in dry soil; large leaves; yellow to brown fall color
Escarpment black cherry	*Prunus serotina* var. *eximia*	grows up to 25 feet; white flower clusters followed by small black cherries; yellow fall color; needs moist soil
Lacey oak	*Quercus laceyi* (or *Q. glaucoides*)	grows up to 20 feet; slow growth rate; interesting blue-green leaf color; not susceptible to oak wilt
Monterrey oak, or Mexican white oak	*Quercus polymorpha*	grows up to 40 feet; deciduous to evergreen; prefers well-drained soil; the young leaves are bronze in color; not susceptible to oak wilt
Pecan*	*Carya illinoenensis*	grows up to 90 feet; large shade tree; needs deep, rich soil; birds and people eat the nuts
Plateau live oak*	*Quercus fusiformis* (or *Q. virginiana*)	grows up to 30 feet; evergreen; large shade tree; needs very little water; susceptible to oak wilt
Texas white ash* (NOT Arizona ash, or Fan Tex ash)	*Fraxinus texensis* (NOT *Fraxinus velutinus*)	grows 40 to 50 feet; grows fairly fast; yellow to orange fall color; needs very little water

Approved Plant List for Landscaping on Fort Hood		
Small Trees		
Blanco crabapple	*Pyrus ioensis* var. *texana* (*Malus ioensis* var. *texana*)	sun; grows up to 12 feet; pink flowers in the spring and interesting fruits in the fall
Carolina buckthorn*	*Rhamnus caroliniana (Frangula caroliniana)*	sun or shade; grows up to 15 feet; large glossy leaves; small purple fruits in late fall
Desert willow	*Chilopsis linearis*	sun or part shade; grows up to 15 feet; large showy pink flowers; does not like to be over watered
Eve's necklace*	*Sophora affinis*	sun or shade; grows up to 20 feet; delicate pink flowers in spring; smooth green bark; interesting bead-like fruit
Mexican plum*	*Prunus mexicana*	sun or part shade; grows up to 20 feet; one of the first to flower in the spring; beautiful white, fragrant flowers; interesting flaky bark
Prairie flame-leaf sumac*	*Rhus lanceolata*	prefers full sun; grows 10-20 feet; small white flowers in the summer; birds will love the red berries; brilliant red color in the fall; will spread to become several small trees, needs room to expand
Rusty blackhaw viburnum*	*Viburnum rufidulum*	sun or shade; grows 10-20 feet; large white flower clusters in spring; red fall color
Smoketree	*Cotinus obovatus*	sun or part shade; grows 12-20 feet; prefers dry soil; interesting flowers/fruit, looks like smoke; orange fall color
Texas redbud*	*Cercis canadensis* var. *texensis*	sun or part shade; grows 20-30 feet; one of the first to flower in spring; beautiful pink flowers
Tall Shrubs		
Deciduous holly*	*Ilex decidua*	sun or part shade; grows 12-20 feet; deciduous; striking red berries on females in fall that persist into winter
Dwarf wax myrtle	*Myrica pusilla*	sun or part shade; evergreen; grows 8-12 feet; golden yellow flowers; small blue fruits are eaten by many different birds
Evergreen sumac*	*Rhus virens*	prefers full sun; thick evergreen foliage, but will turn bronze after a freeze; grows 4-12 feet tall and 6-8 feet wide; red berries in late fall; does not like to be over watered
Golden-ball lead tree	*Leucaena retusa*	sun or part shade; prefers dry soil and does not like to be over watered; grows up to 12 feet; flowers are yellow puffs in spring, summer, and fall
False indigo*	*Amorpha fruticosa*	plant this one where your soil stays wet; grows up to 12 feet; beautiful dark purple tiny flowers in spring
Mexican buckeye*	*Ungnadia speciosa*	sun or shade; grows 12-20 feet tall and 12-20 feet wide; pink flowers in early spring; brilliant yellow fall color; interesting seed pods are left behind after the leaves fall
Prickly ash*, toothache tree, or tickle-tongue	*Zanthoxylum hirsutum*	sun or part shade; grows up to 15 feet; interesting fragrant foliage; has many sharp spines (do not plant this one too near sidewalks); swallowtail butterfly larvae use this plant

Approved Plant List for Landscaping on Fort Hood		
Silktassel	*Garrya ovata* var. *lindheimeri (Garrya lindheimeri)*	evergreen; full sun; prefers dry soil; grows 3-12 feet; silvery-grey leaves
Texas mock orange	*Philadelphus texensis*	sun or part shade; grows up to 12 feet; white flowers in late spring and early summer
Texas mountain laurel*, or Mescal bean	*Sophora secundiflora*	sun or part shade; evergreen; grows 10-20 feet; beautiful fragrant purple flowers; seeds are poisonous if eaten; be patient with this plant, it grows very slowly
Texas pistache (not Chinese pistache)	*Pistacia texana* (not *Pistacia chinensis*)	sun; evergreen; grows 12-30 feet tall and 15-20 feet wide; prefers dry soil; leaves are small and glossy
Wafer-ash*, or hop tree	*Ptelea trifoliata*	sun or shade; grows 3-12 feet; interesting fragrant foliage and fruit; swallowtail butterfly larvae use this plant
Wax myrtle	*Myrica cerifera*	sun or part shade; evergreen; grows up to 15 feet; golden yellow flowers; small blue fruits are eaten by many different birds
Witch hazel	*Hamamelis virginiana*	prefers shade, but can take sun; grows up to 30 feet; golden yellow fall color; interesting yellow flowers in the late fall after the leaves drop
Low Shrubs		
Agarita*, or agarito, or algaritas	*Berberis trifoliolata*	sun or shade; evergreen; spiny leaves (do not plant this one too near sidewalks); grows 3-6 feet tall and 3-6 feet wide; one of the first to flower in the spring; fragrant yellow flowers followed by small red berries
Black dalea*	*Dalea frutescens*	sun; grows 1-3 feet tall and 3-4 feet wide; very small, delicate leaves; purple flowers in the summer and fall
Butterfly bush	*Buddleja marrubiifolia*	sun or part shade; semi-evergreen; grows 4-6 feet tall and 4-6 feet wide; silvery-grey leaves; orange flowers summer and fall that attract butterflies
Chili piquin	*Capsicum annuum*	prefers shade; grows 2-3 feet; small white flowers in summer and fall; small red fruits following the flowers attract birds
Flame acanthus	*Anisacanthus quadrifidus* var. *wrightii*	full sun or part shade; grows 3-4 feet; flowers are red or orange from summer to fall and attract hummingbirds and butterflies
Fragrant mimosa*, or pink mimosa	*Mimosa borealis*	prefers sun; prefers dry soil; has many sharp hooked spines (do not plant this one too near sidewalks); grows 3-7 feet tall; many beautiful pink flowers in early spring
Gregg dalea	*Dalea greggii*	prefers full sun; grows up to 1 foot tall and 2-4 feet wide; works as a ground cover; prefers dry soil; flowers summer and fall
Gregg sage, or cherry sage	*Salvia greggii*	full sun; evergreen; grows up to 3 feet tall; flowers range in color from red to pink to white; attracts hummingbirds; spring, summer, and fall
Mexican oregano	*Poliomentha longiflora*	prefers sun; evergreen; grows up to 3 feet tall and up to 3 feet wide; pink flowers spring, summer, and fall that attract hummingbirds

Approved Plant List for Landscaping on Fort Hood		
Mountain sage	*Salvia regla*	prefers part shade; grows 3-6 feet tall and 3-4 feet wide; plant this one where your soil stays damp; red flowers in the fall that attract hummingbirds
Shrubby blue sage, or mejorana	*Salvia ballotiflora*	prefers sun; grows up to 6 feet tall; flowers spring, summer, and fall; fragrant (minty) leaves
Shrubby boneset*, fragrant white mistflower, or thorouthwort	*Eupatorium havanense*	needs some shade; grows 3-5 feet tall and 3-5 feet wide; white flowers in the late summer and fall that attract butterflies
Skunkbush*, or aromatic sumac	*Rhus trilobata (Rhus aromatica)*	sun or part shade; usually grows less than 3 feet tall, and 3-5 feet wide; delicate small leaves; red berries in the fall; leaves turn brilliant red in the fall
Turk's cap*	*Malvaviscus arboreus* var. *drummondii*	prefers shade; grows 2-6 feet tall and 3-5 feet wide; red flowers summer and fall that attract butterflies and hummingbirds
Yaupon holly	*Ilex vomitoria*	sun or shade; evergreen; grows 12-20 feet tall and 10-15 feet wide (dwarf varieties available that grow 2-4 feet tall and 2-4 feet wide); red berries on females
Vines		
Coral honeysuckle	*Lonicera sempervirens*	full sun; evergreen; elongate red flowers in early spring and some flowers in summer; attracts butterflies and hummingbirds
Crossvine	*Bignonia capreolata*	sun or part shade; evergreen; large orange flowers in the spring
Lindheimer's morning glory	*Ipomoea lindheimeri*	sun or part shade; delicate perennial; large pale purple flowers
Purple leather flower*	*Clematis pitcheri*	sun or part shade; delicate perennial; purple flowers with leathery petals
White bush honeysuckle*	*Lonicera albiflora*	prefers sun; grows as a shrub or a vine; small white flowers are quite fragrant; attracts butterflies; red berries in summer
Virginia creeper*	*Parthenocissus quinquefolia*	sun or part shade; interesting leaves; bird will eat the berries; bright red fall color
Xerophytes – plants that are adapted to especially dry soil conditions		
Devil's shoestring*	*Nolina lindheimeriana*	sun; prefers dry soil; smaller clusters of leaves with tall flower stalks
Lechuguilla	*Agave lechuguilla*	sun; prefers very dry soil; interesting spiny foliage; very tall flower stalks; spreads by offshoots and needs lots of room to expand
Texas sotol	*Dasylirion texanum*	sun; prefers dry soil; grows 3-4 feet across; interesting spiny foliage; very tall flower stalks
Red yucca	*Hesperaloe parviflora*	sun; prefers dry soil; red flowers on a tall stalk; attracts hummingbirds
Spanish dagger	*Yucca treculeana* or *Yucca torreyi*	sun; prefers dry soil; grows 3-12 feet tall; leaves are stiff and spear-like (do not plant this one too near sidewalks); white flowers in spring
Texas sacahuista*, or basket grass	*Nolina texana*	sun; prefers dry soil; large clusters of leaves, grows 3 feet across; white flowers hidden within leaves

Approved Plant List for Landscaping on Fort Hood		
Perennial Flowers		
Aromatic aster*, or fall aster	*Aster oblongifolius*	sun or part shade; grows 2-3 feet tall and 2-3 feet wide; purple flowers in the fall
Big red sage	*Salvia penstemonoides*	sun or part shade; grows 3-4 feet tall and 1-2 feet wide; magenta flowers summer and fall that attract hummingbirds
Blackfoot daisy*	*Melampodium leucanthum*	full sun; prefers dry soil; grows up to 1 foot tall, and 1-2 feet wide; white flowers during spring, summer, and fall
Bushy skullcap*	*Scutellaria wrightii*	full sun; grows up to 1 foot tall and 1 foot wide; lots of small purple flowers spring, summer, and fall
Canyon sage	*Salvia lycioides*	flowers spring and fall
Cedar sage*	*Salvia roemeriana*	needs shade; evergreen; grows 1-2 feet tall and 3 feet wide; red flowers in spring that attract hummingbirds
Chocolate daisy, or lyre-leaf green eyes	*Berlandiera lyrata*	yellow daisy flowers from summer to fall
Damianita	*Chrysactinia mexicana*	prefers sun; grows 1-2 feet tall and 1-2 feet wide; yellow flowers; does well at dry sites
Engelmann daisy*, or cutleaf daisy	*Engelmannia pinnatifida (Engelmannia peristenia)*	full sun; yellow flowers in spring and summer
Fall obedient plant, or false dragon-head	*Physostegia virginiana*	shade or part sun; grows 2-4 feet tall and up to 2 feet wide; purple flowers in the fall
Gaura*	*Gaura lindheimeri*	sun or part shade; grows 2-4 feet tall and 3 feet wide; pink to white flowers spring and summer
Gayfeather*	*Liatris mucronata*	prefers sun; grows 1-2 feet tall; purple flowers in the fall
Giant blue sage*	*Salvia azurea*	full sun; grows 3-6 feet tall; delicate blue flowers
Goldenrod*	*Solidago canadensis* (or *S. nemoralis*)	full sun; grows 2-5 feet tall; abundant yellow flowers in the fall; prefers dry soil
Heath aster*	*Aster ericoides*	sun; grows 1-2 feet tall and up to 1 foot wide; numerous small white flowers in the fall
Hill Country penstemon, or Scarlet penstemon	*Penstemon triflorus*	sun or part shade; prefers dry soil; grows 1-2 feet tall and 1-2 feet wide; pinkish-red flowers in spring and summer
Mealy sage*	*Salvia farinacea*	full sun; 1-3 feet tall and 1-2 feet wide; prefers dry soil; purple flowers
Pigeonberry*	*Rivina humilis*	prefers shade; 1-2 feet tall and up to 2 feet wide; white flowers and bright red fruits from summer to fall
Pink skullcap	*Scutellaria suffretescens*	sun or part shade; each plant can spread to 2 feet wide; dark pink flowers spring, summer, and fall
Prairie larkspur*	*Delphinium carolinianum*	sun or part shade; white or blue flowers along 1-3 feet tall stalks

Approved Plant List for Landscaping on Fort Hood		
Prostrate lawnflower*, or horseherb	*Calyptocarpus vialis*	part sun or shade; small yellow flowers spring, summer, and fall; a low-growing ground cover
Purple cone-flower*	*Echinacea angustifolia*	sun or part shade; grows 1-2 feet tall; large purple flowers in the spring and summer that attract butterflies
Red columbine*	*Aquilegia canadensis*	needs shade; plant this one where your soil stays damp; grows 1-3 feet tall and 1-2 feet wide; interesting leaves; beautiful red flowers that attract hummingbirds
Rock penstemon, or cut-leaf penstemon	*Penstemon baccharifolius*	prefers dry soil; grows up to 2 feet tall; large red flowers in spring, summer, and fall
Texas betony	*Stachys coccinea*	prefers shade; grows 1-2 feet tall and 2-3 feet wide; leaves are gray-green in color; red flowers in the spring, summer, and fall
Texas rock rose, or rose pavonia	*Pavonia lasiopetala*	sun or part shade; grows 1-3 feet tall and 2-3 feet wide; pink flowers during the summer and fall that attract butterflies
Texas star hibiscus	*Hibiscus coccineus*	full sun; grows up to 4 feet tall and up to 4 feet wide; orange star-like flowers all summer and into the fall
Tropical sage*	*Salvia coccinea*	sun or shade; grows up to 3 feet tall, and 1-2 feet wide; red flowers in spring, summer, and fall that attract butterflies and hummingbirds
Wild fox-glove*	*Penstemon cobaea*	sun; prefers dry soil; grows 1-2 feet tall; large white flowers in spring
Wood fern*, or river fern	*Thelypteris kunthii*	prefers shade; plant this one where your soil stays damp; grows 2-5 feet tall and up to 3 feet wide
Woolly ironweed*	*Vernonia lindheimeri*	full sun; prefers dry soil; grows 1-2 feet tall; lots of small purple flowers in the summer
Ornamental (tall) Grasses		
Big bluestem*	*Andropogon gerardii*	full sun or part shade; grows 3-5 feet tall and needs lots of room to spread; flowers in the fall
Bull muhly	*Muhlenbergia emersleyi*	full sun or part shade; grows 3-5 feet tall; flowers in the fall have a purplish color
Indian grass*, or yellow Indian grass	*Sorghastrum nutans*	prefers full sun, can grow in part shade; grows 3-5 feet tall and needs lots of room to spread; yellow fall color
Lindheimer's muhly* or big muhly	*Muhlenbergia lindheimeri*	a clump grass to use instead of Pampas grass; grows 3-5 feet tall and 3 feet wide; flowers in the fall
Little bluestem*	*Schizachyrium scoparium*	sun; grows 2-5 feet tall and needs lots of room to spread; leaves are blue-green in color and the flower stalks turn bronze after the first frost
Mexican feather grass	*Stipa tenuissima*	sun to part shade; grows 1-2 feet tall; leaves are thin and bright green; flowers in late summer
Pine muhly	Muhlenbergia dubia	prefers full sun; prefers dry soil; grows 1-2 feet tall; leaves are gray-green in color

Approved Plant List for Landscaping on Fort Hood		
Turf Grasses		
Buffalo grass*	*Buchloe dactyloides*	prefers sun; grows very short and needs very little mowing; needs very little water once established; does not respond to fertilizer; spreads by seeds as well as by runners; needs to be weeded until established
Bermuda grass	*Cynodon dactylon*	sun or shade; grows short and needs little mowing; needs only moderate amounts of water (1 inch per week); will invade into nearby beds
Zoysia, or zoysiagrass or Manilla zoysia	*Zoysia matrella* or *Zoysia japonica*	sun or part shade; forms a dense turf; needs only moderate amounts of water (1 inch per week)
Native sun turf grass mix (blue grama and buffalograss mix, 34/66%)	*Bouteloua gracilis* and *Buchloe dactyloides*	full sun; available as seed only, plant spring to summer; grows short and needs very little mowing; needs very little water once established; does not respond to fertilizer

*Indicates plants native to Fort Hood.

APPENDIX J:

Site Plans and Specifications

(Submitted Under Separate Cover)

APPENDIX K:

Utility Cost Information

Ft Hood Utility Rates

Rate A Government

Water: $2.20095 per k/gal
Sewage: $2.17588 per k/gal
Electric: $0.09956 $/kwh
Gas: $7.48930 $/mcf

Rate B Contractor

Water: $3.48929 k/gal
Sewer: $4.3155 k/gal
Electric: $0.11151 $/kwh
Gas: $8.10671 $/mcf

APPENDIX L:

LEED Project Credit Guidance

Master Site

LEED-NC 2009/v 3.0 Project Checklist

Project Name: Operation Readiness Training Complex; Package 1 *(Master Site Registration)*
Project Location: Fort Hood, TX
Date: Sept 2011
Required Rating: Silver (Campus)

Note: Building related credits. *(Reference Appendix P USGBC Registration for coordination of Master Site and Building Credits.)*

Points required by RFP or provided (Includes both GOV/Infrastructure AE & Building Contractor Points) to meet Silver Rating
Possible points by GOV/Infrastructure AE or Building Contractor.
POINTS NOT AVAILABLE OR NOT ALLOWED

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP			Note: Refer to LEED-NC Reference Guide for Specific Requirements for Credits & Prerequisites	Notes
0	10	0	7	7	26				**Sustainable Sites**	
Y					0		Prereq 1	C	**Construction Activity Pollution Prevention** Erosion & Sedimentation Control Plan shall conform to EPA Construction General Permit (comply with NPDES)	By Building Contractor
	1				1		Credit 1	D	**Site Selection** Do not develop on the following: farmland, previously undeveloped land 5' below 100 yr flood, endangered species habitat, w/in 100' of wetlands, previously undeveloped land w/in 50' of water body & public parkland	Site Complies
				5	5	+	Credit 2	D	**Development Density & Community Connectivity** Previously developed site with density of 60,000 sf/acre OR within 1/2 mile of residential zone (or average density of 10 units/acre) and 10 basic services w/ pedestrian access (exemplary for 120,000 sf/acre)	Site does not meet density or connectivity requirements
				1	1		Credit 3	D	**Brownfield Redevelopment** Defined as contaminated by ASTM E1903-97 Phase II Environmental Site Assessment, local voluntary cleanup program or government agency	No known contamination
			6		6	+	Credit 4.1	D	**Alternative Transportation**, Public Transportation Access Must have pedestrian/bike access AND within 1/2 mile of light rail OR 1/4 mile of 2+ bus lines (exemplary for comprehensive plan OR 2+ light rail lines OR 4+ bus lines AND 200+ transit rides per day)	Bus stop provided within site, Hood DPW to confirm number of connecting routes
	1				1		Credit 4.2	D	**Alternative Transportation**, Bicycle Storage & Changing Rooms Bike racks for 5% of peak building users AND showers for 0.5% employees	Coordinate FTE calculations with each individual building
	3				3		Credit 4.3	D	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles Preferred/discounted parking for 5% parking capacity OR refueling stations for 3% parking capacity OR low-emitting/fuel-efficient vehicles for 3% FTE OR access to LEV/FEV vehicle-sharing program for 3% FTE	Provide preferred parking for 5% total parking capacity (or 3% FTE)
	2				2		Credit 4.4	D	**Alternative Transportation**, Parking Capacity Meet minimum zoning AND provide preferred parking OR 20% discount for carpools for 5% parking capacity OR provide no new parking	Parking does not exceed ORTC requirements (25%), provide preferred parking for carpools (match # of LEV/FEV spaces)
				1	1	+	Credit 5.1	C	**Site Development,** Protect or Restore Habitat Greenfield: limit site disturbance (40' bldg, 10' walks/parking, 15' roads/main utilities, 25' constructed permeable surfaces); Previously Developed: native landscape for 50% (excluding building footprint) or 20% (including building footprint) of site, whichever is greater (exemplary for 75%)	Native landscaping will be used to greatest extent possible, but not expected to exceed 50% of site
	1				1	+	Credit 5.2	D	**Site Development,** Maximize Open Space Exceed zoning by 25% OR equal to building footprint if no zoning OR 20% of site if no open space required by zoning (exemplary for double)	Coordinate w/ each building to determine total building footprint
	1				1	+	Credit 6.1	D	**Stormwater Design,** Quantity Control Existing imperviousness less than 50%: post-development rate and quantity less than pre-development OR stream channel protection; Existing imperviousness greater than 50%: decrease runoff by 25%	Existing site is less than 50% impervious, infiltration through bioswales - stormwater calcs in process
	1				1	+	Credit 6.2	D	**Stormwater Design,** Quality Control Use BMPs to capture & treat 90% avg annual rainfall and remove 80% TSS	Semi-arid watershed, infiltrate minimum 0.75" of rainfall
			1		1	+	Credit 7.1	C	**Heat Island Effect,** Non-Roof 50% hardscape shaded OR pavement with SRI 29+ OR open grid paving OR 50% parking covered by material with SRI 29+ (exemplary for 100%)	TBD - pavement calcs in process
					1	+	Credit 7.2	D	**Heat Island Effect,** Roof 75% of roof, SRI 78+ for low-slope (≤ 2:12) / SRI 29+ for steep-slope OR 50% vegetated roof OR combination (exemplary for 100% vegetated roof)	By Building Contractor
					1		Credit 8	D	**Light Pollution Reduction** Limit light trespass from interior, exterior lighting power density to meet ASHRAE 90.1-2007, reduce sky-glow and light trespass at project boundary	Parking and other site lighting will comply, buildings must show compliance individually

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP				
2	4	0	0	0	10				**Water Efficiency**	
Y					0		Prereq 1	D	**Water Use Reduction**, 20% Reduction Reduction based on EPAct 2005 baseline - fixture type and controls (w/c 1.6 gpf; urinals: 1.0 gpf; public lavs: 0.5 gpm; private lavs, kitchen & janitor sinks: 2.2 gpm; showers: 2.5 gpm) AND/OR non-potable water use	By Building Contractor
	4				4		Credit 1	D	**Water Efficient Landscaping,** 50% (2 pts) or No Potable/No Irrigation (4 pts) Reduce potable water use for irrigation by plant species selection and irrigation efficiency AND/OR use of captured rainwater, recycled wastewater/greywater or non-potable public water system OR install landscaping that requires no permanent irrigation system	Native and drought-tolerant landscaping - no permanent irrigation will be installed
					2	+	Credit 2	D	**Innovative Wastewater Technologies** Reduce potable water use by 50% for sewage conveyance through fixture type/non-potable water use OR treat/infiltrate 50% wastewater on-site (exemplary: 100% reduction in potable water use OR 100% reuse/infiltration)	By Building Contractor
2					4	+	Credit 3	D	**Water Use Reduction** 30% (2 pts), 35% (3 pts) or 40% (4 pts) Reduction based on EPAct 2005 baseline - fixture type and controls AND/OR non-potable water use (exemplary for 45%)	By Building Contractor

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP
20	0	0	0	0	35	

Energy & Atmosphere

Y			0	Prereq 1 — C — **Fundamental Commissioning of the Building Energy Systems** CxA to review OPR and BOD, develop/incorporate commissioning requirements into construction documents, develop/implement commissioning plan, verify installation/performance of systems to be commissioned AND complete summary commissioning report — By Building Contractor
Y			0	Prereq 2 — D — **Minimum Energy Performance** 10% improvement for new buildings (5% for renovations) based on ASHRAE 90.1-2007 baseline (building envelope, HVAC, lighting, etc.) OR Prescriptive Compliance Path by ASHRAE Advanced Energy Design Guide or Advanced Buildings Core Performance Guide — By Building Contractor
Y			0	Prereq 3 — D — **Fundamental Refrigerant Management** Zero CFC-based refrigerants OR phase-out plan for existing equipment — By Building Contractor
15			19	Credit 1 — D — **Optimize Energy Performance** Improve proposed building performance compared to ASHRAE 90.1-2007 baseline by whole building simulation OR Prescriptive Compliance Path by ASHRAE Advanced Energy Design Guide (1 pt max) or Advanced Buildings Core Performance Guide (1-3 pts max) — By Building Contractor
				12% New Buildings or 8% Existing Building Renovations — 1
				14% New Buildings or 10% Existing Building Renovations — 1
				16% New Buildings or 12% Existing Building Renovations — 1
				18% New Buildings or 14% Existing Building Renovations — 1
				20% New Buildings or 16% Existing Building Renovations — 1
				22% New Buildings or 18% Existing Building Renovations — 1
				24% New Buildings or 20% Existing Building Renovations — 1
				26% New Buildings or 22% Existing Building Renovations — 1
				28% New Buildings or 24% Existing Building Renovations — 1
				30% New Buildings or 26% Existing Building Renovations — 1
				32% New Buildings or 28% Existing Building Renovations — 1
				34% New Buildings or 30% Existing Building Renovations — 1
				36% New Buildings or 32% Existing Building Renovations — 1
				38% New Buildings or 34% Existing Building Renovations — 1
				40% New Buildings or 36% Existing Building Renovations — 1
				42% New Buildings or 38% Existing Building Renovations
				44% New Buildings or 40% Existing Building Renovations
				46% New Buildings or 42% Existing Building Renovations
				48% New Buildings or 44% Existing Building Renovations
2			7	Credit 2 — D — **On-Site Renewable Energy** Based on annual building energy cost as calculated in EA Credit 1 - consider solar, wind, geothermal, hydro, biomass, bio-gas, etc. (exemplary for 15%) — By Building Contractor
				1% On-Site Renewable Energy
				3% On-Site Renewable Energy
				5% On-Site Renewable Energy
				7% On-Site Renewable Energy
				9% On-Site Renewable Energy
				11% On-Site Renewable Energy
				13% On-Site Renewable Energy
			2	Credit 3 — C — **Enhanced Commissioning** In addition to EAp1 : CxA to review design documents prior to mid-construction document phase, review contractor submittals, develop systems manual for O&M staff, verify training for O&M staff & occupants AND review building operation within 10 months after substantial completion — By Building Contractor
			2	Credit 4 — D — **Enhanced Refrigerant Management** No refrigerants OR requires calculation of refrigerant ozone depletion and global warming potentials ($LCGWP + LCODP \times 10^5 \leq 100$) — By Building Contractor
3			3	Credit 5 — C — **Measurement & Verification** Requires M&V Plan to monitor and evaluate building and/or energy systems performance for minimum 1 year post-construction occupancy AND corrective action plan if results show savings are not being achieved — By Building Contractor
			2	Credit 6 — C — **Green Power** Provide 35% of building's electricity use (from EA Credit 1) through two-year renewable energy contract (exemplary for 70% or four-year contract) — By Building Contractor

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP			
3	0	0	0	0	14				
								Materials & Resources	
Y					0		Prereq 1	D	**Storage & Collection of Recyclables** *Include area to collect and store recyclables including paper, corrugated cardboard, glass, plastics AND metals*	*By Building Contractor*
					3		Credit 1.1	C	**Building Reuse-Structure:** Maintain Existing Walls, Floors & Roof *Maintain existing structure (structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing) - if project includes an addition over 2x the sf of existing building, credit is not applicable (55%=1 pt, 75%=2 pts, 95%=3 pts)*	*By Building Contractor*
					1		Credit 1.2	C	**Building Reuse-Interior:** Maintain 50% of Non-Structural Elements *Includes int. walls, doors, floor coverings, clg systems, etc. - if project includes addition over 2x the sf of existing building, credit is not applicable*	*By Building Contractor*
1					2	+	Credit 2	C	**Construction Waste Management**, Divert 50% (1 pt), 75% (2 pts) *Recycle or salvage construction and demolition debris - calculations based on weight or volume but must be consistent (exemplary for 95%)*	*By Building Contractor*
					2	+	Credit 3	C	**Materials Reuse**, 5% (1 pt), 10% (2 pts) *Salvaged, refurbished or reused materials - calculations based on total materials cost for Div. 3-10 (exemplary for 15%)*	*By Building Contractor*
2					2	+	Credit 4	C	**Recycled Content**, 10% (1 pt), 20% (2 pts) *Recycled content = post-consumer + 1/2 pre-consumer - consider steel, concrete, gypsum, carpet, acoustic ceiling tiles, etc. - calculations based on total materials cost for Div. 3-10 (exemplary for 30%)*	*By Building Contractor*
					2	+	Credit 5	C	**Regional Materials**, 10% (1 pt), 20% (2 pts) *Use products extracted, harvested or recovered, processed AND manufactured within 500 miles of project site - calculations based on total materials cost for Div. 3-10 (exemplary for 30%)*	*By Building Contractor*
					1	+	Credit 6	C	**Rapidly Renewable Materials**, 2.5% *Use products made from plants typically harvested within ten-year cycle or shorter - consider bamboo, wool, cotton insulation, agrifiber, linoleum, wheatboard, strawboard, cork, etc. (exemplary for 5%)*	*By Building Contractor*
					1	+	Credit 7	C	**Certified Wood** *Minimum 50% of wood must be FSC certified - based on total wood material cost only (exemplary for 95%)*	*By Building Contractor*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP				
3	0	0	0	0	15			**Indoor Environmental Quality**		
Y					0		Prereq 1	D	**Minimum IAQ Performance**	
									Meet ASHRAE 62.1-2007 minimum outdoor air ventilation rates	*By Building Contractor*
Y					0		Prereq 2	D	**Environmental Tobacco Smoke** (ETS) **Control**	
									No smoking in building or within 25' of all entries, outdoor air intakes and operable windows OR separate designated smoking rooms with direct outside exhaust, deck-to-deck partitions and negative pressure	*Coordinate with Building Contractor*
					1		Credit 1	D	**Outdoor Air Delivery Monitoring**	
									CO2 sensors (in spaces with greater than 25 people per 1000 sf / less than 40 sf per occupant) AND direct outdoor airflow measurement devices	*By Building Contractor*
					1		Credit 2	D	**Increased Ventilation**	
									30% beyond ASHRAE 62.1-2007 minimum outdoor air ventilation rates	*By Building Contractor*
1					1		Credit 3.1	C	**Construction IAQ Management Plan**, During Construction	
									Contractor to develop & implement IAQ Plan based on SMACNA guidelines AND protect stored & installed absorptive materials from moisture damage AND use MERV 8 filters at each return air grille if air handlers used during construction AND replace all filters immediately prior to occupancy	*By Building Contractor*
1					1		Credit 3.2	C	**Construction IAQ Management Plan**, Before Occupancy	
									Building flush-out (14,000 cu.ft. of outdoor air per sf) while maintaining at least 60 °F and less than 60% relative humidity OR occupancy after partial flush-out (3,500 cu.ft. per sf) while continuing flush-out OR air quality testing	*By Building Contractor*
					1		Credit 4.1	C	**Low-Emitting Materials**, Adhesives & Sealants	
									VOC limits for site-applied interior adhesives, sealants and sealant primers (SCAQMD Rule 1168) and aerosol adhesives (GS-36)	*By Building Contractor*
					1		Credit 4.2	C	**Low-Emitting Materials**, Paints & Coatings	
									VOC limits for site-applied interior paints, coatings and primers (GS-11: flats 50 g/L, non-flats 150 g/L), anti-corrosive and anti-rust paints applied to interior ferrous metal substrates (GS-03: 250 g/L) and wood finishes, floor coatings, stains, etc. (SCAQMD Rule 1113)	*By Building Contractor*
					1		Credit 4.3	C	**Low-Emitting Materials**, Flooring Systems	
									Requirements for interior carpet (CRI Green Label Plus), carpet cushions (CRI Green Label), carpet adhesives (EQ Credit 4.1 VOC limit of 50 g/L), hard surface flooring (FloorScore), concrete / wood / bamboo / cork finishes (SCAQMD Rule 1113) and tile setting adhesive / grout (SCAQMD Rule 1168)	*By Building Contractor*
					1		Credit 4.4	C	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	
									No composite wood products or laminating adhesives with added urea-formaldehyde resins (on-site and shop-applied)	*By Building Contractor*
					1		Credit 5	D	**Indoor Chemical & Pollutant Source Control**	
									10' entryway system at regularly used entries AND direct exhaust (0.50 cfm/sf) w/ neg. pressure (5 Pa avg, 1 Pa w/ closed doors) AND self-closing doors & hard lid clg where gas/chemicals used AND install MERV 13 filters at regularly occupied spaces (return & outdoor air) AND containment for hazardous liquid waste from chem. mixing (janitor, housekeeping, labs, etc.)	*By Building Contractor*
					1		Credit 6.1	D	**Controllability of Systems**, Lighting	
									Controls for 90% occupants (individual task lighting in open work spaces) AND lighting system controllability for all shared multi-occupant spaces	*By Building Contractor*
					1		Credit 6.2	D	**Controllability of Systems**, Thermal Comfort	
									Temperature controls for 50% of occupants (including open work spaces) AND controls for all shared multi-occupant spaces	*By Building Contractor*
1					1		Credit 7.1	D	**Thermal Comfort**, Design	
									Meet ASHRAE 55-2004, Thermal Comfort Conditions for Human Occupancy	*By Building Contractor*
					1		Credit 7.2	D	**Thermal Comfort**, Verification	
									Achieve credit above AND implement occupant survey with corrective action AND install permanent monitoring system.	*By Building Contractor*
					1	+	Credit 8.1	D	**Daylight & Views**, Daylight, 75% of Spaces	
									For all regularly occupied areas: computer simulation (daylight illumination level 25 fc to 500 fc) OR calculated prescriptive daylight zone ratio (VLT x WFR = 0.150 to 0.180) OR measurement of indoor light level (25 fc) AND glare control required for all options.	*By Building Contractor*
					1	+	Credit 8.2	D	**Daylight & Views**, Views for 90% of Spaces	
									Vision glazing between 2'-6" and 7'-6" AFF for 90% of all regularly occupied spaces - demonstrated by horizontal (section) view and plan view.	*By Building Contractor*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP			
1	1	0	0	0	6		**Innovation & Design Process**		
	1				1		Credit 1.1 D **Innovation in Design or Exemplary Performance**		
							SSc5.2 Site Development, Maximize Open Space (double building footprint)	*Open space expected to exceed double the total building footprint*
					1		Credit 1.2 D **Innovation in Design or Exemplary Performance**	
							TBD	*By Building Contractor*
					1		Credit 1.3 D **Innovation in Design or Exemplary Performance**	
							TBD	*By Building Contractor*
					1		Credit 1.4 D **Innovation in Design**	
							TBD	*By Building Contractor*
					1		Credit 1.5 D **Innovation in Design**	
							TBD	*By Building Contractor*
1					1		Credit 2 C **LEED® Accredited Professional**	
							At least one principal participant of the project team shall be a LEED AP (include copy of certificate)	*Provide.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP		
0	2	0	0	1	6		**Regional Priority Credits (project zip code: 76544)**	
				1	1		Credit 1.1 C **Regional Priority:**	
							SSc5.1 Site Development, Protect or Restore Habitat	*See description above*
	1				1		Credit 1.2 D **Regional Priority:**	
							SSc6.1 Stormwater Design, Quantity Control	*See description above*
	1				1		Credit 1.3 D **Regional Priority:**	
							SSc6.2 Stormwater Design, Quality Control	*See description above*
					1		Credit 1.4 D **Regional Priority:**	
							WEc2 Innovative Wastewater Technologies	
					1		Credit 1.5 D **Regional Priority:**	
							EAc2 On-Site Renewable Energy, 1%	
					1		Credit 1.6 C **Regional Priority:**	
							MRc2 Construction Waste Management, Divert 75%	

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP	
29	17	0	7	8	112		**Project Totals** (pre-certification estimates)

Certified 40-49 points **Silver** 50-59 points **Gold** 60-79 points **Platinum** 80-110 points

Battalion Headquarters

LEED-NC 2009/v 3.0 Project Checklist

Project Name: Operation Readiness Training Complex; Package 1 *(Battalion Headquarters Registration)*
Project Location: Fort Hood, TX
Date: Sept 2011
Required Rating: Silver (Campus)

Note: Master Site related credits. *(Reference Appendix P USGBC Registration for coordination of Master Site and Building Credits.)*

Points required by RFP or provided (Includes both GOV/Infrastructure AE & Building Contractor Points) to meet Silver Rating
Possible points by GOV/Infrastructure AE or Building Contractor.
POINTS NOT AVAILABLE OR NOT ALLOWED

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP	Note: Refer to LEED-NC Reference Guide for Specific Requirements for Credits & Prerequisites	Notes
0	10	0	7	7	26		**Sustainable Sites**	
Y					0		Prereq 1 C **Construction Activity Pollution Prevention**	
							Erosion & Sedimentation Control Plan shall conform to EPA Construction General Permit (comply with NPDES)	*Building Contractor to document.*
	1				1		Credit 1 D **Site Selection**	
							Do not develop on the following: farmland, previously undeveloped land 5' below 100 yr flood, endangered species habitat, w/in 100' of wetlands, previously undeveloped land w/in 50' of water body & public parkland	*Site Complies*
				5	5	+	Credit 2 D **Development Density & Community Connectivity**	
							Previously developed site with density of 60,000 sf/acre OR within 1/2 mile of residential zone (or average density of 10 units/acre) and 10 basic services w/ pedestrian access (exemplary for 120,000 sf/acre)	*Site does not meet density or connectivity requirements*
				1	1		Credit 3 D **Brownfield Redevelopment**	
							Defined as contaminated by ASTM E1903-97 Phase II Environmental Site Assessment; local voluntary cleanup program or government agency.	*No known contamination*
			6		6	+	Credit 4.1 D **Alternative Transportation**, Public Transportation Access	
							Must have pedestrian/bike access AND within 1/2 mile of light rail OR 1/4 mile of 2+ bus lines. (exemplary for comprehensive plan OR 2+ light rail lines OR 4+ bus lines AND 200+ transit rides per day)	*Bus stop provided within site. Hood DPW to confirm number of connecting routes*
	1				1		Credit 4.2 D **Alternative Transportation**, Bicycle Storage & Changing Rooms	
							Bike racks for 5% of peak building users AND showers for 0.5% employees	*Coordinate FTE calculations with each individual building*
	3				3		Credit 4.3 D **Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	
							Preferred/discounted parking for 5% parking capacity OR refueling stations for 3% parking capacity OR low-emitting/fuel-efficient vehicles for 3% FTE OR access to LEV/FEV vehicle-sharing program for 3% FTE	*Provide preferred parking for 5% total parking capacity (or 3% FTE)*
	2				2		Credit 4.4 D **Alternative Transportation**, Parking Capacity	
							Meet minimum zoning AND provide preferred parking OR 20% discount for carpools for 5% parking capacity OR provide no new parking	*Parking does not exceed ORTC requirements (25%), provide preferred parking for carpools (match # of LEV/FEV spaces)*
				1	1	+	Credit 5.1 C **Site Development**, Protect or Restore Habitat	
							Greenfield : limit site disturbance (40' bldg, 10' walks/parking, 15' roads/main utilities, 25' constructed permeable surfaces); Previously Developed : native landscape for 50% (excluding building footprint) or 20% (including building footprint) of site, whichever is greater (exemplary for 75%)	*Native landscaping will be used to greatest extent possible, but not expected to exceed 50% of site*
	1				1	+	Credit 5.2 D **Site Development**, Maximize Open Space	
							Exceed zoning by 25% OR equal to building footprint if no zoning OR 20% of site if no open space required by zoning (exemplary for double)	*Coordinate w/ each building to determine total building footprint*
	1				1	+	Credit 6.1 D **Stormwater Design**, Quantity Control	
							Existing imperviousness less than 50% : post-development rate and quantity less than pre-development OR stream channel protection; Existing imperviousness greater than 50% : decrease runoff by 25%	*Existing site is less than 50% impervious; infiltration through bioswales - stormwater calcs in process*
	1				1	+	Credit 6.2 D **Stormwater Design**, Quality Control	
							Use BMPs to capture & treat 90% avg annual rainfall and remove 80% TSS	*Semi-arid watershed, infiltrate minimum 0.75" of rainfall*
			1		1	+	Credit 7.1 C **Heat Island Effect**, Non-Roof	
							50% hardscape shaded OR pavement with SRI 29+ OR open grid paving OR 50% parking covered by material with SRI 29+ (exemplary for 100%)	*TBD - pavement calcs in process*
					1	+	Credit 7.2 D **Heat Island Effect**, Roof	
							75% of roof SRI 78+ for low-slope (≤2:12) / SRI 29+ for steep-slope OR 50% vegetated roof OR combination (exemplary for 100% vegetated roof)	*Building Contractor to document.*
					1		Credit 8 D **Light Pollution Reduction**	
							Limit light trespass from interior, exterior lighting power density to meet ASHRAE 90.1-2007, reduce sky-glow and light trespass at project boundary	*Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP		
2	4	0	0	0	10		**Water Efficiency**	
Y					0		Prereq 1 D **Water Use Reduction**, 20% Reduction	
							Reduction based on EPAct 2005 baseline - fixture type and controls (wc: 1.6 gpf; urinals: 1.0 gpf; public lavs: 0.5 gpm; private lavs, kitchen & janitor sinks: 2.2 gpm; showers: 2.5 gpm) AND/OR non-potable water use	*Building Contractor to document.*
	4				4		Credit 1 D **Water Efficient Landscaping**, 50% (2 pts) or No Potable/No Irrigation (4 pts)	
							Reduce potable water use for irrigation by plant species selection and irrigation efficiency AND/OR use of captured rainwater, recycled wastewater/greywater or non-potable public water system OR install landscaping that requires no permanent irrigation system	*Native and drought tolerant landscaping - no permanent irrigation will be installed*
					2	+	Credit 2 D **Innovative Wastewater Technologies**	
							Reduce potable water use by 50% for sewage conveyance through fixture type/non-potable water use OR treat/infiltrate 50% wastewater on-site (exemplary: 100% reduction in potable water use OR 100% reuse/infiltration)	*Building Contractor to document.*
2					4	+	Credit 3 D **Water Use Reduction**, 30% (2 pts), 35% (3 pts) or 40% (4 pts)	
							Reduction based on EPAct 2005 baseline - fixture type and controls AND/OR non-potable water use (exemplary for 45%)	*Government requires a minimum of 30% reduction. Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP			
20	0	0	0	0	35		**Energy & Atmosphere**		
Y					0		Prereq 1	C	**Fundamental Commissioning of the Building Energy Systems**
									CxA to review OPR and BOD, develop/incorporate commissioning requirements into construction documents, develop/implement commissioning plan, verify installation/performance of systems to be commissioned AND complete summary commissioning report — *Building Contractor to document.*
Y					0		Prereq 2	D	**Minimum Energy Performance**
									10% improvement for new buildings (5% for renovations) based on ASHRAE 90.1-2007 baseline (building envelope, HVAC, lighting, etc.) OR Prescriptive Compliance Path by ASHRAE Advanced Energy Design Guide or Advanced Buildings Core Performance Guide — *Building Contractor to document.*
Y					0		Prereq 3	D	**Fundamental Refrigerant Management**
									Zero CFC-based refrigerants OR phase-out plan for existing equipment — *Building Contractor to document.*
15					19	+	Credit 1	D	**Optimize Energy Performance**
									Improve proposed building performance compared to ASHRAE 90.1-2007 baseline by whole building simulation OR Prescriptive Compliance Path by ASHRAE Advanced Energy Design Guide (1 pt max) or Advanced Buildings Core Performance Guide (1-3 pts max) — *Building Contractor to document.*
							1		*12% New Buildings or 8% Existing Building Renovations*
							1		*14% New Buildings or 10% Existing Building Renovations*
							1		*16% New Buildings or 12% Existing Building Renovations*
							1		*18% New Buildings or 14% Existing Building Renovations*
							1		*20% New Buildings or 16% Existing Building Renovations*
							1		*22% New Buildings or 18% Existing Building Renovations*
							1		*24% New Buildings or 20% Existing Building Renovations*
							1		*26% New Buildings or 22% Existing Building Renovations*
							1		*28% New Buildings or 24% Existing Building Renovations*
							1		*30% New Buildings or 26% Existing Building Renovations*
							1		*32% New Buildings or 28% Existing Building Renovations*
							1		*34% New Buildings or 30% Existing Building Renovations*
							1		*36% New Buildings or 32% Existing Building Renovations*
							1		*38% New Buildings or 34% Existing Building Renovations*
							1		*40% New Buildings or 36% Existing Building Renovations*
									42% New Buildings or 38% Existing Building Renovations
									44% New Buildings or 40% Existing Building Renovations
									46% New Buildings or 42% Existing Building Renovations
									48% New Buildings or 44% Existing Building Renovations
2					7	+	Credit 2	D	**On-Site Renewable Energy**
									Based on annual building energy cost as calculated in EA Credit 1 - consider solar, wind, geothermal, hydro, biomass, bio-gas, etc. (exemplary for 15%) — *Building Contractor to document.*
									1% On-Site Renewable Energy
							2		*3% On-Site Renewable Energy*
									5% On-Site Renewable Energy
									7% On-Site Renewable Energy
									9% On-Site Renewable Energy
									11% On-Site Renewable Energy
									13% On-Site Renewable Energy
					2	+	Credit 3	C	**Enhanced Commissioning**
									<u>In addition to EAp1</u> : CxA to review design documents prior to mid-construction document phase, review contractor submittals, develop systems manual for O&M staff, verify training for O&M staff & occupants AND review building operation within 10 months after substantial completion — *Government requires this credit. Building Contractor to document.*
					2		Credit 4	D	**Enhanced Refrigerant Management**
									No refrigerants OR requires calculation of refrigerant ozone depletion and global warming potentials ($LCGWP + LCODP \times 10^5 \leq 100$) — *Building Contractor to document.*
3					3		Credit 5	C	**Measurement & Verification**
									Requires M&V Plan to monitor and evaluate building and/or energy systems performance for minimum 1 year post-construction occupancy AND corrective action plan if results show savings are not being achieved — *Building Contractor to document.*
					2	+	Credit 6	C	**Green Power**
									Provide 35% of building's electricity use (from EA Credit 1) through two-year renewable energy contract (exemplary for 70% or four-year contract) — *Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP				
3	0	0	0	4	14		**Materials & Resources**			
Y					0		Prereq 1	D	**Storage & Collection of Recyclables**	
									Include area to collect and store recyclables including paper, corrugated cardboard, glass, plastics AND metals	*Building Contractor to document.*
				3	3		Credit 1.1	C	**Building Reuse-Structure:** Maintain Existing Walls, Floors & Roof	
									Maintain existing structure (structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing) - if project includes an addition over 2x the sf of existing building, credit is not applicable (55%=1 pt, 75%=2 pts, 95%=3 pts)	*Not Applicable.*
				1	1		Credit 1.2	C	**Building Reuse-Interior:** Maintain 50% of Non-Structural Elements	
									Includes int. walls, doors, floor coverings, clg systems, etc. - if project includes addition over 2x the sf of existing building, credit is not applicable	*Not Applicable.*
1					2	+	Credit 2	C	**Construction Waste Management**, Divert 50% (1 pt), 75% (2 pts)	
									Recycle or salvage construction and demolition debris - calculations based on weight or volume but must be consistent (exemplary for 95%)	*Government requires this credit. Building Contractor to document. Coordination with Site Contractor.*
					2	+	Credit 3	C	**Materials Reuse**, 5% (1 pt), 10% (2 pts)	
									Salvaged, refurbished or reused materials - calculations based on total materials cost for Div. 3-10 (exemplary for 15%)	*Building Contractor to document.*
2					2	+	Credit 4	C	**Recycled Content**, 10% (1 pt), 20% (2 pts)	
									Recycled content = post-consumer + 1/2 pre-consumer : consider steel, concrete, gypsum, carpet, acoustic ceiling tiles, etc. - calculations based on total materials cost for Div. 3-10 (exemplary for 30%)	*Building Contractor to document.*
					2	+	Credit 5	C	**Regional Materials**, 10% (1 pt), 20% (2 pts)	
									Use products extracted, harvested or recovered, processed AND manufactured within 500 miles of project site - calculations based on total materials cost for Div. 3-10 (exemplary for 30%)	*Building Contractor to document.*
					1	+	Credit 6	C	**Rapidly Renewable Materials**, 2.5%	
									Use products made from plants typically harvested within ten-year cycle or shorter - consider bamboo, wool, cotton insulation, agrifiber, linoleum, wheatboard, strawboard, cork, etc. (exemplary for 5%)	*Building Contractor to document.*
					1	+	Credit 7	C	**Certified Wood**	
									Minimum 50% of wood must be FSC certified - based on total wood material cost only (exemplary for 95%)	*Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP				
3	0	0	0	0	15		**Indoor Environmental Quality**			
Y					0		Prereq 1	D	**Minimum IAQ Performance**	
									Meet ASHRAE 62.1-2007 minimum outdoor air ventilation rates	*Building Contractor to document.*
Y					0		Prereq 2	D	**Environmental Tobacco Smoke** (ETS) **Control**	
									No smoking in building or within 25' of all entries, outdoor air intakes and operable windows OR separate designated smoking rooms with direct outside exhaust, deck-to-deck partitions and negative pressure	*Building Contractor to document.*
					1		Credit 1	D	**Outdoor Air Delivery Monitoring**	
									CO2 sensors (in spaces with greater than 25 people per 1000 sf / less than 40 sf per occupant) AND direct outdoor airflow measurement devices	*Building Contractor to document.*
					1		Credit 2	D	**Increased Ventilation**	
									30% beyond ASHRAE 62.1-2007 minimum outdoor air ventilation rates	*Building Contractor to document.*
1					1		Credit 3.1	C	**Construction IAQ Management Plan**, During Construction	
									Contractor to develop & implement IAQ Plan based on SMACNA guidelines AND protect stored & installed absorptive materials from moisture damage AND use MERV 8 filters at each return air grille if air handlers used during construction AND replace all filters immediately prior to occupancy	*Building Contractor to document.*
1					1		Credit 3.2	C	**Construction IAQ Management Plan**, Before Occupancy	
									Building flush-out (14,000 cu.ft. of outdoor air per sf) while maintaining at least 60 °F and less than 60% relative humidity OR occupancy after partial flush-out (3,500 cu.ft. per sf) while continuing flush-out OR air quality testing	*Building Contractor to document.*
					1		Credit 4.1	C	**Low-Emitting Materials**, Adhesives & Sealants	
									VOC limits for site-applied interior adhesives, sealants and sealant primers (SCAQMD Rule 1168) and aerosol adhesives (GS-36)	*Building Contractor to document.*
					1		Credit 4.2	C	**Low-Emitting Materials**, Paints & Coatings	
									VOC limits for site-applied interior paints, coatings and primers (GS-11: flats 50 g/L; non-flats 150 g/L), anti-corrosive and anti-rust paints applied to interior ferrous metal substrates (GS-03: 250 g/L) and wood finishes, floor coatings, stains, etc. (SCAQMD Rule 1113)	*Building Contractor to document.*
					1		Credit 4.3	C	**Low-Emitting Materials**, Flooring Systems	
									Requirements for interior carpet (CRI Green Label Plus), carpet cushions (CRI Green Label), carpet adhesives (EQ Credit 4.1 VOC limit of 50 g/L), hard surface flooring (FloorScore), concrete / wood / bamboo / cork finishes (SCAQMD Rule 1113) and tile setting adhesive / grout (SCAQMD Rule 1168)	*Building Contractor to document.*
					1		Credit 4.4	C	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	
									No composite wood products or laminating adhesives with added urea-formaldehyde resins (on-site and shop-applied)	*Building Contractor to document.*
					1		Credit 5	D	**Indoor Chemical & Pollutant Source Control**	
									10' entryway system at regularly used entries AND direct exhaust (0.50 cfm/sf) w/ neg. pressure (5 Pa avg, 1 Pa w/ closed doors) AND self-closing doors & hard lid clg where gas/chemicals used AND install MERV 13 filters at regularly occupied spaces (return & outdoor air) AND containment for hazardous liquid waste from chem. mixing (janitor, housekeeping, labs, etc.)	*Building Contractor to document.*
					1		Credit 6.1	D	**Controllability of Systems**, Lighting	
									Controls for 90% occupants (individual task lighting in open work spaces) AND lighting system controllability for all shared multi-occupant spaces	*Building Contractor to document.*
					1		Credit 6.2	D	**Controllability of Systems**, Thermal Comfort	
									Temperature controls for 50% of occupants (including open work spaces) AND controls for all shared multi-occupant spaces	*Building Contractor to document.*
1					1		Credit 7.1	D	**Thermal Comfort**, Design	
									Meet ASHRAE 55-2004, Thermal Comfort Conditions for Human Occupancy	*Government requires this credit. Building Contractor to document.*
					1		Credit 7.2	D	**Thermal Comfort**, Verification	
									Achieve credit above AND implement occupant survey with corrective action AND install permanent monitoring system	*Building Contractor to document.*
					1	+	Credit 8.1	D	**Daylight & Views**, Daylight 75% of Spaces	
									For all regularly occupied areas: computer simulation (daylight illumination level 25 fc to 500 fc) OR calculated prescriptive daylight zone ratio (VLT x WFR = 0.150 to 0.180) OR measurement of indoor light level (25 fc) AND glare control required for all options	*Building Contractor to document.*
					1	+	Credit 8.2	D	**Daylight & Views**, Views for 90% of Spaces	
									Vision glazing between 2'-6" and 7'-6" AFF for 90% of all regularly occupied spaces - demonstrated by horizontal (section) view and plan view	*Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP			
1	1	0	0	0	6		**Innovation & Design Process**		
	1				1		Credit 1.1	D	**Innovation in Design or Exemplary Performance**
							SSc5.2 Site Development, Maximize Open Space (double building footprint)		*Open space expected to exceed double the total building footprint*
					1		Credit 1.2	D	**Innovation in Design or Exemplary Performance**
							TBD		*Building Contractor to document.*
					1		Credit 1.3	D	**Innovation in Design or Exemplary Performance**
							TBD		*Building Contractor to document.*
					1		Credit 1.4	D	**Innovation in Design**
							TBD		*Building Contractor to document.*
					1		Credit 1.5	D	**Innovation in Design**
							TBD		*Building Contractor to document.*
1					1		Credit 2	C	**LEED® Accredited Professional**
							At least one principal participant of the project team shall be a LEED AP (include copy of certificate)		*Provide.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP			
0	2	0	0	1	6		**Regional Priority Credits (project zip code: 76544)**		
				1	1		Credit 1.1	C	**Regional Priority:**
							SSc5.1 Site Development, Protect or Restore Habitat		*See description above*
	1				1		Credit 1.2	D	**Regional Priority:**
							SSc6.1 Stormwater Design, Quantity Control		*See description above*
	1				1		Credit 1.3	D	**Regional Priority:**
							SSc6.2 Stormwater Design, Quality Control		*See description above*
					1		Credit 1.4	D	**Regional Priority:**
							WEc2 Innovative Wastewater Technologies		*Building Contractor to document.*
					1		Credit 1.5	D	**Regional Priority:**
							EAc2 On-Site Renewable Energy, 1%		*Building Contractor to document.*
					1		Credit 1.6	C	**Regional Priority:**
							MRc2 Construction Waste Management, Divert 75%		*Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP
29	17	0	7	12	112	

Project Totals **(pre-certification estimates)**

Certified 40-49 points **Silver** 50-59 points **Gold** 60-79 points **Platinum** 80-110 points

Transient Barracks

LEED-NC 2009/v 3.0 Project Checklist

Project Name: Operation Readiness Training Complex; Package 1 *(Transient Barracks Registration)*
Project Location: Fort Hood, TX
Date: Sept 2011
Required Rating: Silver (Campus)

Note: Master Site related credits. *(Reference Appendix P USGBC Registration for coordination of Master Site and Building Credits.)*

Points required by RFP or provided (Includes both GOV/Infrastructure AE & Building Contractor Points) to meet Silver Rating
Possible points by GOV/Infrastructure AE or Building Contractor.
POINTS NOT AVAILABLE OR NOT ALLOWED

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP	Note: Refer to LEED-NC Reference Guide for Specific Requirements for Credits & Prerequisites			Notes
0	10	0	7	7	26		**Sustainable Sites**			
Y					0		Prereq 1	C	**Construction Activity Pollution Prevention**	
									Erosion & Sedimentation Control Plan shall conform to EPA Construction General Permit (comply with NPDES)	*Building Contractor to document.*
	1				1		Credit 1	D	**Site Selection**	
									Do not develop on the following: farmland, previously undeveloped land 5' below 100 yr flood, endangered species habitat, w/in 100' of wetlands, previously undeveloped land w/in 50' of water body & public parkland	*Site Complies*
				5	5	+	Credit 2	D	**Development Density & Community Connectivity**	
									Previously developed site with density of 60,000 sf/acre OR within 1/2 mile of residential zone (or average density of 10 units/acre) and 10 basic services w/ pedestrian access (exemplary for 120,000 sf/acre)	*Site does not meet density or connectivity requirements*
				1	1		Credit 3	D	**Brownfield Redevelopment**	
									Defined as contaminated by ASTM E1903-97 Phase II Environmental Site Assessment; local voluntary cleanup program or government agency.	*No known contamination*
			6		6	+	Credit 4.1	D	**Alternative Transportation**, Public Transportation Access	
									Must have pedestrian/bike access AND within 1/2 mile of light rail OR 1/4 mile of 2+ bus lines. (exemplary for comprehensive plan OR 2+ light rail lines OR 4+ bus lines AND 200+ transit rides per day)	*Bus stop provided within site. Hood DPW to confirm number of connecting routes*
	1				1		Credit 4.2	D	**Alternative Transportation**, Bicycle Storage & Changing Rooms	
									Bike racks for 5% of peak building users AND showers for 0.5% employees	*Coordinate FTE calculations with each individual building*
	3				3		Credit 4.3	D	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	
									Preferred/discounted parking for 5% parking capacity OR refueling stations for 3% parking capacity OR low-emitting/fuel-efficient vehicles for 3% FTE OR access to LEV/FEV vehicle-sharing program for 3% FTE	*Provide preferred parking for 5% total parking capacity (or 3% FTE)*
	2				2		Credit 4.4	D	**Alternative Transportation**, Parking Capacity	
									Meet minimum zoning AND provide preferred parking OR 20% discount for carpools for 5% parking capacity OR provide no new parking	*Parking does not exceed ORTC requirements (25%), provide preferred parking for carpools (match # of LEV/FEV spaces)*
				1	1	+	Credit 5.1	C	**Site Development**, Protect or Restore Habitat	
									Greenfield : limit site disturbance (40' bldg, 10' walks/parking, 15' roads/main utilities, 25' constructed permeable surfaces); Previously Developed : native landscape for 50% (excluding building footprint) or 20% (including building footprint) of site, whichever is greater (exemplary for 75%)	*Native landscaping will be used to greatest extent possible, but not expected to exceed 50% of site*
	1				1	+	Credit 5.2	D	**Site Development**, Maximize Open Space	
									Exceed zoning by 25% OR equal to building footprint if no zoning OR 20% of site if no open space required by zoning (exemplary for double)	*Coordinate w/ each building to determine total building footprint*
	1				1	+	Credit 6.1	D	**Stormwater Design**, Quantity Control	
									Existing imperviousness less than 50% : post-development rate and quantity less than pre-development OR stream channel protection; Existing imperviousness greater than 50% : decrease runoff by 25%	*Existing site is less than 50% impervious; infiltration through bioswales - stormwater calcs in process*
	1				1	+	Credit 6.2	D	**Stormwater Design**, Quality Control	
									Use BMPs to capture & treat 90% avg annual rainfall and remove 80% TSS	*Semi-arid watershed, infiltrate minimum 0.75" of rainfall*
			1		1	+	Credit 7.1	C	**Heat Island Effect**, Non-Roof	
									50% hardscape shaded OR pavement with SRI 29+ OR open grid paving OR 50% parking covered by material with SRI 29+ (exemplary for 100%)	*TBD - pavement calcs in process*
					1	+	Credit 7.2	D	**Heat Island Effect**, Roof	
									75% of roof SRI 78+ for low-slope (≤2:12) / SRI 29+ for steep-slope OR 50% vegetated roof OR combination (exemplary for 100% vegetated roof)	*Building Contractor to document.*
					1		Credit 8	D	**Light Pollution Reduction**	
									Limit light trespass from interior, exterior lighting power density to meet ASHRAE 90.1-2007, reduce sky-glow and light trespass at project boundary	*Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP				
2	4	0	0	0	10		**Water Efficiency**			
Y					0		Prereq 1	D	**Water Use Reduction**, 20% Reduction	
									Reduction based on EPAct 2005 baseline - fixture type and controls (wc: 1.6 gpf; urinals: 1.0 gpf; public lavs: 0.5 gpm; private lavs, kitchen & janitor sinks: 2.2 gpm; showers: 2.5 gpm) AND/OR non-potable water use	*Building Contractor to document.*
	4				4		Credit 1	D	**Water Efficient Landscaping**, 50% (2 pts) or No Potable/No Irrigation (4 pts)	
									Reduce potable water use for irrigation by plant species selection and irrigation efficiency AND/OR use of captured rainwater, recycled wastewater/greywater or non-potable public water system OR install landscaping that requires no permanent irrigation system	*Native and drought tolerant landscaping - no permanent irrigation will be installed*
					2	+	Credit 2	D	**Innovative Wastewater Technologies**	
									Reduce potable water use by 50% for sewage conveyance through fixture type/non-potable water use OR treat/infiltrate 50% wastewater on-site (exemplary: 100% reduction in potable water use OR 100% reuse/infiltration)	*Building Contractor to document.*
2					4	+	Credit 3	D	**Water Use Reduction**, 30% (2 pts), 35% (3 pts) or 40% (4 pts)	
									Reduction based on EPAct 2005 baseline - fixture type and controls AND/OR non-potable water use (exemplary for 45%)	*Government requires a minimum of 30% reduction. Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP			
20	0	0	0	0	35		**Energy & Atmosphere**		
Y					0		Prereq 1	C	**Fundamental Commissioning of the Building Energy Systems**
									CxA to review OPR and BOD, develop/incorporate commissioning requirements into construction documents, develop/implement commissioning plan, verify installation/performance of systems to be commissioned AND complete summary commissioning report — *Building Contractor to document.*
Y					0		Prereq 2	D	**Minimum Energy Performance**
									10% improvement for new buildings (5% for renovations) based on ASHRAE 90.1-2007 baseline (building envelope, HVAC, lighting, etc.) OR Prescriptive Compliance Path by ASHRAE Advanced Energy Design Guide or Advanced Buildings Core Performance Guide — *Building Contractor to document.*
Y					0		Prereq 3	D	**Fundamental Refrigerant Management**
									Zero CFC-based refrigerants OR phase-out plan for existing equipment — *Building Contractor to document.*
15					19	+	Credit 1	D	**Optimize Energy Performance**
									Improve proposed building performance compared to ASHRAE 90.1-2007 baseline by whole building simulation OR Prescriptive Compliance Path by ASHRAE Advanced Energy Design Guide (1 pt max) or Advanced Buildings Core Performance Guide (1-3 pts max) — *Building Contractor to document.*
							1		*12% New Buildings or 8% Existing Building Renovations*
							1		*14% New Buildings or 10% Existing Building Renovations*
							1		*16% New Buildings or 12% Existing Building Renovations*
							1		*18% New Buildings or 14% Existing Building Renovations*
							1		*20% New Buildings or 16% Existing Building Renovations*
							1		*22% New Buildings or 18% Existing Building Renovations*
							1		*24% New Buildings or 20% Existing Building Renovations*
							1		*26% New Buildings or 22% Existing Building Renovations*
							1		*28% New Buildings or 24% Existing Building Renovations*
							1		*30% New Buildings or 26% Existing Building Renovations*
							1		*32% New Buildings or 28% Existing Building Renovations*
							1		*34% New Buildings or 30% Existing Building Renovations*
							1		*36% New Buildings or 32% Existing Building Renovations*
							1		*38% New Buildings or 34% Existing Building Renovations*
							1		*40% New Buildings or 36% Existing Building Renovations*
									42% New Buildings or 38% Existing Building Renovations
									44% New Buildings or 40% Existing Building Renovations
									46% New Buildings or 42% Existing Building Renovations
									48% New Buildings or 44% Existing Building Renovations
2					7	+	Credit 2	D	**On-Site Renewable Energy**
									Based on annual building energy cost as calculated in EA Credit 1 - consider solar, wind, geothermal, hydro, biomass, bio-gas, etc. (exemplary for 15%) — *Building Contractor to document.*
									1% On-Site Renewable Energy
							2		*3% On-Site Renewable Energy*
									5% On-Site Renewable Energy
									7% On-Site Renewable Energy
									9% On-Site Renewable Energy
									11% On-Site Renewable Energy
									13% On-Site Renewable Energy
					2	+	Credit 3	C	**Enhanced Commissioning**
									<u>In addition to EAp1</u> : CxA to review design documents prior to mid-construction document phase, review contractor submittals, develop systems manual for O&M staff, verify training for O&M staff & occupants AND review building operation within 10 months after substantial completion — *Government requires this credit. Building Contractor to document.*
					2		Credit 4	D	**Enhanced Refrigerant Management**
									No refrigerants OR requires calculation of refrigerant ozone depletion and global warming potentials ($LCGWP + LCODP \times 10^5 \leq 100$) — *Building Contractor to document.*
3					3		Credit 5	C	**Measurement & Verification**
									Requires M&V Plan to monitor and evaluate building and/or energy systems performance for minimum 1 year post-construction occupancy AND corrective action plan if results show savings are not being achieved — *Building Contractor to document.*
					2	+	Credit 6	C	**Green Power**
									Provide 35% of building's electricity use (from EA Credit 1) through two-year renewable energy contract (exemplary for 70% or four-year contract) — *Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP				
3	0	0	0	4	14		**Materials & Resources**			
Y					0		Prereq 1	D	**Storage & Collection of Recyclables**	
									Include area to collect and store recyclables including paper, corrugated cardboard, glass, plastics AND metals	*Building Contractor to document.*
				3	3		Credit 1.1	C	**Building Reuse-Structure:** Maintain Existing Walls, Floors & Roof	
									Maintain existing structure (structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing) - if project includes an addition over 2x the sf of existing building, credit is not applicable (55%=1 pt, 75%=2 pts, 95%=3 pts)	*Not Applicable.*
				1	1		Credit 1.2	C	**Building Reuse-Interior:** Maintain 50% of Non-Structural Elements	
									Includes int. walls, doors, floor coverings, clg systems, etc. - if project includes addition over 2x the sf of existing building, credit is not applicable	*Not Applicable.*
1					2	+	Credit 2	C	**Construction Waste Management**, Divert 50% (1 pt), 75% (2 pts)	
									Recycle or salvage construction and demolition debris - calculations based on weight or volume but must be consistent (exemplary for 95%)	*Government requires this credit. Building Contractor to document. Coordination with Site Contractor.*
					2	+	Credit 3	C	**Materials Reuse**, 5% (1 pt), 10% (2 pts)	
									Salvaged, refurbished or reused materials - calculations based on total materials cost for Div. 3-10 (exemplary for 15%)	*Building Contractor to document.*
2					2	+	Credit 4	C	**Recycled Content**, 10% (1 pt), 20% (2 pts)	
									Recycled content = post-consumer + 1/2 pre-consumer : consider steel, concrete, gypsum, carpet, acoustic ceiling tiles, etc. - calculations based on total materials cost for Div. 3-10 (exemplary for 30%)	*Building Contractor to document.*
					2	+	Credit 5	C	**Regional Materials**, 10% (1 pt), 20% (2 pts)	
									Use products extracted, harvested or recovered, processed AND manufactured within 500 miles of project site - calculations based on total materials cost for Div. 3-10 (exemplary for 30%)	*Building Contractor to document.*
					1	+	Credit 6	C	**Rapidly Renewable Materials**, 2.5%	
									Use products made from plants typically harvested within ten-year cycle or shorter - consider bamboo, wool, cotton insulation, agrifiber, linoleum, wheatboard, strawboard, cork, etc. (exemplary for 5%)	*Building Contractor to document.*
					1	+	Credit 7	C	**Certified Wood**	
									Minimum 50% of wood must be FSC certified - based on total wood material cost only (exemplary for 95%)	*Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP				
3	0	0	0	0	15		**Indoor Environmental Quality**			
Y					0		Prereq 1	D	**Minimum IAQ Performance**	
									Meet ASHRAE 62.1-2007 minimum outdoor air ventilation rates	*Building Contractor to document.*
Y					0		Prereq 2	D	**Environmental Tobacco Smoke** (ETS) **Control**	
									No smoking in building or within 25' of all entries, outdoor air intakes and operable windows OR separate designated smoking rooms with direct outside exhaust, deck-to-deck partitions and negative pressure	*Building Contractor to document.*
					1		Credit 1	D	**Outdoor Air Delivery Monitoring**	
									CO2 sensors (in spaces with greater than 25 people per 1000 sf / less than 40 sf per occupant) AND direct outdoor airflow measurement devices	*Building Contractor to document.*
					1		Credit 2	D	**Increased Ventilation**	
									30% beyond ASHRAE 62.1-2007 minimum outdoor air ventilation rates	*Building Contractor to document.*
1					1		Credit 3.1	C	**Construction IAQ Management Plan**, During Construction	
									Contractor to develop & implement IAQ Plan based on SMACNA guidelines AND protect stored & installed absorptive materials from moisture damage AND use MERV 8 filters at each return air grille if air handlers used during construction AND replace all filters immediately prior to occupancy	*Building Contractor to document.*
1					1		Credit 3.2	C	**Construction IAQ Management Plan**, Before Occupancy	
									Building flush-out (14,000 cu.ft. of outdoor air per sf) while maintaining at least 60 °F and less than 60% relative humidity OR occupancy after partial flush-out (3,500 cu.ft. per sf) while continuing flush-out OR air quality testing	*Building Contractor to document.*
					1		Credit 4.1	C	**Low-Emitting Materials**, Adhesives & Sealants	
									VOC limits for site-applied interior adhesives, sealants and sealant primers (SCAQMD Rule 1168) and aerosol adhesives (GS-36)	*Building Contractor to document.*
					1		Credit 4.2	C	**Low-Emitting Materials**, Paints & Coatings	
									VOC limits for site-applied interior paints, coatings and primers (GS-11: flats 50 g/L; non-flats 150 g/L), anti-corrosive and anti-rust paints applied to interior ferrous metal substrates (GS-03: 250 g/L) and wood finishes, floor coatings, stains, etc. (SCAQMD Rule 1113)	*Building Contractor to document.*
					1		Credit 4.3	C	**Low-Emitting Materials**, Flooring Systems	
									Requirements for interior carpet (CRI Green Label Plus), carpet cushions (CRI Green Label), carpet adhesives (EQ Credit 4.1 VOC limit of 50 g/L), hard surface flooring (FloorScore), concrete / wood / bamboo / cork finishes (SCAQMD Rule 1113) and tile setting adhesive / grout (SCAQMD Rule 1168)	*Building Contractor to document.*
					1		Credit 4.4	C	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	
									No composite wood products or laminating adhesives with added urea-formaldehyde resins (on-site and shop-applied)	*Building Contractor to document.*
					1		Credit 5	D	**Indoor Chemical & Pollutant Source Control**	
									10' entryway system at regularly used entries AND direct exhaust (0.50 cfm/sf) w/ neg. pressure (5 Pa avg, 1 Pa w/ closed doors) AND self-closing doors & hard lid clg where gas/chemicals used AND install MERV 13 filters at regularly occupied spaces (return & outdoor air) AND containment for hazardous liquid waste from chem. mixing (janitor, housekeeping, labs, etc.)	*Building Contractor to document.*
					1		Credit 6.1	D	**Controllability of Systems**, Lighting	
									Controls for 90% occupants (individual task lighting in open work spaces) AND lighting system controllability for all shared multi-occupant spaces	*Building Contractor to document.*
					1		Credit 6.2	D	**Controllability of Systems**, Thermal Comfort	
									Temperature controls for 50% of occupants (including open work spaces) AND controls for all shared multi-occupant spaces	*Building Contractor to document.*
1					1		Credit 7.1	D	**Thermal Comfort**, Design	
									Meet ASHRAE 55-2004, Thermal Comfort Conditions for Human Occupancy	*Government requires this credit. Building Contractor to document.*
					1		Credit 7.2	D	**Thermal Comfort**, Verification	
									Achieve credit above AND implement occupant survey with corrective action AND install permanent monitoring system	*Building Contractor to document.*
					1	+	Credit 8.1	D	**Daylight & Views**, Daylight 75% of Spaces	
									For all regularly occupied areas: computer simulation (daylight illumination level 25 fc to 500 fc) OR calculated prescriptive daylight zone ratio (VLT x WFR = 0.150 to 0.180) OR measurement of indoor light level (25 fc) AND glare control required for all options	*Building Contractor to document.*
					1	+	Credit 8.2	D	**Daylight & Views**, Views for 90% of Spaces	
									Vision glazing between 2'-6" and 7'-6" AFF for 90% of all regularly occupied spaces - demonstrated by horizontal (section) view and plan view	*Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP			
1	1	0	0	0	6		**Innovation & Design Process**		
	1				1		Credit 1.1	D	**Innovation in Design or Exemplary Performance**
							SSc5.2 Site Development, Maximize Open Space (double building footprint)		*Open space expected to exceed double the total building footprint*
					1		Credit 1.2	D	**Innovation in Design or Exemplary Performance**
							TBD		*Building Contractor to document.*
					1		Credit 1.3	D	**Innovation in Design or Exemplary Performance**
							TBD		*Building Contractor to document.*
					1		Credit 1.4	D	**Innovation in Design**
							TBD		*Building Contractor to document.*
					1		Credit 1.5	D	**Innovation in Design**
							TBD		*Building Contractor to document.*
1					1		Credit 2	C	**LEED® Accredited Professional**
							At least one principal participant of the project team shall be a LEED AP (include copy of certificate)		*Provide.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP			
0	2	0	0	1	6		**Regional Priority Credits (project zip code: 76544)**		
				1	1		Credit 1.1	C	**Regional Priority:**
							SSc5.1 Site Development, Protect or Restore Habitat		*See description above*
	1				1		Credit 1.2	D	**Regional Priority:**
							SSc6.1 Stormwater Design, Quantity Control		*See description above*
	1				1		Credit 1.3	D	**Regional Priority:**
							SSc6.2 Stormwater Design, Quality Control		*See description above*
					1		Credit 1.4	D	**Regional Priority:**
							WEc2 Innovative Wastewater Technologies		*Building Contractor to document.*
					1		Credit 1.5	D	**Regional Priority:**
							EAc2 On-Site Renewable Energy, 1%		*Building Contractor to document.*
					1		Credit 1.6	C	**Regional Priority:**
							MRc2 Construction Waste Management, Divert 75%		*Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP
29	17	0	7	12	112	

Project Totals **(pre-certification estimates)**

Certified 40-49 points **Silver** 50-59 points **Gold** 60-79 points **Platinum** 80-110 points

Officers Quarters

LEED-NC 2009/v 3.0 Project Checklist

Project Name: Operation Readiness Training Complex; Package 1 *(Officers Quarters Registration)*
Project Location: Fort Hood, TX
Date: Sept 2011
Required Rating: Silver (Campus)

Note: Master Site related credits. *(Reference Appendix P USGBC Registration for coordination of Master Site and Building Credits.)*

Points required by RFP or provided (Includes both GOV/Infrastructure AE & Building Contractor Points) to meet Silver Rating
Possible points by GOV/Infrastructure AE or Building Contractor.
POINTS NOT AVAILABLE OR NOT ALLOWED

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP	Note: Refer to LEED-NC Reference Guide for Specific Requirements for Credits & Prerequisites			Notes
0	10	0	7	7	26		**Sustainable Sites**			
Y					0		Prereq 1	C	**Construction Activity Pollution Prevention**	
									Erosion & Sedimentation Control Plan shall conform to EPA Construction General Permit (comply with NPDES)	*Building Contractor to document.*
	1				1		Credit 1	D	**Site Selection**	
									Do not develop on the following: farmland, previously undeveloped land 5' below 100 yr flood, endangered species habitat, w/in 100' of wetlands, previously undeveloped land w/in 50' of water body & public parkland	*Site Complies*
				5	5	+	Credit 2	D	**Development Density & Community Connectivity**	
									Previously developed site with density of 60,000 sf/acre OR within 1/2 mile of residential zone (or average density of 10 units/acre) and 10 basic services w/ pedestrian access (exemplary for 120,000 sf/acre)	*Site does not meet density or connectivity requirements*
				1	1		Credit 3	D	**Brownfield Redevelopment**	
									Defined as contaminated by ASTM E1903-97 Phase II Environmental Site Assessment; local voluntary cleanup program or government agency.	*No known contamination*
			6		6	+	Credit 4.1	D	**Alternative Transportation**, Public Transportation Access	
									Must have pedestrian/bike access AND within 1/2 mile of light rail OR 1/4 mile of 2+ bus lines. (exemplary for comprehensive plan OR 2+ light rail lines OR 4+ bus lines AND 200+ transit rides per day)	*Bus stop provided within site. Hood DPW to confirm number of connecting routes*
	1				1		Credit 4.2	D	**Alternative Transportation**, Bicycle Storage & Changing Rooms	
									Bike racks for 5% of peak building users AND showers for 0.5% employees	*Coordinate FTE calculations with each individual building*
	3				3		Credit 4.3	D	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	
									Preferred/discounted parking for 5% parking capacity OR refueling stations for 3% parking capacity OR low-emitting/fuel-efficient vehicles for 3% FTE OR access to LEV/FEV vehicle-sharing program for 3% FTE	*Provide preferred parking for 5% total parking capacity (or 3% FTE)*
	2				2		Credit 4.4	D	**Alternative Transportation**, Parking Capacity	
									Meet minimum zoning AND provide preferred parking OR 20% discount for carpools for 5% parking capacity OR provide no new parking	*Parking does not exceed ORTC requirements (25%), provide preferred parking for carpools (match # of LEV/FEV spaces)*
				1	1	+	Credit 5.1	C	**Site Development**, Protect or Restore Habitat	
									Greenfield : limit site disturbance (40' bldg, 10' walks/parking, 15' roads/main utilities, 25' constructed permeable surfaces); Previously Developed : native landscape for 50% (excluding building footprint) or 20% (including building footprint) of site, whichever is greater (exemplary for 75%)	*Native landscaping will be used to greatest extent possible, but not expected to exceed 50% of site*
	1				1	+	Credit 5.2	D	**Site Development**, Maximize Open Space	
									Exceed zoning by 25% OR equal to building footprint if no zoning OR 20% of site if no open space required by zoning (exemplary for double)	*Coordinate w/ each building to determine total building footprint*
	1				1	+	Credit 6.1	D	**Stormwater Design**, Quantity Control	
									Existing imperviousness less than 50% : post-development rate and quantity less than pre-development OR stream channel protection; Existing imperviousness greater than 50% : decrease runoff by 25%	*Existing site is less than 50% impervious; infiltration through bioswales - stormwater calcs in process*
	1				1	+	Credit 6.2	D	**Stormwater Design**, Quality Control	
									Use BMPs to capture & treat 90% avg annual rainfall and remove 80% TSS	*Semi-arid watershed, infiltrate minimum 0.75" of rainfall*
			1		1	+	Credit 7.1	C	**Heat Island Effect**, Non-Roof	
									50% hardscape shaded OR pavement with SRI 29+ OR open grid paving OR 50% parking covered by material with SRI 29+ (exemplary for 100%)	*TBD - pavement calcs in process*
					1	+	Credit 7.2	D	**Heat Island Effect**, Roof	
									75% of roof SRI 78+ for low-slope (≤2:12) / SRI 29+ for steep-slope OR 50% vegetated roof OR combination (exemplary for 100% vegetated roof)	*Building Contractor to document.*
					1		Credit 8	D	**Light Pollution Reduction**	
									Limit light trespass from interior, exterior lighting power density to meet ASHRAE 90.1-2007, reduce sky-glow and light trespass at project boundary	*Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP				
2	4	0	0	0	10		**Water Efficiency**			
Y					0		Prereq 1	D	**Water Use Reduction**, 20% Reduction	
									Reduction based on EPAct 2005 baseline - fixture type and controls (wc: 1.6 gpf; urinals: 1.0 gpf; public lavs: 0.5 gpm; private lavs, kitchen & janitor sinks: 2.2 gpm; showers: 2.5 gpm) AND/OR non-potable water use	*Building Contractor to document.*
	4				4		Credit 1	D	**Water Efficient Landscaping**, 50% (2 pts) or No Potable/No Irrigation (4 pts)	
									Reduce potable water use for irrigation by plant species selection and irrigation efficiency AND/OR use of captured rainwater, recycled wastewater/greywater or non-potable public water system OR install landscaping that requires no permanent irrigation system	*Native and drought tolerant landscaping - no permanent irrigation will be installed*
					2	+	Credit 2	D	**Innovative Wastewater Technologies**	
									Reduce potable water use by 50% for sewage conveyance through fixture type/non-potable water use OR treat/infiltrate 50% wastewater on-site (exemplary: 100% reduction in potable water use OR 100% reuse/infiltration)	*Building Contractor to document.*
2					4	+	Credit 3	D	**Water Use Reduction**, 30% (2 pts), 35% (3 pts) or 40% (4 pts)	
									Reduction based on EPAct 2005 baseline - fixture type and controls AND/OR non-potable water use (exemplary for 45%)	*Government requires a minimum of 30% reduction. Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP			
18	0	0	0	0	35		**Energy & Atmosphere**		
Y					0		Prereq 1	C	**Fundamental Commissioning of the Building Energy Systems**
									CxA to review OPR and BOD, develop/incorporate commissioning requirements into construction documents, develop/implement commissioning plan, verify installation/performance of systems to be commissioned AND complete summary commissioning report — *Building Contractor to document.*
Y					0		Prereq 2	D	**Minimum Energy Performance**
									10% improvement for new buildings (5% for renovations) based on ASHRAE 90.1-2007 baseline (building envelope, HVAC, lighting, etc.) OR Prescriptive Compliance Path by ASHRAE Advanced Energy Design Guide or Advanced Buildings Core Performance Guide — *Building Contractor to document.*
Y					0		Prereq 3	D	**Fundamental Refrigerant Management**
									Zero CFC-based refrigerants OR phase-out plan for existing equipment — *Building Contractor to document.*
15					19	+	Credit 1	D	**Optimize Energy Performance**
									Improve proposed building performance compared to ASHRAE 90.1-2007 baseline by whole building simulation OR Prescriptive Compliance Path by ASHRAE Advanced Energy Design Guide (1 pt max) or Advanced Buildings Core Performance Guide (1-3 pts max) — *Building Contractor to document.*
							1		*12% New Buildings or 8% Existing Building Renovations*
							1		*14% New Buildings or 10% Existing Building Renovations*
							1		*16% New Buildings or 12% Existing Building Renovations*
							1		*18% New Buildings or 14% Existing Building Renovations*
							1		*20% New Buildings or 16% Existing Building Renovations*
							1		*22% New Buildings or 18% Existing Building Renovations*
							1		*24% New Buildings or 20% Existing Building Renovations*
							1		*26% New Buildings or 22% Existing Building Renovations*
							1		*28% New Buildings or 24% Existing Building Renovations*
							1		*30% New Buildings or 26% Existing Building Renovations*
							1		*32% New Buildings or 28% Existing Building Renovations*
							1		*34% New Buildings or 30% Existing Building Renovations*
							1		*36% New Buildings or 32% Existing Building Renovations*
							1		*38% New Buildings or 34% Existing Building Renovations*
							1		*40% New Buildings or 36% Existing Building Renovations*
									42% New Buildings or 38% Existing Building Renovations
									44% New Buildings or 40% Existing Building Renovations
									46% New Buildings or 42% Existing Building Renovations
									48% New Buildings or 44% Existing Building Renovations
					7	+	Credit 2	D	**On-Site Renewable Energy**
									Based on annual building energy cost as calculated in EA Credit 1 - consider solar, wind, geothermal, hydro, biomass, bio-gas, etc. (exemplary for 15%) — *Building Contractor to document.*
									1% On-Site Renewable Energy
									3% On-Site Renewable Energy
									5% On-Site Renewable Energy
									7% On-Site Renewable Energy
									9% On-Site Renewable Energy
									11% On-Site Renewable Energy
									13% On-Site Renewable Energy
					2	+	Credit 3	C	**Enhanced Commissioning**
									<u>In addition to EAp1</u> : CxA to review design documents prior to mid-construction document phase, review contractor submittals, develop systems manual for O&M staff, verify training for O&M staff & occupants AND review building operation within 10 months after substantial completion — *Government requires this credit. Building Contractor to document.*
					2		Credit 4	D	**Enhanced Refrigerant Management**
									No refrigerants OR requires calculation of refrigerant ozone depletion and global warming potentials ($LCGWP + LCODP \times 10^5 \leq 100$) — *Building Contractor to document.*
3					3		Credit 5	C	**Measurement & Verification**
									Requires M&V Plan to monitor and evaluate building and/or energy systems performance for minimum 1 year post-construction occupancy AND corrective action plan if results show savings are not being achieved — *Building Contractor to document.*
					2	+	Credit 6	C	**Green Power**
									Provide 35% of building's electricity use (from EA Credit 1) through two-year renewable energy contract (exemplary for 70% or four-year contract) — *Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP				
3	0	0	0	4	14		**Materials & Resources**			
Y					0		Prereq 1	D	**Storage & Collection of Recyclables**	
									Include area to collect and store recyclables including paper, corrugated cardboard, glass, plastics AND metals	*Building Contractor to document.*
				3	3		Credit 1.1	C	**Building Reuse-Structure:** Maintain Existing Walls, Floors & Roof	
									Maintain existing structure (structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing) - if project includes an addition over 2x the sf of existing building, credit is not applicable (55%=1 pt, 75%=2 pts, 95%=3 pts)	*Not Applicable.*
				1	1		Credit 1.2	C	**Building Reuse-Interior:** Maintain 50% of Non-Structural Elements	
									Includes int. walls, doors, floor coverings, clg systems, etc. - if project includes addition over 2x the sf of existing building, credit is not applicable	*Not Applicable.*
1					2	+	Credit 2	C	**Construction Waste Management**, Divert 50% (1 pt), 75% (2 pts)	
									Recycle or salvage construction and demolition debris - calculations based on weight or volume but must be consistent (exemplary for 95%)	*Government requires this credit. Building Contractor to document. Coordination with Site Contractor.*
					2	+	Credit 3	C	**Materials Reuse**, 5% (1 pt), 10% (2 pts)	
									Salvaged, refurbished or reused materials - calculations based on total materials cost for Div. 3-10 (exemplary for 15%)	*Building Contractor to document.*
2					2	+	Credit 4	C	**Recycled Content**, 10% (1 pt), 20% (2 pts)	
									Recycled content = post-consumer + 1/2 pre-consumer : consider steel, concrete, gypsum, carpet, acoustic ceiling tiles, etc. - calculations based on total materials cost for Div. 3-10 (exemplary for 30%)	*Building Contractor to document.*
					2	+	Credit 5	C	**Regional Materials**, 10% (1 pt), 20% (2 pts)	
									Use products extracted, harvested or recovered, processed AND manufactured within 500 miles of project site - calculations based on total materials cost for Div. 3-10 (exemplary for 30%)	*Building Contractor to document.*
					1	+	Credit 6	C	**Rapidly Renewable Materials**, 2.5%	
									Use products made from plants typically harvested within ten-year cycle or shorter - consider bamboo, wool, cotton insulation, agrifiber, linoleum, wheatboard, strawboard, cork, etc. (exemplary for 5%)	*Building Contractor to document.*
					1	+	Credit 7	C	**Certified Wood**	
									Minimum 50% of wood must be FSC certified - based on total wood material cost only (exemplary for 95%)	*Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP				
3	0	0	0	0	15		**Indoor Environmental Quality**			
Y					0		Prereq 1	D	**Minimum IAQ Performance**	
									Meet ASHRAE 62.1-2007 minimum outdoor air ventilation rates	*Building Contractor to document.*
Y					0		Prereq 2	D	**Environmental Tobacco Smoke** (ETS) **Control**	
									No smoking in building or within 25' of all entries, outdoor air intakes and operable windows OR separate designated smoking rooms with direct outside exhaust, deck-to-deck partitions and negative pressure	*Building Contractor to document.*
					1		Credit 1	D	**Outdoor Air Delivery Monitoring**	
									CO2 sensors (in spaces with greater than 25 people per 1000 sf / less than 40 sf per occupant) AND direct outdoor airflow measurement devices	*Building Contractor to document.*
					1		Credit 2	D	**Increased Ventilation**	
									30% beyond ASHRAE 62.1-2007 minimum outdoor air ventilation rates	*Building Contractor to document.*
1					1		Credit 3.1	C	**Construction IAQ Management Plan**, During Construction	
									Contractor to develop & implement IAQ Plan based on SMACNA guidelines AND protect stored & installed absorptive materials from moisture damage AND use MERV 8 filters at each return air grille if air handlers used during construction AND replace all filters immediately prior to occupancy	*Building Contractor to document.*
1					1		Credit 3.2	C	**Construction IAQ Management Plan**, Before Occupancy	
									Building flush-out (14,000 cu.ft. of outdoor air per sf) while maintaining at least 60 °F and less than 60% relative humidity OR occupancy after partial flush-out (3,500 cu.ft. per sf) while continuing flush-out OR air quality testing	*Building Contractor to document.*
					1		Credit 4.1	C	**Low-Emitting Materials**, Adhesives & Sealants	
									VOC limits for site-applied interior adhesives, sealants and sealant primers (SCAQMD Rule 1168) and aerosol adhesives (GS-36)	*Building Contractor to document.*
					1		Credit 4.2	C	**Low-Emitting Materials**, Paints & Coatings	
									VOC limits for site-applied interior paints, coatings and primers (GS-11: flats 50 g/L; non-flats 150 g/L), anti-corrosive and anti-rust paints applied to interior ferrous metal substrates (GS-03: 250 g/L) and wood finishes, floor coatings, stains, etc. (SCAQMD Rule 1113)	*Building Contractor to document.*
					1		Credit 4.3	C	**Low-Emitting Materials**, Flooring Systems	
									Requirements for interior carpet (CRI Green Label Plus), carpet cushions (CRI Green Label), carpet adhesives (EQ Credit 4.1 VOC limit of 50 g/L), hard surface flooring (FloorScore), concrete / wood / bamboo / cork finishes (SCAQMD Rule 1113) and tile setting adhesive / grout (SCAQMD Rule 1168)	*Building Contractor to document.*
					1		Credit 4.4	C	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	
									No composite wood products or laminating adhesives with added urea-formaldehyde resins (on-site and shop-applied)	*Building Contractor to document.*
					1		Credit 5	D	**Indoor Chemical & Pollutant Source Control**	
									10' entryway system at regularly used entries AND direct exhaust (0.50 cfm/sf) w/ neg. pressure (5 Pa avg, 1 Pa w/ closed doors) AND self-closing doors & hard lid clg where gas/chemicals used AND install MERV 13 filters at regularly occupied spaces (return & outdoor air) AND containment for hazardous liquid waste from chem. mixing (janitor, housekeeping, labs, etc.)	*Building Contractor to document.*
					1		Credit 6.1	D	**Controllability of Systems**, Lighting	
									Controls for 90% occupants (individual task lighting in open work spaces) AND lighting system controllability for all shared multi-occupant spaces	*Building Contractor to document.*
					1		Credit 6.2	D	**Controllability of Systems**, Thermal Comfort	
									Temperature controls for 50% of occupants (including open work spaces) AND controls for all shared multi-occupant spaces	*Building Contractor to document.*
1					1		Credit 7.1	D	**Thermal Comfort**, Design	
									Meet ASHRAE 55-2004, Thermal Comfort Conditions for Human Occupancy	*Government requires this credit. Building Contractor to document.*
					1		Credit 7.2	D	**Thermal Comfort**, Verification	
									Achieve credit above AND implement occupant survey with corrective action AND install permanent monitoring system	*Building Contractor to document.*
					1	+	Credit 8.1	D	**Daylight & Views**, Daylight 75% of Spaces	
									For all regularly occupied areas: computer simulation (daylight illumination level 25 fc to 500 fc) OR calculated prescriptive daylight zone ratio (VLT x WFR = 0.150 to 0.180) OR measurement of indoor light level (25 fc) AND glare control required for all options	*Building Contractor to document.*
					1	+	Credit 8.2	D	**Daylight & Views**, Views for 90% of Spaces	
									Vision glazing between 2'-6" and 7'-6" AFF for 90% of all regularly occupied spaces - demonstrated by horizontal (section) view and plan view	*Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP			
1	1	0	0	0	6		**Innovation & Design Process**		
	1				1		Credit 1.1	D	**Innovation in Design or Exemplary Performance**
							SSc5.2 Site Development, Maximize Open Space (double building footprint)		*Open space expected to exceed double the total building footprint*
					1		Credit 1.2	D	**Innovation in Design or Exemplary Performance**
							TBD		*Building Contractor to document.*
					1		Credit 1.3	D	**Innovation in Design or Exemplary Performance**
							TBD		*Building Contractor to document.*
					1		Credit 1.4	D	**Innovation in Design**
							TBD		*Building Contractor to document.*
					1		Credit 1.5	D	**Innovation in Design**
							TBD		*Building Contractor to document.*
1					1		Credit 2	C	**LEED® Accredited Professional**
							At least one principal participant of the project team shall be a LEED AP (include copy of certificate)		*Provide.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP			
0	2	0	0	1	6		**Regional Priority Credits (project zip code: 76544)**		
				1	1		Credit 1.1	C	**Regional Priority:**
							SSc5.1 Site Development, Protect or Restore Habitat		*See description above*
	1				1		Credit 1.2	D	**Regional Priority:**
							SSc6.1 Stormwater Design, Quantity Control		*See description above*
	1				1		Credit 1.3	D	**Regional Priority:**
							SSc6.2 Stormwater Design, Quality Control		*See description above*
					1		Credit 1.4	D	**Regional Priority:**
							WEc2 Innovative Wastewater Technologies		*Building Contractor to document.*
					1		Credit 1.5	D	**Regional Priority:**
							EAc2 On-Site Renewable Energy, 1%		*Building Contractor to document.*
					1		Credit 1.6	C	**Regional Priority:**
							MRc2 Construction Waste Management, Divert 75%		*Building Contractor to document.*

Yes D/B	Yes GOV	? D/B	? GOV	No	Avail	ExP
27	17	0	7	12	112	

Project Totals **(pre-certification estimates)**

Certified 40-49 points **Silver** 50-59 points **Gold** 60-79 points **Platinum** 80-110 points

APPENDIX M:

LEED Owner's Project Requirements (OPR)

Owner's Project Requirements Document for LEED Fundamental Commissioning

Project: Army Standard Design (SD) - Operational Readiness Training Complex (ORTC)
Battalion Headquarters Bldg, Transient Training
CAT CODE: 14184

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)
Office Building with classrooms; includes individual administration offices for CO, OX, CSM, Staff Section Leaders, and Chaplain.

Describe pertinent project history. (example: standard design development)
Current Army Standard Design was developed in 2006. Each Brigade HQ's contains 10,238 gross square foot (GSF) and may be programmed as part of an Operational Readiness Training Complex (ORTC) or incrementally as needed.

Broad Goals

What are the broad goals relative to program needs?
To provide economical, minimum, essential administration space to accommodate transient training and mobilization activities at power projection platforms.

What are the broad goals relative to future expansion?
Each of the facility type in the Operational Readiness Training Complex is functionally complete and does not require future expansion.

What are the broad goals relative to flexibility?
The standard design does not require a high degree of flexibility. Operable walls are preferred in classrooms to allow for flexibility in room size.

What are the broad goals relative to quality of materials?
Material selections may vary in response to local climatic and geographic conditions. However, materials must be durable, austere and relatively maintenance free. Use of modular/pre-fabricated construction processes and materials are encouraged, but not at the expense of durability.

What are the broad goals relative to construction costs?
Facility must meet construction cost limitations.

What are the broad goals relative to operational costs?
Meet or exceed 40% energy reduction requirements Minimize operating costs as much as possible within budget.

Other broad goals: *(Insert as applicable)*
To provide essentially the same functional facility at all locations (site-adapt) to the extent possible to facilitate unit mobility and to reduce repetitive design costs.

To achieve overall program efficiencies and cost reductions using regional task order contracts for each standard.

To reduce construction time to 18 months or less.

2. *Environmental and Sustainability Goals*

What are the project goals relative to sustainability and environmental issues? (Example: LEED Silver rating)
Meet or exceed LEED Silver rating.

What are the project goals relative to energy efficiency? (Example: Meet EPACT)
Meet or exceed 40% energy reduction requirements.

What are the project goals and requirements for building siting that will impact energy use?
To the greatest extent possible, orient buildings with the long axis facing due south and incorporate passive solar design features in plan and elevations. Utilize site energy technologies (photo voltaic, wind power, solar hot water heating, etc) if life cycle cost effective.
Refer to local requirements indicated in Paragraph 6 of Statement of Work.

What are the project goals and requirements for building facade that will impact energy use?
To the greatest extent possible, incorporate passive solar shading features, customized window glazing for each orientation and landscaping to reduce heat gain. Exterior appearance must be compatible with adjacent architectural character.

What are the project goals and requirements for building fenestration that will impact energy use?
Incorporate passive solar shading features and customized window glazing to reduce solar gain based upon each orientation. Design must also incorporate. Antiterrorism/Force Protection criteria (UFC 4-010-01).

What are the project goals and requirements for building envelope that will impact energy use?
Building envelope shall be designed with integral air barriers (for all spaces that are both heated and air-conditioned) and blower door tested to achieve minimum air infiltration requirements. Envelope shall also be designed with no cold bridges.

What are the project goals and requirements for building roof that will impact energy use?
Roof shall be a high albedo material meeting requirements of LEED, _____
Sustainable Sites Credit 7.2, Heat Island Effect, Roof for reduction of heat island effect.
Special local requirements are indicated in Paragraph 6 of Statement of Work.

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.
Administrative functions and classroom facilities.

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.
Occupancy for building is 29 (FTE) and 186 (Transient) persons. The typical occupancy schedule is normal business 0700 and 1600 work days with occasional evening and weekend use by different functional groups.

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.
After-hour access will be permitted with use of individual keys or by Programmable Key Card (installation preference). Lighting motion sensors or wall switches.

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: IESNA RP-1-04, Exterior Lighting shall be full cutoff type Luminaries.
Temperature: Refer to UFC 3-410-01FA Incl. Change 4, Section 2-2
Humidity: 50%
Air Quality: ASHRAE 62.1
Ventilation: ASHRAE 62.1
Filtration: UFC 3-410-01FA

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.
Noise Criteria (NC) rating shall be for:

- Sleeping Rooms; 20 - 30
- Private Offices; Meeting/Conference Rooms, Classrooms; 30 - 35
- Reception Areas, Large Offices; 35 - 40
- Lobbies, Maintenance /Electrical Rooms, 40 - 50

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: Per Standard Design and installation preference.

Temperature: None
Humidity: None
Air Quality: None
Ventilation: None

What, if any, specific types of lighting are desired? (example: fluorescent in 2x2 grid, accent lighting, particular lamps)
Per Standard Design and installation preference.

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: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Ventilation
Desired Type: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Air Conditioning
Desired Type: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.

Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Refrigeration
Desired Type: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: HVAC Controls
Desired Type: Per installation preference or requirements.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Automation: Controls shall be DDC type connected to the installation EMCS (if applicable).
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Domestic Hot Water
Desired Type: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment

vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Lighting Controls
Desired Type: Per Standard Design and installation preference.
Quality: _____
Preferred Manufacturer: _____
Reliability: _____
Automation: _____
Flexibility: _____
Maintenance Requirements: _____
Efficiency Target: _____
Desired Technologies: _____

Indicate desired features for the following commissioned system: Daylighting Controls
Desired Type: Provide in common spaces and corridors where feasible.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Automation: Provide integration with dimming controls to continuously adjust light level based on the illumination level provided by daylighting and occupancy sensors if feasible.
Flexibility: _____
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: _____

Desired Technologies: Per installation preference.
Indicate desired features for the following commissioned system: Emergency Power
Desired Type: Per Standard Design and installation preference.
Quality: _____
Preferred Manufacturer: _____
Reliability: _____
Automation: _____
Flexibility: _____
Maintenance Requirements: _____
Efficiency Target: _____
Desired Technologies: _____

Indicate desired features for the following commissioned system: Other
Desired Type: Per Standard Design and installation preference.
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?
Varies; DPW Contractor or staff.

Will the facility be connected to an EMCS? If so, what are the interface requirements? (example: monitoring points, control points, scheduling)
Varies; See Standard Design.

What is the desired level of training and orientation for building occupants to understand and use the building systems?
Minimal for occupants; Per RFP requirements.

What is the desired level of training and orientation for O&M staff to understand and maintain the building systems?
As indicated in Section CONSTRUCTION CLOSEOUT.

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 Occupt Adjustability Reqmt.

Owner's Project Requirements Document for LEED Fundamental Commissioning

Project: Army Standard Design (SD) - Operational Readiness Training Complex (ORTC)
Enlisted Barracks, Transient Training
CAT CODE: 72114

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)
Open bay barracks for transient trainees; includes 2+2 sleeping rooms for enlisted officers showers, toilets, and laundry facilities.

Describe pertinent project history. (example: standard design development)
Current Army standard design was developed in 2006. Four- two story barracks make up a battalion level complex. (Options allow for two-four story barracks) Each two story barracks contains 30,558 gross square feet (GSF) and may be programmed as part of an Operational Readiness Training Complex (ORTC) or incrementally as needed.

Broad Goals

What are the broad goals relative to program needs?
To provide economical, minimum, essential housing to accommodate transient training and mobilization activities at power projection platforms.

What are the broad goals relative to future expansion?
Each of the facility types in the Operational Readiness Training Complex is functionally complete and does not require future expansion.

What are the broad goals relative to flexibility?
The standard design does not require a high degree of flexibility.

What are the broad goals relative to quality of materials?
Material selections may vary in response to local climatic and geographic conditions. However, materials must be durable, austere and relatively maintenance free. Use of modular/pre-fabricated construction processes and materials are encouraged, but not at the expense of durability.

What are the broad goals relative to construction costs?
Facility must meet construction cost limitations.

What are the broad goals relative to operational costs?
Meet or exceed 40% energy reduction requirements Minimize operating costs as much as possible within budget.

Other broad goals: *(Insert as applicable)*
To provide essentially the same functional facility at all locations (site-adapt) to the extent possible to facilitate unit mobility and to reduce repetitive design costs.

To achieve overall program efficiencies and cost reductions using regional task order contracts for each standard.

To reduce construction time to 18 months or less.

2. *Environmental and Sustainability Goals*

What are the project goals relative to sustainability and environmental issues? (Example: LEED Silver rating)
Meet or exceed LEED Silver rating.

What are the project goals relative to energy efficiency? (Example: Meet EPACT)
Meet or exceed 40% energy reduction requirements.

What are the project goals and requirements for building siting that will impact energy use?
To the greatest extent possible, orient buildings with the long axis facing due south and incorporate passive solar design features in plan and elevations. Utilize site energy technologies (photo voltaic, wind power, solar hot water heating ,etc) if life cycle cost effective.
Refer to local requirements indicated in Paragraph 6 of Statement of Work.

What are the project goals and requirements for building facade that will impact energy use?
To the greatest extent possible, incorporate passive solar shading features, customized window glazing for each orientation and landscaping to reduce heat gain. Exterior appearance must be compatible with adjacent architectural character.

What are the project goals and requirements for building fenestration that will impact energy use?
Incorporate passive solar shading features and customized window glazing to reduce solar gain based upon each orientation. Design must also incorporate. Antiterrorism/Force Protection criteria (UFC 4-010-01).

What are the project goals and requirements for building envelope that will impact energy use?
Building envelope shall be designed with integral air barriers (for all spaces that are both heated and air-conditioned) and blower door tested to achieve minimum air infiltration requirements. Envelope shall also be designed with no cold bridges.

What are the project goals and requirements for building roof that will impact energy use?
Roof shall be a high albedo material meeting requirements of LEED, _____
Sustainable Sites Credit 7.2, Heat Island Effect, Roof for reduction of heat island effect.
Special local requirements are indicated in Paragraph 6 of Statement of Work.

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.
Sleeping quarters, restroom & shower facilities, and laundry facilities.

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.
Occupancy for building is 168 (FTE) people. Because this is a residential - occupancy, the building will be occupied throughout the day, with highest occupancy between 1700 and 0800.

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.
E7/E8 rooms shall have individual lighting controls. Rest of building will be operated through central building automation system.

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: IESNA RP-1-04, Exterior Lighting shall be full cutoff type Luminaries.
Temperature: Refer to UFC 3-410-01FA Incl. Change 4, Section 2-2
Humidity: 50%
Air Quality: ASHRAE 62.1
Ventilation: ASHRAE 62.1
Filtration: UFC 3-410-01FA

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.
Noise Criteria (NC) rating shall be for:

- Sleeping Rooms; 20 - 30
- Private Offices; Meeting/Conference Rooms, Classrooms; 30 - 35
- Lobbies, Maintenance/Electrical Rooms, 40 - 50
- Laundry Areas, Shops, Garages; 45 - 65

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: Per Standard Design and installation preference.

Temperature: None
Humidity: None
Air Quality: None
Ventilation: None

What, if any, specific types of lighting are desired? (example: fluorescent in 2x2 grid, accent lighting, particular lamps)
Per Standard Design and installation preference.

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: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Ventilation
Desired Type: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Air Conditioning
Desired Type: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type

of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Refrigeration
Desired Type: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: HVAC Controls
Desired Type: Per installation preference or requirements.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Automation: Controls shall be DDC type connected to the installation EMCS (if applicable).
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Domestic Hot Water
Desired Type: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.

Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Lighting Controls
Desired Type: Per Standard Design and installation preference.
Quality: _____
Preferred Manufacturer: _____
Reliability: _____
Automation: _____
Flexibility: _____
Maintenance Requirements: _____
Efficiency Target: _____
Desired Technologies: _____

Indicate desired features for the following commissioned system: Daylighting Controls
Desired Type: Provide in common spaces and corridors where feasible.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Automation: Provide integration with dimming controls to continuously adjust light level based on the illumination level provided by daylighting and occupancy sensors if feasible.
Flexibility: _____
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: _____

Desired Technologies: Per installation preference.
Indicate desired features for the following commissioned system: Emergency Power
Desired Type: Per Standard Design and installation preference.
Quality: _____
Preferred Manufacturer: _____
Reliability: _____
Automation: _____
Flexibility: _____
Maintenance Requirements: _____
Efficiency Target: _____
Desired Technologies: _____

Indicate desired features for the following commissioned system: Other
Desired Type: Per Standard Design and installation preference.
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?
Varies; DPW Contractor or staff.

Will the facility be connected to an EMCS? If so, what are the interface requirements? (example: monitoring points, control points, scheduling)
Varies; See Standard Design.

What is the desired level of training and orientation for building occupants to understand and use the building systems?
Minimal for occupants; Per RFP requirements.

What is the desired level of training and orientation for O&M staff to understand and maintain the building systems?
As indicated in Section CONSTRUCTION CLOSEOUT.

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.

Owner's Project Requirements Document for LEED Fundamental Commissioning

Project: Army Standard Design (SD) - Operational Readiness Training Complex (ORTC)
Senior Enlisted / Officers Quarters, Transient Training
CAT CODE: 72412

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)
Semi-private sleeping quarters for transient trainees; includes 2+2 sleeping rooms for enlisted officers showers, toilets, and laundry facilities.

Describe pertinent project history. (example: standard design development)
Current Army standard design was developed in 2006. Each two story sleeping quarters contains 22,579 gross square feet (GSF) and may be programmed as part of an Operational Readiness Training Complex (ORTC) or incrementally as needed.

Broad Goals

What are the broad goals relative to program needs?
To provide economical, minimum, essential housing to accommodate transient training and mobilization activities at power projection platforms.

What are the broad goals relative to future expansion?
Each of the facility types in the Operational Readiness Training Complex is functionally complete and does not require future expansion.

What are the broad goals relative to flexibility?
The standard design does not require a high degree of flexibility.

What are the broad goals relative to quality of materials?
Material selections may vary in response to local climatic and geographic conditions. However, materials must be durable, austere and relatively maintenance free. Use of modular/pre-fabricated construction processes and materials are encouraged, but not at the expense of durability.

What are the broad goals relative to construction costs?
Facility must meet construction cost limitations.

What are the broad goals relative to operational costs?
Meet or exceed 40% energy reduction requirements Minimize operating costs as much as possible within budget.

Other broad goals: *(Insert as applicable)*
To provide essentially the same functional facility at all locations (site-adapt) to the extent possible to facilitate unit mobility and to reduce repetitive design costs.

To achieve overall program efficiencies and cost reductions using regional task order contracts for each standard.

To reduce construction time to 18 months or less.

2. *Environmental and Sustainability Goals*

What are the project goals relative to sustainability and environmental issues? (Example: LEED Silver rating)
Meet or exceed LEED Silver rating.

What are the project goals relative to energy efficiency? (Example: Meet EPACT)
Meet or exceed 40% energy reduction requirements.

What are the project goals and requirements for building siting that will impact energy use?
To the greatest extent possible, orient buildings with the long axis facing due south and incorporate passive solar design features in plan and elevations. Utilize site energy technologies (photo voltaic, wind power, solar hot water heating ,etc) if life cycle cost effective.
Refer to local requirements indicated in Paragraph 6 of Statement of Work.

What are the project goals and requirements for building facade that will impact energy use?
To the greatest extent possible, incorporate passive solar shading features, customized window glazing for each orientation and landscaping to reduce heat gain. Exterior appearance must be compatible with adjacent architectural character.

What are the project goals and requirements for building fenestration that will impact energy use?
Incorporate passive solar shading features and customized window glazing to reduce solar gain based upon each orientation. Design must also incorporate. Antiterrorism/Force Protection criteria (UFC 4-010-01).

What are the project goals and requirements for building envelope that will impact energy use?
Building envelope shall be designed with integral air barriers (for all spaces that are both heated and air-conditioned) and blower door tested to achieve minimum air infiltration requirements. Envelope shall also be designed with no cold bridges.

What are the project goals and requirements for building roof that will impact energy use?
Roof shall be a high albedo material meeting requirements of LEED, _____
Sustainable Sites Credit 7.2, Heat Island Effect, Roof for reduction of heat island effect.
Special local requirements are indicated in Paragraph 6 of Statement of Work.

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.
Sleeping quarters, restroom & shower facilities, and laundry facilities.

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.
Occupancy for building is 80 (FTE) people. Because this is a residential - occupancy, the building will be occupied throughout the day, with highest occupancy between 1700 and 0800.

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.
Sleeping rooms shall have individual lighting controls. Rest of building will be operated through central building automation system.

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: IESNA RP-1-04, Exterior Lighting shall be full cutoff type Luminaries.
Temperature: Refer to UFC 3-410-01FA Incl. Change 4, Section 2-2
Humidity: 50%
Air Quality: ASHRAE 62.1
Ventilation: ASHRAE 62.1
Filtration: UFC 3-410-01FA

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.
Noise Criteria (NC) rating shall be for:

- Sleeping Rooms; 20 - 30
- Private Offices; Meeting/Conference Rooms, Classrooms; 30 - 35
- Lobbies, Maintenance/Electrical Rooms, 40 - 50
- Laundry Areas, Shops, Garages; 45 - 65

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: Per Standard Design and installation preference.

Temperature: None
Humidity: None
Air Quality: None
Ventilation: None

What, if any, specific types of lighting are desired? (example: fluorescent in 2x2 grid, accent lighting, particular lamps)
Per Standard Design and installation preference.

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: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Ventilation
Desired Type: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Air Conditioning
Desired Type: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type

of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Refrigeration
Desired Type: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: HVAC Controls
Desired Type: Per installation preference or requirements.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Automation: Controls shall be DDC type connected to the installation EMCS (if applicable).
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.
Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Domestic Hot Water
Desired Type: Per Standard Design and installation preference.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment
Automation: Control HVAC system from DDC system connected to installation EMCS (if applicable)
Flexibility: None, the Standard Design governs square footage and function adjacencies requirements.
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: Equipment efficiency should meet most current ASHRAE 90.1 requirements.

Desired Technologies: Per Standard Design and installation preference.

Indicate desired features for the following commissioned system: Lighting Controls
Desired Type: Per Standard Design and installation preference.
Quality: _____
Preferred Manufacturer: _____
Reliability: _____
Automation: _____
Flexibility: _____
Maintenance Requirements: _____
Efficiency Target: _____
Desired Technologies: _____

Indicate desired features for the following commissioned system: Daylighting Controls
Desired Type: Provide in common spaces and corridors where feasible.
Quality: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Preferred Manufacturer: Per installation preference if feasible.
Reliability: Equipment should remain serviceable over life of building or to the extent typical of the type of equipment.
Automation: Provide integration with dimming controls to continuously adjust light level based on the illumination level provided by daylighting and occupancy sensors if feasible.
Flexibility: _____
Maintenance Requirements: Equipment should be located to allow easy maintenance access. Equipment vendors or repair service should be able to respond within 24 hours.
Efficiency Target: _____

Desired Technologies: Per installation preference.
Indicate desired features for the following commissioned system: Emergency Power
Desired Type: Per Standard Design and installation preference.
Quality: _____
Preferred Manufacturer: _____
Reliability: _____
Automation: _____
Flexibility: _____
Maintenance Requirements: _____
Efficiency Target: _____
Desired Technologies: _____

Indicate desired features for the following commissioned system: Other
Desired Type: Per Standard Design and installation preference.
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?
Varies; DPW Contractor or staff.

Will the facility be connected to an EMCS? If so, what are the interface requirements? (example: monitoring points, control points, scheduling)
Varies; See Standard Design.

What is the desired level of training and orientation for building occupants to understand and use the building systems?
Minimal for occupants; Per RFP requirements.

What is the desired level of training and orientation for O&M staff to understand and maintain the building systems?
As indicated in Section CONSTRUCTION CLOSEOUT.

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 Occupt Adjustability Reqmt.

APPENDIX N:

LEED Requirements for Multiple Contractor Combined Projects

(Not Used) - Refer to Appendix L & P

APPENDIX O:

LEED Strategy Tables

(Not Used) - Refer to Appendix L

APPENDIX P:

USGBC Registration

The ORTC Phase 1 project was registered as a block with GBCI under LEED-NC 2009 and will follow the USGBC "2010 LEED Application Guide for Multiple Buildings and On-Campus Building Projects" (2010 AGMBC). LEED Online access will be provided to the D-B Contractor upon award of project.

The 2010 AGMBC was developed to streamline the certification process for multiple building and campus projects, while providing direction for applying the LEED rating system to projects on a shared site. USGBC and GBCI recognize these projects require unique guidance in order to:

- encourage a holistic, sustainable approach
- capture economies of scale in the certification process through shared credits
- address the unique challenges and opportunities inherent in campus projects

The A-E registered the ORTC Phase 1 "Master Site" block to act as a grouping mechanism and allow individual project registrations to be linked together. Campus credit and prerequisite information will be documented by the A-E within the "Master Site" registration.

Each barracks (4 total) was individually registered as part of this block and will reference the "Master Site" to utilize pre-approved campus credits. The A-E will be responsible for fees associated with the "Master Site" review, but the D-B Contractor will be responsible for all LEED certification costs associated with the barracks.

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

NOTE TO SPECIFIER:

1. Appendix R" will be a Adobe Acrobat pdf version of the Specifier completed "Sample Preliminary Submittal Register." The Sample Register is Excel Spreadsheet format of the RMS Input Form 4288A, which serves two purposes.

2. First, The Register allows the both Government and the Proposers to see and estimate the cost of the Division 00 and Division 01 submittals required by the contract in addition to the Contractor generated submittal register items developed during Design After Award.

3. Secondly, after award, the Government will provide the Contractor the actual Excel Spreadsheet for the Contractor to input the data into RMS to create the Submittal Register used during contract performance. See Section 01 33 00 (Submittal Procedures), paragraph 1.8 (Submittal Register) for the contract requirements.

4. For the contract or task order Solicitation, the Specifier must complete APPENDIX R, found at the following link:
http://mrsi.usace.army.mil/rfp/Shared%20Documents/Sample%20Preliminary%20Submittal%20Register.xls , save it as a PDF file and then upload it into the Wizard as Appendix R.

5. The RMS Input Form initially includes submittals required by the standardized Model RFP Division 00 and Division 01 Sections, except Section 01 10 00, paragraph 3. Examine the Special Contract Requirements, paragraphs 3 and 6 and any other locally developed portions of the RFP for required submittals and add them to the Input Form. Do not duplicate submittals already listed in the standardized RMS Input Form, because the Contractor needs to submit this information only once.

6. After award, the Government provides the Excel spreadsheet to the selected contractor to develop and input the RMS Input form for the submittal register required by paragraph 1.8 of Section 01 33 00, Submittals.

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:

Section 01 10 00 Supplemental Requirements

MEMORANDUM FOR PROJECT DISTRIBUTION

SUBJECT: OPERATIONAL READINESS TRAINING COMPLEX (ORTC) - PHASE I FACILITIES & SITE (PACKAGE 1)
SITE: FORT HOOD, TX (NORTH FORT)

APPENDIX AA: Section 01 10 00, Supplemental Requirements.

The following information SUPERSEDES the requirements defined in Section 01 10 00:

Paragraph 3.2.2.1.:
Replace this paragraph in its entirety with the following: "See Appendix J for POV parking requirements and layout."

Paragraph 3.2.2.2.:
Replace this paragraph in its entirety with the following: "NOT USED."

Paragraph 3.2.2.4.:
Replace this paragraph in its entirety with the following: "NOT USED."

Paragraph 3.2.2.4.:
Replace this paragraph in its entirety with the following: "NOT USED."

Paragraph 3.2.3.3.:
Remove the last sentence of the paragraph regarding the dining facility.

Paragraph 3.2.3.6.:
Add the following paragraph:
"3.2.3.6 Thermal Bridge.
A thermal bridge (or cold bridge) occurs when a thermally conductive material (such as a metal stud, steel frame or concrete beam, slab or column) penetrates or bypasses the exterior insulation system. Design the building envelope to align all insulating elements, such as the continuous wall insulation from top of footing to roof insulation, insulated glazing, and insulated doors. Wrap insulation around roof overhangs. Disconnect window and door sills from interior construction. Utilize thermally broken window and door frames. Provide details to eliminate thermal bridges particularly at floor slabs, roof/wall intersections, steel lintels and relief angles, metal through-wall flashings, and building corners."

Paragraph 3.2.5.1.:
Replace this paragraph in its entirety with the following: "NOT USED."

Paragraph 3.2.6.8.:
Add the following to the paragraph:
"3.2.6.8 All buildings shall be provided with a gas meter and regulator designed to meet the requirement of the gas loads. The gas meter shall be monitored by the DDC controller and shall also meet the DPW specification for type meter."

Paragraph 3.2.8.4.:
Replace this paragraph in its entirety with the following: "NOT USED."

Paragraph 3.5.3.14.:
Replace this paragraph in its entirety with the following:
"3.5.3.14 Each Company Storage

A. Provide space for seating minimum 14 people at a conference table and space for a wall mounted television. Assure adequate framing is provided to support a large flat screen television for training/briefings as well as entertainment. The television and mounting bracket shall not be in the contract since it will be included in the government's FF&E Package.

B. Provide power and data/internet ports along walls and power/cable/data connection for television.

C. Company Storage is intended to be flexible in use, as determined by each Unit or Units occupying the building. This space may be used for administration, equipment storage, or conferencing. Weapons storage is also an option for this space, assuming proper security measures are taken by the individual units."

Paragraph 4.1.:
Under the Associated Air Balance Council (AABC), replace "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" with "National Standards for Total System Balance".

Paragraph 5.9.2.1.:
Change paragraph to read:
Outdoor and Indoor Calculations and Requirements: Outdoor and indoor design conditions shall be as defined in the project specific requirements of this section in paragraph 6.0.

Paragraph 5.9.4.14.:
Add the following paragraph:
5.9.4.14 Temperature and Humidity Variations

a. Equipment shall have the capacity to maintain the required indoor design temperature and humidity conditions at the given outdoor design conditions.
b. All equipment shall have controls that allow selection of a range of setpoints; the setpoint shall not be limited to the indoor design condition.
c. The controls shall regulate the equipment to maintain the selected setpoint so long as the equipment capacity is sufficient to achieve the selected setpoint.
d. After reaching setpoint, the controls shall maintain the air temperature within 2 degrees F of setpoint at all times so long as the HVAC equipment has sufficient capacity to achieve the setpoint.
e. The controls shall limit the change in air temperature to 2 degrees F in 15 minutes.
f. At no time shall the space relative humidity exceed 60%RH.

Paragraph 6.4.4.2.:
Replace the paragraph with the following:
"Emergency Vehicle Access: Provide driveways to allow access for fire trucks and emergency vehicles in accordance with NFPA 1, UFC 3-600-01, and UFC 4-021-01. Emergency access driveways shall have minimum turning radii of 45 feet to accommodate fire trucks and emergency vehicles. Fire lane and driveway striping shall follow the color and pattern scheme provided in the site design drawings or in accordance with the Installation requirements. Access to the emergency driveways shall be restricted with removable bollards or metal pipe swing gates with a removable center bollard. Refer to gate details in drawings if applicable. Removable bollards shall be one-man lift type."

Paragraph 6.4.6.2.:
Replace the first sentence with the following: "The water distribution system is as shown in Appendix J."

Paragraph 6.4.6.3.:
Replace paragraph in its entirety with the following:
"Natural Gas Distribution: Natural Gas distribution lines are as shown in Appendix J. Coordinate points of connection to the facility with the installation DPW. The Contractor shall provide natural gas service to the face of the building and shall install the site gas distribution piping. The Contractor shall install the gas meter and connect the meter to the building stub out and install gas related systems within the buildings. Contractor shall design and construct the natural gas service lines with ANSI B31.8, Gas Transmission

Distribution and Piping Systems. Natural gas shall be provided to and within the building. Provide a meter/regulator assembly for the facility with a valved bypass."

Paragraph 6.4.6.4.:
Replace the first sentence with the following: "The sanitary sewer system is as shown in Appendix J."

Paragraph 6.4.7.2
Replace subparagraph (a) in its entirety with the following:
"Finished Floor Elevations: A building's finished floor elevation shall be a minimum of 6 inches above the highest point of the adjacent outside finished grade, unless there is an overriding technical reason to deviate. Slope the finished grade a minimum of 5% for the first 10 feet away from the building."

Paragraph 6.5.1.:
Add the following sentence to the end of the paragraph:
"The third priority is for durability in construction and finishes, assuring a long building life despite the rigors of use in short term training periods of a few weeks to a few months. While factory fabricated systems are acceptable, construction shall not incorporate full scale modular construction such as that used for off-frame modular or manufactured buildings."

Paragraph 6.5.2.6.:
Add subparagraph: "(b) Door Frames. Knock-down frames are not permitted."
Add subparagraph: "(c) Mail Distribution Room. Provide combination lock on Mail Distribution Room doors. Coordination with Contracting Officer. Mail boxes shall be cluster type, with heavy gauge aluminum cabinet wrapper, pedestal mounted heavy duty stainless steel, and front loading aluminum cabinet. Include combination lock, stainless steel door hardware and hinges, font matching US Block 1L, 5/8" high engraving, no color fill. Color shall be powder coat or baked-on, factory finished. Color shall be coordinated with Ft Hood DPW."

Paragraph 6.5.3.:
Replace the paragraph with the following:
"6.5.3. Programmable Electronic Key Card Access Systems:

Provide Stanley Security Solution Inc, B.A.S.I.S. G System for the following:

1. Barracks building entry doors.
2. Barracks building senior leader living/sleeping room entrance doors.
3. Officers' Quarters building entry doors.
4. Officers' Quarters living/sleeping room entrance doors.

This system and this description shall take precedence over the Installation Design Guide where there are differences.

(a) Description: Stanley BASIS G Mortise Lockset with Mag-Stripe reader, Key Over-ride sensor, extended battery, and hard master key system using standard IC cores (small format, non-restricted).

(b) Part Number: 45HG7TV4MS-626-EXBB-SH-TRK-3-KOS. Prior to ordering, Contractor shall confirm that all features required by solicitation shall be provided and shall revise part number as necessary.

(c) Contractor shall program the locks and shall initialize the database entries to match the format of the existing North Fort Hood's central barracks database. The Contractor shall be responsible for acquiring data format, for proposing & confirming data entries with NFH staff, and for all tasks required to turn over a complete, ready, and usable system. Contractor shall provide User Training to the NFH staff concerning the encoding of replacement keys and the use of equipment & BASIS G software.

(d) At final delivery, the Contractor shall turn-over the new encoder that was only used to make key cards for this project, shall provide a box of 500 blank key cards to NFH staff, and shall provide ten (10)

electronic locks (that match installed locks) to the DPW Lock Shop for use as spares."

Paragraph 6.5.4.3.:
Add paragraph:
"6.5.4.3. Projection Screen.
Provide wall mounted electric projection screen controls. For Projection Screens, reference Section 01 10 00, Paragraph 3.3.3.1 and 3.3.3.3."

Paragraph 6.6.2.4.:
Add paragraph:
"6.6.2.4 Live Loads:
Design live loads shall be per the IBC but not lower than the following minimums:
(a) Elevated floors, 60 pounds per square foot (psf).
(b) Slab on grade, 150psf."

Paragraph 6.6.5.:
Add paragraph:
"6.6.5 Structural Steel
(a) Detail all moment connections. Moment connections shall not be designed by the steel fabricator.
(b) When moment connections are required above the foundation, use bolted rather than welded connections where possible.
(c) Provide complete weld details including all weld lengths and sizes.
(d) Indicate the location of all A325 bolts.
(e) Indicate all framed openings on the structural drawings, including the framing material size and shape.
(f) For all structural welding, a welding inspector is required to visually inspect and report all job welded joists, beams, and moment connections.

Paragraph 6.8.1.:
Add paragraph:
"6.8.1 Automatic Sprinkler System Piping shall be minimum schedule 40."

Paragraph 6.9.1(c).:
Change "DOIM" to "NEC (Network Enterprise Center)".

Paragraph 6.9.1.9.(d):
Change paragraph to the following: "Transformer shall be pad mounted radial fed with load break switch (3-2 position)."

Paragraph 6.9.2.:
Change paragraph to the following: "NOT USED, see Appendix J for Site Design."

Paragraph 6.9.3.:
Replace the paragraph with the following: "Site and Parking Lot Lighting: Provide independent site transformers and lighting controls separate from buildings' transformers and controls. Site lighting shall be LED type."

Paragraph 6.9.5.:
Change the first sentence to the following: "Provided electric meter mounted on interior distribution equipment."
Delete last sentence in paragraph.

Paragraph 6.9.6.:
Add the following before the last sentence: "Provide 100 copper pairs and 12-stands fiber to each 4-story Barracks and to the Battalion HQ."

Paragraph 6.9.6.:
Change “DOIM” to “NEC (Network Enterprise Center)”.

Paragraph 6.10.5.:
Add the following paragraph:
“6.10.5 Work Station Power. Under floor conduit and hardwiring for work stations shall be provided to serve each individual workstation. Overhead power poles are not acceptable.”

Paragraph 6.11.:
Change “DOIM” to “NEC (Network Enterprise Center)”.

Paragraph 6.11.:
Add the following three subparagraphs to paragraph 6.11.:
“6.11.1 Outdoor design conditions for Fort Hood, TX include the following:
Winter Design Dry Bulb (99% occurrence): 29degrees F DB / 15 gr/lb MCHR
Summer Design Dry Bulb (1% occurrence): 97 degrees F DB / 74 degrees F MCWB
Summer Design Wet Bulb (1% occurrence): 77 degrees F WB / 89 degrees F MCDB

6.11.2 Indoor design conditions include the following:
Comfort cooling areas: 78 degrees F DB / 50% RH
Comfort heating areas: 68 degrees F DB
Freeze protection only areas: 40 degrees F DB
If indoor relative humidity (RH) in comfort heating areas is expected to drop below 20% on a winter design dry bulb day with design occupancy, provide humidification to increase the indoor RH to 30%.

6.11.3 Humid Area: WB exceeds 67 degrees F for 3472 hours annually. Because the number of hours is over 3000, the Special Criteria for Humid Areas found in UFC 3-410-01FA applies, and the following additional design condition is provided for the required system analysis and selection:
Summer Design Humidity Ratio (0.4% occurrence): 136 gr/lb / 83 degrees F MCDB”

Paragraph 6.12.3.:
Add the following paragraph:
“To help meet the requirement for 0.75W/ft2 enhancement, increase the 4800K Correlated Color Temperature, assure light uniformity, use direct/indirect type light fixtures, and lower footcandle levels where feasible.”

Paragraph 6.13.1.:
Add the following to the paragraph: “PIVs shall be mounted on the exterior of the buildings as required by the Installation Fire Department.”

Paragraph 6.13.2.:
Add the following to the paragraph:
“Smoke Detectors: Smoke detection devices in sleeping areas shall be individually monitored and addressed. Tampering with a smoke detector shall transmit a trouble signal to the Fire Department. Smoke activation shall sound in the room/suite and the specific location shall be annunciated at the fire alarm panel. Smoke detection devices and sounders shall be 24 vdc, powered from the fire alarm panel.

Paragraph 6.13.3.1.:
Revise (c), sub-sentence (b) as follows: “Room smoke detectors as a trouble upon activation.”

Paragraph 6.13.3.1.:
Revise (c), sub-sentence (d) as follows: “Elevator machine room and hoistway tamper switches.”

Paragraph 6.13.3.1.:
Revise (c), sub-sentence (e) as follows: “Elevator machine room and hoistway flow switches.”

Paragraph 6.13.3.1.:
Revise (c), sub-sentence (f) as follows: “NOT USED.”

Paragraph 6.13.3.1.:
Add the following subparagraphs:
“(d) All valves and building PIVs shall be tamper switched.”
“(e) The fire alarm and detection system shall be addressable and supervised.”
“(f) All devices shall be addressable and supervised to include smoke detectors, heat detectors and pull stations.”
“(g) Each building shall have independent fire alarm control panels and suppression systems. Multiple panels shall NOT be connected together.”

Paragraph 6.13.3.2.:
Add the following as the second sentence “Pull Stations shall not utilize break glass, rods or special tools to reset.”

Paragraph 6.13.4.1.:
Add the following to the paragraph: “Connect building MNS system activation buttons and keyed microphone to the relay card and audio board of the BT-XM transceiver.”

Paragraph 6.13.4.2.:
Replace the paragraph with the following:
“(a) Suspicious Activity (Fast Whoop x 5 seconds) (female voice) “May I have your attention please! A possible breach in security has been reported. Please remain calm. You are instructed to take appropriate security measures and to report suspicious personnel, vehicles, packages or activities to security personnel.”

(b) Terrorist Threat (fast Whoop x 5 seconds) (female voice) “May I have your attention please. A terrorist threat has occurred. Please remain calm and take appropriate security measures.”

(c) Weather (1 khz steady tone x 5 seconds) (female voice) “The National Weather Service has issued a severe weather alert for this area. Tune to local radio and television stations for further guidance.”

(d) Chemical Hazard Emergency (Chime tone x 5 seconds) (female voice) "May I have your attention please! A chemical hazard has been reported, please remain calm and take appropriate measures to avoid the hazard."

APPENDIX BB:

Preliminary FF&E Information

BATTALION HEADQUARTERS BUILDING; TRANSIENT TRAINING

PRELIMINARY FF&E INFORMATION

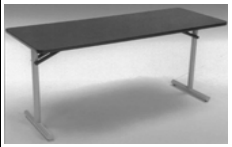
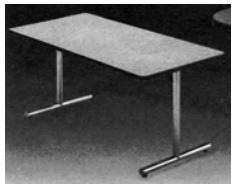
Operational Readiness Training Complex Standard Design

CID Requirements: **BATTALION HQ BUILDING; TRANSIENT TRAINING**

Code	Furniture Type	Description		Location	Total Quantity
C1	Management height armchair: *Ergonomic task chair Adjustable: height, seat depth, lumbar and arm rests. Arms shall be height and width adjustable and pivot. Seat and back shall have tilt lock and tension control. Shall be 5 star base with soft and hard (3") casters depending on floor finish.*	Knoll, RPM, 8P4-2-A5GH, Grade B		**(9)** 1 ea in offices 108, 116, 117, 118, 119, 122, 123, 124, 126. **(20)** 125, Open Office **(14)** 127, Conference	43
		KI, Piretti 2000, P2MP/RA/P/C, Grade 2			
		Allsteel, Trooper 24-Hour, TR-MWD, Gd B			
C2	Guest Chair Fully upholstered, sled-base arm chair, steel base and arms, split seat and back	Knoll, RPM, 6A8-2-SL, Grade B		**(14)** 2 ea in offices 108, 116, 117, 118, 119, 122, 123 **(8)** 4 each in offices 124 and 126	22
		KI, Piretti, PSSFAU/GLD, Grade 2			
		Allsteel, Trooper TR-SAP, Grade B			

Operational Readiness Training Complex Standard Design

CID Requirements: **BATTALION HQ BUILDING; TRANSIENT TRAINING**

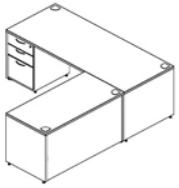
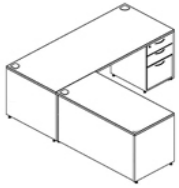
Code	Furniture Type	Description		Location	Total Quantity
C3	Classroom Stack Chair *Polypropylene seat and back, steel frame, split back and seat, armless, sled base, stackable*	Allsteel, Nimble, NMBL-1FC0		**(168)** 57 ea in Classrooms 102A, 102B & 102C	171
		KI, Matrix, MX/NS			
		Haworth, Very, SCH44-OS			
T1	Folding Table *24 x 60, vinyl1.25" thick T-mold edge, laminate top, metal base*	Falcon, 24FT series 1300, 24 x 60		**(87)** 29 ea in Classrooms 102A, 102B & 102C **(6)** 127, Conference	93
		KI, Barron, B25ST/54B			
		Unicore, R Series, R02460 custom size			

Operational Readiness Training Complex Standard Design

CID Requirements: **BATTALION HQ BUILDING; TRANSIENT TRAINING**

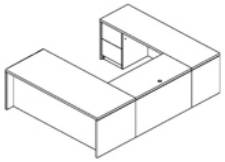
Code	Furniture Type	Description		Location	Total Quantity
SYS1	System Cluster *8 cubes* 3" thick monolithic panel 6" panel increments power-data access at base, work surface and top	Knoll, Dividends: 6' x 6' workstation with panels 64" - 66" high, 24" and 48" wide. (qty.1) *48" x 24" radius corner worksurface, (qty.2) 24" x 24" worksurfaces, (qty.1) 48" overhead, (qty.1) 24" overhead, (qty.1) B/B/F, tasklight*		(2) 125, Open Office	2
		Steelcase, Answer *6' x 6' workstation with panels 64" - 66" high, 24" and 48" wide.* *(qty.1) 48" x 24" radius corner worksurface, (qty.2) 24" x 24" worksurfaces, (qty.1) 48" overhead, (qty.1) 24" overhead, (qty.1) B/B/F, tasklight*			
		Teknion, Expansion *6' x 6' workstation with panels 64" - 66" high, 24" and 48" wide.* *(qty.1) 48" x 24" radius corner worksurface, (qty.2) 24" x 24" worksurfaces, (qty.1) 48" overhead, (qty.1) 24" overhead, (qty.1) B/B/F, tasklight*			
SYS2	System Cluster *4 cubes* *3" thick monolithic panel* *6" panel increments power-data access at base, work surface and top*	Knoll, Dividends: 6' x 6' workstation with panels 64" - 66" high, 24" and 48" wide. (qty.1) *48" x 24" radius corner worksurface, (qty.2) 24" x 24" worksurfaces, (qty.1) 48" overhead, (qty.1) 24" overhead, (qty.1) B/B/F*		(1) 125, Open Office	1
		Steelcase, Answer *6' x 6' workstation with panels 64" - 66" high, 24" and 48" wide.* *(qty.1) 48" x 24" radius corner worksurface, (qty.2) 24" x 24" worksurfaces, (qty.1) 48" overhead, (qty.1) 24" overhead, (qty.1) B/B/F*			

CID Requirements: **BATTALION HQ BUILDING; TRANSIENT TRAINING**

Code	Furniture Type	Description		Location	Total Quantity
		Teknion, Expansion *6' x 6' workstation with panels 64" - 66" high, 24" and 48" wide.* *(qty.1) 48" x 24" radius corner worksurface, (qty.2) 24" x 24" worksurfaces, (qty.1) 48" overhead, (qty.1) 24" overhead, (qty.1) B/B/F*			
DK1	Desk with RIGHT return Full height modesty panel, steel desk, laminate top, atleast (1) grommet on each work surface	Teknion, Expansion Desking: RDRRM3066, 30 x 66 desk B/B/F RDRSM2448, 24 x 48 return RBSPM22286612, B/B/F pedestal Steelcase, Avenir MD6630LRP, 30 x 66 desk w/ B/B/F ped MR4824LRP, 24 x 48 return w/ B/B/F Knoll, Calibre: CS1-6630(5)l, 30 x 66 desk with B/B/F pedestal CR1-4824(7)L, 24 x 48 return with B/B/F pedestal		**(4)** 1 ea in offices 117, 119, 123, 126	4
DK2	Desk with LEFT return Full height modesty panel, steel desk, laminate top, atleast (1) grommet on each work surface	Teknion, Expansion Desking : RDRRM3066, 30 x 66 desk RDRSM2448, 24 x 48 return RBSPM22286612, B/B/F pedestal Steelcase, Avenir MD6630LLP, 30 x 66 desk w/ B/B/F ped MR4824LLP, 24 x 48 return w/ B/B/F		**(4)** 1 ea in offices 108, 116, 118, 122	4

Operational Readiness Training Complex Standard Design

CID Requirements: **BATTALION HQ BUILDING; TRANSIENT TRAINING**

Code	Furniture Type	Description		Location	Total Quantity
		Knoll, Calibre: CS1-6630(5)l, 30 x 66 desk with B/B/F pedestal CR1-4824(7)L, 24 x 48 return with B/B/F pedestal			
DK3	Executive-U Desk Full height modesty panel, steel desk, laminate top, atleast (1) grommet on each work surface	Teknion, Expansion Desking: RDRRM3672, 36 X 72 desk RDRDM2442, 24 x 42 bridge RDRRM2472, 24 x 72 credenza RBSPM22281212, F/F pedestal RBSPM22286612, B/B/F pedestal		**(1)** 124, Commander	1
		Steelcase, Avenir MD7236LRP, 36 x 72 desk with B/B/F MBR4824, 24 x 48 bridge MD7224LP, 24 x 72 credenza with F/F			
		Knoll,Calibre: CS1-7236(5)L, 36 x 72 single pedestal B/B/Fdesk CB1-4224, 24 x 42 bridge CU1-7224(7)(7)L 24x72 credenza with 2 F/F pedestals			
F1	3-high Lateral File *36" wide* Steel drawers, complete full depth access to drawers, anti-rebound feature prevents bounce-back, saftey interlock system, leveling glides, counterweight, lockable	Knoll, Calibre, C2F3936ECCC		**(6)** 125, Open Office	6
		Unicore, Opus, LATFF33629			

CID Requirements: **BATTALION HQ BUILDING; TRANSIENT TRAINING**

Code	Furniture Type	Description		Location	Total Quantity
		Allsteel, Persona, FLF336N			

CID Requirements: **BATTALION HQ BUILDING; TRANSIENT TRAINING**

Code	Furniture Type	Description		Location	Total Quantity
F2	4-high Lateral File *36" wide* *Steel drawers, complete full depth access to drawers, anti-rebound feature prevents bounce-back, saftey interlock system, leveling glides, counterweight, lockable*	Knoll, Calibre, C2F5136ECCCC		**(9)** 1 ea in offices 108, 116, 117, 118, 119, 122, 123, 124, 126.	9
		Unicore, Opus, LATFF43629			
		Allsteel, Persona, YFLF436N			
US1	Utility Shelving24 x 36 x 84+, starter Steel heavy-duty shelving, open shelving, cross-bracing on back and sides for stability. 850lb. capacity	Lyon, 8032H		**(3)** 109, Mail Distribution **(3)** 110, Storage **(3)** 114, Storage **(3)** 121, Medical Storage	12
		Unicore, SHV017553			
		Penco, 462375P			

BARRACKS; TRANSIENT TRAINING (4-STORY, OPTION A)

PRELIMINARY FF&E INFORMATION

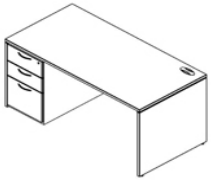
CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION A)**

Code	Furniture Type	Description		Location	Total Quantity
C1	*Management height armchair: Ergonomic task chair Adjustable: height, seat depth, lumbar and arm rests. Arms shall be height and width adjustable and pivot. Seat and back shall have tilt lock and tension control. Shall be 5 star base with soft and hard (3") casters depending on floor finish.*	Knoll, RPM, 8P4-2-A5GH, Grade B		(4) 1 each in Corridors 102, 202, 302, 402	4
		KI, Piretti 2000, P2MP/RA/P/C, Grade 2			
		Allsteel, Trooper 24-Hour, TR-MWK, Grade B			
C4	*Armless Task Chair: Ergonomic task chair Adjustable: height, seat depth and lumbar. Seat and back shall have tilt lock and tension control. Shall be 5 star base with soft and hard (3") casters depending on floor finish.*	Knoll, RPM, 8C4-2-A5GH, Grade B		(16) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		KI, Piretti 2000, P2TP/NA/BF/TL/N, Grade 2			
		Allsteel, Trooper 24-hour, TR-MAD, Gd 2			

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION A)**

Code	Furniture Type	Description		Location	Total Quantity
C6	Stack Chair Upholstered seat and back, split seat and back, metal frame and arms.	Spec, Snowball I, 1841, Grade 2		(56) 14 in each Team Area 105, 205, 305, 405	56
		Falcon, Lucky, GT710, Grade B			
		KI, Perry, PRYU/NS Grade 2			
T2	Conference Table 60" x 24"			(24) 6 in each Team Area 105, 205, 305, 405	24

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION A)**

Code	Furniture Type	Description		Location	Total Quantity
DK4	Single pedestal Desk Steel desk, full modesty panel, laminate top, vinyl edge, atleast one grommet on worksurface	Teknion, Expansion Desking RDRRM3066, 30 x 66 desk RBSPM22286612, B/B/F Pedestal		(4) 1 each in Corridors 102, 202, 302, 402	4
		Steelcase, Avenir MD6630RP, 30 x 66 desk with B/B/F			
		Knoll, Calibre: CS1-6630(5)L, 30 x 66 desk with B/B/F pedestal			
W1	Washer *Top loading*	Speed Queen Commercial, LWS17		(32) 8 each in Laundry 110, 210, 310, 410	32
		Whirlpool, GCAM27292MQ			
		GE WNRD205OW			

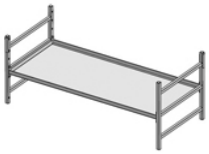
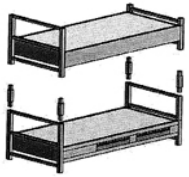
CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION A)**

Code	Furniture Type	Description		Location	Total Quantity
D1	Dryer *Electric heat*	Speed Queen Commercial, LES17		(40) 10 each in Laundry 110, 210, 310, 410	40
		Whirlpool, GCEM2790MQ			
		GE DNCD450GW			
B2	Wood Bunkable Bed Oak, single bed, stackable, headboard, footboard, fascia rails and sagless spring unit	Adden, Roomate Casegoods, Stackable Beds RM07TRK D 38" x W 85" x H 36.21		(16) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		Rodco-Brandt, 3/3 Bed, Stackable Single Bed 6601-1 D 41" x W 85" x H 30.5"			
		New England Woodcrafters, 146S Solid Oak Single Bunkable Bed D 36" x W 80" x 36" H			

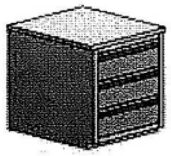
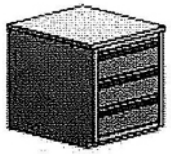
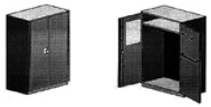
CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION A)**

Code	Furniture Type	Description		Location	Total Quantity
CH2	5-Dwr Chest At least an Oak veneer on hardwood veneer, laminate top, no face frame	Adden, Roomate Casegoods,Chest 5-Drawer RM04W D 18" x W 30" x H 45.25"		(16) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		Rodco-Brandt, 644-2 Chest 5-Drawer D 21" x W 19" x H 46"			
		New England Woodcrafters, 200 Series, 204E Five Drawer Chest D 19" x W 32" x H 47"			
DK5	Single Ped. Desk At least an Oak veneer on hardwood veneer, plywood core, laminate top, 3 drawers-on being a file drawer	Adden, Roomate Casegoods, Desk 3-Drawer RM05 D 24" x W 42"		(16) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		Rodco-Brandt, Desk Nightstand 6653-1 D 24" x W 48"			
		New England Woodcrafters, 200 Series #205, Pedestal Desk D 24" x W 42"			

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION A)**

Code	Furniture Type	Description		Location	Total Quantity
NS1	3-Dwr Night Stand At least an Oak veneer on hardwood veneer, laminate top, no face frame	Adden, Roomate Casegoods, Nightstand 3-Drawer RM03 D 24" W 30"		(16) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		Rodco-Brandt, 3Drawer Nightstand 6646-1 D 18" x 30" W			
		New England Woodcrafters, 200 Series #203C, 3 Drawer Chest D 19" x W 32"			
B1	Metal Bunkable Bed Adjustable nylon glides, durable steel constuction, sratch-resistant coating, 12 gauge corner angles and gussets for added strength, Baked on powder paint finish. Available options include, lockable casters or lift beds.	KLN Steel Products Unbunked: W 37" x L 84" x H 32" Bunked: W 37" x L 84" x H 64"		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424	320
		Dehler			
		AVTEQ Living Unbunked: W 36" x L 82" x H 38" Bunked: Including 12" adapter W 36" x L 82" x H 88"	No photo available		

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION A)**

Code	Furniture Type	Description		Location	Total Quantity
CH1	3-Dwr Metal Insert Chest Adjustable nylon glides, steel construction, scratch-resistant coating, 12 gauge drawer stops to prevent accidental drawer removal, baked-on powder paint finish. A	KLN Steel Products W 20.5" x D 20"		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424	320
		Dehler			
		AVTEQ Living W 25" x D 20"	No photo available		
LK2	Metal Wardrobe Lockers Durable steel construction, scratch-resistant paint, 3-point locking system, padlock hasp and stainless steel face plate, 14 gauge hinges secured to 12 gauge steel reinforcements in door and frame, baked on powder coat finish, corrosion resistant clothing rods and coat hooks.	KLN Steel Products D 24" x W 36" x H 78"		(640) 40 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424	640
		Dehler			
		AVTEQ Living D 24" x W 36" x H 78"	No photo available		

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION A)**

Code	Furniture Type	Description		Location	Total Quantity
TV1	TV Stand 36-38"	Oak TV stand with out casters		(4) 1 each inTeam Room 105, 205, 305, 405	4
BD1	Single Mattress Innerspring	Unicor, Nightingale Firm 7210007160706		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424; 2 each in rooms 108, 109, 208, 209, 308, 309, 408, 409	336
L1	Single Bed Linens	Unicor, White Flat Sheets 180 Count		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424; 2 each in rooms 108, 109, 208, 209, 308, 309, 408, 409	336
L2	Pillow Case	Unicor, Pillow Case 180 Count,		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424; 2 each in rooms 108, 109, 208, 209, 308, 309, 408, 409	336
L3	Pillow	Unicor, Pillow: Washable, Flame Resistant, Non-allergenic		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424; 2 each in rooms 108, 109, 208, 209, 308, 309, 408, 409	336
L4	Blanket	Unicor, Cotton Blanket 55" x 84"		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424; 2 each in rooms 108, 109, 208, 209, 308, 309, 408, 409	336

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION A)**

Code	Furniture Type	Description		Location	Total Quantity
AC1	Trash	Rubbermaid Fire Resistant Wastebasket 28 qt. #2543		(16) 1 in rooms 102, 105, 108, 109, 202, 205, 208, 209, 302, 305, 308, 309, 402, 405, 408, 409	16
AC2	Shower Curtain	3' wide for Shower Stall		(96) 6 each in Shower Room112, 118, 120, 126, 212, 218, 220, 226, 312, 318, 320, 326, 412, 418, 420, 426 (8)1 each in Bath 108A, 109A, 208A, 209A, 308A, 309A, 408A, 409A	104
TV2	TV	LG 55" LCD Flat Panel HDTV, 1080P, LED backlit, Engergy Star		(4) 1 each in Team Room 105, 205, 305, 405	4
TV3	TV Mounting Bracket	Rocketfish Full-Motion Wall Mount for 32"-56" Flat Panel TVs, Extends 10.2" Black		(4) 1 each in Team Room 105, 205, 305, 405	4
TV4	DVD	Crosley DVD Player: CR200HDP		(4) 1 each in Team Room 105, 205, 305, 405	4

BARRACKS; TRANSIENT TRAINING (4-STORY, OPTION B)

PRELIMINARY FF&E INFORMATION

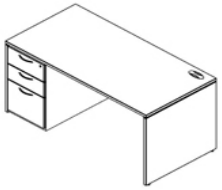
CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION B)**

Code	Furniture Type	Description		Location	Total Quantity
C1	*Management height armchair: Ergonomic task chair Adjustable: height, seat depth, lumbar and arm rests. Arms shall be height and width adjustable and pivot. Seat and back shall have tilt lock and tension control. Shall be 5 star base with soft and hard (3") casters depending on floor finish.*	Knoll, RPM, 8P4-2-A5GH, Grade B		(4) 1 each in Corridors 102, 202, 302, 402	4
		KI, Piretti 2000, P2MP/RA/P/C, Grade 2			
		Allsteel, Trooper 24-Hour, TR-MWK, Grade B			
C4	*Armless Task Chair: Ergonomic task chair Adjustable: height, seat depth and lumbar. Seat and back shall have tilt lock and tension control. Shall be 5 star base with soft and hard (3") casters depending on floor finish.*	Knoll, RPM, 8C4-2-A5GH, Grade B		(16) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		KI, Piretti 2000, P2TP/NA/BF/TL/N, Grade 2			
		Allsteel, Trooper 24-hour, TR-MAD, Gd 2			

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION B)**

Code	Furniture Type	Description		Location	Total Quantity
C6	Stack Chair Upholstered seat and back, split seat and back, metal frame and arms.	Spec, Snowball I, 1841, Grade 2		(56) 14 in each Team Area 105, 205, 305, 405	56
		Falcon, Lucky, GT710, Grade B			
		KI, Perry, PRYU/NS Grade 2			
T2	Conference Table 60" x 24"			(24) 6 in each Team Area 105, 205, 305, 405	24

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION B)**

Code	Furniture Type	Description		Location	Total Quantity
DK4	Single pedestal Desk Steel desk, full modesty panel, laminate top, vinyl edge, atleast one grommet on worksurface	Teknion, Expansion Desking RDRRM3066, 30 x 66 desk RBSPM22286612, B/B/F Pedestal		(4) 1 each in Corridors 102, 202, 302, 402	4
		Steelcase, Avenir MD6630RP, 30 x 66 desk with B/B/F			
		Knoll, Calibre: CS1-6630(5)L, 30 x 66 desk with B/B/F pedestal			
W1	Washer *Top loading*	Speed Queen Commercial, LWS17		(32) 8 each in Laundry 110, 210, 310, 410	32
		Whirlpool, GCAM27292MQ			
		GE WNRD205OW			

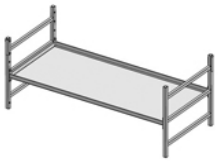
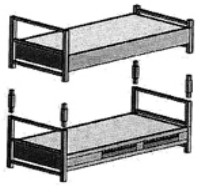
CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION B)**

Code	Furniture Type	Description		Location	Total Quantity
D1	Dryer *Electric heat*	Speed Queen Commercial, LES17		(40) 10 each in Laundry 110, 210, 310, 410	40
		Whirlpool, GCEM2790MQ			
		GE DNCD450GW			
B2	Wood Bunkable Bed Oak, single bed, stackable, headboard, footboard, fascia rails and sagless spring unit	Adden, Roomate Casegoods, Stackable Beds RM07TRK D 38" x W 85" x H 36.21		(16) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		Rodco-Brandt, 3/3 Bed, Stackable Single Bed 6601-1 D 41" x W 85" x H 30.5"			
		New England Woodcrafters, 146S Solid Oak Single Bunkable Bed D 36" x W 80" x 36" H			

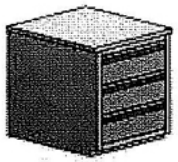
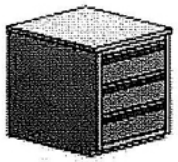
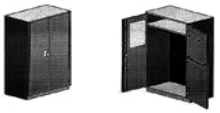
CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION B)**

Code	Furniture Type	Description		Location	Total Quantity
CH2	5-Dwr Chest At least an Oak veneer on hardwood veneer, laminate top, no face frame	Adden, Roomate Casegoods,Chest 5-Drawer RM04W D 18" x W 30" x H 45.25"		(8) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		Rodco-Brandt, 644-2 Chest 5-Drawer D 21" x W 19" x H 46"			
		New England Woodcrafters, 200 Series, 204E Five Drawer Chest D 19" x W 32" x H 47"			
DK5	Single Ped. Desk At least an Oak veneer on hardwood veneer, plywood core, laminate top, 3 drawers-on being a file drawer	Adden, Roomate Casegoods, Desk 3-Drawer RM05 D 24" x W 42"		(8) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		Rodco-Brandt, Desk Nightstand 6653-1 D 24" x W 48"			
		New England Woodcrafters, 200 Series #205, Pedestal Desk D 24" x W 42"			

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION B)**

Code	Furniture Type	Description		Location	Total Quantity
NS1	3-Dwr Night Stand At least an Oak veneer on hardwood veneer, laminate top, no face frame	Adden, Roomate Casegoods, Nightstand 3-Drawer RM03 D 24" W 30"		(8) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		Rodco-Brandt, 3Drawer Nightstand 6646-1 D 18" x 30" W			
		New England Woodcrafters, 200 Series #203C, 3 Drawer Chest D 19" x W 32"			
B1	Metal Bunkable Bed Adjustable nylon glides, durable steel constuction, sratch-resistant coating, 12 gauge corner angles and gussets for added strength, Baked on powder paint finish. Available options include, lockable casters or lift beds.	KLN Steel Products Unbunked: W 37" x L 84" x H 32" Bunked: W 37" x L 84" x H 64"		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424	320
		Dehler			
		AVTEQ Living Unbunked: W 36" x L 82" x H 38" Bunked: Including 12" adapter W 36" x L 82" x H 88"	No photo available		

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION B)**

Code	Furniture Type	Description		Location	Total Quantity
CH1	3-Dwr Metal Insert Chest Adjustable nylon glides, steel construction, scratch-resistant coating, 12 gauge drawer stops to prevent accidental drawer removal, baked-on powder paint finish. A	KLN Steel Products W 20.5" x D 20"		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424	320
		Dehler			
		AVTEQ Living W 25" x D 20"	No photo available		
LK2	Metal Wardrobe Lockers Durable steel construction, scratch-resistant paint, 3-point locking system, padlock hasp and stainless steel face plate, 14 gauge hinges secured to 12 gauge steel reinforcements in door and frame, baked on powder coat finish, corrosion resistant clothing rods and coat hooks.	KLN Steel Products D 24" x W 36" x H 78"		(640) 40 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424	640
		Dehler			
		AVTEQ Living D 24" x W 36" x H 78"	No photo available		

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION B)**

Code	Furniture Type	Description		Location	Total Quantity
TV1	TV Stand 36-38"	Oak TV stand with out casters		(4) 1 each in Common Area 105, 205, 305, 405	4
BD1	Single Mattress Innerspring	Unicor, Nightingale Firm 7210007160706		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424	320
L1	Single Bed Linens	Unicor, White Flat Sheets 180 Count		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424	320
L2	Pillow Case	Unicor, Pillow Case 180 Count,		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424	320
L3	Pillow	Unicor, Pillow: Washable, Flame Resistant, Non-allergenic		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424	320
L4	Blanket	Unicor, Cotton Blanket 55" x 84"		(320) 20 each in Sleep Bays 114, 116, 122, 124, 214, 216, 222, 224, 314, 316, 322, 324, 414, 416, 422, 424	320

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION B)**

Code	Furniture Type	Description		Location	Total Quantity
AC1	Trash	Rubbermaid Fire Resistant Wastebasket 28 qt. #2543		(16) 1 in rooms 102, 105, 108, 109, 202, 205, 208, 209, 302, 305, 308, 309, 402, 405, 408, 409	16
AC2	Shower Curtain	3' wide for Shower Stall		(96) 6 each in Shower Room 112, 118, 120, 126, 212, 218, 220, 226, 312, 318, 320, 326, 412, 418, 420, 426 (8)1 each in Bath 108A, 109A, 208A, 209A, 308A, 309A, 408A, 409A	104
TV2	TV	LG 55" LCD Flat Panel HDTV, 1080P, LED backlit, Engergy Star		(4) 1 each in Team Room 105, 205, 305, 405	4
TV3	TV Mounting Bracket	Rocketfish Full-Motion Wall Mount for 32"-56" Flat Panel TVs, Extends 10.2" Black		(4) 1 each in Team Room 105, 205, 305, 405	4
TV4	DVD	Crosley DVD Player: CR200HDP		(4) 1 each in Team Room 105, 205, 305, 405	4

BARRACKS; TRANSIENT TRAINING (4-STORY, OPTION C)

PRELIMINARY FF&E INFORMATION

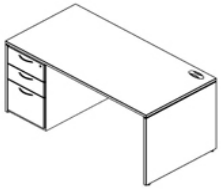
CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION C)**

Code	Furniture Type	Description		Location	Total Quantity
C1	*Management height armchair: Ergonomic task chair Adjustable: height, seat depth, lumbar and arm rests. Arms shall be height and width adjustable and pivot. Seat and back shall have tilt lock and tension control. Shall be 5 star base with soft and hard (3") casters depending on floor finish.*	Knoll, RPM, 8P4-2-A5GH, Grade B		(4) 1 each in Corridors 102, 202, 302, 402	4
		KI, Piretti 2000, P2MP/RA/P/C, Grade 2			
		Allsteel, Trooper 24-Hour, TR-MWK, Grade B			
C4	*Armless Task Chair: Ergonomic task chair Adjustable: height, seat depth and lumbar. Seat and back shall have tilt lock and tension control. Shall be 5 star base with soft and hard (3") casters depending on floor finish.*	Knoll, RPM, 8C4-2-A5GH, Grade B		(16) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		KI, Piretti 2000, P2TP/NA/BF/TL/N, Grade 2			
		Allsteel, Trooper 24-hour, TR-MAD, Gd 2			

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION C)**

Code	Furniture Type	Description		Location	Total Quantity
C6	Stack Chair Upholstered seat and back, split seat and back, metal frame and arms.	Spec, Snowball I, 1841, Grade 2		(56) 14 in each Team Area 105, 205, 305, 405	56
		Falcon, Lucky, GT710, Grade B			
		KI, Perry, PRYU/NS Grade 2			
T2	Conference Table 60" x 24"			(24) 6 in each Team Area 105, 205, 305, 405	24

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION C)**

Code	Furniture Type	Description		Location	Total Quantity
DK4	Single pedestal Desk Steel desk, full modesty panel, laminate top, vinyl edge, atleast one grommet on worksurface	Teknion, Expansion Desking RDRRM3066, 30 x 66 desk RBSPM22286612, B/B/F Pedestal		(4) 1 each in Corridors 102, 202, 302, 402	4
		Steelcase, Avenir MD6630RP, 30 x 66 desk with B/B/F			
		Knoll, Calibre: CS1-6630(5)L, 30 x 66 desk with B/B/F pedestal			
W1	Washer *Top loading*	Speed Queen Commercial, LWS17		(32) 8 each in Laundry 110, 210, 310, 410	32
		Whirlpool, GCAM27292MQ			
		GE WNRD205OW			

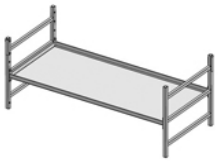
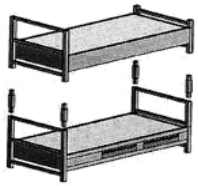
CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION C)**

Code	Furniture Type	Description		Location	Total Quantity
D1	Dryer *Electric heat*	Speed Queen Commercial, LES17		(40) 10 each in Laundry 110, 210, 310, 410	40
		Whirlpool, GCEM2790MQ			
		GE DNCD450GW			
B2	Wood Bunkable Bed Oak, single bed, stackable, headboard, footboard, fascia rails and sagless spring unit	Adden, Roomate Casegoods, Stackable Beds RM07TRK D 38" x W 85" x H 36.21		(16) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		Rodco-Brandt, 3/3 Bed, Stackable Single Bed 6601-1 D 41" x W 85" x H 30.5"			
		New England Woodcrafters, 146S Solid Oak Single Bunkable Bed D 36" x W 80" x 36" H			

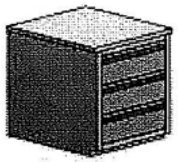
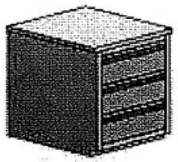
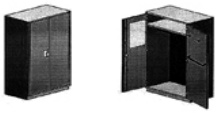
CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION C)**

Code	Furniture Type	Description		Location	Total Quantity
CH2	5-Dwr Chest At least an Oak veneer on hardwood veneer, laminate top, no face frame	Adden, Roomate Casegoods,Chest 5-Drawer RM04W D 18" x W 30" x H 45.25"		(16) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		Rodco-Brandt, 644-2 Chest 5-Drawer D 21" x W 19" x H 46"			
		New England Woodcrafters, 200 Series, 204E Five Drawer Chest D 19" x W 32" x H 47"			
DK5	Single Ped. Desk At least an Oak veneer on hardwood veneer, plywood core, laminate top, 3 drawers-on being a file drawer	Adden, Roomate Casegoods, Desk 3-Drawer RM05 D 24" x W 42"		(16) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		Rodco-Brandt, Desk Nightstand 6653-1 D 24" x W 48"			
		New England Woodcrafters, 200 Series #205, Pedestal Desk D 24" x W 42"			

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION C)**

Code	Furniture Type	Description		Location	Total Quantity
NS1	3-Dwr Night Stand At least an Oak veneer on hardwood veneer, laminate top, no face frame	Adden, Roomate Casegoods, Nightstand 3-Drawer RM03 D 24" W 30"		(16) 2 each Senior Leaders Quarters 108, 109, 208, 209, 308, 309, 408, 409	16
		Rodco-Brandt, 3Drawer Nightstand 6646-1 D 18" x 30" W			
		New England Woodcrafters, 200 Series #203C, 3 Drawer Chest D 19" x W 32"			
B1	Metal Bunkable Bed Adjustable nylon glides, durable steel constuction, sratch-resistant coating, 12 gauge corner angles and gussets for added strength, Baked on powder paint finish. Available options include, lockable casters or lift beds.	KLN Steel Products Unbunked: W 37" x L 84" x H 32" Bunked: W 37" x L 84" x H 64"		(384) 24 each in Sleep Bays 115, 116, 123, 124, 215, 216, 223, 224, 315, 316, 324, 324, 415, 416, 423, 424	384
		Dehler			
		AVTEQ Living Unbunked: W 36" x L 82" x H 38" Bunked: Including 12" adapter W 36" x L 82" x H 88"	No photo available		

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION C)**

Code	Furniture Type	Description		Location	Total Quantity
CH1	3-Dwr Metal Insert Chest Adjustable nylon glides, steel construction, scratch-resistant coating, 12 gauge drawer stops to prevent accidental drawer removal, baked-on powder paint finish. A	KLN Steel Products W 20.5" x D 20"		(384) 24 each in Sleep Bays 115, 116, 123, 124, 215, 216, 223, 224, 315, 316, 324, 324, 415, 416, 423, 424	384
		Dehler			
		AVTEQ Living W 25" x D 20"	No photo available		
LK2	Metal Wardrobe Lockers Durable steel construction, scratch-resistant paint, 3-point locking system, padlock hasp and stainless steel face plate, 14 gauge hinges secured to 12 gauge steel reinforcements in door and frame, baked on powder coat finish, corrosion resistant clothing rods and coat hooks.	KLN Steel Products D 24" x W 36" x H 78"		(768) 48 each in Sleep Bays 115, 116, 123, 124, 215, 216, 223, 224, 315, 316, 324, 324, 415, 416, 423, 424	768
		Dehler			
		AVTEQ Living D 24" x W 36" x H 78"	No photo available		

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION C)**

Code	Furniture Type	Description		Location	Total Quantity
TV1	TV Stand 36-38"	Oak TV stand with out casters		(4) 1 each in Common Area 105, 205, 305, 405	4
BD1	Single Mattress Innerspring	Unicor, Nightingale Firm 7210007160706		(384) 24 each in Sleep Bays 115, 116, 123, 124, 215, 216, 223, 224, 315, 316, 324, 324, 415, 416, 423, 424	384
L1	Single Bed Linens	Unicor, White Flat Sheets 180 Count		(384) 24 each in Sleep Bays 115, 116, 123, 124, 215, 216, 223, 224, 315, 316, 324, 324, 415, 416, 423, 424	384
L2	Pillow Case	Unicor, Pillow Case 180 Count,		(384) 24 each in Sleep Bays 115, 116, 123, 124, 215, 216, 223, 224, 315, 316, 324, 324, 415, 416, 423, 424	384
L3	Pillow	Unicor, Pillow: Washable, Flame Resistant, Non-allergenic		(384) 24 each in Sleep Bays 115, 116, 123, 124, 215, 216, 223, 224, 315, 316, 324, 324, 415, 416, 423, 424	384
L4	Blanket	Unicor, Cotton Blanket 55" x 84"		(384) 24 each in Sleep Bays 115, 116, 123, 124, 215, 216, 223, 224, 315, 316, 324, 324, 415, 416, 423, 424	384

CID Requirements: **BARRACKS (4-STORY); TRANSIENT TRAINING (OPTION C)**

Code	Furniture Type	Description		Location	Total Quantity
AC1	Trash	Rubbermaid Fire Resistant Wastebasket 28 qt. #2543		(16) 1 in rooms 102, 105, 108, 109, 202, 205, 208, 209, 302, 305, 308, 309, 402, 405, 408, 409	16
AC2	Shower Curtain	3' wide for Shower Stall		(96) 6 each in Shower Room 112, 118, 120, 126, 212, 218, 220, 226, 312, 318, 320, 326, 412, 418, 420, 426 (8)1 each in Bath 108A, 109A, 208A, 209A, 308A, 309A, 408A, 409A	104
TV2	TV	LG 55" LCD Flat Panel HDTV, 1080P, LED backlit, Engergy Star		(4) 1 each in Team Room 105, 205, 305, 405	4
TV3	TV Mounting Bracket	Rocketfish Full-Motion Wall Mount for 32"-56" Flat Panel TVs, Extends 10.2" Black		(4) 1 each in Team Room 105, 205, 305, 405	4
TV4	DVD	Crosley DVD Player: CR200HDP		(4) 1 each in Team Room 105, 205, 305, 405	4

OFFICERS QUARTERS; TRANSIENT TRAINING

PRELIMINARY FF&E INFORMATION

CID Requirements: **OFFICERS QUARTERS; TRANSIENT TRAINING**

Code	Furniture Type	Description		Location	Total Quantity
C4	*Armless Task Chair: Ergonomic task chair Adjustable: height, seat depth and lumbar. Seat and back shall have tilt lock and tension control. Shall be 5 star base with soft and hard (3") casters depending on floor finish.*	Knoll, RPM, 8C4-2-A5GH, Grade B		(80) 2 each in two-person sleep rooms, 20 room/floor, two floors.	80
		KI, Piretti 2000, P2TP/NA/BF/TL/N, Grade 2			
		Allsteel, Trooper 24-hour, TR-MAD, Gd 2			
C5	Lounge Chair Crypton upholstered seat, back and arms with wood arm cap; wood stained to match adjacent furnishings	Adden, Mission Lounge MS101, grade B		(8) 4 each in Common Areas 103, 203	8
		Weiland, Bridge with Wood Cap C07W-1, Grade B			
		Transformations, Ashton, AS-C-FC, Grade B			

CID Requirements: **OFFICERS QUARTERS; TRANSIENT TRAINING**

Code	Furniture Type	Description		Location	Total Quantity
C6	Stack Chair Upholstered seat and back, split seat and back, metal frame and arms.	Spec, Snowball I, 1841, Grade 2		(8) 4 each in Common Areas 103, 203	8
		Falcon, Lucky, GT710, Grade B			
		KI, Perry, PRYU/NS Grade 2			
SO1	3-seat Sofa Crypton upholstered seat, back and arms with wood arm cap; wood stained to match adjacent furnishings	Adden, Mission Lounge MS103, grade B		(2) 1 each in Common Areas 103, 203	2
		Wieland, Bridge C07W-3 Grade B			
		Transformations, Ashton, AS-S-FC, Grade B			

CID Requirements: **OFFICERS QUARTERS; TRANSIENT TRAINING**

Code	Furniture Type	Description		Location	Total Quantity
T2	Game Table 36" x 36" Round single-pedestal, laminate top, 1.25" solid vinyl T-mold edge, metal pedestal	Falcon, 4400 series, 36 x 36 square		(1) 1 in Common Area 103 (2) 2 in Common Area 203	3
		Nevins, Mavis Series, Galaxy DS36TMHGX06			
		Shelby Williams, J11 Series 36" square			
T3	End Table Wood top and base, legs and edge	Adden, Mission Table MST01L		(4) 2 each in Common Areas 103, 203	4
		Weiland, Bridges C200-212226, 22 x 26			
		Thomasville, Diversity End Table 48981-212			

CID Requirements: **OFFICERS QUARTERS; TRANSIENT TRAINING**

Code	Furniture Type	Description		Location	Total Quantity
T4	Coffee Table Wood top and base, legs and edge	Adden, Mission Table MST04		(2) 1 each in Common Areas 103, 203	2
		Weiland, Bridges C200-182042, 20 x 42			
		Thomasville, Diversity Cocktail Table 48981-122			
W1	Washer *Top loading*	Speed Queen Commercial, LWS17		(8) 4 each in Laundry 107, 207	8
		Whirlpool, GCAM27292MQ			
		GE WNRD205OW			

CID Requirements: **OFFICERS QUARTERS; TRANSIENT TRAINING**

Code	Furniture Type	Description		Location	Total Quantity
D1	Dryer *Electric heat*	Speed Queen Commercial, LES17		(10) 5 each in Laundry 107, 207	10
		Whirlpool, GCEM2790MQ			
		Crosley, CDE6500W			
R1	Refrigerator *Refrigerator with top mount freezer*	Amana, A9RXNMFWW			1
		GE GTK18IBW			
		GE Hotpoint 18BBW			

CID Requirements: **OFFICERS QUARTERS; TRANSIENT TRAINING**

Code	Furniture Type	Description		Location	Total Quantity
B2	Wood Bunkable Bed Oak, single bed, stackable, headboard, footboard, fascia rails and sagless spring unit	Adden, Roomate Casegoods, Stackable Beds RM07TRK		(80) 4 in each living module	80
		Rodco-Brandt, 3/3 Bed, Stackable Single Bed 6601-1			
		New England Woodcrafters, 146S Solid Oak Single Bunkable Bed			
CH2	5-Dwr Chest At least an Oak veneer on hardwood veneer, laminate top, no face frame	Adden, Roomate Casegoods,Chest 5-Drawer MC04WD		(80) 4 in each living module	80
		Rodco-Brandt, 644-2 Chest 5-Drawer			
		New England Woodcrafters, 200 Series, 204E Five Drawer Chest			

CID Requirements: **OFFICERS QUARTERS; TRANSIENT TRAINING**

Code	Furniture Type	Description		Location	Total Quantity
DK5	Single Ped. Desk At least an Oak veneer on hardwood veneer, plywood core, laminate top, 3 drawers-on being a file drawer	Adden, Roomate Casegoods, Desk 3-Drawer RM06		(80) 4 in each living module	80
		Rodco-Brandt, Desk Nightstand 6653-1			
		New England Woodcrafters, 200 Series #205, Pedestal Desk			
NS1	3-Dwr Night Stand At least an Oak veneer on hardwood veneer, laminate top, no face frame	Adden, Roomate Casegoods, Nightstand 3-Drawer RM03		(80) 4 in each living module	80
		Rodco-Brandt, 3Drawer Nightstand 6646-1			
		New England Woodcrafters, 200 Series #203C, 3 Drawer Chest			

APPENDIX CC:

Interior Signage Requirements

Chapter 11

INTERIOR SIGNS

Section 11A--Introduction

11.1. General Information. Interior signs should complement interior architecture and color schemes if at all possible. Since buildings vary a great deal, interior signs will also vary. The standards discussed here apply to buildings that do not have custom designed interior signs and are also intended to serve as a guide for the design of all interior signs. This chapter gives the standards for interior signs, including information on size, appearance, message, permitted graphics and layout.

11.2. Color. Standard brown or any dark color appropriate to the interior environment of the specific building may be used.

11.3. Design Parameters. All interior signs should be designed so that they require the minimum possible maintenance. The sign system should be flexible enough to adapt to frequent personnel changes and office relocations. The system shown here is designed to guide visitors through a building from the entrance point to the correct floor, the correct area of a floor, the correct office and (if appropriate) the correct desk.

11.4. Standards. All interior signs should follow these standards for system organization, sign types, and sizes. Variations in types of hardware and colors are permitted. These signs are designed to be compatible with the signs shown in the GSA Manual on the Design of Sign/Symbol Systems for Federal Facilities.

11.5. Mounting. Mounting options will vary with each system. For facilities or functional areas that require frequent removal and replacement of interior signs, consider the use of hook and loop fasteners, such as Velcro . A hook and loop attachment system allows for easy sign removal and replacement when frequent sign changes are required, does not require skilled labor and minimizes damage to wall surfaces.

11.6. Sources. There are many commercial sign systems available. There are usually national and local manufacturers of interior signs in most metropolitan areas. There are also many sign-making machines available.

11.6.1. References. Refer to the most recent version of the National Fire Protection Association (NFPA) NFPA 101 Life Safety Code and the NFPA Life Safety Code Handbook for the design and placement of all signs relating to means of egress and other life safety issues. Refer to Chapter 3 for the design and placement of all signs relating to the Americans with Disabilities Act.

Section 11B--Interior Sign Types

11.7. Main Categories. Like exterior signs, interior signs are standardized by function. The four

main sign categories are Information, Direction, Identification and Regulation.

11.8. Other Information. Bulletin boards display materials that relate to information, regulation, and motivation and are covered at the end of this chapter. The size, recommended design and layout for each type of sign are provided on the following pages. Information on typography and graphics can be found in Chapter 2. See Chapter 12 for information on sign structure and details.

11.9. Building Directory Sign Types AA1 and AA1a.

11.9.1. Usage, Location and Visibility. Types AA1 and AA1a building directories are used for major buildings. They are located in the main entrance lobby and should be clearly visible to visitors as they enter the building. For purposes of the ADAAG, these are considered to be temporary signs and need not comply.

11.9.2. Components of Type AA1. The Type AA1 building directory has two components. The permanent header panel gives the name of the building or the major organization, and may also show the unit organization emblem. The directory section is a changeable letter board with molded plastic letters that have tabs to align the letters in the slots of the letter board. It lists the name of each tenant in the building.

11.9.3. Components of Type AA1a. The Type AA1a building directory is similar to the Type AA1 directory, with the addition of a schematic building floor plan to assist in visitor orientation.

11.9.4. Building Directory Sign type AA1 Layout.

11.9.4.1. Colors. Colors should coordinate with the building interior design scheme.

11.9.4.2. Dimensions. 900 mm x 1 800 mm (3’- 0” x 6’- 0”).

11.9.4.3. Typography.

- Heading: upper and lower case Helvetica medium, 50 mm (2") capital letter height, flush left.
- Secondary Heading: upper and lower case Helvetica regular, 50 mm (2") capital letter height, flush left.
- The heading area will accommodate two lines with a maximum line length of 30 tiles or characters per line.
- Text: upper and lower case Helvetica medium, 12 mm (½ ”) capital letter height, flush left.
- The text area will accommodate three columns of 19 lines each, with a maximum line length of 45 tiles or characters per line.

11.9.4.4. Emblem: Authorized organizational emblem, 100 mm x 100 mm (4" x 4"), upper left corner.

Figure 11.1. Interior Sign Types.

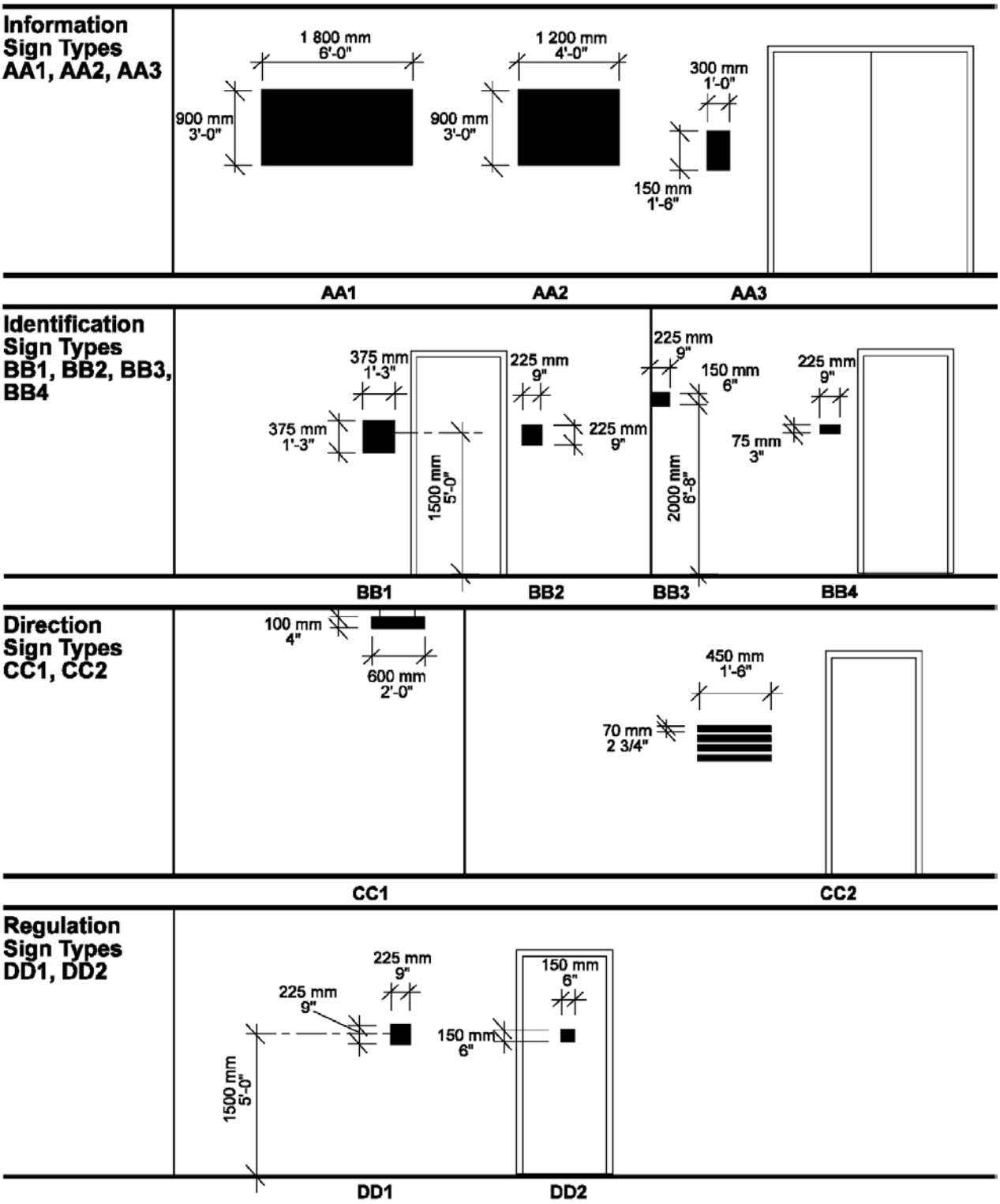


Figure 11.2. Placement of Building Directory Signs Types AA1 and AA1a.

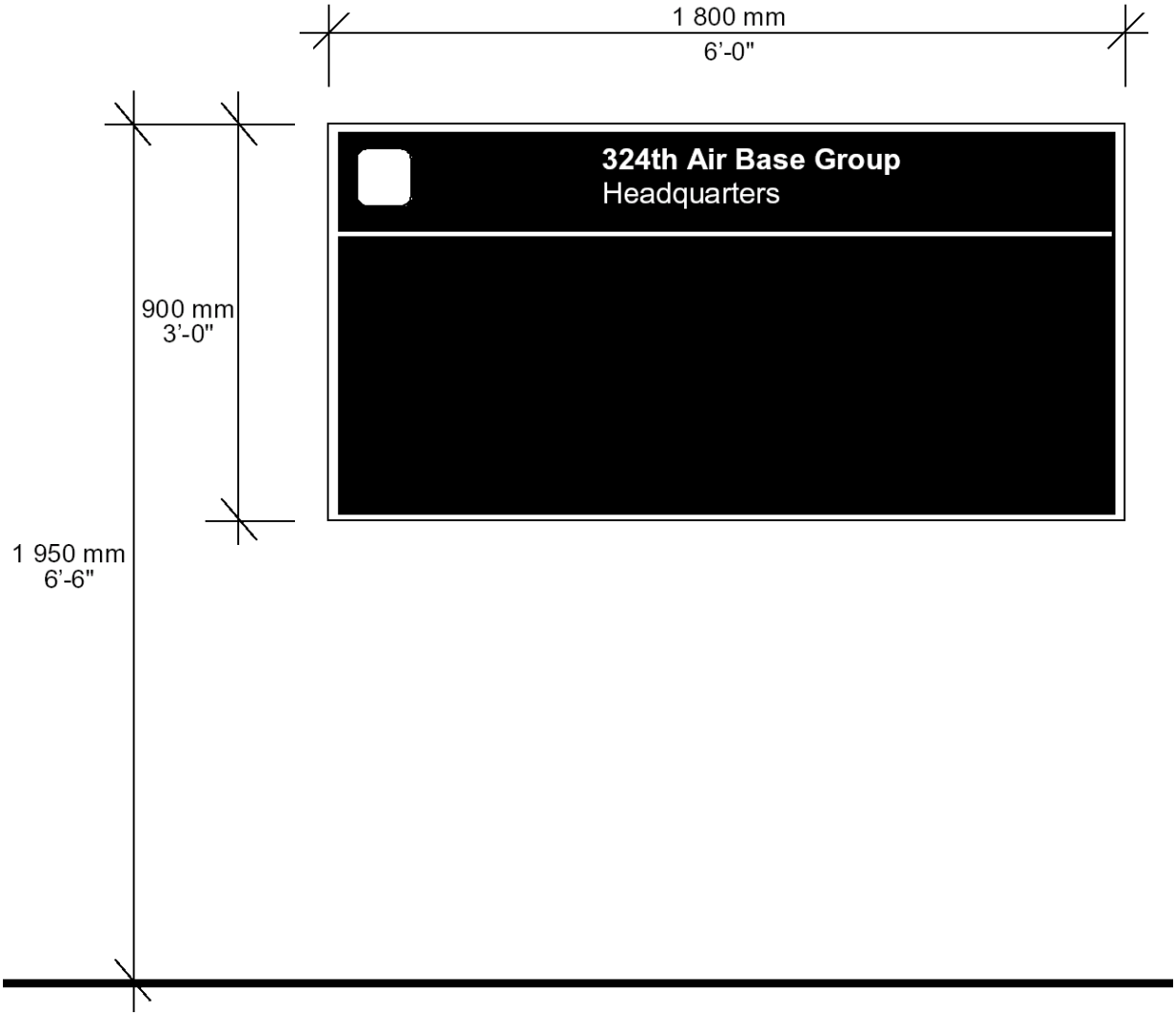
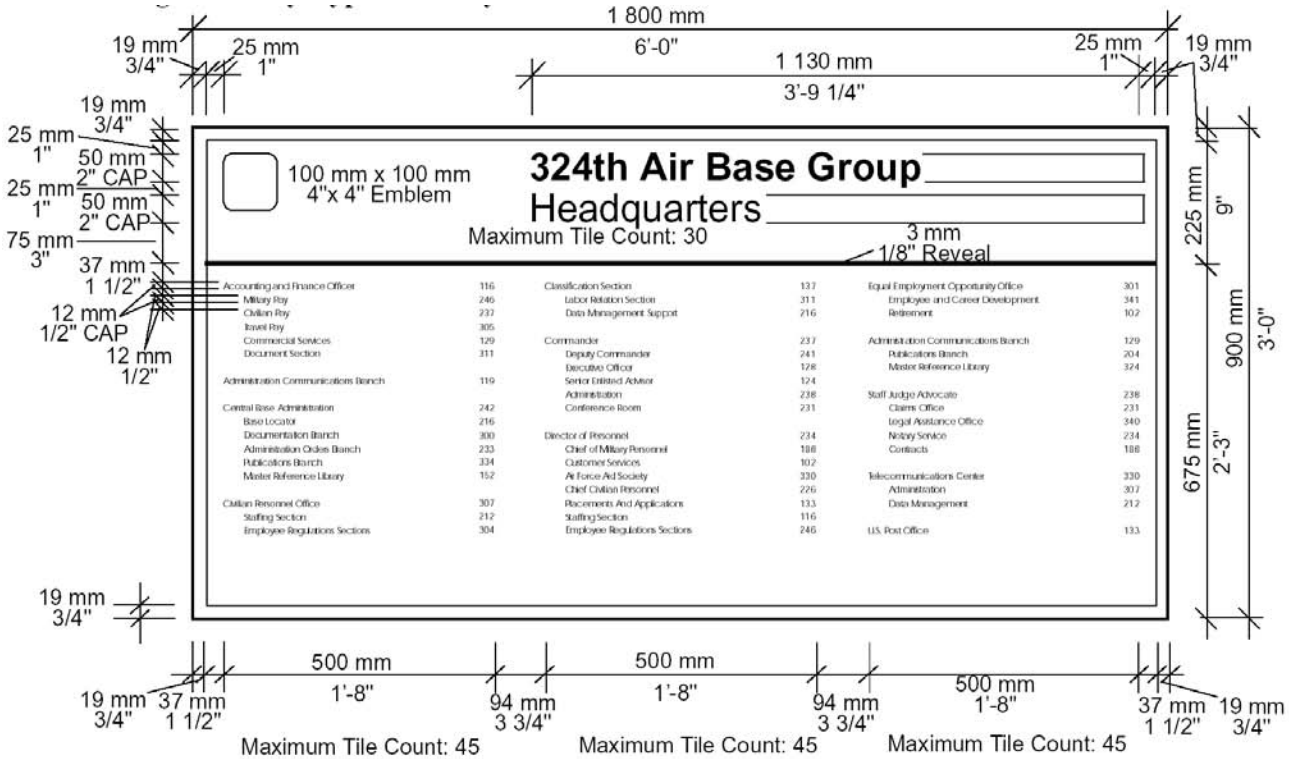


Figure 11.3. Building Directory Type AA1 Layout.



11.9.5. Building Directory Sign Type AA1a Layout.

11.9.5.1. Colors. Colors should coordinate with the building interior design scheme.

11.9.5.2. Dimensions. Height is 900 mm (3’- 0”). Width may vary from 1 800 mm (6’ -0”) to 2 700 mm (9’-0”).

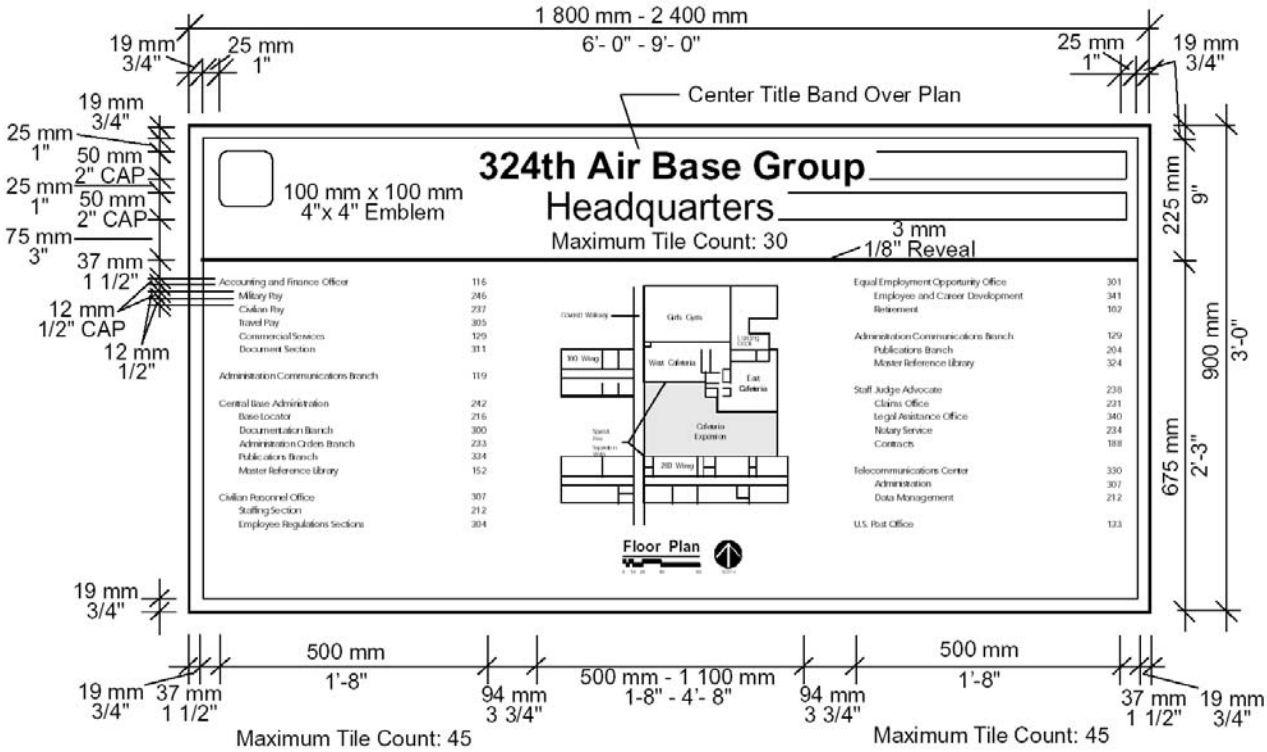
11.9.5.3. Typography.

- Heading: upper and lower case Helvetica medium, 50 mm (2”) capital letter height, centered over building floor plan.
- Secondary Heading: upper and lower case Helvetica regular, 50 mm (2") capital letter height, centered over building floor plan.
- The heading area will accommodate two lines with a maximum line length of 30 tiles or characters per line.
- Text: upper and lower case Helvetica medium, 12 mm ½” capital letter height, flush left.
- The text area will accommodate three columns of 19 lines each, with a maximum line length of 45 tiles or characters per line.

11.9.5.4. Emblem. Authorized organizational emblem, 100 mm x 100 mm (4" x 4"), upper left corner.

11.9.5.5. Building Floor Plan. Aligned and centered with directory text. This should be a professional quality schematic graphic.

Figure 11.4. Building Directory Sign Type AA1a Layout.



11.10. Building Directory Sign Type AA2 and Floor Directory Sign Type AA3.

11.10.1 Usage, Location and Visibility of AA2. The Type AA2 building directory is similar to the Type AA1 directory but lists fewer tenants. It should be located in the main entrance lobby and should be clearly visible to visitors as they enter the building. For purposes of the ADAAG, these are considered to be temporary signs and need not comply.

11.10.2. Locations and Visibility of AA3. The Type AA3 floor directory should be located in the elevator lobby of each floor, clearly visible to traffic entering the lobby from elevators or corridors. If the floor is not serviced by elevators, the floor directory should be located in the major stairway landings. For purposes of the ADAAG, these are considered to be temporary signs and need not comply.

11.11. Building Directory Sign Type AA2 Layout.

11.11.1. General Information. The Type AA2 building directory consists of a permanent header panel showing the name of the building or the major organization and a changeable directory that lists each tenant. An organizational emblem is not used on the header panel of the Type AA2 directory. The directory section is a board with changeable copy inserts or tiles.

Changeable letter boards with molded plastic changeable letters are a less favored option.

11.11.2. Colors. Colors should coordinate with the building interior design scheme.

11.11.3. Dimensions. 900 mm x 1 200 mm (3’- 0” x 4’- 0”)

11.11.4. Typography.

- Heading: upper and lower case Helvetica medium, 50 mm (2") capital letter height, flush left.
- Secondary Heading: upper and lower case Helvetica regular, 50 mm (2") capital letter height, flush left.
- The heading area will accommodate two lines with a maximum line length of 30 tiles or characters per line.
- Text: upper and lower case Helvetica medium, 12 mm (1/2”) capital letter height, flush left.
- The text area will accommodate two columns of 19 lines each, with a maximum line length of 45 tiles or characters per line.

Figure 11.5. Placement of Building Directory Sign Type AA2 and Floor Directory Sign Type AA3.

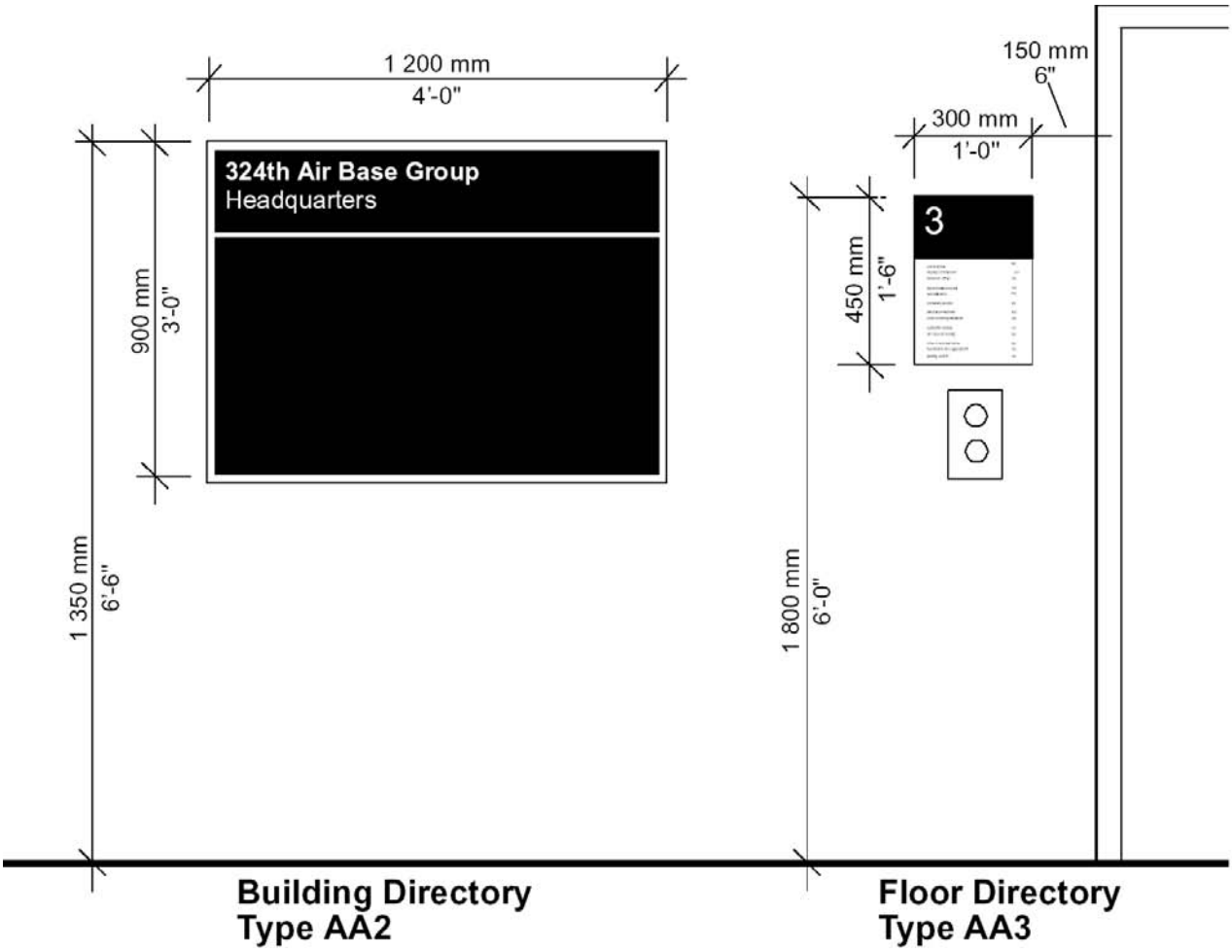
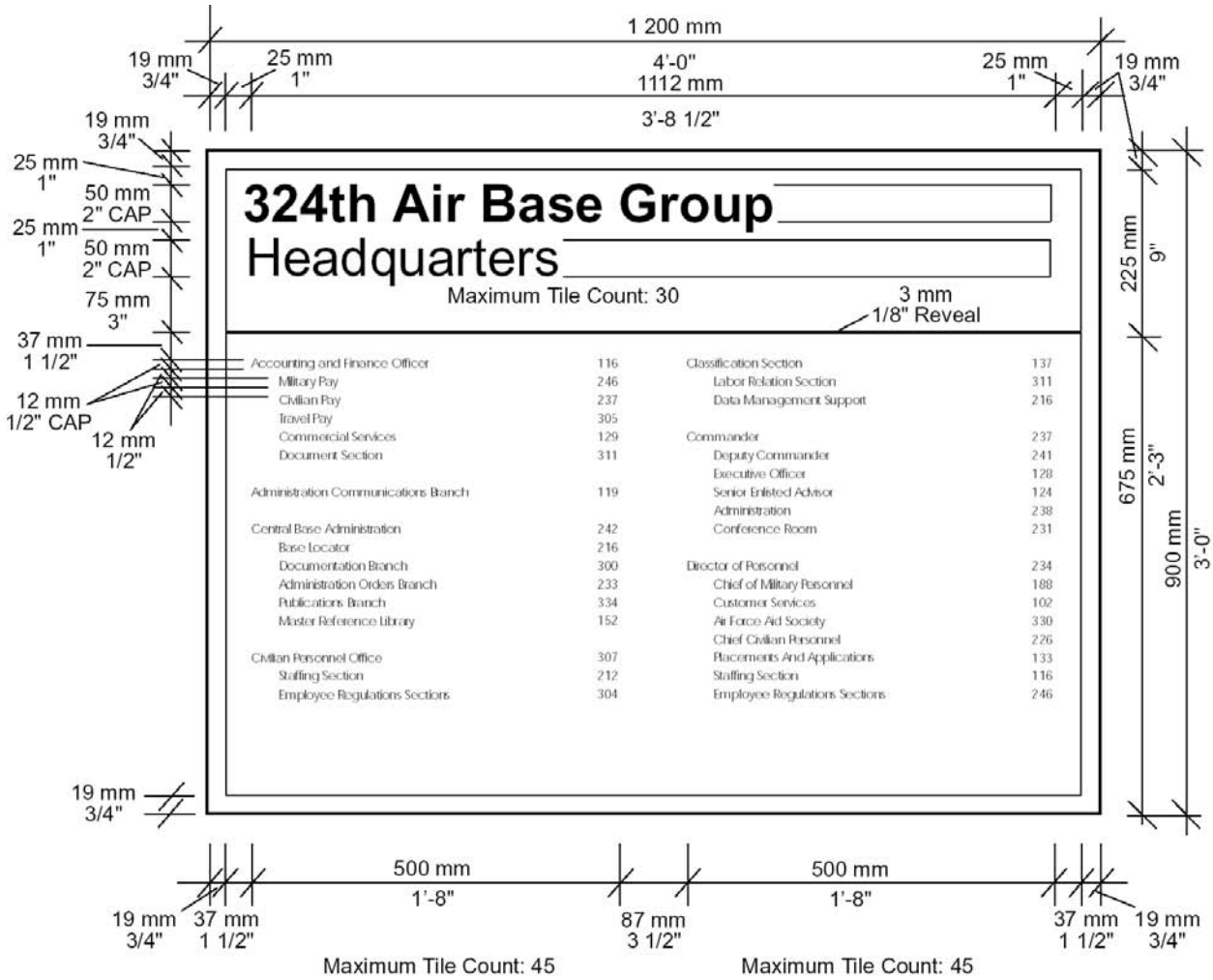


Figure 11.6. Building Directory Sign Type AA2 Layout.



11.12. Floor Directory Sign Type AA3 Layout.

11.12.1. General Information. The Type AA3 floor directory consists of a permanent header panel with the floor number, plus an insert panel that lists each tenant on the floor. The insert panel is a clear sleeve which will accept a paper or plastic insert listing the names of the tenants. A laser printed card stock sheet may be used as an insert, as shown in Figure 11.7.

11.12.2. Colors. Colors should coordinate with the building interior design scheme.

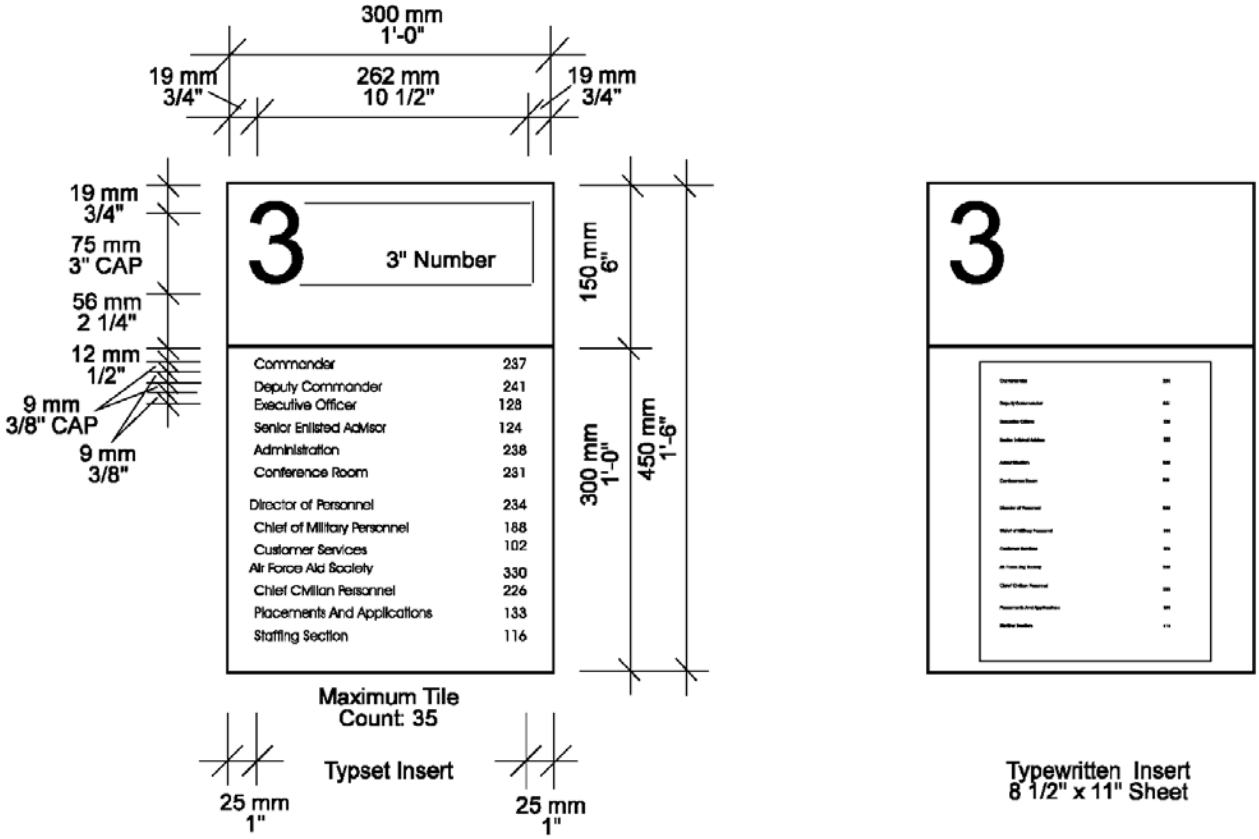
11.12.3. Dimensions. 450 mm x 300 mm (1’- 6” x 1’- 0”).

11.12.4. Typography.

- Floor number: Helvetica medium, 75 mm (3") number, flush left.
- Insert, headings: upper and lower case Helvetica medium, 9 mm (3/8") capital letter height, flush left.

- Insert, text: upper and lower case Helvetica regular, 9 mm (3/8") capital letter height, flush left.
- The insert message area will accommodate 15 lines with a maximum length of 35 tiles or characters per line.

Figure 11.7. Floor Directory Sign Type AA3 Layouts.



11.13. Office Identification Signs Types BB1, BB2, BB3 and BB4.

11.13.1. Usage. There are four types of office identification signs. The Type BB1 sign is used to identify a major office or area in a building (such as a wing or annex). The Type BB2 and Type BB3 signs are used for all other designated offices. The room number sign, Type BB4, is used to identify a secondary office entrance or a room with no designated function. 11.13.2. Description. The Type BB2 sign is a wall mounted sign, and is preferred to the Type BB3 projecting sign because it is easier to fabricate and maintain, but both types may be used. Each sign consists of a permanent header panel with the room number, wing, or annex designation plus an insert panel which identifies the occupant. The insert panel is a clear sleeve which will accept a paper or plastic insert with the name of the occupant. The Type BB4 sign consists of a header panel only, with no insert panel. It should be positioned at the same height from the floor as the Type BB2 sign. (See Figure 11.8)

11.13.3. Office Identification Sign Type BB1 Layout.

11.13.3.1. Colors. Colors should coordinate with the building interior design scheme

11.13.3.2. Dimensions. 375 mm x 375 mm (1’-3" x 1’-3").

11.13.3.3. Typography.

- Heading: upper case Helvetica medium 37 mm (1 ½ ") capital letter height, flush left.
- The heading area will accommodate two lines with a maximum of 10 tiles or characters per line and accompanying Grade Two Braille.
- Tenant name: upper and lower case Helvetica medium, 19 mm (3/4 ") capital letter height, flush left.
- Secondary information: upper and lower case Helvetica regular, 19 mm (3/4”) capital letter height, flush left.
- The insert area will accommodate four lines with a maximum of 24 tiles or characters per line.

11.13.4. Office Identification Signs Type BB2, BB3 and BB4 Layouts.

11.13.4.1. Colors. Colors should coordinate with the building interior design scheme.

11.13.4.2. Dimensions. BB2 - 225 mm x 225 mm (9" x 9"), BB3 - 150 mm x 300 mm (6" x 12"),
BB4 - 75 mm x 225 mm (3" x 9").

11.13.4.3. Typography.

- Room number BB2, BB4: Helvetica medium, 37 mm (1 ½ ") numbers, flush left and accompanying Grade Two Braille.
- Room number BB3: Helvetica medium 75 mm (3”) numbers, flush left.
- Tenant name: upper and lower case Helvetica medium, 12 mm (½ ”) capital letter height, flush left.
- Secondary information: upper and lower case Helvetica regular, 12 mm (½ ”) capital letter height, flush left.
- The insert area for the Type BB2 sign will accommodate four lines with a maximum of 21 tiles or characters per line.
- The insert area for the Type BB3 sign will accommodate one line with a maximum of 21 tiles or characters per line.

11.14. Office Identification Signs Type BB5, BB6 and BB7.

11.14.1. Usage, Placement and Description of BB5. The office partition identification sign Type BB5 is used to identify offices in open office areas. Place sign on the corner of the partition closest to traffic circulation. The sign consists of a permanent header panel showing the office workstation number and an insert panel which identifies the occupant. The insert panel has a clear sleeve which accepts a paper or plastic insert with the name of the occupant.

11.14.2. Usage and Placement of BB6. Use the Type BB6 desk plaque to identify individuals. If the base is removed, it may also be mounted on the office partition instead of the Type BB5 sign.

11.14.3. Usage of BB7. The service identification sign, Type BB7, is used to identify restrooms, telephones, and other services. The symbols for these services are shown in Figures 2.29, 2.30 and 2.31.

11.14.4. Sign Type BB5 - Office Partition Identification Sign.

11.14.4.1. Colors. Colors should coordinate with the building interior design scheme

11.14.4.2. Dimensions 150 mm x 150 mm (6" x 6").

11.14.4.3. Typography.

- Office identification: upper case Helvetica medium letters and numbers, 25 mm (1") high, flush left.
- Tenant Name: typewritten on a 75 mm x 150 mm (3" x 6") card, flush left, as shown in Figure 11.12.

Figure 11.8. Office Identification Signs Types BB1, BB2 and BB3.

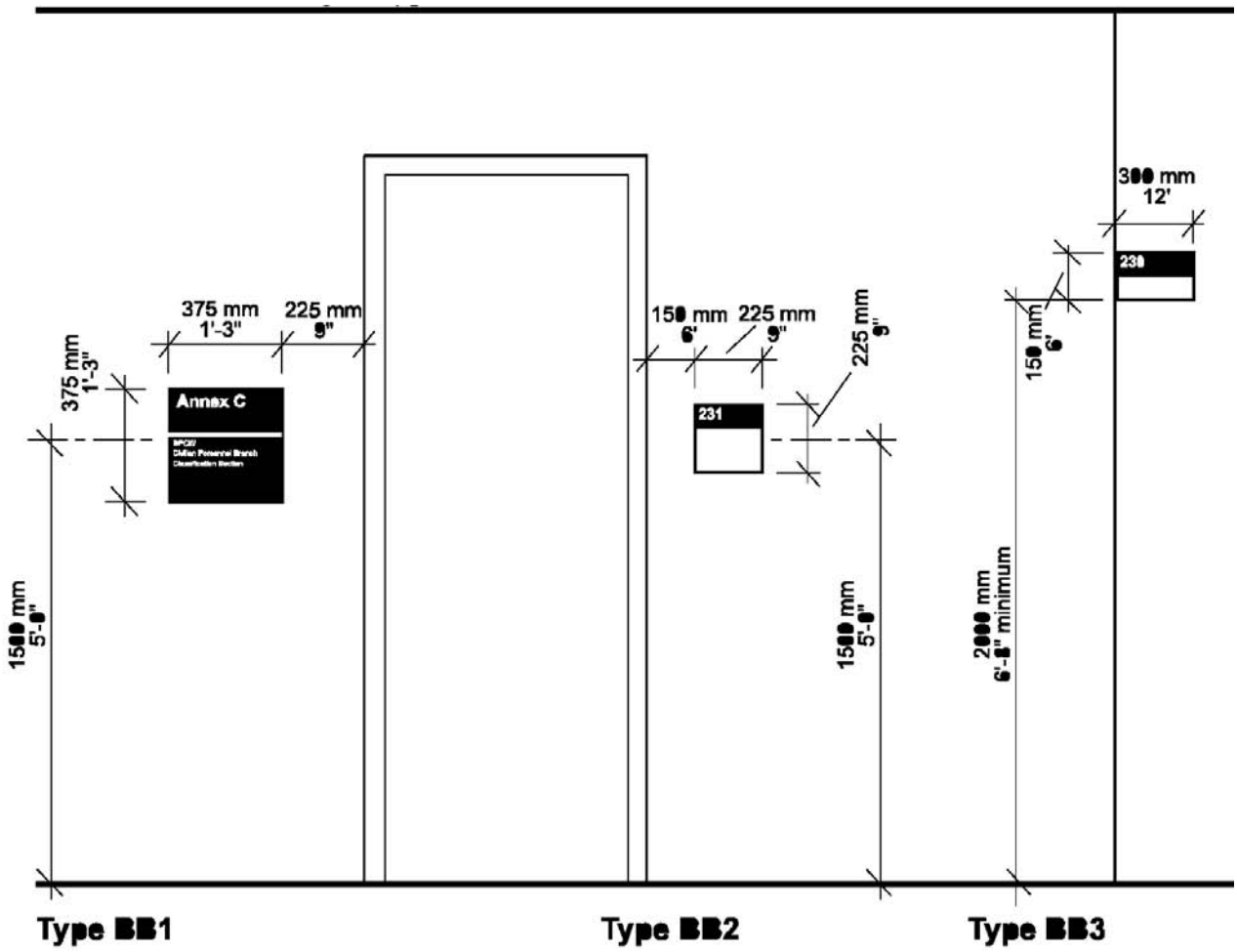


Figure 11.9. Office Identification Sign Type BB1 Layout.

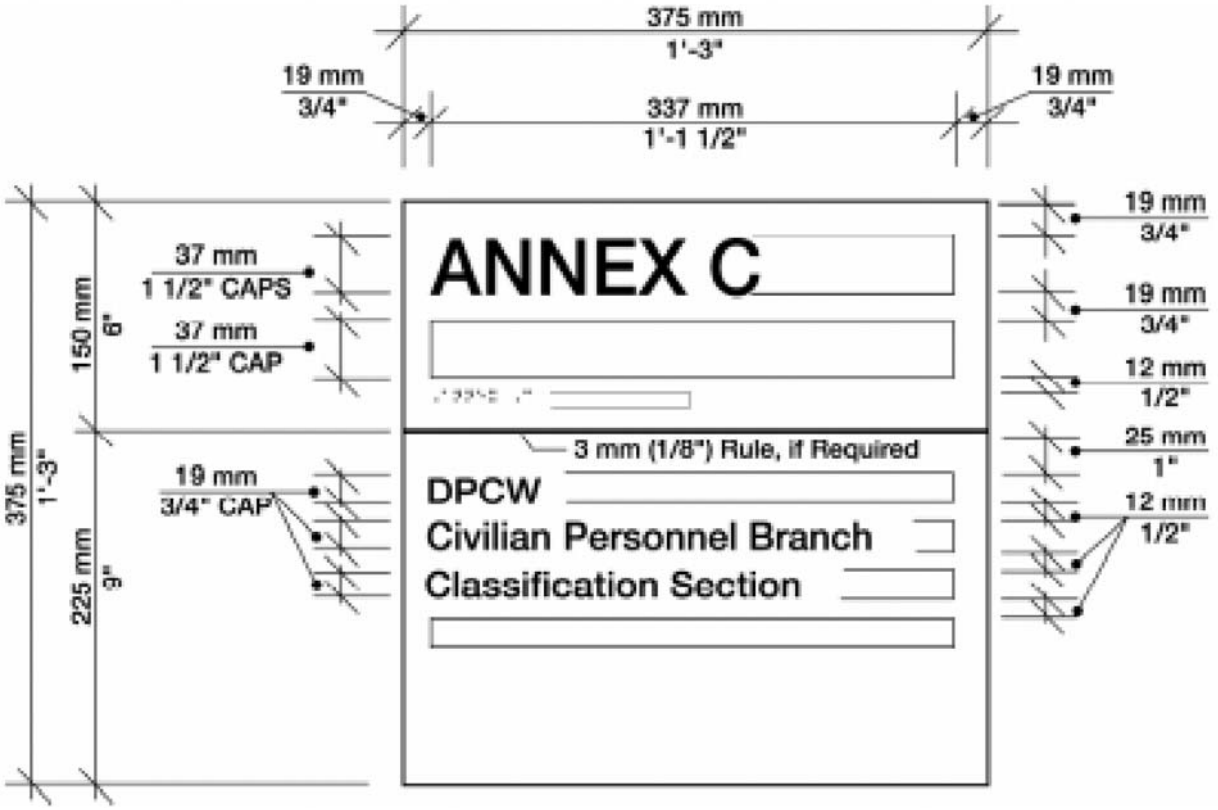


Figure 11.10. Office Identification Types BB2, BB3 and BB4 Layouts.

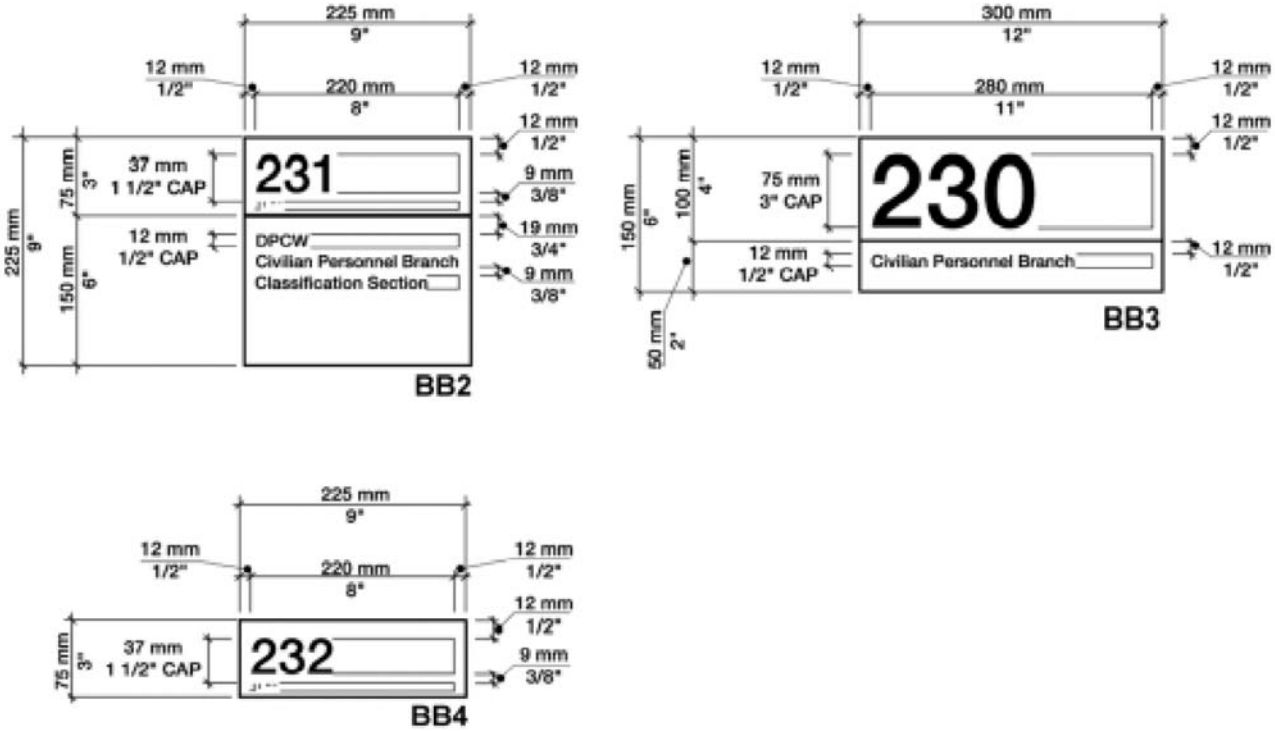


Figure 11.11. Placement of Identification Signs Types BB5, BB6 and BB7.

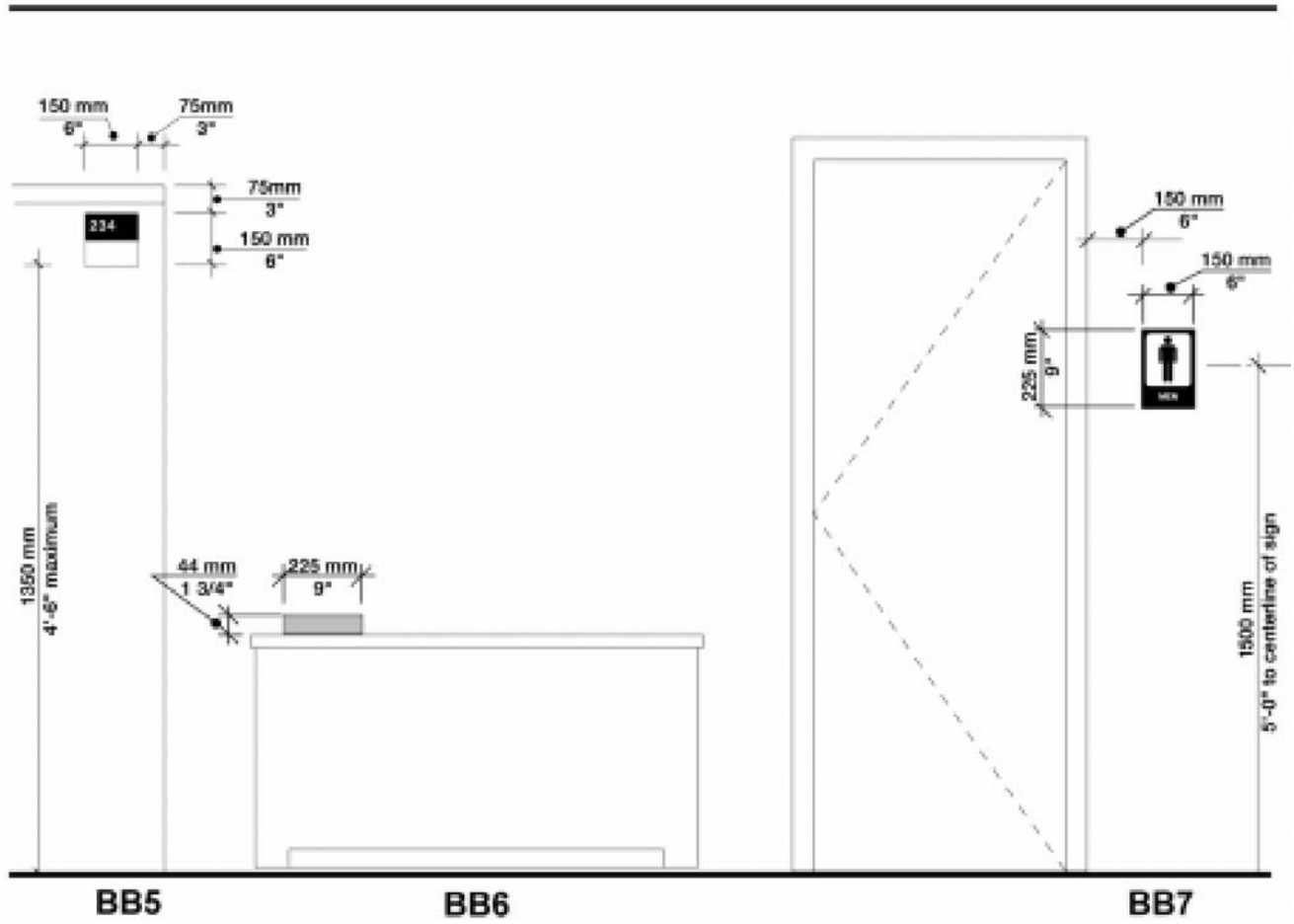
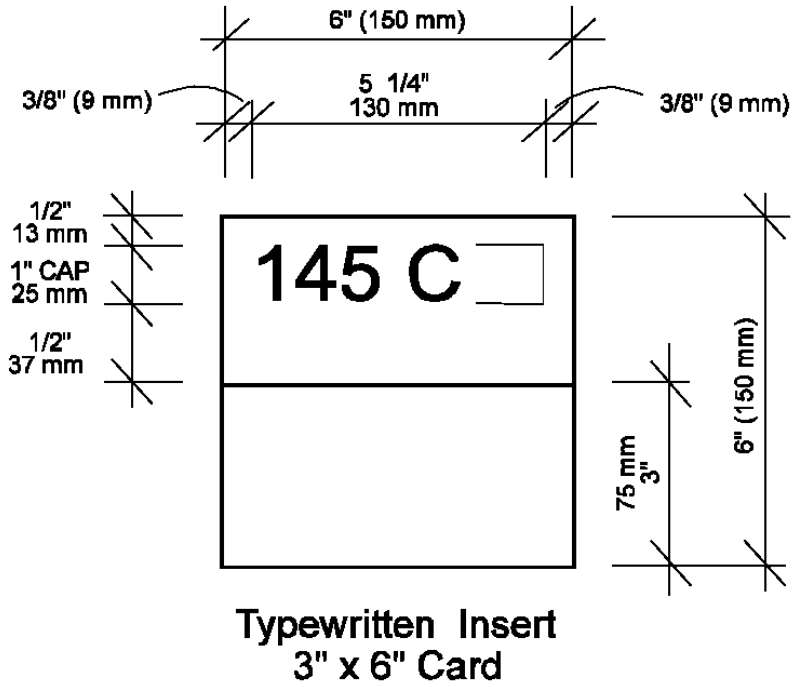


Figure 11.12. Office Partition Sign Identification Type BB5 Layout.



11.14.5. Office Identification Sign Type BB6 Layout - Desk Plaque.

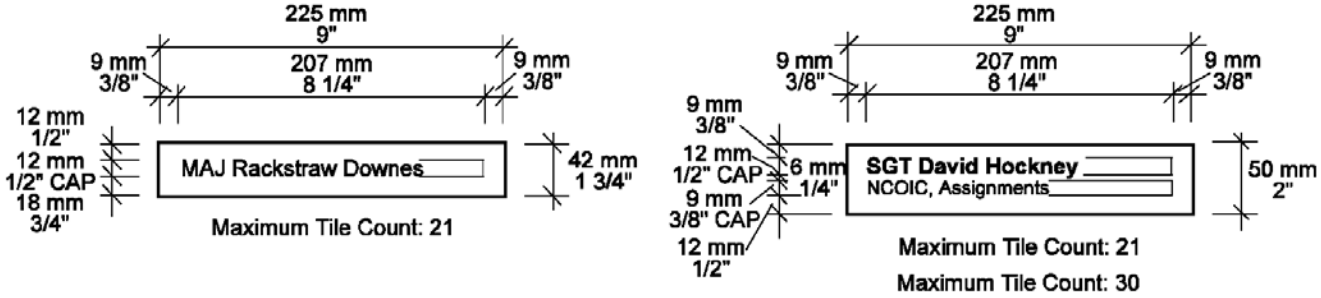
11.14.5.1. Colors. Colors should coordinate with the building interior design scheme.

11.14.5.2. Dimensions. 44 mm x 225 mm (1 ¾ " x 9") and 50 mm x 225 mm (2" x 9").

11.14.5.3. Typography.

- Name: upper and lower case Helvetica medium, 12 mm (½ ") capital letter height, flush left. The name line will accommodate a maximum of 21 tiles or characters.
- Title: upper and lower case Helvetica medium, 9 mm (3/8 ") capital letter height, flush left. The title line will accommodate a maximum of 30 tiles or characters.

Figure 11.13. Office Identification Sign Type BB6 Layout.



11.14.6. Office Identification Sign Type BB7 Layout - Service Identification.

11.14.6.1. Colors. Colors to coordinate with building interior design scheme.

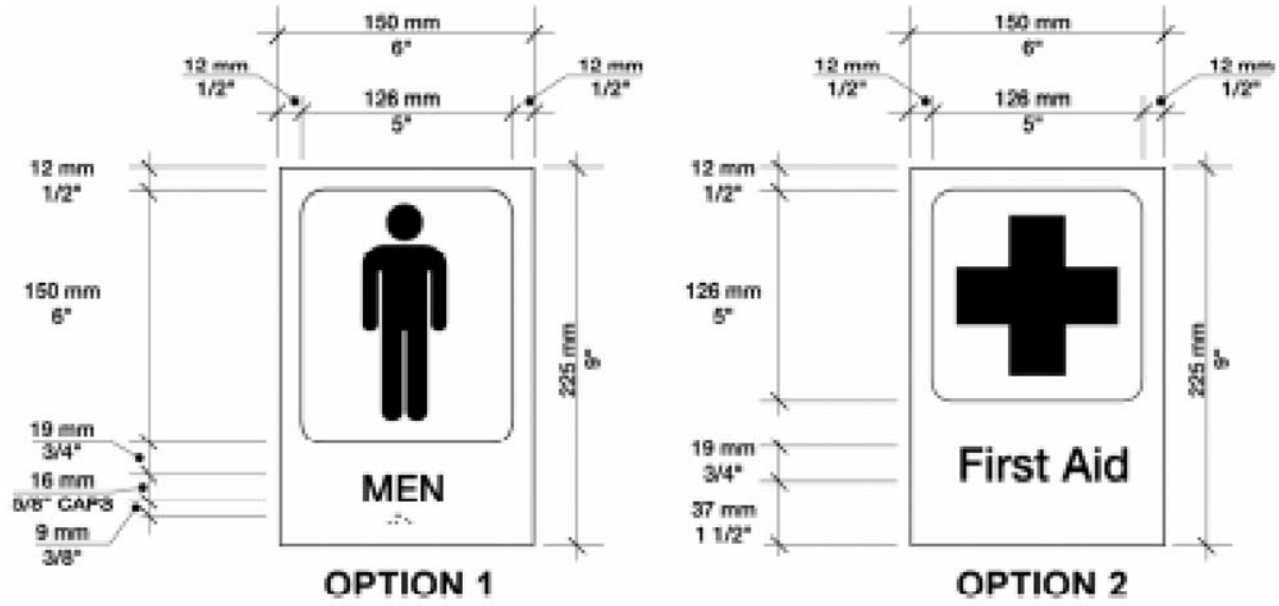
11.14.6.2. Symbols. Black symbol or red symbol (where appropriate) on white background.

11.14.6.3. Dimensions. 225 mm x 150 mm (9" x 6").

11.14.6.4. Typography.

- Service name (Option 1): upper case Helvetica medium, 16 mm (5/8") capital letter height, centered with accompanying Grade Two Braille. The message line will accommodate a maximum of 7 tiles.
- Service name (Option 2): upper and lower case Helvetica medium, 19 mm (3/4") capital letter height, centered. The message line will accommodate a maximum of 9 tiles.

Figure 11.14. Service Identification Sign Type BB7 Layout.



11.15. Direction Signs Types CC1 and CC2.

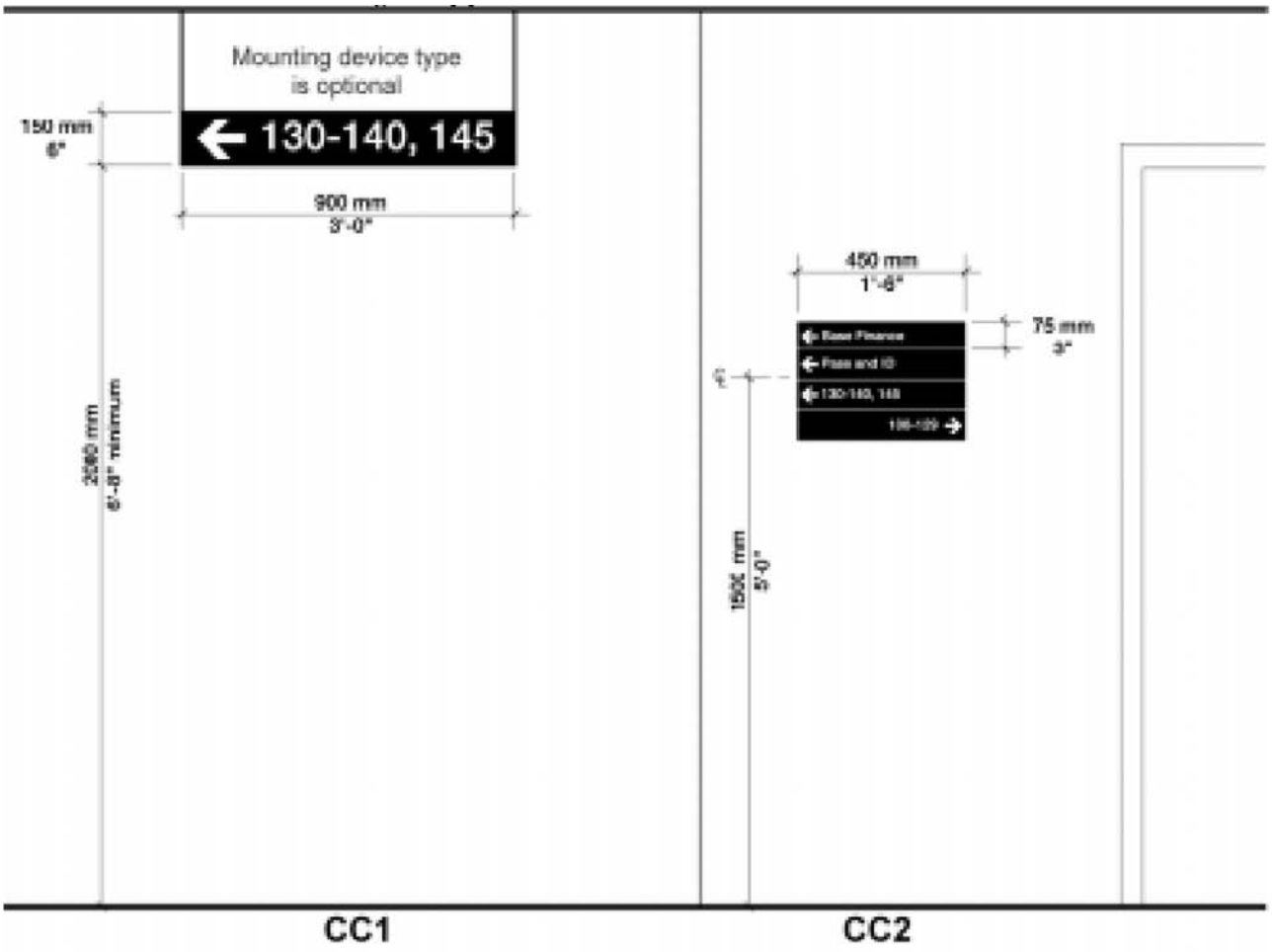
11.15.1. Types and Locations. There are two types of direction signs: the ceiling mounted Type CC1 sign and the wall mounted Type CC2 sign. A direction sign should be located at each decision point in the path of travel, for example, opposite elevators or stairways, and at each corridor intersection.

11.15.2. Information. Direction signs should indicate room numbers. The destinations most often sought by people entering the building for the first time (such as Finance, Pass and ID, or Vehicle Registration) should be listed by name. All others should be identified by room number alone. This greatly simplifies both initial fabrication and maintenance.

11.15.3. Signage System. Direction signs should tie into the interior signage system. Every building should have a directory (Sign Type AA2) at each entrance and a floor directory (Sign Type AA3) at each elevator or stairway landing. The directories should include room numbers in order to give continuity of directional information from entry through arrival on the floor and location of the room. Room numbers placed on or beside office doors complete the system.

11.15.4. Placement of Messages. Messages are placed flush left or flush right to the arrow. Arrows pointing to the left, up, or down, have flush left messages, and arrows pointing to the right have flush right messages. The arrow is centered in the space between the message and the edge of the sign.

Figure 11.15. Placement of Direction Signs Types CC1 and CC2.



11.15.5. Direction Signs Type CC1 Layouts.

11.15.5.1. Colors. Colors should coordinate with the building interior design scheme.

11.15.5.2. Dimensions. Slats - 150 mm x 900 mm (6" x 3’- 0”).

11.15.5.3. Typography. Upper and lower case Helvetica medium, 75 mm (3") capital letter height, flush left or right (to arrow). The message area of each slat will accommodate a maximum of 11 tiles or characters.

11.15.5.4. Arrow. Standard tile, 113 mm (4 ½") high, placed left or right as appropriate.

11.15.6. Direction Sign Type CC2 Layout.

11.15.6.1. Dimensions. Slats - 75 mm x 450 mm (3" x 1'- 6").

11.15.6.2. Typography. Upper and lower case Helvetica medium, 25 mm (1") capital letter height, flush left or right (to arrow). The message area of each slat will accommodate a maximum of 16 tiles or characters.

11.15.6.3. Arrow. Standard tile, 37 mm (1 ½") high, placed left or right as appropriate.

Figure 11.16. Direction Sign Type CC1 Layout.

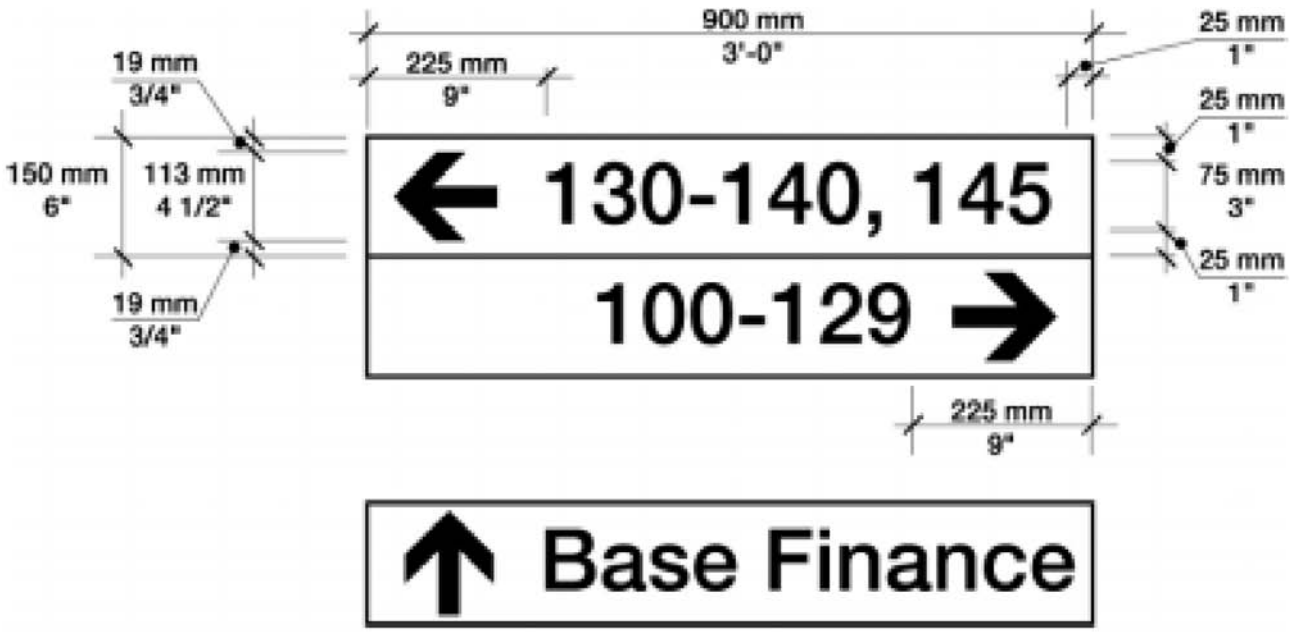
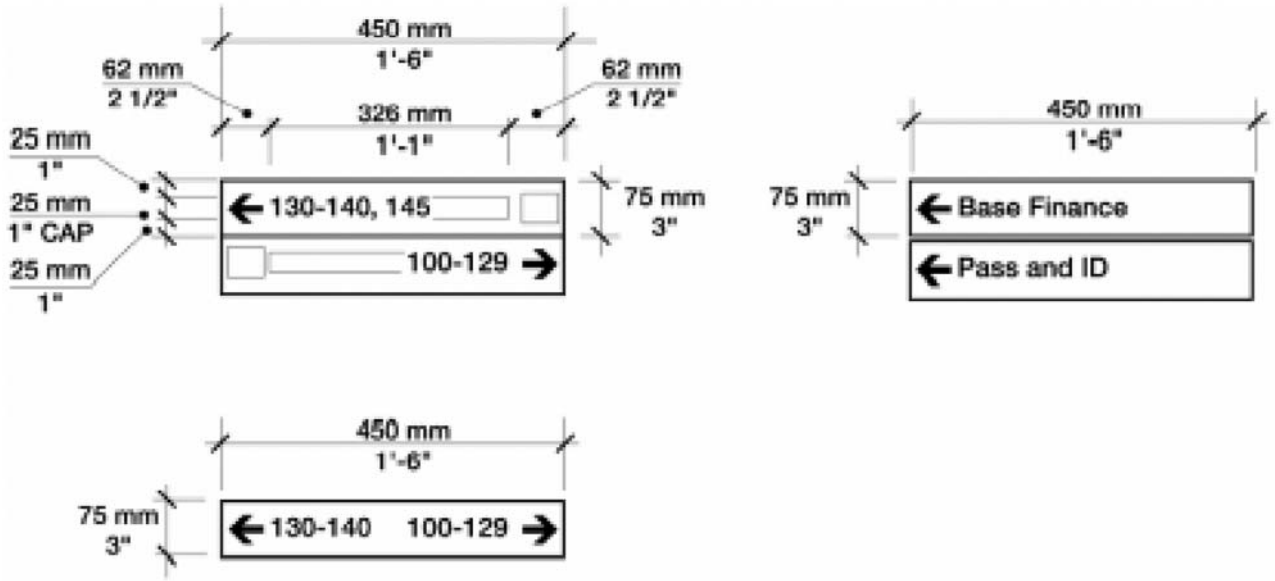


Figure 11.17. Direction Sign Type CC2 Layout.



11.16. Regulation Signs Types DD1 and DD2.

11.16.1. Standards. There are many regulation signs required for use in Air Force buildings. Air Force standards for safety signs are contained in AFOSH 9166, General Industrial Operations, and are updated by the Air Force Safety Center (AFSC/SEGS).

11.16.2. Locations. These signs should be located where specific warning or prohibitive information is required. The Type DD1 sign should be located in open areas (such as hangars or workshops), and the Type DD2 sign should be located in offices, labs and corridors.

11.16.3. Message. If the symbol on the Type DD2 sign needs reinforcement by a word message for clarity, use the sign layout for the Type BB7 sign. See Figure 11.14.

11.16.4. Regulation Signs Types DD1 and DD2 Layouts.

11.16.4.1. Colors. Symbols - black symbol and standard red circle with bar on white background.

11.16.4.2. Type DD1 Sign Dimensions. 225 mm x 225 mm (9" x 9").

11.16.4.3. Type DD1 Sign Symbol. 187 mm x 187 mm square (7 ½ " x 7 ½ ").

11.16.4.4. Type DD2 Sign Dimensions. 150 mm x 150 mm (6" x 6").

11.16.4.5. Type DD2 Sign Symbol. 125 mm x 125 mm square (5" x 5").

11.17. Bulletin Boards Sign Type EE1.

11.17.1. Usage. Bulletin boards are used to display many kinds of information, including notices, regulations, memoranda, and posters to promote worthwhile causes and advertise special events.

11.17.2. Appearance. The appearance of a bulletin board is completely dependent on the visual quality and organization of the materials mounted on it. The unit commander or the person in charge of maintaining the bulletin board must insist that materials are kept current and neatly arranged.

11.17.3. Description. The Type EE1 bulletin board consists of a permanent header panel with a general title, such as “Notices” or “Information”, and a cork panel for bulletins and announcements.

11.17.4. Colors. Colors to coordinate with building interior color scheme.

- Header panel - white letters on dark background.
- Cork panel - muted tone to coordinate with building interior color scheme.

11.17.5. Dimensions. 900 mm x 1 800 mm (3’- 0” x 6’- 0”).

11.17.6. Typography. Heading - upper and lower case Helvetica medium, 50 mm (2") capital letter height, flush left.

Figure 11.18. Placement of Regulation Signs Types DD1 and DD2.

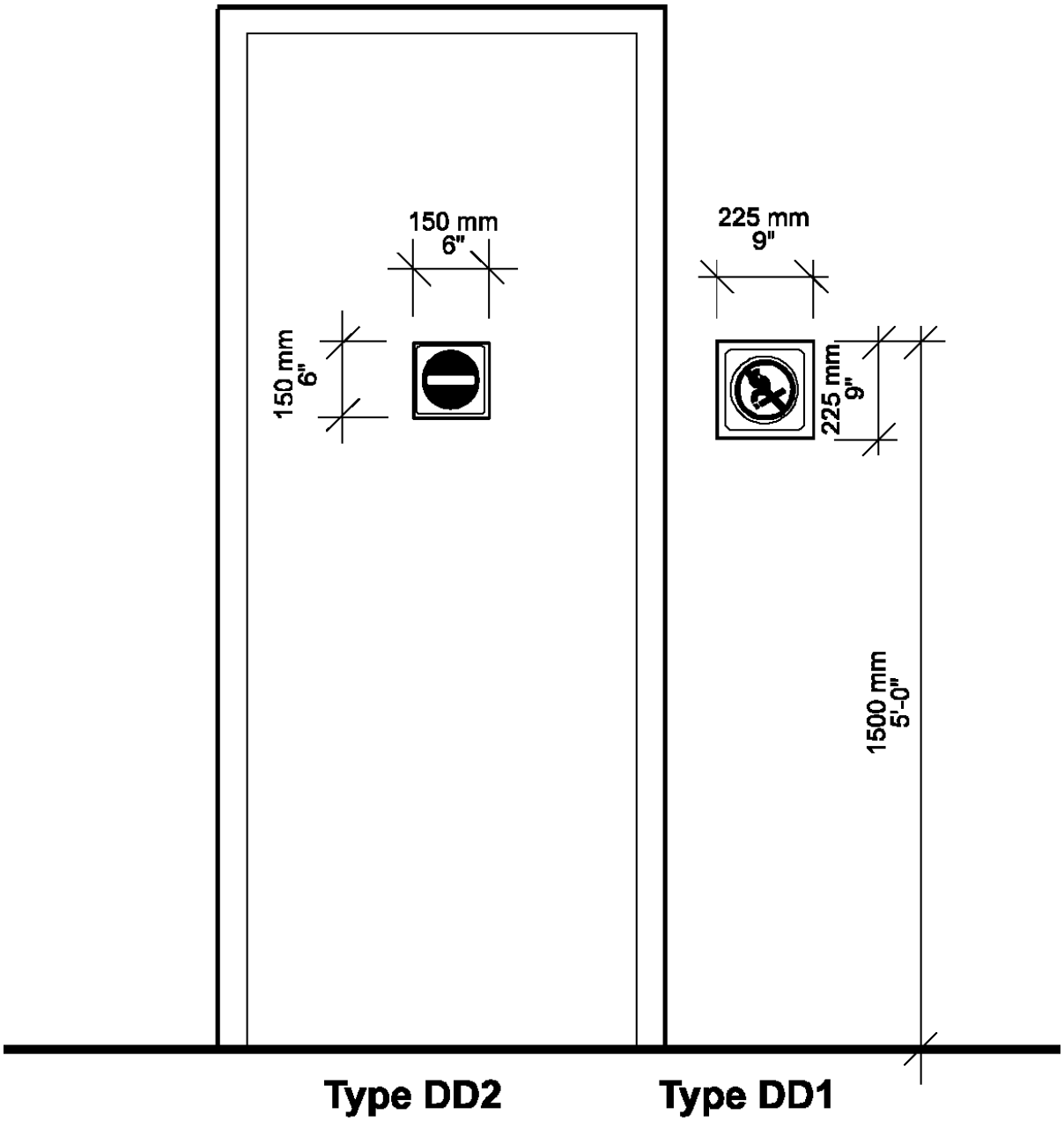


Figure 11.19. Regulation Signs Types DD1 and DD2 Layouts.

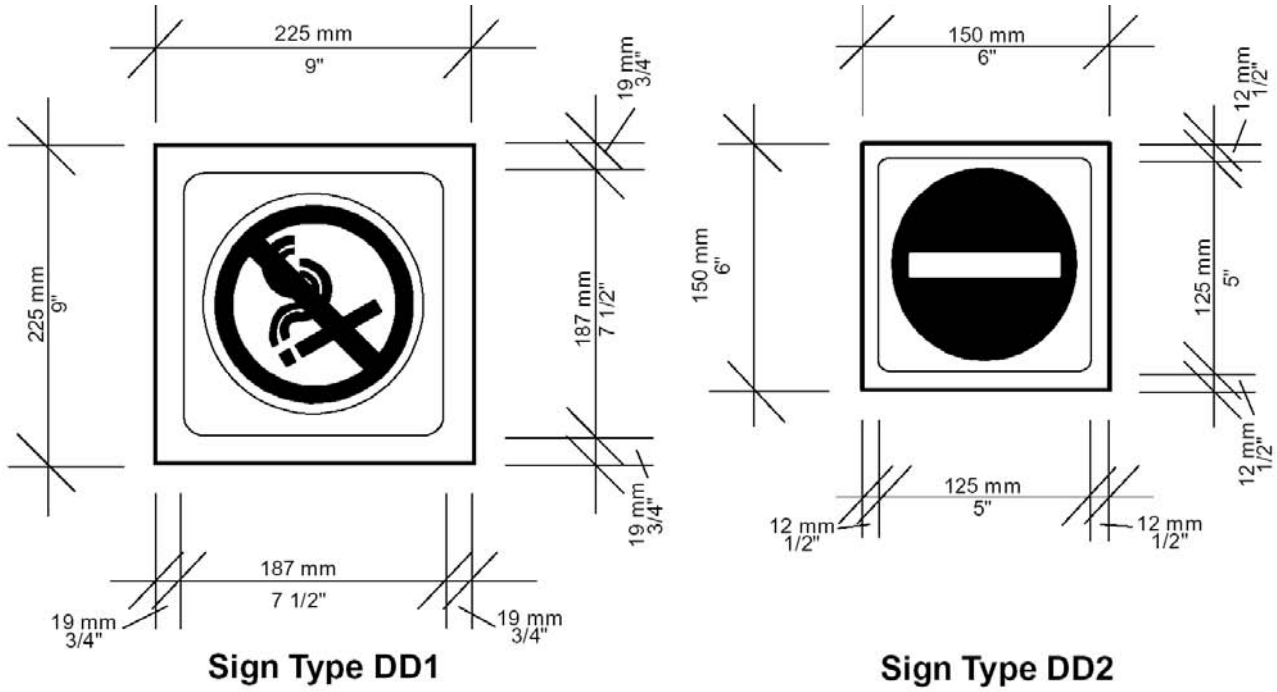


Figure 11.20. Placement of Bulletin Board Type EE1.

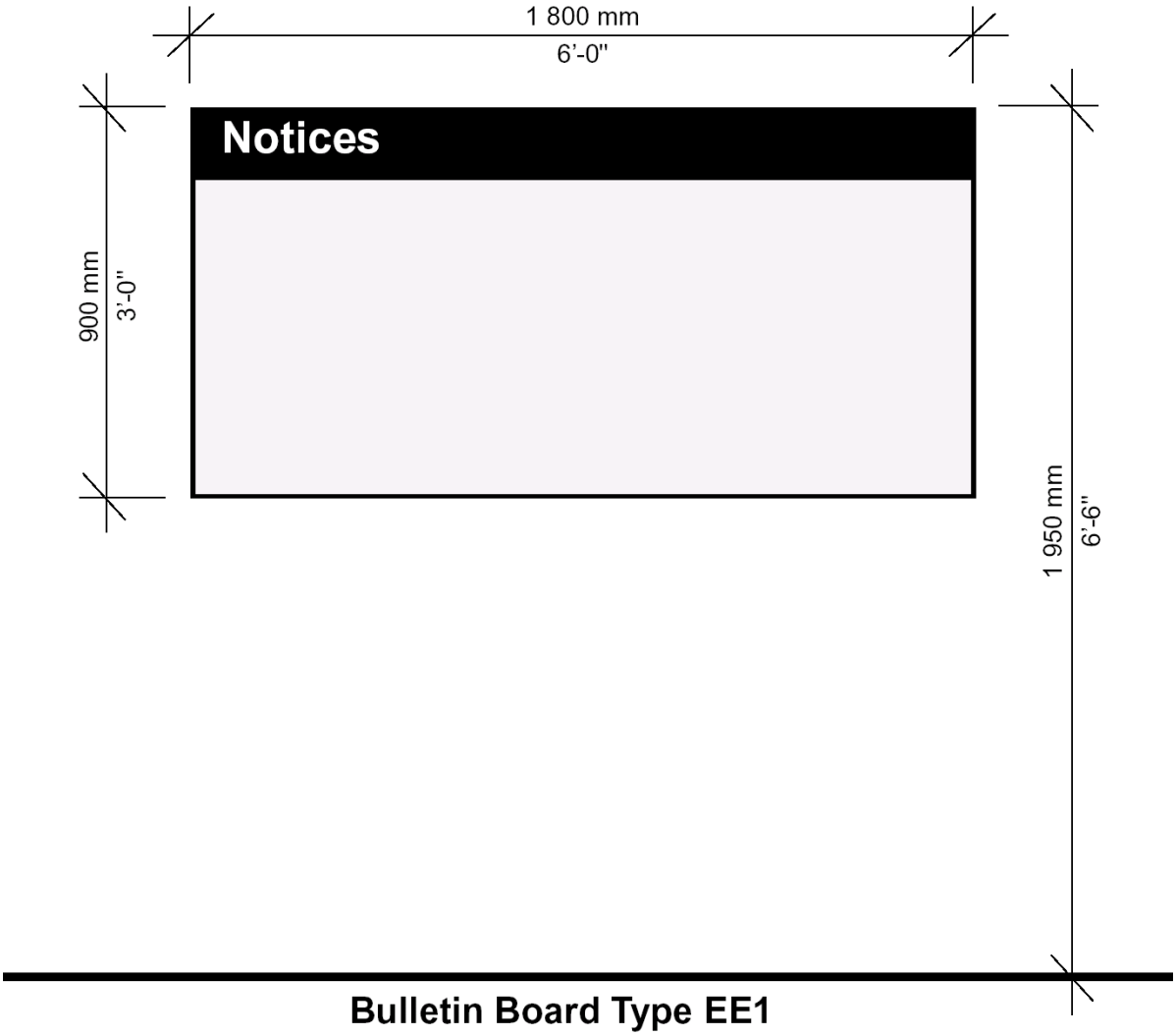
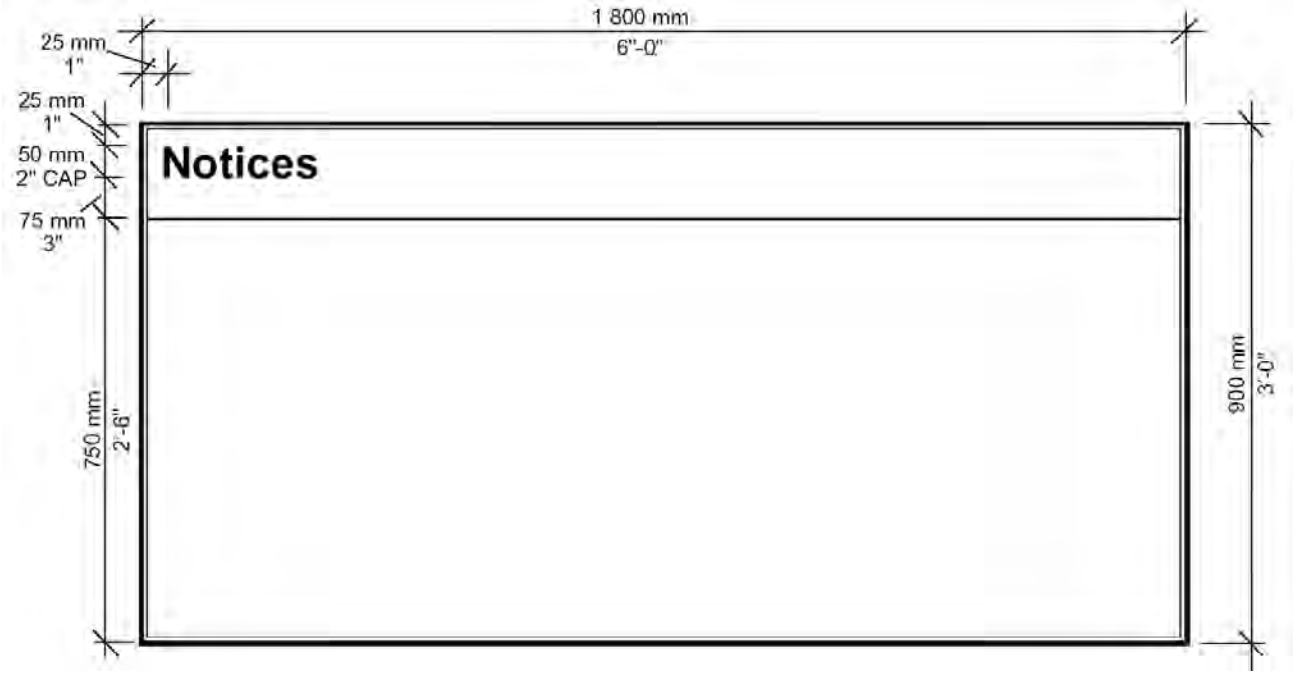


Figure 11.21. Bulletin Boards Sign Type EE1.



APPENDIX DD:

Government Field Office Trailer Requirements

[redacted]

SECTION 01 52 00.00 44

GOVERNMENT FIELD OFFICE

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.

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI 700	ARI 700 (1999; Apx C) Specifications for Fluorocarbon and Other Refrigerants

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

IESNA RP-1	(1993) Office Lighting

INTERNATIONAL CODE COUNCIL (ICC)

ICC Building Code	(2000) International Building Code

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROICEDURES:

SD-03 Product Data

Government Field Office; G.

Provide manufacturer catalog data, specifications, and shop drawings for approval, verifying all dimensions, fixtures and equipment. Note all deviations on drawings.

1.3 ANCILLARY RESPONSIBILITY

All work in this Section is considered as an ancillary responsibility of the Contractor and no separate payment will be made for it.

PART 2 PRODUCTS

2.1 GOVERNMENT FIELD OFFICE

The Contractor shall furnish and set up complete, including tie-downs and connection to existing utilities, ready to use at the project site and in a location designated by the Contracting Officer, an office for use by the

Government during the life of the Contract. The project office shall be a relocatable modular building or trailer, be weatherproof, have a minimum floor size of 14 feet by 40 feet, have two offices, common area, conference room, and toilet facilities. Provide a connecting door between the two rooms and exterior doors for each room, sufficient number of adjustable windows for each room for adequate light and ventilation, and a battery-operated smoke detector alarm for each room. Conference room shall be large enough for the conference table and 10 chairs and the equipment specified below. The offices and conference room shall have interior doors to the common area. Space shall include heat, electric power, telephone, lighting, plumbing, air conditioning, and high speed broad band internet service from a local cable provider. Equip with hot water heater, overhead lighting in accordance with IESNA RP-1 standards, and have adequate air conditioning, heating, and potable water supply. The walls and ceiling of the project office shall be insulated and the interior and exterior walls shall be of a prefinished material. The building shall be constructed of wood, metal or other acceptable construction materials and shall be designed in accordance with the ICC Building Code. The windows and doors shall be screened and the doors provided with dead bolt type locksets. Exterior door hinge pins shall be non-removable. The windows shall be operable and be securely fastened from the inside. Glass panels in windows shall be protected by bars or heavy mesh screens to prevent easy access to the building through these panels. In warm weather, air conditioning capable of maintaining the office at 50 percent relative humidity and a room temperature 20 degrees F below the outside temperature when the outside temperature is 95 degrees F, shall be furnished. If window-style air conditioner(s) is used, the refrigerant shall be one of the fluorocarbon gases that is in accordance with ARI 700 and has an Ozone Depletion Potential (ODP) of less than or equal to 0.05. Provide a mail slot in the door or a lockable mail box mounted on the surface of the door.

Equip the office with the following:

- The trailer shall be compete with 2 each - Two-line telephone with speaker phone, memory buttons, voice mail, and conference call ability; 2 each telephone lines with dual line jacks in each of the two offices and one in the conference room, wired so that one line can be used for a computer as well as voice);

- Operable window mini blinds;

- Water cooler/bottled water dispenser with chiller and heated water with a paper cup holder and a continuous supply of paper cups.

Conference Room:

- conference table with minimum 10 chairs
- lockable supply locker for office supplies
- bookcase (minimum 60 inches tall, 32 inches wide and 15 inches deep)
- microwave (1 cu. foot)and microwave stand
- refrigerator (10 cu. ft.)
- fax machine with memory (Canon FAX-LC710 or copier with similar features)
- marker board (3 feet by 6 feet)
- projection screen
- plans table (48 inch by 30 inch work area -

minimum)

Each Office:

- desk with three drawers and middle drawer (48 inch by 30 inch work area - minimum)
- height adjustable swivel chair
- stool for plans table
- plans rack for full size plans
- 3-drawer lockable file cabinet
- small bookcase (approximately 40 inches tall, 30 inches wide and 305 mm12 inches deep)
- bulletin board or marker board (approximately 3 feet by 2.5 feet)

Common Area:

- one desk, one swivel chair, one small bookcase and one three-drawer file cabinet, type as specified above for each office.
- Combination copier, printer, and scanner connected to both office computers (unit shall have features similar to those of HP PSC 1610 or 2355 3-in-1 printer package or Epson Stylus All-In-One CX4600 Printer Package. Furnish cables and continuous supply of ink and paper)
- four guest chairs
- digital camera (such as Kodak Easy Share Model Z612, 6 megapixels or higher, 12X optical zoom lens digital camera, optical image stabilization, with USB connection capability, media card capability, video capture, image downloading software and compatible software to view and print pictures, and two compatible 512 MB media cards)
- 3 each, removable flash drives (Lexar 1.0 GB, USB 2.0 Jump drive or equivalent) to remain the property of the Government.
- lockable supply locker for office supplies
- 2 bookcases (minimum 60 inches tall, 32 inches wide and 15 inches deep)
- coffee maker (12 cup)
- main entrance door should have a covered entrance (minimum 6 feet by 4 feet)]

Computer equipment and software, including printers, copiers, fax machines, scanners, cameras, etc., shall be new and covered by standard manufacturer's warranty. Facsimile machines and copier machines shall also be new and covered by manufacturer's standard warranty plus a service/repair contract for the duration of this contract.

2.1.1 Manufacturer

Manufacturer shall be regularly engaged in the construction and on-site erection of relocatable modular buildings or trailers.

2.1.2 Utilities

Exterior utilities shall be permanently installed to the modular unit and connected with existing utilities. Exposed utilities shall be insulated to prevent freezing. Utilities shall be connected and disconnected in accordance with local codes and to the satisfaction of the Contracting Officer. Contractor shall be responsible for the cost of all utility usage

at the Government trailer, including monthly service charges for telephone and Digital Service Lines for each computer. The contractor shall provide a Digital Service Line separate with a stand alone connection for the sole use of the Government.

2.1.3 Vehicular Access and Parking

The Contractor shall provide improved access road and parking area for 5 vehicles adjacent to the Government Field Office.

PART 3 EXECUTION

3.1 ERECTION

Erect the building in accordance with building manufacturer's written recommendations at a location designated by the Contracting Officer. Securely anchor trailer(s) to the ground at all four corners to guard against movement during high winds. Water and weather proof the unit and make ready for use within 15 days after Contract Notice to Proceed.

3.2 JANITORIAL SERVICES

Provide daily janitorial services, trash collection, and building maintenance, including paper cups, toilet paper, paper towels, etc, and all necessary cleaning supplies during the life of the Contract.

3.3 MAINTENANCE AND REPAIR

The Contractor shall be responsible for maintenance and repair of the office during the life of the Contract.

3.4 RELOCATION

The Contractor shall be responsible for relocating the Government Field Office should it be required to accommodate the sequence of construction. The relocation will be at no expense to the Government.

3.5 OWNERSHIP AND DISPOSITION

The office, including all furniture and equipment, shall remain the property of the Contractor at completion of the construction. The Contractor shall remove the unit and all associated equipment and utilities after the Government vacates the office. The Government reserves the right to delay vacating the office premises for up to 21 days following final acceptance of completed construction.

-- End of Section --

APPENDIX EE:

Section 00 73 00 Attachments and Forms

STANDING OPERATING PROCEDURE
No. MNT 02-04

Directorate of Public Works
III Corps and Fort Hood, TX
Fort Hood, TX 76544-5028

PROCEDURE FOR RECEIPT OF MECHANICAL KEYS FROM CONTRACTORS

~ MAY 2005 ~

1. PURPOSE: To outline the procedure to perform all contracting and credit card purchases for installation of locking devices or duplicating key requirements.

2. OBJECTIVE: To provide a simplified procedure to facilitate lock and key control at Fort Hood.

3. APPLICABILITY: This Standard Operating Procedure (SOP) is applicable to Contractors, Contracting Officer Representatives (COR) and Corps of Engineer personnel. The SOP applies to all types of locks/keys used on Fort Hood Real Property facilities except for "card reader" (plastic) type locks and keys. Card reader and cardkey operations are covered under separate SOP.

4. RESPONSIBILITIES

A. Existing Facilities

(1) Contractors. Directorate of Public Works (DPW) and Corps of Engineer personnel will provide keys that match the key codes and hardware in all existing facilities where locking mechanisms are being installed or replaced.

(2) For contract orders that do not require total replacement of the locking system for a facility, the appropriate facility key codes will be obtained from the DPW Lock Shop located in building 4208. The purpose of this requirement is to ensure that new or replacement keys are compatible with the respective existing building key system(s).

(3) There will be five keys provided consisting of four facility manager keys and one key to be used as a board key by the DPW Lock Shop. The keys will be marked as specified in paragraph 5 below.

(4) The contractor will provide an updated key schedule and building floor plan through the Contracting Officer Representative (COR) or Corps of Engineers representative to the Real Property office located in building 4612 before an action can be completed for payment for completion of contract and/or services. The floor plan will be in one-half print size drawing or larger. Key designations will be legible to the eye.

(5) Mechanical/electrical/utility rooms are keyed with a 3-1 keyed core. The Lock Shop will provide 3-1 keys to the contract COR for the use by the contractor until contract completion.

If the project contract adds one or more mechanical/electrical/utility rooms to the building(s), the contractor will provide required L keyway blank cores to the project COR. The COR will provide the blank cores to the Lock Shop and submit a service order request to Work Services for the Lock Shop to have the new cores pinned to 3-1 keys. The COR will insure that all 3-1 locks are installed and working properly.

B. New Facilities.

(1) Contractors, DPW and Corps of Engineer personnel will provide keys, key schedules, key codes, hardware list and floor plans for all facilities where locking mechanisms are being installed. This will occur no later than 30 days prior to turn over of facility to DPW. It the 30 days suspense cannot be met the COR will negotiate a new suspense with Real Property.

(2) Locks will be keyed in sets or subsets as scheduled by contract specifications. The following types and amounts of keys will be provided:

(a) Five change keys per lock set provided for each room door and each entry and/or exit door in the facility. The five keys will consist of four facility manager keys (in one envelope or on one key ring) for Real Property and one key (in one envelope or on one key ring) to be used as a board key by the DPW Lock Shop.

(b) Twelve master keyed sets (master, grandmaster and/or great grandmaster key(s) as appropriate for use by the DPW Lock Shop and by Emergency Services (Fire Department).

(c) Six control/core keys will be provided by for use by the DPW Lock Shop.

(d) The keys will be marked as specified in paragraph 5 below.

(3) The contractor will maintain secure control of all keys until turned over to Real Property.

(4) Keys, key schedules, key codes, hardware list and floor plans will be provided through the COR to Real Property located in building 4612 before any action can be completed for Final payment.

(5) The keys are to be provided to Real Property the day of final inspection and acceptance of the new facility.

APPENDIX P

STANDING OPERATING PROCEDURE
No. MNT 02-04

Directorate of Public Works
III Corps and Fort Hood, TX
Fort Hood, TX 76544-5028

(6) The Project COR will be responsible for turning in all keys, key schedules, bitting codes, and facility floor plans as referenced in paragraph 4.B.(1) above to DPW Real Property. This must occur before final payment is made to the Contractor.

(7) Locks shall be Grade #1 with 7 pin interchangeable cores (IC) Falcon brand or equal.

5. KEY MARKING:

A. "US GOVERNMENT/DO NOT DUPLICATE" will be marked on keys provided.

B. The four Facility Manager keys will be marked with the building code and room number. (See enclosure 1).

C. The DPW Lock Shop board key will be marked with the facility number and room number. The board key will not be marked with the code of the facility/building. (See enclosure 2).

D. The 12 Master keys will be marked with building number, building code and an "M" (Master), "GM" (Grandmaster) or "GGM" (Great Grandmaster) as applicable.

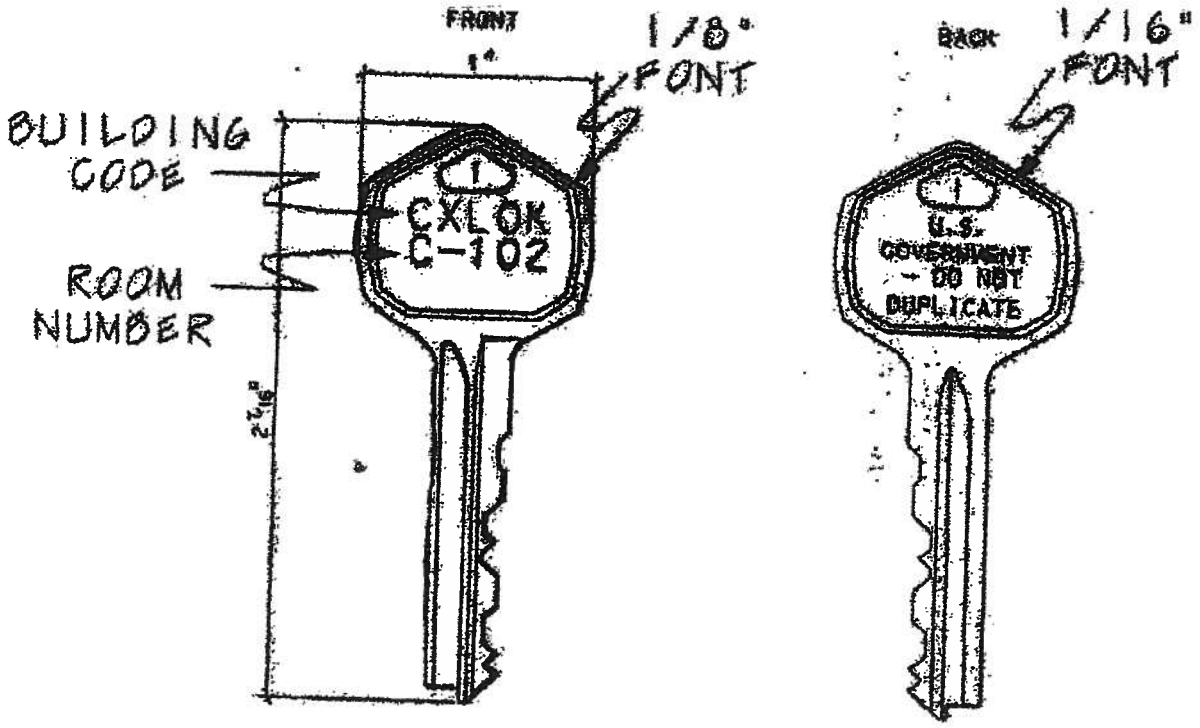
E. The six core keys will be marked with building number, building code, and a "C".

F. Key markings will be between 1/16 inch and 1/8 inch and be legible to the eye.

Encls

RODERICK A. CHISOLM
Director of Public Works

CF:
All DPW Divisions



CHANGE KEY

FOUR EACH PER LOCK

Construction Materials Testing Frequencies

Soils:

Building Pads----1 test per 2000 square feet for subgrade and select/non-expansive fill using other than hand operated equipment

---- 1 test per 500 square feet for subgrade and select/nom-expansive fill using hand operated equipment

-----Moisture density curve, atterberg limits and classification for each different material

-----When using nuclear density gauges to determine density, check tests (sand cone) will be taken for the first five tests and every fifth test thereafter.

----- 6 inch compacted tests.....92% compaction (ASTM 1557 Method C)

----- Non-expansive fill: THD Item 247 Type A Grade 1 or 2 (PI < 12)

----- Select Fill: Liquid limit < 35 and PI < 20

General cut and fill areas:

------ 1 test per 2000 square yards for raw subgrade using other than hand operated equipment

------ 1 test per 500 square yards using hand operated equipment

------ 1 test per 100 linear feet in all roadways

------ Moisture density curve, atterberg limits and classification for each different material

---- 6 inch compacted lifts------90% compaction (ASTM C1557 Method C)

---- 1 test per 6 inch compacted lift on each manhole, inlet or other walls and structures

------ When using nuclear density guages, check tests (sand cone) will be taken for the 1st 5 tests and every fifth test thereafter.

Lime Stabilized Subgrade

-------Rate of application if PI < 25-------4%
PI >25<40---5%
PI>40---------6%

Lime (Cont)

-------6 inch compacted lifts
-------95% compaction of ASTM C 1557 (Method C)
-------density test—one test per 500 square yards
-------Sand cones (one for one until correlation is approved)
-------Thickness tests—one test per 500 square yards
-------Lime to be applied in slurry ONLY
--------Gradation of pulverized material shall be 60% passing the #4 sieve excluding rock
--------Lime products shall have 99.5% passing the #20 sieve and 85% passing the #100 sieve
--------in place stabilized materials materials will be curing for 7 days with bituminous materials (MC-30)

Subbase----1 density test per 1000 square yards for each 6 inch compacted lift
----THD Item 247 Type A Grade I or 2
---- Wear test < 50% loss
---- Sieve analysis—1 test per each day material delivered
---- In place sieve analysis and wear test (1test per 3000 square yards)completed base
---- Check tests (sand cone) for 1st five test and every fifth test thereafter

Aggregate base Course:
----- One density test per 500 square yards for each 6 inch compacted lift
----- Item 247 Type A Grade I
----- Wear test < 50%
-----1 sieve analysis each day material is delivered
-----1 sieve analysis and wear test per 3000 square yards of completed base
-----Check test (sand cone) for 1st 5 tests and every 5th test thereafter

Utilities:
----- Initial backfill for bedding and extending a minimum of 1 foot above the pipe shall conform to ASTM D 448 size #6 stone

----- Final density---1 density test per 100 linear feet for each 6 inch compacted lift in roads, paved and traffic areas
----1 density test per 300 linear feet for each 12 inch compacted lift In grassed and turfed areas

** All testing technicians shall be NICET Level 1 Soils certified.

Concrete:

** All testing technicians shall be ACI Level I concrete field testing certified

Slumps:
Piers----------5 to 7 inch
Grade beams--- 2-4 inch
Slabs ---------- 1-3 inch
Curb and gutter/ Sidewalks –1-3 inch
** Pumped concrete---6 inch slump

All exposed concrete shall have air contents between 3-5%
Maximum concrete temperature--- 85 degrees unless retarder is used—then 90degrees

Strengths:
Piers/slabs/grade beams -----3000psi
Slabs subject to vehicular traffic----650 psi flexural strength
Curb & gutter? Sidewalks---------3500 psi
Miscellaneous structures-----3000 psi

Strength testing-----one test per 150 cubic yards or every 5000 square feet, whichever is greater

Aggregate testing –one test per week on both coarse and fine aggregate

Asphalt:

Mix gradation shall conform to THD Item 341 Type D.
Marshall method (ASTM D 1559) 50 blow shall be used for specimens
----Stability –500 (if high stability areas then 1800)
-----Flow < 16

------% voids 3-5%
-----% void filled 75-85%

The mixture shall be tested once every 200 hundred tons for:
-----gradation (extraction test ----mechanical or ignition oven allowed)
-----lab density, flow, stability
-----maximum theoretical density

Field density test shall be tested using drilled cores. Three cores per 200 tons (two mats and one joint). Cores will be used fro thickness tests also.

Density requirements---Mat density 97% of lab compacted density
---Joint density 95% of lab compacted density

Masonry:
Mortar test---one test per day (ASTM C 780)---1800 psi
Grout test----one test per day (ASTM C 39)----2000 psi
----9-11 inch slump

C&D DISPOSAL LOG

1. Contract # _____
2. Contractor _____
3. Vehicle # _____

DATE	DESCRIPTION OF DEBRIS	BLDG#	DRIVER	WEIGHT	RECEIVER

All printed copies are uncontrolled documents

N

LANDFILL

Special Waste such as dead animals, regulated and non-regulated asbestos containing material, lead-based paint are accepted with manifest from DPW Classification Unit.
All Municipal Solid Waste

SCALE

NEW DIRT ROAD

M-F 0730-1630; Sat 0730-1330. Loads must be tarped and completely contained in the vehicle to obtain entrance into the landfill. Contractor must have Contract # and Bldg # to provide to the scale operator.

GO TO SCALE 1ST

IMMU

SOIL, SAND, ROCK, CLEAN MASONRY, BRICK, CONCRETE (NO PROTRUDING REBAR), ASPHALT

SEE BACK OF SHEET

TURKEY RUN ROAD

TANK DESTROYER BLVD

CLARKE ROAD

CLEAR CREEK

79TH STREET

GO TO SCALE 1ST

HARD WOOD

CEDAR, OAK, OTHER TREES. MUST BE SEPARATED. TREES MUST BE CUT 8' OR SHORTER. NO ROOT BALLS.

GO TO SCALE 1ST

COMPOST

YARD WASTE, TRIMMINGS, MANURE, LIMBS, LEAVES, SHRUBS, UNTREATED LUMBER. LUMBER MUST BE CUT 8' OR SHORTER. NO METAL PIECES EXCEPT FOR SMALL NAILS AND SCREWS.

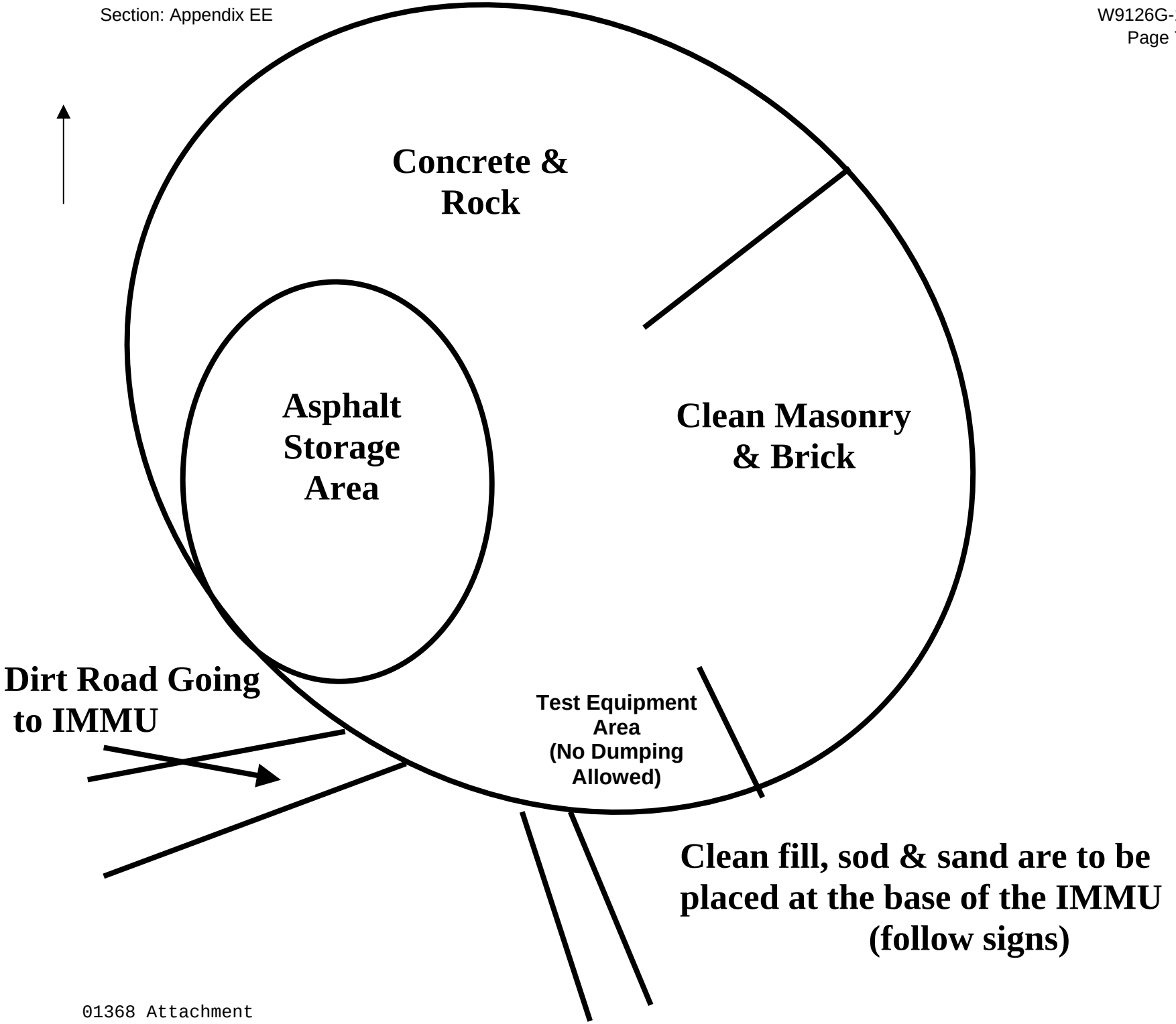
FORT HOOD RECYCLE CENTER BLDG #4621. Located at 65th and Railhead Dr., 287-6732. M-F 0730-1600 Center accepts cardboard, paper, metal, useable pallets. **NOT SHOWN.**

DRMO: BLDG # 4286. Located at 80th and Tank Destroyer, 287-2723. M-TH 0730-1300. DRMO accepts tires, white goods, lead acid batteries and engine and machine parts. Appointment only facility. **NOT SHOWN.**

DPW CLASSIFICATION UNIT: BLDG #1345. Located at 37th and North Ave, 288-7627. M-TH 0730-1630 Unit accepts regulated wastes such as liquids, florescent light bulbs, paints, solvents and oil filters. Appointment only facility. **NOT SHOWN.**

WFH GATE

79TH GATE


Concrete &
Rock
Asphalt
Storage
Area
Clean Masonry
& Brick
Dirt Road Going
to IMMU
Test Equipment
Area
(No Dumping
Allowed)
Clean fill, sod & sand are to be
placed at the base of the IMMU
(follow signs)

Proposed Project Emissions Inventory Questionnaire for New Sources

Indicate proposed source type and complete required information.
Complete separate questionnaire sheet for each proposed project.

Requestor: _____ Date: _____ Phone: _____
Project # _____
Facility Name / Building Number: _____
Descriptive Name of Facility: _____
Location of Facility: UTM Zone: 14 Horizontal Coordinate _____E
Vertical Coordinate _____N

ENV Use Only

Received on _____ for submittal in _____ Permit

AUTHORIZATION TO PROCEED WITH CHANGE
Authorized by: _____ Title: _____
Signature: _____ Date: _____

AUTHORIZATION FOR STARTUP
Authorized by: _____ Title: _____

DEGREASERS (Covered by 30 Texas Administrative Code (TAC) 106.454)

- Attach MSDS of proposed degreaser solvent
- Degreaser Type: Parts Cleaner / Paint Gun Cleaner (circle one)
- Make_____Model_____Serial #_____
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons/year

DEGREASERS

- Attach MSDS of proposed degreaser solvent
- Degreaser Type: Parts Cleaner / Paint Gun Cleaner (circle one)
- Make_____Model_____Serial #_____
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons/year

DEGREASERS

- Attach MSDS of proposed degreaser solvent
- Degreaser Type: Parts Cleaner / Paint Gun Cleaner (circle one)
- Make_____Model_____Serial #_____
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons/year

Proposed Project Emissions Inventory Questionnaire for New Sources (p.2)

INTERNAL COMBUSTION UNITS (I.E. GENERATORS, ENGINE TEST CELLS)
(Covered by 30 TAC 106.511 and 30 TAC 106.261)

- Power Rating: _____kw
- Engine Horsepower: _____
- Make_____Model_____Serial #_____
- Fuel Type: MUR / Diesel / JP8 / Natural Gas / Propane / Other_____ (circle one)
- Integrated Fuel Tank Capacity: _____gallons
- Associated Fuel Tank(s): YES / NO (circle one) Complete Separate Questionnaire for Each Tank
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____

INTERNAL COMBUSTION UNITS (I.E. GENERATORS, ENGINE TEST CELLS)

- Power Rating: _____kw
- Engine Horsepower: _____
- Make_____Model_____Serial #_____
- Fuel Type: MUR / Diesel / JP8 / Natural Gas / Propane / Other_____ (circle one)
- Integrated Fuel Tank Capacity: _____gallons
- Associated Fuel Tank(s): YES / NO (circle one) Complete Separate Questionnaire for Each Tank
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons or CuFt/ year

INTERNAL COMBUSTION UNITS (I.E. GENERATORS, ENGINE TEST CELLS)

- Power Rating: _____kw
- Engine Horsepower: _____
- Make_____Model_____Serial #_____
- Fuel Type: MUR / Diesel / JP8 / Natural Gas / Propane / Other_____ (circle one)
- Integrated Fuel Tank Capacity: _____gallons
- Associated Fuel Tank(s): YES / NO (circle one) Complete Separate Questionnaire for Each Tank
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons or CuFt/ year

Proposed Project Emissions Inventory Questionnaire for New Sources (p.3)

REFRIGERATION EQUIPMENT (I.E. AIR CONDITIONING SYSTEM, FREEZER)
(Covered by 30 TAC 106.103)

- Power Rating: _____kw
- Unit Type: Chiller / Direct Expansion / Geothermal / Other_____
- Number of compressors: _____
- Make_____Model_____Serial #_____
- Refrigerant Type: R-22 / R-134a / R-404 / Other_____ (circle one or write in)
- Amount of Charge:_____ lbs; Initial Charge Date:_____/_____/_____
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year_____

REFRIGERATION EQUIPMENT (I.E. AIR CONDITIONING SYSTEM, FREEZER)

- Power Rating: _____kw
- Unit Type: Chiller / Direct Expansion / Geothermal / Other_____
- Number of compressors: _____
- Make_____Model_____Serial #_____
- Refrigerant Type: R-22 / R-134a / R-404 / Other_____ (circle one or write in)
- Amount of Charge:_____ lbs; Initial Charge Date:_____/_____/_____
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time hours/day days/week weeks/year

REFRIGERATION EQUIPMENT (I.E. AIR CONDITIONING SYSTEM, FREEZER)

- Power Rating: _____kw
- Unit Type: Chiller / Direct Expansion / Geothermal / Other_____
- Number of compressors: _____
- Make_____Model_____Serial #_____
- Refrigerant Type: R-22 / R-134a / R-404 / Other_____ (circle one or write in)
- Amount of Charge:_____ lbs; Initial Charge Date:_____/_____/_____
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year_____

Proposed Project Emissions Inventory Questionnaire for New Sources (p.4)

FUEL STORAGE TANKS

(Covered by 30 TAC 115.473 , 30 TAC 106.478 and 30 TAC Chap 115)

- Fuel Type: MUR / Diesel / JP-8 / Propane / Other _____ (circle one)
- Tank Type: Aboveground / Underground (circle one)
- Vapor Control Equipped: YES / NO (circle one)
- Tank Volume: _____gallons
- Tank Dimensions: Dia _____Length_____Height_____ Color: _____
- Tank Type: Horizontal Fixed Roof / Vertical Fixed Roof / Internal Floating Roof / Pressure Tank External Floating Roof / Underground Tank
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year_____
- Normal Operating Rate: _____gallons/year
- Maximum Operating Rate: _____gallons/hour

FUEL STORAGE TANKS

- Fuel Type: MUR / Diesel / JP-8 / Propane / Other _____ (circle one)
- Tank Type: Aboveground / Underground (circle one)
- Vapor Control Equipped: YES / NO (circle one)
- Tank Volume: _____gallons
- Tank Dimensions: Dia _____Length_____Height_____ Color: _____
- Tank Type: Horizontal Fixed Roof / Vertical Fixed Roof / Internal Floating Roof / Pressure Tank External Floating Roof / Underground Tank
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year_____
- Normal Operating Rate: _____gallons/year
- Maximum Operating Rate: _____gallons/hour

FUEL STORAGE TANKS

- Fuel Type: MUR / Diesel / JP-8 / Propane / Other _____ (circle one)
- Tank Type: Aboveground / Underground (circle one)
- Vapor Control Equipped: YES / NO (circle one)
- Tank Volume: _____gallons
- Tank Dimensions: Dia _____Length_____Height_____ Color: _____
- Tank Type: Horizontal Fixed Roof / Vertical Fixed Roof / Internal Floating Roof / Pressure Tank External Floating Roof / Underground Tank
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year_____
- Normal Operating Rate: _____gallons/year
- Maximum Operating Rate: _____gallons/hour

Proposed Project Emissions Inventory Questionnaire for New Sources (p.5)

FUEL DISPENSING UNITS (Covered by 30 TAC 106.412)

- Fuel Type: MUR / Diesel / JP-8 / Other _____ (circle one)
- Dispensing Type: Retail / Bulk (circle one)
- Vapor Control Equipped : YES / NO (circle one)
- Dispenser Pump Capacity: _____ gallons/minute
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons/year

FUEL DISPENSING UNITS

- Fuel Type: MUR / Diesel / JP-8 / Other _____ (circle one)
- Dispensing Type: Retail / Bulk (circle one)
- Vapor Control Equipped : YES / NO (circle one)
- Dispenser Pump Capacity: _____ gallons/minute
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons/year

FUEL DISPENSING UNITS

- Fuel Type: MUR / Diesel / JP-8 / Other _____ (circle one)
- Dispensing Type: Retail / Bulk (circle one)
- Vapor Control Equipped : YES / NO (circle one)
- Dispenser Pump Capacity: _____ gallons/minute
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons/year

FUEL DISPENSING UNITS

- Fuel Type: MUR / Diesel / JP-8 / Other _____ (circle one)
- Dispensing Type: Retail / Bulk (circle one)
- Vapor Control Equipped : YES / NO (circle one)
- Dispenser Pump Capacity: _____ gallons/minute
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons/year

Proposed Project Emissions Inventory Questionnaire for New Sources (p.6)

WELDING OPERATIONS (Covered by 30 TAC 106.227)

- Attach approved MSDS of each welding rod type used in process
- Make_____Model_____Serial #_____
- Particulate Matter Control Efficiency of hood (if available): _____%
- Exhaust Fan Ventilation Rate :_____scfm
- Acetylene on hand: _____lbs of gas
- Oxygen on hand: _____ lbs of gas
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____# of rods/year

WELDING OPERATIONS

- Attach approved MSDS of each welding rod type used in process
- Make_____Model_____Serial #_____
- Particulate Matter Control Efficiency of hood (if available): _____%
- Exhaust Fan Ventilation Rate :_____scfm
- Acetylene on hand: _____lbs of gas
- Oxygen on hand: _____ lbs of gas
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____# of rods/year

WELDING OPERATIONS

- Attach approved MSDS of each welding rod type used in process
- Make_____Model_____Serial #_____
- Particulate Matter Control Efficiency of hood (if available): _____%
- Exhaust Fan Ventilation Rate :_____scfm
- Acetylene on hand: _____lbs of gas
- Oxygen on hand: _____ lbs of gas
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____# of rods/year

Proposed Project Emissions Inventory Questionnaire for New Sources (p.7)

EXTERNAL COMBUSTION UNITS (Boilers, Hotwater Heaters, Process Heaters)
(Covered by 30 TAC 106.102 and 30 TAC 106.183)

- Fuel Type: Natural Gas / Boiler Fuel / Diesel (circle one)
- Make_____Model_____Serial #_____
- MMBTU Input Rating of Equipment: _____
- Height of Stack: _____Diameter of Stack: _____
- Stack Exhaust Velocity: _____ft / sec
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons/year

EXTERNAL COMBUSTION UNITS (Boilers, Hotwater Heaters, Process Heaters)

- Fuel Type: Natural Gas / Boiler Fuel / Diesel (circle one)
- Make_____Model_____Serial #_____
- MMBTU Input Rating of Equipment: _____
- Height of Stack: _____Diameter of Stack: _____
- Stack Exhaust Velocity: _____ft / sec
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons/year

EXTERNAL COMBUSTION UNITS (Boilers, Hotwater Heaters, Process Heaters)

- Fuel Type: Natural Gas / Boiler Fuel / Diesel (circle one)
- Make_____Model_____Serial #_____
- MMBTU Input Rating of Equipment: _____
- Height of Stack: _____Diameter of Stack: _____
- Stack Exhaust Velocity: _____ft / sec
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons/year

Proposed Project Emissions Inventory Questionnaire for New Sources (p.8)

SURFACE COATING OPERATIONS (Covered by 30 TAC 106.433 , 30 TAC 106.436 or 30 TAC 116.110)

- Attach approved MSDS of each coating and solvent used in process
- Particulate Matter Control Efficiency of Booth: _____%
- Booth Air Flow Rate:_____scfm
- Transfer Efficiency of Paint Gun: _____%
- Number of Paint Guns: _____
- Associated Heater: YES / NO (circle one) Complete Separate Questionnaire for Each Heater
- Associated Gun Cleaner: YES / NO (circle one) Complete Separate Questionnaire for Each Cleaner
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons/year (each coating and solvent)

SURFACE COATING OPERATIONS

- Attach approved MSDS of each coating and solvent used in process
- Particulate Matter Control Efficiency of Booth: _____%
- Booth Air Flow Rate:_____scfm
- Transfer Efficiency of Paint Gun: _____%
- Number of Paint Guns: _____
- Associated Heater: YES / NO (circle one) Complete Separate Questionnaire for Each Heater
- Associated Gun Cleaner: YES / NO (circle one) Complete Separate Questionnaire for Each Cleaner
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons/year (each coating and solvent)

SURFACE COATING OPERATIONS

- Attach approved MSDS of each coating and solvent used in process
- Particulate Matter Control Efficiency of Booth: _____%
- Booth Air Flow Rate:_____scfm
- Transfer Efficiency of Paint Gun: _____%
- Number of Paint Guns: _____
- Associated Heater: YES / NO (circle one) Complete Separate Questionnaire for Each Heater
- Associated Gun Cleaner: YES / NO (circle one) Complete Separate Questionnaire for Each Cleaner
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____gallons/year (each coating and solvent)

Proposed Project Emissions Inventory Questionnaire for New Sources (p.9)

BRAKE REPAIR OPERATIONS (Covered by 30 TAC 106.261 and 30 TAC 106.262)

- Attach approved MSDS of each welding rod type used in process
- Make_____Model_____Serial #_____
- Particulate Matter Control Efficiency of hood (if available): 1st Stage _____%; 2nd Stage_____%
- Exhaust Fan Ventilation Rate :_____scfm
- Acetylene on hand: _____lbs of gas
- Oxygen on hand: _____ lbs of gas
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____# of Brakes Repaired/year

BRAKE REPAIR OPERATIONS

- Attach approved MSDS of each welding rod type used in process
- Make_____Model_____Serial #_____
- Particulate Matter Control Efficiency of hood (if available): 1st Stage _____%; 2nd Stage_____%
- Exhaust Fan Ventilation Rate :_____scfm
- Acetylene on hand: _____lbs of gas
- Oxygen on hand: _____ lbs of gas
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____# of Brakes Repaired/year

BRAKE REPAIR OPERATIONS

- Attach approved MSDS of each welding rod type used in process
- Make_____Model_____Serial #_____
- Particulate Matter Control Efficiency of hood (if available): 1st Stage _____%; 2nd Stage_____%
- Exhaust Fan Ventilation Rate :_____scfm
- Acetylene on hand: _____lbs of gas
- Oxygen on hand: _____ lbs of gas
- Seasonal Operating Percentage for This Emission Point:
  Spring _____% Summer _____% Fall _____% Winter _____% Note: Total Must Equal 100%
- Normal Operating Schedule: Start Time_____hours/day _____days/week _____weeks/year____
- Normal Operating Rate: _____# of Brakes Repaired/year

Proposed Project Emissions Inventory Questionnaire for New Sources (p.10)

ENV Use Only

FIN, EPN and CIN determination comes from Emissions Inventory Guidelines

FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____
FIN # _____	EPN #_____	CIN #_____

HVAC Service/Maintenance Report Log

Building Number_____ Appliance/Unit Serial Number _____ Total Installed Charge _____
Maximum Allowable Annual Leakage Rate[1] _____

Date	Service / Maintenance Action	Technician	Refrigerant Added (lbs)	Refrigerant Removed (lbs)	Loss Due To[2] Accidental Venting (lbs)	Net Leakage[3] (lbs)	Annualized Leakage Rate[4] (%)	Leak Repaired (Yes/No/NA)	Comments

Notes:
1. Maximum Annual Leakage = 35% (Refrigeration) or 15% (Air Conditioning).
2. Each time an accidental or unintentional release occurs, the technician must document the release on an accidental/unintentional release form (Attachment (2)).
3. Net Leakage (lb) Since Last Charging = Refrigerant Added (lb) Since Last Charging - Refrigerant Removed (lb) Since Last Charging - Loss Due to Accidental or Unintentional Venting (lb) Since Last Charging.
4. Annualized Leakage Rate = (Net Leakage / Installed Charge) x (365 / Number of Days Since Refrigerant Last Added) x 100.

Maintain for Record Purposes for 5 Years

Accidental or Unintentional Venting Report

Date _____

Location_____

Refrigeration Unit _____

Type of Refrigerant Vented _____ Approx. How Many Pounds Were Vented _____

Description of Accidental Venting Incident _____

_____

_____

What Was the Cause of the Release? _____

_____

_____

What Precautions Have Been Taken to Prevent This from Happening Again?

_____

_____

Technician Name/Rank or Grade _____ Certification Number _____

Shop Supervisor Signature_____Date _____

Shop Supervisor Printed Name and Rank _____

Maintain for Record Purposes for 5 Years

Figure: 30 TAC §290.47(d)

Appendix D: Customer Service Inspection Certificate

Customer Service Inspection Certificate

Name of PWS _____ PWS I.D.# _____
Location of Service _____

Reason for Inspection: New construction..... ☐
Existing service where contaminant hazards are suspected ..... ☐
Major renovation or expansion of distribution facilities ..... ☐

I _____, upon inspection of the private water distribution facilities connected to the aforementioned public water supply do hereby certify that, to the best of my knowledge:

		Compliance	Non-Compliance
(1)	No direct connection between the public drinking water supply and a potential source of contamination exists. Potential sources of contamination are isolated from the public water system by an air gap or an appropriate backflow prevention assembly in accordance with Commission regulations.	☐	☐
(2)	No cross-connection between the public drinking water supply and a private water system exists. Where an actual air gap is not maintained between the public water supply and a private water supply, an approved reduced pressure-zone backflow prevention assembly is properly installed and a service agreement exists for annual inspection and testing by a certified backflow prevention assembly tester.	☐	☐
(3)	No connection exists which would allow the return of water used for condensing, cooling or industrial processes back to the public water supply.	☐	☐
(4)	No pipe or pipe fitting which contains more than 8.0% lead exists in private water distribution facilities installed on or after July 1, 1988.	☐	☐
(5)	No solder or flux which contains more than 0.2% lead exists in private water distribution facilities installed on or after July 1, 1988.	☐	☐

I further certify that the following materials were used in the installation of the private water distribution facilities:

Figure: 30 TAC §290.47(f)

Appendix F: Sample Backflow Prevention Assembly Test and Maintenance Report

The following form must be completed for each assembly tested. A signed and dated original must be submitted to the public water supplier for record keeping purposes:

BACKFLOW PREVENTION ASSEMBLY TEST AND MAINTENANCE REPORT

NAME OF PWS: _____
PWS I.D. # _____
MAILING ADDRESS _____
CONTACT PERSON _____
LOCATION OF SERVICE: _____

The backflow prevention assembly detailed below has been tested and maintained as required by TCEQ regulations and is certified to be operating within acceptable parameters.

TYPE OF ASSEMBLY

[ ] Reduced Pressure Principal
[ ] Double Check Valve
[ ] Pressure Vacuum Breaker
[ ] Reduced Pressure Principle-Detector
[ ] Double Check-Detector
[ ] Spill-Resistant Pressure Vaccum Breaker

Manufacturer_____ Size _____
Model Number_____ Located At _____
Serial Number_____

Is the assembly installed in accordance with manufacturer recommendations and/or local codes? ____

Figure: 30 TAC §290.47(f)

	Reduced Pressure Principle Assembly			Pressure Vacuum Breaker	
	Double Check Valve Assembly				
	1st Check	2nd Check	Relief Valve	Air Inlet	Check Valve
Initial Test	Held at ____ psid Closed Tight [ ] Leaked [ ]	Held at ____ psid Closed Tight [ ] Leaked [ ]	Opened at ___ psid Did not open [ ]	Opened at ___ psid Did not open [ ]	Held at ____ psid Leaked [ ]
Repairs and Materials Used					
Test After Repair	Held at ____ psid Closed Tight [ ] Leaked [ ]	Held at ____ psid Closed Tight [ ] Leaked [ ]	Opened at ___ psid	Opened at ___ psid	Held at ____ psid

Test gauge used: Make/Model_____ SN:_____ Calibration Date:_____
Remarks:_____
The above is certified to be true at the time of testing.

Firm Name _____ Certified Tester _____
Firm Address _____ Cert. Tester No. _____ Date_____
Firm Phone #_____

* TEST RECORDS MUST BE KEPT FOR AT LEAST THREE YEARS
** USE ONLY MANUFACTURER'S REPLACEMENT PARTS

APPENDIX FF:

Recommendations for Exterior Colors and Material

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT HOOD
FORT HOOD, TEXAS 76544-5000

REPLY TO ATTENTION OF

IMWE-HOD-PWM

19 April 2011

MEMORANDUM FOR Fort Worth District Corps of Engineers, U.S. Army Corps of Engineers (CESWF-PM-J/Ms. Glenna M. Wheatley), P.O. Box 17300, Fort Worth, Texas 76102-0300

SUBJECT: Recommendations for Exterior Colors and Materials, Operational Readiness Training Complex (ORTC) Project Number (PN) 65374, P2 333141, FY2012 Fort Hood, Texas

1. This memorandum is to recommend the exterior colors and materials for the Operational Readiness Training Complex (ORTC) PN 65374. The Chief of Master Planning Branch, Real Property Planning Division (RPPD) recommends the following finishes as it complies with the Fort Hood Installation Design Guide and the architectural theme of future developments on North Fort Hood.

2. Recommendations are as follow:

a. Roofs: Combination of Hip roofs, 3:12 pitch, Standing Seam Metal Roof, Galvalume color or similar, factory finished.

b. Metal awnings, and rods: 36" overhang at exterior windows extending from façade. Color to complement roof color, factory finished.

c. Fascia and soffit: Metal, factory finished, color to match Desert Sand SIG200, MBCI or similar.

d. Wall:

(1) Wainscot: Indigenous limestone full size veneer 4"-4 ½" thick, 4", 6" and 8" height, sawn top and bottom, Ashlar pattern. Blend to match 40% Cream, 30% Nicotine, 10% Grey Lueder, 10% dark Blue, 10% Shell white, up to 8'-0" height on Main Facades and up to window height on secondary facades. Hot hip galvanized ties, minimum 14 gauge, are required.

(2) Brick veneer, to match Doeskin color, ACME or similar, with natural stone, smooth finish banding above window height throughout the building.

(3) Accent Banding through the building: Limestone White color.

IMWE-HOD-PWM
SUBJECT: Recommendations for Exterior Colors and Materials, Operational Readiness Training Complex (ORTC) Project Number (PN) 65374, P2 333141, FY2012 Fort Hood, Texas

e. Exterior metal canopies at building entrances: Color and material to match roof, masonry columns at main entrance to match exterior masonry.

f. Gutters and Downspouts: Metal, DS Leader factory finished, color to match Desert Sand SIG200, MBCI or similar.

g. Splash Block: Concrete, color to be neutral.

h. Fenestration:

(1) Window frame: Shall be 2" insulated frame, clear anodized aluminum.

(2) Glazing: Tinted, light green.

(3) Window sill: Natural limestone, smooth finish.

(4) Main entrance doors: Aluminum storefront doors and frames, Architectural class 1 clear anodized aluminum, double pane, full glass. Glazing tinted light green.

(5) Secondary doors and frames: Galvanized, insulated frame and hollow metal core, color to match Desert Sand SIG200, gloss finish, MBCI or similar, with window lite where applicable.

i. Metal elements: Lighting fixtures, roof and wall ventilators shall be metal and uniform in color, galvanized or powder coated, factory finished. Mechanical louvers and grills shall be anodized aluminum, color to match exterior metal trim.

j. Dumpster enclosure: Masonry enclosure shall match Doeskin color, ACME or similar, limestone wainscot, and natural stone cap smooth finish.

k. Mechanical yard enclosure: Masonry enclosure shall include Limestone wainscot, metal louver type of fencing or similar, and natural stone cap smooth finish. Enclosure shall include a lockable gate.

l. Exterior building Number: Shall be 8"x30" 1/8-inch thick aluminum panel, 6" Black lettering on White background reflective sheeting, Diamond Grade. Sign plate placement shall be coordinated with Fort Hood DPW Master Planning.

IMWE-HOD-PWM
SUBJECT: Recommendations for Exterior Colors and Materials, Operational Readiness Training Complex (ORTC) Project Number (PN) 65374, P2 333141, FY2012 Fort Hood, Texas

m. Site sign: Shall be monument type. Masonry base shall match building limestone color blend. Brushed aluminum metal letters and color Crest. Colors shall be approved by III Corps Fort Hood Historian. Crest must be in accordance with the Institute of Heraldry.

3. Point of contact for this memorandum is Adriana Cocannouer, Architect, Master Planning Branch, Directorate of Public Works, (254) 288-2757 or adriana.cocannouer@us.army.mil

Kristina L Manning

KRISTINA MANNING
Chief, Planning Branch