



**US Army Corps  
of Engineers®**

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# Technical Instructions

## Barracks Upgrade Program

Headquarters  
U.S. Army Corps of Engineers  
Engineering and Construction Division  
Directorate of Military Programs  
Washington, DC 20314-1000



## FOREWORD

These technical instructions (TI) provide design and construction criteria and apply to all U.S. Army Corps of Engineers (USACE) commands having military construction responsibilities. TI will be used for all Army projects and for projects executed for other military services or work for other customers where appropriate.

TI are living documents and will be periodically reviewed, updated, and made available to users as part of the HQUSACE responsibility for technical criteria and policy for new military construction. CEMP-ET is responsible for administration of the TI system; technical content of TI is the responsibility of the HQUSACE element of the discipline involved. Recommended changes to TI, with rationale for the changes, should be sent to HQUSACE, ATTN: CEMP-ET, 20 Massachusetts Ave., NW, Washington, DC 20314-1000.

TI are effective upon issuance. TI are distributed only in electronic media through the TECHINFO Internet site <http://www.hnd.usace.army.mil/techinfo/index.htm> and the Construction Criteria Base (CCB) system maintained by the National Institute of Building Sciences at Internet site <http://www.nibs.org/ccb/>. Hard copies of these instructions produced by the user from the electronic media should be checked against the current electronic version prior to use to assure that the latest instructions are used.

FOR THE DIRECTOR OF MILITARY PROGRAMS.



KISUK CHEUNG, P.E.  
Chief, Engineering and Construction Division  
Directorate of Military Programs



**US Army Corps  
of Engineers®**

Headquarters

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## **Annex B**

# **Architectural and Engineering Instructions**

for

# **Barracks Upgrade Program**

First Edition

28 February 1997

Headquarters

U.S. Army Corps of Engineers  
Directorate of Military Programs  
Engineering Division  
Washington, D.C. 20314-1000

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## FOREWORD

These Architectural and Engineering Instructions (AEI) for the Barracks Upgrade Program (BUP) have been developed to be responsive to the needs of the Department of the Army, Army Installation Commanders, Directors of Public Works, Unit Commanders, and the soldiers. This AEI will support the upgrade of the Lyles, Bissett, Carlisle, and Wolfe (LBC&W) and the Benham, Blair & Affiliates (BB&A) barrack types constructed in the 1970s under the Volunteer Army Program (VOLAR) and the upgrade of other existing Army barracks types. These instructions provide design policy and technical guidance in support of the BUP.

This AEI is a living document and will be reviewed, updated, republished, and redistributed on a continuous basis for the purpose of revitalizing and enhancing our design and engineering support to military installations. These instructions apply to Major Subordinate Commands (MSC), district commands, and other U.S. Army Corps of Engineers (USACE) field offices having military construction responsibilities. This AEI is intended for use by the design and engineering elements involved with the BUP in support of Army installations.

Please send your comments and lessons learned using this AEI. With your permission, I plan to share your experiences with other team members in the Corps. Essays!

FOR THE DIRECTOR OF MILITARY PROGRAMS:



KISUK CHEUNG, P.E.  
Chief, Engineering Division  
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**ARCHITECTURAL AND ENGINEERING INSTRUCTIONS  
FOR  
BARRACKS UPGRADE PROGRAM**

**CHAPTER 1 - GENERAL INSTRUCTIONS**

**1. PURPOSE.** These Architectural and Engineering Instructions (AEI) provide design policy and technical guidance for design and engineering services in support of the Barracks Upgrade Program (BUP) for Army installations.

**2. APPLICABILITY.** This AEI is effective immediately and applies to the design and engineering elements within all Major Subordinate Commands (MSC), district commands, and other USACE field offices having Military Construction (MILCON) responsibilities; hereafter referred to as "Design Agency."

**3. REPRODUCTION AND ACCESS.** Local reproduction of this AEI is authorized; access and viewing will be possible in the near future through our home-page on the *Internet*.

**4. PROPONENT OFFICE.** This AEI will be periodically reviewed, updated, and redistributed by the Architectural and Planning Branch, Engineering Division, Directorate of Military Programs, HQUSACE. Recommended changes, along with the rationale for the changes, should be sent to HQUSACE, ATTN: CEMP-EA, 20 Massachusetts Ave., N.W., Washington, D.C. 20314-1000.

**5. OBJECTIVES.**

**a.** The BUP is a long term Army commitment to improve the quality of soldier life by upgrading barracks such as these designs by Lyles, Bissett, Carlisle, and Wolfe (LBC&W) and the Benham, Blair & Affiliates (BB&A) which were constructed in the 1970's under the Volunteer Army Program (VOLAR). It includes upgrades to other existing Army barrack types to modified one-plus-one criteria. After upgrading, buildings should approximately achieve new space criteria and construction standards in accordance with the standard design package for Unaccompanied Enlisted Personnel Housing (UEPH), (see reference B-7, Appendix B, *Architectural and Engineering Instructions (AEI), Design Criteria*). This program focuses on the barracks building, i.e., the living areas, walk-in closets, semi-private baths, service area, and building repair. Each project will rely on sound architectural and engineering judgment to ensure the maximum use of existing assets within authorized funds. Recognizing however that existing building configuration, partition location, pipe chase size, structural column arrangement, window

location, and other considerations preclude meeting new space criteria and construction standards, the following additional guidance is provided to assist in project development: Under no circumstances will private living/sleeping rooms be less than 7.9 m<sup>2</sup> (85 ft<sup>2</sup>) in BUP projects.

**b.** Upgrade barracks consistent with guidance from the Office of the Assistant Chief of Staff for Installation Management (OACSIM) to the Army's one-plus-one standard and improve the quality of life for the soldier. The BUP shall meet the Army's one-plus-one standard to the maximum extent possible/practical within the severe limitations of existing facilities.

**c.** Minimize costs associated with designing, constructing, and managing the program by capitalizing on the repetitive nature of the work to keep costs to a minimum.

**d.** Use a standard design approach to the maximum extent possible to minimize the number of user requested changes to projects, and capture and reuse additional site specific designs.

**6. REFERENCES.** The following references and additional information sources are available for use with this AEI.

**a.** Code of Federal Regulation (CFR), 10 CFR 435, *Energy Conservation Voluntary Performance Standards for New Buildings; Mandatory for Federal Buildings.*

**b.** Code of Federal Regulation (CFR), 10 CFR 436, *Federal Energy Management and Planning Programs*

**c.** Federal Emergency Management Agency (FEMA) documents.

(1) *FEMA 273, NEHRP Guidelines for the Seismic Rehabilitation of Buildings.*

(2) *FEMA 274, NEHRP Commentary on the Guidelines for the Seismic Rehabilitation of Buildings.*

**d.** Army Regulations.

(1) AR 415 series, including: AR 415-15, *Military Construction, Army (MCA) Program Development.*

(2) AR 420-46, *Water and Sewage.*

(3) AR 420-47, *Solid Waste Management.*

(4) AR 420-49, *Heating, Energy Selection and Fuel Storage, Distribution, and Dispensing Systems*.

- e. Installation Real Property Master Plans.
- f. Engineering Regulation, ER 1110-345-100, *Engineering and Design, Design Policy for Military Construction*.
- g. Engineering Manual, EM 1110-1-1300, *Engineering and Design, Construction Cost Estimates*.
- h. Engineering Circular. EC 25-1-243, Tri-Service Center, Architectural, Engineering and Construction (A/E/C) Computer-Aided Design and Drafting (CADD) Standards.
- i. *Architectural and Engineering Instructions (AEI), Design Criteria*, latest edition, and the criteria documents referenced therein.
- j. *Architectural and Engineering Instructions (AEI), Installation Support*, latest edition, and the criteria documents referenced therein.
- k. *Generic Standard Packages for the Lyles, Bissett, Carlisle & Wolfe barracks type and the Benham, Blair & Affiliates barracks type*.
- l. *Program Management Plan, Barracks Upgrade Program*, latest edition.
- m. *Military Handbook (MIL-HDBK) 1008B, Fire Protection for Facilities*, latest edition.
- n. CEMP-EA/DAIM-FDH *Acquisition Plan for Unaccompanied Enlisted Personnel Housing (UEPH) Furniture and Furnishing*, dated 28 April 1994.

**7. "GOOD NEWS STORIES" AND RECOMMENDATIONS.** Design agencies are encouraged to submit their Good News Stories and Recommendations for updating this AEI directly to HQUSACE, ATTN: CEMP-EA, 20 Massachusetts Ave., N.W., Washington, D.C. 20314-1000.

**8. CUSTOMER SATISFACTION.** Each design agency must strive to be the professional team of choice, providing quality design, engineering and technical services that is focused on customer satisfaction. The goal should be to **exceed** our customers' expectations! This goal can be met by working jointly with the customer to deliver a quality product in a reliable, cost effective, responsive, cooperative, innovative, and efficient manner!

## CHAPTER 2 - PLANNING AND DESIGN DEVELOPMENT

**1. CENTER OF DESIGN DEVELOPMENT.** The Fort Worth District (CESWF) is the Center of Design Development (CDD) responsible for developing the "Generic" Standard Packages for the LBC&W and BB&A barracks upgrades.

### 2. INITIAL PLANNING.

**a. General.** In the initial planning stages, district teams should evaluate the type (e.g., service, product, design, cost, and/or construction) and complexity of assigned projects. Then the design team needs to determine the design method most appropriate, including the use of "in-house" design and cost engineering support. Close coordination between the design team and the project manager is critical in making these determinations.

**b. Project Approval.** The installation commander or the Director of Public Works (DPW) must sign the project approval documentation (e.g., DD Form 1391 or DA Form 4283, *Facilities Engineering Work Request*). This is necessary to comply with the requirements of AR 420-10, and to classify the work properly. The OACSIM has the responsibility for approval of disbursement of funds for a project under BUP. However, the DPW has the responsibility for final project approval and work classification, regardless of the source of funds

**c. Communications.** The installation and OACSIM should be involved at all stages of project development and design. A meeting should be held with the installation at an early stage to determine the requirements of the project. Installation input is crucial in establishing accurate requirements so that misunderstandings and subsequent costly modifications during contract administration are avoided. The design agency should be aware of the installation's stockage (types of materials on hand), usage requirements (e.g., frequency and type of use) and/or problems in order to have the least impact on their logistic process.

### 3. DESIGN RESPONSIBILITIES.

**a. Generic Standard Design.** Fort Worth District (CESWF) will develop the LBC&W and the BB&A generic standard packages. This generic standard package, based on the assumption that construction of the VOLAR barracks is essentially the same throughout the Continental United States (CONUS), will provide a set of design documents (plans and specifications) for each standard building type (LBC&W and BB&A). The generic design packages are not site-specific. For barracks types other than LBC&W and BB&A, generic design packages will not be developed. Renovation designs for these barracks will be on a project by project basis. The final

design package, for all BUP projects (LBC&W/BB&A and other barracks) will be developed by the geographic district. The geographic district will be responsible for the completeness of the advertised product. The design package will incorporate the use of current HQUSACE Computer Aided-Design and Drafting (CADD) and automation technology standards provided in EC 25-1-243. These CADD standards should comply with the installation DPW needs and/or systems.

**b. Generic Standard Design Checklist.** Each generic standard design package will include a checklist for geographic districts to use for tabulating deficiencies and validating major component requirements (which may have been modified over the years) at each project site. A generic construction cost estimate for a full scope rehabilitation, indicating estimated unit prices, area cost factor, specific pricing time frame, and a model solicitation/contract package will also be prepared by CESWF.

**c. Value Engineering.** The OACSIM has consented to VE studies of the generic designs for the two standard barracks types (LBC&W and BB&A). Individual projects based on the generic designs will undergo a Value Engineering Review, led by the district Value Engineering Officer, focusing on potential site specific proposals and ensuring that appropriate proposals offered in the generic study are applied at the local projects (and savings shown accordingly). VE for projects based on non-standard designs will be in accordance with current policy, i.e., VE studies shall be performed on all projects over \$2M unless waived by the MSC commander. The user(s) shall be invited to participate in the Value Engineering Review along with any needed technical support for analysis. Construction Value Engineering Change Proposals (VECP) shall be coordinated with the Center for Design Development (CESWF) to ensure compliance with HQ and OACSIM wishes.

**d. Metric system.** In accordance with current design policy (ER 1110-345-100), O&M work does not require the use of the metric system of measurement. The metric system of measurement should only be used in those areas (e.g., OCONUS) where it is common practice.

**e. Typical Scope of Work for Architect-Engineers (A-E) Contracts (if Applicable).** The geographic district should develop a standardized Scope of Work (SOW) for the BUP that can be used at multiple installations for repetitive buildings. The SOW should be standardized with examples of the requirements for the A-E as guidance on the type of design and procurement process to which their design will be submitted.

**f. Existing Conditions Survey.**

(1) Building Survey. A building survey will be conducted by the design district for all buildings to be modernized in a project in coordination with the installation DPW. This survey will be conducted to determine the existing conditions and building deficiencies before initiating

design or before an IDQ contract delivery order is issued (if applicable).

(2) Survey Information. Prior to the initiation of detailed project development, the geographic district design team/A-E should meet with the installation at the project site to conduct a joint site survey. This survey should include, but not be limited to:

- (a) Identifying the installation unit/building (s).
- (b) Determining the installations' requirements and expectations, and including these in the survey.
- (c) Clarifying the site specific requirements and services, special products and/or design requirements, a thorough review of the DD Form 1391 and, if applicable to the type of project, DA Form 4283, type of funds required, verifying approval limits, obtaining as-built/record drawings and documents, and other planning data. The DD Form 1391 must reflect site specific requirements.
- (d) Determining the extent of investigation required, a deficiency tabulation, special technical problems (such as structural damage), seismic requirements, adequacy of utilities, fire protection deficiencies, corrosion, extent of modifications to electrical, communications, Energy Monitoring and Control System (EMCS), plumbing and HVAC systems.
- (e) Determining the requirement for a security survey. Coordination with the installation security officer to assure that all physical and electronic security, and anti-terrorism concerns are incorporated.
- (f) Resolving engineering environmental issues such as the presence of lead base paint or friable and non-friable asbestos, contaminated soil, extent of environmental surveys required, and the need for infrared, x-ray or other types of surveys of roofs, if applicable. Note: Designers should research documentation of recent surveys by the installation (if available) or perform the survey as part of the their scope.
- (g) Determining the project costs including the design effort required and costs, and an estimate of the construction costs.

(3) Importance of the Survey. Early planning and coordination between the design team and the installation are important to reduce costs so that the OACSIM and the installation are provided a satisfactory product. For maintenance and repair projects, major design modifications are often required late in project development because poor initial site investigations do not reflect the true conditions of existing structures. Removal work by the building contractor often results

in numerous unforeseen site conditions not shown on as-built/record drawings. One way to reduce redesign costs and additional construction costs is to perform a thorough visual site investigation and deficiency tabulation with photographs using digital cameras (See *AEI, Installation Support*).

#### **4. DESIGN QUALITY ASSURANCE.**

**a. Mandatory Requirements.** Design agencies preparing BUP contract documents are responsible for ensuring that the quality and details of the documents meet the customers' needs and all applicable Public Laws, Executive Orders, FAR, DFARS, AFARS, EFARS, CFR, DoD directives and instructions, Army regulations, and fire and life safety codes. Using the *AEI, Design Criteria*, the Corps of Engineers Guide Specifications (CEGS), and the Corps of Engineers Abridged Guide Specifications (CEAGS) facilitates compliance with all mandatory requirements. For LBC&W or BB&A barracks, the CESWF generic design packages are mandatory for use.

**b. Simplicity and Quality.** Simplicity and quality must be achieved for each project. However, design agencies are cautioned that over-simplification of contract documents can result in the omission of important details that could increase the cost and the amount of change orders during contract administration. An incorrect project construction SOW (e.g., over or under scope) can also increase the cost and the amount of contract modifications during contract administration.

#### **5. PROCEDURES FOR USING A BUP GENERIC STANDARD DESIGN PACKAGE.**

**a. Initial Site Adaption.** The geographic district administering the project design, to the extent allowed by the BUP generic standard design package (LBC&W or BB&A barracks), will tailor the generic standard design to specific requirements of the project. This may include adapting the BUP generic standard design for the appropriate size or scope (as programmed on the DD Form 1391), site design and engineering, and selecting the appropriate options allowed in the BUP generic standard design package to address local conditions. Such options may include structural, environmental, design selection of VAV or fan coil HVAC systems, and the architectural theme. Material selections, climatic requirements, and other project specific features may also have to be addressed. If the geographic district administering the project design requires any clarifications or assistance concerning the generic standard design package, Mr. Wayne McDonald, CESWF-ED-MR, (817) 978-2240, fax (817) 978-3348, U.S. Army Engineer (USEA) District, Fort Worth, P.O. Box 17300, Fort Worth, TX 76102-0300, should be contacted.

**b. Typical/Repeated Site Adaption.** Once the BUP generic standard design package has been used for an individual facility at a given installation, that design (design and construction documentation) will become the standard design for all subsequent applications. Subsequent uses of the standard design drawings will be site adaptations, requiring only modifications for scope, and size. Revisions approved and implemented for the basic BUP generic standard design package, may be incorporated into these installation standard design drawings, as appropriate at that particular Army installation.

**c. Waiver From the Use of a BUP Generic Standard Design Package.** There may be circumstances where the use of a BUP generic standard design package could be inappropriate for an individual facility. In such cases, a request for waiving the use of the BUP generic standard design package will be submitted by the installation, through the MACOM, to the OACSIM (with an information copy to HQUSACE (CEMP-EA)) for review. The installation is responsible for preparing this submittal such that it clearly documents the rationale for the waiver request, and submitting the request through the MACOM for which the facility is programmed. See Chapter 2, Paragraphs 6.j and 6.k for standard and optional features.

(1) A request for waiver will follow a standard format. The initiator of the request will identify the following:

(a) The functional and operational requirements of the facility for which the BUP generic standard design package is not, or cannot be made, responsive.

(b) The required feature(s) of the BUP generic standard design package that is (are) nonresponsive to each of the identified facility requirements.

(c) A description of the incompatibility between each of the identified facility requirements and the affected required feature(s) of the BUP generic standard design package.

(d) The estimated construction cost impact of the waiver.

(2) The OACSIM may seek input from HQUSACE, CESWF, the geographic district designing the actual project, or the users of the individual facility. Upon review of the request and coordination with the MACOM that programmed the facility and HQUSACE, the OACSIM will approve or disapprove the waiver request.

**6. DESIGN CRITERIA AND SPECIAL TECHNICAL CONSIDERATIONS.** Designs should comply with the *AEI, Design Criteria* and pertinent regulations, including AR 415-15. Additionally, for utility systems, designs should comply with all applicable regulations, including AR 420-46, AR 420-47, and AR 420-49. For energy related issues refer to Federal Regulation 10

CFR 435. For cost effective design related issues refer to Federal Regulation 10 CFR 436.

**a. Architectural.**

(1) Exit Provisions. Attention will be given to provide a clear means of egress and exit routes in modernized areas. All exit provisions will conform to the Life Safety Code, NFPA 101, unless otherwise noted in these instructions, see paragraph f. Fire Protection.

(2) Coded Locksets. Coded locksets, for the entry doors of the living units, are part of the BUP. If the installation DPW desires that these types of locksets not be provided, they must obtain concurrence or a waiver from OACSIM.

(3) Reusable Doors with Cylindrical Locks. Projects where existing doors and frames will be reused for the living/sleeping rooms, and the doors are equipped with cylindrical type locksets, a type F-90 cylindrical lock conforming to ANSI STD A156.2 lockset may be provided in lieu of the F-13 mortise lock. However, since the F-90 cylindrical lock does not have a dead bolt, and therefore offers less security than the F-13 mortise lock, the F-90 lockset will only be authorized subject to the following conditions:

(a) The provost marshal at the installation must be satisfied with the security provided by the F-90 lockset. If approval is not obtained from the installation provost marshal, the F-13 lockset will be installed.

(b) The F-90 lockset will include the removable core cylinder capability as specified above for the F-13 lockset.

(c) The type F-90 lockset will be specified to include a 1.9-cm (3/4-inch) latch bolt throw.

(4) Windows.

(a) A minimum of fifty percent of the glass area will be operable for ventilation and possible emergency egress.

(b) At least one window in each room must meet requirements for a secondary means of escape (see Chapter 2, paragraph 6.f on fire protection).

(5) Insulation. Because of the emphasis placed on energy conservation, increased insulation qualities and quantities will be provided with a corresponding decrease in HVAC loads and equipment sizes when it is economically feasible and justified. Existing roofing will not be

removed for the sole purpose of increasing existing insulation thicknesses.

(6) Concealed Piping and Duct Work. All insulated and uninsulated piping and duct work in habitable areas, such as living/sleeping rooms, bathrooms and central toilet facilities, corridors, and lobbies will be concealed. Insulated piping in laundry rooms and janitor's closets will be protected from damage with a metal cover or other appropriate means.

(7) Bathroom Fixtures. Chapter 15, table 15-4, *AEI, Design Criteria* with the appropriate footnotes provides criteria and guidance for bathroom fixture requirements in BUP buildings to be upgraded.

**b. Furniture and Furnishings.** Furniture and Furnishings are not part of the FY97 BUP. However, geographic districts will include a contract option in FY98 and out year contracts to permit the construction contractor to install furniture and furnishings for barracks upgrade under the BUP. Furniture and furnishings packages for BUP projects will be centrally procured and managed by OACSIM (reference CEMP-EA/DAIM-FDH *Acquisition Plan for Unaccompanied Enlisted Personnel Housing (UEPH) Furniture and Furnishing*, dated 28 April 1994).

**c. Structural.**

(1) Seismic Safety Rehabilitation Guidance. Seismic upgrade for barracks in Zones 2A, 2B, 3, and 4 will be part of this program for buildings that have been identified under the Army's Seismic Risk Reduction Program as having seismic deficiency.

(a) Under the Army's Seismic Risk Mitigation Program (SRMP), the Seismic Technical Center of Expertise (STCX) in the North Pacific Division is currently screening and evaluating the Army's buildings throughout the country. Prior to doing barracks evaluation under BUP, the STCX shall be contacted to determine the status of the screening and evaluation. If the barracks in question have already been evaluated under the SRMP, reports describing their ability to survive a seismic event will be furnished. The geographic district will use the results of this evaluation to perform design for the seismic upgrade. If the barracks have not been evaluated, the STCX will give the scheduled time for their evaluation. If the scheduled evaluation is not timely to suit the BUP schedule, the barracks upgrade shall proceed without the seismic upgrade provisions. If the building has been found to be seismically deficient under an independent evaluation by the district or the installation, the geographic district must perform design retrofit for inclusion into the contract plans and specifications.

(b) The results of SRMP, to date, indicate that the LBC&W barrack types meet the requirements for Zones 1 and 2A with no structural upgrade. The LBC&W barrack types do not meet the requirements for Zones 2B and 3 and will require structural modification. Seattle

District has performed a structural evaluation for Fort Lewis barracks (LBC&W) and prepared a design for structural modification. The Fort Lewis design shall be used for the LBC&W barrack types in Zones 2B and 3. The BB&A barracks satisfies the requirements in Zones 1 and 2A, where all barracks of this type are located, and require no structural work.

(c) The demand capacity and level which this seismic upgrade rehabilitation must achieve is found in the Federal Emergency Management Agency (FEMA) documents *FEMA 273, NEHRP Guidelines for the Seismic Rehabilitation of Buildings* and *FEMA 274, NEHRP Commentary on the Guidelines for the Seismic Rehabilitation of Buildings*. Any questions concerning seismic evaluation, rehabilitation design, or seismic criteria can be directed to Ray Decker in STCX, 503-326-6877. Policy questions shall be directed to Ray Navidi or Charles Gutberlet, HQUSACE (CEMP-ET), (202) 761-0223.

(2) Roofs.

(a) Roof diaphragms and connections will be investigated, particularly connections to the frames or shear walls.

(b) If Standing Seam Metal Roof Systems (SSMRS) are used, the structural design of the roof system and its interaction with the building must be evaluated. It is doubtful that the SSMRS would imposed structural loading on the building that would be beyond the building's capacity. However, because the SSMRS adds considerably to the height of the building, a structural evaluation of lateral load is advisable.

(c) There is a moratorium on the use of cold formed steel load bearing members. Supports for the roof SSMRS or any other loadbearing structural element may not incorporate colc formed steel members.

**d. Communications.**

(1) Background. Old barracks buildings may only have a few administrative telephone lines and a couple of pay phones. If that is the case, there will not be enough outside cable pairs or switch capacity to accommodate individual phone lines for each soldier.

(2) BUP must include bringing communications up to current DoD standards. That means one telephone outlet and one TV outlet per occupancy area. A separate utility closet should be provided for the communications systems. In most cases, any required exterior upgrade for telephone or cable TV will be provided by the commercial utility for those services. It may require extensive upgrade of outside plant telephone infrastructure. All communications issues must be coordinated with the installation's Director of Information Management (DOIM). POC -

Bob Fite, HQUSACE (CEMP-ET), (202)-761-8626 or DSN 763-8626.

**e. Energy Monitoring and Control System.** The standard design for the BUP must include Energy Monitoring and Control System (EMCS) for those installations where they have an existing base-wide EMCS. The Utility Monitoring Center of Expertise in Huntsville should be contacted in the review process and development of contract requirements using simplified methods.

**f. Fire Protection.**

(1) General Requirements. The criteria document for fire protection is Military Handbook (MIL-HDBK) 1008B, Fire Protection for Facilities. MIL-HDBK 1008B requires compliance to the NFPA 101, Life Safety Code (LSC).

(a) Projects in this program will meet the requirements of the LSC for existing occupancies. The applicable occupancy chapter of the LSC for existing barracks is Chapter 17, Existing Hotels and Dormitories.

(b) At least one operable window for each living area that meets the requirement of a secondary means of escape as prescribed in Paragraphs 17-2.1 and 21-2.2.3 of the LSC. This provision requires a clear opening not less than 20 inches in width, 24 inches in height and 5.7 square feet in area.

(2) Lyles, Bissett, Carlisle, and Wolfe Barracks.

(a) Barracks of the LBC&W design are three-story barracks that provide occupants with a single exit. Paragraph 17-2.4 of the Life Safety Code (LSC) requires not less than two exits. An exception is that a single exit is allowed, if the building is equipped with an automatic sprinkler system, fire separation of exit and exit access, and fire separation between units. The LSC allows an equivalent level of protection as an alternative to requirements prescribed by the code. Equivalent protection must be approved by the authority having jurisdiction, which in this case is HQUSACE. In lieu of the required sprinkler protection as required by Paragraph 17-2.4 of the LSC, the following is approved as an equivalent level of protection.

(b) LBC&W Barracks With Open Vestibules (Breezeways). In this arrangement, the access vestibules to the exit stairs are open on two sides in the form of a breezeway. The exit stair is also open to the exterior. This arrangement is per the standard design. Fire protection will be provided as follows:

1/ One-hour fire-rated construction to separate the rooms from the vestibule, and ½-hour fire-rated construction between living units, as required by Paragraph 17-2.4 Exception.

2/ The project is in compliance with all other applicable requirements of the LSC, including the requirement for smoke detectors and a fire alarm evacuation system connected to the fire department.

(c) LBC&W Barracks With Enclosed Vestibules. In this arrangement the vestibules are enclosed. This option is not per the generic design and a request for waiver is required. If a waiver is approved by the OACSIM, the following fire protection will be provided:

1/ Sprinkler protection and smoke detection in the enclosed vestibule. The sprinkler protection would consist of two sprinkler heads; one sprinkler head in the alcove and one sprinkler head in the center of the vestibule.

2/ Heat detection throughout the building, except in the sprinklered areas. Heat detectors would be in addition to the smoke detectors located in the living units and required by code.

3/ One-hour fire-rated construction to separate the rooms from the vestibules, and ½-hour fire-rated construction between units, as required by Paragraph 17-2.4 Exception.

4/ One-hour fire-rated construction of the exterior wall between the stair and vestibule to provide separation of the exterior stairway from the building. This is a code requirement even if the building is fully sprinklered.

(3) Benham, Blair & Affiliates Barracks. Barracks of the BB&A design are three-story barracks with interior exit corridors. These barracks will comply to NFPA 101, Life Safety Code for existing occupancy. The Life Safety Code does not require sprinkler protection for these barracks.

(4) Barracks Other Than Lyles, Bissett, Carlisle, and Wolfe and the Benham, Blair & Affiliates. These barracks will comply to NFPA 101, Life Safety Code for existing occupancy.

(5) Fire Protection for Mechanical Rooms and Laundry Rooms. The Life Safety Code requires that mechanical rooms equipped with boilers or fuel-fired equipment, and laundry rooms be provided with either one-hour fire-rated separation or automatic sprinkler protection. If the sprinkler option is selected, the feed for the sprinklers can be supplied from an adequately sized domestic water feed main inside the building.

(6) Fire Detection and Fire Alarm Systems. All barracks in BUP will be equipped with detection and fire alarm systems per the Life Safety Code. Interior corridors will be equipped with smoke detectors connected to the building fire alarm evacuation system. Smoke detectors in the individual sleeping areas, when in alarm, will sound a local alarm only and will not activate the building fire alarm evacuation system. All other devices will sound the alarm throughout the stack or building. Heat detectors within the sleeping rooms are not required except for LBC&W barracks with enclosed vestibules. A manual pull station should be provided at each exit and on each floor at the stair entrance. In the LBC&W design, the fire alarm system should sound evacuation alarms in the individual stacks and not throughout the building in adjacent stacks.

**g. Mechanical Systems.**

(1) Special energy studies and energy budget calculations will not be required; however, system selections must be based on life cycle cost comparisons where appropriate. All new or replacement equipment and systems must comply with current energy and water conservation standards.

(2) The following requirements are based on the LBC&W barracks originally designed and constructed in the 1970's. The upgrade shall be in accordance with the standard design. If the barracks have received recent major mechanical upgrades, all of the indicated work may not be required and portions may be deleted from the project if the results will provide essentially the same degree of comfort, maintenance, life cycle cost effectiveness and quality.

(a) Building HVAC systems will be replaced in their entirety including, chilled and heating water piping, dual temperature piping and condensate drains exterior to the building mechanical room, fan coil units, controls and outside air supplies.

(b) New heating, cooling and ventilation loads will be calculated based on the new room layouts, occupancies, internal loads, etc. These new loads will be used to size the fan coil units, VAV terminal units, pipe sizes, control valve Cv ratings and similar.

(c) Chillers, boilers, heat exchangers and similar mechanical room or central equipment will be replaced where justified based on condition and remaining economic life.

(d) When fan coil units are the primary method for heating and cooling the spaces, outside air will be treated (heated/cooled) and ducted to each space from separate roof/attic mounted air handing units. The toilet exhaust shall operate continuously and the outside air/exhaust air quantities shall be balanced to maintain a positive pressure in the bedrooms

(e) The generic standard design will indicate a four pipe fan coil system to ensure that space is sufficient for the piping requirements. However, a two pipe system is standard for most locations, where simultaneous heating and cooling of the building is not required. A VAV system design will also be included in the generic package for use in humid areas and where VAV systems may be more life cycle cost effective.

(3) For barracks originally designed by BB&A and for nonstandard barracks, the HVAC design shall duplicate the above requirements to the extent feasible and shall provide systems of essentially identical comfort levels, life cycle cost effectiveness and quality.

(4) For LBC&W barracks, the building plumbing system will be replaced in its entirety including domestic cold and hot water piping and waste and vent lines down through the first floor level, and plumbing fixtures. The upgrade shall be in accordance with the standard design. If the barracks have received a major plumbing upgrade in the last several years, all of the indicated work may not be required and portions may be deleted from the project if the results will provide essentially the same degree of comfort, maintenance, life cycle cost effectiveness and quality. For BB&A barracks and for other barrack types, the plumbing design shall duplicate these requirements to the extent feasible and shall provide systems of essentially identical comfort levels, life cycle cost effectiveness and quality as the standard design for upgrade of the LBC&W barracks.

**h. Electrical Interior.** If the interior electrical wiring is more than 15 years old, it should be replaced. All of the electrical equipment (receptacles, light fixtures, panel boards) should be replaced. One possible exception is transformers, which may be in acceptable condition for continued use. Due to the increased usage and load sizes of electrical appliances by the building users, as well as potentially increased loads for mechanical equipment, the size of the electrical service to the building may need to be increased. Electrical equipment rooms are to be provided separate from other spaces, such as mechanical rooms. Existing electrical equipment spaces may be inadequate for new equipment or for current electrical working space or ventilation requirements. Routing of electrical circuits through existing structure may be a physical challenge. The LBC&W standard design plan to route the electrical, communications and TV wiring over the roof will result in many roof penetrations, as presently designed. Unless the building is being provided with a new peaked (gable) roof, leakage is a serious construction and maintenance concern with this approach.

**i. Hazardous and Toxic Materials.** Provisions for Hazardous and Toxic Materials (HTM) investigations must be included in the BUP design packages, for removal of asbestos, lead based paint, mercury or other hazardous and toxic materials that have been identified for removal (e.g., site survey, etc).

**j. Standard Features.**

- (1) Convert living unit to exterior access (LBC&W only).
- (2) Living unit must have semi-private spaces.
- (3) Closets are part of the BUP. However, the amount of space provided for BUP may be less than what the DA standard design for new barracks provides. Closet sizes for the LBC&W and the BB&A standards are both undersized because of the lack of available space.
- (4) Upgrade interior finishes (furred-out walls with gypsum wall board).
- (5) Provide a service module for each living unit.
- (6) Provide lockable storage in rooms.
- (7) Upgrade electrical and provide new main panel.
- (8) Provide individual phone lines and TV hookups.
- (9) Upgrade security lighting.
- (10) Provide motion detector lights at entry ways.
- (11) Provide new HVAC systems complete with adequate treated ventilation air to maintain positive pressure. HVAC systems for humid area applications shall have adequate moisture removal capabilities.
- (12) Provide adequate washers and dryers.
- (13) Replace undersized bath tubs.
- (14) Eliminate CMU partitions in living units.
- (15) Replace plumbing.
- (16) Replace windows (treat windows with lower panels as one unit).
- (17) Repair Stairwells.

(18) Removal of asbestos, lead base paint or other HTM, if any.

**k. Optional Features.**

(1) Cleaning of Exterior. Cleaning of the exterior of the barracks buildings is authorized, if desired by the installation.

(2) Roofs. Currently SSMRS with gables are part of the BUP. However, if the installation DPW desires that SSMRS not be provided or to use another type of roof system, because of cost, architectural theme, etc, they must obtain concurrence from the OACSIM.

(3) Ceiling Fans. Currently ceiling fans are part of the BUP. However, If the installation DPW desires that ceiling fans not be provided, they must obtain concurrence from the OACSIM.

(4) Mail Boxes. One community pedestaled postal mail box per building is authorized, if desired by the installation.

**l. Checklists.** Design agencies are encouraged to use the "Generic Checklist" developed by CESWF (part of the "Generic" Standard Package). This checklist identifies repetitive types of deficiencies in a simplistic "yes and no" format.

**7. DESIGN ANALYSIS.**

**a. General.** Design analysis should be complete and kept to the minimum necessary to ensure the adequacy of the design.

**b. Renovations and Replacements.** The design analysis should reflect the installation (s) articulated needs and desires. When applicable, the design analysis will also substantiate that all building components and systems, renovated or replaced, will be upgraded or replaced to comply with the latest, life cycle, cost-effective technologies, where technically feasible for the application at hand.

**c. Standard Design Analysis Sheets.** Standard design analysis sheets should be developed by each design agency for use with the BUP process.

**8. PROJECT DRAWINGS.** There is no standard number of drawing sheets required for a particular project. Drawings should be combined, if possible, to keep the total number of sheets to a minimum. Again, local variations are authorized based on the practices in each design agency. Digital photographs inserted directly on drawings are an effective way to convey proposed work

and existing conditions while reducing design costs (e.g., demolition or repair).

## **9. STANDARD COMPUTER-AIDED DESIGN AND DRAFTING DETAILS.**

**a. Computer-Aided Design and Drafting Reference Files.** Currently, the Tri-Service CADD/GIS Technology Center is sponsoring an initiative to prepare and maintain active reference files and generic details. The center is located at the USACE Waterways Experiment Station, ATTN: CEWES-IM-DA, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199. District commands are encouraged to utilize the generic details available through CEWES-IM-DA. Completed BUP designs (hard copy), with lessons-learned, will be filtered through HQUSACE CEMP-EA (see Chapter 2, paragraph 13 of this *AEI*).

**b. Tri-Service Center, Architectural, Engineering and Construction Computer-Aided Design and Drafting Standards (EC 25-1-243).** This manual sets standards that provide a consistent and compatible platform for CADD system use throughout USACE. The uniform CADD platform provides a means for rapid and accurate transfer and integration of most project-related information throughout the life cycle of the facility, regardless of the CADD system used. Included in the manual are graphic standards, discipline specific cell libraries, description of deliverables, and data exchange formats. This manual is applicable to all HQUSACE elements, MSC and design agencies, and should be used to the maximum extent practicable under the BUP process. Additionally, it is critically important that the CADD products produced are compatible with the installations' CADD needs, systems, and standards.

### **c. Design Agency Standard Details.**

(1) Each design agency is encouraged to use appropriate details already developed by CESWF, however, they may develop a standard set of details, unique to that design agency, that could be used with BUP contracts. **Design agencies are encouraged to share their BUP standard details with other design agencies and HQUSACE (CEMP-EA).**

(2) The standard details should be stored in CADD or PC format for ease of usage. A method for obtaining CADD or PC details should be included in the SOW for A-E contractors. The SOW should include submittal of details that the A-E developed during a design contract.

**10. SPECIAL STUDIES (if applicable).** When using the BUP process, the number and extent of special studies should be kept to an **absolute minimum**.

## 11. SPECIFICATIONS.

**a. General.** BUP specifications should be concise and describe only the minimum requirements necessary to obtain the desired materials, services, and level of quality required. Specifications should reference industry standards whenever possible as the briefest way to adequately define project requirements for products and services. To speed up contract administration, requirements for contractor submittals (e.g., shop drawings, test reports, and certificates) should be minimized to the maximum extent possible with the concurrence of the design agency Construction Division and the installation.

**b. Trade (Brand) Names and Proprietary Items.** Generally, materials, systems, equipment, and methods should be specified by reference to industry standards in a way that does not unnecessarily restrict competition. When adequate industry reference standards are not available, project specifications may be developed using proprietary and brand name "or equal" descriptions in accordance with DFARS 210.004 (b) (3). This option should be considered early in the design process and **only** after close coordination, and approval by contracting and counsel.

**c. Project Specifications.** The Corps of Engineers Abridged Guide Specifications (CEAGS), developed and maintained by HQUSACE, are intended for small projects, minor elements of large projects, and maintenance and repair projects. These documents are a condensed version of the Corps of Engineers Guide Specifications (CEGS) and are well-suited as guides for developing many portions of the BUP project specifications. For other portions of the project specifications or where CEAGS do not exist, it will be more appropriate to edit the basic CEGS. There are two official media for distributing all HQUSACE MILCON guide specifications: *TECHINFO* and Construction Criteria Base (CCB).

(1) TECHINFO. TECHINFO is a computer-based construction criteria information system that is managed by the U.S. Army Engineering and Support Center, Huntsville. The system is designed to facilitate the flow of information to and from USACE technical users and contains the most current editions of guide specifications and HQUSACE design and engineering criteria documents. *TECHINFO* may be accessed through the USACE Home Page on Internet (located at <http://www.usace.army.mil>) or by dialing the system data line at (205) 895-1799 via a personal computer and modem. *TECHINFO* questions may be addressed to the system operator, telephone (205) 895-1826.

(2) Construction Criteria Base. Construction Criteria Base (CCB) is a Department of Defense sponsored compact disk-read only memory (CD-ROM) system distributed by the National Institute of Building Sciences (NIBS). In addition to the guide specifications, CCB contains HQUSACE design and engineering criteria and standards, and criteria and guide specifications issued by other military departments, Federal agencies, and private industry. The

CCB CD-ROM is updated and issued quarterly, and is available on a yearly subscription basis. CCB information may be obtained from HQUSACE (CEMP-EA), telephone (202) 761-1203.

**12. SPECIAL CONTRACT REQUIREMENTS.** The design agency should determine whether special contract requirements, instructions, conditions and notices to offerors, or any other statements can be referenced in the solicitation. This option should be considered **only** after close coordination with, and approval by, OACSIM, construction staff, contracting and counsel. See the *Program Management Plan* (PMP) for detailed information on Special Contract Requirements.

**13. COST ESTIMATES.** The construction cost estimate based on the generic standard package (LBC&W) was prepared using the MS-DOS version of MCACES Gold based on costs for Fort Hood, Texas in February 1997. The costs must be adjusted for location and escalation, non-standard barracks, as well as site-adapted for a project. The cost estimate includes total replacement of various systems such as mechanical, electrical and others, which is noted elsewhere, that may not be required. The estimate contains costs for both non-phased construction and phased construction that is based on one building module at a time.

**a. Scope.** The cost engineer should ensure that the proper scope is reflected in the estimates, that the scope and work classification described in the DA Form 4283 or the DD Form 1391 is accurately reflected in the cost estimate. Deviations of funds and design errors should be reported to the design team leader who will then coordinate with the project manager.

**b. Funds and Cost Data.** Projects with costs above funding limitations or PA must be brought to the immediate attention of the project manager and HQUSACE (CEMP-MA) to ensure that funds can be made available to cover the actual estimated costs, prior to advertisement or negotiation. All projects should be designed within the available funds. Where cost data are not available or for non-standard barracks, the procedures developed in TM 5-800-2 should be followed. The use of MCACES is mandatory for detailed estimates.

**c. Additional Information.** For additional information on cost estimates contact Mr. Ronald Hatwell, CEMP-EC, COM (202) 761-1240 or DSN 763-1240; facsimile COM (202) 761-0999 or DSN 763-0999; Internet ronald.hatwell@inet.hq.usace.army.mil.

**14. "LESSONS-LEARNED."** HQUSACE (CEMP-EA) will develop, operate, and maintain a Lessons-Learned system for the BUP that reflects all technical changes, modifications, and recommendations to the BUP design criteria. Send all recommended changes, modifications, and copies of your site specific designs to HQUSACE, ATTN: CEMP-EA, 20 Massachusetts Ave., N.W., Washington, D.C. 20314-1000. This will enable us to share and provide continued design, contracting, and construction feedback to districts executing the BUP.

### CHAPTER 3 - CONSTRUCTION PHASE (Post Award) SERVICES

**1. CONSTRUCTION ACTIVITIES.** Upon receipt of the code 9 directive from HQUSACE, the geographic district will be responsible for accomplishing the following activities (see PMP for additional information):

**a.** Perform Bidability, Constructibility, Operability, and Engineering review concurrently with site adaptation of generic standard design.

**b.** Verify the presence or absence of asbestos, lead based paint and other HTM prior to contract advertisement.

**c.** Confirm schedule for vacancy of buildings. Although **not recommended**, if it is decided to maintain partial occupancy during construction, the “stack” containing the mechanical room must be the first one turned over to the contractor. Also, temporary utility services, including temporary boilers and chillers when necessary, must be provided. Even in this case, some temporary utility outages may be unavoidable. This partial occupancy of a building during construction will add significantly to the construction cost and effect the construction schedule. Construction sequencing should be included in the contract documents and be submitted for Government review and approval (see the PMP for additional information).

**d.** Develop and issue separate task order for each building to be renovated. Task order development and negotiations shall be funded as a design activity. The scope of each task order shall be limited to that described on the approved DD Form 1391. Pricing of each task order shall be negotiated based upon the unit prices in the basic contract. Work will commence within 90 days of issuance of the task order. The contracting officer will verify that the DPW has certified work categorization at the time of task order issuance (see the PMP for additional information).

**2. ENGINEERING DURING CONSTRUCTION AND SHOP DRAWINGS.** One of the keys to achieving quality is to assure sound architectural and engineering surveillance during construction and shop drawing reviews. The design team must be in very close coordination with construction, contracting, resource management, project management (funding issues), the OACSIM and the installation to obtain their concurrence and approval when doing engineering during construction and shop drawing efforts that are discussed below.

**a. Shop Drawing Submittals.** The design team should evaluate specific systems, especially those related to issues such as fire protection, roofing, and HVAC, to require submittal of shop drawings. This must be done prior to Invitation For Bids (IFB) on a construction contract.

**b. Continuation of Design.** The design team should determine issues to be reviewed as a continuation of design during construction (e.g., automatic sprinkler systems and structural steel fabrication). Shop drawing review for HVAC requires detailed surveillance. Roofing is another system requiring shop drawings to assure that documents correctly address problems related to substrate repair, release of trapped moisture, and types of roofing. This must be done prior to IFB on a construction contract.

**3. AS-BUILT/RECORD DRAWINGS (If Applicable).** As-built/record drawings are not part of the BUP. The geographic district resident engineer should provide a marked-up working copy of the final drawings to the DPW. If the DPW desires as-built/record drawings for their BUP to be provided by the district, the DPW must provide O&M funds to the district. The design team members must be in very close coordination with the OACSIM, the installation, construction, contracting, and project management to obtain their concurrence and approval when providing as-built/record drawings efforts. The following options should be considered for maintaining as-built/record drawings (if applicable):

**a. Photographic Drafting (If Applicable).** After completion of a project, photographs of the new work could be taken and included with the as-built/record drawings.

**b. Computer-Aided Design and Drafting Drawings (If Applicable).** When plans are developed using CADD, conventional drawing sizes can be reproduced for the as-built/record drawings, and the plans stored on diskettes, compact disk (CD) or other automated media.

**c. Storage Procedures (If Applicable).** As-built/record drawings storage procedures should be determined in coordination with the installation when applicable (installation must provide funds).