



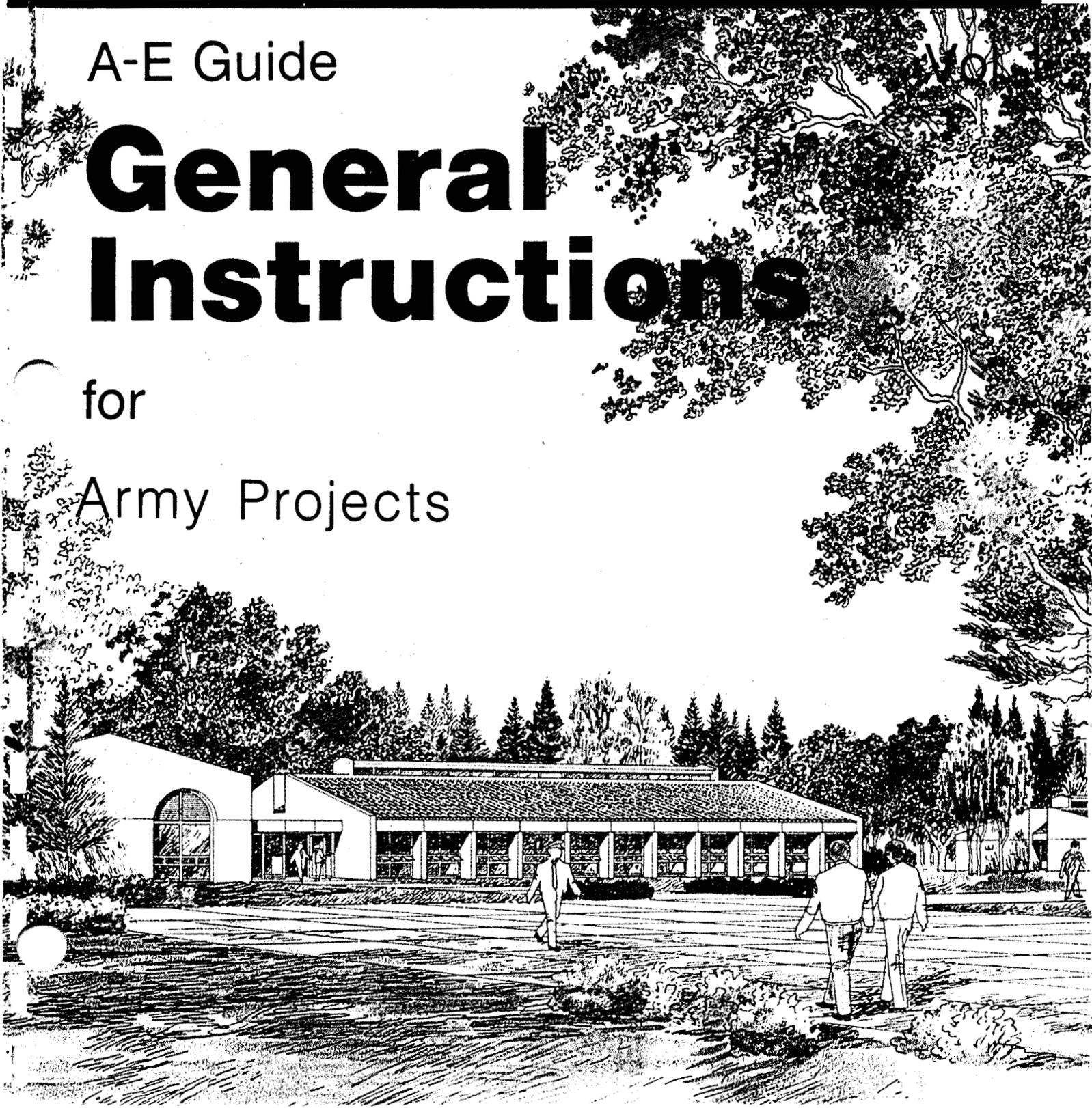
US Army Corps
of Engineers
Sacramento District

A-E Guide

General Instructions

for

Army Projects



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CHAPTER I

GENERAL INFORMATION

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"Plan and control your progress,
lest you be through before you finish."

CHAPTER I

GENERAL INFORMATION

1.0 OBJECTIVE OF GUIDE

1.1 This guide prescribes general procedures and instructions for preparing design documents under the direction of the Sacramento District, Corps of Engineers, hereinafter referred to as COE or CESPK. The Architect-Engineer (A-E) (Use of the terminology "A-E" hereinafter refers to both Architect-Engineers and COE designers) is to take into account that these procedures may differ from their usual procedures, and may require a more complete and extensive analysis and documentation than is customary in private practice, since shop drawing review and field inspection will not, in most cases, be in the A-E's contract. This guide is part of a three volume set as follows:

- 1.1.1 VOL. 1-General Instructions-Army
- 1.1.2 VOL. 2-Cost Estimating - (a) Manual - (b) CACES, as appropriate
- 1.1.3 VOL. 3-Specifications

1.2 The procedures and instructions in this guide shall be strictly adhered to. In the event of conflict between this guide and the A-E's design contract, the contract shall take precedence. However, the conflict shall be brought to the immediate attention of the COE for resolution.

2.0 COORDINATION WITH THE COE

2.1 A COE Project Manager (PM) is designated from the appropriate Project Management Section and is responsible for the day-to-day coordination and management of the project design and the A-E contract. All questions shall be directed to the PM. With the exception of A-E fee proposals (see Paragraph 4.0), all written communications shall be addressed to the PM at the following address:

District Engineer
U.S. Army Engineer District, Sacramento
ATTN: CESPK-ED-M (Name of Project Manager)
650 Capitol Mall
Sacramento, California 95814-4794.

The fee proposal shall be labeled "FEE PROPOSAL" on the outside of the envelope to preclude premature opening of the proposal.

2.2 The A-E is cautioned to take instructions from specific COE representatives only. Any problems relating to design, which endanger fulfillment of contractual requirements, shall immediately be brought to the attention of the PM. Oral understandings shall be confirmed in writing by either the A-E or COE, at request of either party. The A-E shall not perform services requested by any person in the COE which he considers to be a change in work or services required by his contract and necessitating an adjustment in contract price until he has, 1.) made a proposal to COE covering such extra services, 2.) negotiated a mutually satisfactory fee, and 3.) received a notice to proceed in writing from the contracting officer.

3.0 PREDESIGN CONFERENCE

3.1 Upon approval of selection, the A-E will be notified in writing. This notification will also request that the A-E submit certain financial data (e.g., wage and overhead rates) to the A-E Negotiations Section of the COE (see address in Paragraph 4.1 below). The A-E will be requested to participate in a predesign conference to discuss the scope of the project prior to preparation of a fee proposal and actual negotiations. To assist in preparation for the conference, the COE PM will provide the A-E a copy of the Project Development Brochure (PDB) which outlines the functional requirements of the facility, and a basic technical criteria package. The A-E shall attend the Pre-design conference with his lead designers in each of the applicable disciplines assigned to the project. This conference is usually held at the military installation hosting the proposed project. Representatives of the users of the facility, the Major Command (MACOM) the users fall under, and the installation Director of Engineering and Housing (DEH) will also attend this conference. At this time the A-E may propose scope of work changes that he feels are in the best interest of the project. If the A-E is tasked with geotechnical or survey work, see appropriate Appendices for additional information.

4.0 PRENEGOTIATION CONFERENCE

4.1 The prenegotiation conference is scheduled by the PM and is normally held at the District Office. For smaller less complex project, the prenegotiation conference may be held telephonically. For smaller less complex projects, the prenegotiation conference may be held telephonically. During the prenegotiation conference, the predesign conference minutes, the scope of work, the requirements of the A-E's Design Quality Control Plan (see Paragraph 10.0) and all phases of the required effort affecting the A-E's fee are discussed so that the A-E has a clear understanding of the scope of his efforts and can make an equitable fee proposal. Any scope of work changes proposed shall be brought up at this time. COE PM will introduce A-E to the COE negotiator who then becomes the point of contact for matters relating to the fee proposal. The COE negotiator will explain the desired format of the A-E's fee proposal. The proposal shall be submitted on a specific date established by mutual agreement during this conference. The negotiation date will also be established at this time. A-E fee proposals shall be sent to the Chief, A-E Negotiations Section using the following address:

District Engineer
U.S. Army Engineer District, Sacramento
ATTN: CESPKE-M, A-E Negotiations Section
650 Capitol Mall
Sacramento, California 95814-4794

5.0 NEGOTIATION CONFERENCE

5.1 Negotiations will normally be held in COE offices. The objective is to reach an agreement on a fair and reasonable fee for the work and services required. During negotiations the scope of work will again be reviewed as necessary, and the A-E's proposal will be examined and discussed in detail. Major changes in the scope of work are unacceptable at this time unless the A-E has previously notified the PM that certain scope changes are necessary.

Subsequent to the successful completion of negotiations and upon approval of the Contracting Officer, the A-E will receive written notice to proceed.

This notice will normally be forwarded with the unsigned contract to the A-E for signature within approximately 10 days after completion of negotiations.

6.0 CRITERIA

6.1 Functional Criteria. The PDB provided to the A-E is prepared by the installation and is used to establish project functional requirements. Specific mention of materials, system selection, matching exterior appearance or existing systems in the PDB are informational only. Design must proceed based upon authorized standard criteria unless a specific written waiver is issued by the COE.

6.2 Technical Criteria. The COE will furnish the A-E with all available data and criteria concerning the project. A Basic Design Criteria Package will be transmitted to the A-E prior to negotiations. The A-E shall request Technical Manuals, Design Manuals, Guide Specifications, and other pertinent publications, refer to "Criteria Index" of available references in Chapter V. The A-E shall thoroughly familiarize himself with the detailed technical criteria furnished, since his design must conform to all applicable requirements contained in the criteria. Any deviations from established criteria, including the use of criteria obtained from the User, or other sources, must receive prior approval of the PM. Where the technical criteria contained or referred to is not met, the A-E will be required to re-design to the established criteria at his own time and expense. Except in those cases when specific written waiver of criteria has been issued by COE. Any questions or problems encountered by the A-E in following the established criteria shall be promptly submitted to the PM for resolution. In those instances where the Government does not possess criteria on a subject, the A-E shall clearly describe what criteria he used and why. If published criteria does not exist for a portion of the work, the A-E shall provide back-up to substantiate the development of specifications or design details for this work.

6.3 Informational Material. Any "typical" documents (Design Analysis, specifications, drawings, etc. from another project) shown to the A-E are for background information only, and are not authorized criteria unless specifically stated in the scope of work.

7.0 TRADE NAMES AND PROPRIETARY ITEMS

7.1 The use of trade names or proprietary items on the drawings and/or in the specifications by adopting a manufacturer's description of a particular commercial article followed by the words "or approved equal" shall be avoided. See A-E Guide, Volume 3, Specifications, for a complete discussion on use of trade names and proprietary items.

8.0 DESIGN EXCELLENCE

8.1 Things to Consider. Design excellence is a prime goal for all Army installations. The purpose is to achieve complete facilities which have a favorable effect on morale, personnel efficiency and community spirit. To achieve the goal, the following items must be considered throughout the design process:

- Appearance - The structure should be pleasant and in harmony with the surrounding environment. Check with the DEH and COE PM to see if specific installation, architectural standards or design guides exist.
- Function - Interior room adjacencies and exterior building relationships must be considered with flexibility in use and possibility of expansion in mind.
- Maintainability - Provide a practical design that utilizes easy to maintain materials and equipment.

9.0 ENVIRONMENTAL CONSIDERATIONS

9.1 Special attention shall be given to the environmental factors in the design and construction of Army installations to eliminate or minimize degradation of the environment in accordance with (IAW) Public Law 91-190, National Environment Policy Act; PL 92-500, Federal Water Pollution Control Act; PL 94-580, Resource Conservation and Recovery Act; PL 89-272, Solid Waste Disposal Act; PL 95-217, Clean Water Act; PL 95-95, Clean Air Act 1977; PL 93-523, Safe Drinking Water Act; Executive Orders 11514 and 12088; and to meet the Federal, State and local environmental quality standards, particularly with regard to air and water pollution.

10.0 DESIGN QUALITY CONTROL

10.1 Purpose. The responsibility of the A-E for checking and coordinating of all design documents cannot be overemphasized. The A-E is responsible for producing complete, competent, properly coordinated, and thoroughly checked design documents within agreed schedules. When a construction contractor and the COE are in dispute over an interpretation and the issue must be resolved by a claim, the contractor most often prevails since he need only prove that his position is reasonable, while the COE must prove that the design intent is free from ambiguity or uncertainty. A-E liability for design errors and omissions will be pursued by the Corps of Engineers.

10.2 Design Quality Control (DQC) Plan. Concurrent with the fee proposal submittal, three (3) copies of the A-E's written DQC Plan shall be submitted to the COE PM for approval. The DQC Plan will be reviewed by the COE negotiator, PM and Design Quality Assurance Section. If comments are generated during this review, the A-E shall respond to the comments in writing and/or revise the plan accordingly and resubmit prior to initiating design. The A-E will be expected to follow the approved DQC plan throughout the course of the project to assure a quality end product. Should future events dictate revisions to the approved DQC Plan, the A-E shall notify the PM in writing and submit the revised plan for approval. The plan shall be prepared in 8-1/2" x 11" format. Any charts or schedules included in the plan that are larger than this size shall be folded to conform to an 8-1/2" x 11" format. The plan shall include a title page and a table of contents. The following basic elements shall be included in the DQC Plan:

10.2.1 Management Approach. Define the specific management methodology to be followed during the course of the contract including such aspects as design coordination procedures, quality control, communications, and managerial continuity and flexibility.

10.2.2 Management Structure. Delineate the organizational composition of the firm to clearly show the interrelationship of the management and design team components including all consultants. Include an organization chart to identify the key design and review team members showing their specific responsibilities.

10.2.3 Planning and Scheduling. Include a time-scale bar chart or Critical Path Method (CPM) design schedule showing the sequence of events involved in carrying out the project tasks within the specified period of service. Clearly show the A-E review and correction periods occurring prior to submittals to the COE. It will be a forward planning as well as project monitoring tool.

10.2.4 A-E Review Effort. The Design Quality Control Plan shall include, but not be limited to the following A-E performed review elements:

- Design Development Review
- Criteria Review
- Presentation of Data Review
- Editing of Guide Specification review
- Design Budget Review
- Inter-Disciplinary Review
- Final Review

10.2.5 Quality Control. The professional quality, technical accuracy and the coordination of all design documents and other services to be provided by the prime Architect-Engineer and any subcontractors/consultants used is of major importance. It is therefore a requirement for the A-E to have a logical and functional quality control program to assure that errors and deficiencies in all submittals are minimal. To meet this requirement, the A-E shall perform technical and inter-disciplinary reviews and shall correct all errors and deficiencies in the design documents prior to submitting them to the COE for review. The A-E's cover letter which transmits the design documents for review shall include a statement of certification that the A-E has performed a detailed review and coordination of the submitted documents. The A-E's performance evaluation will be based in large part on how his design package reflects conformance with his DQC Plan. The A-E's contractual obligation to provide complete, well coordinated, and error free documents has far-reaching consequences. Therefore, the A-E is cautioned to place special emphasis on this aspect of the DQC Plan. In the event damage to the Government results from negligent performance of any of the services to be furnished under this contract, the A-E will be held liable for such damages. The Government's review effort in no way relieves the A-E of his contractual responsibilities. For this reason, an effective quality control plan is critical.

10.2.6 A-E Quality Control Checklist. The DQC Plan shall include the quality control checklist shown in Appendix A. The purpose of the checklist is to provide a useful tool for the A-E to assure a quality contract package.

The list points out numerous areas which, when appropriately considered during the design, will help ensure a quality project. This list should not be taken as covering all aspects of the project. The completed checklist shall be submitted as an attachment to the A-E's transmittal letter transmitting the final design package to the COE. If during COE review of the final design documents it becomes apparent that items initialed off have in fact not been completed/coordinated, the COE PM shall be notified and appropriate action taken. Possible actions include return of the final design package to the A-E for correction, withholding of contract payments and/or completion of an interim "unfavorable" A-E evaluation for inclusion in our A-E selection office files.

10.2.7 Corrections of Deficiencies. The A-E will establish a formal procedure to correct all design errors and omissions during construction. The A-E will maintain a master list of all errors identified and the action taken.

11.0 CONDUCT OF WORK

11.1 In the performance of his design service contract with the COE, the A-E shall:

11.1.1 Execute the work diligently and aggressively and promptly advise the PM of all significant developments.

11.1.2 Prepare a summary of all significant discussions between the A-E and representatives of other Government agencies relating to work under this contract and promptly furnish a copy to the PM.

11.1.3 Prepare a summary of significant telephone conversations relating to the technical phases of work under this contract and promptly furnish a copy to the PM.

11.1.4 Promptly furnish to the PM copies of all written communications pertaining to the work under this contract received from other Government agencies. When it is clearly indicated that a copy of the communications has been furnished to the PM by the originator, concurrence of action will be obtained from the PM.

11.1.5 Take appropriate measures to obtain clarification of design criteria requirements, to acquire all pertinent design information, and to incorporate such information in the work being performed. This action will be accomplished through the PM.

12.0 REVIEW PROCESS

12.1 Automated Review Management System (ARMS). ARMS is a computerized method for transmittal and storage of design review comments. It provides interactive capability to address and respond to design review comments. ARMS requires use of a VT100 or ANSI emulating terminal. The Sacramento District has established ARMS for use on all Army projects. An "Architect-

Engineer Response" package will be forwarded to you to explain use of the system. If you encounter any problems or have questions or comments, please call the ARMS Hotline at (916) 551-3126. A 24-hour answering machine is connected to this line.

12.2 Review Comments. All design data prepared by the A-E will be reviewed by the COE and other agencies for conformance with the contract requirements and technical as well as functional criteria. This review effort in no way replaces the A-E's review requirements outlined in Paragraph 10.0 above.

12.2.1 All review comments made by other than COE Design Quality Assurance (DQA) personnel will be "coordinated" by the DQA section. That is, they will be reviewed for applicability to the project against the project's design criteria and annotated with one of the letter codes listed below. The intent is to give the A-E direction as to what action is required on each comment:

Withdrawn	-	Withdrawn by maker. A-E take not action.
Concur	-	A-E to comply
Changed Scope	-	Change in design scope - technically acceptable. PM to decide on incorporation.
Information	-	For A-E's information.
Denied	-	A-E take no action.
Duplicate	-	Duplicate comment. A-E take action per other similar comment.

This annotation will appear, with the letters DQA preceding it, directly beneath the comment (i.e., DQA: Concur).

12.2.2 Review comments generated by DQA personnel have no annotations. All DQA comments and comments with a "Concur" annotation are to be incorporated into the design and responded to by the A-E per Paragraph 12.2.3. below.

12.2.3 The A-E shall follow directions provided in the "Architect-Engineer Response: package and respond to the review comments in ARMS as follows:

12.2.3.1 For comments annotated Withdrawn, Info, Denied, and Duplicate, a "NOT DONE" response is acceptable.

12.2.3.2 For all comments annotated Concur, or Changed Scope, the A-E shall enter a response of "DONE" or "NOT DONE" and:

12.2.3.2.1 If "DONE", A-E MUST provide the sheet number and/or page number where the change has taken place. The ARMS system will prompt the A-E with "Where" to provide this information after the "DONE" annotation is entered.

12.2.3.2.2 If "NOT DONE", the A-E MUST provide a rebuttal. The ARMS system will prompt the A-E with "Why" to provide the rebuttal. All rebuttals MUST be cleared with the appropriate DQA discipline reviewer by phone through

the PM. This is to be done and documented by the A-E as soon as possible; definitely before the next submittal.

12.2.3.3 Review comments on prior submittals will be checked for incorporation in the subsequent submittals. Those comments verified as done and explanations concurred with will be annotated, >>BACKCHECKED: A-E action done: in ARMS. Previous comments not verified as done or explanations not concurred with will be annotated, ">>BACKCHECKED: A-E action disapproved,

resubmitted" and will appear in the current review stage's comments. These comments will require further action by A-E prior to next submittal. All final submittals will be backchecked by the COE, after A-E corrections are made, to ensure compliance with or resolution of comments to the satisfaction of the COE.

12.2.4 Submitting a separate sheet of paper with location of compliance or rebuttals is not allowed. All information MUST be entered into ARMS.

12.2.5 Always annotate and forward the review comments in ARMS. If the A-E has any hardware or software problems with the ARMS system, call the ARMS hotline, (916) 551-3126.

12.2.6 The A-E is encouraged to call and discuss any problematic comments with the appropriate reviewer in our DQA Section. The last name and phone number of each DQA discipline's unit leader appears in the upper right hand corner of the cover sheet accompanying the copy of review comments sent to the A-E.

13.0 VALUE ENGINEERING

13.1 The COE reserves the right to perform value engineering studies on projects either during or after completion of design. The value engineering studies may be performed by the COE or other Architect-Engineer firms designated by the COE. The COE, at its discretion, may require the A-E to implement any or all design changes resulting from the value engineering studies or the engineering evaluations after completion of design. The A-E, during the course of his design, shall look for and identify those high-cost, low-value items which may be accomplished in other ways at less cost. During review of the PDB and other design criteria, and prior to initiating the design, any potential value engineering items shall be reported to the PM. Depending on the project's construction dollar value, the A-E shall prepare certain value engineering cost forms. These forms and their preparation are described in detail in the Cost Estimating Guide (Volume 2 of the A-E Guide).

14.0 SITE VISITS

14.1 Each time the A-E makes a visit to the project site, for whatever reason, he shall check in at the nearest COE Resident Office or Project Office. COE construction field personnel can be invaluable in facilitating the A-E's access to the project site and in contacting information sources through the DEH office at the Installation. Contact the PM for the location of the nearest COE construction Resident Office, and provide at least one day notice prior to the visit. All site visits shall be coordinated with the PM.

15.0 CONTRACT PAYMENTS

15.1 The A-E shall submit monthly estimates for the value of the design services performed to the District A-E Negotiation Section on ENG Form 93, which will be checked by the COE PM against progress made, and certified for payment. Forms are available from the District A-E Negotiations Section and shall be used. Completed ENG Form 93 shall be mailed to the address listed in Paragraph 4.1 of this Chapter.

16.0 RESPONSIBILITY AFTER DESIGN COMPLETION.

16.1 The A-E is required to support the District after completion of his design contract should errors or omissions in the documents prepared by the A-E create problems in bidding or administering the contract for construction. The support provided by the A-E shall take whatever form is necessary to correct the errors or omissions in the original documents. Such required design corrections shall be done in a timely manner at no additional cost to the Government.

16.2 Engineering related services may be required in direct support of a project's construction, apart from that described in Paragraph 16.1 above. If required, these services will be defined in a scope of work prepared by the PM. This work shall not be performed by the A-E until an appropriate fee for the work has been negotiated and notice to proceed is issued by the contracting officer of the COE. Services may include monthly site visits to the project, conference attendance or special inspections.

17.0 ELECTRONIC BULLETIN BOARD

17.1 An Electronic Bulletin Board (EBB) has been established by the Sacramento District to facilitate transfer of design related information such as guide specifications and other technical criteria between the COE and the A-E. At this time, staffing is not available to provide continuous updating of the material on the EBB, therefore, the A-E is not to consider material on the EBB as necessarily current. Contact your PM for access procedure.

TYPICAL PROJECT MILESTONES

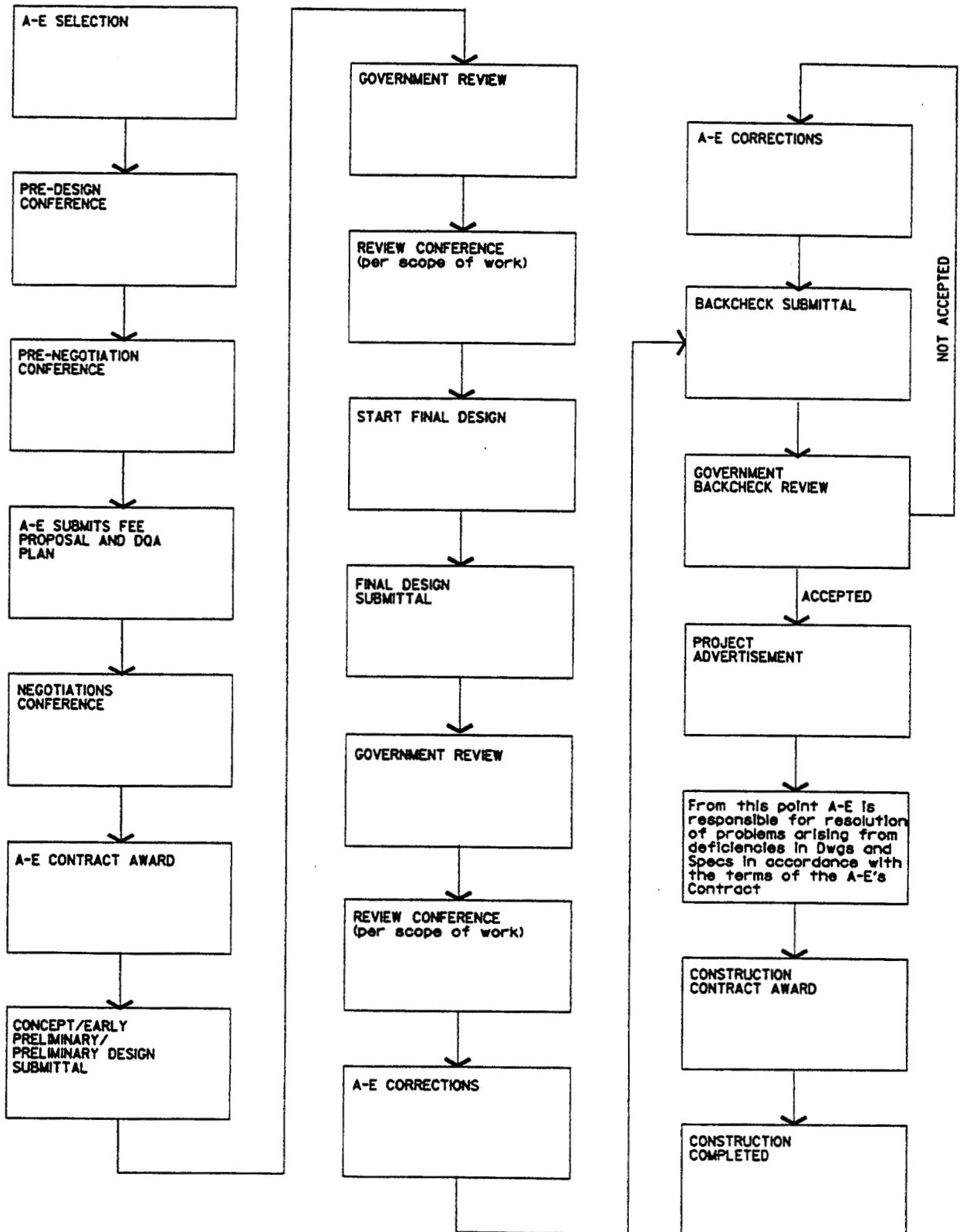


figure 1

TYPICAL PROJECT DOCUMENTS PREPARED BY A - E

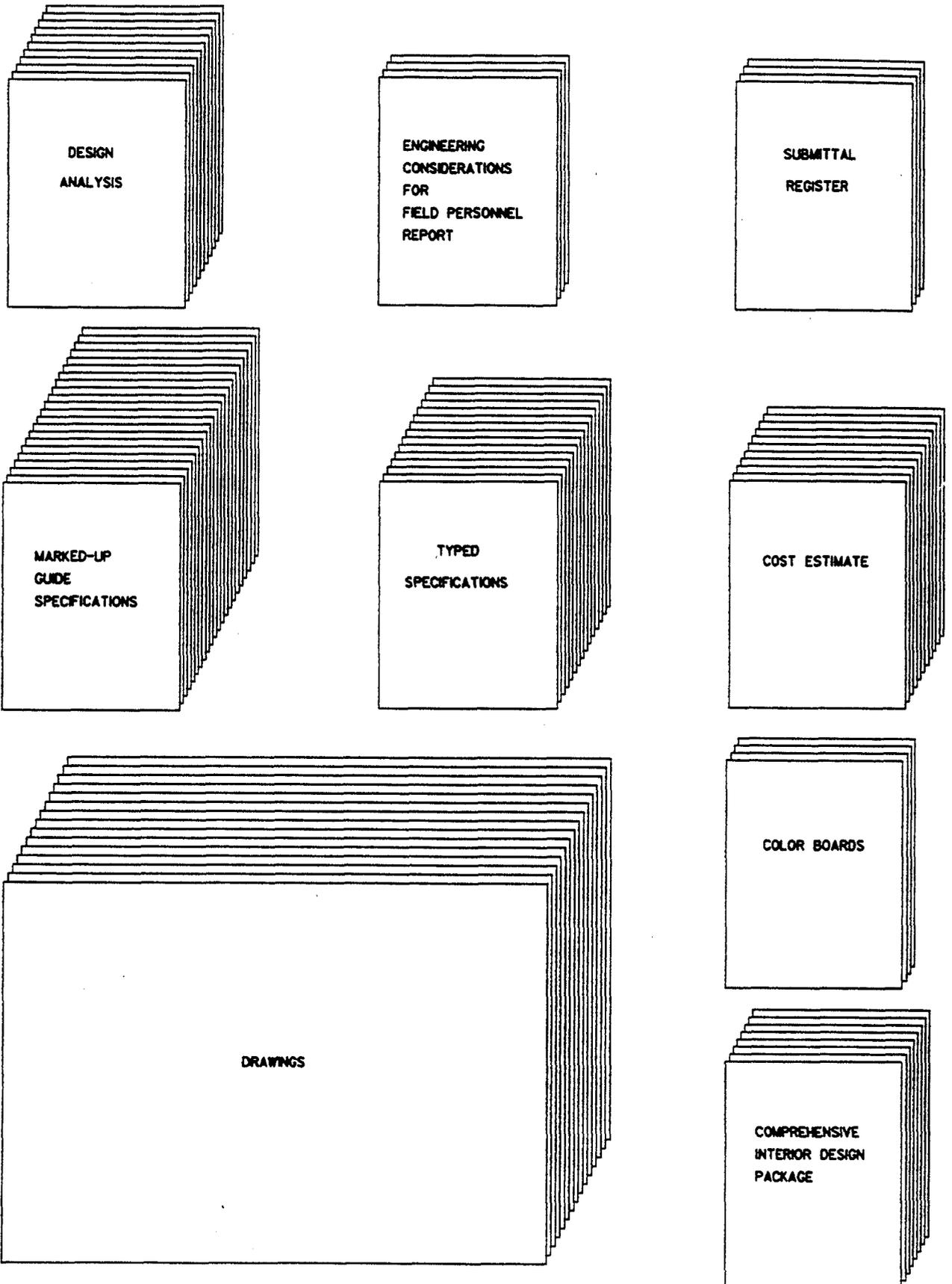


figure 2

CHAPTER II
PRESENTATION OF DATA

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Figure 3	Typical Drawing Set	
Figure 4	Typical Design Analysis Assembly	

"The bitterness of poor quality is remembered long after
the exultation of meeting the schedule has passed."

CHAPTER II
PRESENTATION OF DATA

1.0 GENERAL

1.1 The standards for data presentation contained in this chapter shall be strictly adhered to in the preparation of the project documents required by the A-E Scope of Work. No exceptions will be allowed unless authorized by the COE in the Scope of Work.

1.2 These standards describe the quality expected, the various technical features and requirements of the drawings and specific information that must be included in the various documents. It is not intended to be a complete list of all features. The A-E has the responsibility to show all information necessary to completely describe the project. Regardless of local practice or procedures, the designer must prepare the drawings with the expectation that both the COE, in the role of construction manager, and the construction contractors will be able to construct the building or facility without numerous modifications to correct design deficiencies.

2.0 DRAWINGS

2.1 Drawing Media: Original drawings are defined as the final design drawings submitted to the COE by the designer. These originals may be first generation drawings produced by the designer/draftsman or they may be copies of those drawings subject to the allowable media, processes and techniques of preparation described herein. Original drawings as submitted will be used to produce bid and construction documents and will eventually become record As-Built documents. Therefore, they must be of durable material and be able to produce quality prints. All sheets shall be 30" x 42" and have COE standard borders and title blocks. A sample title block is shown in Chapter IV, Plate 2. This title block is for all sheets other than the cover sheet. The cover sheet title block, Chapter IV, Plate 1, requires a number of signatures by COE personnel. Drafting media of the following types are available for use on roads, airfields, utilities, and railroad projects: single plan and profile, double plan and profile, and cross-section (grid 10 x 10). All original drawings submitted shall be capable of being changed by use of erasers or liquid erasing fluids and drawn upon with plastic lead, pencil or ink on both sides. Paper diazo reproducibles are not acceptable.

2.1.1 Allowable media for original drawings are as follows:

2.1.1.1 Drawing film as supplied by COE PM (equivalent to Dietrick Post DPD.3).

2.1.1.2 Photo wash-off polyester drafting film (3 millimeter minimum thickness, double matted, equivalent to "Cronoflex").

2.1.1.3 Polyester draft film (3 millimeter minimum thickness, double matted, equivalent to "Mylar").

2.1.2 It is understood that A-E firms utilize many different design/drafting techniques rather than drafting "final" on original material, especially for drawings such as standard detail sheets. The A-E may use

whatever technique he feels comfortable with. However, for final originals, the COE will accept only the material described in Paragraph 2.1.1 above. If the A-E does not utilize drawing film provided by the COE PM or "Mylar" material, he must submit "Cronoflex's" that meet the following criteria:

2.1.2.1 Image to be on reverse side that is erasable or fluid removable.

2.1.2.2 Must be high contrast photo quality (no background and with all line work dark and dense), suitable for the production of diazo prints, offset 1/2-size prints, and 35 mm film record copy. If drawings are not of photo quality, as determined by the COE, A-E shall resubmit drawings of acceptable quality. Poor Cronoflex's reflect poorly done originals and will not be accepted.

2.1.2.3 Exposure must be made using a vacuum-frame contact printer.

2.1.2.4 Must resist yellowing and/or darkening of background from exposure to ultraviolet light and during print storage in file.

2.1.3 The final originals to be submitted to the COE must be single thickness drawing sheets and sized no less than the Government-supplied drawing paper.

2.1.4 Drawing material that does not meet COE standards shall be rejected at any time during design. The A-E is liable for replacing rejected drawings at his own expense.

2.2 Drawing Preparation. Preparation of all work shall be for 1/2-size reduction unless instructed otherwise. Most modern reproduction processes of half-size or smaller do not tolerate shading, whether it be by color or background shading; therefore, shading is not permitted on final originals. Parallel lines shall never be so close together that they will merge into one line. The clear space between lines shall always be of greater width than the adjoining lines. Lettering shall be single stroke, freehand or mechanical, all capitals, with a minimum height of 1/8-inch; again keeping in mind that lettering must be fully legible at 1/2-size reduction. Lettering styles and sizes shall be standardized within a set of drawings regardless of discipline involved.

2.2.1 Unacceptable Processes and Techniques: the following items are not acceptable on original drawings:

2.2.1.1 Transfer type letters and symbols.

2.2.1.2 Details and notes applied with adhesives (stick-ons).

2.2.1.3 Drawings made of pieces of different drawing sheet media and taped together in composite form.

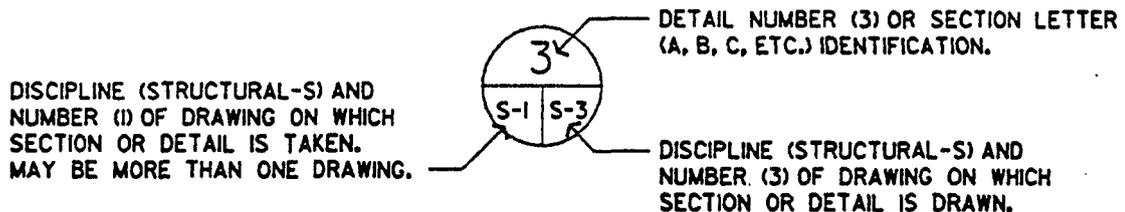
2.2.1.4 Tapes of transfer type letters applied with adhesives.

2.2.2 Numbering of drawings: All drawings shall be consecutively numbered, and numbered by disciplines, as shown in Plate 6, Chapter IV. The drawings shall be placed in the drawing set in the discipline sequence as shown in Figure 3. The cover sheet (G-1) must be the first sheet of the drawing set.

2.2.3 Signature: All final drawings prepared and submitted by the A-E shall bear the stamp and signature of a registered engineer or architect, as identified in the A-E's DQC Plan, preferably one of the principals of the firm under contract to the COE (see Plate 2, Chapter IV for preferred location of stamp). Drawings submitted by the designer shall not be dated.

2.2.4 Orientation: Orientation of plans for all disciplines shall be consistent, with north-arrow pointing toward the top of the sheet or towards the left when necessary.

2.2.5 Cross references: Cross referencing for sections and details shall be based on the discipline drawing number (i.e., S-1, S-3 etc.). The symbol below shall be used for such referencing. Cross referencing between different discipline drawings shall be done by adding a note at the appropriate location stating for example: "For continuation, see Civil drawing C-2." General statements such as "See Civil Drawings" are unacceptable.



2.2.6 "Keyed" Notes. The carte blanche use of "keyed" notes on the drawings is unacceptable. Specific items/features of the design shall be called out by description, detail symbol, equipment symbol, size, etc. at the location shown on the drawing or as close as possible with an arrow pointing to the location on the drawing. In no case will a "mass" of keyed notes placed on one drawing, but referring to items on another drawing be acceptable. "Keyed" notes are allowed in details or sections similar to the extent utilized in COE Standard Details.

2.2.7 Scales: Scales shall be selected to avoid overcrowded and cluttered conditions on the drawings. Drawing layout, together with the proper scales to properly delineate the project, shall be carefully planned in advance. Where necessary to maintain proper scale, drawings or large structures shall be placed on two or more sheets. A graphic scale for each of the different scales used on a drawing shall be placed on the drawing preferably near the title block. See Plate 7, Chapter IV. The design shall be prepared to the scales called for below. Scales shall be consistent

throughout all disciplines drawings. For large, open structures, a smaller scale than required may be allowed on a case-by-case basis, subject to discussion with and approval by the DQA Section and the COE PM at the Pre-Negotiation Conference. If a smaller scale is approved and used, congested areas such as toilet rooms, mechanical or electrical equipment rooms, etc., must be drawn to a minimum 1/4" scale. Acceptability of scale is determined by clarity of drawings at one-half scale reduction.

- Cover sheet (General Sheet): G-
- General information - scale n/a
- Civil Drawings: C-
- Site plan C-, 1" = 40' minimum;
to avoid a crowded condition it may be necessary to use
1" = 20' or 1" = 10'
- Demolition plan C-, 1" = 40' minimum
- Grading and Paving C-
Grading Plan: As appropriate for clarity.
Profile: As required by topography.
Sections: As appropriate for clarity.
Details: As appropriate for clarity.
- Utilities: U-
For projects that involve supply, collection, and/or
distribution utility conduits, use a horizontal scale of 1" =
20' for both the Plan and Profile. Use a vertical scale on the
Profile of 1" = 1' for flat slopes and up to 1" = 10' for steep
slopes. Use double plan and profile sheets when applicable.
- Landscape drawings: L-
- Site plan and legend - 1" = 40', or 1" = 20', as appropriate.
Details - as appropriate for clarity
- Architectural Drawings: A-
- Floor plan and legend - 1/4" = 1'-0"
When a 1/4" = 1'-0" scale does not fit on one sheet, discuss
alternatives available with the COE PM and DQA Section prior
to proceeding with design. For large, open structures, a
1/8" = 1'-0" scale may be used, with congested areas such as
toilet rooms, mechanical rooms, etc. being blown-up to 1/4" =
1'-0"
- Elevations - 1/8" = 1'-0"
- Door and Finish schedule - n/a
- Building section - 1/8" = 1'-0"
- Wall section - 3/4" = 1'-0" (Minimum 1/2" = 1'-0")

- Ceiling plan - 1/4" = 1'-0" or 1/8" = 1'-0"
- Roof plan - 1/16" = 1'-0"
- Details - as appropriate for clarity
- Structural Drawings: S-
 - Foundation plan, legend and general notes - Same scale as architectural floor plan
 - Foundation details - as appropriate for clarity
 - Floor plan - same scale as foundation plan
 - Wall sections - 3/4" = 1'-0"
 - Roof plan - same scale as floor plan
 - Details - as appropriate for clarity
- Mechanical drawings:
 - Plumbing plan, legend and fixture schedule - P - same scale as architectural floor plan, with congested areas enlarged as required for clarity.
 - Details and equipment schedule - as appropriate for clarity
 - HVAC plan and legend - M - same scale as architectural floor plan, with congested areas enlarged as required for clarity
 - Building section - 1/4" = 1'-0"
 - Details - as appropriate for clarity
 - Schedule - n/a
 - FP - Fire Protection Plan - same scale as HVAC
- Electrical drawings: E-
 - Site plan and legend - 1" = 40'
 - Lighting plan - same scale as architectural floor plan
 - Power plan - same scale as architectural floor plan
 - Details and schedule - as appropriate for clarity

2.2.8 Legends: Legends of symbols shall be listed on the first sheet of each design discipline. If two or more disciplines are representing the same item, they must use the same symbol.

2.2.9 Abbreviations: Define abbreviations on the first sheet of each discipline.

2.2.10 Schedules: Provide the following schedules:

2.2.10.1 Door Schedules: A tabular schedule of doors shall be included on the drawings. Every door shall be assigned a separate number and this number shall be clearly indicated on the plans. Doors shall be numbered in consecutive order, by floor, beginning with the principal entrance and progressing counter-clockwise through the plans. An elevation drawing of each type of door identified by an upper case letter shall be provided. Details of each frame type shall be shown and each type shall be identified. See Plate 8, Chapter IV.

2.2.10.2 Window Schedules: A tabular schedule of windows shall also be included. Each window type shall be assigned a number preceded by the letter "W". An elevation drawing of each type of window shall be provided along with pertinent details. Every window shall be clearly indicated by type on the elevation drawings. See Plate 9, Chapter IV.

2.2.10.3 Finish and Color Schedules: Tabular schedules of interior finishes and colors shall be included on the drawings. Finish and color schedules shall identify by room number the finish materials and colors to be used for the floor to include the base; the walls to include any wainscoting and trim; and the ceiling. Meanings of abbreviations used in naming materials and finishes shall be included on the legend sheet or on the same sheet as the schedules. See Plates 10, 11, 12 and 13, Chapter IV.

2.2.10.4 Plumbing and Mechanical Equipment Schedules. Tabular schedules of equipment shall be included on the mechanical drawings. Items shall be identified by equipment type, number, and symbol. Tabulated information shall be sufficient to define the capacity, performance, and requirements of the equipment. (Note: The Sacramento District has developed standard equipment schedules for various types of mechanical equipment. They are on 30" x 42" drawing material and/or floppy disk and are available from the COE PM.)

2.2.11 Room Numbering: Every room shall be assigned a separate number and this number shall be clearly indicated on the plans. The numbers shall be generally assigned as follows:

Basement	001 thru 099	
First Floor		100 thru 199
Second Floor		200 thru 299

Rooms shall be numbered in consecutive order, beginning with the principal entry area and progressing counter-clockwise through the plan. Spaces added by revision shall be given the number of the primary or nearest room followed by the letter, "A", or if more than one additional space, "B".

2.2.12 Key Plans: For projects where more than one drawing sheet is required to show the entire floor plan, "key plans" at minimum 1/32" scale shall be provided on all disciplines floor and roof plans. The area depicted on each drawing shall be cross-hatched accordingly on the "key plan". Show column lines and provide column line designations.

2.3 General information sheets (G-1, G-2, etc): For most projects, one or two sheets will be adequate to show, as a minimum, the title and location of the project, schedule of drawings, a project location plan, and a vicinity map.

2.3.1 Schedule of Drawings. The schedule of drawings shall include the consecutive sheet numbers, the design discipline sheet numbers, and the drawing titles as shown on Plate 6, Chapter IV. Spaces shall be left between each discipline's drawings to allow room for insertion of additional drawings by revisions to the design during design or construction.

2.3.2 Vicinity Map. The vicinity map shall be a single-line type showing major cities, nearby towns, major rivers, streams, current routes of nearby highways and railroads, and a north arrow. See Plate 14 in Chapter IV.

2.3.3 Location Map. Show location of the project on a small scale location map, which will be legible when reduced to 1/2-size. Indicate the general relationship between the new facility and major existing structures and/or streets to facilitate identification of the proposed site. Also, on this location map show the following:

- 2.3.3.1 North arrow.
- 2.3.3.2 Highlight approved project boundaries.
- 2.3.3.3 Contractor's equipment yard.
- 2.3.3.4 Contractor's entrance.
- 2.3.3.5 Haul roads to and around the job site. Provide any notes for special access, if necessary, to the project site on this sheet. Lettering along the haul route shall be 1/8-inch size.
- 2.3.3.6 Location of the COE Resident/Project office.
- 2.3.3.7 Provide a note with phone number and describing location of nearest, private medical facility.
- 2.3.3.8 Security Police location.
- 2.3.3.9 Location of the Director of Engineering and Housing (DEH) office.
- 2.3.3.10 Approved location of the borrow and disposal areas. If there are no on-base borrow or disposal areas, provide a note to that effect on this sheet.

2.4 Revisions to Drawings After Project has Advertised for Construction. These can include drawing revisions issued by amendment during the bidding period and construction change orders requiring changes to drawings. Generally, the A-E will be required to make all necessary revisions. Revisions to the drawings shall be made as follows:

2.4.1 All changes to the drawings shall be identified by the triangle symbol located at the points of revisions. NOTE: The triangle symbol shall not be used for identifying any item other than revisions.

2.4.2 Revision numbers shall be identified by a number located in the center of the triangle. It is important to note that numerous revisions made to a drawing at a given point in time will be identified by the same number in each triangle. As an example, a set of drawings has 10 sheets. Sheets 1, 5, and 7 are revised on 5 July 87. All items revised on these sheets as a result of this revision shall be identified by triangles with the number "1" in the center, indicating the first revision to Sheets 1, 5, and 7. A second revision dated 9 August 87 revises items on Sheets 1, 4, and 9. The items revised on Sheet 1 at this time shall have triangles with the number "2" in the center indicating the second revisions to this sheet, whereas items revised on Sheets 4 and 9 at this time shall have the number "1" in the center of the triangles, as above, indicating the first revisions to these sheets.

2.4.3 Complete the revision block (located just above the title block, see Plates 1 and 2, Chapter IV) by inserting the triangle, with appropriate revision number, in the "revision" column, the date the revision was made in the "date" column, a brief description of the revision in the

"description" column, and the initials of the person making the revision in the first "By" column. When more than one type of revision is made to a drawing at a particular time, the revisions will be described as "Miscellaneous Revisions".

2.4.4 Where revisions result in new drawings to be added, they shall be added at the end of the disciplines to which they belong. As an example, if the previous drawing to the one being added is C8, consecutive sheet 10, then the numbering of the added sheet would be C9, 10A. When new drawings are added, the Schedule of Drawings (included in the G-Sheets) shall be revised to indicate the new drawing number(s). (NOTE: This procedure also applies to contract modifications and preparation of as-built drawings.)

2.5 DEFINITIVE, STANDARD, AND SITE ADAPTIVE DRAWINGS. Definitive, Standard or Site Adaptive drawings shall not be used on a project unless specifically stated in the Scope of Work issued by the COE PM.

2.5.1 Definitive Drawings do not include sufficient information for use in construction, but establish basic functional features in preparation of final project design. The following revisions may be required when definitive drawings are used:

2.5.1.1 Change dimensions to fit modular design.

2.5.1.2 Change fenestration and other features pertinent to adapt to local climatic conditions.

2.5.1.3 Modify for compliance with life safety code and handicap criteria.

2.5.1.4 Change shape and interior arrangement of building as required to conform to site or topographic requirements or tie to existing building.

2.5.1.5 Provide vestibules when required.

2.5.1.6 Modify exterior elevations including roof slopes to comply with current criteria including compatibility with architectural theme.

When definitive drawings are used, it is not permissible to increase the gross area, or add, omit, or effect a major change in area allotted to the various functions of the building. Approved programmed scopes shall not be exceeded.

2.5.2 Standard Drawings. Standard Drawings are working drawings issued by the Corps of Engineers to establish uniform standards in scope and quality for structures likely to be repeated in several locations. All possible local variations with respect to siting, foundation conditions, earthquake zones, topography and climatic conditions cannot be anticipated. When standard drawings are used for a design, applicable portions of those drawings shall be used to the maximum extent practicable. Structural or architectural changes shall be made only if specifically authorized in the directive or design instructions. From time to time the Chief of Engineers publishes general changes to design criteria by means of Engineering Technical Letters (ETL's), revised Technical Manuals (TM's) and Guide Specifications. These changes are officially reflected in instructional data

addressed in Paragraph 6.0 of Chapter I. Modification of previously issued standard drawings to reflect these changes for project (final) drawings is both authorized and required. Otherwise, project documents shall be prepared by modification of the standard documents for site, seismic, and climatic conditions only.

2.5.2.1. The following revisions to standard drawings shall be made where applicable without prior approval.

2.5.2.1.1 Increase depth of footings and foundations to depth of frost line.

2.5.2.1.2 Redesign footings for local soil conditions.

2.5.2.1.3 Add elevation figures to drawings to relate plans to local bench marks.

2.5.2.1.4 Revise heating, air conditioning and insulation requirements due to climatic conditions. Provide for admission of combustion air to furnace and boiler rooms, and rooms containing diesel or gasoline engine-driven equipment.

2.5.2.1.5 Redesign for seismic loads when structure was not designed to resist seismic forces.

2.5.2.2. The following item is not dependent on local conditions and revisions shall not be made without prior approval of the COE:

2.5.2.2.1 Selection of type of materials except as required by directive, or Notes contained in Guide Specifications.

2.5.3 Site Adaptive (Existing Working) Drawings other than "Standard Drawings" as discussed hereinbefore are working drawings previously prepared for a specific installation, under the supervision of this or another District. Changes are required on these drawings to "adapt" them to a specific site. Any specific changes to be made in site adaptive drawings will be called out in the "Scope of Work" and discussed at the predesign conference. Drawings shall also be corrected as hereinbefore required for "Standard Drawings".

2.5.4 All sheets shall have COE standard borders and title blocks. A sample cover sheet title block requiring a number of signatures by COE personnel is shown in Chapter IV, Plate 4. A sample title block for all remaining sheets is shown on Plate 5, Chapter IV.

3.0 SPECIFICATIONS

3.1 Detailed instructions for preparation of specifications are presented in the A-E Guide, Volume 3, Specifications. In the interest of uniform construction, it is mandatory for the A-E to use COE Guide Specifications on all projects unless otherwise noted in the A-E's Scope of Work. A check list of available guide specifications is provided in A-E Guide, Volume 3, Specifications. The A-E shall complete the check list to identify those specifications he needs for the project and submit it to the COE PM. (Note: Guide Specifications

are also available on our Electronic Bulletin Board, however, specifications on the Board are not all current.) Specifications should be followed without deviations; if a change is needed, the A-E must consult with the COE PM.

3.2 Trade Names and Proprietary Items. The use of trade names, proprietary items, and the drafting of a specification by adopting a manufacturer's description of a particular commercial article shall be avoided. See Volume 3, A-E Guide, Specifications for a complete discussion on the subject of trade names and proprietary items.

4.0 COST ESTIMATE

4.1 Detailed instructions for preparation of cost estimates are presented in the A-E Guide, Volume 2, Cost Estimating. The cost estimate submitted with the Concept, Preliminary, or Final submittals must be as accurate as possible based on the design accomplished at that time. These estimates shall follow the CSI format IAW A/E Guide, Volume 2, Cost Estimating. The estimates will be used for programming and budgeting purposes and will be a major factor in determining if the project is to proceed through the final design and construction phases.

4.2 The A-E is reminded of his responsibility to design the project within the programmed funds. If, at any time, it becomes apparent that the project cost will exceed 90% of the programmed amount (85% on rehab or special projects), the A-E shall immediately notify the PM. The A-E shall, at the same time, suggest cost savings measures.

5.0 DESIGN ANALYSIS - CONTENT. See Chapter 3 of this Guide for specific content requirements since they vary depending on the stage of the submittal. If a standard design or other design is being site adapted and a design analysis exists, the analysis for the new project shall include appropriate material from the existing analysis modified to incorporate site adaptations and other essential requirements. The Design Analysis (D.A.) is to be a cumulative document in that it is to be developed and expanded upon with each subsequent submittal so that it represents the complete design history. The Table of Contents shall clearly define the location of all information contained therein, including the information and documents described hereinafter.

5.1 Design Quality Control Plan: Provide the A-E's Design Quality Control Plan, as approved by the COE.

5.2 Narrative: The purpose of the Narrative is to provide a complete explanation of the basis for the design on a discipline by discipline basis including the following: statement of the scope of work; purpose of the project; statement of the applicable criteria; a summary of the economic factors influencing the choice of systems for each discipline along with an explanation of how initial and life cycle costs were handled. It shall also include results of field investigations performed, including basic findings and discussion of need for utility easements, relocations of utilities and/or buildings, operation and maintenance requirements, and any other items discovered that warrant special attention.

5.3 APPENDICES. The following shall be included as appendices to the design analysis:

5.3.1 Geotechnical Report. Provide COE or A-E prepared geotechnical report commensurate with stage of design completion.

5.3.2 Egress Sketch. See Chapter III for specific requirements.

5.3.3 Handicapped Checklist. This checklist is provided by the COE PM and is to be completed by the COE PM at the Predesign Conference and turned over to the A-E for inclusion in the Design Analysis. For a sample of the checklist, see Plate 16, Chapter IV.

5.3.4 Environmental Permit Matrix. (Note: Include only if required by the scope of work.) For specific environmental documentation required by submittal, see Appendix C. The matrix is a summary of permit actions required for successful completion of the project. For a sample of the matrix, see Plate 17, Chapter IV.

5.3.5 Scopes of Work, Conference Minutes and other Pertinent Project Correspondence. The A-E shall include copies of all pertinent data such that the Design Analysis presents the project history from inception to completion of design documents.

5.3.6 Project Development Brochure (PDB). The A-E shall incorporate the approved PDB into the Design Analysis including any approved revisions. This document forms the basis for the functional requirements of the project. It is provided to the A-E by the COE PM.

5.3.7 O&M Provisions: This part of the design analysis shall provide a compilation of design provisions made to enhance and to reduce the cost of operating and maintaining the facility when completed. This shall include the O&M design intentions for each major discipline. This part of the design analysis shall be in a form that can be used separately to supplement the completion records required for formal transfer to the Using Service, or to form the basis for assembling a facility user's manual.

5.3.8 Engineering Considerations and Instructions for Field Personnel. This report is an extension of design into the construction phase of the project. It is a document in which design concepts, assumptions, details and instructions are transmitted to field personnel. The report establishes a basis for communication and coordination between design and construction personnel which is essential for the successful completion of a project. It is to be presented in outline form in the Early Preliminary submittal and bound separately for submission at Final Design. See Appendix B for specific content and submittal requirements.

5.3.9 DD Form 1354 Data Sheet. This document is utilized by COE construction personnel at construction completion to prepare transfer documentation required by the Army. The A-E shall complete the Data Sheet during final design. See Appendix D for instructions.

5.3.10 Design Calculations: Calculations shall be computed and checked by different individuals. Checking shall be accomplished by registered architects, and/or engineers of the firm under contract to COE, as identified in the A-E's DQC Plan. The names of these individuals shall be indicated on the page or insert carrying the calculation. Presentation shall be clear and legible with a tabulation showing all design loads and conditions. The

source of loading conditions, formulas, and references shall be identified. Assumptions and conclusions shall be explained and cross-referencing shall be clear.

5.3.11 Other Appendices to the Design Analysis: Provide any additional project required analyses such as Asbestos Survey results or special Seismic Analyses results, etc. and attach or bind separately as appropriate.

5.4 Use of Computer Programs: When a computer program is used for structural or mechanical analysis etc., the program shall be named and described to include a flow chart showing how the program reaches solution. This description must be sufficient to verify the validity of methods, assumptions, theories, and formulas, but will not require source code documentation or otherwise compromise proprietary programs.

5.5 Classified Material: Design Analyses containing classified material shall be marked and handled in accordance with instructions from the PM. Where only a minor portion of the criteria or calculation is of a classified nature, every effort shall be made to prepare the design analysis so as to permit it to be an unclassified document with proper references to sources of classified material.

5.6 Area Computations: Gross area of structures and net area break-downs for each floor shall be provided in the Design Analysis. The method of computation is specified in Chapter IV, Plate 18. See also the architectural paragraphs in Chapter III.

6.0 DESIGN ANALYSIS - PREPARATION & ASSEMBLY

6.1 Organization: The Design Analysis shall be organized as shown in Figure 4. Note that the Design Analysis defines the development of the project design. Do not delete information from earlier stages of design in subsequent design submittals.

6.2 Size and Layout: All material shall be prepared in relation to a vertically oriented 8-1/2 x 11 inch standard page size. Larger material, folded to 8-1/2 x 11, may be utilized when reduction is not feasible. This applies to all drawings, published data or automatic data processing printouts that must be included in the Design Analysis. Both side margins shall be 3/4 inch minimum to permit loose side binding and head to head printing.

6.3 Assembly and Identification: The original design analysis shall be loosely assembled with a complete table of contents. If more than one volume is required, no single component as shown in Figure 4 shall be segregated into different volumes. All volumes shall be numbered sequentially and loosely assembled under a cover page (see Plate 19, Chapter IV) indicating the volume number and total number of volumes for the project. Each volume shall have the complete table of contents for the entire Design Analysis with the items contained in that volume highlighted. For projects with more than one major facility, the design analysis may be assembled into separate volumes for each facility as per Figure 4.

CHAPTER III
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"There's never enough time to do it right,
but there's always enough time to do it over."

CHAPTER III

SECTION 1 - CONCEPT DESIGN

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CHAPTER III

SECTION 1 - CONCEPT DESIGN

1.0 Concept Design Submittal. The Concept Design submittal shall consist of the following documents:

- Design Analysis
- Drawings
- Outline Specifications
- Cost Estimate
- Draft of Environmental Permit Matrix (if required by the Scope of Work)
- Draft of Engineering Considerations and Instructions for Field Personnel Report
- Other Items as Required by the Scope of Work

This chapter will define, by discipline, the requirements of the Design Analysis and the Drawings. Guidance for the preparation of the Outline Specifications is described in the A-E Guide, Volume 3, Specifications. Requirements of the Cost Estimate are provided in the A-E Guide, Volume 2, Cost Estimating. Refer also to Chapter II, "Presentation of Data" of this Guide for design analysis format, drawing format, and quality requirements. See appropriate appendices of this volume for Environmental Permit Matrix and Engineering Considerations and Instructions for Field Personnel Report requirements.

1.1. Objective. The Concept Design data must be presented in sufficient detail to accomplish the following:

1.1.1 Show the User (customer) how the proposed design satisfies his functional, special, technical, and aesthetic needs.

1.1.2 Show all reviewing agencies that (1) the designer's approach to solution of technical aspects of the project is sound and (2) he intends to utilize appropriate controlling technical criteria (such as TM's, DM's, Guide Specifications, etc.).

1.1.3 Prepare an accurate cost estimate to verify that the project's programmed amount has been properly established.

1.1.4 Show that appropriate and economical civil, architectural, structural, mechanical and electrical systems have been selected for the project.

1.2. Design Analysis - General

1.2.1. Project Description.

1.2.1.1 Construction site. Include a synopsis of the construction site conditions, project requirements and conformance with the master plan.

1.2.1.2 Function. Describe the basic functional objective and capacities of the proposed facility and the estimated function life. Describe the types of activities involved.

1.2.1.3 Personnel and equipment. Describe the range and number of civilian/ military personnel, equipment and vehicles to be accommodated.

1.2.1.4 Constructability. Describe the basic construction systems selected, temporary or permanent, and the estimated structural life of the facility.

1.2.1.5 Desired image or visual appearance to include design of the exterior and interior of the building.

1.2.2. Economic Summary. Describe the economic factors influencing the choice of basic materials, and the civil, architectural, structural, mechanical, electrical and fire safety systems used. The summary shall include:

1.2.2.1 Results of economic studies, which consider not only the initial construction cost, but costs incurred over the projected life of the facility as determined on the basis of the best information available, and in view of the estimated functional life of the facility.

1.2.2.2 Results of value engineering studies performed on the project design.

1.2.3. Energy Conservation: In consideration of the serious national energy shortage and escalating utility costs, designs must incorporate features that can reduce energy consumption. Systems that are energy intensive must be avoided. From among several areas of consideration the following examples are offered:

1.2.3.1 Install automatic programming devices where possible to shut off or curtail air conditioning, heating, lighting, etc., during periods when such services are not required. Where automatic controls are not available, manually reduce or shut off entire building heating and cooling systems at night and during the weekends if unoccupied and unused during those periods.

1.2.3.2 Improve base electrical power factors whenever possible by use of capacitors or synchronous equipment.

1.2.3.3 In lieu of reducing lighting intensities, provide sufficient switching in the lighting layout to allow reduction of utilization and occupant control of smaller areas.

1.2.4. Asbestos Removal. Asbestos removal for all rehab projects when new work ties into existing work, or if demolition must take place before new construction:

1.2.4.1 If, in any earlier correspondence between the A-E and the Corps of Engineers, the presence of asbestos is stated to be known or suspected or, if, during the A-E's field investigation, the presence of friable asbestos is discovered or suspected, or the presence of non-friable asbestos is known to exist in products scheduled for removal, the following becomes a requirement of the project:

1.2.4.1.1 Preparation of an asbestos report and asbestos control plan by a qualified asbestos abatement professional. See EPA 560/5-83-002 (Guidance for Controlling Friable Asbestos-Containing Materials in Buildings) for guidance.

1.2.4.1.2 Preparation of plans and elevations indicating the location and extent of all known asbestos containing products which will require removal, enclosure, encapsulation or encasement.

1.2.4.1.3 Preparation of the Asbestos Specifications CEGS-02080 thru CEGS-02083, as applicable.

1.2.4.1.4 Removal of asbestos shall always be considered the primary goal. When this is not possible, the A-E shall determine the best alternative approach (enclosure, encasement or encapsulation) and shall modify the guide specification accordingly.

1.2.4.1.5 If the project does not contain asbestos, so state.

1.3 Drawings - General Requirements. Throughout the contract documents the designers will not attempt to assign work among the various construction subcontractors. The documents will depict the work to be performed and not attempt to determine which trade will actually do the work.

1.4 Civil Design.

1.4.1. Design Analysis - Narrative/Calculations.

1.4.1.1. Siting: Describe site conditions, including existing topographic features and improvements, affecting or relating to the proposed work. Consider any special or unusual conditions such as former refuse dump areas, a potential for flooding, ground stability, rock outcrops, drainage features and unusual soil conditions. Discuss reasons for facility orientation. Consider such factors as prevailing winds, existing structures, adjacent site conditions, solar loads, clearance restrictions and future development areas. Generally state building siting reasons. Discuss the impact of new construction on existing facilities, considerations for future expansion, requirements for flood protection, set-back requirements or specific clearance requirements, unusual cut or fill requirements.

1.4.1.2. Water Service and Fire Lines. Determine the hydraulic grade line (HGL) at the point of connection to the existing, or new, water distribution system.

1.4.1.3. Water Supply Line and Distribution System. Develop basic and controlling water demands and show required residual pressure. Include fire, domestic and industrial average and/or peak demands as applicable; include information such as known flow tests. For distribution systems, indicate whether additional fire hydrants are needed, and discuss their spacing. Discuss water storage, transient pressure, pump stations, corrosion and scale control needs, and soil boring requirements.

1.4.1.4 Water Supply Works. Provide information on type, condition, and adequacy of existing units such as wells, pumps, reservoirs, etc., and current water use. If these items are already described in an existing report, give summary statement and appropriate reference.

1.4.1.5. Water Treatment. Where water treatment is included in the project, the designer shall provide a copy of the water chemical and physical analysis. For water to be accepted for human consumption it must be palatable; additionally, it should not be destructive to the materials used in its transportation and storage; it should also be suitable for the ancillary uses associated with human habitation (i.e., personal hygiene, laundering of clothes, dishwashing).

1.4.1.6. Building sewer connection. Gravity type building sewers are preferable, if feasible; duplex pneumatic ejectors or sewage pumps are the alternatives when gravity sewage connections cannot be provided.

1.4.1.7. Sanitary and Industrial Sewer Systems. Discuss and determine average, peak, infiltration, inflow, and industrial waste flows for building connections, individual sewers, and force mains from population, measurement, or fixture units as applicable. Describe type of proposed system; where lift stations are required, state type of construction and tentative pump type. Indicate controlling elevations and compliance with minimum velocities and sizes. Discuss nature of industrial wastes.

1.4.1.8. Wastewater Treatment. Analyze wastewater characteristics, degree of treatment required, treatment process, and anticipated effluent quality. Describe anticipated effect of treatment plant effluent. Provide a brief description of units involved including basic data (population, flows, etc.) which will be used in sizing units. Discuss Army and State wastewater discharge regulations, the National Pollutant Discharge Elimination System (NPDES) permit, and pretreatment to discharge to municipal treatment systems. Evaluate and recommend EPA innovative and alternative technologies involving less costly solutions.

1.4.1.9. Percolation tests. Percolation tests are to be used to determine the acceptability of the site and for the design of the subsurface disposal systems. Whenever the Architect-Engineer determines that percolation tests are required for the project, the percolation tests will be made by the District at the request of the COE Project Manager. Discuss the need for percolation tests, and if required, indicate the required depth. Whenever periodic high water conditions are expected, consider another type of absorption field, other than the conventional septic tank-tile field design, such as mounds, fill systems, and underdrain systems.

1.4.1.10. Corrosion Survey. For each new project with utilities systems and/or metallic structures that are buried, submerged, or in contact with either the ground or a substance which may be corrosive, a preliminary survey will be made by the District or Architect-Engineer (depending on contractual provisions) to determine the need for corrosion protection. If the Architect-Engineer determines further tests are required, this recommendation will be presented to the COE Project Manager. Submit a summary of the conclusions on the need for protection against corrosion. When water utility systems are involved in locations where the soils are known to be very corrosive, it may be desirable to use cathodic protection systems as a supplement to (but not in place of) coal tar or cement mortar coatings.

TYPICAL DRAWING SET

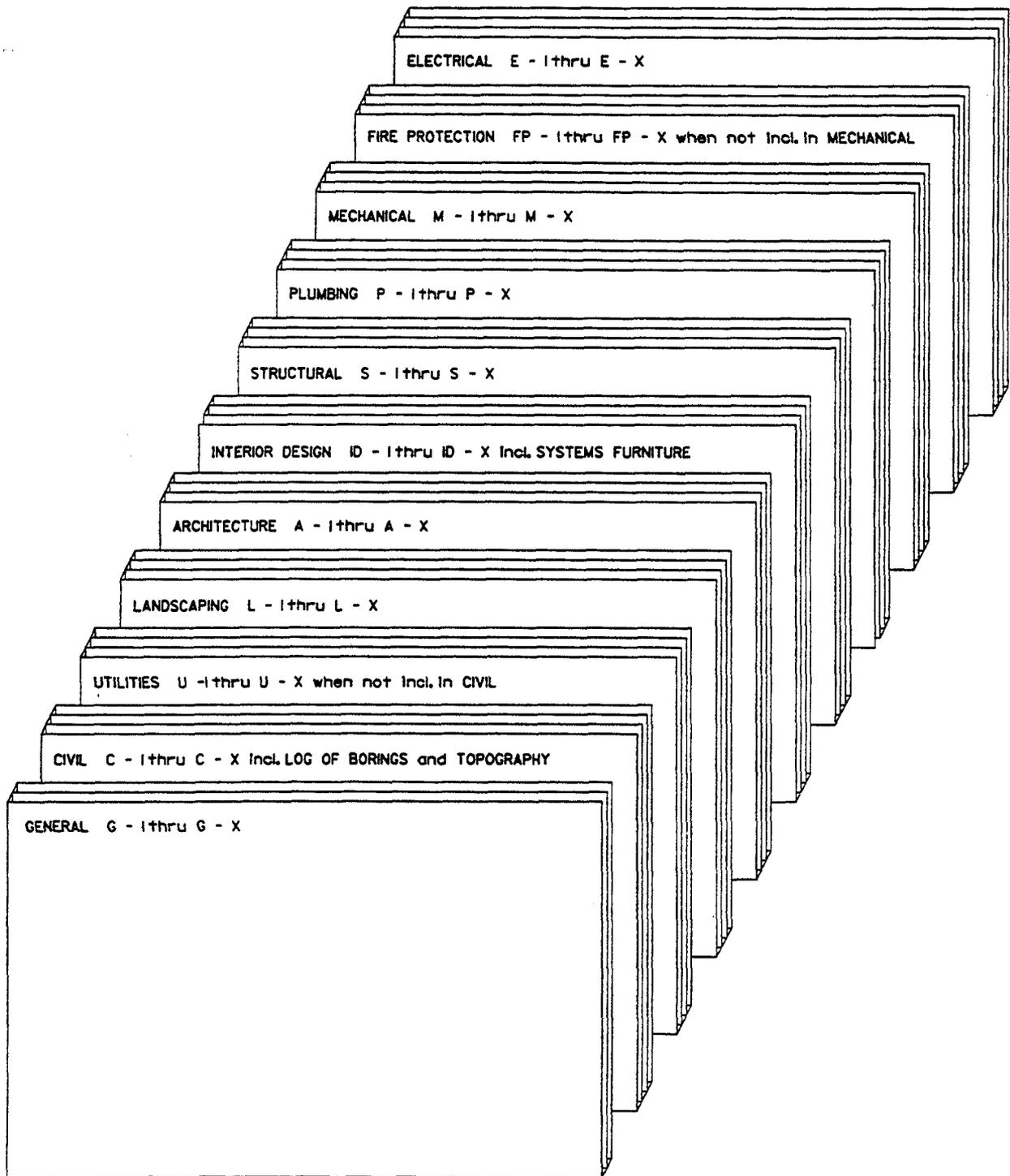


figure 3

TYPICAL DESIGN ANALYSIS ASSEMBLY

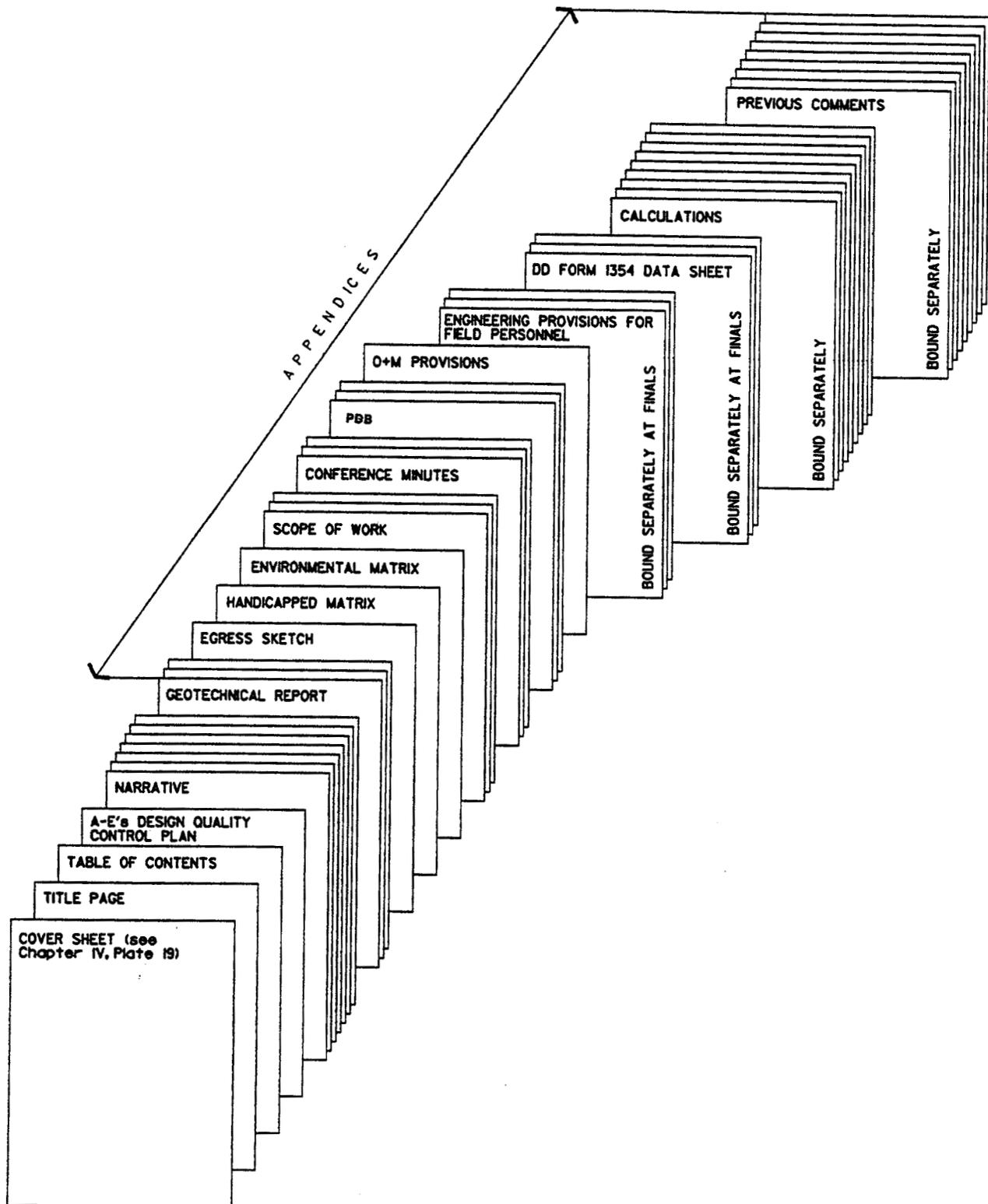


figure 4

1.4.1.11. Surveying. The existing topography is to be shown on the Site Plan; provide the name of the surveyor, the date of the survey or aerial photography, along with all control points with a note on the site plan. The specific surveying and topography drawing requirements are given in Section 2, Preliminary Design.

1.4.1.12. Demolition. Describe any required demolition.

1.4.1.13. Storm Drainage and Grading. Discuss any grading problems, and related system site and tributary area, affecting the drainage requirements. Determine the location, type, size, elevations, and condition of the existing storm drainage system, as well as topography, size and shape of the drainage area, extent and type of development. Acceptable surface drainage systems includes, among others, swales, ditches, gutters, channels, underground pipes and conduits, culverts, and detention ponds. The storm drainage plan must be selected with respect to the existing storm drainage system. Give consideration to future expansion and change in land use within the watershed.

1.4.1.14. Roads, Streets. Discuss traffic volume and composition, as well as design speed, sight distance requirements, intersections or connections to existing roads, streets or parking areas, and traffic routing during construction.

1.4.1.15. Parking, Open Storage, and Hardstand Areas. Determine the general location of parking, storage and hardstand areas, the type of vehicle to be accommodated, location of ingress and egress, pedestrian access, need of handicapped parking spaces, curbs, and curbs-and-gutters.

1.4.1.16. Sidewalks, Fencing, Signage. The walk requirements are determined on the basis of need, regardless of how built-up or isolated an area may be; the width of the walk will be based on pedestrian traffic volume. Fences define perimeters, and when integrated with lighting and with the fenceline cleared of vegetation, can be a very important component of the security system; state the justification and location of gates, and determine if they are to be used for a controlled area or for higher security. Discuss the need for parking, pedestrian, and traffic signal signs.

1.4.1.17. Pavement Design and Logs of Explorations. The Sacramento District's Geotechnical Report includes, among other items, all pavement design. The Geotechnical Report shall be referenced and a copy appended to the Design Analysis as an appendix. The pavement design consists of a cross section of the pavement structure including subgrade, subbase, base course, and surface course or concrete pavement as applicable. The geometric layout of all pavement is the responsibility of the Architect-Engineer.

1.4.1.17.1 District prepared logs of borings are made available as part of the Geotechnical Report. If the Architect-Engineer determines that additional explorations are necessary, they should be requested through the COE Project Manager.

1.4.1.17.2 Additional borings may be required along the route of water supply lines and distribution systems, trunk, branch and lateral sewers, storm drainage systems, and reservoir sites.

1.4.1.18. Military Airfield Pavements. Airfield pavement design, requiring aircraft operation criteria, is accomplished only by the Corps of Engineers. The pavement structure is included in the District's Geotechnical Report without any reference to aircraft operation criteria. The width and length of the airfield pavement is to be obtained from the COE Project Manager.

1.4.1.19. Railroads. State type of service for which railroad track will be provided, the anticipated volume, type of traffic, and the name of the operating agency.

1.4.2. Drawings.

1.4.2.1. General: Layout all utility systems and appurtenances, pavement structures, railroads, fences and surveying data, using the symbols covered in the Civil Legend of Materials, Sheet No. 116 of the District's "Standard Details for Utilities, Foundations, Paving and Railroads."

1.4.2.2. Site Plan: Show new and existing building locations, access roads, parking areas, existing topography, survey control points, fences, bench marks, drainage, sidewalks, landscaping, and demolition requirements. Where drainage facilities are to be provided, indicate direction of flow and points of discharge. Also, show all electrical and mechanical site work that is visible.

1.4.2.3. Utilities Plan: Show new and existing utility lines; points of connection to existing utilities, and any demolition or rerouting of existing utility lines, and all new and existing electrical and mechanical utility lines.

1.5. Landscaping Design.

1.5.1. Design Analysis - Narrative/Calculations. State what general type of landscape treatment exists both on the installation and in the immediate vicinity of the project. Although this project should be harmonious with adjacent landscape treatments or vegetative communities, the design need not necessarily be identical. Refer to the Base Design Guide or Base Plant List, if available. The theme must consider future long range design continuity, and compatibility with user needs and maintenance constraints. Describe how this design satisfies these requirements and provide rationale for the proposed landscape treatment (e.g., mitigation, enhancement, erosion control). All new Army irrigation projects require specific authorization from Headquarters, Department of the Army. In general, irrigation systems receive consideration only in arid or semi-arid areas where rainfall is less than 25-inches annually. Indicate if an irrigation system is authorized.

1.5.2. Drawings. Landscaping drawings are not required at the Concept submittal, but areas to be landscaped shall be indicated on the civil site plan.

1.6. Architectural Design.

1.6.1. Design Analysis - Narrative/Calculations.

1.6.1.1. State the general type of architectural treatment that exists both on the installation, and in the immediate vicinity of the project. Although selected design features of this structure should be repeated from existing structures, the design need not necessarily be identical. Motif must follow the most recent, predominant, existing theme of the installation to insure future long range design continuity. Give description as to how this design satisfies these requirements. Give a description of particular framing and wall systems selected, others considered, and reasons for selection. If setbacks are involved, establish the relevance of setback design provisions.

1.6.1.2. Type of Construction: Provide statement as to type of construction per MIL-HNDBK-1008A and Architectural/Engineering Instructions, e.g., Fire-resistive, protected non-combustible, permanent or temporary, etc.

1.6.1.3. Indicate programmed and computed floor area (for each space or activity): Gross and net areas shall be calculated as indicated in Plate 18, Chapter IV. Indicate occupancy capacities allowed and actual per criteria.

1.6.1.3.1 Net room areas, occupant capacity and gross building areas: Provide gross floor area computations in accordance with Plate 18, Chapter IV. The floor area for each room shall be presented in tabular form in the computation. These areas will not be shown on the drawings. Break down the areas into two categories, those calculated on the basis of full area and those calculated on the basis of one-half area, then show the grand total. Also, show the programmed area for each room and criteria data used.

1.6.1.3.1.1 Calculate full areas (including all openings in floor slabs) measured to the outer surface of the enclosing walls for the following:

1.6.1.3.1.1.1 Floors, including basements.

1.6.1.3.1.1.2 Mezzanines and balconies.

1.6.1.3.1.1.3 Penthouses.

1.6.1.3.1.1.4 Enclosed passages and walks.

1.6.1.3.1.1.5 Furnished usable space with sloping ceilings, with an average height of 7-feet and minimum of 5-feet at perimeter walls.

1.6.1.3.1.1.6 Attached covered shipping and receiving platforms measured from the face of the building walls to edge of the platform.

1.6.1.3.1.2 One-half of the actual area of the following shall be calculated:

1.6.1.3.1.2.1 Covered or open porches and walkways.

1.6.1.3.1.2.2 Roof overhang, if greater than 2'-0".

1.6.1.3.1.2.3 Attached, uncovered, shipping and receiving platforms at truck or railroad car height, measured from the face of the building wall to the edge of the platform. (See Plate 18, Chapter IV)

1.6.1.3.2 "U"-values for each building section.

1.6.1.3.3 Ratio of exterior window and room area, if applicable.

1.6.1.3.4 Estimated annual unit energy consumption.

1.6.1.3.5 Acoustics, if applicable.

1.6.1.3.6 Estimated cost of construction.

1.6.1.4. Economy of Building Construction, Operation, and Maintenance: In order to apply life cycle cost effectiveness, an acceptable method of wall and roof construction including roof profiles shall be defined as early as possible in the design effort. Therefore, include details of proposed wall and roof construction and an analysis to verify the "U" values. The narrative description will present a discussion of different systems and alternative methods together with the reason for a particular selection. Coordinate with mechanical designer.

1.6.1.5. Toilet Room Privacy: Provide a statement defining measures taken in the design to prevent persons outside the toilets from viewing into the toilet area including the mirror and sink areas.

1.6.1.6. Occupational Safety and Health Act (OSHA): Designs will be consistent with the standards issued by the Department of Labor under Section 6 of the Williams-Steiger Occupational Safety and Health Act. Basic materials, equipment, and functional requirements must be in accordance with the criteria contained in Technical manuals (TM's) and Federal Construction Guide Specifications (FCGS). Any conflicts discovered will be brought to the attention of the Project Manager, in writing for resolution.

1.6.1.7. Handicapped Data: Design for the Physically Handicapped shall be IAW Uniform Federal Accessibility Standards. For purposes of determining handicapped requirements, provide a completed handicapped checklist. If facility is not designed for physically handicapped, state the reason.

1.6.1.8. Fire Protection Analysis. Coordinate with the mechanical and electrical designers and provide the following:

1.6.1.8.1 Basic NFPA occupancy classification and hazard (low, ordinary, high) on which analysis is based; type of construction from UBC; area of ground floor and total floor area; building height in feet, and number of stories.

1.6.1.8.2 Building separation distances and access thereto, based on Paragraph 1.6.1.8.1. above, and Military Handbook 1008A.

1.6.1.8.3 Hour (Fire) ratings (show required, not actual) of exterior building walls, exit passageways, corridors, stairs, boiler/mechanical rooms, shafts, storage areas, janitor closets, and other hazard areas; fire and smoke

floor areas; hourly rating of fire/smoke walls; corridor lengths and dead ends; corridor doors and other rated doors. Provide the UL listing for all fire rated walls, floor/ceiling, roof/ceiling systems.

1.6.1.8.4 Extinguishing and/or fire sprinkler systems: Type (wet or dry system); special systems, such as "Carbon Dioxide", "Deluge", or "Standpipe", "AFFF", or "Halon" Systems. Coordinate with mechanical designer.

1.6.1.8.5 Fire alarm and evacuation system: Type, extent, and zoning. Coordinate with electrical designer.

1.6.1.8.6 Operations involving use or storage of flammable and explosive liquids and gases, or accumulation of dusts: System shall be designed to comply with NFPA and UBC. Provide the flash point for all liquids. Describe type of electrical equipment, lighting fixtures, ventilation and other related fire protection features required to minimize hazard(s).

1.6.1.8.7 The analysis shall list applicable NFPA and UBC number references as well as "required" and "design" conditions.

1.6.1.8.8 "Means of egress" sketch shall be provided for each floor indicating exit access, door swings in path of egress, required fire separations, stairs and rated exit passageways. In addition, provide a location of exit sign sketch indicating exit lights including direction and locations for which "Not An Exit" signs may be required. Illumination of means of egress and exit markings shall comply with NFPA 101.

1.6.1.8.9 Roof clutter and the trade-off of cost versus acceptable aesthetics shall be discussed in the Design Analysis and at the Concept Review Conference.

1.6.1.9. Special Requirements for Addition/Alteration Projects.

1.6.1.9.1 Asbestos. See 1.2.4 Asbestos Removal.

1.6.1.9.2 Life Safety. Perform a life safety survey to identify existing violations of means of egress and fire separation per NFPA 101, NFPA 220 and the U.B.C. and describe how new work will impact existing life safety. State the building construction types and occupancy classification. Provide "means of egress" sketches to identify existing violations and recommended corrective actions.

1.6.1.9.3 Physical Security/Anti-Terrorism Features. Coordinate with the Architectural/Engineering Instructions, Chapter 10, Paragraph 6.

1.6.2. Drawings.

1.6.2.1. Floor Plan for each floor at 1/4"=1' scale (except as stated below), showing: (1) overall dimensions, (2) functional arrangement, (3) label all rooms and spaces, (4) interior colors and finishes and exterior colors in tabular form. (Plates 10 and 13 of Chapter IV.)

1.6.2.1.1 For large, open structures, a smaller scale may be allowed on a case-by-case basis, subject to discussion with, and approval by, the

Project Manager at the Pre-Negotiation Conference. If a smaller scale is approved and used, congested areas such as toilet rooms, mechanical or electrical equipment rooms, etc., must be blown up to a minimum scale of 1/4"= 1'.

1.6.2.1.2 Provide interior/exterior colors and finishes in tabular form. Describe colors by words as well as a standard number designation, so that the customer will have no doubts as to what he will receive. The color standard is Federal Standard 595.

1.6.2.1.3 Indicate all major equipment and show to scale.

1.6.2.2. Principal Elevations: Provide a minimum of two principal elevations. Coordinate and show exterior mechanical and electrical equipment and penetrations at each elevation. Scale shall be not less than 1/8"=1'.

1.6.2.3. Building Section: Provide at least one principal section showing floor and roof framing, suspended ceilings, floor-to-floor heights, concealed or open ducts, relations of fenestration to support columns or walls, etc. Due to special needs, other primary transverse or longitudinal sections may be shown. Provide wall section at 1/2"=1' minimum scale as required for clarity, and principal section at minimum scale of 1/8"=1'.

1.6.2.4. Wall Sections: Provide exterior and interior wall section for each type of wall system. These wall sections are to be cut from the floor plan, not the elevation.

1.7. Structural Design.

1.7.1. Design Analysis - Narrative/Calculations.

1.7.1.1. Foundation Design: Provide a statement referencing the Foundation Report which will be attached as an appendix to the Design Analysis. The Foundation Report will normally be provided by the COE. Describe the type of foundation proposed, frost depth, need and type of vapor barrier, estimated depth of bearing, allowable bearing values, compaction requirements, and any other measures mentioned in the soils report or recommended by the designer. On some projects, the soils report may recommend two foundation types as being acceptable. In these cases an economic comparison between the two shall be presented and the more cost effective type selected.

1.7.1.2. System Selection: Provide an economic comparison of at least three structural systems for each area of the building that has a distinctly different framing scheme. Availability of local labor and materials will be considered in selecting the systems. A portion of the structure large enough to be representative of the entire building will be designed in enough detail to provide for a labor and materials estimate that will be the basis of the structural system selection. Each of the systems should be presented on a sketch indicating the sizes of all the framing members for each area of the building with a different framing scheme. Provide calculations required to size members. Investigate various column spacings. For a one-story structure, the comparison will be done for the roof structure and the wall system. For a multi-story facility, a cost comparison will be presented for the roof structure, the floor system, and the wall system. Attach the

comparison to the Design Analysis as an appendix. Provide a word description of all the candidate solutions and indicate that the most economical has been selected.

1.7.1.3. Design Loadings (TM 5-809-1/AFM 88-3, Chap. 1): Provide a discussion of live loadings to be used, to include floor loads, wind, snow, earthquake, etc., together with data to justify deviations from established criteria. Seismic design shall be in accordance with TM 5-809-10/AFM 88-3, Chap. 13. State the Seismic Zone, K, I, C, and Z values. State whether wind load or seismic load governs lateral design for each direction considered and for each independent structural system.

1.7.1.4. Applications to Existing Buildings. For those cases in which additions are connected to existing structures (i.e., no seismic joints), the A-E shall provide calculations for the "integral structure" (i.e., new plus existing). In no case shall the strength of an existing "below code" structure be reduced. Where practicable, the A-E shall upgrade the lateral resistance of the existing system to meet current code. In the projects involving alterations, modifications and/or additions, the A-E shall be responsible for the investigation and design necessary to strengthen existing structural members which are affected by additional loads. For pure alteration and repair projects, a seismic evaluation shall be performed per the following:

1.7.1.4.1. Major Alterations. When any building for which the cost of renovations or repairs exceeds 25 percent of the replacement cost of the existing building, both the existing building and the renovations must be made to resist the appropriate level of earthquake forces. An appropriate level of earthquake force is defined as that level prescribed in the latest edition of TM 5-809-10/AFM 88-3, Chap. 13. The foregoing does not preclude the use of site specific response spectra if already available, or if deemed appropriate for critical facilities.

1.7.1.4.2 Minor Alterations. Minor structural alterations may be made in existing buildings and other structures in conjunction with the upgrading of the total structure. However, the building structure's ability to resist lateral seismic forces shall not be less than that which existed before such alterations were made.

1.7.1.4.3 Seismic Evaluation Submittal Requirements. The seismic evaluation study, complete with conceptual fix (if required) and associated costs, shall be submitted. The seismic evaluation study shall be performed concurrent with other design work and coordinated with other design work to the maximum degree possible, (i.e., be feasible from a functional/architectural standpoint, etc.). The seismic evaluation study and its impact on the project current working estimate (CWE) shall be approved by the COE prior to incorporation into the project's bid documents. A minor alteration project's design documentation shall include routine structural narrative and calculations addressing structural modifications.

1.7.1.5. State the strength (working stresses or yield stresses) for all structural materials on the project.

1.7.1.6. Blast Design: For structures designed for blasts, list all appropriate design parameters such as, for the donor system, amount, type, TNT equivalent, and location of explosive material in each area. For the receiver system, state the personnel, equipment, and other explosive material which requires protection in each area. Also, define the protection categories for each area to prevent the following: (a) Communication of detonation by fragments and high blast pressures; and (b) Mass detonation of explosives as a result of subsequent detonations produced by communication of detonation between two adjoining areas. Define blast wall, blast door, and frangible element locations to complete the description of the protective construction design approach.

1.7.1.7. Future Expansion: Where buildings are to be designed for future expansion, discuss provisions to be taken to insure the projected construction will proceed in a trouble free fashion. State that no provisions have been made for future expansion, if this is the case.

1.7.2. Drawings:

1.7.2.1. Foundation and Floor Plan: Show type of foundation proposed, depths of footings, relation of walls and floor slab to foundation system, overall dimensions, column spacing, joint pattern in slab-on-grade, tie beams, grade beams, etc.

1.7.2.2. Floor Framing Plan: Show spacing of framing members, overall depth of floor structure, column spacing, principal dimensions and shape of the building.

1.7.2.3. Roof Framing Plan: Show locations of framing members, overall shape and dimensions, diaphragm, etc.

1.8. Mechanical Design.

1.8.1. Design Analysis - Narrative/Calculations.

1.8.1.1. Design Conditions. State indoor and outdoor design temperatures for heating and cooling, proposed "U" factors for walls, ceilings, floors, etc., personnel load, equipment heat release (if any), outside air or ventilation requirements and any other special conditions.

1.8.1.2. Heating System. Indicate type of heating plant and justification for selection, operating pressure and temperature, and capacity. Briefly discuss temperature control system. NOTE: Direct Digital Controls (DDC) is prohibited for HVAC controls. DDC may be used only for internal control of individual equipment items provided it does not and will not interface with other systems or equipment. Discuss type of conducting system, i.e., forced warm air with direct fired furnace or hot water coil, forced hot water or steam with direct radiation or unit heaters. Indicate type of heat distribution outside of buildings - steam or high temperature hot water and whether above-ground or underground. State classification of underground system per Paragraph 16 CEGS-15705 (mandatory to use) including soil investigations and survey. Describe type of piping for heating system, insulation; concealed or exposed.

1.8.1.3. Energy Conservation.

1.8.1.3.1 For new construction or major building rehabilitation projects, all architectural, air conditioning and heating design factors such as insulation, orientation, thermal storage, solar shading, size and location of glass areas, multiple glazing, alternative types of systems, and energy recovery shall be analyzed on a life-cycle cost basis and the least life cycle cost alternative chosen. Energy efficient designs shall satisfy the minimum requirements for human comfort and the operational requirements of facilities at the lowest life cycle cost. See also Paragraph 1.2.3 for energy conservation requirements.

1.8.1.3.2 The design of any new building or major renovation project which is heated and exceeds 20,000 ft² (1859 m²) gross area, or is heated and air conditioned, or air conditioned only and exceed 8,000 ft² (685 m²) shall be analyzed using computer analysis. These analyses shall be performed using a professionally recognized and proven design computer program which allows the integration of architectural features and heating and air conditioning systems that would result in the lowest life cycle cost. A-E encouraged to use BLAST for energy analysis via KOA Family reduced time sharing rates on CDC Cybernet. For help in using BLAST, A-E may contact the BLAST Support Office, at 1-800-UI-BLAST or technical center of expertise on energy analysis at (402) 221-7381.

1.8.1.3.3 When specific Army criteria does not indicate the preferred method of heating, ventilating, and air conditioning, the designer is to discuss the alternatives considered and the final selection based on economics, fuel cost, ease of maintenance, etc. A-E shall compare a minimum of three heating and air conditioning systems. Multizone, variable volume or constant volume air handling equipment in combination with water or air cooled reciprocating chillers, centrifugal vs. reciprocating vs. absorption chillers, double bundle condensers and other system combinations shall be considered. The following guidance referenced in the Criteria Index Chapter V under "HVAC, Computer Simulation for Buildings," present the installed first cost, Energy Consumption for Buildings, and the installed first cost, energy consumption (BTU's/sq. ft./yr.), total annual owning and operating cost, annual operating cost, etc., for each system considered. Then select the best system based on the life cycle costing/energy analysis. The U.S. Army Construction Engineering Research Laboratory (USA-CERL) has developed a new economic study computer program titled, "Life Cycle Cost in Design (LCCID)." This program is available (w/o charge) to designers of Military Projects via telecon 1-800-UI-BLAST to the Blast Support Office at the University of Illinois. A-E must fill out the Life Cycle Cost Summary Form taking input and output from computer analysis, see Plate 21, Chapter IV.

1.8.1.3.4 For energy conservation, air-to-air or other types of heat recovery systems shall be investigated. Design procedures will be in accordance with Architectural/Engineering Instructions and ASHRAE Handbook "HVAC Systems & Applications", 1987, Chapter 6.

1.8.1.3.5 Within the limits of functionality and life cycle cost effectiveness, all facilities shall be designed to meet the design energy targets shown in Table 11-1 of Architectural/Engineering Instructions.

1.8.1.3.5.1 Provide energy budget figures for buildings which are 5,000 ft² and over (no minimum sq. ft. for family housing). If a computer simulation of the building is required, then a separate energy budget need not be performed.

The energy budget is the sum total of the energy consumed in a year within the boundaries of the building for space heating, ventilating and cooling, domestic hot water, and lighting. The analysis will not be performed on candidate building systems, but only on the final selected systems, and will be presented in BTU's per square foot per year. For additional guidance refer to the Criteria Reference Chapter V under "HVAC Computer Simulation for Buildings."

1.8.1.3.5.2 Use Energy Budget Figure summary sheet with your calculations. (See TM 5-810-1, Appendix F)

1.8.1.4 Ventilating system. State whether the ventilating system is gravity or mechanical system. If a mechanical system, indicate whether it is supply or exhaust. State the requirement for outside air and the basis for determination of quantity, i.e., number of air changes per hour, or CFM per person, or others.

1.8.1.5 Air conditioning. State as applicable under Architectural/Engineering Instructions, the extent authorized, and as to any authority for waiver of these criteria. State whether for comfort cooling or according to technical requirements or both. For technical requirements, show the authorized tolerances for temperature and humidity control, the degree of air cleaning or purity required, and any other special considerations involved. A description of the air conditioning system proposed, including the capacity; location of the major components; cooling medial (water or DX); zoning and duct arrangement; and type of controls. (See note for Direct Digital Controls (DDC) in Paragraph 1.8.1.2. above). State requirements for outside air and the basis for determination of quantity, i.e. number of air changes per hour or CFM per person, or others.

1.8.1.6 Evaporative cooling. Reference Architectural/Engineering Instructions or TM 5-810-1 as authority, or any authorized waiver of these criteria. Note if this is a single or two-stage process.

1.8.1.7 Cold storage projects. Indicate the room holding temperatures and commodities to be held in cold storage. (May be indicated on drawings.) Also, show the approximate equipment sizes.

1.8.1.8 Service Piping Systems. Include determination and capacity of compressed air, vacuum, or other service piping systems.

1.8.1.9 Plumbing. Provide plumbing fixture determination listing quantity and types of fixtures identified by Federal Specifications. Indicate male and female building population. Describe domestic water heating and storage equipment including capacity, materials, piping types, and insulation requirements.

1.8.1.10. Seismic Considerations. State that design procedure to be used for support and anchorage for mechanical equipment is in accordance with TM 5-809-10.

1.8.1.11. Hazardous waste. Specify only EPA approved materials, equipment and systems for use.

1.8.1.12. Fuel: State type, source, whether firm, or interruptible gas and metering arrangements. Indicate adequacy of existing gas distribution system and of existing gas supply to carry additional load. Indicate type of standby fuel for interruptible gas.

1.8.1.13. Energy Monitoring and Control System. Indicate if base-wide EMCS is existing, under construction, or planned within 5 years. For existing EMCS, identify system in operation.

1.8.1.13.1 Building EMCS shall terminate with the DTC (Data Terminal Cabinet). Individual buildings will be connected to the base-wide EMCS by a separate construction contract at a later date.

1.8.1.13.2 Use TM 5-815-2 for Criteria Reference. Include CEGS-13946 "Building Preparation For EMCS" in outline of specifications.

1.8.1.14. Fire protection. Coordinate with the Architect to ensure all aspects of the fire protection plan are addressed.

1.8.1.14.1 For sprinkler systems, indicate type (wet or dry) system, provide evidence that the system is in compliance with criteria referenced in "CRITERIA INDEX," Chapter V.

1.8.1.14.2 For Halon, carbon-dioxide, foam, dry-chemical, and other special extinguishing systems, show information justifying the arrangement, size, and coverage of each system.

1.8.1.14.3 Include a fire water flow curve, based on flow test data, and determine if the available water quantities and pressures are adequate to meet project requirements. See Fire Protection Handbook, Section 16, Chapter 8C, Hydraulic Flow Curves and Chapter 8F, Analyzing Test Data. (Note that flow test data is normally provided by the installation Director of Engineering and Housing. Coordinate with your COE PM.)

1.8.1.15. Special requirement for all rehab projects. For asbestos requirements see Paragraph 1.2.4. Asbestos Removal.

1.8.1.16. Calculations.

1.8.1.16.1 Calculations of a limited nature shall include heat gain, heat loss, and equipment sizing including the method for handling diversities in the air conditioning load and method for sizing boilers. Show typical air conditioning load calculations, preferably the building peak loads. Detailed room calculations are not required.

1.8.1.16.2 Show plumbing calculations necessary to determine the number of fixtures, cold and hot water capacity requirements, and equipment or capacities of miscellaneous and special systems.

1.8.2. Drawings.

1.8.2.1. Floor Plan. Prepare a floor plan showing heating, ventilating, and air conditioning equipment layout; chillers or refrigeration compressors; boilers; pumps; condensers or cooling towers; air handling units; fans; air distribution duct layout (may be single line); hoods; and other items of major equipment required for the facility.

1.8.2.2. Plumbing. Show the plumbing fixture layout, floor and area drains, and plumbing equipment layout (hot water generator, storage tanks, pumps, air compressors, etc.).

1.8.2.3. Mechanical Rooms.

1.8.2.3.1 Present a study of floor space in the mechanical room and roof space on roof plan by selecting the largest and heaviest of three competing makes of each piece of equipment to go into the room and to mount on the roof. The Mechanical designer shall inform the Structural designer of the selections in order to properly size the roof structure.

1.8.2.3.2 Adequate provisions shall be made in the mechanical rooms to allow for the removal of tubes from boilers, chillers, and condensers, and the removal of coils and filters from air handling units for maintenance or replacement. See "Mechanical Standard Details" by Sacramento District for the maintenance access and clearance zones required for the different types of mechanical equipment. To save room space, full use shall be made of knockout panels or doors on outside walls for tube and other equipment removal. Equipment shall be located to allow ample room for servicing and replacement. Show service clearance required for equipment per manufacturers recommendations. Piping and valves shall be arranged so that they will not prevent personnel movement within the equipment room and all valves shall be located for ready accessibility. Where necessary because of the location of valves and headers, catwalks or ladders shall be furnished for operating and servicing the valves. Gages and thermometers shall be of such size, scale, and location as to be easily read by operating personnel.

1.8.2.3.3 If an outdoor Mechanical Equipment yard is enclosed by a solid CMU fence, adequate air movement must be provided by openings in the wall, wall section overlap with air gap between, removing blocks at certain intervals, etc.

1.9. Electrical Design.

1.9.1. Design Analysis - Narrative/Calculations.

1.9.1.1. General. Provide electrical characteristics (phase, voltage, and number of wires) or circuits.

1.9.1.2. Electrical Load Analysis. Include estimate of total connected load and demand factors, diversity, and resulting kilowatt demand. Breakdown of the estimated connected and demand load shall show: (1) Lighting and convenience outlet load; (2) power load for building equipment such as heating, air conditioning, etc., (3) loads for special operating equipment such as air compressors, generators, pumps, and for power receptacles being provided to energize special equipment. State power factor and size of transformers.

1.9.1.3. Lighting. Describe the proposed standards of design for lighting intensities and type of lighting fixtures for functional areas, both interior and exterior in accordance with design criteria as required in Architectural and Engineering Instructions.

1.9.1.4. Power Describe provisions for motor control, standby electric power, grounding, cathodic protection, and lightning protection as applicable. Indicate voltage drop of service entrance and voltage drop basis for feeders and circuits.

1.9.1.5. Hazardous Classification. Provide a description of the physical limits of each hazardous area and the class, division, and group of equipment and wiring. Discuss special fixtures for hazardous areas.

1.9.1.6. Energy Conservation. Discuss energy conservation measures, such as task lighting and selection of the most efficient type of light fixture. Indicate type of emergency lighting system to be provided.

1.9.1.7. Power Supply. Discuss electrical characteristics of power supply to base, or portion thereof involved, including circuit interrupting requirements and voltage regulations. State adequacy of the existing power supply at the point of take-off. If power source is inadequate, state measures proposed to correct the deficiency. If new power source or local generation is required, discuss the various schemes and submit cost comparisons.

1.9.1.8. Distribution. Discuss basis for selection of primary and secondary distribution voltage, and of overhead or underground construction. Indicate characteristics and standards of design for overhead or underground line. Include a justification for underground line.

1.9.1.9. Fire Alarm. Discuss proposed fire alarm system and means for transmission of signal (if applicable).

1.9.1.10. Signal Systems. Discuss signal systems, i.e.: Program clock, MATV, communications, central sound systems, intrusion detection, etc. (if applicable).

1.9.1.11. Telephone Systems. Discuss the Telephone Systems requirements, i.e., telephone instruments/switching equipment, and inside (and outside) wiring, etc.

1.9.1.12. System Control. Discuss special control, i.e., generator paralleling, switch gear remote control, telemetering, central supervisory control (if applicable).

1.9.1.13. Grounding. Discuss special grounding, i.e., electronic labs, security communications areas, data processing (if applicable).

1.9.1.14. Hospital Designs. Discuss hospital criteria per NFPA, and TM 5-838-2 (if applicable).

1.9.1.15. Seismic Considerations. Statement of support and anchorage design for electrical equipment in seismic areas shall be in accordance with TM 5-809-10.

1.9.1.16. Raised Floor Systems. When raised floor systems are required, state that all stanchions will be made electrically continuous for computer noise with 1 #1/0 BC brought from one point on the stanchions to a computer ground bar located within the raised floor areas. Bond this computer ground bar with 1 #1/0 BC to the service entrance ground bus.

1.9.1.17. TEMPEST/EMP Shielding. State the frequency spectrum of the installed equipment to be afforded TEMPEST/EMP protection. Maximum spectrum/attenuation requirements for TEMPEST shall be: IAW DM4-805-4. Coordinate shielded wall systems with architectural and mechanical designers.

1.9.2. Drawings.

1.9.2.1. Electrical Site Plan. Provide electrical site plan separate from civil site plan including power and communication service lines to the building and exterior location of proposed electrical equipment.

1.9.2.2. Electrical Equipment. Provide power plan showing location of major pieces of electrical equipment such as transformers, switchgear, motor control center, panel boards, communication equipment, power outlets, etc.

1.9.2.3. One-Line Diagrams. Provide one line diagram for the following systems (if applicable):

- 1.9.2.3.1 Electrical
- 1.9.2.3.2 Telephone/communications
- 1.9.2.3.3 Fire Alarm
- 1.9.2.3.4 Signal System (Intrusion Detection, MATV, etc.)

1.9.2.4. Lighting. Provide lighting plan and lighting fixture schedule (show lighting switch locations including type e.g., single pole, 3-way, etc.).

CHAPTER III (Cont.)

SECTION 2 - PRELIMINARY DESIGN

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CHAPTER III (Cont.)

SECTION 2 - PRELIMINARY DESIGN

2.0 Preliminary Design Submittal. The Preliminary Design submittal shall consist of the following documents:

- Design Analysis
- Drawings
- Outline or Draft Specifications
- Cost Estimate
- Completed Environmental Permit Matrix (if required by the Scope of Work)
- Draft Engineering Considerations and Instructions for Field Personnel Report
- Other Items as Required by the Scope of Work

The designer must include the requirements of Section 1 in the Preliminary design documents whether or not a concept submittal was required. This chapter will define, by discipline, requirements of the Design Analysis and the drawings. Guidance for the preparation of the Outline Specifications is described in the A-E Guide, Volume 3, Specifications. Requirements of the Cost Estimate are provided in the A-E Guide, Volume 2, Cost Estimating. Refer also to Chapter II, "Presentation of Data", of this Guide for design analysis format, drawing format, and quality requirements. See appropriate Appendices of this volume for Environmental Permit Matrix and Engineering Considerations and Instructions for Field Personnel Report requirements.

2.1. Objective. The Preliminary Design data must be presented in sufficient detail to accomplish the following:

2.1.1 Verify that the User's (Customer's) functional and special technical needs have been met, including the minimum requirements stated in this section.

2.1.2 Verify to all reviewing agencies that 1.) all previous review comments have been appropriately addressed, 2.) the designer's approach to the solution of the technical aspects of the project is sound and 3.) appropriate controlling criteria (such as TM's, DM's, Guide Specifications, etc.) are being adhered to. Justification for non-compliance with criteria must be provided in the Design Analysis.

2.1.3 Prepare an accurate cost estimate to verify the project programmed amount has been properly established.

2.1.4 Show that appropriate and economical civil, architectural, structural, mechanical, and electrical systems have been selected for the project.

2.2 Design Analysis - General Requirements. Expand upon and/or modify the narrative and calculations developed in the Concept submittal, as outlined in Section 1, to satisfy the Preliminary Submittal requirements. Update the narrative and calculations to include any changes brought about by review comments or changes in the Scope of Work.

2.3. Civil Design.

2.3.1. Design Analysis - Narrative/Calculations. Expand upon the discussion of civil features that was presented in the concept submittal to include the items described below as applicable to the project.

2.3.1.1. Water Service and Fire lines. Support with calculations the selection of the water service line to the project; indicate the invert elevation at the point of entry to the building. In those locations where frost penetration is not a factor the depth of cover for the fire lines shall be as described in the next paragraph. If frost penetration exists, the same criteria still holds, but as a minimum, "the top of the fire line shall be buried not less than one foot below the frost line for the locality" - as stated in NFPA 24. If a fire sprinkler system is to be hydraulically designed by the project's contractor, provide in the Civil narrative and on the exterior utility drawing the static pressure and the needed available residual pressure at the base of the sprinkler riser for a predetermined flow.

2.3.1.2. Water Supply Line and Distribution System:

2.3.1.2.1 Show adequacy of distribution system to supply controlling demands; include information basic to this determination, and support with hydraulic computations. If the water requirements for the project are considerable, state whether a determination has been made regarding the capability of the existing system to meet the additional demand or if further hydraulic analysis is needed.

2.3.1.2.2 Give the friction coefficient, controlling elevations, special material requirements and any special features of the design such as pressure reducing, sustaining and relief valves.

2.3.1.2.3 When applicable discuss the needs of air valves, vacuum valves, combination air vacuum/air release valves (CAV/ARV), and blow-off valves. Discuss the criteria followed for the selection and location of CAV/ARV and blow-off valves. Supplement the Design Analysis with a drawing showing the profile of the entire water distribution system; also discuss the criteria followed for the location and number of gate valves and fire hydrants.

2.3.1.2.4 Use a minimum cover over pipes of 2.5-feet in grassed areas, 3-feet under unpaved driveways or roadways, and 4 feet under railroad tracks. The bottom of the water main must be at least 12-inches above the top of the gravity sanitary sewer, and 24-inches above the top of a pressure sewer pipe. For irrigation systems, discuss types of sprinkler heads, effective coverage, spacing and zoning, automatic flow control valves, and back flow prevention units.

2.3.1.2.5 For projects that involve supply, collection, and/or distribution utility conduits, rigid or flexible, support with calculations the trench design (bedding, initial backfill, and final backfill) for each one of the pipe options given in the COE Guide Specifications. The trench design is to be based on American Water Works Association (AWWA) Standards, or American Society of Civil Engineers Manuals and Reports on Engineering practice, as applicable; a trench cross section for each one of the pipe options is to be shown on the drawings. A Soil classification of the native

soil, including as a minimum: identification, gradation, group symbol, and Atterberg limits, is to be made part of the supporting data of the trench design. Any deletion of a pipe option, as called for in the COE Guide Specifications, must be supported with complete engineering calculations. The engineering based justification for the deletion of the pipe option must also be narrated in the Design Analysis. Since controlled compaction is required during construction, hydraulic consolidation of bedding or backfill (initial or final) material is not to be allowed. Thrust block area is to be based on actual bearing soil capacity, and a pressure of not less than 1.5 times the maximum expected pressure including surge; provide the supporting computations.

2.3.1.2.6 The pipe embedment detail terminology, shown on the construction drawings, must match exactly that of CEGS "Excavation, Trenching, and Backfilling for Utilities Systems". For each one of the pipe options, the embedment terminology compatible with AWWA and ASTM calls for: Foundation (if required), Bedding, Haunching, Initial Backfill (all within the pipe embedment) and Final Backfill.

2.3.1.2.7 Provide a compacted, well graded granular material for the pipe's bedding, and a densely compacted initial backfill. Select the gradation number, depending on the pipe material specified, from either ASTM C-33, Table 2, or ASTM D448, Table 1. Tabulate the Sieve Size vs. the Percent Passing after the gradation number is selected. Indicate the percent compaction within the pipe embedment and final backfill.

2.3.1.2.8 When high water tables are anticipated, embedment materials without substantial voids are required to prevent soil migration. Sand should not be used if the pipe zone area is subject to a fluctuating groundwater table or where there is a possibility of the sand migrating into the pipe bedding or trench walls.

2.3.1.2.9 Filling and Draining Procedures. For water supply lines and distribution systems, longer than a few thousand feet, a special plan/profile drawing must be prepared at a smaller scale, e.g., 1" = 100' or 1" = 200' and made part of the construction drawings. These drawings should show pipeline stationing, all appurtenances, and other major physical and design features.

2.3.1.2.10 Outline a Pipeline Filling and Draining Procedure on the drawings. Fill the different water lines from the lowest point in each individual line limiting the flow rate to 1 (one) foot per second; provide drain valves sized to provide a flushing velocity of 2.5 feet per second; show at which locations the pipeline is to be filled from; discuss air evacuation thru the combination air vacuum/air release valves (CAV/ARV).

2.3.1.2.11 Show the points of connection to the existing water system as well as valves and appurtenances. The filling and draining operation narrative must take into account the physical layout of the existing water system so that it can be isolated properly with a minimum of inconvenience to the consumers during the filling and draining operations.

2.3.1.3. Water Supply Works:

2.3.1.3.1 Discuss the selection of the type of units, materials, economy of operation, controls, etc. Provide a statement of sizes or capacities of major components, any critical elevations or dimensions, and essential related items as covered in the computations.

2.3.1.3.2 Include data on existing supplies and for new sources such as wells and surface supplies. Provide data for all water wells and test drilling programs with full explanation of factors affecting choice of location, type, diameter, depth, and important related characteristics.

2.3.1.4. Water Treatment. After analyzing the water characteristics, establish the necessity for and extent of treatment options. The Army potable water is defined in TB MED 576, "Treated Water Quality Standards", which also spells out the Army water quality requirements.

2.3.1.4.1 The selection of one particular type of design, when two or more types of design are known to be feasible, must be based on the results of an economic study. The results of these economic studies are to be included in this Preliminary Design.

2.3.1.4.2 The Standards outlined in TB MED 576 are maximum values and every reasonable attempt should be made to obtain water of better quality. The applicable water quality standards are presented in Appendix H. Waters having physical characteristics exceeding the limits of Appendix H should not, as a general rule, be used for drinking.

2.3.1.4.3 Appendix H of TB MED 576 covers both the National Interim Primary Drinking Water Regulations (NIPDWR), in Section I, and the National Secondary Drinking Water Regulations (NSDWR) in Section II. Note that Army facilities shall endeavor to provide drinking water of the highest quality in consonance with NSDWR.

2.3.1.4.4 Army installations must comply with regulations on levels of organic compounds in drinking water and will be required to install removal equipment if these compounds are detected. Reference is made to ETL 1110-3-367, "Trace Organic Compounds in Potable Water Supplies," which supplements TM 5-813-3, "Water Supply-Water Treatment" Supplement #1, and provides basic information pertaining to the occurrence, detection, and treatment of trace organic compounds that may be found in drinking water. Reference is also made to TM 5-813-8, "Water Desalination."

2.3.1.4.5 List all criteria used for the design of each treatment process and operation. Furnish all calculations showing the design of the processes and operation including the organic loading. Provide a hydraulic profile of the treatment plant. Describe the elements of the design selected including the capacities and number of units, monitoring equipment, and controls.

2.3.1.5. Building sewer connection. The minimum pipe diameter for a gravity building sewer connection is 6-inches on at least 0.6% slope. Calculations are required only for gravity building sewer connections larger than 6-inch diameter and for all pressurized building sewer connections.

2.3.1.6. Sanitary and Industrial Sewer System. Describe the existing system covering particularly the type, capacity, condition, present flow, and unsatisfactory elements of component parts for major extensions. Where lift stations are required, state pump type and size, volume of wet well, cycle time, and pump controls. Include data concerning state requirements for pollution control. Indicate controlling elevations and compliance with slope and size criteria. Confirm adequacy of existing sewers to carry additional flow.

2.3.1.7. Wastewater Treatment. Where waste treatment is included in the job, discuss the degree of treatment required to meet the applicable discharge standards. Describe the receiving stream and the elements of the design including the capacities and number of units, monitoring equipment and controls. List all criteria used for the design of the treatment process and operation; furnish all calculations. Provide a hydraulic profile of the wastewater treatment plant. The alternatives that were considered and the reason for selecting the design over the alternatives shall be discussed demonstrating how the design will achieve the treatment goals. Pilot plant testing programs which are to be conducted will be described, and in the case of land treatment, a soil testing program will be developed and described.

2.3.1.8. Storm Drainage and Grading: Discuss the drainage design. The discussion shall include the rainfall intensity and return period, concentration times, infiltration rates, the size of the contributing area, method of computation, ponding effects, if any, and the reasons behind the selection of each of the above. Describe the grading plan and the controlling slopes which will be used in the design. Identify any local or state requirements for which the storm drainage design must comply. Discuss the existing site features affecting grading such as walks, fences, curbs, buildings, streets, and elevation of high water, as well as unusual cut or fill requirements. Provide all the computations used for determining the design flow and pipe sizes; also drainage area maps for systems that drain into or through the project area.

2.3.1.9. Roads, Streets. Discuss the geometric features of the paved areas such as widths of traffic lanes and shoulders. Data relating to the design such as vertical and horizontal controls and the class and category of road or street shall be included. Include all computations for curves, alignment, sight distance, and super elevations.

2.3.1.10. Parking, Open Storage, and Hardstand Areas. Discuss the derivation of the number of parking spaces. For the parking lot layout: discuss the selection of 90°, 60°, and 45° stalls, aisles, access lanes and stall dimensions, slopes of the surfaced areas, pavement markings, traffic signs, pedestrian access, planting islands, as well as the number and location of handicapped, visitors, and staff parking spaces.

2.3.1.11. Sidewalks, Fencing, Signage: Discuss sidewalk grade, location, and derivation of width, as well as joints, and joint layout. Discuss justification of fencing and describe the type and height of fences and gates. The description shall include features such as barbed wire, gate controllers, fabric, posts, and tension wires. Discuss street name plates, stop, and reserved parking signs, and sign posts.

2.3.1.12. Dust and Erosion Control: Include a statement of the proposed type and method of accomplishing dust and erosion control, reasons for selection, and extent of the area to be treated. Consider if erosion control will be required during construction. If no treatment is proposed, justify omission.

2.3.1.13. Railroads. Discuss the type and depth of the ballast section, weight of rail, use of relayer rail, bumpers, ties, spikes, turnouts, and road-bed preparation.

2.3.1.14. NPDES Permit: In projects where waste water is not discharged into an existing collection and disposal system, the NPDES permit will be referenced and appended to the Design Analysis.

2.3.1.15. Economic Analysis: Furnish economic comparisons between feasible alternatives for site layout, facility orientation, utilities systems, paved areas, and other site improvements.

2.3.1.16. Environmental Impact: Review the Environmental Impact Analysis (Environmental Impact Assessment or Environmental Impact Statement) to determine whether any design feature changes the conclusions or recommendations of the analysis. Should changes to the analysis be required as a result of the design, a complete description of the required changes shall be included in the narrative portion of the Design Analysis. If no changes are required to the analysis, the designer shall include this conclusion in the Design Analysis narrative.

2.3.1.17. Energy Efficiency: Where the civil design includes energy consuming processes, provide studies on comparative energy conservation measures.

2.3.1.18. Surveying.

2.3.1.18.1 The survey should make reference to the origin of the vertical datum. There should be a note on the drawings indicating that all elevations are based on the National Geodetic Vertical Datum (NGVD) 1929, or whatever datum was used for this project.

2.3.1.18.2 The survey should make reference to the origin of the horizontal datum. There should be a note on the drawings indicating that grid coordinates are based on the California State Coordinate System Zone II, or whatever datum was used for this project.

2.3.1.18.3 Provide enough spot elevations on the topography map to support the contours. No point on any topo map should be more than one inch (1") from either a contour or a spot elevation.

2.3.1.18.4 A finished floor of a building should never be used as a vertical point of reference for a survey. If it is necessary to use such a reference, a well defined point, such as a chiseled square in the south side of main entry door, should be clearly marked in the field and identified on the drawing.

2.3.1.18.5 At least two (2) horizontal and vertical control points should be shown on the topography drawings so that the construction contractor can not only initiate his survey but also check it for possible blunders. If aerial photogrammetric methods were used to obtain this mapping, a control diagram should be included with the topography maps.

2.3.1.18.6 A tabulation should be shown on the topography mapping that lists each control point together with its coordinates, elevation, and a description of the point.

2.3.1.18.7 Coordinates and elevations should only be shown to two (2) decimal places. Elevations on ground surfaces should only be shown to one (1) decimal place. Values displayed to more decimal places than required, indicate a greater precision than was required or obtained.

2.3.1.18.8 If the original topographic mapping for this project was provided by the Sacramento District, a copy of that mapping should be included with the construction drawings.

2.3.1.18.9 The Civil exterior utilities drawing must include a subsurface utility survey.

2.3.1.18.10 For water supply and distribution system lines, a set of plan and profile drawings shall be prepared, which shall show as a minimum the following information:

2.3.1.18.10.1 Survey base line with physical control points.

2.3.1.18.10.2 Existing physical features such as buildings, fences, structures, utilities, trees, and drainage systems.

2.3.1.18.10.3 Existing and proposed ground elevations along the centerline of the pipe shall be shown on the profile.

2.3.1.18.10.4 In plan, the proposed pipeline bearings and its relationship to the survey base line.

2.3.1.18.10.5 In profile, the centerline elevation of the proposed pipeline.

2.3.1.18.10.6 Beginning and ending points of the pipeline and all appurtenances.

2.3.1.19. Military Airfield Pavements: The District will furnish the section of the pavement structure, a brief description of foundation explorations, materials investigations, field tests, a statement of values used in pavement design, basis for selection of pavement section, and a description of the adopted pavement sections. A copy of the Geotechnical Report will be appended to the Design Analysis.

2.3.1.20. Future expansion. Where buildings are to be designed for future expansion, discuss provisions to be taken to insure the projected construction will proceed in a trouble-free fashion. If no provisions have been made for future expansion, so state.

2.3.2. Drawings. Expand and fully develop drawings used in Concepts, as applicable. Add any new sheets necessary to complete the presentation, including the following:

2.3.2.1. Topography. The topography drawing should show only the existing site conditions. Demolition and new construction should not be shown on this drawing. The topography drawing could be screened and used as a base map on which to show features to be demolished, or new features to be constructed on the site. In any event the topography drawing should stand alone so that the construction surveyor will know where to find control and other necessary information about the site.

2.3.2.2. Soil Explorations and Logs: The Sacramento District's drawings, showing the boring stations and logs of boring, will be incorporated into the final drawing set by the A-E.

2.3.2.3. Demolition. Provide sufficient dimensions of the structures to be demolished; for pavement structures, identify the type, whether reinforced, and the thickness; indicate if the utility lines are to be removed or abandoned in place; always indicate if the structure is to be removed to grade or to what vertical distance below grade; show the size of any trees to be removed.

2.3.2.4. Siting: Show the dimensions of all new work and the relation of new work to existing facilities using offset dimensions from existing structures; show sufficient horizontal and vertical controls to clearly indicate the siting of the facility, if necessary use coordinates for locating the new work. Only one bench mark will be used, except where a very large area is involved. Indicate the bench mark location, elevation, and description. Provide a north arrow and at least two horizontal control points. With airfields, this information must be shown for each separate area of pavement. Clearly locate the on-site borrow and disposal areas. If they are on-post, but away from the construction site, show them on the Location Map of the G-sheet drawings. If there are no on-post borrow and disposal areas, provide a note to that effect on the G-sheet and, if possible, indicate on the Vicinity Map, or with a note, where they would be located. Indicate possible future construction using short dashed lines. Show the facility superimposed on the existing topography map and the soil borings locations.

2.3.2.5. Grading and Paving. Provide a north arrow and show the grading and drainage conditions including swales, direction of drainage, point of discharge, and ditches using notes, symbols, spot elevations and contours. Provide finished grades for new work and show existing topography. Provide sections showing the relationship between existing ground and finished grades, pavements, shoulders, ditches, swales, curbs, gutters, buildings, and other structures. Provide a minimum of one cross-section in each direction through a building and site development area. Show the finished floor elevation and critical spot elevations; locate or make references to monuments and bench

marks for horizontal and vertical control. For clarity show removal, relocations, and new work for all other utilities on separate drawings.

2.3.2.5.1 Provide profiles for all storm drains and culverts; indicate top and flow line elevations of all drainage structures, storm drain pipe with size and invert elevations, ground profile, and new or existing structures or utilities crossing the new storm drain. Show the location, dimensions, and geometrical layout of all roads, streets, walks, pads, open storage areas, hardstand areas, runways, aprons, taxiways, and over-runs. Indicate different surfaces and pavement sections with symbols and notes. Provide details showing joints, curbs, gutters, signs, sealants, sidewalks, and pavement sections. For rigid pavements, spot elevations shall be provided at each joint intersection. Include all elements of the pavement with depths and compaction density requirements. Clearly show joint layout, thickened edges, location of tie-down anchors, markings, and striping.

2.3.2.5.2 Other related construction details are parking, fencing, railroads, and plan/profile and sections. Show the geometrical layout of the parking stalls including handicapped, visitors, and staff parking stalls, along with aisles, pavement slope and markings, traffic signs and pedestrian access. Provide separate signing and striping drawings when extensive work of this nature is required. Do not show fence lengths. Show the location and dimensions of all railroad tracks and features. Provide details showing switches, turnouts, and road crossings. Include all elements of the track section with depth and compaction requirements for the ballast construction. Provide plan and profile for roads, runways, taxiways, channels, and other work that requires longitudinal layout and grade controls. The drawings shall include the new features and alignment superimposed on existing topography. Show stationing and finished grades at 100-foot intervals with intermediate points as required by vertical and horizontal curves and other features. Drawing sheets may be either single or double plan and profile. Provide cross sections at 100-foot intervals, or less, as required by topography and grading. Cross sections can be included in contract documents or as supplements to the plans.

2.3.2.6. Utilities, Exterior.

2.3.2.6.1 Show all existing and new pipes with sizes (such as water, sanitary and industrial sewers, storm drain and gas lines), valves, manholes, fire hydrants, service boxes, inlets, culverts, headwalls and cleanouts. Show existing pipe's material if such information is available. Provide a north arrow on the utilities site plan and show the relation between the utilities and roads, buildings, sidewalks, etc. Provide the sizes, strengths or classes corresponding to the different material options. Indicate the invert elevations and points of entry to buildings for utility lines. Show the fire sprinkler data required in the Civil design analysis. Do not show lengths of utility runs on plan sheets for Lump Sum Bid. (See A-E Guide, Volume 3, Specifications.)

2.3.2.6.2 Profiles shall be provided for wastewater collection lines, force mains, water supply and distribution lines. Show existing topography on both Plan and Profile. Profiles will also be provided to show adequate cover in areas of varying topography. The profiles shall show minimum cover and required excavation and backfill depths, new and existing utilities, invert

elevations, stationing, surface features such as roads, curbs, sidewalks, etc., and appurtenances to the utility systems.

2.3.2.6.3 Furnish details of all features such as valves, manholes, fire hydrants, service boxes, inlets, headwalls, cleanouts, thrust blocks, pipe encasements, frames, grates, covers, steps, etc. For treatment facilities, provide details for treatment units. Show all inplant lines and process piping. In congested areas or in areas where data is unclear as to the exact location of utilities, the utilities drawings should contain the following note:

"Elevations of utilities are given to the extent of information available. Where elevations are not given at points of existing utilities crossings, such elevations shall be determined by the contractor and reported to the Contracting Officer. When unknown lines are exposed, their location and elevation shall likewise be reported."

2.4. Landscaping Design:

2.4.1. Design Analysis - Narrative/Calculations. See prior submittal requirements.

2.4.2. Drawings. In addition to that required in prior submittals, provide the following:

2.4.2.1 Show proposed special design features such as flagpoles, raised planters, benches, trails, and special paving treatments.

2.4.2.2 A plant schedule listing both the botanical and common names of species to be used.

2.4.2.3 If an irrigation system is required, provide the following: an irrigation plan showing connection to water service and the dynamic head at the point of connection; the main and branch lines; valves and, if an automatic system, the controller location(s).

2.5. Architectural Design.

2.5.1. Design Analysis - Narrative.

2.5.1.1. Functional and technical requirements.

2.5.1.1.1 Equipment, furniture and furnishings to include all items required. Provide a tabulation of all equipment in the project to show the following: (If none, so state for each subparagraph below.)

2.5.1.1.1.1 Contractor Furnished-Contractor Installed (CF-CI).

2.5.1.1.1.2 Government Furnished-Government Installed (GF-GI or not in contract (N.I.C.)).

2.5.1.1.2 Energy conservation including solar energy applications and energy budget goals.

2.5.1.1.3 Sound and vibration control.

2.5.1.1.4 Interior parking and service areas.

2.5.1.1.5 Physical security; lock and keying, intrusion detection, alarms, restricted access areas, interior guard/canine support and ties to local authorities. Coordinate with Anti-Terrorism requirements, Architectural/Engineering Instruction, Chapter 10, Paragraph 6.

2.5.1.1.6 Signage; directional, informational, and motivational.

2.5.1.1.7 Exterior and interior finish materials; textures, colors and resistances.

2.5.1.2 Design objectives and provisions.

2.5.1.2.1 Adaptation of the building to the size, shape, and orientation of the site to include benefit from natural warming and cooling effects afforded by the site.

2.5.1.2.2 State how location on the site relative to local climate affects the placement of entries, fenestration, and roof overhangs due to prevailing wind, sun, and noise. Discuss architectural features and relative costs, i.e., the use of tinted or thermal glass if required as opposed to glass ordinarily used.

2.5.1.2.3 Organization of functional spaces to establish workable adjacency relationships.

2.5.1.2.4 Building layout to establish convenient circulation flows for materials, equipment, services and people and also to include evacuation during emergencies.

2.5.1.2.5 Consolidation of spaces into sound compatible zones and protective construction zones, e.g., for fire, storm, and fallout.

2.5.1.2.6 Space layout compatible with modular (structural and environmental) support systems.

2.5.1.2.7 Building expandability/changeability. Where buildings are to be designed for further expansion, discuss provisions to be taken to insure the projected construction will proceed in a trouble-free fashion. If no provisions have been made for future expansion, so state.

2.5.1.2.8 Physical security.

2.5.1.2.9 Barrier-free design.

2.5.1.2.10 Energy conservation.

2.5.1.2.11 Building wall and roof construction: Provide statement of required type of construction based on occupancy, area, and height. State required wall and roof "U" values.

2.5.1.2.12 Acoustical design for interior and exterior sound sources.

2.5.1.2.13 Composition of masses and spaces and architectural details to reflect the desired image, and the scale and nature of the activities involved.

2.5.1.2.14 Perception of the building details and volumes. (Specific provisions made, e.g., an identifiable sequence of viewing positions for experiencing the architectural and interior design).

2.5.1.2.15 Enhancement of materials and systems maintenance and operation.

2.5.1.2.16 Economy of building construction, operation and maintenance: Life cycle cost effectiveness. Provide an economic comparison of the in-place costs of three or more wall systems. The comparison will only consider systems which meet the required "U" factors, are suitable to the seismic zone, and meet the durability and esthetic requirements for the project. Present the first costs for each component of the wall system, combine these, and arrive at an overall cost per square foot of wall surface. Describe the maintenance requirements for each system that was studied. Provide a section through each wall system and show all components of the wall. Attach the economic comparison to the Design Analysis as an appendix.

2.5.1.2.17 A narrative of the interior design objectives. The narrative shall be concise and clearly written and shall include the following:

2.5.1.2.17.1 Delineation of the designer's philosophy and intent relative to the interior design scheme before it is integrated into the contract documents. See DM 4-805-3 regarding interior design.

2.5.1.2.17.2 Discussion of how this particular interior design scheme will help humanize our Army environment by fostering desired behavior and eliminating negative responses; coordinate with installation Design Guide.

2.5.1.2.18 Roof clutter and the trade-off of cost versus acceptable aesthetics shall be discussed in the Design Analysis and at the Preliminary Review Conference. Concurrence of the user regarding acceptability of the roof aesthetics will be obtained and documented at the Preliminary Review Conference.

2.5.1.3. Coordination with installation or outside agencies.

2.5.1.3.1 Physical security support.

2.5.1.3.2 Blind vending operations.

2.5.1.3.3 Occupation safety and health, as required.

2.5.1.3.4 Government furnished equipment.

2.5.1.3.5 Make up of signage.

2.5.1.3.6 Operations and maintenance support.

2.5.1.4. Fire Protection. See Concept Design Fire Protection requirements.

2.5.1.5. Color Boards. Provide one color board for projects in which the construction cost of the structure only, exceeds \$1,000,000.

2.5.1.5.1 Color Boards shall be submitted in a standard 8-1/2" x 11" three-ring binder. Fold-outs may be employed to 25 1/2" x 33" as long as they refolded with the standard binder. Number of color boards shall be as called for in the project scope. If pre-finished textured metal panels are required, samples shall be submitted with the boards.

2.5.1.5.2 Actual material samples shall be displayed showing color, texture, pattern, finish, thickness, etc., for all appearance relate items where choice exists. These samples shall be large enough to indicate true patterns. However, care should be taken to present materials in proportion to that which will actually be installed in a given situation. Samples shall be organized by color schemes with a separate sample for each scheme. The schemes shall be coordinated by room names and numbers shown on the architectural floor plans. Colors shall be labeled with generic color names.

2.5.1.5.3 Project title and installation shall be written in the lower right-hand corner of each module.

2.5.2. Design Analysis - Calculations. See Concept Phase.

2.5.3. Drawings. Further refine and continue to develop the information required in Section 1 of this Chapter.

2.6. Structural Design.

2.6.1. Design Analysis - Narrative. Further refine and continue to develop the information required in Section 1 of this Chapter.

2.6.2. Design Analysis - Calculations. Show the development of all live and dead loadings. Also, provide calculations for the preliminary sizing of the main structural members and major elements of the foundation.

2.6.3. Drawings.

2.6.3.1. Foundation Plan: Provide overall foundation layout, showing column locations, grade beams, pile locations, slab-on-grade joint pattern, etc. Also, provide a representative section, showing a typical foundation element and typical slab-on-grade. See AFM 88-5 Chap. 2/TM-5-809-2 and COE Standard Details for Utilities, Foundation, Paving and Railroads, Sheets F-1 to F-9. Concrete slabs on grade shall not bear directly on or be tied to footings, pedestals, or walls. At least 6-inches of earth or gravel cushion shall be provided.

2.6.3.2. Floor/Roof Framing Plans: Provide overall framing layouts (with dimensions) of the main structural elements. Show horizontal and vertical bracing locations and seismic joint locations.

2.7. Mechanical Design.

2.7.1. Design Analysis - Narrative.

2.7.1.1. See Concept submittal requirements. The designer shall provide solutions to any problems identified in the Concept submittal and justify or refine all assumptions made at concept stage (user shall be contacted if required).

2.7.1.2. Designs must meet EPA emission standards when No. 5 fuel oil, No. 6 fuel oil or coal is burned as fuel and when other hazardous emissions are produced.

2.7.1.3. Provide a list of energy saving features which have been incorporated into the project, such as run-around coils, thermal wheels, and double bundle condensers. Additional energy saving ideas may be found in the "Criteria Index," Chapter V, under "HVAC Computer Simulation for Buildings."

2.7.1.4. Indicate the pieces of equipment and controls that will be tied into a base wide EMCS. The A-E shall coordinate the selected points with the user.

2.7.1.5. For physically handicapped requirements, state what provisions have been incorporated.

2.7.1.6. Provide the following information for liquid petroleum storage and distribution systems: describe the unloading facilities, the type of system, such as LPG vapor or central air mix; state the basis for storage capacity, rate of pumping and number of dispensing outlets; equipment power requirements, and a description of the tank.

2.7.1.7. Future expansion: Where buildings are to be designed for further expansion, discuss provisions to be taken to insure the projected construction will proceed in a trouble-free fashion. If no provisions have been made for future expansion, so state.

2.7.1.8. Meters. State type, number and location of Utility meters and environmental permits required IAW Architectural/Engineering Instruction.

2.7.2 Design Analysis - Calculations:

2.7.2.1 See Concept submittal requirements.

2.7.2.2 Provide all calculations which are necessary to justify the systems selected on the basis of economic and environmental impact. If A/E uses computer calculations for cooling loads, he must fill out the enclosed load estimate form taking input and output from computer analysis. See Plate 20, Chapter IV.

2.7.2.3 Show plumbing calculations as necessary to determine equipment or capacities of miscellaneous and special systems.

2.7.3. Drawings.

2.7.3.1. See Concept submittal requirements.

2.7.3.2. Show the location of the Data Terminal Cabinet (DTC) on the plans (in the Mechanical room).

2.7.3.3. Prepare a 1/4"=1' or 1/2"=1' scale partial floor plan of the bathroom areas and pipe chases of dormitory type facilities to insure that sufficient room is available for the plumbing, heating, and air conditioning equipment.

2.7.3.4. Coordinate reflected ceiling plan with architectural and electrical designer.

2.7.3.5. Show a schematic piping diagram for heating and cooling systems.

2.7.3.6. Prohibition of the following types of construction where subterranean termite conditions are known to exist:

2.7.3.6.1 Buildings with sub-slab or intra-slab heating, ventilation, or air conditioning (HVAC) ducts.

2.7.3.6.2 Buildings with plenum-type, sub-floor HVAC systems, as currently defined in Federal Housing Administration minimum acceptable construction criteria guidance.

2.7.3.6.3 Buildings with HVAC ducts in enclosed crawl spaces which are exposed to the ground.

2.7.3.6.4 Buildings with outer HVAC systems where any part of the ducting is in contact with or exposed to the ground.

The above constraints do not apply to exhaust ducts.

2.7.3.6. Demolition: Indicate if any demolition is required for the project. Determine the extent of the required demolition. Provide demolition drawings with necessary information for contractor to be able to bid the job, i.e., size and length of pipe or ducts to be removed or relocated; size and location of equipment to be removed; clear identification of all new, existing to be removed or relocated, existing to remain items. NOTE: contractor is not obligated to visit the job site before the bid, so all above information shall be provided on demolition drawings.

2.8. Electrical Design.

2.8.1. Design Analysis - Narrative. Complete the discussion of electrical features that was presented in the Concept submittal. Update the narrative to include any changes brought about by review comments, and include the following:

2.8.1.1. State and justify type of transformer insulation selected. Show characteristics of any subsequent transformation on the load side of the service entrance and a statement of why the particular voltage was selected. State alternative systems or equipment considered and reasons for selecting a given system.

2.8.1.2. Provide an economic comparison to justify selection of major pieces of electrical equipment. The Study will only consider alternatives which meet the design criteria and perform the functions intended. Provide the first cost for each alternative considered and list advantages/disadvantages of each. Attach the economic comparison as an appendix to the Design Analysis. The following items shall be studied:

2.8.1.2.1 Transformer types.

2.8.1.2.2 Main switch boards.

2.8.1.3. Provide present worth, economic/energy study for the various types of lighting fixtures considered. The study will show the annual costs of power and maintenance for each fixture type over its service life. These costs will then be brought back to the present and combined with the first cost to determine the most economical fixture type. Assume an annual interest rate of 7%. Advantages and disadvantages of each will also be noted.

2.8.1.4. State type of service entrance equipment (circuit breakers and/or fusible switches) and reason for selection.

2.8.1.5. Discuss the following: Lightning protection, motor control centers, standby electric power, special purpose receptacles and outlets, grounding, D.C. or high frequency.

2.8.1.6. For airfield lighting projects, state whether cable is to be direct burial or in duct. Discuss provisions for standby power, and comment on type of lighting system (such as high intensity or medium intensity, runway, approach or taxiway lighting), lighting equipment, and any conditions peculiar to the installation.

2.8.1.7. For protective lighting systems, provide a statement of requirements for fence lighting, area lighting, building security lighting, etc. Include proposed type of luminary, wattage of lamps, type of lamp beam spread, and how mounted on poles, buildings, etc.

2.8.1.8. If cathodic protection is required, provide a description of the location, type, and extent of the system to be installed. State the basis for the design proposed.

2.8.1.9. Generating plants: In addition to a discussion of the design approach, provide the following for generating plants: estimated connected load, maximum demand load, number and size of units (including KW and PF ratings), engine governor and voltage regulating requirements, voltage and basis for selection, and justification for use of special equipment such as load sensing governors.

2.8.1.10. Future expansion: Where buildings are to be designed for future expansion, discuss provisions to be taken to insure the projected construction will proceed in a trouble-free fashion. If no provisions have been made for future expansion, so state.

2.8.2. Design Analysis - Calculations. Provide calculations to backup sizing of major pieces of electrical equipment. The degree of completion shall be comparable to that of the narrative and drawings.

2.8.3. Drawings.

2.8.3.1. Provide plans showing the locations of major pieces of electrical equipment and outside distribution system. (Transformers shall include KVA and voltage ratings; outside distribution system shall include number of ducts for each duct bank, duct sizes, number of cables for each duct and cable size/types.)

2.8.3.2. Provide plans showing the locations of special receptacles, telephone outlets, fire alarm (F.A.) control panel, F.A. manual stations, F.A. bells/horns/smoke detectors, etc.

2.8.3.3. Coordinate with architectural designer in the preparation of the "Location of Exit Signs".

2.8.3.4. Coordinate with architectural designer in the preparation of facility elevations.

2.8.3.5. Coordinate with architectural and mechanical designers for reflected ceiling plan.

CHAPTER III (Cont.)

SECTION 3 - FINAL DESIGN

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CHAPTER III (Cont.)

SECTION 3 - FINAL DESIGN

3.0 Final Design Submittal. The Final Design submittal shall consist of the following documents:

- Design Analysis
- Drawings
- Typed Specifications
- Marked-up Guide Specifications
- Cost Estimate
- DD Form 1354 Data Sheet
- Completed Environmental Permit Matrix (if required by the scope of work)
- Final Engineering Considerations and Instructions for Field Personnel Report
- Other Items as Required by the Scope of Work

The designer must include the requirements of SECTIONS 1 and 2, of this guide, in the Final Design documents whether or not any previous submittals were required. This chapter will define, by discipline, requirements of the Design Analysis and the Drawings. The specific requirements for preparation of the Typed Specifications and Marked-up Guide Specifications are described in A-E Guide, Volume 3, Specifications. The specific requirements for the preparation of the Cost Estimate are contained in A-E Guide, Volume 2, Cost Estimating. A-E shall also refer to Chapter II, "Presentation of Data" of this guide for Design Analysis format and drawing format and quality requirements. See the appropriate appendix of this volume for Environmental Permit Matrix Plate 17, Chapter IV, and Engineering Considerations and Instructions for Field Personnel Report requirements. (Appendix B)

3.1. Objective. The final submittal represents 100% of the design effort and is intended to present a biddable, constructable and operable design package, conforming to all the appropriate criteria. Final design will be accomplished by developing and refining the design as presented in the previously prepared submittal(s) (Concept, Preliminary as applicable) and as modified by the review comments.

3.2. Changes to Basic Design. Major changes to the basic design will not be permitted at this time, unless these changes are the result of review comments, changes in criteria, changes in scope of work, or unforeseen problems necessitating the A-E to alter his original design. All the changes shall be resolved through the COE PM before proceeding. If major changes have been made since the last submittal, such changes shall be identified and described in the Design Analysis.

3.3. Design Analysis - General Requirements. The Design Analysis, prepared for previous submittals, shall be expanded and refined into final form to contain that which was required by SECTIONS 1 and 2 of this chapter plus requirements contained herein.

3.4. Drawings - General Requirements. Expand and fully develop the drawings required by Sections 1 and 2 of this chapter adding new drawings as necessary to meet the requirements stated hereinafter. Include in the drawings, all plans, elevations, sections, wall penetrations, furred spaces, duct and pipe chases necessary for mechanical and electrical systems. Consider spacing of required off-sets of beams, girders, reinforcing steel, joists and truss members. Where space is tight, show unequivocally that the systems will fit in the space provided. Particular attention shall be paid to areas of duct branches and cross-overs. Close coordination between all designers shall be accomplished to avoid conflicts between the various disciplines' drawings. Whenever additive or deductive bid items are required, the limits of work or scope of these items shall be well defined on the respective disciplines' drawings and clearly defined by word description in the specifications. (See A-E Guide, Volume 3, Specifications, for bid schedules). Make sure adequate details are provided to cover those situations where additive bid items are not awarded such that the drawings present a complete design without the additive bid items.

3.5. Civil Design.

3.5.1. Design Analysis - Narrative. Complete the discussion of civil features that was presented in the Concept and/or Preliminary submittals. Update the narrative to include any changes brought about as a result of review comments.

3.5.2. Design Analysis - Calculations. See Preliminary submittal requirements. Update the calculations to include any changes required by review comments.

3.5.3. Drawings. Expand and fully develop drawings used in Concept, and/or Preliminary submittals. Add any new sheets necessary to complete the presentation.

3.6. Landscaping Design.

3.6.1. Design Analysis - Narrative. Complete the discussion of the landscape treatment that was presented in the Concept, and/or Preliminary submittals. Update the Design Analysis to include any changes brought about by review comments. If no landscaping is required, so state.

3.6.2. Design Analysis - Calculations. Provide all calculations used for determining pipe sizes, type of sprinkler head in regards to area of coverage, and number of heads per valve. Define water pressure used in analysis and state how that value was determined.

3.6.3. Drawings.

3.6.3.1. Landscaping Plan. Show exact location of each plant, with a connecting line to plan symbol indicating type of plants and number of plants. Show exact location of construction features, i.e., benches, mowing strips, drainage ways, header boards, fences, retaining walls, garden structures, planters, pathways, walkways, service and refuse areas. These features are to be detailed on the landscaping plan sheets.

3.6.3.2. Planting details and sections. Details and sections required to define the work are to be drawn to a scale of 1/2" = 1'-0" minimum or as approved by the COE.

3.6.3.3. Planting schedule. Provide a plant schedule to include the following:

3.6.3.3.1 Common name.

3.6.3.3.2 Botanical name.

3.6.3.3.3 Quantity of each variety planted.

3.6.3.3.4 Height after planting.

3.6.3.3.5 Container size and kind of container space pattern. Tree size should be a minimum of 15 gallons to improve survivability.

3.6.3.4. Irrigation Plan. The irrigation plan shall be drawn on a separate sheet. Show all irrigation lines, spray heads, and drip emitters. Show coverage of each spray head on the drawing. Show pipe sizes, control valves, vacuum breakers and point of connection to water distribution system, including the dynamic head at the point of connection. Show mechanical appurtenances necessary for the proper function of the system. Each item will be indicated by an appropriate symbol. Indicate each kind and size of pipe by symbol. Provide a table indicating types of spray heads and drip emitters, diameter of coverage, gallons per minute (gpm) and minimum pounds per square inch (psi) required at each head. Indicate total water requirement and pressure required for the system.

3.6.3.5. Irrigation schedule. Provide an irrigation schedule to include the following:

3.6.3.5.1 Type and size of head, gpm, pressure in psi required and radius.

3.6.3.5.2 Type and size of drip emitter.

3.6.3.5.3 Type and size of valve.

3.6.3.5.4 Type of controller.

3.6.3.5.5 Type and size of pipe.

3.6.3.5.6 Type of backflow preventor.

3.6.3.5.7 Method of tap.

3.6.3.6. Irrigation Details. Other details shall be added as necessary to clearly show the work to be done. Irrigation details and sections are to be drawn to a scale of 3/4" = 1'-0" minimum as approved by the COE.

3.7. Architectural Design.

3.7.1. Design Analysis - Narrative. Complete the discussion of architectural features presented in the Concept and/or Preliminary submittals. Update the narrative to include any changes brought about by review comments.

3.7.2. Design Analysis - Calculations. Update the floor area calculations IAW Plate 18, Chapter IV, to reflect changes brought about by review comments and/or floor plan changes.

3.7.3. Drawings. Expand and fully develop drawings used in Concept, and/or Preliminary submittals. Add any new sheets necessary to complete the presentation, including the following:

3.7.3.1 Finish and colors: Complete for each space by use of "Finish Schedule, Finish Legend and Color Schemes" (see Plates 10, 11, 12, and 13, Chapter IV). Include color of factory finished materials (e.g., floor tile) for all interior finishes and for all building exterior finishes.

3.7.3.2 Door schedule: This shall follow sample formate indicated on Plate 8, Chapter IV.

3.7.3.3 Window schedule: This shall follow sample format indicated on Plate 9, Chapter IV.

3.7.3.4 Roof clutter and the trade-off of cost versus acceptable aesthetics shall be discussed in the Design Analysis and at the Preliminary Review Conference. Concurrence of the user regarding acceptability of the roof aesthetics will be obtained and documented at the Preliminary Review Conference.

3.8. Structural Design.

3.8.1. Design Analysis - Narrative. Complete the discussion of structural features that was presented in the Concept and/or Preliminary submittals. Update the narrative to include any changes brought about by review comments.

3.8.2. Design Analysis - Calculations. Present complete structural calculations covering all parts of the structure and miscellaneous facilities.

3.8.2.1. Design methods shall be described, including assumptions, theories, and technical formulas employed in design solutions.

3.8.2.2. Live loads shall be placed to produce maximum stresses and minimum stresses where there is a possibility of stress reversal.

3.8.2.3. If special methods of solution, tables, etc., are employed, references should be made in the calculations to the sources of such material.

3.8.2.4. For addition/alteration type projects, provide calculations necessary to verify adequacy of existing structure to support new functional loads or to satisfy any new loading criteria.

3.8.2.5. When a computer is utilized to perform design calculations, the analysis shall include copies of computer input data and output summaries presented in understandable language, accompanied by diagrams which identify joints, members, areas, etc., according to the notations used in the data listings. This will form an integral part of the Design Analysis in lieu of manual calculations otherwise required. A complete listing of all computer output will be provided, bound separately, when it is too voluminous for inclusion in the Design Analysis. These listings will be augmented by intermediate results where applicable, so that sufficient information is available to permit manual checks of final results. Include a sample hand calculation of each structural element (e.g., a truss) under one loading condition (i.e., usually the most critical) for each major system (e.g., lateral system, beam framing, etc.). This will facilitate reviewers who are not familiar with your particular program in spot checking the balance of the submitted computer data.

3.8.2.6 When submitting computer data, include one sample hand calculation of one item (e.g., a truss), under one loading condition (i.e., usually the most critical) for each major system (e.g., lateral system, beam framing, etc.). This aid will facilitate the speed of those reviewers not familiar with your particular program in spot checking the balance of the submitted computer data.

3.8.3. Drawings. Expand and fully develop drawings used in Concept and/or Preliminary submittals. Add any new sheets necessary to complete the presentation.

3.8.3.1. The structure should be carefully studied so that elaborate details are not required and all information necessary for construction is clearly and simply presented on the drawings. Typical sections shall be truly typical and not representative of one particular condition.

3.8.3.2. Wall Elevations: Wall elevations shall be provided for precast or tilt-up concrete panels, showing typical reinforcing, reinforcing around openings, connections, etc. The intent is to show one complete design on the drawings, even though manufacturers may prefer to detail things differently.

3.8.3.3. Joints: The location and details of all joints shall be shown on the drawings. Include control joints in slabs-on-grade, construction joints in walls, floors, roofs, and expansion and seismic joints.

3.8.3.4. Structural data: State the soil bearing values and other pertinent information from the Geotechnical Report, design live loads for various areas of the building; design wind load; seismic zone; Z, I, K, C, S values, whether or not the building has been designed for future horizontal or vertical loads; and any other notes necessary to clarify or complete the information shown on the drawing. The COE or A-E prepared Geotechnical Report shall not be referenced because it is not part of the contract documents. Check all general structural notes for conflicts with the specifications. The notes should not repeat the specifications. All structural data shall appear on the first sheet of the structural drawings.

3.8.3.5. Stair Details Show all structural beams and connections that are shown supporting stairs usually detailed on the Architectural Drawings.

3.8.3.6. Roof Details.

3.8.3.6.1 Show all fastener details of roof deck to supporting members.

3.8.3.6.2 Show all roof framing connections, including RC and CMU beam seats, column connections, and beam-to-girder connections (as appropriate).

3.8.3.6.3 Show all details that provide slip joints for temperature changes and all details that transfer lateral loads to the vertical shear system.

3.8.3.6.4 Show all additional framing needed to provide for concentrated vertical loads, including both at and between node(s) of roof trusses.

3.8.3.6.5 On roofs where the deck is not used as a diaphragm, indicate crossbracing between all roof framing members. Specifically on roof trusses, show cross bracing at 3'-0" maximum.

3.8.3.7 Composite construction and continuous framing. Where beam reactions are required on contract drawings for composite construction and continuous framing (as stipulated for Steel Framed Beam Connections in the AISC Manual of Steel Construction), the A/E is not relieved from drawing completely all of the various beam-to-beam and beam-to-column connection details that normally would be drawn for any construction that is non-continuous, non-composite, or both under service load.

3.9. Mechanical Design.

3.9.1. Design Analysis - Narrative. Complete the discussion of Mechanical features that was presented in the Concept and/or Preliminary submittals. Update the narrative to include any changes brought about by review comments.

3.9.2. Design Analysis - Calculations.

3.9.2.1. Finalize all calculations leading to sizing of distribution systems, selection of equipment, power requirements, controls, and selection of auxiliary equipment.

3.9.2.2. Equipment selection is restricted to regularly cataloged items of domestic manufacture, in commercial service for at least two (2) years prior to bid opening, and supplied by dealers having service organizations supporting the project location. Completely identify each piece of equipment with three manufacturers' names, model numbers, and characteristics. Do not indicate proprietary manufacturers' names and model numbers on the drawings or in the specifications. Provide catalog cuts of selected equipment.

3.9.2.3. Provide complete tabulation of cooling loads. Psychrometric charts for all the air handling systems with cooling are required.

3.9.2.4. Fire Pumps. If required fire pumps shall be sized per NFPA 20 and NFPA Handbook Section 16, Chapter 6. Indicate pump flow vs. pressure. Indicate combined (i.e., fire pump demand plus outside hydrant demand) to assure yard system pressure does not fall below 20 psig. Include catalog cuts and manufacturers published pump curve.

3.9.2.5. For projects being on shelf for one year or more, available fire water flow shall be verified a second time at the next submittal; the mechanical designer shall refer to base Fire Marshall to conduct one more flow test to be aware of all possible changes in water supply in this period of time.

3.9.3. Drawings. Expand and fully develop drawings used in Concept and/or Preliminary submittals. List room names and numbers on all plans and partial plans as shown on the architectural plans. Add any new sheets necessary to complete the presentation, including the following:

3.9.3.1. Plumbing. Provide the following:

3.9.3.1.1 Show water, waste and vent piping in two-dimensional riser diagrams for complicated plumbing systems, such as medical, dental facilities and others and for all buildings two or more stories high.

3.9.3.1.2 Provide a schedule of plumbing fixtures and equipment. Coordinate schedule with Table I of Specification Sections CEGS-15400 or 15410.

3.9.3.2. Heating, Ventilating and Air Conditioning (HVAC). Provide the following:

3.9.3.2.1 Double line air distribution ducts will be required for all cross sections, elevations, and in mechanical rooms. Single line ducts may be used for air distribution layout, provided sufficient cross sections are shown for congested areas, and for areas that are subject to potential structural interference.

3.9.3.2.2 If required for clarification of duct sizes and duct runs, show single line riser diagrams for supply, return, and exhaust air systems in multi-story buildings. Provide sections where needed to show special relations and indicate the typical location of lights, structural members, etc.

3.9.3.2.3 Locate and detail all fire dampers.

3.9.3.2.4 Provide piping schematics to show all complicated flow processes.

3.9.3.2.5 Provide a sequence of operation and control, and control system schematic diagrams for each Mechanical System.

3.9.3.3. Fire Protection. Provide the following:

3.9.3.3.1 Minor fire protection work may be shown on the plumbing plan. Title block shall indicate that the drawing is for both plumbing and fire protection.

3.9.3.3.3 For detail of sprinkler riser, see COE Standard Mechanical Detail Drawings.

3.9.3.3.2 Identify all sprinkled areas. Use different identification (symbols) for areas with different density (type of hazard). List each symbol with its pertinent hazard and density in the legend and symbols.

3.9.3.3.4 Show the riser locations on the plans.

3.9.3.3.5 Do not show sprinkler system layout, i.e., location of mains, branches, and sprinkler heads.

3.9.3.3.6 For Hydraulically Calculated Sprinkler Systems, show the following information (see MIL-HDBK-1008A).

3.9.3.3.6.1 Type of hazard.

3.9.3.3.6.2 Minimum area of water demand.

3.9.3.3.6.3 Minimum rate of water application (density) GPM/sq. ft.

3.9.3.3.6.4 Any special sprinkler head temperature rating or classification.

3.9.3.3.6.5 Minimum hose stream requirements.

3.9.3.3.6.6 Fire Hydrant location and flow data including static and residual pressures (normally listed in design analysis and/or shown on Civil Drawings).

3.9.3.3.6.7 For projects with several sprinkled areas of different density, provide a table listing the miscellaneous areas, occupancy rating, density, area of demand, and hose stream requirements.

3.9.3.3.6.8 For warehouses (refer to NFPA 231 and NFPA 231C), the following shall be shown on the drawings.

3.9.3.3.6.8.1 commodity classification.

3.9.3.3.6.8.2 pallet type.

3.9.3.3.6.8.3 shelf type (open, slatted or solid).

3.9.3.3.6.8.4 encapsulated or non-encapsulated.

3.9.3.3.6.8.5 maximum storage height (not rack height).

3.9.3.3.6.8.6 storage rack configuration (single, double or multiple row).

3.9.3.3.6.8.7 whether sidewall sprinkler protection of columns is required.

3.9.3.3.6.8.8 Whether in-rack sprinklers are required due to storage height in excess of 25-feet, encapsulation

of pallets, or to minimize fire water requirements for storage height of less than 25-feet.

- 3.9.3.3.6.8.9 whether in-rack sprinklers are required at one level, two levels or at every tier.
- 3.9.3.3.6.8.10 in-rack sprinkler water demand
- 3.9.3.3.6.8.11 ceiling sprinkler density (GPM/SF)
- 3.9.3.3.6.8.12 design area of sprinkler operation
- 3.9.3.3.6.8.13 ceiling sprinkler water demand
- 3.9.3.3.6.8.14 inside hose stream demand (minimum 100 GPM)
- 3.9.3.3.6.8.15 combined inside and outside hose demand (minimum 500 GPM)
- 3.9.3.3.6.8.16 duration of water supply required (see NFPA 231C)
- 3.9.3.3.6.8.17 fire protection riser location(s)
- 3.9.3.3.6.8.18 fire wall/partition locations
- 3.9.3.3.6.8.19 water flow available at base of riser (GPM flow rate and associated residual pressure)

3.9.3.4. Energy Monitoring and Control Systems (EMCS).

3.9.3.4.1 The designer is required to coordinate selection of points to be monitored with the using agency.

3.9.3.4.2 Provide schematic diagrams and I-O summary as shown in TM 5-815-2.

3.9.3.4.3 The EMCS schematic diagrams shall be separate from the control system diagrams as described above in Subparagraph 3.9.3.2.5.

3.10. Electrical Design.

3.10.1. Design Analysis - Narrative. Complete the discussion of electrical features that was presented in the Concept and/or Preliminary submittals. Update the narrative to include any changes brought about by review comments.

3.10.1.1. Describe any special switching or dimming systems required for any area.

3.10.1.2. Provide rationale for selection of reduced-voltage starting equipment.

3.10.1.3. Provide an energy impact analysis.

3.10.2. Design Analysis - Calculations.

3.10.2.1. Provide complete design calculations for all interior and exterior electrical systems.

3.10.2.2. Provide manufacturers' names and model numbers for each major piece of equipment used in determining dimensional and weight requirements. Do not use proprietary names and model numbers on the drawings or in the specifications. See Chapter 1, Paragraph 7.0, and A-E Guide, Volume 3, Specifications.

3.10.2.3. Calculations for the maintained foot-candle intensities in all areas shall be shown.

3.10.2.4. Provide calculations for sizing transformer(s) and short-circuit interrupting capacity.

3.10.2.5. Voltage drop on all service and feeder circuits, and a worst-case branch circuit.

3.10.2.6. Additional calculations as required to supplement the designs.

3.10.2.7. For presentation of computer data, see structural computations final submittal.

3.10.3. Drawings. Expand and fully develop drawings used in Concept and/or Preliminary submittals adding new sheets as necessary to meet minimum requirements stated hereafter. Concept drawings may be used in this expansion to finals, if applicable. Show in plan, necessary elevations and sections, all wall penetrations, furred spaces, duct and pipe chases necessary for mechanical and electrical systems. Consider spacing or required off-sets of beams, girders, reinforcing steel, joists and truss members. Where space is tight, show unequivocally that the above systems will fit the space provided. Particular attention should be paid to areas of duct branches and cross-overs. Close liaison between all designers is necessary here to avoid conflicts in the drawings. Whenever additive or deductive bid items are required, the limits of work or scope shall be well defined on the drawings for the respective disciplines unless clearly defined by description in the specifications (See A-E Guide, Volume 3, Specifications, for Bid Schedules).

3.10.3.1. Outside distribution system. Provide the following:

3.10.3.1.1 Overhead: Show location of new and existing poles, and routing of new lines on an electrical-only site plan. Indicate type and size of existing overhead conductors.

3.10.3.1.2 Underground: Show location of new and existing manholes and handholes on an electrical-only site plan. Locate and show details of major equipment. Show routing of ductline, ductline sections and detail of pole riser. Show adequate detail for complex grounding system (if applicable).

3.10.3.1.3 Area lighting: Show location of street, parking and walkway lighting poles. Provide details of luminaires, poles and bases. Details of luminaires shall only be provided when not covered by COE Standard Drawing No. 40-06-04.

3.10.3.1.4 Floodlighting (on poles): Provide layout of lighting poles, showing dimensions and aiming angles.

3.10.3.1.5 Distribution System Profiles. For overhead and/or underground distribution projects over 2,000 linear feet in total length, profiles shall be furnished as described under Civil Design.

3.10.3.1.6 Telephone Service Connection. Show the exterior telephone service point of connection.

3.10.3.2. Interior distribution system. Provide the following:

3.10.3.2.1 Floor Plan. Define the physical limits of each hazardous area and the class, division and group of equipment and wiring. Show conduit seals IAW NEC Article 500. Show sizes of all conduits including conduit to be wired by others. Indicate number and size of conductors based on copper conductors. See Guide Specification CEGS-16415 for aluminum conductor options. Provide a numbering system for all circuits. Detail seismic restraints for all electrical equipment. Show complete fixture, switch, and receptacle arrangement, fixture details and identification of fixture type, special control equipment diagrams and complex switching diagrams. Indicate energy saving fluorescent fixtures with matched ballast and lamps. Provide fire rated recessed fluorescent fixtures to match fire rating of ceiling.

3.10.3.2.2 Electrical Equipment. For all electrical equipment, list the performance characteristics required, complete schematic diagrams, and a written description of operation of complex control systems.

3.10.3.2.3 Panel Schedules. For panelboards, switchboards, power switchgear assemblies and motor control centers, provide total connected load, total spare load, main and branch circuit ratings, interrupting ratings, frame sizes for each circuit, number of poles, and description of each load.

3.10.3.2.4 Wiring Diagrams. Show a wiring diagram for each of the following systems on the plans: telephone, television, fire alarm, intercommunication, public address, and other required special systems. Show locations only of all antennas, service entrances, outlets and major equipment on a floor plan.

3.10.3.2.5 Airfield Lighting. Where airfield lighting is included in the project, show location, controlling dimensions, extent of the proposed system, routing of supply circuits, location of vaults and control towers, and locations for various types of lighting units.

3.10.3.2.6 Cathodic Protection. Where a cathodic protection system is included, show extent of the facilities to be protected, location and type of anode beds, location of test points, details for sectionalizing bonding and insulating (where applicable) an underground piping system, and source and routing of supply for impressed current.

3.10.3.2.7 Generating Plant. If the project includes a generating plant, provide a one line wiring diagram, fuel oil and coolant piping diagrams, equipment details and layout, and transfer controls in block form.

CHAPTER IV
REFERENCE PLATES

1. TITLE BLOCK (Cover Sheet Only	PLATE #1
2. TITLE BLOCK	PLATE #2
3. TITLE BLOCK (COE Prepared Topography Or Logs of Borings Drawings)	PLATE #3
4. TITLE BLOCK (Site Adaptation Cover Sheet)	PLATE #4
5. TITLE BLOCK (Site Adaptation other than Cover Sheet)	PLATE #5
6. SCHEDULE OF DRAWINGS	PLATE #6
7. GRAPHIC SCALES	PLATE #7
8. DOOR SCHEDULE	PLATE #8
9. WINDOW TYPES	PLATE #9
10. FINISH SCHEDULE, FINISH LEGEND AND COLOR SCHEME INSTRUCTIONS	PLATE #10
11. SAMPLE SCHEDULE FOR PLATE 10	PLATE #11
12. EXAMPLE FLOOR PLAN FOR PLATE 10	PLATE #12
13. SAMPLE EXTERIOR COLOR SCHEDULE	PLATE #13
14. SAMPLE VICINITY MAP	PLATE #14
15. SAMPLE LOCATION MAP	PLATE #15
16. HANDICAPPED CHECKLIST (BLANK)	PLATE #16
17. ENVIRONMENTAL PERMIT MATRIX (BLANK)	PLATE #17
18. GROSS AREA TAKEOFF	PLATE #18
19. SUPPORT DOCUMENT COVER SHEET INSTRUCTIONS	PLATE #19
20. AIR FORCE FORM 108 - AIR CONDITIONING LOAD ESTIMATE	PLATE #20
21. LIFECYCLE COST SUMMARY FORM	PLATE #21

"If it hasn't been reviewed,
it hasn't been designed."

CORPS OF ENGINEERS' INITIALS
DESIGNER'S INITIALS

▲					
▲	25 JAN 88	ADDED SHEET A-4 TO SCHEDULE OF DRAWINGS	J.N.	CS	
REVISION	DATE	DESCRIPTION	BY	BY	
NAME AND ADDRESS OF A-E FIRM UNDER CONTRACT TO COE			DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA		
DESIGNED: *	INSTALLATION		STATE		
DRAWN: *	PROJECT TITLE DRAWING TITLE				
CHECKED: *					
SUBMITTED: **					
SIGNATURES AFFIXED BELOW INDICATE OFFICIAL RECOMMENDATION AND APPROVAL OF ALL DRAWINGS IN THIS SET AS INDEXED ON THIS SHEET					
APPROVAL RECOMMENDED: COE SIGNATURE <small>CHIEF, BRANCH</small>		APPROVED: COE SIGNATURE <small>CHIEF, ENGINEERING DIVISION</small>		DATE: DATE WILL BE ADDED LATER BY COE	
PREPARED UNDER THE DIRECTION OF COE SIGNATURE <small>COL., CORPS OF ENGINEERS, U. S. A.</small>			SCALE:	SPEC. No.	
			SHEET G-1	FILE No. DISCIPLINE NUMBERING SYSTEM	
			1 OF 19	CONSECUTIVE NUMBERING SYSTEM	

TITLE BLOCK
(COVER SHEET ONLY)

* FIRST INITIAL AND LAST NAME OF DESIGN PERSONNEL
** SIGNED BY PRINCIPAL OF A-E FIRM UNDER CONTRACT TO COE.

TITLE BLOCK
(OTHER THAN COVER SHEET)

CORPS OF ENGINEERS' INITIALS _____ DESIGNER'S INITIALS _____				
△				
△	25 JAN 88	CHANGED LOCATION OF LOUVERED DOOR	J.N.	C.S.
REVISION	DATE	DESCRIPTION	BY	BY
NAME AND ADDRESS OF A-E FIRM UNDER CONTRACT TO COE			DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA	
DESIGNED: *	INSTALLATION		STATE	
DRAWN: *	PROJECT TITLE DRAWING TITLE			
CHECKED: *	DISCIPLINE NUMBERING SYSTEM _____		CONSECUTIVE NUMBERING SYSTEM _____	
SUBMITTED: * *	DATE APPROVED DATE WILL BE ADDED LATER BY COE	SCALE SHEET A-4	SPEC. No.	FILE No.
		9 OF 19		

A-E FIRM'S PRINCIPAL'S STAMP



* FIRST INITIAL AND LAST NAME OF DESIGN PERSONNEL
 ** SIGNED BY PRINCIPAL OF A-E FIRM UNDER CONTRACT TO COE

SAMPLE TITLE BLOCK

(COE PREPARED TOPOGRAPHY
OR LOGS OF BORINGS SHEET)

PROJECT FILE NUMBER GOES HERE

REVISION		DATE	DESCRIPTION	BY
△				
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GEO TECHNICAL BRANCH			DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA	
DESIGNED:	FORT IRWIN		CALIFORNIA	
R.L.T.	DINING FACILITY			
DRAWN:	LOCATIONS OF BORINGS			
R.L.T., R.A.W.				
CHECKED:	MDR			
SUBMITTED:	DATE APPROVED:	SCALE:	FILE NO.	SPEC. NO.
<i>Charles E. Stangor</i>	DATE WILL BE ADDED LATER BY: COE	SHEET C-6	238-25-207	7008
CHIEF, SOILS DESIGN SECTION		BOF87		

REFERENCE: SACRAMENTO DISTRICT EXPLORATION LOG FILE NUMBER 230-01-237

OR: REFERENCE: SACRAMENTO DISTRICT TOPOGRAPHY FILE NUMBER

WHEN TOPOGRAPHY OR LOGS OF BORINGS
DRAWINGS ARE SUPPLIED BY THE COE
PLACE REFERENCE TO COE LOG OF BORING
OR TOPOGRAPHY FILE NUMBER HERE

SAMPLE TITLE BLOCK

(SITE ADAPTATION COVER SHEET)

REVISION	DATE	DESCRIPTION	BY	BY
▲				
SHE ADAPTED BY: NAME AND ADDRESS OF A-E FIRM UNDER CONTRACT TO COE SUBMITTED BY: SIGNED BY PRINCIPAL OF A-E FIRM UNDER CONTRACT TO COE				
NEEDED FOR SITE ADAPTATION AT (INSTALLATION)			DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA	
SPEC. NO. _____ APPROVAL RECOMMENDED BY: COE SIGNATURE CHIEF, BRANCH _____ PREPARED UNDER THE DIRECTION OF _____ COL. CORPS OF ENGINEERS, U. S. A.			DATE: DATE WILL BE ADDED LATER BY COE APPROVED: COE SIGNATURE CHIEF, ENGINEERING DIVISION _____ DISTRICT ENGINEER	
REVISION	DATE	DESCRIPTION	BY	BY
▲				
 PROJECT TITLE SHEET TITLE 			STATE	
DESIGNER: NAME _____ DRAWN: NAME _____ CHECKED: NAME _____ SUBMITTED: _____			INSTALLATION _____ PROJECT TITLE _____ SHEET TITLE _____	
SIGNATURES AFFIXED BELOW INDICATE OFFICIAL RECOMMENDATION AND APPROVAL OF ALL DRAWINGS IN THIS SET AS INDEXED ON THIS SHEET				
APPROVAL RECOMMENDED BY: _____ CHIEF, BRANCH _____ PREPARED UNDER THE DIRECTION OF _____ COL. CORPS OF ENGINEERS, U. S. A.			APPROVED: _____ CHIEF, ENGINEERING DIVISION _____ DATE: _____ SCALE AS NOTED: _____ SPEC. NO.: 1234 SHEET: G-1 FILE NO.: 123-45-6789 DISTRICT ENGINEER	

2" CLEARANCE FOR FUTURE REVISIONS

TITLE BLOCK ADDED FOR CURRENT SITE ADAPTATION (AVAILABLE FROM C.O.E.)

PREVIOUSLY PREPARED PROJECT TITLE BLOCK

SAMPLE TITLE BLOCK

(SITE ADAPTATION OTHER THAN COVER SHEET)

REVISION	DATE	DESCRIPTION	SUBMITTED BY: SIGNED BY PRINCIPAL OF A-E FIRM UNDER CONTRACT TO COE				
A			DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA				
A							
SITE ADAPTED BY: NAME AND ADDRESS OF A-E FIRM UNDER CONTRACT TO COE			DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA				
MODIFIED FOR SITE ADAPTATION AT (INSTALLATION)			SPEC. NO. _____ DATE ADDED BY COE				
REVISION	DATE	DESCRIPTION	DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA				
A			DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA				
A							
DESIGNED:			INSTALLATION		PROJECT TITLE		STATE
NAME			PROJECT TITLE		SHEET TITLE		STATE
DRAWN:							
NAME							
CHECKED:			PROJECT TITLE		SHEET TITLE		STATE
NAME							
SUBMITTED:			SCALE: AS NOTED		SPEC. NO.: 1234		FILE NO.: 123-45-6789
DATE APPROVED:			SHEET: A-25		25		
DATE APPROVED:			SHEET: A-25		25		

2" CLEARANCE FOR FUTURE REVISIONS

TITLE BLOCK ADDED FOR CURRENT SITE ADAPTATION (AVAILABLE FROM C.O.E.)

PREVIOUSLY PREPARED PROJECT TITLE BLOCK

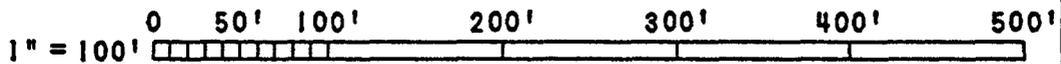
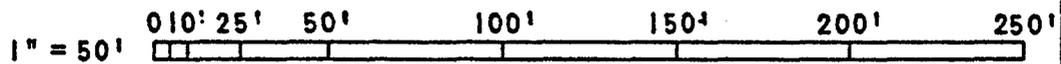
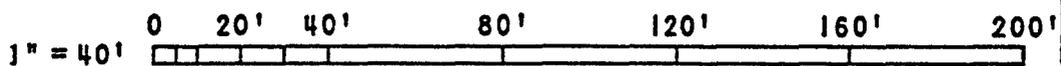
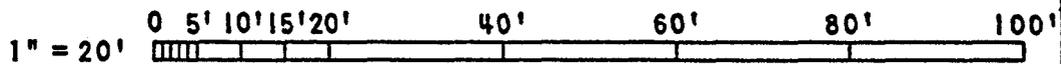
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CONSECUTIVE SHEET NO.	DISCIPLINE SHEET NO.	DRAWING TITLE
1 of 18	G-1	PROJECT TITLE AND LOCATION, VICINITY MAP, LOCATION MAP, AND SCHEDULE OF DRAWINGS
2 of 18	C-1	GRADING PLAN, BUILDING LAYOUT, LEGEND, AND ABBREVIATIONS
3 of 18	U-1	UTILITIES (if not shown on CIVIL Sheets)
4 of 18	L-1	LANDSCAPE PLAN, LEGEND, AND ABBREVIATIONS
5 of 18	A-1	FLOOR PLAN, FINISH AND DOOR SCHEDULE, LEGEND, AND ABBREVIATIONS
6 of 18	A-2	ELEVATIONS
7 of 18	A-3	BUILDING SECTIONS
8 of 18	A-4	ROOF PLAN, REFLECTED CEILING PLAN & DETAILS
9 of 18	S-1	FOUNDATION PLAN, FIRST FLOOR FRAMING PLAN, LEGEND, AND ABBREVIATIONS
10 of 18	S-2	ROOF FRAMING PLAN
11 of 18	S-3	WALL FRAMING AND MISCELLANEOUS DETAILS
12 of 18	P-1	PLUMBING PLAN, LEGEND, AND ABBREVIATIONS
13 of 18	M-1	MECHANICAL PLAN, LEGEND, AND ABBREVIATIONS
14 of 18	M-2	EQUIPMENT SCHEDULES AND DETAILS
15 of 18	FP-1	FIRE PROTECTION PLAN
16 of 18	E-1	SITE PLAN, LEGEND, AND ABBREVIATIONS
17 of 18	E-2	FLOOR PLAN AND PANEL SCHEDULE
18 of 18	E-3	RISER DIAGRAMS AND DETAILS

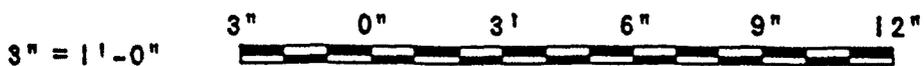
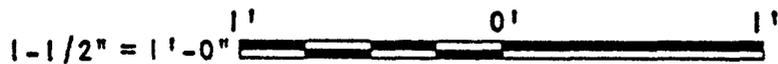
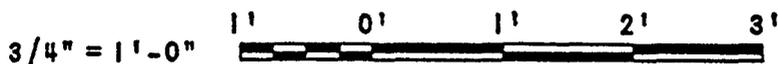
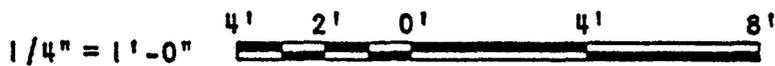
NOTE TO DESIGNER: ALL SCHEDULES OF DRAWINGS PREPARED FOR, AND BY, THE SACRAMENTO DISTRICT OFFICE SHALL BE IN THIS FORMAT AND THE SEQUENCE OF DISCIPLINES SHALL FOLLOW THE ORDER INDICATED. PROVIDE AS MANY DRAWINGS WITHIN EACH DISCIPLINE AS NECESSARY TO COMPLETELY DESCRIBE THE PROJECT. IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT THE CHIEF, DESIGN QUALITY ASSURANCE SECTION ARMY OR AIR FORCE, AS APPROPRIATE, THROUGH YOUR CORPS OF ENGINEERS PROJECT MANAGER. SEE CHAPTER II FOR FURTHER DISCUSSION.

SAMPLE GRAPHIC SCALES

GRAPHIC SCALES (ENGINEERING)



GRAPHIC SCALES (ARCHITECTURAL)



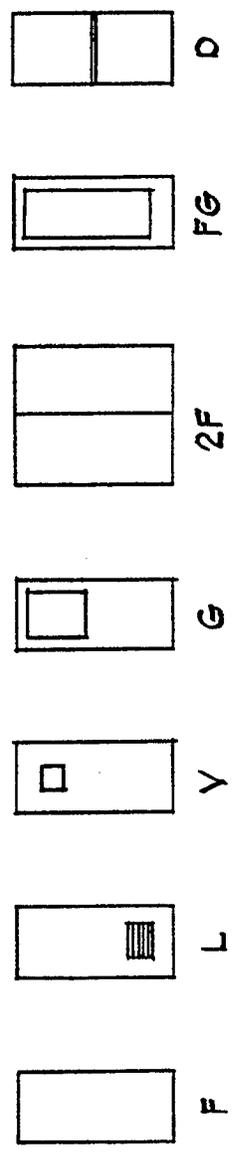
SAMPLE DOOR SCHEDULE

DOOR SCHEDULE												
NO. TYPE	SIZE	MAT.	*TYPE	FIN.	RATING	FRAME **				H.W.	REMARKS	
						MAT.	GAGE	HEAD	JAMB			SILL
1 F	3'-0" x 7'-0" x 1 3/4"	STL	XH	PAINT	3/4 HR	STL	16	6	6	12	1	
2 V	3'-0" x 7'-0" x 1 3/4"	WD S.C.	-	PAINT	-	STL	16	5	5	13	2	
3 FG	3'-0" x 7'-0" x 1 3/4"	ALUM	-	PAINT	-	ALUM	-	4	2	10	4	TEMPERED GLASS
4 L	2'-6" x 7'-0" x 1 3/4"	WD H.C.	-	STAIN	-	STL	18	7	7	-	2	
5 2F	2-3'-0" x 7'-0" x 1 3/4"	STL	HVY	PAINT	20 MIN.	STL	16	8	9	14	6	

** SEE DWG _____ FOR DETAILS

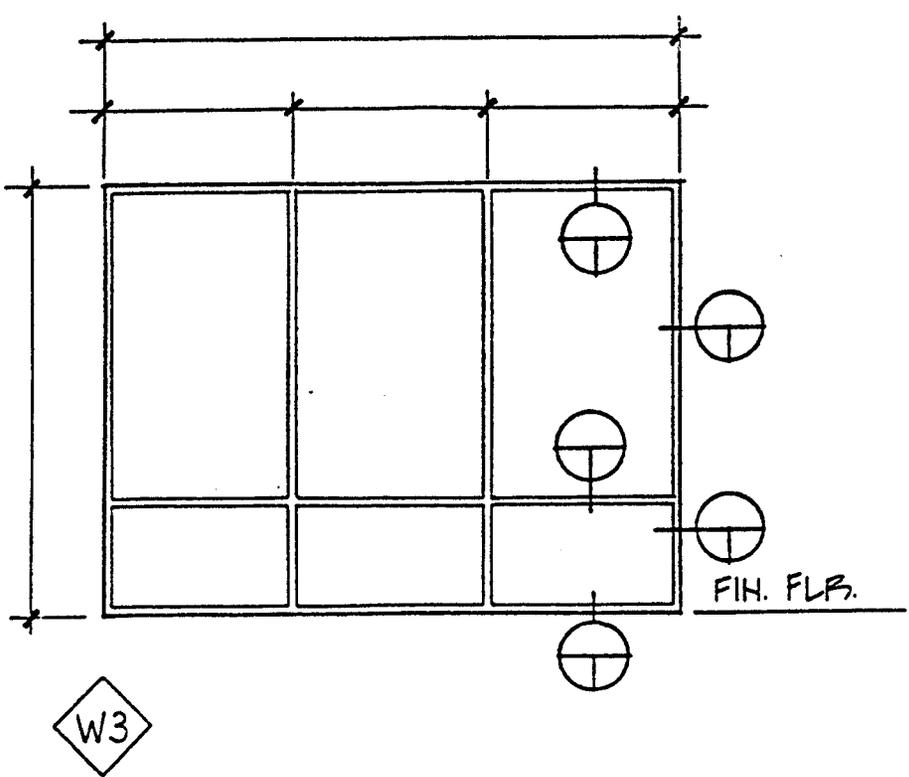
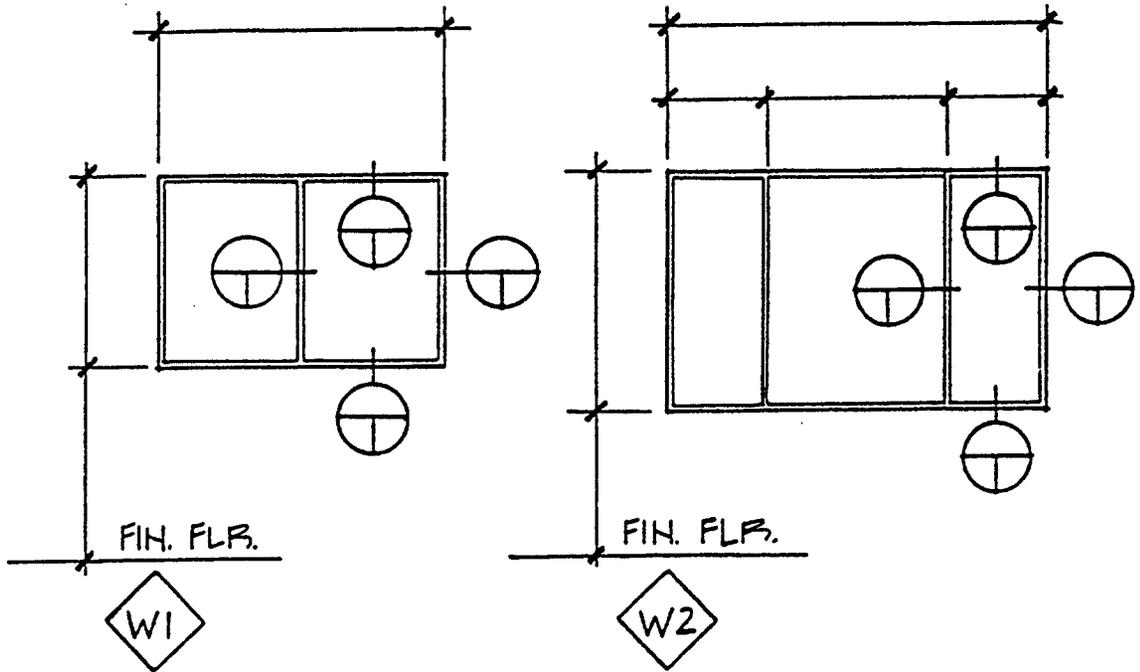
* APPLIES TO STEEL DOORS
STANDARD = STD, HEAVY = HVY,
EXTRA HEAVY = XH

DOOR TYPES



NOTE: ALL DOOR TYPES SHALL UTILIZE STEEL DOOR INSTITUTE STANDARD DOOR TYPE NOMENCLATURE. FOR SPECIAL DOORS USE OWN NOMENCLATURE WITH EXPLANATION.

SAMPLE WINDOW TYPES



FINISH SCHEDULE, FINISH LEGEND AND INTERIOR COLOR SCHEME INSTRUCTIONS

DIRECTIONS FOR USE OF THE INTERIOR FINISH SCHEDULE AND COLOR FINISH LEGEND

A. The Interior Finish Schedule shall be used in conjunction with the Color Finish Legend. The format shown shall be followed but is not meant to be restrictive. If the complexity of the project differs from what is illustrated, then columns of information may be added or deleted as appropriate.

B. Abbreviations used shall be as shown. Additions to this list are acceptable depending on additional finishes used within a project.

AC: ACOUSTICAL CEILING	P: PAINT
AWC: ACOUSTICAL WALL COVERING	PLAM: PLASTIC LAMINATE
B: BASE	QT: QUARRY TILE
C: CARPET	RB: RESILIENT BASE
CMU: CONCRETE MASONRY UNIT	S: STAIN
CONC: CONCRETE	SV: SHEET VINYL
CT: CERAMIC TILE	SWC: SYNTHETIC WALL COVERING
EXP: EXPOSED	VCT: VINYL COMPOSITION TILE
FWC: FABRIC WALL COVERING	VWC: VINYL WALL COVERING
G: GROUT	WF: WOOD FLOORING
GWB: GYPSUM WALLBOARD	X: NO FINISH

C. The abbreviations are used to specify the material, manufacturer, pattern reference and color reference for the item. This information shall be provided as the Color Finish Legend. Items, such as carpet tile and broadloom designations, shall be distinguished under the Color Finish Legend.

D. All blank spaces on the Interior Finish Schedule shall be filled with the abbreviations provided and shall be referenced in the Color Finish Legend including all multiple listings of finishes used, i.e. CT1; XYZ Inc, X12, Dove Grey 1234, CT2; XYZ Inc, X17, Rose Dust 5678.

E. Wainscot shall be indicated by listing both the wall finish above the wainscot and the wainscot material within the appropriate schedule box, i.e. P1/CT2.

F. Surface receiving a paint finish requires an abbreviation of the material receiving the application. List within the appropriate box, i.e. P1-GWB.

G. The column labeled as Trim shall be used for Door and Window Frame, Chair Rail notations, etc.

H. The column listed as Misc. shall be used to specify the placement of miscellaneous items such as Plastic Laminate, Toilet Partitions, Grout Color etc. that do not otherwise relate to one of the other columns in the schedule. Also note detail sheets if applicable.

I. The column listed as Remarks shall be used for notating any information that needs clarification, i.e. chair rail, door, window frames, or metal roof deck finish.

J. Provided on the following page is an example of the Interior Finish Schedule and Color Finish Legend as required. NOTE: A DOT MATRIX IS NOT ACCEPTABLE.

K. The Designer shall use this format when submitting a Interior Finish Schedule and Color Finish Legend for review. Alterations are subject to approval from Sacramento District Design Quality Assurance (DQA).

L. Provide a list of all the different color schemes and list all room numbers in their appropriate scheme. i.e. Scheme 1: Room #101, #108, etc.

SAMPLE FINISH SCHEDULE, FINISH LEGEND AND INTERIOR COLOR SCHEME

INTERIOR FINISH SCHEDULE												
RM NO	ROOM NAME	FLOOR	BASE	WALLS				CEILING		TRIM	MISC	REMARKS
				N	E	S	W	MAT'L	HT			
100	VEST	QT1	B2	VWC1	VWC1	VWC1	VWC1	P1-GWB	8-0	P2		P2-FRAME
101	CORR	C1	RB1	VWC1	VWC1	VWC1	VWC1	AC 1	8-0	P2		
102	COMMAND	C2	RB1	SWC1	SWC1	SWC1	SWC1	AC 1	8-0	P2		
103	PVT TLT	CT1	B1	VWC2	CT2/VWC2	VWC2	VWC2	P1-GWB	8-0	P2	G1	
104	ADMIN	C1	RB1	P1-GWB	P1-GWB	SWC1	P1-GWB	AC 1	9-0	P2		
105	BRK RM	VCT1	RB2	P2-GWB	P1-GWB	P1-GWB	P1-GWB	AC 1	9-0	P2	FLAM1	CHAIR RL
106	PHN RM	VCT1	RB2	EXP	EXP	EXP	EXP	EXP	VAR	P2		P2-RF DK
107	OFFICE	C2	RB2	P1-GWB	SWC1	SWC1	P1-GWB	AC 1	9-0	P2		
108	UTILITY	EXP	EXP	EXP	EXP	EXP	EXP	EXP	VAR	P2		P2-RF DK

NOTES:

Colors listed by manufacturers are for identification purposes only, and are not intended to limit selections to products by manufacturers indicated. An exact match for manufacturers' colors is not required. The selections serve only to indicate the color which the manufacturers' standard must approach.

COLOR FINISH LEGEND**AC: ACOUSTICAL CEILING**

AC 1: Mfg, product #, color

B: BASE

B 1: Mfg, product #, color #1

B 2: Mfg, product #, color #2

C: CARPET

C 1: Mfg, product #, color #1

C 2: Mfg, product #, color #2

CT: CERAMIC TILE

CT 1: Mfg, product #, color #1

CT 2: Mfg, product #, color #2

EXP: EXPOSED**G: GROUT**

G 1: Mfg, product #, color

FLAM: PLASTIC LAMINATE

FLAM 1: Mfg, product #, color

COLOR SCHEMES

Scheme 1: Room #101, #108

Scheme 2: Room #102

Scheme 3: Room #103, #107

P: PAINT

P 1: Mfg, product #, color #1

P 2: Mfg, product #, color #2

QT: QUARRY TILE

QT 1: Mfg, product #, color

RB: RESILIENT BASE

RB 1: Mfg, product #, color #1

RB 2: Mfg, product #, color #2

SWC: SYNTHETIC WALL COVERING

SWC 1: Mfg, product #, color

VCT: VINYL COMPOSITION TILE

VCT 1: Mfg, product #, color

VWC: VINYL WALL COVERING

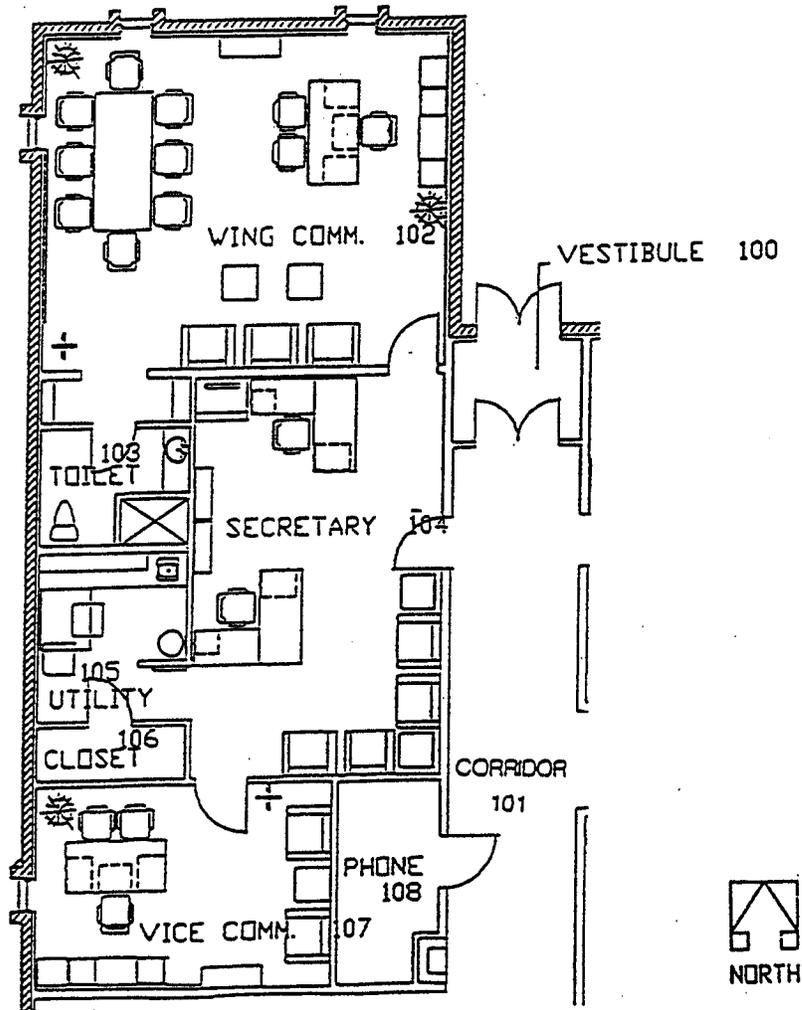
VWC 1: Mfg, product #, color #1

VWC 2: Mfg, product #, color #2

Scheme 4: Room #104

Scheme 5: Room #105, #106

EXAMPLE FLOOR PLAN

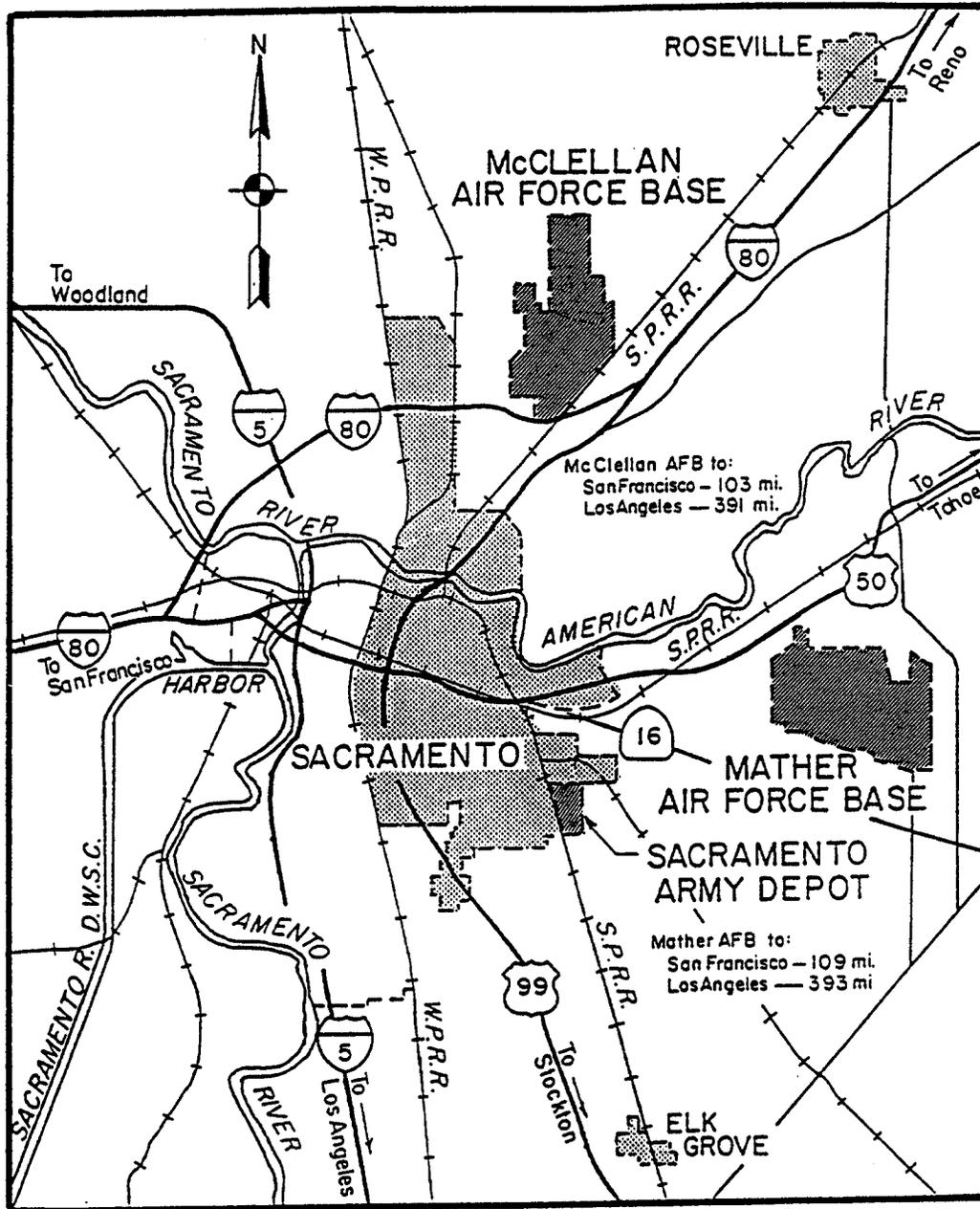


See Interior Finish Schedule and Color Finish Legend on previous pages for example of application.

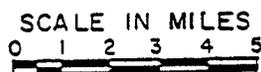
SAMPLE EXTERIOR COLOR SCHEDULE

EXTERIOR COLOR SCHEDULE					
WALLS	PILASTERS	SOFFITS	DOORS	RAILINGS	STOREFRONT FRAMING
CONCRETE MASONRY UNITS 34410 LIGHT GREEN	CONCRETE 34424 GRAY GREEN	STUCCO 34554 LIGHT - YELLOW - GREEN	STEEL 30252 LIGHT TAN - RED	STEEL 30109 DEEP TAN	ALUM MEDIUM BRONZE
<p>NOTES:</p> <p>GRAVEL STOPS, DOWNSPOUTS, LEADERS, LOUVERS, CAP FLASHING: 34410 (LIGHT GREEN)</p> <p>STEEL DOOR FRAMES: 34412 (MEDIUM GREEN)</p> <p>OTHER MISC. FERROUS METAL: 34554 (LIGHT YELLOW GREEN)</p> <p>INSUL. WALL PANELS: 20227 (MEDIUM BROWN)</p>					
<p><i>EXCEPT AS OTHERWISE DESIGNATED, COLORS ARE DESIGNATED BY FEDERAL STANDARD 595 AND ARE FOR COLOR ONLY. GLOSS SHALL BE DETERMINED FROM APPROPRIATE SPECIFIED MATERIAL PUBLICATION. COLORS LISTED BY MANUFACTURERS ARE FOR IDENTIFICATION PURPOSES ONLY, AND ARE NOT INTENDED TO LIMIT SELECTIONS TO PRODUCTS OF THE MANUFACTURERS INDICATED. AN EXACT MATCH FOR MANUFACTURERS COLORS IS NOT REQUIRED; THE SELECTIONS SERVE ONLY TO INDICATE THE COLOR WHICH THE MANUFACTURERS STANDARD MUST APPROACH.</i></p>					

SAMPLE VICINITY MAP

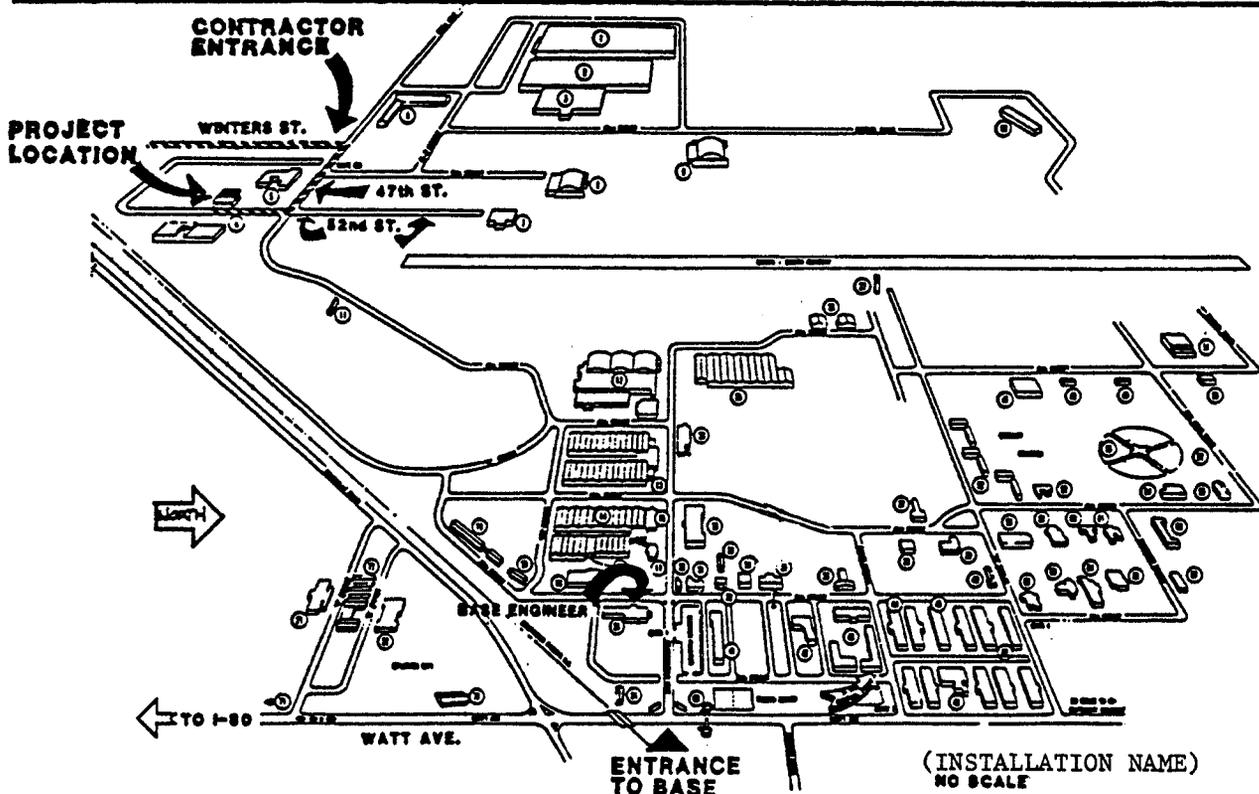


VICINITY MAP



SAMPLE PROJECT LOCATION MAP

PROJECT LOCATION MAP



CONTRACTOR ACCESS NOTES

1. CONTRACTORS ACCESS TO SITE VIA WINTERS ST. FROM US 500 USE GATE 000 & PROCEED EAST ON 47TH ST. TO 52ND ST. TURN RIGHT ONTO 52ND ST. & PROCEED TO BLDG. SITE
2. CLEARANCE REQ'D FOR ACCESS TO BASE BY ARMY CORPS OF ENGINEERS
3. TRASH HANDLING SYSTEM NOT AVAILABLE TO CONTRACTOR DISPOSAL REQ'D OFF BASE IN ACCORDANCE W/ LOCAL CODES.
4. BORROW & DISPOSAL AREAS NOT AVAILABLE ON BASE TO THE CONTRACTOR. REQ'D DISPOSAL WILL OCCUR OFF BASE IN ACCORDANCE W/ LOCAL CODES.
5. CONTRACTOR EQUIPMENT & MATERIAL STORAGE AREA AVAILABLE NEXT TO SITE. NO COVERED STORAGE AVAILABLE. CONTRACTOR RESPONSIBLE FOR SECURITY THEREOF.
6. UTILITIES AVAILABLE TO CONTRACTOR: ELECTRIC POWER AND WATER. COST COORDINATED W/ ARMY CORPS OF ENGINEERS.

SHOW THE FOLLOWING LOCATIONS FOR AIR FORCE PROJECTS.

1. CORPS RESIDENT OFFICE
2. CONTRACTOR ENTRANCE
3. DIRECTOR OF ENGINEERING AND HOUSING
4. SECURITY POLICE OFFICE
5. PROVIDE NOTE DESCRIBING LOCATION OF THE EMERGENCY MEDICAL FACILITY AND PHONE NO.
6. CONTRACTOR'S EQUIPMENT YARD
7. BORROW AND DISPOSAL AREA
(IF THERE IS NO BORROW OR DISPOSAL AREAS ON THE FACILITY PROVIDE A NOTE TO THAT EFFECT)
8. HAUL ROUTE - HIGHLIGHT HAUL ROUTE



SAFETY PAYS



DRAWING REDUCED



US Army Corps
of Engineers
Sacramento District

PHYSICALLY HANDICAPPED CHECKLIST

PROJECT: _____

INSTALLATION: _____ FY: _____ PN: _____

SPECIFICATION NO.: _____

	ASSIGNED PERSONNEL		VISITORS	
	MEN	WOMEN	MEN	WOMEN
NON-AMBULATORY: wheelchairs				
SEMI-AMBULATORY: braces or crutches, amputees, arthitics, spastics, pulmonary or cardiac ill				
MANUAL: loss of upper extremities				
VISUAL: total or near total blindness				
AUDITORY:				
COORDINATION: faulty or palsy from brain, spinal, or peripheral nerve injury				

(Fill in only "YES" or "NO" in each of the above boxes)

PROJECT MANAGER

DATE



US Army Corps
of Engineers
Sacramento District

ENVIRONMENTAL PERMITS MATRIX

PROJECT _____

INSTALLATION _____ FY: _____ PN: _____

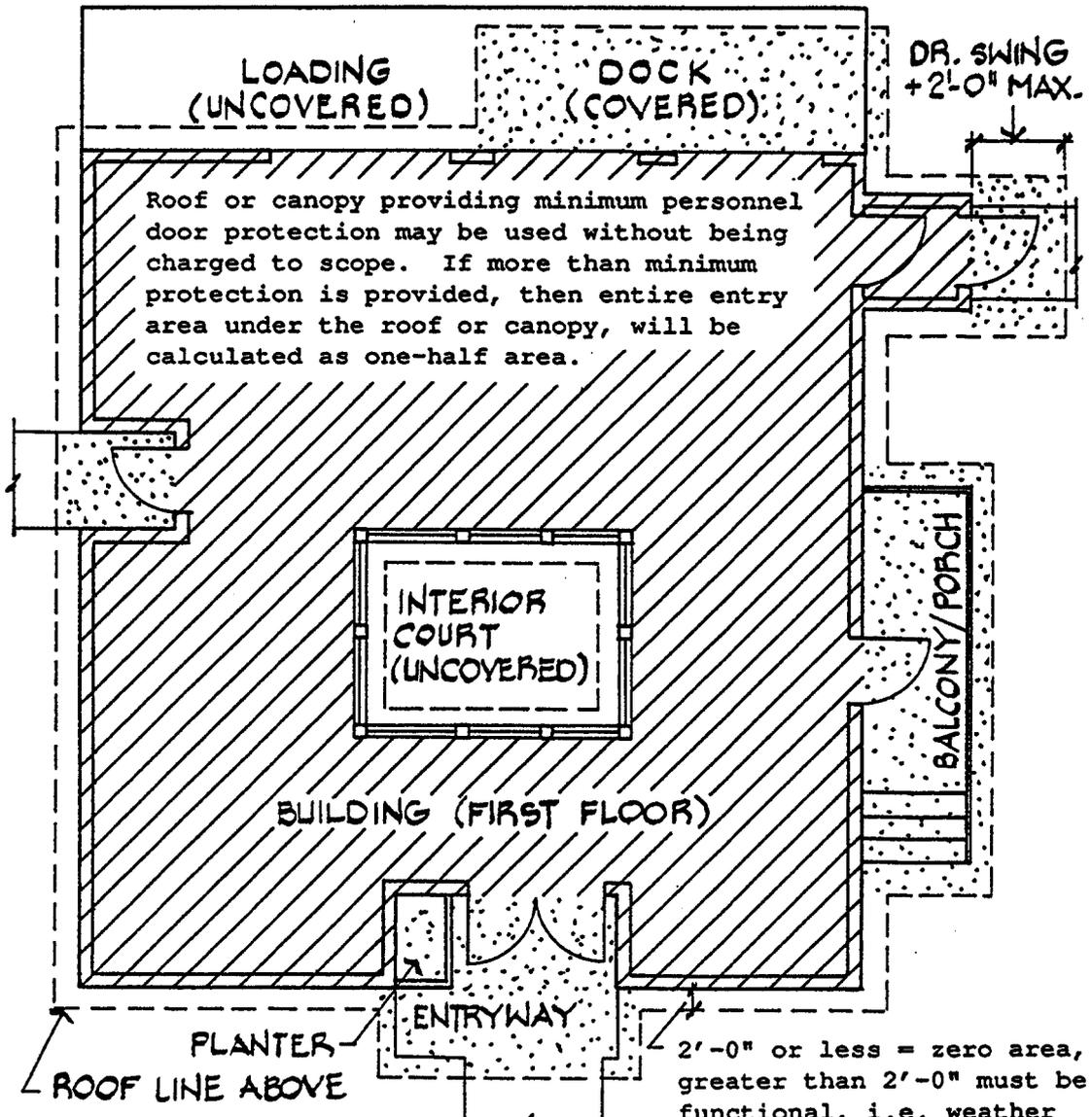
COMPLETED AT _____ 30% _____ 60% PRELIMINARY DESIGN.

TYPE OF PERMIT	PERMITTING ACTION				PIECE OF EQUIPMENT OR OPERATION	PERMITTING AUTHORITY CONTACTED AND DATE	PERMIT FEE
	REQ'D Y/N	NUMBER OF PERMITS	TIME REQ'D FOR PERMIT (DAYS)				
			PREP	APP			
AIR QUALITY							
WATER QUALITY							
SOLID WASTE							
HAZARDOUS WASTE 1.							
OTHER 2.							

1. INCLUDES UNDERGROUND TANK PERMITS FOR FUELS AND OTHER HAZARDOUS MATERIALS.
2. OTHER REQUIREMENTS MIGHT INCLUDE: ARCHAEOLOGICAL/CULTURAL RESOURCE CLEARANCE, STATE HISTORICAL PRESERVATION OFFICE (SHPO) COORDINATION, FEDERAL AVIATION ADMINISTRATION (FAA) COORDINATION, AND ETC...

NOTE: SEE APPENDIX C FOR SPECIFIC INSTRUCTIONS FOR COMPLETING THIS FORM.

INSTRUCTIONS FOR COMPLETING GROSS AREA TAKEOFF



LEGEND

- FULL AREA
- HALF AREA
- ZERO AREA

First Floor	_____ S.F.
1/2 Cov. Load. Dock	_____ S.F.
1/2 Cov. Balcony	_____ S.F.
1/2 cov. Entryway	_____ S.F.
 Total Gross Area	 _____ S.F.



US Army Corps
of Engineers
Sacramento District

COVER SHEET for ARMY PROJECTS

DATE _____

INSTALLATION: _____

JOB TITLE: _____

PROJECT NUMBER: _____

DOCUMENT DESCRIPTION: (Design Analysis, Specification, Cost Estimate, etc...)

SACRAMENTO DISTRICT:

DRAWING FILE NUMBER: _____

SPECIFICATION NUMBER: _____

NUMBER OF SHEETS TOTAL: _____

NUMBER OF SHEETS BY VOLUME.

VOL. 1 _____
VOL. 2 _____
VOL. 3 _____

REMARKS: COE Project Manager:
A/E Firm:

AIR CONDITIONING LOAD ESTIMATE				DATE	BASE	ESTIMATOR	PAGE	OF	PAGES	
BUILDING NO.		SPACE NO.		SPACE USE		AREA		DAILY OPERATION		
ITEM	QUANTITY	GAIN	FACTOR	BTU/HR	DAILY RANGE	F	ELEV	FT	LAT	
SOLAR GAIN GLASS						ESTIMATE FOR <input type="checkbox"/> PEAK LOAD <input type="checkbox"/> PARTIAL LOAD		SUN TIME		
GLASS	SF X	X			CONDITIONS	DB	WB	% RH	DP	
GLASS	SF X	X			OUTSIDE					
GLASS	SF X	X			ROOM					
GLASS	SF X	X			DIFFERENCE		XXX	XXX	XXX	
SOLAR & TRANS-WALLS & ROOF						SELECTED ROOM CONDITIONS DB WB % RH				
WALL	SF X	X			OUTSIDE AIR					
WALL	SF X	X								
WALL	SF X	X								
WALL	SF X	X								
ROOF	SF X	X			VENTILATION REQ'D					
TRANSMISSION GAIN-OTHER										
ALL GLASS	SF X	FX				SMOKING NOT PERMITTED	PEOPLE X	CFM PERSON =		
PARTITION	SF X	FX				AREA	SF X	CFM SF =		
CEILING	SF X	FX				REQ'D			CFM	
FLOOR	SF X	FX				INFILTRATION				
O.A. INFIL	CFM X	FX 1.08								
INTERNAL HEAT						CRACK	FT X	CFM FT =		
PEOPLE		X				DOORS	F X	CFM DOOR =		
POWER		X				TOTAL			CFM	
LIGHTS	WATTS X 3.4	X				EXH FAN				
						TOTAL O.A. THRU COOLING COIL = _____ CFM				
SEN. HT. SUBTOTAL						Coordination of cooling design and heating design is essential and a study of the heating estimate should be made at this time.				
STORAGE CREDIT - SEE NOTE _____						APPARATUS DEWPOINT TEMPERATURE				
ROOM SENSIBLE HEAT						ESHF = $\frac{\text{EQUIV SEN HT}}{\text{EQUIV TOTAL HT}} = 0. \dots$				
SUPPLY DUCT HEAT GAIN	% +	SUPPLY DUCT LEAKAGE	% +	SUPPLY FAN H.P.	%	INDICATED ADP = _____ F. SELECTED ADP = _____ F				
O.A.	CFM X	FX	B.F. X 1.08			COIL AIR QUANTITY				
EQUIVALENT SENSIBLE HEAT						SYSTEM $\Delta T = (1 - \frac{SF}{BF}) (TRM - F - TAOP - F) = \dots F$				
LATENT HEAT						CFM = $\frac{\text{EQUIV SEN HT}}{1.08 X F \text{ SELECTED } \Delta T} = \dots$				
INFILTRATION	CFM X	G/LB X 0.68			ROOM SUPPLY AIR					
PEOPLE		X			ROOM SEN HEAT = _____ CFM					
VAPOR TRANSMISSION - SEE NOTE						1.08 X _____ F SELECTED ROOM ΔT				
ROOM LATENT HEAT						REHEAT REQ'D _____ BTU/HR - SEE NOTE _____				
SUPPLY DUCT LEAKAGE GAIN						NOTES (REF AFM 86-15, ATCH 13)				
O.A.	CFM X	G/LB X	B.F. X 0.68							
EQUIVALENT LATENT HEAT										
EQUIVALENT TOTAL HEAT										
O. A. HEAT										
SEN.	CFM X	FX (1- BF) X 1.08								
LAT.	CFM X	G/LB X (1- BF) X 0.68								
RETURN DUCT HEAT GAIN	% +	RETURN DUCT AIR GAIN	% +	RETURN/SUPPLY FAN H.P.	%	SUMMARY		CHECK FIGURES		
COOLING COIL GRAND TOTAL HEAT					S.A.	=	CFM	SF/TON	=	
PUMP H.P. % + PIPING HEAT GAIN %					O.A.	=	CFM	S.A./SF	=	
REF EQUIPMENT GRAND TOTAL HEAT					EXH AIR	=	CFM	O.A./S.A.	=	
					REF EQUIP	=	TONS			

LIFE CYCLE COST ANALYSIS SUMMARY

LOCATION: _____ REGION NO: _____ PROJECT NO: _____

PROJECT TITLE: _____ FY: _____

DISCRETE PORTION NAME: _____

ANALYSIS DATE: _____ ECONOMIC LIFE: _____ YEARS PREPARED BY: _____

1. INVESTMENT

A. CONSTRUCTION COST \$ _____
 B. GOVERNMENT SIOH \$ _____
 C. DESIGN COST \$ _____
 D. ENERGY CREDIT CALC (1A+1B=1C)X.9 \$ _____
 E. SALVAGE VALUE \$ _____
 F. TOTAL INVESTMENT (1D-1E) ----->\$ _____

2. ENERGY COST:

	(1)	(2)	(3)	(4)	(5)
	<u>ANNUAL UNITS</u>				
<u>FUEL</u>	<u>UNIT COST</u>	<u>OF ENERGY</u>	<u>ANNUAL \$</u>	<u>DISCOUNT</u>	<u>DISCOUNTED</u>
	<u>\$/MBTU</u>	<u>MBTU/YR</u>	<u>COST</u>	<u>FACTOR</u>	<u>COST</u>
A. ELEC	\$ _____	_____	\$ _____	_____	\$ _____
B. DIST	\$ _____	_____	\$ _____	_____	\$ _____
C. RESID	\$ _____	_____	\$ _____	_____	\$ _____
D. NG	\$ _____	_____	\$ _____	_____	\$ _____
E. COAL	\$ _____	_____	\$ _____	_____	\$ _____
F. TOTAL		_____	\$ _____		----->\$ _____

3. NON ENERGY COST:

A. ANNUAL RECURRING COST: \$ _____
 (1) DISCOUNT FACTOR: _____
 (2) DISCOUNTED COST (3A X 3A1): \$ _____

B. NON-RECURRING COST:

	(1)	(2)	(3)	(4)
<u>ITEM</u>	<u>COST</u>	<u>YEAR OF</u>	<u>DISCOUNT</u>	<u>DISCOUNTED</u>
		<u>OCCURANCE</u>	<u>FACTOR</u>	<u>COST</u>
a. _____	\$ _____	_____	_____	\$ _____
b. _____	\$ _____	_____	_____	\$ _____
c. _____	\$ _____	_____	_____	\$ _____
d. TOTAL	\$ _____			----->\$ _____

C. TOTAL NON ENERGY DISCOUNTED COST (3A2 + 3Bd4): \$ _____

4. LIFE CYCLE COST (1F + 2F5 + 3C): \$ _____

CHAPTER V
DESIGN CRITERIA

<u>Paragraph</u>	<u>Subject</u>	<u>Page</u>
1.0	General Instructions	V-1
2.0	Dates of Publications	V-1
3.0	Availability of Criteria	V-1
4.0	Conflicts in Criteria	V-1
5.0	Revisions to Criteria	V-1
6.0	Basic Design Criteria Package	V-2
7.0	Criteria Index	V-2
Figure 5	Typical Revision to Criteria Implementation Instructions	

"When all else fails, read the instructions."

CHAPTER V

DESIGN CRITERIA

1.0. GENERAL INSTRUCTIONS

1.1. All projects shall conform to the criteria contained in the "Scope of Work" unless the A-E is given instructions in writing to the contrary. In cases where a COE review determines criteria has not been followed, the A-E will be required to conform his design to the criteria at his own time and expense, per the appropriate paragraphs of the A-E's contract.

2.0. DATES OF PUBLICATIONS

2.1. To eliminate the need to continually change the dates of the criteria references, dates are not included on the criteria index contained herein. The A-E will be issued the latest copy for all COE publications requested. Since the criteria often changes, the A-E shall discard criteria from any past COE projects and request up-to-date material. For all non-COE references, the A-E shall use those current at the time his contract is signed. If there is any question regarding this issue, it shall be resolved with the PM.

3.0. AVAILABILITY OF CRITERIA

3.1. Publications such as guide specs., TM's, AFM's, DM's, DOD manuals and Sacramento District prepared manuals such as, "COE Standard details for Utilities, Foundations and Railroads", are available on request from the COE PM. Other Government documents which are not available from the COE will be so noted in the criteria list. The A-E is responsible for obtaining these items from the appropriate Government agencies. All other references, such as American Concrete Institute's "Building Code Requirements for Reinforced Concrete", etc., shall be obtained by the A-E from other sources. See A-E Guide, Volume 3, Specifications for source of such references.

4.0. CONFLICTS IN CRITERIA

4.1. In many instances, a subject has more than one criteria reference. These references may give conflicting information on a given point. In all cases, the Government publication will control over non-Government publications and Sacramento District references, unless otherwise stated. If there is any doubt regarding the controlling criteria, the A-E shall contact the COE PM.

5.0. REVISIONS TO CRITERIA

5.1. Periodically, revisions, or "SPK Supplements" will be issued by the Sacramento District to implement new criteria in the format shown in Figure 5. Each "SPK Supplement" will be dated and contain a "cover sheet" with instructions to the designer on implementation. Normally, "routine" will be indicated for those changes that do not incur either re-design effort or schedule slippage; on rare occasions, "special" will be indicated for critical changes officially directed regardless of impact on stage of

design. In addition, an "index supplement" will be issued with each "SPK supplement" to track previous and/or current changes to the same design criteria.

6.0. BASIC DESIGN CRITERIA PACKAGE. Upon notification from the COE PM, the District's Design Quality Assurance (DQA) Section will transmit to the A-E a Basic Design Criteria Package. This package contains criteria that, for the most part, is generic to all designs. It includes such documents as the A-E Guide, Volumes 1, 2, and 3, Standard Details, the Seismic Design Manual (AFM 88-3, Chapter 13) and the Criteria and Standards for Air Force Construction (AFR 88-15) and several Engineer Technical Letters (ETL's). The A-E is requested not to re-request these documents unless absolutely necessary.

7.0. CRITERIA INDEX

7.1. The information that follows has been organized to facilitate the A-E's search for applicable criteria and the subsequent ordering of that criteria through the COE PM. The following pages contain:

7.1.1 DISCIPLINE/SUBJECT LISTING OF CRITERIA. To aid in your search for applicable criteria, this list has been developed with subjects presented in alphabetical order under each major discipline category. Please note that duplicative references to certain criteria may occur from discipline to discipline. Pay close attention to the remarks column. It will tell you if the document is not available from (N.A.F.) the COE.

7.1.2 NUMERICAL CRITERIA INDEX. This can be used as an "order form" simply by making a copy and circling the required documents. This list only contains those documents most frequently requested, therefore the A-E may find it necessary to add document numbers to this list.

7.2. All of the above shall be thoroughly examined by the A-E to make certain that all applicable criteria is utilized and adhered to. For guide specification lists the A-E is directed to the A-E Guide, Volume 3, Specifications.

U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
SACRAMENTO, CA

SUPPLEMENTAL IMPLEMENTATION
TM 5-811-1/AFM 88-9 Chap 1
SPK Supplement
September 1985

TO: Designers

Current changes are listed on the Index Supplement and those issued with this supplement are preceded with an asterisk (*).

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INSTRUCTIONS TO DESIGNER

ROUTINE IMPLEMENTATION

The attached updated material supplements and/or revises corresponding material furnished for your contract and shall be incorporated into preliminary and final designs unless such incorporation will incur redesign or schedule slippage.

SPECIAL IMPLEMENTATION

The attached updated material supplements and/or revises corresponding material furnished for your contract and shall be incorporated into the design for all Sacramento District work, regardless of the stage of design.

DISCIPLINE/SUBJECT CRITERIA INDEX

CIVIL

<u>SUBJECT</u>	<u>TITLE</u>	<u>CRITERIA REFERENCE</u>	<u>NO.</u>	<u>REMARKS</u>
ARMS RANGES	Arms Range, Small Arms		AFM 50-25	
AIRFIELDS				
Design, General	Airfield Design, General Provisions		TM 5-824-1/ AFM 88-6, Chap. 1	
Design, Flexible	Airfield Design, Flexible		TM 5-825.2/ AFM 88-6, Chap. 2	
Pavement Evaluation	Airfield Pavement Evaluation, Flexible		TM 5-827-2/ AFM 88-24, Chap. 2	
Pavement Evaluation	Airfield Pavement Evaluation, Rigid		TM 5-827-3/ AFM 88-24, Chap. 3	
Pavement Marking	Airfield Pavements, Marking		AFR 88-16	
BACKFILL	Backfill for Subsurface Structures		TM 5-818-4/ AFM 88-5, Chap. 5	
CONCRETE				
Standard Practice	Concrete, Standard Practices for Military Structures		TM 5-805-1/ AFM 88-3, Chap. 6	
Floor Slabs, heavy loads	Concrete Floor Slabs on Grade Subjected to Heavy Loads		TM 5-809-12/ AFM 88-3, Chap. 15	
DEWATERING, GROUNDWATER CONTROL	Dewatering and Groundwater Control for Deep Excavations		TM 5-818-5/ AFM 88-5, Chap. 6	
DD FORM 1391 PREPARATION	Project Development Brochure		TM 5-800-3	
DRAINAGE				
Drainage, Grading	Drainage and Grading		AFR 88-15, Chap. 2, Sec. A & B	
Surface	Drainage, Surface, for Airfields and Heliports.		TM 5-820-1/ AFM 88-5, Chap. 1	
Subsurface	Drainage and Erosion Control Subsurface Drainage Facilities for Airfield Pavements		TM 5-820-2/ AFM 88-5, Chap. 2	
Structures	Drainage and Erosion Control Structures for Airfields and Heliports		TM 5-820-3/ AFM 88-5, Chap. 3	

Areas other than Airfields	Drainage, Areas other than Airfields	TM 5-820-4/ AFM 88-5, Chap. 4	
ENVIRONMENTAL	Environmental Impact	DA PAM 200-1/ AR 200-1	
	Environmental Quality	AR 200-1	
FACILITIES	Facility Requirements, Standard	AFM 86-2	
FENCE	Fence and Details Ty. FE-5, FE-6, FE-7	CEGS-02444 Dwg. # 40-16-08	
FIRE PROTECTION	Fire, Protection for Facilities	MIL-Handbook-1008A	
FOUNDATIONS			
Procedures	Foundation Design, Procedures For	TM 5-818-1	
Expansive Soils	Foundations in Expansive Soils	TM 5-818-7	
GROUTING	Grouting Methods and Equipment	TM 5-818-6/ AFM 88-32	
HAZARDOUS WASTE			
Disposal/Treatment	Harzardous Waste Land Disposal/ Land Treatment Facilities	TM 5-814-7	
INSTALLATION DESIGN	Installation Design	TM 5-803-5/ AFM 88-43	
LANDSCAPING			
Design	Landscape Design and Planting	TM 5-803-13 AFM 126-8	
Ground Cover	Landscaping, Establishment of Herbaceous Ground Cover	TM 5-830-2/ AFM 88-17, Chap. 2	
Planting	Installation Design	TM 5-803-5/ AFM 88-43	
Dust Control	Landscaping, Dust Control	TM 5-830-3/ AFM 88-17, Chap. 3	
Planting Trees,	Landscaping, Planting and Maintenance	TM 5-830-4/ AFM 88-17, Chap. 4	Some installations have lists of trees, shrubs, etc., suitable for their climate. Contact the PM for the appropriate list.
PARKING			
Non organizational vehicle	Installation Design	TM 5-803-5/ AFM 88-43	
Handicapped	Uniform Federal Accessibility Standards (UFAS)	UFAS	

PAVEMENT DESIGN		
Frost	Pavement Design - Seasonal Frost Conditions	TM 5-818-2/ AFM 88-6, Chap. 4
PAVEMENT EVALUATION		
Frost	Pavement Evaluation, Frost Conditions	TM 5-818-3/ AFM 88-24, Chap. 4
PAVEMENTS		
General Provisions	General Provisions and Geometric Design for Roads, Streets, Walks, and Open storage areas	TM 5-822-2/ AFM 88-7, Chap. 5
Soil Stabilization	Pavements, Soil Stabilization, for Road/Streets	TM 5-822-4/ AFM 88-7, Chap. 4
Flexible Pavements	Flexible Pavements for Roads, Streets, Walks, and Open Storage Areas	TM 5-822-5/ AFM 88-7, Chap. 3
Rigid Pavements	Rigid Pavements for Roads, Streets, Walks, and Open Storage Areas	TM 5-822-6/ AFM 88-7, Chap. 1
Concrete	Standard Practice for Concrete Pavements	TM 5-822-7/ AFM 88-6, Chap. 8
Bituminous	Standard Practice for Bituminous Pavements	TM 5-822-8/ AFM 88-6, Chap. 9
Flexible, Airfields	Flexible Pavement Design for Airfields	TM 5-825-2/ AFM 88-6, Chap. 2
Rigid, Airfields	Rigid Pavement for Airfields	TM 5-825-3/ AFM 88-6, Chap. 3
Repair	Repair of Rigid Pavements Using Epoxy Resin Grouts, Mortars, and Concretes	TM 5-822-9 AFM 88-6, Chap. 10
PEST CONTROL	Pest Control Facilities	MIL - HDBK - 1028/8
PLANNING		
Airfields	Airfield Design, General Provisions	TM 5-824-1/ AFM 88-6, Chap. 1
Master	Principles and Procedures, Planning Guide	TM 5-803-1
Airfield and Heliport	Planning, Airfields and Heliport	TM 5-803-10/ AFR 88-33
	Airfield and Heliport Planning Criteria	TM 5-803-7/ AFR 86-14

Land	Land Use Planning	TM 5-803-8	
Sports	Planning and Design of Outdoor Sports Facilities	TM 5-803-10/ AFR 88-33	
Children's Play	Children's Play Areas and Equipment Recreation Facilities	TM 5-803-11/ AFM 88-30	
Master, Air Base	Master Air Base Planning	AFM 86-6	
Airfield	Airfield and Airspace Planning	AFM 86-8	
RAILROADS	Railroad Design and Construction at Army and Air Force Installations	TM 5-850-2/ AFM 88-7, Ch. 2	
SAFETY	Safety and Health Requirements	EM 385-1-1	
SEWAGE	Criteria and Standards for Air Force Construction	AFR 88-15, Chap. 2, Sec. C	
Gravity	Sanitary and Industrial Wastewater Collection - Gravity Sewers and Appurtenances	TM 5-814-1/ AFM 88-11, Vol 1; AFR 88-15, Sec. E&F	
Force Mains	Sanitary and Industrial Wastewater Collection - Pumping Stations and Force Mains	TM 5-814-2/ AFM 88-11, Vol. 2; AFR 88-15, Chap. 15, Sec. E&F	
Treatment	Domestic Wastewater Treatment	TM 5-814-3/ AFM 88-11, Chap. 3, AFR 88-15, Chap. 15, Sec. G	
SIGNAGE	Department of the Air Force sign standards	AFP 88-40	
	Manual on Uniform Traffic Control Devices for Streets & Highways		N.A.F. COE
SOLID WASTES			
General Considerations	Criteria and Standards for Air Force Construction	AFR 88-15, Ch. 15, Sec. G	
Incineration	Sanitary Engineering, Incinerators	TM 5-814-4/AFM 88-11, Chap. 4	
Sanitary Landfill	Sanitary Landfill	TM 5-814-5/ASCE Man. No. 39	
STANDARD DETAILS	Standard Details for Utilities, Foundations, Paving, and Railroads	COE, Sacramento District	

SURVEYING & MAPPING	Sacramento District Design Manual for Surveying & Mapping	DM 4-805-10	
SYMBOLS			
Legends for Drawings	Standard Details for Utilities, Foundations, Paving and Railroads	COE, Sacramento District	
TIE DOWN ANCHOR AND GROUNDING ROD	For Aircraft Aprons	CEGS-02611	
TRAFFIC			
Design	Traffic Engineering for Better Signs and Markings	MTMC Pam 55-14	N.A.F. COE
Design	Traffic Engineering for Better Roads	MTMC Pam 55-10	N.A.F. COE
Design	Mastering Traffic Engineering	MTMC Pam 55-16 Vol. III	N.A.F. COE
US RESERVE FORCES			
Facilities Criteria	Design Guide for US Army Reserve Reserve Facilities	DG 1110-3-107	Army & Air Force
Utility, Services and siting	Criteria and Standards for Air Force Construction	AFR 88-15, Chap. 2, Sec. D	
WATER			
General	Water Supply, General Considerations	TM 5-813-1/ AFM 88-10, Chap. 1	
Army Potable Water	Occupational and Environmental Health. Sanitary Control and Surveillance of Water Supplies at Fixed Installations	TB MED 576	
Distribution	Water Supply, Water Distribution Systems	TM 5-813-5/ AFM 88-10, Chap. 5	
Sources	Water Supply, Water Sources	TM 5-813-2/ AFM 88-10, Chap. 2	
Storage	Water Supply, Water Storage	TM 5-813-4/ AFM 88-10, Chap. 4	
Supply	Criteria and Standards for Air Force Construction	AFR 88-15, Chap. 15, Sec. C	Air Force only. Provides guidance in materials selection for Water Supply Treatment and Distribution facilities Prescribe Water Supply requirements for fire protection at Army and Air Force Installations for anti-aircraft tactical sites, including family housing, Air control and Warning Stations and Reserve Centers

Frost Penetration	Load Assumption for Buildings	TM 5-809-1 Appendix A	
Supply for Fire Protection	Water Supply for Fire Protection	TM 5-813-6/e AFM 88-10, Chap. 6	
Special Projects	Water Supply for Special Projects	TM 5-813-7/ AFM 88-10, Chap. 7	
Treatment	Water Desalination Water Treatment Plant Design Water Supply, Water Treatment	TM 5-813-8 ASCE Manual AFM 88-10, Vol 3.	
WELLS	Types. Hydraulics. Design. Construct Groundwater Standard for Deep Wells Manual of Water Well Construction Practices Water Well Standards	TM 5-813-1 AWWA Manual No. M21 AWWA Standard A100 EPA Manual 570/9-75 -001 State of California Bulletin 74	N.A.F. COE N.A.F. COE N.A.F. COE N.A.F. COE
Swimming Pools	Swimming pools and bathing facilities	TB MED 575	
Ground-water Contamination	Protection of Public Water Supplies from Ground Water Contamination.	EPA 625/4-85/016	N.A.F. COE
Ground-water Restoration, Sampling Tracers; Monitoring Wells.	Ground Water Handbook	EPA 625/6-87/016	N.A.F. COE
Wastewater discharge regulations and treatment processes.	Evaluation Criteria Guide for water pollution prevention, control, and abatement programs.	TM 5-814-8 (No AFM number given)	
Underground storage tanks-removal, replacement.	(a) EPA-Part 280 of Title 40 of the Code of Federal Regulations, published in the Federal Register on September 23, 1988. (b) Applicable Implementing Agency. (EPA, designated State or local agency responsible for carrying out one approved UST Program).	N.A.F. COE N.A.F. COE	

ARCHITECTURAL

<u>SUBJECT</u>	<u>TITLE</u>	<u>CRITERIA REFERENCE</u>	<u>NO.</u>	<u>REMARKS</u>
GENERAL	Criteria and Standards for Air Force Construction		AFR 88-15	
	Design Criteria/Architectural and Engineering Instructions		AEI w/chge 1	Use also on AF jobs where AFR 88-15 is silent.
	Construction Criteria for Army Facilities		TM 5-800-1	Supplement to AEI
	Master Planning for Army Installations		AR 210-20	
	Military Construction Army Program Development		AR 415-15	
CAULKING AND SEALANTS	Caulking and Sealants		TM 5-805-6	
	Caulking and Sealants		CEGS-07920	
CHILD CARE	Joint Services Construction Criteria Document for Military Child Development Centers			
	Child Development Services		AR 608-10	
	Design Guide - Child Care Centers		DG 1110-3-140	
	Children's Play Areas and Equipment		TM 5-803-11	
CHEMICAL FALLOUT	Protection Against Chemical and Biological Agents and Radiological Fallout		TM 5-855-2	
CLEAN ROOMS	Criteria for Air Force Clean Facility Design and Construction		AFM 88-4, Chap. 5	
COLORS	Federal Standard Colors		Fed. Std. 595a	Order from General Services Administration, Washington D.C. 20406
COLOR SELECTION	Check with individual Installation for exterior colors			
COMMISSARIES	Decor Guide for Commissary Store Facilities		D-58 CERL Technical Report	
COMMUNITY CENTERS	Site Planning - Community Centers		TM 5-803-6	

CONSTRUCTION TYPES	Criteria and Standards for Air Force Construction	AFR 88-15	
	Building Construction, Standard Types	NFPA 220	
	Uniform Building Code	UBC	as modified by Mil-HDBK-
	AEI Design Criteria		1008
CONSOLIDATED FACILITIES	Space Planning Guide for TDA Consolidated Facilities	TM 5-841-2	
CONTINUING EDUCATION FACILITIES	Design Guide - Army Continuing Education System Centers	DG 1110-3-112	
COURIER STATIONS	Courier Station Design	TM 5-844-1	
DESIGN AND CONSTRUCTION MANAGEMENT	Design and Construction Management	AFR 89-1	
DINING FACILITIES	Decor Guide for Enlisted Personnel Dining Facilities	D-38 CERL Technical Data Series	
DOORS	Criteria and Standards for Air Force Construction	AFR 88-15	
	NFPA 80, 101		
	Steel Door Institute	SDI 100	N.A.F. COE
EXPLOSIVES STANDARDS	Explosives Safety Standards	AFR 127-100	
	Ammunition and Explosive	DOD 5100.76-M	
FIELD OFFICES	Design Guide - CID Field Offices	DG 1110-3-144	
FIRE AND SMOKE PARTITIONS	Criteria and Standards for Air Force Construction	AFR 88-15	
	Fire Protection for Facilities Engineering, Design and Construction	MIL-HDBK-1008A	
	National Fire Protection Association	NFPA-Life Safety Code	N.A.F. COE
	UBC		
	Underwriters Laboratories (UL) Fire Resistance Directory		N.A.F. COE
FIRE AREA LIMITATION	UBC		UBC N.A.F. COE

FIRE PROTECTION	Fire Protection for Facilities	MIL-HDBK-1008A	
	Engineering, Design and Construction Criteria and Standards for Air Force Construction	AFR 88-15, Chap. 15-H	
	Fire Protection for Facilities Engineering, Design and Construction	MIL-HDBK-1008A	
FIRE SEPARATION OF BUILDINGS	Criteria and Standards for Air Force Construction	AFR 88-15, Chap. 1	
	UBC		
	Fire Protection for Facilities Engineering, Design and Construction	MIL-HDBK-1008A	
FLASHING, SHEET METAL	Architectural Sheet Metal Manual by Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)	SMACNA	N.A.F. COE
HANDICAPPED CRITERIA	Uniform Federal Accessibility Standards UFAS		
HARDWARE, BUILDERS'	Builders Hardware Manufacturers Assoc.	BHMA/ANSI	BHMA material N.A.F. COE
HEALTH FACILITIES	Design and Construction of Air Force Health Facilities	AFR 88-50	
	Army Health Facility Design	TM 5-838-2	
	Construction and Material Schedule for Military Medical and Dental Facilities	MIL-STD-1691a	
INSULATION	Criteria and Standards for Air Force Construction	AFR 88-15	
INTERIOR FINISHES	Criteria and Standards for Air Force Construction	AFR 88-15	
INTERIOR DESIGN	Statement-of-work for Comprehensive Interior Design Requirements Comprehensive Interior Design Requirements	AFP 88-41 DTL 1110-4-20	
LIFE SAFETY	National Fire Protection Association	NFPA 101	
LAUNDRY PLANTS	Laundries and Dry-Cleaning Plants	TM 5-842-2	
MAINTENANCE FACILITIES	Space Planning guide for TOE Maintenance Facilities	TM 5-841-1	
MASONRY WALLS, 'U' VALUES	Masonry Wall "U" Values	DM 4-805-1	

MASTER PLANNING

Master Planning - Principles and Procedures TM 5-803-1

The Overlay - Composite Method of Master Plan Preparation TB ENG-353

Preparation of Master Plans by Negative Engraving and Type Overlay Techniques Including Samples of Master Planning Components TB ENG-353-1

MATERIALS OF CONSTRUCTION

Criteria and Standards for Air Force Construction AFR 88-15

MOBILE HOMES

Convertible Mobile Home Communities TM 5-845-2

Procurement Manual for Mobile Home Community One-Step "turnkey" contract

MUNITIONS PRODUCTION

Safety Regulation to Munitions Production Base Support Construction Program Projects R 385-100

MUSIC CENTERS

Design Guide - Music and Drama Centers DG 1110-3-120

NOISE

Noise and vibration Control for Mech. Equipment TM 5-805-4/
AFM 88-37

Planning in the Noise Environment TM 5-803-2

NUCLEAR EFFECT

Designing Facilities to Resist Nuclear Weapons Effects TM 5-858-1

OCCUPANCY CLASSIFICATION

NFPA NFPA 101

Fire Protection for Facilities Engineering, Design and Construction MIL-HDBK-1008A

UBC

OCCUPATIONAL SAFETY AND HEALTH

Safety and Health Requirements Manual EM 385-1-1

OSHA

General Industry Standards

OFFICERS CLUB

Design Guide - Commissioned and Non-Commissioned Officers Club DG 1110-3-134

PAINT

Paints and Protective Coatings TM 5-618

Painting New Construction and Maintenance EM 1110-2-3400

PETROLEUM FACILITIES	Petroleum Fuel Facilities	NAVFAC DM-22
PHYSICAL FITNESS CENTER	Petroleum Fuel Facilities Design Guide - Physical Fitness Centers	DM 4-805-9 DG 1110-3-128
PHYSICAL SECURITY	Security, Air Physical Security Program	AFR 207-1
	Physical Security of Arms Ammunition and Explosives	AR 190-11
	Physical Security of Sensitive Conventional Arms Ammunition and Explosives	DOD 5100,76-M
PORTS	Engineering and Design of Military Ports	TM 5-805-9
POWER PLANTS	Power Plant Acoustics	TM 5-800-3
PROTECTIVE DESIGN	Fundamentals of Protective Design	TM 5-855-1
RAISED FLOORS	Raised Floor Systems	TM 5-805-13
RANGE COMPLEXES	Design Information for Multi-purpose Range Complex (Light Infantry)	HNDM 1110-1-8
RECREATION FACILITIES	Planning Design of Outdoor Sports Facilities	TM 5-803-10
	Design of Recreation Areas and Facilities - Access and Circulation	EM 1110-2-410
	Design Guide - Recreation Centers	DG 1110-3-132
	Outdoor Recreation Facilities	TM 5-803-12
RESERVE FACILITIES	Design Guide - U.S. Army Reserve Facilities	DG 1110-3-107
ROOFING DESIGN	Criteria and Standards for Air Force Construction	AFR 88-15
	Built-up Roofing	SPK 7-A
	Roof Deck Systems	TM 5-805-3
	Roofing Design	TM 5-805-14
	Metal Roofing and Siding	TM 5-809-8/ AFM 88-3, Chap. 8
SAFETY	Safety and Health Requirements	EM 385-1-1

Listed in A-E Guide
Vol. 3-Specs.

SECURITY	Physical Security	NAVFAC DM 13.1	
	Designing for Security	TM 5-853-1	
SERVICE SCHOOLS	Space and Planning Criteria for US Army Service Schools	TM 5-843-1	
	Design Guide - US Army Service Schools	DG 1110-3-106	
SIGN STANDARDS	Sign Standards	AFP 88-40	
STORAGE DEPOTS	Storage Depots	TM 5-840-2	
SWIMMING POOLS	Storage and Materials Handling	DOD 4145.19-R-1	
	Occupational and Environmental Health Swimming Pools and Bathing Facilities	TB MED-575	
TEMPEST SHIELDING	Tempest/EMP Shielding	DM 4-805-4	
UNACCOMPANIED ENLISTED PERSONNEL HOUSING	Enlisted Dormitory Design Guide		specify Air Force
WIND	Design Criteria for Facilities in Areas Subject to Typhoons and Hurricanes	TM 5-809-11	
X-RAYS	X-Ray Shielding	TM 5-805-12	
	Diagnostic X-Ray, etc. Protection	TB MED-62	
VAULTS	Vaults, Arms Storage and Secure Storage Areas	DM 4-805-2	

STRUCTURAL

<u>SUBJECT</u>	<u>TITLE</u>	<u>CRITERIA REFERENCE</u>	<u>NO.</u>	<u>REMARKS</u>
GENERAL DESIGN STRUCTURE	Seismic Design for Buildings		TM 5-809-10/ AFM 88-3, Chap. 13	
	Seismic Design Guidelines for Essential Buildings		TM 5-809-10-1/ AFM 88-3, Chap. 13, Sec A	
	Seismic Upgrading Existing Building		TM 5-809-10-2/ AFM 88-3, Chap. 13.2	Draft Edition Only
	Structures to Resist the Effects of Accidental Explosion		TM 5-1300/AFM 88-3,	Available on loan basis only
	Fundamental of Protective Design		TM 5-855-1	Non-nuclear
	Protection Against Chemical and Biological Agents and Radiological Fallout		TM 5-855-2	
	Explosive Safety Standards		AFR 127-100	
	Vaults, Arms storage and secure storage areas		DM 4-805-2	
	Load Assumptions for Buildings		TM 5-809-1/ AFM 88-3, Chap. 1	Live, lateral, wind and snow loads. Frost penetration determination
	Structural Design - Thin-Shell Construction		TM 5-809-9/ AFM 88-3, Chap. 12	
	Structural Design - Structures other than Buildings		TM 5-809-6	
	Working Stresses for Structural Design		EM 110-1-2101	
	Physical Security		NAVFAC DM 13.1	
FOUNDATION AND SOIL	Procedures for Foundation Design of Buildings and Other Structures (Except Hydraulic Structures)		TM 5-818-1/ AFM 88-3, Chap. 7	
	Standard Details for Utilities, Foundations, Paving and Railroads		C.O.E. Sacramento District	See Plates F1 through F12.
	Foundation in Expansive Soils		TM 5-818-7	

CONCRETE

Concrete Structural Design for Buildings	TM 5-809-2/ AFM 88-3, Chap. 2	Also see TM 5-809-10
Building Code Requirements for Reinforced Concrete	ACI 318	N.A.F. COE Also see TM 5-809-10
ACI Detailing Manual	SP-66	N.A.F. COE Also, see COE Standard Details. Sacramento District
Concrete Floor Slabs on Grade Subjected to Heavy Loads	TM 5-809-12/ AFM 88-3, Chap. 15	
Design Manual for Composite Decks, from Deck, and Roof Decks	Steel Deck Institute	N.A.F. COE
Standard Practice for Concrete Military Structures	TM 5-805-1/ AFM 88-3, Chap. 6	
Design Handbook, Precast and Prestressed Concrete	Prestressed Concrete Institute	N.A.F. COE
Retaining Walls	EM 1110-2-2502	Also see ACI 318
Grouting Methods and Equipment	TM 5-818-6/ AFM 88-32	

MASONRY

Masonry Structural Design for Buildings	TM 5-809-3/ AFM 88-3, Chap. 3	Seismic zones 0 and 1 only. Also, see TM 5-809-10 for other zones
Reinforced Masonry Engineering Handbook	Masonry Institute of America	N.A.F. COE

STEEL

Manual of Steel Construction	AISC	N.A.F. COE Also, see TM 5-809-10
Steel and Aluminum, Structural Design for Buildings	TM 5-809-4/ AFM 88-3, Chap. 4	Also see SDI Design Manual for Steel Deck.
Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders	Steel Joist Institute	N.A.F. COE
Welding: Design, Procedures and Inspection	TM 5-805-7/ AFM 88-4, Chap. 7	
Structural Welding Code - Steel	AWS D1.1	N.A.F. COE
Structural Welding Code - Reinforcing Steel	AWS D1.4	N.A.F. COE
Code-Formed Steel Design Manual	AISI	N.A.F. COE Also, see TM 5-809-10

WOOD

Wood Structural Design for Buildings

TM 5-809-5/
AFM 88-3, Chap. 5

MISCELLANEOUS

Raised Floor System

TM 5-805-13/
AFM 88-4, Chap. 9

Metal Building Systems Manual

MBMA

N.A.F. COE

Metal Roofing and Siding

TM 5-809-8/
AFM 88-3, Chap. 8

MECHANICAL

<u>SUBJECT</u>	<u>TITLE</u>	<u>CRITERIA REFERENCE</u>	<u>NO.</u>	<u>REMARKS</u>
FIRE PROTECTION	Policy and General Standards Mechanical Fire Protection		AFM 88-15, Chaps. 1 & 15, Sec. H	
	Military Handbook. Fire Protection for Facilities Engineering, Design, and Construction		MIL-HDBK-1008A	
	Fire Protection Criteria		AEI, Chap. 9	
	Mechanical Standard Details		COE, Sacramento District	
	Military Handbook, Covered Storage		MIL-HDBK-1032/2	
HEATING, VENTILATING &	Mechanical; Air Conditioning, Mechanical Ventilation		AFR 88-15, Chap. 15, I & J	
	Air Conditioning, Evaporative Cooling, Dehumidification, Mec. Ventilation and Refrigeration.		AEI w/chge 1	
	High Temperature Water Heating Systems		TM 5-810-2/ AFR 88-28	
	Mechanical Design; Heating, Ventilating, and Air Conditioning		TM 5-810-1	
	Heating Criteria and Mechanical Equipment		AEI w/chge 1	
	Engineering Weather Data		TM 5-785/ AFM 88-29/P-89	
	ASHRAE Guides			As Directed by AFR 88-15 & AEI
	Mechanical Standard Details		COE, Sacramento District	
	American Conference of Government Industrial Hygienist Manual			Special Ventilation applications such as Exhaust Hoods, Paint Spray Booths, Toxic Vapors, etc. Publication N.A.F. COE
	Mechanical Refrigeration and Ventilation in Cold Storage Facilities		TM 5-810-3/ AFM 88-8, Chap. 2	
PLUMBING	Plumbing. Domestic Wastes. Industrial Wastes		AFR 88-15, Chap. 15, Sec. D, E, & F	
	Criteria for Plumbing Equipment		AEI w/chge 1	

	National Standard Plumbing Code		Latest Edition. Army & Air Force. N.A.F. COE
	Plumbing	TM 5-810-5/ AFM 88-8, Chap. 4	
	Federal Specification Plumbing Fixtures (Land Use) (General Specifications)	WW-P-541	Document N.A.F. COE
	Non Industrial Gas Piping Systems	TM 5-810-6/ AFM 88-8, Chap. 5	
	Gas Distribution	TM 5-848-1/ AFM 88-12, Chap. 4	
	High Pressure Gas and Cryogenic System	TM 5-810-7/ AFM 88-10, Vol 3	
	Compressed Air	TM 5-810-4/ AFM 88-8, Ch. 3	
	Water Supply; Water Storage	TM 5-813-4	
	Water Supply; Water Supply for Fire Protection.	TM 5-813-6	
	Sanitary Engineering Incinerators	TM 5-814-4	
	Mechanical Standard Details	COE, Sacramento District U-45 (AF) U-46 (Army)	Rainfall Intensity Tables
	Mechanical Standard Details	COE, Sacramento District	
	ASHRAE Book of Fundamentals		N.A.F. COE Legend and Symbols
HEALTH AND MEDICAL FACILITIES	Criteria for Design and Construction of Air Force Health Facilities	AFM 88-50	Includes Hospitals and Dental Clinics, etc. Additional criteria will be provided on a per project basis.
	Army Health Facility Design	TM 5-838-2	See Remark Above
	Mechanical Standard Details	COE, Sacramento District	
	Plumbing, Hospital	CEGS-15410	Listed in A-E Guide, Vol 3 - Specifications

ENERGY CONSERVATION	Policy and General Standards. Mechanical	AFR 88-15, Chap. 1 & 15	Include economic analysis (LCCA-Life Cycle Cost Analysis), ECIP (Energy Conservation Investment Program), EBF (Energy Budget Figure) etc.
	Energy Conservation	AEI w/chge 1	Same as above
ENERGY BUDGET CALCS	Building Design Energy Budgets	TM 5-810-1 App, "F".	
	Energy Monitoring and Control Systems	TM 5-815-2/ AFM 88-36	Additional guidance on a Project Case Basis
	Mechanical Design; Heating, Ventilating and Air Conditioning - Energy Conservation	TM 5-810-1	
PETROLEUM & FUEL FACILITIES	Air Force Petroleum Fuel Facilities	DM 4-805-9	Sacramento District Design Manual. Developed from NAVFAC DM-22. See ETL 84-3 for AF.
	Handling Aircraft and Automotive Fuels	TM 5-848-2	
	Ground Storage of Coal	TM 5-848-3	
SOLAR ENERGY	Mechanical Design Heating, Ventilating and Air-Conditioning	TM 5-810-1, Appendix H	
	Solar Energy Systems	TM 5-804-2	
	Solar Applications	ETL 86-14	
OCCUPATIONAL SAFETY AND HEALTH	Life Safety Code Handbook	NFPA 101	Most Stringent Criteria Governs NFPA 101 & OSHA Standards N.A.F. COE
	OSHA, General Industry Standards		
	AFOOSH Standards Safety and Health Requirements	AFOOSH 127-66 EM 385-1-1	N.A.F. COE
MISCELLANEOUS ITEMS; MECHANICAL & OTHERS	Seismic Protection		
	Seismic Design for Buildings	TM 5-809-10/ AFM 88-3, Chap. 13	
	Seismic Design Guidelines For Essential Buildings	TM-809-10-1/ AFM 88-3, Ch. 13, Sect. A	
	Seismic Protection for Mechanical, Electrical Equipment	CEGS-15200	Listed in A-E Guide, Vol 3 - Specifications

Pollution	Air Pollution Control for Boilers and Incinerator	TM 5-815-1/ AFR 19-6	
UEPH (Barracks)	AF - Unaccompanied Enlisted Personnel Housing (UEPH)	AFR 88-15, Chap. 15, Sec. H	
	Barracks & BQ's	AEI w/chge 1 & 3	
	Enlisted Dormitory Design Guide,		Specify Air Force or Army
	HVAC Duct Construction Standards	SMACNA	Document N.A.F. COE
Noise/Acoustics	Power Plant Acoustics	TM 5-805-9/ AFM 88-20	
	Noise and Vibration Control for Mechanical Equipment	TM 5-805-4/ AFM 88-37 DM - 3.10	
	Uniform Federal Accessibility	UFAS	
Reserve Facilities	UFAS Reserve Facilities	AFR 88-15	
	Design Guide for U.S. Army Reserve Facilities.	DG-1110-3-107	
Family Housing	Family Housing Facilities Criteria	AEI w/chge 1 & 3	
	Family Housing Design	AFM 88-25	
Kitchens and Dishwashing	Mechanical Design; Heating, Ventilation and Air Conditioning	TM 5-810-1, Chap. 4, Para 4.2.b.	Specific criteria will be provided on a Project Case Basis Air Force: Use TM in conjunction with AFR 88-15, para 15-103, sub-para 3.b.
Dining Facilities	A/C, Mech., Vent., EC, & Dehum.	AFR 88-15, Chap. 15, Section I	
	Enlisted Personnel Dining Facilities	AEI w/chge 1 & 3	
CHILD CARE	Joint Services Construction Criteria Document for Military Child Development Centers.		Document N.A.F. COE
	Child Development Services	AR 608-10	
	Child Development Centers	AEI w/change 1	
TACTICAL VEHICLES	TOE and TDA Unit Maintenance Facilities	AEI w/chge 1	N.A.F. COE

STORAGE FACILITIES

Hazardous Waste Storage Facilities

MIL-HDBK 1005/13

Military Handbook. Covered Storage

MIL-HDBK 1032/2

Storage and Materials Handling

DOD 4145.19-R-1

Storage Depots

TM 5-840-2

COMMISSARY

Commissary Facilities

AEI w/chge 1

ELECTRICAL

<u>SUBJECT</u>	<u>TITLE</u>	<u>CRITERIA REFERENCE</u>	<u>NO.</u>	<u>REMARKS</u>
AIRFIELD LIGHTING	Airfield & Airspace Criteria		AFM 86-8	
	Army Aviation Lighting		TM 5-811-5	
	Visual Air Navigation Facilities		AFM 88-14	
	FAA Runway and Taxiway Lighting Systems Guides		AC 150/5340-24	N.A.F. COE
BONDING GROUNDING, ETC. FOR ELECTROMAGNETIC COMPATIBILITY	Bonding Grounding & Electrical Requirements for Electromagnetic Compatibility		Sam Tech Manual 80.3	N.A.F. COE
	Bonding, Electrical and Lighting Protection for Aerospace Systems		MIL-B-5087B (ASG)	N.A.F. COE
	Electromagnetic Compatibility & Grounding Requirements for Space System Facilities		MIL-STD 1542	N.A.F. COE
	Grounding, Bonding & Shielding for Common Long Haul/Tactical Comm. Systems		MIL-STD 188-124A	N.A.F. COE
	Method of Insertion-Loss Measurement EMC Handbook Vol. 3		MIL-STD-220A	N.A.F. COE
	Grounding, Bonding & Shielding Vol. 1 & 2		MIL-STD-419	
COMMUNICATION SYSTEMS	Elect. Comm. Systems Engr., Inside Plant		TM 11-486-4	N.A.F. COE
	Elect. Com. Systems Engr., Outside Plant wire		TM 11-486-5	N.A.F. COE
	Voice/Data Telephone Systems		TM 5-811-9	
	AFCC Tech. Bulletin on Building Cable and Duct Systems		TB 86-07-EZ	Available from 1842nd EEG/EEICS, Scott AFB, IL 62225-6348
	AFCC Tech. Bulletin on Local Area Network User Requirement Analysis-PCR, Part I		TB 85-02-EC	Available from 1842nd EEG/EEICS, Scott AFB, IL 62225-6348
	AFCC Tech. Bulletin on Local Area		RB 85-04-EC	Available from 1842nd EEG/EEICS, Scott AFB, IL 62225-6348

	AFCC Tech. Bulletin on Broadband Local Area Network, Preliminary Design and Cost Estimating	TB 85-07-EC	Available from 1842nd EEG/EEICS, Scott AFB, IL 62225-6348
	Telephone System-Prewire (SPK Prepared Guide Specification)	CEGS-16710 (Revise-Sep 1986)	Listed in A-E Guide Vol. 3 - Specifications.
CORROSION CONTROL	Cathodic Protection Design	AFM 88-45	
	Electrical Design, Cathodic Protection	TM 5-811-7	
EMERGENCY/GENERATING SYSTEMS	Recommended Practice for Emergency & Standby Power Systems (Orange Book)	IEEE Standard 446	N.A.F. COE
	Motors and Generators	NEMA MG.1	N.A.D. COE
	Criteria & Standards for Air Force Construction	AFR 88-15, Chap. 16,	
EXPLOSIVE SAFETY	Ordinance Safety Manual	DARCOM-R-385/100	N.A.F. COE
	Explosive Safety Standards	AFE 127-100	
	Ammunition & Explosive Standards	TM 9-1300-206	
EXTERIOR ELECTRICAL SYSTEMS	Electrical Power Supply & Distribution	TM 5-811-1/ AFM 88-9, Chap. 1	
	Criteria & Standards for Air Force Construction	AFR 88-15, Chap. 16, Section B	
	Electrical Services	AR 420-43, Chap. 3	
FIRE ALARM SYSTEM 7 FIRE PROTECTION	Criteria & Standards for Air Force Construction	AFR 88015, Chap. 16, Section A	
	Fire Protection for Facilities Engineering, Design and Construction	MIL-HDBK 1008A	
	Life Safety Code	NFPA 101	N.A.F. COE
GROUNDING	Recommended Practice for Grounding (Green Book)	IEEE Standard 142	N.A.F. COE
	Special Systems Grounding	DM 4-805-5	
	Guideline on Electrical Power for ADP Installation	FIPS Pub 94	N.A.F. COE

INTERIOR ELECTRICAL SYSTEMS	Interior Electrical System	TM 5-811-2/ AFM 88-9, Chap. 2	
	Design Criteria for Army Construction	AEI	
	Criteria & Standards for Air Force Construction	AFR 881-5, Chap. 16, Section A	
	Electrical Services	AR 420-43, Chap. 4	
	National electrical Code	NFPA 70	N.A.F. COE
	OSHA Safety and Health Std., General Industry Standard	29 CFR part 190	N.A.F. COE
	Recommended Practice for Elec. Power Dist. for Industrial Plants	IEEE Standard 141	N.A.F. COE
	Recommended Practice for Electrical Systems in Commercial Buildings	IEEE Standard 241	N.A.F. COE
	Recommended Practice for Protection & Coordination of Comm. & Ind. Power Systems	IEEE Standard 242	N.A.F. COE
	Recommended Practice for Power System Analysis (Brown Book)	IEEE Standard 399	N.A.F. COE
INTERIOR INTRUSION PROTECTION SYSTEM (J.SIIDS)	Installation, Operation & Checkout of J-SIIDS	TM 5-6350-262-14/14	
	Intrusion Detection Systems	DM 4-805-6	
	Intrusion Detection Systems	TM 5-811-8	
LIGHTING FIXTURES & LIGHTING	OCE Lighting Fixtures Standard	Standard DWG. N. 40-06-04	
	IES: Office (RP-1), Industrial (RP-7), Roadway (RP-8) & Sports (RP-6) Lighting Manuals	ANSI's	N.A.F. COE
	Illumination CALCS. by Zonal Cavity Method. IES Lighting Handbooks, Vol. I & II	1988 Vol. I & II	N.A.F. COE
LIGHTING PROTECTION	Lightning & Static Electricity Protection	TM 5-811-3/ AFM 88-9, Chap 3	
	Lightning Protection Code	NFPA-78	N.A.F. COE
MEDICAL FACILITIES	Army Health Facilities Design	TM 5-838-2	
	Medical/Dental Facilities	MIL-STD-1691A	

	Criteria for Design & Constr of Air Force Health Facilities	AFR 88-50	
	Standard for Health Care Facilities	NFPA-99	N.A.F. COE
	Recommended Practice for Electrical Systems in Health Care Facilities	IEEE Standard 603	N.A.F. COE
OVERHEAD ELECTRICAL SUPPLY & COMMUNICATION	National Electrical Safety Code	ANSI C2	N.A.D. COE
	Rule for Overhead Elec Line Constr Gen. Ord. 95	G.O. 95	User for Calif Projects Only. N.A.F. COE
PHYSICALLY HANDICAPPED	Uniform Federal Accessibility Standards	UFAS	
RAISED FLOORS	Raised Floor System	TM 5-805-13/ AFM 88-4, Chap. 9	
SAFETY	Safety and Health Requirements	EM 385-1-1	
SECURITY	USAF Resource Protection Program	AFR 125-37	
	AF Physical Security Program	AFR 207-1	
	Design for Security	TM 5-853-1	
	Construction for Secure Conference Rooms	AFP 88-26	
	Physical Security	FM 19-30	
	Vaults, Arms, Storage & Secure Storage Areas	DM 4-805-2	
	Security of Army Property at Unit and Installation Level	AR 190-51	
	Physical Security Standard for Sensitive Compartmented Information Facilities	DIAM 50-3	
	Physical Security of Arms Ammunition and Explosives	AR 190-11	
SEISMIC DESIGN	Seismic Design for Buildings	TM 5-809-10; AFM 88-3, Chap. 13	Refer to Chapters on "Mechanical & Electrical Elements"
	Seismic Protection for Mechanical, Electrical Equipment	CEGS-15200	
STATIC ELECTRICITY	Lightning & Static Electricity Protection	TM 5-811-3/ AFM 88-9, Chap 13	

SYMBOLS	Graphic Symbols for Electricity & Electronics Diagrams	ANSI Y32.2	N.A.F. COE
	Graphic Symbols for Electrical & Wiring and Layout Diagrams	ANSI Y32.9	N.A.F. COE
TEMPEST (RED/BLACK CRITERIA)	Military Standardization Handbook Red/Black Engineer Installation Guidelines	MIL HDBK 232	Classified Material. A/E must have security clearance
	Tempest/EMP Shielding	Dm 4-805-4	
	NEMP/Tempest Protection	TM 5-855-5	
TRAILER PARKS	Convertible Mobile Home Communities	TM 5-845-2	
UNDERGROUND ELEC SUPPLY & COMMUNICATIONS SYSTEMS	National Electrical Safety Code	ANSI C2	N.A.F. COE
	Rules for Underground Electrical Line Construction	G.O. 128	For Calif Proj. only N.A.F. COE
USAF RESERVE FACILITIES	USAF Reserve Facilities	AFR 88-15	
US ARMY RESERVE FACILITIES	US Army Reserve Facilities	DG 1110-3-107	
X-RAY & RF SHIELDING/EMP	Tempset/EMP Shielding	DM 4-805-4	
	X-Ray Shielding	TM 5-805-12	
	Aerospace Medicine	AFM 161-38	

NUMERICAL CRITERIA INDEX

The following is a partial list of frequently utilized criteria. When requesting project specified criteria from the COE Project Manager, the A-E designer shall furnish a similar numerical ordered list.

NUMBER	NUMBER	NUMBER	NUMBER
TM 5-618	TM 5-810-2	(AFM 88-5, Ch 1)	TM 5-838-2
TM 5-785	(AFR 88-28)	TM 5-820-2	TM 5-840-2
TM 5-800-3	TM 5-810-3	(AFM 88-5, Ch 2)	TM 5-841-1
TM 5-803-1	(AFM 88-8, Ch 2)	TM 5-820-3	TM 5-858-1
TM 5-802-1	TM 5-810-4	(AFM 88-5, Ch 3)	TM 5-1300
TM 5-803-2	(AFM 88-8, Ch 3)	TM 5-820-4	TM 5-6350-262-14/14
(AFM 19-10)	TM 810-5	(AFM 88-5, Ch 4)	TM 9-1300-206
TM 5-803-4	(AFR 88-8, Ch 4)	TM 5-822-2	TM 11-685
TM 5-803-5	TM 5-810-6	(AFM 8807, Ch 5)	AFM 50-25
(AFM 88-43)	(AFM 88-8, Ch 5)	TM 5-822-4	AFM 86-2
TM 5-803-6	TM 5-810-7	(AFM 8807, Ch 4)	AFM 86-6
TM 5-803-7	(AFM 88-12, Ch 4)	TM 5-822-5	AFM 86-8
(AFR 86-14)	TM 5-811-1	(AFM 8807, Ch 3)	AFM 88-4, Ch 5)
TM 5-803-8	(AFM 88-9, Ch 1)	TM 5-822-6	AFM 88-14
TM 5-803-10	TM 5-811-2	(AFM 8807, Ch 1)	AFM 88-25
(AFM 88-33)	(AFM 88-9, Ch 2)	TM 5-822-7	AFM 88-45
TM 5-803-11	TM 5-811-3	(AFM 88-6, Ch 8)	AFM 88-50
(AFM 88-30)	(AFM 88-9, Ch 3)	TM 5-822-8	AFP 88-40
TM 5-803-12	TM 5-811-4	(AFM 88-6, Ch 9)	AFP 88-41
TM 5-803-13	(AFM 88-9, Ch 4)	TM 5-822-9	AFR 88-15
TM 5-804-2	TM 5-811-5	TM 5-823-2	AFR 88-50
TM 5-805-1	TM 5-811-6	TM 5-823-3	AFR 89-1
(AFM 88-3, Ch 6.)	TM 5-811-7	TM 5-823-4	AFR 125-37
TM 5-805-3	TM 5-813-1	TM 5-824-1	AFR 127-100
TM 5-805-4	(AFM 88-10, Ch 1)	(AFM 88-6, Ch 1)	AFR 207-1
(AFM 88-37)	TM 5-813-3	TM 5-824-3	DG 1110-3-104
TM 5-805-6	(AFM 88-10, Ch 3)	(AFM 88-6, Ch 3)	DG 1110-3-106
(AFM 88-4, Ch 4)	TM 5-813-4	TM 5-824-4	DG 1110-3-107
TM 5-805-7	(AFM 88-10, Ch 4)	TM 5-825-2	DG 1110-3-112
(AFM 88-4, Ch 7)	TM 5-813-5	(AFM 88-6, Ch 2)	DG 1110-3-119
TM 5-805-9	(AFM 88-10, Ch 5)	TM 5-825-3	DG 1110-3-120
TM 5-805-12	TM 5-813-6	TM 5-825-3-1	DG 1110-3-124
TM 5-805-13	(AFM 88-10, Ch 6)	TM 5-826-1	DG 1110-3-126
(AFM 88-4, Ch 9)	TM 5-813-7	TM 5-826-2	DG 1110-3-128
TM 5-805-14	(AFM 88-10, Ch 7)	TM 5-826-3	DG 1110-3-132
TM 5-807-7	TM 5-813-8	TM 5-826-4	DG 1110-3-134
TM 5-807-10	TM 5-814-1	TM 5-827-2	DG 1110-3-140
TM 5-809-1	(AFM 88-11, Ch 1)	(AFM 88-24, Ch 2)	DG 1110-3-144
(AFM 88-3, Ch 1)	TM 5-814-2	TM 5-827-3	DG 1110-3-150
TM 5-809-2	(AFM 88-11, Ch 2)	(AFM 88-24, Ch 3)	DM 4-805-1
(AFM 88-3, Ch 2)	TM 5-814-3	TM 5-830-2	DM 4-805-4
TM 5-809-3	(AFM 88-11, Ch 3)	(AFM 88-17, Ch 2)	DM 4-805-5
(AFM 88-3, Ch 3)	TM 5-814-4	TM 5-830-3	DM 4-805-9
TM 5-809-4	(AFM 88-11, Ch 4)	(AFM 88-17, Ch 3)	EM 385-1-1
(AFM 88-3, Ch 4)	TM 5-818-7	TM 5-830-4	EM 1110-1-2101
TM 5-809-5	TM 5-820-1	(AFM 88-17, Ch 4)	EM 1110-2-410

EM 1110-2-501
(AFM 88-3, Ch 4)
TM 5-809-6
TM 5-809-8
(AFM 88-3, Ch 8)
TM 5-809-9
(AFM 88-3, Ch 12)
TM 5-809-10
(AFM 88-3, Ch 13)
TM 5-809-10-1
(AFM 88-3, Ch 13)
TM 5-809-10-2
(AFM 88-3, Ch 13.2)
TM 5-809-11
(AFM 88-3, Ch 14)
TM 5-809-12
(AFM 88-3, Ch 15)
TM 5-810-1
(AFM 88-8, Ch 1)

TM 5-814-5
TM 5-814-7
TM 5-814-8
(AFR 19-6)
TM 5-815-2
(AFM 88-36)
TM 5-818-1
(AFM 88-3, Ch 7)
TM 5-818-2
(AFM 88-6, Ch 4)
TM 5-818-3
(AFM 88-24, Ch 4)
TM 5-818-4
(AFM 88-5, Ch 5)
TM 5-818-5
(AFM 88-5, Ch 6)
TM 5-818-6
(AFM 88-32)

TM 5-841-2
TM 5-842-1
TM 5-842-2
TM 5-843-1
TM 5-844-1
(AFM 88-21, Ch 1)
TM 5-845-2
TM 5-848-1
(AFM 88-12, Ch 1)
TM 5-848-2
(AFM 88-12, Ch 2)
TM 5-848-3
(AFM 88-12, Ch 3)
TM 5-850-1
TM 5-850-2
TM 5-853-1
TM 5-855-1
TM 5-855-2

EM 1110-2-503
EM 1110-2-2502
ETL 86-14
HNDM 1110-1-8
MIL HDBK 419
MIL HDBK 1008A
MIL HDBK 1028/8
MIL STD 1691A
NAVFAC DM 13.1
NAVGAC DM 22
TB ENG 353
TB ENG 353-1
TB ENG 354
TB MED 575
TB MED 576
TB MED 62
ARCH & ENG INSTR
STD DETAILS

APPENDICES

<u>Appendix</u>	<u>Subject</u>
Appendix A	Design Quality Control Checklist
Appendix B	Engineering Considerations and Instructions for field Personnel Report
Appendix C	Environmental Considerations
Appendix D	DD Form 1354 Data Sheet, Army
Appendix E	Geotechnical Requirements
Appendix F	Abbreviations and Acronyms

Appendix A

DESIGN QUALITY CONTROL CHECKLIST

1.0 Purpose. The purpose of completing this checklist is to verify that the Design Quality Control Plan submitted by you has been adhered to during the design process. To complete the checklist, the person or persons responsible for the various items shall initial in the space provided to signify that the item has been completed/coordinated. If discovered during review by the COE that items initialed off have in fact not been completed/coordinated, the COE PM will be notified and appropriate action taken. Possible actions include return of final design package to the A-E for correction, withholding of contract payments and completion of an "unfavorable" A-E evaluation for inclusion in our A-E selection office files.

2.0 Submittal Requirements

2.1 Concept/Preliminary Submittals. No submittal required, although it is suggested the A-E utilize the checklist during the design process to make sure nothing "falls through the crack" along the way.

2.2 Final Design. The checklist that follows shall be completed and submitted as an attachment to your transmittal letter accompanying the final design package to the COE.

DESIGN QUALITY CONTROL CHECKLIST

Project: _____

Location: _____

A-E: _____

INITIALS

GENERAL ITEMS

1. Work "by others" and "work this contract" are clearly differentiated and interface points identified. _____
2. All known existing features and improvements are properly and completely delineated and dimensioned. _____
3. Orientation, horizontal coordinate systems, elevations, and vertical datum are properly shown and referenced. _____
4. Adequate subsurface investigations of the site have been made and logs and notes thereof are clearly shown on plans and referred to in specifications. _____
5. The recommendations of COE Geotechnical Branch have been considered in establishment of control elevations, foundation treatment and assignment of bearing values for footing design. _____
6. Adequate provisions have been made in the specifications for protection and maintenance of, access to, and utility services for existing facilities. _____

FUNCTIONAL ADEQUACY AND TECHNICAL FEASIBILITY OF DESIGN

1. The functional and technical design requirements are in full accord with current applicable criteria and design directions. The applicable written guidance has been referenced in the Design Analysis. (Space allocations for buildings, per capita quantities for utilities, load capacities for floor or pavements, areas for hardstands, widths and lengths of runways, flow rate for fueling systems, etc.) _____
2. All reasonably possible conditions of grading, loading, operations, utilities and combinations thereof have been considered in the design and evidenced in the design analysis narrative and calculations. _____
3. The design is based on use of economical and proven materials and equipment throughout. _____

SUFFICIENCY OF PLANS AND SPECIFICATIONS AS CONTRACT DOCUMENTS

1. All necessary details, notes, schedules, and dimensions are shown on the drawings and are fully consistent throughout. _____
2. For unit-price contracts, payment items and quantities are clearly defined, and unit price bid schedules arranged to allow flexibility in award of contract. _____
3. Title blocks, drawing titles, drawing scales, specification subtitles, and section identification markings are shown and referenced in accordance with the A/E Guide. _____
4. Requirements for installation of Government-furnished equipment are clearly delineated. _____
5. Ample space allowances are available for installation and servicing of equipment. _____
6. The terminology used on the drawings agrees with that used in the specifications and does not repeat requirements stated in the specifications. _____
7. Publications not referenced in the specifications have been deleted from the paragraph, entitled "Applicable Publications." All publications listed in the specifications are referenced in the paragraph, entitled "Applicable Publications." _____
8. Finish and color schedules have been coordinated with drawings. _____
9. When drawings are reduced to 1/2 size, all lettering, dimensions, symbols, and wiring and piping runs etc. are clear and distinct. _____
10. The drawings and specifications for all disciplines have been properly reviewed and coordinated to preclude conflicts. _____

Appendix B

ENGINEERING CONSIDERATIONS AND INSTRUCTIONS FOR FIELD PERSONNEL

1.0 Purpose. The "Engineering Considerations and Instructions for Field Personnel" report is used to transmit special design concepts, assumptions, and instructions on how to construct unique design details to field personnel. The report establishes a basis for communication and coordination between design and construction personnel. The Scope of Work prepared by the COE PM will define whether or not this report is required for your project.

2.0 Report Format and Content. As applicable to your project, include the following information in your report:

2.1 Title Page. List project title, location and date of report.

2.2 List of Design Personnel. Provide a list of key design personnel that could be contacted for technical assistance during construction. Include name, design specialty, and telephone number.

2.3 Special Design Considerations. Provide a clear and concise explanation of special design concepts and/or unique features by discipline; Civil, Architectural, Structural, Mechanical, Electrical, etc. such that COE construction personnel can identify and properly inspect these special items of work. Examples of items to discuss include:

- 2.3.1 Step-by-step instruction for constructing complex building features, i.e., this needs to be done before that, etc.
- 2.3.2 Critical tolerances.
- 2.3.3 Special testing requirements.
- 2.3.4 Critical or unusual product and performance specifications such as high pressure, temperatures or capacities.
- 2.3.5 Situations where manufacturer should oversee equipment installation.
- 2.3.6 Long-lead procurement items.
- 2.3.7 Government-furnished equipment.
- 2.3.8 Special operational constraints, i.e., utility outage periods, aircraft runway closures, phasing of work in occupied buildings or other special construction phasing required.
- 2.3.9 Any permits that must be obtained prior to and during construction.
- 2.3.10 Critical safety precautions required, especially in the areas of asbestos, or other minimum quality assurance testing amount/frequency for critical items.

2.4 Shop Drawing Review. Provide a list of items or features of the project where you feel you alone have the expertise to properly review shop drawings involved.

2.5 Schedule of Required Site Vists by Design Personnel. If you deem site visits on certain phases of construction are necessary, a site visitation schedule shall be prepared identifying the critical construction stages and the number of days of notification required from the COE.

3.0 Submittal Requirements.

3.1 Early Preliminary/Preliminary Submittal. Provide, in draft form, those items required by Paragraph 2.0 above bound as an appendix to the Design Analysis.

3.2 Final Submittal. Provide, in final form, those items required by Paragraph 2.0 above. The document shall be bound separately in 8-1/2 x 11 format with a cover page indicating the project title and location for ease of identification by field personnel.

Appendix C

ENVIRONMENTAL CONSIDERATIONS

1.0 General. The maintenance and enhancement of environmental quality will be given full consideration early in the design process. The A-E shall ensure that the project is designed in full compliance with all environmental regulations applicable to the project. Areas of concern include:

- 1.1 Air Quality
- 1.2 Water Quality
- 1.3 Noise Control
- 1.4 Solid Waste Disposal
- 1.5 Hazardous Waste
- 1.6 Historic Preservation
- 1.7 Archeological Resources
- 1.8 Threatened and Endangered Species

2.0 Submittal Requirements. When required by the scope of work, the A-E shall provide a listing of all applicable permits or licenses and any other authorizations required to construct and operate the project on an Environmental Permit Matrix (see blank form Chapter IV, Plate 17). The completion of this form shall be based on a compliance review of the proposed project based on applicable areas of concern listed above, and their specific regulations. Where proposed projects do not require any environmental permits or licenses, the A-E shall submit a letter to the COE with the concept Submittal certifying the designer's conclusions.

2.1 Concept Submittal Requirements. For each permit required, the following information shall be provided on the Environmental Permit Matrix:

- 2.1.1 Permitting authority (Federal, State and/or local).
- 2.1.2 Type permit/authorization required.
- 2.1.3 Procedure and time necessary to process permit.
- 2.1.4 Fee schedule - to include filing/application fees, charges for actual emissions and fees relative to testing of abatement equipment toward ensuring compliance with environmental requirements.
- 2.1.5 Data and/or studies required.
- 2.1.6 Outline of approach for obtaining permit information (attach to matrix).

The A-E shall notify the District of any major discrepancies existing between the design criteria provided by the COE and the pollution abatement criteria.

2.2 Preliminary/Final Submittal Requirements. Provide completed applications and any other required documents for all permits, licenses and/or authorizations required for construction/operation of the facility including, but not limited to, the following:

- 2.2.1 Solid Waste Disposal
- 2.2.2 Sanitary Landfill
- 2.2.3 Toxic and Hazardous Waste storage, transportation and disposal
- 2.2.4 Wastewater discharge

- 2.2.5 Open burning
- 2.2.6 Incineration
- 2.2.7 Locating, constructing and operating related facilities
- 2.2.8 Stationary Source operation
- 2.2.9 Noise generation
- 2.2.10 Cultural Resource disturbance
- 2.2.11 Biological Resource disturbance
- 2.2.12 Visual Resource disturbance

The A-E shall prepare all supporting material required for the applications including emission surveys, diagrams, pollutant load calculations, etc. Copies of all correspondence from permitting agencies which either detail permit requirements or indicate that no permits are necessary shall be furnished to the District by the A-E.

Regulatory Agency Contacted: Identify the regulatory agency contacted. Include regulator's name(s) and dates of contact. Ensure the appropriate regulatory agency is contacted, i.e., don't expect the Air Resources Board to know about permitting requirements for underground tanks, etc.

Permit Fee: Indicate the amount of dollars which must accompany the permit application. This should be determined when the regulator is contacted.

Comments: Insert whatever is necessary to clarify what has or has not been done.

3.5 Incomplete Matrices or permit applications obviously erroneously prepared will be returned to the A-E for completion.

Appendix D

DD FORM 1354 DATA SHEETS FOR AIR FORCE PROJECTS

1.0 General. The DD Form 1354 Data Sheet contains a summary of project information that is used by COE construction resident offices in completing the official DD Form 1354 upon completion of construction and transfer of the facility to the owner agency. The A-E shall utilize his design analysis narrative and information and cost estimate quantities and costs in completing the majority of information on the data sheets. Specific instructions for completion of the data sheets are contained on the data sheets themselves. Any questions should be directed to the COE Project Manager. For your convenience the attached blank data sheets are on our Electronic Bulletin Board. For access, contact your COE PM.

2.0 Submittal Requirements.

2.1 Concept/Preliminary Submittals. No submittal required.

2.2 Final Submittal. Submit completed DD Form 1354 Data Sheet with your final design submittal package as an appendix of your Design Analysis (bound separately) (see Chapter II).

Instructions to Designer: The information you supply on this data sheet will be utilized by the COE Construction Resident Office in completing facility transfer document DD Form 1354 at time of construction completion. Complete this data sheet as it applies to your project. The data sheet is divided into two parts; Facility and Features Within the 5' Line, and Features Outside the 5' Line. Your design analysis and cost estimate will be invaluable in completing this document. If more than one type of building or facility is involved, fill out a separate data sheet for each. If additive bid items are involved, clearly identify which items are additives or fill out separate data sheets for each. If project involves alterations to an existing facility, include description of features/building being demolished and describe any upgrades to existing materials in item 10., "Description of Project" below.

(Note: The highlighted block numbers that appear in parentheses on this form refer to specific DD Form 1354 block numbers and are for COE Construction Resident Office personnel use.)

FACILITY AND FEATURES WITHIN THE 5' LINE

1. Facility Category Code (from DD Form 1391 or Project Development Brochure)(Block #18): _____
2. Facility Title (Project Title)(Block #19): _____
3. Location (i.e. Yuma P.G., Az., Sierra A.D., Ca.)(Block #9): _____
4. Drawing File Number (Block #25): _____
5. Building Occupancy Capacity: _____
6. No. of Units (Block #20): 1 (Note: The No. of Units will always be "1" unless more than one of the same type of building/facility is included in the project.)
7. Type of Construction (Permanent [P], Semi-Permanent [S], Temporary [T])(Block #21): P (Note: If type of construction is other than "permanent", change designation accordingly.)
8. Total Building Area (sf)(Blocks 22 and 23): _____
9. Total Project Cost (Block #24): _____
10. Description of Project (from design analysis narrative)(Block #26): _____

11. No. of Usable Floors (Block #26): _____

12. Construction Materials Used (Block #26):
- a.Foundation (concrete, masonry, etc.): _____
 - b.Floors (wood, concrete, etc.): _____
 - c.Exterior Walls (concrete, masonry, brick, etc.): _____
 - d.Roof (built-up, standing seam metal, strip shingle, etc.): _____

13. Building Systems: From the lists below, select those systems which apply to your project and complete the package of information required for each system in the spaces provided. Restate the Category Code number, Facility and Unit of Measure provided in the lists. In the "Remarks" area, briefly describe the system type and components. A completed sample is provided as a guide. If the project has building systems other than those listed below, complete all information except the Category Code number in the spaces provided.

a. HVAC

<u>Cat. Code</u>	<u>Facility</u>	<u>Unit of Measure</u>
821-22	Heating Plant, Oil Fired > 3.5 Million Btu	MB
821-23	Heating Plant, Oil Fired 0.75 to 3.5 Million Btu	MB
821-24	Heating Plant, Oil Fired < 0.75 Million Btu	MB
821-32	Heating Plant, Gas Fired >3.5 Million Btu	MB

<u>Cat. Code</u>	<u>Facility</u>	<u>Unit of Measure</u>
821-33	Heating Plant, Gas Fired 0.75 to 3.5 Million Btu	MB
821-34	Heating Plant, Gas Fired < 0.75 Million Btu	MB
821-83	Heat Pump	MB
890-25	Dehumidification Equipment	Tn
826-11	Air Conditioning Plant > 100 Tons	Tn
826-12	Air Conditioning Plant 26 to 100 Tons	Tn
826-13	Air Conditioning Plant 6 to 25 Tons	Tn
826-14	Air Conditioning Plant 0 to 5 Tons	Tn
826-21	Refrigeration Plant > 5 HP	HP
826-22	Refrigeration Plant < 5 HP	HP
826-31	Evaporation Cooling Equipment	CM
826-32	Mechanical Ventilation Equipment	CM
890-61	Cooling Tower 26 - 99 Ton	Tn
890-62	Cooling Tower Over 100 Ton	Tn
827-11	Chilled Water Distribution System > 100 Tons	Tn
827-12	Chilled Water Distribution System 25 to 100 Tons	Tn
890-20	Compressed Air Plant (Equipment)	HP
890-21	Compressed Air Lines	LF
890-22	Vacuum Lines	LF

b. Fire Protection

<u>Cat. Code</u>	<u>Facility</u>	<u>Unit of Measure</u>
880-10	Fire Alarm System	BX (Boxes)
880-50	Automatic Sprinkler System	LF
880-60	Special Fire Extinguisher System	LF
880-70	Standpipe System	LF
880-90	Other (Halon, CO2, etc.)	

c. Security Systems

<u>Cat. Code</u>	<u>Facility</u>	<u>Unit of Measure</u>
880-40	Intrusion Alarm System	BX (Boxes)

d. Emergency Power Systems

<u>Cat. Code</u>	<u>Facility</u>	<u>Unit of Measure</u>
811-60	Standby Generator Plant	KV

Sample:

Cat. Code (Block #18): 880-10 Facility (Block #19): Fire Alarm System No. of Units (Block #20): 1
 Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): BX (Boxes)
 Total Quantity (Block #23): 10 Pull Boxes Cost (Block #24): 12,764 Percent * : 1%
 Remarks (Describe per instructions above) (Block #26): System is manually operated by pull boxes which are tied into alarm bells and the fire alarm panels. There are ten pull boxes, 3 alarm bells, 2 fire alarm panels and associated wiring.

* Insert percentage that represents the percent of this item as related to the total project cost shown in item 9 above. This figure will be used by the COE Construction Resident Office for prorating costs when actual cost data is known.

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

● Insert percentage that represents the percent of this item as related to the total project cost shown in item 9 above. This figure will be used by the COE Construction Resident Office for prorating costs when actual cost data is known.

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
 Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
 Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
 Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
 Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
 Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
 Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
 Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
 Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
 Remarks (Describe per instructions above) (Block #26): _____

FEATURES OUTSIDE THE 5' LINE

1. Pavements. From the list below, select those pavement types which apply to your project and complete the package of information required for each pavement type in the spaces provided below. Restate the Category Code number, Facility and Unit of Measure provided. The "No. of Units" defines the number of occurrences of the "Facility." For example, if the "Facility" is a runway, and the project includes two runways, the "No. of Units" = 2. In the "Remarks" area, completely describe the pavement section from finish grade through the compacted subgrade including pavement type, thickness and types of base materials and length and width of features. Also, provide quantity breakdown by differing thicknesses of pavement surface. (Provide total quantity in the "Quantity" space.) A completed sample is provided as a guide. If the project has pavement types other than those listed below, complete all information except the Category Code in the spaces provided.

<u>Cat. Code</u>	<u>Facility</u>	<u>Unit of Measure</u>
111-10	Fixed Wing Runway	SY
111-30	Helipads and Helicopter Parking Pads	SY
112-10	Standard Taxiway	SY
113-10	Fixed Wing Aircraft Parking Apron	SY
113-20	Rotary Wing Aircraft Parking Apron	SY
113-30	Aircraft Maintenance Parking Apron	SY
113-40	Hangar Access Apron	SY
851-10	Roads, Paved	SY
851-20	Vehicular Bridges	SY
852-10	Parking Area Organizational Vehicles	SY
852-15	Parking Area Nonorganizational Vehicles	SY
852-17	Covered Walkways	SY
852-20	Sidewalk	SY
452-10	Open Storage Area	SY
452-11	Open Storage Area Other than Concrete or Bit.	SY

Sample:

Cat. Code (Block #18): 851-10 Facility (Block #19): Road, Paved No. of Units (Block #20): 1
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): SY
Total Quantity (Block #23): 10.691 SY Cost (Block #24): 63,866 Percent * : 15%
Remarks (Describe per instructions above) (Block #26): Consists of 2" bituminous surface course over 6" stabilized aggregate base course over 6" compacted subgrade.

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

* Insert percentage that represents the percent of this item as related to the total project cost shown in item 9 above. This figure will be used by the COE Construction Resident Office for prorating costs when actual cost data is known.

2. Utilities. From the list below, select those utility systems or features which apply to your project and complete the package of information required for each system/feature in the spaces provided. Restate the Category Code number, Facility and Unit of Measure provided. The "No. of Units" defines the number of occurrences of the "Facility." For example, if the "Facility" is Telephone Duct and the project has one, then the "No. of Units" = 1. In the "Remarks" area provide quantity breakdown by size/type of wire, pipe, etc. as appropriate. (Provide total quantity in the "Quantity" space.) Also describe ancillary features such as numbers of manholes, handholes, etc. A completed sample is provided as a guide. If the project has utility systems/features other than those listed below, complete all information except the Category Code in the spaces provided.

<u>Cat. Code</u>	<u>Facility</u>	<u>Unit of Measure</u>
132-32	Communication Cable Vault	EA
135-10	Communication Lines	MI (Miles)
136-10	Runway and Threshold Lighting, Med. Intensity	LF
136-11	Runway and Threshold Lighting, High Intensity	LF
136-12	Approach Lighting System	LF
136-15	Helipad Lighting	LF
136-20	Taxiway Lighting	LF
136-30	Parking Apron Lighting	LF
812-10	Airfield Security Lighting (Perimeter)	LF
812-30	Exterior Lighting (Street, Flood, Security)	LF
812-41	Overhead Electrical Distribution	LF
812-42	Underground Electrical Distribution	LF
812-60	Distribution Transformer	KV
813-20	Substation	KV
813-50	Switching Station	KV
813-60	Transformers	KV
822-10	Steam Condensate Lines	LF
822-20	Hot Water Lines	LF
822-40	Steam Lines	LF
824-10	Gas Pipe Line	LF
890-19	Inert Gas Lines	LF
832-10	Sanitary Sewer	LF
832-20	Combined Sewer	LF
832-30	Sewage Pumping Station	LF
832-40	Industrial Waste Sewer	LF
841-20	Elevated Water Storage Tank, Potable	GA
844-40	Elevated Water Storage Tank, Nonpotable	GA
841-21	Ground Storage Tank	GA
841-40	Reservoir, Raw Water	GA
844-50	Reservoir or Ground Storage Tank, Nonpotable	GA
841-30	Water Well	KG
842-10	Water Pipe Line, Potable	LF
845-10	Water Pipe Line, Nonpotable	LF
842-20	Water Pumping Station, Potable	SF
845-20	Water Pumping Station, Nonpotable	SF
843-10	Fire Protection Pumping Station, Nonpotable	SF
843-11	Fire Hydrants, Nonpotable	EA
843-30	Fire Protection System, Nonpotable	LF
871-10	Storm Sewer	LF
871-20	Drainage Ditch, Paved	LF
871-60	Storm Drainage Pumping Station	LF

Sample:

Cat. Code (Block #18): 632-10 Facility (Block #19): San Sewer No. of Units (Block #20): 1
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): LF
Total Quantity (Block #23): 2805 LF Cost (Block #24): 59,500 Percent * : 25%
Remarks (Describe per instructions above) (Block #26): Consists of 1595 LF of 8" VCP and 1210 LF of 6" VCP
connected to existing main. Includes 12 manholes and 2 cleanouts.

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

* Insert percentage that represents the percent of this item as related to the total project cost shown in item 9 above. This figure will be used by the COE Construction Resident Office for prorating costs when actual cost data is known.

3. Miscellaneous. From the list below, select those items which apply to your project and complete the package of information for each item in the spaces provided. Restate the Category Code number, Facility and Unit of Measure provided. The "No of Units" defines the number of occurrences of the "Facility." For example, if the "Facility" is Heating Fuel Oil Storage Tank and the project has one Tank, then the "No. of Units" = 1. If the "Facility" is Retaining Wall and the project has two distinct Retaining Walls, then the "No. of Units" = 2. In the "Remarks" area, using the key words from the Remarks column below, provide a complete description of the item. A completed sample is provided as a guide. If the project has miscellaneous items other than those listed below, complete all information except the Category Code in the spaces provided.

<u>Cat. Code</u>	<u>Facility</u>	<u>Unit of Measure</u>	<u>Remarks</u>
411-80	Heating Fuel Oil Storage Tank	BL	Type, Size, Fuel
851-40	Traffic Signals	EA	Type, Controls
860-10	Railroad Tracks	MI	Lb. Rail, Length, Turnouts, etc.
871-30	Irrigation Facility	LF	Controls, No. & Type of Heads, Length
871-50	Retaining Walls	LF	Mat'l., Width, Height, Length
872-10	Fencing or Walls	LF	Type, Height, Length, Gates
872-70	Lightning Protection System	LF	Type, No. of Points, Method of Grounding
932-10	Site Clearing and Grading	SY	Describe Site Clearing/Grading Required
932-20	Landscape Planting	SY	Plant Types, Number
932-30	Landscape Berms/Mounds	SY	Berm/Mound Size, Length
933-10	Demolition	EA	Describe Demolition Required
934-10	Cut and Fill (Site Improvement)	CY	Describe Where Cut & Fill are Required

Sample:

Cat. Code (Block #18): 872-10 Facility (Block #19): Fence No. of Units (Block #20): 1
 Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): LF
 Total Quantity (Block #23): 3000 LF Cost (Block #24): 20,000 Percent * : 10%
 Remarks (Describe per instructions above) (Block #26): Consists of 2000 L.F. of 7' high chain link fence around building and 1000 L.F. of 7' high chain link fence with one 20' Gate around parking area. Fence around parking area includes outriggers with three strands barbed wire.

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
 Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
 Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
 Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
 Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
 Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
 Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
 Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
 Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
 Remarks (Describe per instructions above) (Block #26): _____

* Insert percentage that represents the percent of this item as related to the total project cost shown in item 9 above. This figure will be used by the COE Construction Resident Office for prorating costs when actual cost data is known.

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

Cat. Code (Block #18): _____ Facility (Block #19): _____ No. of Units (Block #20): _____
Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): _____
Total Quantity (Block #23): _____ Cost (Block #24): _____ Percent * : _____
Remarks (Describe per instructions above) (Block #26): _____

* Insert percentage that represents the percent of this item as related to the total project cost shown in item 9 above. This figure will be used by the COE Construction Resident Office for prorating costs when actual cost data is known.

Appendix E

GEOTECHNICAL REQUIREMENTS

1.0 Geotechnical Information - COE Prepared

1.1 General Procedure. Results of foundation investigations, relevant geological data, seismic design criteria, foundation design criteria, and pavement design sections are normally provided to the A-E by the District's Geotechnical Branch in the form of Geotechnical Reports. Two geotechnical reports generally will be provided. The first, a preliminary report (informal) which presents general foundation and pavement design criteria, will be provided about four weeks after the Geotechnical Branch has been notified to begin work. The second, the Final Geotechnical Report which presents site specific design criteria and recommendations will be provided after explorations and laboratory testing are completed, and no later than two weeks after the designer has been given notice to begin final design. The A-E will provide an additional site plan "mylar" with the concept or early preliminary submittal on which the actual exploration program will be based and the location of explorations will be shown. The approved site plan shall show the existing topography and structures, coordinate grid system, and location of major design features.

1.2 The District will provide the A-E, for incorporation into the Contract Drawings, a sheet(s) on which the actual exploration locations are depicted and subsurface exploration logs are shown. If requested, the Geotechnical Report will also include percolation rates, resistivity readings, corrosion potential, and shear wave velocities of the subsurface materials. The A-E shall utilize the geotechnical information and design criteria provided to complete the preparation of the project's design documents.

1.3 In addition to the previous information, the District's Geotechnical Branch will provide "Engineering Considerations and Instructions for Field Personnel" for the geotechnical portions of the project for inclusion in the A-E prepared report of the same title.

1.4 Airfield Pavements. For all projects involving design of airfield pavements, the District's Geotechnical Branch will furnish the following for incorporation by the A-E into the project documents:

1.4.1 Sketches of pavement sections for the project, including types and thicknesses of surface and base materials, and lateral limits of each type.

1.4.2 Sketches of the geometric layout of all joints and sections of all the joints showing configuration and sealing details.

1.4.3 Sketches of subdrains (if required for the project) showing general location and typical sections and guidance criteria as required.

1.4.4 Draft specifications (guide specifications marked up for the specific project) for inclusion by the A-E into the construction contract documents for the following items of work:

1.4.4.1 Demolition (if required).

- 1.4.4.2 Clearing and Grubbing (if required).
- 1.4.4.3 Excavation, Embankment, and Subgrade Preparation.
- 1.4.4.4 Subdrainage system (if required).
- 1.4.4.5 Base materials.
- 1.4.4.6 Surfacing.
- 1.4.4.7 Joint sealing (if required).
- 1.4.4.8 Pavement repairs (if required).

2.0 Geotechnical information - A-E Prepared

2.1 Generally, all geotechnical investigations will be conducted by the Corps of Engineers Geotechnical Branch. However, when geotechnical investigations are performed as part of the A-E design contract, such information shall be obtained by a competent and reputable geotechnical firm specializing in such work. Adequate subsurface information will be obtained and presented for use by designers of structures, grading, drainage, disposal fields, and other design features meeting the District's criteria. Prior to negotiation of the contract, the A-E will furnish recommendations as to extent and type of subsurface investigation the geotechnical firm proposes. Scope of these services will be agreed upon and they will become a part of the A-E design contract. The A-E will discuss results of the geotechnical investigations with Construction-Operation's Quality Assurance specialists and the Sacramento District's Geotechnical Branch specialist in foundation and materials design. Field and laboratory operations will be subject to inspections by COE as considered appropriate. The A-E shall prepare location and logs of exploration sheet(s) to include into the contract drawings. Finally, the A-E shall prepare Engineering Considerations and Instructions for Field Personnel report also. (See Appendix B for information on what to include in this report.)

Appendix F

ABBREVIATIONS AND ACRONYMS

A-E	ARCHITECT-ENGINEER
AEI	ARCHITECTURAL AND ENGINEERING INSTRUCTIONS
AFFF	AQUEOUS FILM FORMING FOAM
AFM	AIR FORCE MANUAL
AFR	AIR FORCE REGULATION
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
ARMS	AUTOMATED REVIEW MANAGEMENT SYSTEM
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS
ATTN:	ATTENTION
AWWA	AMERICAN WATER WORKS ASSOCIATION
BLAST	BUILDING LOADS ANALYSIS AND SYSTEM THERMO DYNAMICS
BTU	BRITISH THERMAL UNIT
CAV/ARV	COMBINATION AIR VACUUM/AIR RELEASE VALVES
CEGS	CORPS OF ENGINEERS GUIDE SPECIFICATIONS
CESPK	CORPS OF ENGINEERS, SACRAMENTO DISTRICT
CDC	CHILD DEVELOPMENT CENTERS
CMU	CONCRETE MASONRY UNIT
COE	CORPS OF ENGINEERS
CPM	CRITICAL PATH METHOD
CSI	CONSTRUCTION SPECIFICATION INSTITUTE
CWE	CURRENT WORKING ESTIMATE
DA	DESIGN ANALYSIS OR DEPARTMENT OF THE ARMY
DD	DEPARTMENT OF DEFENSE

DDC	DIRECT DIGITAL CONTROL
DEH	DIRECTORATE OF ENGINEERING AND HOUSING
DM	DESIGN MANUAL
DOD	DEPARTMENT OF DEFENSE
DQA	DESIGN QUALITY ASSURANCE
DQC	DESIGN QUALITY CONTROL
DTC	DATA TERMINAL CABINET
DX	DIRECT EXPANSION
EBB	ELECTRONIC BULLETIN BOARD
EMCS	ENERGY MONITORING AND CONTROL SYSTEM
EMP	ELECTROMAGNETIC PULSE
EPA	ENVIRONMENTAL PROTECTION AGENCY
ETL	ENGINEERING TECHNICAL LETTER
FA	FIRE ALARM
FCGS	FEDERAL CONSTRUCTION GUIDE SPECIFICATION
GPM	GALLONS PER MINUTE
HGL	HYDRAULIC GRADE LINE
HVAC	HEATING, VENTILATING, AND AIR CONDITIONING
IAW	IN ACCORDANCE WITH
MACOM	MAJOR COMMAND
MATV	MASTER TV ANTENNA SYSTEM
MIL-HDBK	MILITARY HANDBOOK
NAF	NONAPPROPRIATED FUNDS
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NGVD	NATIONAL GEODETIC VERTICULAR DATUM
NIPDWR	NATIONAL INTERIM PRIMARY DRINKING WATER REGULATIONS
NPDES	NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

NSDWR NATIONAL SECONDARY DRINKING WATER REGULATIONS
OCE OFFICE OF THE CHIEF OF ENGINEERS
O&M OPERATIONS AND MAINTENANCE
OSHA OCCUPATIONAL SAFETY AND HEALTH ACT
PDB PROJECT DEVELOPMENT BROCHURE
PM PROJECT MANAGER
PSI POUNDS PER SQUARE INCH
PSIG POUNDS PER SQUARE INCH, GAUGE
RC REINFORCED CONCRETE
STD STANDARD
TM TECHNICAL MANUAL
UBC UNIFORM BUILDING CODE
UL UNDERWRITERS' LABORATORIES, INC.
USACE US ARMY CORPS OF ENGINEERS
USA-CERL US ARMY-CONSTRUCTION ENGINEERING RESEARCH LAB
USAR US ARMY RESERVE

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USAR US ARMY RESERVE

Department of the Army
Sacramento District, Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

A-E Guide Volume 1, General Instruction for
Army Projects

2 October 1990

1. These changes to A-E Guide Volume 1, General Instructions, January 1990, advises all organizational elements of the current changes to be implemented as of 12 October 1990.

2. The attached paragraphs have been updated to meet the latest Corps of Engineers, Sacramento District policies. Please see current changes listed below.

Change No.	Page No.	Disposition
1	iv	Remove and replace with new page iv.
2	I-6, 7, 8	Delete paragraphs 12.0, 12.1 thru 12.2.5 and replace with new paragraphs 12.0, 12.1 thru 12.2.5.
3	I-9	Delete paragraphs 17.0, 17.1 and replace with new paragraphs 17.0 and 17.1.
4	II-9	Delete paragraphs 3.0 and 3.1 and replace with new paragraphs 3.0 and 3.1.
5	III-9	Remove and replace with new page III-9.
6	III-11	Remove and replace with new page III-11.
7	III-12	Remove and replace with new page III-12.
8	III-14	Remove and replace with new page III-14.
9	III-15	Remove and replace with new page III-15.
10	III-16	Remove and replace with new page III-16.
11	III-33	Remove and replace with new page III-33.
12	III-42	Remove and replace with new page III-42.
13	III-43	Remove and replace with new page III-43.
14	III-44	Remove and replace with new page III-44.
15	III-46	Remove and replace with new page III-46.
16	Chap IV	Reference plates. Remove and replace with new page.
17		Following Plate #21, add new page, Plate #22.
18		Following Plate #22, add new page, Plate #23.
18a		Following Plate #23, add new page, Plate #23 page 2.
19	V-2	Remove and replace with new page V-2.
20	D-1	Remove and replace with new page D-1.

3. File this change sheet in front of the A-E Guide, Volume 1, General Instructions for Army Projects for reference purposes.

CHAPTER	SUBJECT	PAGE
3.6	Landscaping Design	III-39
	3.6.1. Design Analysis - Narrative	III-39
	3.6.2. Design Analysis - Calculations	III-39
	3.6.3. Drawings	III-39
3.7	Architectural Design	III-41
	3.7.1. Design Analysis - Narrative	III-41
	3.7.2. Design Analysis - Calculations	III-41
	3.7.3. Drawings	III-41
3.8	Structural Design	III-41
	3.8.1. Design Analysis - Narrative	III-41
	3.8.2. Design Analysis - Calculations	III-41
	3.8.3. Drawings	III-42
3.9	Mechanical Design	III-43
	3.9.1. Design Analysis - Narrative	III-43
	3.9.2. Design Analysis - Calculations	III-43
	3.9.3. Drawings	III-43
3.10	Electrical Design	III-46
	3.10.1. Design Analysis - Narrative	III-46
	3.10.2. Design Analysis - Calculations	III-46
	3.10.3. Drawings	III-47

IV

REFERENCE PLATES

- #1 Title Block (Cover Sheet Only)
- #2 Title Block
- #3 Title Block (COE Prepared Topo .
or Log of Borings Drawings)
- #4 Title Block (Site Adaptation
Cover Sheet)
- #5 Title Block (Site Adaptation -
Other than Cover Sheet)
- #6 Schedule of Drawings
- #7 Graphic Scales
- #8 Door Schedule
- #9 Window Types
- #10 Finish Schedule, Finish Legend and
Color Scheme Instructions
- #11 Sample Schedule for Plate #10
- #12 Example Floor Plan for Plate #10
- #13 Sample Exterior Color Schedule
- #14 Sample Vicinity Map
- #15 Sample Location Map
- #16 Handicapped Checklist (Blank)
- #17 Environmental Permit Matrix (Blank)
- #18 Gross Area Takeoff
- #19 Support Document Cover Sheet (Blank)
- #20 Air Force Form 108 - Air Conditioning
Load Estimate
- #21 Life Cycle Cost Summary Form
- #22 Design Annual Energy Use (DAE)
- #23 AMPRS Energy Conservation Compliance Codes Input Form

12.0 Review Process.

12.1 Automated Review Management System (ARMS). ARMS is a computerized method for transmittal and storage of design review comments. ARMS requires use of VT100 emulating terminal. The Sacramento District has established ARMS for use on all ARMY projects. An "Architect Engineer Response" package will be forwarded to you to explain use of the system. If you encounter any problems or have questions or comments, please call the ARMS Hotline at (916) 551-3126. A 24-hour answering machine is connected to this line.

12.2 Review Comments. All design data prepared by the A-E will be reviewed by the COE and other agencies for conformance with the contract requirements and technical as well as functional criteria. This review effort in no way replaces the A-E's review requirements outlined in paragraphs 10.0 above. Complete instructions on how the A-E is to handle review comments will be included with the comments in ARMS.

12.2.1 All review comments made by other than COE Design Quality Assurance (DQA) personnel will be "coordinated" by the DQA Section. That is, they will be reviewed for applicability to the project against the project's design criteria and annotated in ARMS with directions on the action the A-E is to take.

12.2.2 Review comments generated by DQA will not be annotated. All DQA comments are to be incorporated into the design documents.

12.2.3 Following A-E incorporation of the review comments into the design documents, DQA personnel will backcheck the actions taken. It is imperative the A-E indicate in ARMS where in the design documents the comment is being incorporated. If the A-E feels a comment is inappropriate, he may elect to rebut the comment in ARMS.

12.2.4 The resubmittal and backcheck process will continue until all appropriate comments are properly incorporated.

12.2.5 The A-E is encouraged to call and discuss any problematic comments with the appropriate reviewer in our DQA Section. The last name and phone number of each DQA reviewer appears in the upper left hand corner of the cover sheet accompanying the review comments sent to the A-E

(REV 12/90 #3)

**A-E GUIDE, VOLUME 1, GENERAL INSTRUCTIONS
FOR ARMY PROJECTS**

17.0 Electronic Bulletin Board.

17.1 The Sacramento Electronic Bulletin Board called SPKSPECS is available for use by all Architect/Engineer firms. The Bulletin Board allows designers to retrieve guide specifications, engineering technical letters and other useful design criteria. Consult with your Corps of Engineers Project Manager for information access to the bulletin board and/or reference A-E Guide Vol 3. Criteria available on the Electronic Bulletin Board will not be furnished in hard copy unless there is a special request coordinated through the COE PM. All hard copy criteria requested by A-E's must be directly related to the project being designed. The final determination of criteria design applicability will lie with the COE Design Quality Assurance Section.

(REV 12/90 #4)

A-E GUIDE, VOLUME 1, GENERAL INSTRUCTIONS
FOR ARMY PROJECTS

3.0 Specifications.

3.1 Detailed instructions for preparation of specifications are presented in the A-E Guide Volume 3, Specifications. In the interest of uniform construction, it is mandatory for the A-E to use COE Guide Specifications on all projects unless otherwise noted in A-E Guide, Vol 3, Specifications. A-E's shall acquire all COE guide specifications via our SPKSPECS (Electronic Bulletin Board). The bulletin board provides the most current guide specifications available for use. Consult with COE PM for information on access to the bulletin board and/or reference A-E Guide Vol 3. It shall be noted that specifications should be followed without deviations; however, if a change is needed, the A-E must consult with COE PM.

(REV 12/90 #5)

floor areas; hourly rating of fire/smoke walls; corridor lengths and dead ends; corridor and other rated doors. Provide the UL listing for all fire rated walls, floor/ceiling, roof/ceiling systems.

1.6.1.8.4 Extinguishing and/or fire sprinkler systems: Type (wet or dry system); special systems, such as "Carbon Dioxide", "Deluge", or "Standpipe", "AFFF", or "Halon" Systems. Coordinate with mechanical designer.

1.6.1.8.5 Fire alarm and evacuation system: Type, extent, and zoning. Coordinate with electrical designer.

1.6.1.8.6 Operations involving use or storage of flammable and explosive liquids and gases, or accumulation of dusts: System shall be designed to comply with NFPA and UBC. Provide the flash point for all liquids. Describe type of electrical equipment, lighting fixtures, ventilation and other related fire protection features required to minimize hazard(s).

1.6.1.8.7 The analysis shall list applicable NFPA and UBC number references as well as "required" and "design" conditions.

1.6.1.8.8 "Means of egress" sketch shall be provided for each floor indicating exit access, door swings in path of egress, required fire separations, stairs and rated exit passageways. In addition, provide location of exit sign sketch indicating exit lights including direction and locations for which "Not An Exit" signs may be required. Illumination of means of egress and exit markings shall comply with NFPA 101.

1.6.1.8.9 Roof clutter and the trade-off of cost versus acceptable aesthetics shall be discussed in the Design Analysis and at the Concept Review Conference.

1.6.1.9. Special Requirements for Addition/Alteration Projects.

1.6.1.9.1 Asbestos. See 1.2.4 Asbestos Removal.

1.6.1.9.2 Life Safety. Perform a life safety survey to identify existing violations of means of egress and fire separation per NFPA 101, NFPA 220 and the U.B.C. and describe how new work will impact existing life safety. State the building construction types and occupancy classification. Provide "means of egress" sketches to identify existing violations and recommended corrective actions.

1.6.1.9.3 Physical Security/Anti-Terrorism Features. Coordinate with the Architectural/Engineering Instructions, Chapter 10, Paragraph 6.

1.6.2. Drawings. The drawings shall contain sufficient detail to enable a bidder to successfully bid the project without a site visit.

1.6.2.1. Floor Plan for each floor at 1/4"=1' scale (except as stated below), showing: (1) overall dimensions, (2) functional arrangement, (3) label all rooms and spaces, (4) interior colors and finishes and exterior colors in tabular form. (Plates 10 and 13 of Chapter IV.)

1.6.2.1.1 For large, open structures, a smaller scale may be allowed on a case-by-case basis, subject to discussion with, and approval by, the

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comparison to the design analysis as an appendix. Provide a word description of all the candidate solutions and indicate that the most economical has been selected.

1.7.1.3. Design Loadings (TM 5-809-10/AFM 88-3, Chap. 1): Provide a discussion of live loadings to be used, to include floor loads, wind, snow, earthquake, etc., together with data to justify deviations from established criteria. Seismic design shall be in accordance with TM 5-809-10/AFM 88-3 Chap. 13. State the Seismic Zone, K, I, C, and Z values. State whether wind load or seismic load governs lateral design for each direction considered and for each independent structural system.

1.7.1.4. Applications to Existing Buildings For those cases in which additions are connected to existing structures (i.e., no seismic joints), the A-E shall provide calculations for the "integral structure" (i.e., new plus existing). In no case shall the strength of an existing "below code" structure be reduced. Where practicable, the A-E shall upgrade the lateral resistance of the existing system to meet current code. In the projects involving alterations, modifications and/or additions, the A-E shall be responsible for the investigation and design necessary to strengthen existing structural members which are affected by additional loads. For pure alteration and repair projects, a seismic evaluation shall be performed per the following:

1.7.1.4.1. Major Alterations. When any building for which the cost of renovations or repairs exceeds 25 percent of the replacement cost of the existing building, both the existing building and the renovations must be made to resist the appropriate level of earthquake forces. An appropriate level of earthquake force is defined as that level prescribed in the latest edition of TM 5-809-10/AFM 88-3, Chap. 13. The foregoing does not preclude the use of site specific response spectra if already available, or if deemed appropriate for critical facilities.

1.7.1.4.2 Minor Alterations. Minor structural alterations may be made in existing buildings and other structures in conjunction with the upgrading of the total structure. However, the building structure's ability to resist lateral seismic forces shall not be less than that which existed before such alterations were made.

1.7.1.4.3 Seismic Evaluation Submittal Requirements. The seismic evaluation study, complete with conceptual fix (if required) and associated costs, shall be submitted. The seismic evaluation study shall be performed concurrent with other design work and coordinated with other design work to the maximum degree possible, (i.e., be feasible from a functional/architectural standpoint, etc.). The seismic evaluation study and its impact on the project current working estimate (CWE) shall be approved by the COE prior to incorporation into the project's bid documents. A minor alteration project's design documentation shall include routine structural narrative and calculations addressing structural modifications.

1.7.1.5. State the strength (working stresses or yield stresses) for all structural materials on the project.

1.8.1.2. Heating System. Indicate type of heating plant and justification for selection, operating pressure and temperature, and capacity. Briefly discuss temperature control system. NOTE: Direct Digital Controls (DDC) is prohibited for HVAC controls. DDC may be used only for internal control of individual equipment items provided it does not and will not interface with other systems or equipment. Discuss type of conducting system, i.e., forced warm air with direct fired furnace or hot water coil, forced hot water or steam with direct radiation or unit heaters. Indicate type of heat distribution outside of buildings - steam or high temperature hot water and whether above-ground or underground. State classification of underground system per Specification Section C655 - 02695 (mandatory to use) including soil investigations and survey. Describe type of piping for heating system, insulation, concealed or exposed.

1.8.-1.1. Design Conditions. State indoor and outdoor design temperatures for heating and cooling; proposed "U" factors for walls, ceilings, floors, etc.; personnel load, equipment heat release (if any); outside air or ventilation requirements and any other special conditions.

1.8.1. Design Analysis - Narrative/Calculations.

1.8. Mechanical Design

etc.

1.7.2.3. Roof Framing Plan: Show locations of framing members, overall shape and dimensions, diaphragm,

spacing, principal dimensions and shape of the building.
1.7.2.2. Floor Framing Plan: Show spacing of framing members, overall depth of floor structure, column

walls and floor slab to foundation system, overall dimensions, column spacing, joint pattern in slab-on-grade, tie beams, grade beams, etc.
1.7.2.1. Foundation and Floor Plans: Show type of foundation proposed, depths of footings, relation of

1.7.2. Drawings:

1.7.1.7. Future Expansion: Where buildings are to be designed for future expansion, discuss provisions to be taken to insure the projected construction will proceed in a trouble free fashion. State that no provisions have been made for future expansion, if this is the case.

1.7.1.6. Blast Design: For structures designed for blasts, list all appropriate design parameters such as, for the donor system, amount, type, TNT equivalent, and location of explosive material in each area. For the receiver system, state the personnel, equipment, and other explosive material which requires protection in each area. Also, define the protection categories for each area to prevent the following: (a) Communication of detonation by fragments and high blast pressure; and (b) Mass detonation of explosives as a result of subsequent detonations produced by communication of detonation between two adjoining areas. Define blast wall, blast door, and frangible element locations to complete the description of the protective construction design approach.

1.7.1.7. Future Expansion: Where buildings are to be designed for future expansion, discuss provisions to be taken to insure the projected construction will proceed in a trouble free fashion. State that no provisions have been made for future expansion, if this is the case.

1.8.1.10. Seismic Considerations. State that design procedure to be used for support and anchorage for mechanical equipment is in accordance with IM 5-809-10.

1.8.1.9 Plumbing. Provide plumbing fixture determination listing quantity and types of fixtures identified by Federal Specifications. Indicate male and female building population. Describe domestic water heating and storage equipment including capacity, materials, piping types, and insulation requirements.

1.8.1.8 Service Piping Systems. Include determination and capacity of compressed air, vacuum, or other service piping systems.

1.9.1.7 Cold Storage Projects. Indicate the room holding temperatures and commodities to be held in cold storage. (May be indicated on drawings.) Also, show the approximate equipment sizes.

1.8.1.6 Evaporative Cooling. Reference Architectural/Engineering Instructions or IM 5-810-1 as authority, or any authorized waiver of these criteria. Note if this is a single or two-stage process.

1.8.1.5 Air Conditioning. State as applicable under Architectural/Engineering Instructions, the extent authorized, and as to any authority for waiver of these criteria. State whether for comfort cooling or according to technical requirements or both. For technical requirements, show the authorized tolerances for temperature and humidity control, the degree of air cleaning or purity required, and any other special considerations involved. A description of the air conditioning system proposed, including the capacity, location of the air components, cooling media (water or DX), zoning and duct arrangements, and type of controls. (See note for Direct Digital Controls (DDC) in Paragraph 1.8.1.2, above). State requirements for outside air and the basis for determination of quantity, i.e., number of air changes per hour or CFM per person, or others.

1.8.1.4 Ventilating System. State whether the ventilating system is gravity or mechanical system. If a mechanical system, indicate whether it is supply or exhaust. State the requirement for outside air and the basis for determination of quantity, i.e., number of air changes per hour, or CFM per person, or others.

1.8.1.3.2 Use Design Annual Energy Use (DAE) summary sheet with your calculations. (See #22) Include AMPS Energy Conservation Codes Input Form (See Plate #23)

1.8.1.3.1 If a computer simulation of the building is required, then a separate energy budget need not be performed. The energy budget is the sum total of the energy consumed in a year within the boundaries of the building for space heating, ventilating and cooling, domestic hot water, and lighting. The analysis will not be performed on candidate building systems, but only on the final selected systems, and will be presented in BTU's per square foot per year. For additional guidance refer to the Criteria Reference Chapter V under "HVAC Computer Simulation for Buildings."

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1.8.1.11 Hazardous Waste. Hazardous waste; Underground Fuel Storage and Waste Tanks. Specify only EPA approved materials, equipment and systems for use. All systems must comply with Federal, State and local regulations.

1.8.1.12. Fuel: State type, source, whether firm, or interruptible gas and metering arrangements. Indicate adequacy of existing gas distribution system and of existing gas supply to carry additional load. Indicate type of standby fuel for interruptible gas.

1.8.1.13. Energy Monitoring and Control System. Indicate if base-wide EMCS is existing, under construction, or planned within 5 years. For existing EMCS, identify system in operation.

1.8.1.13.1 Building EMCS shall terminate with the DTC (Data Terminal Cabinet). Individual buildings will be connected to the base-wide EMCS by a separate construction contract at a later date.

1.8.1.13.2 Use TM 5-815-2 for Criteria Reference. Include CECS-138/4 "Building Preparation For EMCS" in outline of specifications.

1.8.1.14. Fire protection. Coordinate with the Architect to ensure all aspects of the fire protection plan are addressed.

1.8.1.14.1 For sprinkler systems, indicate type (wet or dry) system, provide evidence that the system is in compliance with criteria referenced in "CRITERIA INDEX," Chapter V.

1.8.1.14.2 For Halon, carbon-dioxide, foam, dry-chemical, and other special extinguishing systems, show information justifying the arrangement, size, and coverage of each system. For AFFF systems, the designer shall make provisions for proper disposal of the AFFF in a manner acceptable to the installation environmental office and CEH.

1.8.1.14.3 Include a fire water flow curve, based on flow test data, and determine if the available water quantities and pressures are adequate to meet project requirements. See Fire Protection Handbook, Section 17, Chapter 8, Hydraulic Flow Curves and Analyzing Test Data. (Note that flow test data is normally provided by the installation Director of Engineering and Housing. Coordinate with your COE PM.) The mechanical and civil designers must coordinate their efforts to ensure adequate water quantity is available.

1.8.1.15. Special requirement for all rehab Projects. For asbestos requirements see Paragraph 1.2.4. Asbestos Removal.

1.8.1.16. Calculations.

1.8.1.16.1 Calculations of limited nature shall include heat gain, heat loss, and equipment sizing including the method for handling diversities in the air conditioning load and method for sizing boilers. Show typical air conditioning load calculations, preferably the building peak loads. Detailed room calculations are not required.

1.8.1.16.2 Show plumbing calculations necessary to determine the number of fixtures, cold and hot water capacity requirements, and equipment or capacities of miscellaneous and special systems.

1.8.2. Drawings.

1.8.2.1. Floor Plan. Prepare a floor plan showing heating, ventilating, and air conditioning equipment layout; chillers or refrigeration compressors; boilers; pumps; condensers or cooling towers; air handling units; fans; air distribution duct layout (may be single line); hoods; and other items of major equipment required for the facility.

1.8.2.2. Plumbing. Show the plumbing fixture layout, floor and area drains, and plumbing equipment layout (hot water generator, storage tanks, pumps, air compressors, etc.).

1.8.2.3. Mechanical Rooms.

1.8.2.3.1 Present a study of floor space in the mechanical room and roof space on roof plan by selecting the largest and heaviest of three competing makes of each piece of equipment to go into the room and to mount on the roof. The Mechanical designer shall inform the Structural designer of the selections in order to properly size the roof structure.

1.8.2.3.2 Adequate provisions shall be made in the mechanical rooms to allow for the removal of tubes from boilers, chillers, and condensers, and the removal of coils and filters from air handling units for maintenance or replacement. See "Mechanical Standard Details" by Sacramento District for the maintenance access and clearance zones required for the different types of mechanical equipment. To save room space, full use shall be made of knockout panels or doors on outside walls for tube and other equipment removal. Equipment shall be located to allow ample room for servicing and replacement. Show service clearance required for equipment per manufacturers recommendations. Piping and valves shall be arranged so that they will not prevent personnel movement within the equipment room and all valves shall be located for ready accessibility. Where necessary because of the location of valves and headers, catwalks or ladders shall be furnished for operating and servicing the valves. Gages and thermometers shall be of such size, scale, and location as to be easily read by operating personnel.

1.8.2.3.3 If an outdoor Mechanical Equipment yard is enclosed by a solid CMU fence, adequate air movement must be provided by openings in the wall, wall section overlap with air gap between, removing blocks at certain intervals, etc., for air cooled mechanical and electrical equipment.

1.9. Electrical Design.

1.9.1. Design Analysis - Narrative/Calculations.

1.9.1.1. General. Provide electrical characteristics (phase, voltage, and number of wires) or circuits.

1.9.1.2. Electrical Load Analysis. Include estimate of total connected load and demand factors, diversity, and resulting kilowatt demand. Breakdown of the estimated connected and demand load shall show: (1) Lighting and convenience outlet load; (2) power load for building equipment such as heating, air conditioning, etc., (3) loads for special operating equipment such as air compressors, generators, pumps, and for power receptacles being provided to energize special equipment. State power factor and size of transformers.

(REV 12/90 #11)

2.6.3.2. Floor/Roof Framing Plans: Provide overall framing layouts (with dimensions) of the main structural elements. Show horizontal and vertical bracing locations and seismic joint locations.

2.7. Mechanical Design.

2.7.1. Design Analysis - Narrative.

2.7.1.1. See Concept submittal requirements. The designer shall provide solutions to any problems identified in the Concept submittal and justify or refine all assumptions made at concept stage (user shall be contacted if required).

2.7.1.2. Designs must meet EPA emission standards when No. 5 fuel oil, No. 6 fuel oil or coal is burned as fuel and when other hazardous emissions are produced.

2.7.1.3. Provide a list of energy saving features which have been incorporated into the project, such as run-around coils, thermal wheels, and double bundle condensers. Additional energy saving ideas may be found in the "Criteria Index," Chapter V, under "HVAC Computer Simulation for Buildings."

2.7.1.4. Indicate the pieces of equipment and controls that will be tied into a base wide EMCS. The A-E shall coordinate the selected points with the Base EMCS Specialist.

2.7.1.5. For physically handicapped requirements, state what provisions have been incorporated.

2.7.1.6. Provide the following information for liquid petroleum storage and distribution systems: describe the unloading facilities, the type of system, such as LPG vapor or central air mix; state the basis for storage capacity, rate of pumping and number of dispensing outlets; equipment power requirements, and a description of the tank.

2.7.1.7. Future expansion: Where buildings are to be designed for further expansion, discuss provisions to be taken to insure the projected construction will proceed in a trouble-free fashion. If no provisions have been made for future expansion, so state.

2.7.1.8. Meters. State type, number and location of Utility meters and environmental permits required IAW Architectural/ Engineering Instruction.

2.7.2 Design Analysis - Calculations:

2.7.2.1 See Concept submittal requirements.

2.7.2.2 Provide all calculations which are necessary to justify the systems selected on the basis of economic and environmental impact. If A/E uses computer calculations for cooling loads, he must fill out the enclosed load estimate form taking input and output from computer analysis. See Plate 20, Chapter IV.

2.7.2.3 Show plumbing calculations as necessary to determine equipment or capacities of miscellaneous and special systems.

3.8.3.5. Stair Details Show all structural beams and connections that are shown supporting stairs usually detailed on the Architectural Drawings

3.8.3.4. Structural data: State the soil bearing values and other pertinent information from the Geotechnical Report, design live loads for various areas of the building; design wind load; seismic zones Z, I, K, C, S values; whether or not the building has been designed for future horizontal or vertical loads; and any other notes necessary to clarify or complete the information shown on the drawing. The CDE or A-E prepared Geotechnical Report shall not be referenced because it is not part of the contract documents. Check all general structural notes for conflicts with the specifications. The notes should not repeat the specifications. All structural data shall appear on the first sheet of the structural drawings.

3.8.3.3. Joints: The location and details of all joints shall be shown on the drawings. Include control joints in slabs-on-grade, construction joints in walls, floors, roofs, and expansion and seismic joints.

3.8.3.2. Wall Elevations: Wall elevations shall be provided for all precast or tilt-up concrete panels, showing I for each panel uniquely typically reinforcing, rebar, connections, dimensions, panel ID markings and site locations, and all other embedments etc. The intent is to show a complete design on the drawings; even though manufacturers may prefer to detail things differently.

3.8.3.1. The structure should be carefully studied so that elaborate details are not required and all information necessary for construction is clearly and simply presented on the drawings. Typical sections shall be truly typical and not representative of one particular condition.

3.8.3. Drawings. Expand and fully develop drawings used in Concept and/or Preliminary submittals. Add any new sheets necessary to complete the presentation.

3.8.2.6. When submitting computer data, include one sample hand calculation of one item (e.g., a truss) under one loading condition (i.e., usually the most critical) for each major system (e.g., lateral system, beam framing, etc.). This aid will facilitate the speed of those reviewers not familiar with your particular program in spot checking the balance of the submitted computer data.

3.8.2.5. When a computer is utilized to perform design calculations, the analysis shall include copies of computer input data and output summaries presented in understandable language, accompanied by diagrams which identify joints, members, areas, etc., according to the notations used in the data listings. This will form an integral part of the Design Analysis in lieu of manual calculations otherwise required. A complete listing of all computer output will be provided, bound separately, when it is too voluminous for inclusion in the Design Analysis. These listings will be augmented by intermediate results where applicable, so that sufficient information is available to permit manual checks of final results. Include a sample hand calculation of each structural element (e.g., a truss) under one loading condition (i.e., usually the most critical) for each major system (e.g., lateral system, beam framing, etc.). This will facilitate reviewers who are not familiar with your particular program in spot checking the balance of the submitted computer data.

3.8.3.6. Roof Details.

3.8.3.6.1 Show all fastener details of roof deck to supporting members.

3.8.3.6.2 Show all roof framing connections, including RC and CMU beam seats, column connections, and beam-to-girder connections (as appropriate).

3.8.3.6.3 Show all details that provide slip joints for temperature changes and all details that transfer lateral loads to the vertical shear system.

3.8.3.6.4 Show all additional framing needed to provide for concentrated vertical loads, including both at and between node(s) of roof trusses.

3.8.3.6.5 On roofs where the deck is not used as a diaphragm, indicate crossbracing between all roof framing members. Specifically on roof trusses, show cross bracing at 3'-0" maximum.

3.8.3.7 Composite construction and continuous framing. Where beam reactions are required on contract drawings for composite construction and continuous framing (as stipulated for Steel Framed Beam Connections in the AISC Manual of Steel Construction), the A/E is not relieved from drawing completely all of the various beam-to-beam and beam-to-column connection details that normally would be drawn for any construction that is non-continuous, non-composite, or both under service load.

3.9. Mechanical Design.

3.9.1. Design Analysis - Narrative. Complete the discussion of Mechanical features that was presented in the Concept and/or Preliminary submittals. Update the narrative to include any changes brought about by review comments.

3.9.2. Design Analysis - Calculations.

3.9.2.1. Finalize all calculations leading to sizing of distribution systems, selection of equipment, power requirements, controls, and selection of auxiliary equipment. Include calculations for noise/sound reduction. A-E must carefully select HVAC equipment locations and investigate any duct noise attenuation required to ensure that HVAC systems will not result in noise problems.

3.9.2.2. Equipment selection is restricted to regularly cataloged items of domestic manufacture, in commercial service for at least two (2) years prior to bid opening, and supplied by dealers having service organizations supporting the project location. Completely identify each piece of equipment with three manufacturers' names, model numbers, and characteristics. Do not indicate Proprietary manufacturers' names and model numbers on the drawings or in the specifications. Provide catalog cuts of selected equipment.

3.9.2.3. Provide complete tabulation of cooling loads. Psychrometric charts for all the air handling systems with cooling are required.

(REV 12/90 #14)

3.9.2.4. Fire Pumps. If required fire pumps shall be sized per NFPA 20 and NFPA Handbook Section 17 Chapter 6. Indicate pump flow vs. pressure. Indicate combined (i.e., fire pump demand plus outside hydrant demand) to assure yard system pressure does not fall below 20 psig. Include catalog cuts and manufacturers published pump curve.

3.9.2.5. For projects being on shelf for one year or more, available fire water flow shall be verified a second time at the next submittal; the mechanical designer shall refer to base Fire Marshall to conduct one more flow test to be aware of all possible changes in water supply in this period of time.

3.9.3. Drawings. Expand and fully develop drawings used in Concept and/or Preliminary submittals. List room names and numbers on all plans and partial plans as shown on the architectural plans. Add any new sheets necessary to complete the presentation, including the following:

3.9.3.1. Plumbing. Provide the following:

3.9.3.1.1 Show water, waste and vent piping in two-dimensional riser diagrams for complicated plumbing systems, such as medical, dental facilities and others and for all buildings two or more stories high.

3.9.3.1.2 Provide a schedule of plumbing fixtures and equipment. Coordinate schedule with Table I of Specification Sections DEGS-15400 or 15410.

3.9.3.2. Heating, Ventilating and Air Conditioning (HVAC). Provide the following:

3.9.3.2.1 Double line air distribution ducts will be required for all cross sections, elevations, and in mechanical rooms. Single line ducts may be used for air distribution layout, provided sufficient cross sections are shown for congested areas, and for areas that are subject to potential structural interference.

3.9.3.2.2 If required for clarification of duct sizes and duct runs, show single line riser diagrams for supply, return, and exhaust air systems in multi-story buildings. Provide sections where needed to show special relations and indicate the typical location of lights, structural members, etc.

3.9.3.2.3 Locate and detail all fire dampers.

3.9.3.2.4 Provide piping schematics to show all complicated flow processes.

3.9.3.2.5 Provide a sequence of operation and control, and control system schematic diagrams for each Mechanical System.

3.9.3.3. Fire Protection. Provide the following:

3.9.3.3.1 Minor fire protection work may be shown on the plumbing plan. Title block shall indicate that the drawing is for both plumbing and fire protection.

of pallets, or to minimize fire water requirements for storage height of less than 25 feet.

3.9.3.3.6.8.9 whether in-rack sprinklers are required at one level, two levels or at every tier.

3.9.3.3.6.8.10 in-rack sprinkler water demand

3.9.3.3.6.8.11 ceiling sprinkler density (GPM/FT²)

3.9.3.3.6.8.12 design area of sprinkler operation

3.9.3.3.6.8.13 ceiling sprinkler water demand

3.9.3.3.6.8.14 inside hose stream demand (minimum 100 GPM)

3.9.3.3.6.8.15 combined inside and outside hose demand (minimum 500 GPM)

3.9.3.3.6.8.16 duration of water supply required (see NFPA 231C)

3.9.3.3.6.8.17 fire protection riser location(s)

3.9.3.3.6.8.18 fire wall/partition locations

3.9.3.3.6.8.19 water flow available at base of riser (GPM flow rate and associated residual pressure)

3.9.3.4. Energy Monitoring and Control Systems (EMCS).

3.9.3.4.1 The designer is required to coordinate selection of points to be monitored with the installation EMCS coordinator.

3.9.3.4.2 Provide schematic diagrams and I/O summary as shown in TM 5-815-2.

3.9.3.4.3 The EMCS schematic diagrams shall be separate from the control system diagrams as described above in Sub-paragraph 3.9.3.2.5.

3.10. Electrical Design.

3.10.1. Design Analysis - Narrative. Complete the discussion of electrical features that was presented in the Concept and/or Preliminary submittals. Update the narrative to include any changes brought about by review comments.

3.10.1.1. Describe any special switching or dimming systems required for any area.

3.10.1.2. Provide rationale for selection of reduced-voltage starting equipment.

3.10.1.3. Provide an energy impact analysis.

3.10.2. Design Analysis - Calculations.

CHAPTER IV

REFERENCE PLATES

1. TITLE BLOCK (Cover Sheet Only)	PLATE #1
2. TITLE BLOCK	PLATE #2
3. TITLE BLOCK (DOE Prepared Topography Or Legs of Springs Drawings)	PLATE #3
4. TITLE BLOCK (Site Adaptation Cover Sheet)	PLATE #4
5. TITLE BLOCK (Site Adaptation other than Cover Sheet)	PLATE #5
6. SCHEDULE OF DRAWINGS	PLATE #6
7. GRAPHIC SCALES	PLATE #7
8. DOOR SCHEDULE	PLATE #8
9. WINDOW TYPES	PLATE #9
10. FINISH SCHEDULE, FINISH LEGEND AND COLOR SCHEME INSTRUCTIONS	PLATE #10
11. SAMPLE SCHEDULE FOR PLATE 10	PLATE #11
12. EXAMPLE FLOOR PLAN FOR PLATE 10	PLATE #12
13. SAMPLE EXTERIOR COLOR SCHEDULE	PLATE #13
14. SAMPLE VICINITY MAP	PLATE #14
15. SAMPLE LOCATION MAP	PLATE #15
16. HANDICAPPED CHECKLIST (BLANK)	PLATE #16
17. ENVIRONMENTAL PERMIT MATRIX (BLANK)	PLATE #17
18. GROSS AREA TAKEOFF	PLATE #18
19. SUPPORT DOCUMENT COVER SHEET INSTRUCTIONS	PLATE #19
20. AIR FORCE FORM 108 - AIR CONDITIONING LOAD ESTIMATE	PLATE #20
21. LIFECYCLE COST SUMMARY FORM	PLATE #21
22. DESIGN ANNUAL ENERGY USE (DAE) SUMMARY	PLATE #22
23. AMPRS ENERGY CONSERVATION COMPLIANCE CODES INPUT FORM	PLATE #23

"If it hasn't been reviewed,
it hasn't been designed."

AMFAS ENERGY Conservation COMPLIANCE CODES INPUT FORM

SUSPENSE DATE _____

PROJECT IDENTIFICATION NUMBER _____
 AMFAS FACILITY _____
 PROJECT DESCRIPTION _____
 LOCATION/STATION _____

There are six mandatory AMFAS Energy Conservation Input Selections. Please complete the following input and return to the project manager by the suspense date noted above:

1. Data Item 0061- DESIGN ENERGY TARGET (DET) - Enter the Design Energy Target from AEI Table 11-1 (normalized as required) the appropriate table of AF Energy Budget ETL, or other energy budget used by the funding proponent. Up to six numeric characters.

DET = BTU/SQFT/YR

2. Data Item 0062 DESIGN ANNUAL ENERGY USE (DAE) - Enter the calculated Design Annual Energy Use Up to six numeric characters.

DAE = BTU/SQFT/YR

3. Data Item 1245, Character 3 - ENERGY CONSERVATION COMPLIANCE CODE - Select one letter from the following list to indicate the current status of compliance with the required Design Energy Target and enter on the space below:

_____ ENERGY CONSERVATION COMPLIANCE CODE

- A DAE LESS THAN OR EQUAL TO DET - COMPLIES
- B DAE GREATER THAN DET- REDESIGN UNDERWAY
- C DAE GREATER THAN DET- WAIVER REQUESTED
- D DAE GREATER THAN DET- WAIVER APPROVED

4. Data Item 1245, Character 4 - CALCULATION TOOL CODE - Select one letter from the list below to indicate the primary tool or method used to calculate the Design Annual Energy Use reported in Data Item 0062 and enter on the line below:

_____ CALCULATION TOOL CODE

- | | | |
|--------------------------------|--------------------------------|---------------------|
| A BLAST (Harris) | B BLAST (CBC) | |
| C BLAST (INTERFRO Stand Alone) | D BLAST (INTERGRAPH Interface) | E BLAST (MICRO 286) |
| F BLAST (MICRO 386) | | |
| G BLAST (MACINTOSH) | H BLAST (OTHER) | |
| I DOE 2 (MAINFRAME) | J DOE 2 (MICRO) | |
| K ESP II | L OTHER HOUR BY HOUR | |
| M TRACE (MAINFRAME) | N ULTRATRACE | |
| O TRACE EASY | P CARRIER HAP | |
| Q OTHER CONDENSED HOURLY | R CARRIER E20 | |
| S ELITE | T ASEAM II | |
| U OTHER MODIFIED BIN | V VARIABLE DEGREE DAY | |
| W OTHER NOT LISTED ABOVE | X HAND CALCULATIONS | |

ANSI ENERGY CONSERVATION COMPLIANCE CODES INPUT FORM

5. Data Item 1245, Character 5 - Heating Fuel Code - Select one letter from the list below to indicate the primary heating fuel used in the facility and enter on the line below:

----- HEATING FUEL CODE			
A	NATURAL GAS (ON SITE)	B	FUEL OIL (ON SITE)
C	COAL (ON SITE)	D	ELECTRIC HEAT PUMP
E	ELECTRIC RESISTIVE (NEEDS WAIVER)		
F	OTHER ON SITE FUEL (I.E. WOOD REFUSE, ETC.)		
G	CENTRAL SYSTEM (OIL FIRED)	H	CENTRAL STEAM (GAS FIRED)
I	CENTRAL STEAM (COAL FIRED)	J	CENTRAL STEAM (OTHER)
K	CENTRAL HTHW (OIL FIRED)	L	CENTRAL HTHW (GAS FIRED)
M	CENTRAL HTHW (COAL FIRED)	N	CNTR. LOW TEMP HW (OTHER)
O	CNTR. LOW TEMP HW (OIL)	P	CNTR. LOW TEMP HW (GAS)
Q	CNTR. LOW TEMP HW (OTHER)	R	PASSIVE SOLAR
S	ACTIVE SOLAR	T	RADIANT (OVERHEAD GAS)
U	RADIANT (OVERHEAD ELEC)	V	RADIANT (IN SLAB)
W	OTHER (NOT LISTED ABOVE)	X	NO HEATING

6. Data Item 1245, Character 6-AIR CONDITIONING CODE - Select one letter from the list below to indicate the status of air-conditioning for the predominate portion of the facility design and place the letter in the space below:

----- COOLING SYSTEM CODE	
A	MECHANICAL VENTILATION ONLY
B	MECHANICAL REFRIGERATION (ON SITE ELEC)
C	MECHANICAL REFRIGERATION (ON SITE GAS)
D	MECHANICAL REFRIGERATION (ON SITE OTHER FUEL)
E	MECHANICAL REFRIGERATION (HEAT PUMP)
F	CENTRAL CHILLED WATER
G	AIR CONDITIONING (OTHER)
H	EVAPORATIVE COOLING

NAME OF PREPARER -----
OFFICE SYMBOL/TEL NO. -----
DATE -----

(REV 12/90 #19)

design. In addition, an "index supplement" will be issued with each "SPK supplement" to track previous and/or current changes to the same design criteria.

6.0. BASIC DESIGN CRITERIA PACKAGE. Upon notification from the COE PM, the District's Design Quality Assurance (DQA) Section will transmit to the A-E a Basic Design Criteria Package. This package contains criteria that, for the most part, is generic to all designs. It includes such documents as the A-E Guide, Volumes 1, 2, and 3, Standard Details, the Seismic Design Manual TMS-809-1, Architectural and Engineering Instructions.) The A-E is requested not to re-request these documents unless absolutely necessary.

7.0. CRITERIA INDEX

7.1. The information that follows has been organized to facilitate the A-E's search for applicable criteria and the subsequent ordering of that criteria through the COE PM. The following pages contain:

7.1.1 DISCIPLINE/SUBJECT LISTING OF CRITERIA. To aid in your search for applicable criteria, this list has been developed with subjects presented in alphabetical order under each major discipline category. Please note that duplicative references to certain criteria may occur from discipline to discipline. Pay close attention to the remarks column. It will tell you if the document is not available from (N.A.F.) the COE.

7.1.2 NUMERICAL CRITERIA INDEX. This can be used as an "order form" simply by making a copy and circling the required documents. This list only contains those documents most frequently requested, therefore the A-E may find it necessary to add document numbers to this list.

7.2. All of the above shall be thoroughly examined by the A-E to make certain that all applicable criteria is utilized and adhered to. For guide specification lists the A-E is directed to the A-E Guide, Volume 3, Specifications.

(REV 12/90 #20)

DD FORM 1354 DATA SHEETS FOR ARMY PROJECTS

1.0 General. The DD Form 1354 Data Sheet contains a summary of project information that is used by COE construction resident offices in completing the official DD Form 1354 upon completion of construction and transfer of the facility to the owner agency. The A-E shall utilize his design analysis narrative and information and cost estimate quantities and costs in completing the majority of information on the data sheets. Specific instructions for completion of the data sheets are contained on the data sheets themselves. Any questions should be directed to the COE Project Manager. For your convenience the attached blank data sheets are on our Electronic Bulletin Board. For access, contact your COE PM.

2.0 Submittal Requirements.

2.1 Concept/Preliminary Submittals. No submittal required.

2.2 Final Submittal. Submit completed DD Form 1354 Data Sheet with your final design submittal package as an appendix of your Design Analysis (bound separately) (see Chapter II).