

CHAPTER I
GENERAL INFORMATION

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

TABLE OF CONTENTS

<u>CHAPTER</u>	<u>SUBJECT</u>	<u>PAGE</u>
----------------	----------------	-------------

I		1
	GENERAL INFORMATION	1
	1.0. <u>OBJECTIVE OF GUIDE</u>	1
	2.0. <u>COORDINATION WITH THE COE</u>	1
	3.0. <u>PREDESIGN CONFERENCE</u>	2
	4.0. <u>PRENEGOTIATION CONFERENCE</u>	2
	5.0. <u>NEGOTIATION CONFERENCE</u>	2
	6.0. <u>CRITERIA</u>	3
	6.1. <u>Functional Criteria</u>	3
	6.2. <u>Technical Criteria</u>	3
	6.3. <u>Informational Material</u>	3
	7.0. <u>TRADE NAMES AND PROPRIETARY ITEMS</u>	3
	8.0. <u>DESIGN EXCELLENCE</u>	3
	8.1. <u>Things to Consider</u>	3
	8.2. <u>Things to Avoid</u>	4
	9.0. <u>ENVIRONMENTAL CONSIDERATIONS</u>	4
	10.0. <u>DESIGN QUALITY CONTROL</u>	5
	10.1. <u>Purpose</u>	5
	10.2. <u>Design Quality Control (DQC) Plan</u>	5
	11.0. <u>CONDUCT OF WORK</u>	6
	12.0. <u>REVIEW PROCESS</u>	7
	12.1. <u>Automated Review Management System (ARMS)</u>	7
	12.2. <u>Review Comments</u>	7
	13.0. <u>VALUE ENGINEERING</u>	8
	14.0. <u>SITE VISITS</u>	9
	15.0. <u>CONTRACT PAYMENTS</u>	9
	16.0. <u>RESPONSIBILITY AFTER DESIGN COMPLETION.</u>	9
	17.0. <u>ELECTRONIC BULLETIN BOARD</u>	9
	Figure 1 - <u>Typical Project Milestones</u>	10
	Figure 2 - <u>Typical Project Documents Prepared by A-E</u>	11
CHAPTER II		1
	PRESENTATION OF DATA	1
	1.0. <u>GENERAL</u>	1
	2.0. <u>DRAWINGS</u>	1
	2.1. <u>Drawing Media</u>	1
	2.2. <u>Drawing Preparation</u>	2
	2.2.1. <u>Unacceptable Processes and Techniques</u>	2
	2.2.2. <u>Numbering of drawings</u>	2
	2.2.3. <u>Signature</u>	2
	2.2.4. <u>Orientation</u>	3
	2.2.5. <u>Cross references</u>	3
	2.2.6. <u>"Keyed" Notes</u>	3
	2.2.7. <u>Scales</u>	3
	2.2.8. <u>Legends</u>	5
	2.2.9. <u>Abbreviations</u>	5

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

CHAPTER I
GENERAL INFORMATION

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
	2.2.10. Schedules	5
	2.2.11. <u>Room Numbering</u>	6
	2.2.12. <u>Key Plans</u>	6
	2.3. General information sheets (G-1, G-2, etc)	6
	2.3.1. <u>Schedule of Drawings</u>	6
	2.3.2. <u>Vicinity Map</u>	6
	2.3.3. <u>Location Map</u>	8
	2.4. <u>Revisions to Drawings After Project has Advertised for Construction</u>	8
	2.5. <u>Definitive, Standard, and Site Adaptive Drawings</u>	8
3.0.	<u>SPECIFICATIONS</u>	12
4.0.	<u>COST ESTIMATE</u>	12
5.0.	<u>DESIGN ANALYSIS - CONTENT</u>	13
6.0.	<u>DESIGN ANALYSIS - PREPARATION & ASSEMBLY</u>	16
	Figure 3 - Typical Drawing Set	17
	Figure 4 - Typical Design Analyses Assembly	18
III		1
	SECTION 1 - CONCEPT DESIGN	1
	1.0. <u>Concept Design Submittal</u>	1
	1.1. <u>Objective</u>	1
	1.2. <u>Civil Design</u>	2
	1.2.1. <u>Design Analysis - Narrative/Calculations</u>	2
	1.2.2. <u>Drawings</u>	3
	1.3. <u>Architectural/Structural Design</u>	3
	1.3.1. <u>Design Analysis - Narrative/Calculations</u>	3
	1.3.2. <u>Drawings</u>	5
	1.4. <u>Mechanical Design</u>	6
	1.4.1. <u>Design Analysis - Narrative/Calculations</u>	6
	1.4.2. <u>Drawings</u>	8
	1.5. <u>Electrical Design</u>	8
	1.5.1. <u>Design Analysis - Narrative/Calculations</u>	8
	1.5.2. <u>Drawings</u>	8
	SECTION 2 - EARLY PRELIMINARY DESIGN	10
	2.0. <u>Early Preliminary Design Submittal</u>	10
	2.1. <u>Objective</u>	10
	2.2. <u>Design Analysis - General Requirements</u>	11
	2.3. <u>Drawings - General Requirements</u>	11
	2.4. <u>Civil Design</u>	11
	2.4.1. <u>Design Analysis - Narrative/Calculations</u>	11
	2.4.2. <u>Drawings</u>	13
	2.5. <u>Landscaping Design</u>	13
	2.5.1. <u>Design Analysis - Narrative/Calculations</u>	13
	2.5.2. <u>Drawings</u>	13
	2.6. <u>Architectural Design</u>	13
	2.6.1. <u>Design Analysis - Narrative/Calculations</u>	13
	2.6.2. <u>Drawings</u>	15
	2.7. <u>Structural Design</u>	15
	2.7.1. <u>Design Analysis - Narrative/Calculations</u>	15
	2.7.2. <u>Drawings</u>	17
	2.8. <u>Mechanical Design</u>	17
	2.8.1. <u>Design Analysis - Narrative</u>	17
	2.8.2. <u>Design Analysis - Calculations</u>	18

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

CHAPTER I
GENERAL INFORMATION

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
	2.8.3. <u>Drawings</u>	18
	2.9. <u>Electrical Design</u>	19
	2.9.1. <u>Design Analysis - Narrative/Calculations</u>	19
	2.9.2. <u>Drawings</u>	20
SECTION 3 - PRELIMINARY DESIGN		23
3.0. <u>Preliminary Design Submittal</u>		23
	3.1. <u>Objective</u>	23
	3.2. <u>Design Analysis - General Requirements</u>	24
	3.3. <u>Drawings - General Requirements</u>	24
	3.4. <u>Civil Design</u>	24
	3.4.1. <u>Design Analysis - Narrative</u>	24
	3.4.2. <u>Design Analysis - Calculations</u>	26
	3.4.3. <u>Drawings</u>	27
	3.5. <u>Landscaping Design</u>	28
	3.5.1. <u>Design Analysis - Narrative/Calculations</u>	28
	3.5.2. <u>Drawings</u>	28
	3.6. <u>Architectural Design</u>	28
	3.6.1. <u>Design Analysis - Narrative/Calculations</u>	28
	3.6.2. <u>Drawings</u>	29
	3.7. <u>Structural Design</u>	29
	3.7.1. <u>Design Analysis - Narrative</u>	29
	3.7.2. <u>Design Analysis - Calculations</u>	30
	3.7.3. <u>Drawings</u>	30
	3.8. <u>Mechanical Design</u>	31
	3.8.1. <u>Design Analysis - Narrative</u>	31
	3.8.2. <u>Design Analysis - Calculations</u>	31
	3.8.3. <u>Drawings</u>	31
	3.9. <u>Electrical Design</u>	31
	3.9.1. <u>Design Analysis - Narrative</u>	32
	3.9.2. <u>Design Analysis - Calculations</u>	33
	3.9.3. <u>Drawings</u>	33
SECTION 4 - FINAL DESIGN		36
4.0. <u>Final Design Submittal</u>		36
	4.1. <u>Objective</u>	36
	4.2. <u>Changes To Basic Design</u>	36
	4.3. <u>Design Analysis - General Requirements</u>	36
	4.4. <u>Drawings - General Requirements</u>	37
	4.5. <u>Civil Design</u>	37
	4.5.1. <u>Design Analysis - Narrative</u>	37
	4.5.2. <u>Design Analysis - Calculations</u>	37
	4.5.3. <u>Drawings</u>	37
	4.6. <u>Landscaping Design</u>	39
	4.6.1. <u>Design Analysis - Narrative</u>	39
	4.6.2. <u>Design Analysis - Calculations</u>	39
	4.6.3. <u>Drawings</u>	40
	4.7. <u>Architectural Design</u>	41
	4.7.1. <u>Design Analysis - Narrative</u>	41
	4.7.2. <u>Design Analysis - Calculations</u>	41
	4.7.3. <u>Drawings</u>	41
	4.8. <u>Structural Design</u>	41
	4.8.1. <u>Design Analysis - Narrative</u>	41
	4.8.2. <u>Design Analysis - Calculations</u>	41
	4.8.3. <u>Drawings</u>	42
	4.9. <u>Mechanical Design</u>	43

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

CHAPTER I
GENERAL INFORMATION

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
	4.9.1. <u>Design Analysis - Narrative</u>	43
	4.9.2. <u>Design Analysis - Calculations</u>	43
	4.9.3. <u>Drawings</u>	43
	4.10. <u>Electrical Design</u>	45
	4.10.1. <u>Design Analysis - Narrative</u>	45
	4.10.2. <u>Design Analysis - Calculations</u>	45
	4.10.3. <u>Drawings</u>	45
IV	REFERENCE PLATES	48
	1. TITLE BLOCK (Cover Sheet Only)	48
	2. TITLE BLOCK	48
	3. TITLE BLOCK (COE Prepared Topography Or Logs of	48
	4. TITLE BLOCK (Site Adaptation Cover Sheet)	48
	5. TITLE BLOCK (Site Adaptation other than Cover Sheet)	48
	6. SCHEDULE OF DRAWINGS	48
	7. GRAPHIC SCALES	48
	8. DOOR SCHEDULE	48
	9. WINDOW TYPES	48
	10. FINISH SCHEDULE, FINISH LEGEND AND COLOR SCHEME	48
	11. SAMPLE SCHEDULE FOR PLATE 10	48
	12. EXAMPLE FLOOR PLAN FOR PLATE 10	48
	13. SAMPLE EXTERIOR COLOR SCHEDULE	48
	14. SAMPLE VICINITY MAP	48
	15. SAMPLE LOCATION MAP	48
	16. HANDICAPPED CHECKLIST (BLANK)	48
	17. ENVIRONMENTAL PERMIT MATRIX (BLANK)	48
	18. GROSS AREA TAKEOFF	48
	19. SUPPORT DOCUMENT COVER SHEET INSTRUCTIONS	48
	20. SUPPORT DOCUMENT COVER SHEET (BLANK)	48
	21. AIR FORCE FORM 108 - AIR CONDITIONING LOAD ESTIMATE	48
	22. SAMPLE COMPLETED AIR FORCE FORM 108	48
V	DESIGN CRITERIA	1
	1.0. <u>GENERAL INSTRUCTIONS</u>	1
	2.0. <u>DATES OF PUBLICATIONS</u>	1
	3.0. <u>AVAILABILITY OF CRITERIA</u>	1
	4.0. <u>CONFLICTS IN CRITERIA</u>	1
	5.0. <u>REVISIONS TO CRITERIA</u>	1
	6.0. <u>BASIC DESIGN CRITERIA PACKAGE</u>	3
	7.0. <u>CRITERIA INDEX</u>	3

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lest you be through before you finish."

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, Air Force
Appendix E	Geotechnical Requirements
Appendix F	Surveying and Mapping Requirements
Appendix G	Comprehensive Interior Design Requirements
Appendix H	Renderings
Appendix I	Air Force Installation Vicinity Maps

"When all else fails,, read the instructions."

CHAPTER I
GENERAL INFORMATION

Chapter

Paragraph # and Subject

Page

I-1

"Plan and control your progress,
lest you be through before you finish."
I-2

CHAPTER I
GENERAL INFORMATION

Chapter

Paragraph # and Subject

Page

I-3

"Plan and control your progress,
lest you be through before you finish."
I-6

CHAPTER I
GENERAL INFORMATION

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
	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.	

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

CHAPTER I
GENERAL INFORMATION

Chapter

Paragraph # and Subject

Page

I-5

"Plan and control your progress,
lest you be through before you finish."
I-10

CHAPTER I
GENERAL INFORMATION

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

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

e. 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.

f. 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.

11.0. CONDUCT OF WORK

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

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CHAPTER I
GENERAL INFORMATION

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

b. 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.

c. 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.

d. 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.

e. 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 of the COE is in the process of implementing ARMS on all military projects. If your scope of work requires you to use ARMS, 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 original 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 red 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:

- W/D - Withdrawn by maker. A-E take no action.
- C - Concur. A-E to comply.
- C-S - Changed construction scope - technically acceptable - PM to decide on incorporation.
- Info- For A-E's information.
- D - Denied. A-E take no action.
- Dup - Duplicate comment, A-E take action per other similar comment.

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CHAPTER I
GENERAL INFORMATION

Chapter

Paragraph # and Subject

Page

I-7

"Plan and control your progress,
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I-14

CHAPTER I
GENERAL INFORMATION

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

identify those high-cost, low-value items which may be accomplished in other

I-8

"Plan and control your progress,
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I-16

CHAPTER I
GENERAL INFORMATION

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

ways at less cost. During review of the PB 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 (Vol. 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 BCE 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 is required to 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 as available from the District A-E Negotiation Section 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. Title II services may be required in direct support of a project's construction, apart from that described in 16.1 above. If required, these services will be defined in a scope of work prepared by the PM. No Title II work shall 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 this office 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 or access procedure.

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CHAPTER I
GENERAL INFORMATION

Chapter

Paragraph # and Subject

Page

I-9

"Plan and control your progress,
lest you be through before you finish."
I-18

TYPICAL PROJECT MILESTONES

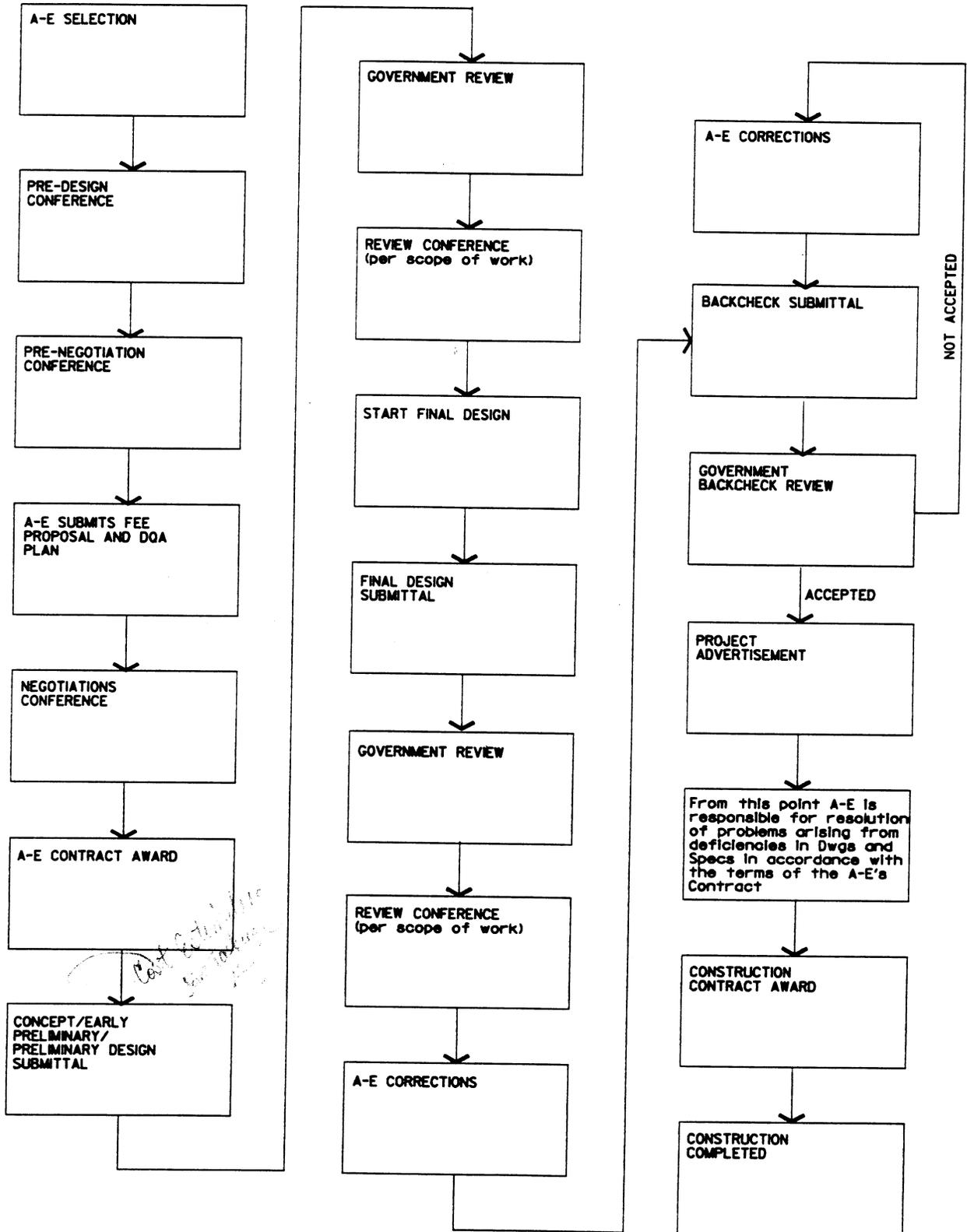


figure 1

TYPICAL PROJECT DOCUMENTS PREPARED BY A - E

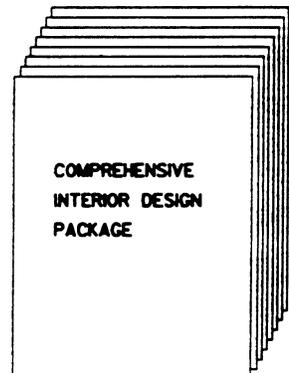
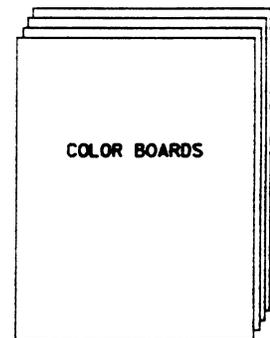
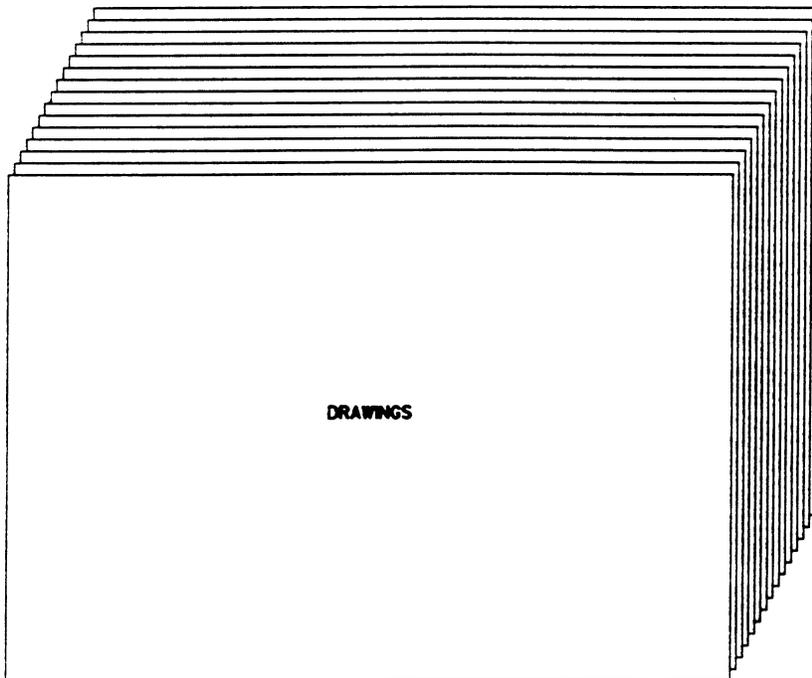
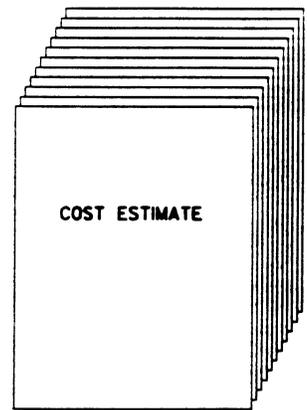
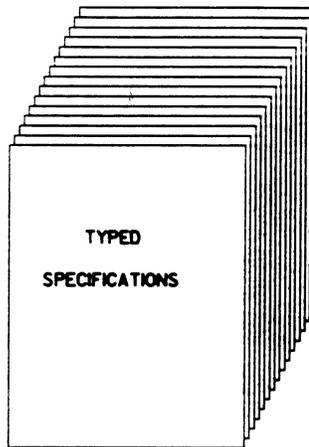
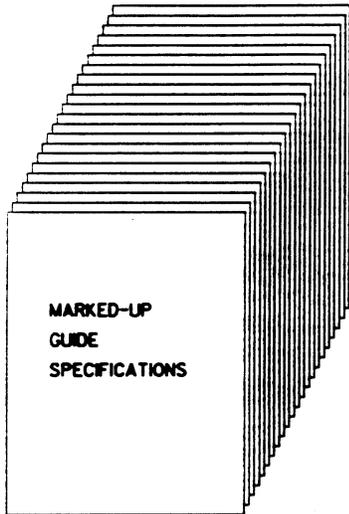
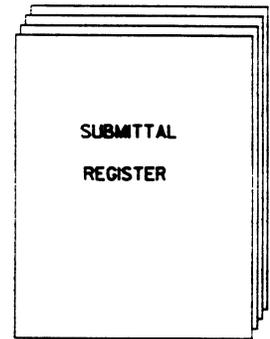
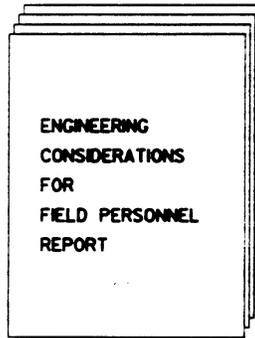
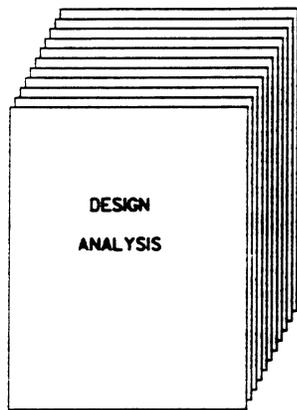


figure 2

CHAPTER II
PRESENTATION OF DATA

<u>Paragraph</u>	<u>Subject</u>	<u>Page</u>
1.0.	GENERAL	II-1
2.0.	DRAWINGS	II-1
3.0.	SPECIFICATIONS	II-14
4.0.	COST ESTIMATE	II-15
5.0.	DESIGN ANALYSIS - CONTENT	II-16
6.0.	DESIGN ANALYSIS - PREPARATION & ASSEMBLY	II-20
Figure 3	Typical Drawing Set	II-23
Figure 4	Typical Design Analysis Assembly	II-25

"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 and 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 1. This title block is for all sheets other than the cover sheet. The cover sheet title block, Chapter IV, Plate 2, 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:

- a. Drawing film as supplied by COE PM (equivalent to Dietrick Post DPD.3).
- b. Photo wash-off polyester drafting film (3 mil minimum thickness, double matted, equivalent to "Cronoflex").
- c. Polyester draft film (3 mil 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"

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material, he must submit "Cronoflex's" that meet the following criteria:

- a. Image to be on reverse side that is erasable or fluid removable.
- b. 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.
- c. Exposure must be made using a vacuum-frame contact printer.
- d. 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 one-half 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 half-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:

- a. Transfer type letters and symbols.
- b. Details and notes applied with adhesives (stick-ons).
- c. Drawings made of pieces of different drawing sheet media and taped together in composite form.
- d. 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: 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'

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- 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 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'-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:
· P - Plumbing plan, legend and fixture schedule - same scale as architectural floor plan, with congested areas enlarged as required for clarity.
· Details and equipment schedule - as appropriate for clarity
· M - HVAC plan and legend - 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:

a. 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.

b. 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.

c. 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;

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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.

d. 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 the title and location of the project, schedule of drawings, a project location plan, a vicinity map, legend and list of abbreviations. Sheet G-1 on all projects shall contain as a minimum, the project title, installation name, project number and fiscal year.

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. Appendix I contains vicinity maps for the various Air Force installations.

2.3.3. Location Map. Show location of the project on a small scale location map indicating the general relationship between the new facility and major existing structures and/or streets to facilitate identification of the proposed site. On the location map show the north arrow and highlight the approved project boundaries, the Contractor's equipment yard, the Contractors' entrance to the installation, haul roads, location of the COE Resident/Project office, location and phone numbers of nearest medical facility, location of the BCE office, and the 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. See Plate 15 in Chapter IV.

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:

a. 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.

b. 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.

c. 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".

d. 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.

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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:

- a. Change dimensions to fit modular design.
- b. Change fenestration and other features pertinent to adapt to local climatic conditions.
- c. Modify for compliance with life safety code and handicap criteria.
- d. Change shape and interior arrangement of building as required to conform to site or topographic requirements or tie to existing building.
- e. Provide vestibules when required.
- f. 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 forces, 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.

- a. Increase depth of footings and foundations to depth of frost line.
- b. Redesign footings for local soil conditions.
- c. Add elevation figures to drawings to relate plans to local bench marks.

d. 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.

e. 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:

a. 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. 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, Early Preliminary, Preliminary, or Final submittals must be as accurate as possible based on the design accomplished at that time. These

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estimates shall follow the CSI format IAW the CACES system. 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:

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

b. Egress Sketch. See Chapter III for specific requirements.

c. 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.

d. 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 and Appendix C.

e. 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.

f. Project Book (PB). The A-E shall incorporate the approved PB 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.

g. 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.

h. 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.

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

j. Design Calculations: Calculations shall be computed and checked by separate 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.

k. Review Comments. All review comments generated by all reviewers on the project, annotated by the COE, and responded to by the A-E, shall be included as an appendix to the design analysis.

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1. Other Appendices to the D.A. 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 of 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 breakdowns 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.

TYPICAL DRAWING SET

ELECTRICAL E - 1 thru E - X

FIRE PROTECTION FP - 1 thru FP - X when not Incl. in MECHANICAL

MECHANICAL M - 1 thru M - X

PLUMBING P - 1 thru P - X

STRUCTURAL S - 1 thru S - X

INTERIOR DESIGN ID - 1 thru ID - X Incl. SYSTEMS FURNITURE

ARCHITECTURE A - 1 thru A - X

LANDSCAPING L - 1 thru L - X

UTILITIES U - 1 thru U - X when not Incl. in CIVIL

CIVIL C - 1 thru C - X Incl. LOG OF BORINGS and TOPOGRAPHY

GENERAL G - 1 thru G - X

CHAPTER III

TABLE OF CONTENTS

<u>Section</u>	<u>Subject</u>	<u>Page</u>
1 III-1	Concept Design	
2 III-9	Early Preliminary Design	
3 III-21	Preliminary Design	
4	Final Design	III-33

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

CHAPTER III

SECTION 1 - CONCEPT DESIGN

<u>Paragraph</u> <u>Page</u>	<u>Subject</u>
1.0 III-1	Concept Design Submittal
1.1 III-1	Objective
1.2 III-2	Civil Design
1.3 III-4	Architectural/Structural Design
1.4 III-6	Mechanical Design
1.5 III-8	Electrical Design

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

CHAPTER III

SECTION 1 - CONCEPT DESIGN

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

- Design Analysis
- Schematic Drawings
- Cost Estimate
- Other Items as required by the Scope of

Work

This Chapter will define, by discipline, requirements of the Design Analysis and Schematic Drawings. Format and quality of design analysis and drawings shall be per Chapter II, "Presentation of Data," of this guide. Concept drawings shall include sufficient information to outline the scope of work requirements and to show the general design of the project to approximately the 20 percent stage of completion.

Develop all drawings to a uniform level so that the entire project can be reviewed for conformance with authorized scope and criteria. Include features to depict the minimum required information in accordance with requirements hereinafter. If the size and/or complexity of the pertinent project requires additional information be presented to supplement the narrative description, show such information.

Guidance for preparation of the cost estimate is covered in Volume 2, Cost Estimating, and shall be a Code A or Code B estimate as defined in the scope of work. Standard definitive or other repetitive standard drawings shall be utilized if applicable and available, and only if specified in the scope of work.

1.1. Objective. This phase of design shall establish a fixed design direction for the project by demonstrating the appropriateness of one design solution over at least two (2) other alternatives. The submittal shall provide sufficient information to demonstrate that the users' functional needs and space requirements can be met within the programmed budget and scope of work. Applicable criteria shall be listed, and major design constraints and/or opportunities such as the following addressed:

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over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

a. Identification of any apparent criteria and/or code violation that may occur if project is constructed as presently scoped.

b. Identification of construction interferences, and any required utility outages, including interior heating/cooling, power and lighting.

c. Recommendation of construction phasing, where appropriate.

d. Recommendations for revising the present scope of work to better improve the payback or alleviate any of the problems addressed in paragraphs a. and b. above.

e. Description of site conditions and reasons for site plan as presented. Any information needed to support the A-E's design approach shall be provided in a form appropriate for review.

III-1

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

III-2

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

1.2. Civil Design.

1.2.1. Design Analysis - Narrative/Calculations. The various aspects of the civil design requirements shall be described. The type and extent of the civil features under consideration and the designer's recommendations for their design shall be presented. Calculations shall be provided to justify the recommendations made and shall be consistent with the level of detail of design involved in a concept submittal.

1.2.1.1. Siting. Describe site conditions including existing topographic features and improvements affecting or relating to the proposed work. Address any special or unusual conditions such as former refuse dump area, hazardous or toxic waste problems, potential for flooding, ground instability, rock outcroppings, drainage features, unusual soil conditions, and any contaminated soil or groundwater conditions.

1.2.1.2. Water Distribution System. Develop basic and controlling water demands and show required residual pressures, flows and tentative pipe sizes. Include fire, domestic and industrial average and/or peak demands, as applicable. Show adequacy of distribution system to supply controlling demands mindful that this controlling demand will be primarily dictated by the fire water flow demand and pressure (if applicable). Include information basic to this determination, such as known flow tests and/or computations. If added daily water requirements of project are considerable, state whether the capability of the supply system to meet total requirements has been determined or whether it requires analysis. Water meters will be included in the project design only if determined necessary by the Major Command. Water meters shall be considered where reimbursement to local authorities/agencies is required.

1.2.1.3. Water Treatment. State whether water treatment is required for this project.

1.2.1.4. Sanitary Sewer System. Discuss peak flow and average flow determinations in gallons per hour and day for building connections, individual sewers and force mains from population, measurement, or fixture units, as

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

applicable. Describe the existing system, covering particularly the type, capacity, condition, degree of treatment, present flow and unsatisfactory elements of component parts for major extensions. Describe type of system proposed. Do not specify pipe materials. Provide engineering justification for deleting any pipe material options, such as those which must be deleted due to corrosive conditions.

1.2.1.5. Sewage Treatment. State type of waste involved, degree of treatment required, type of treatment plant proposed, and required effluent quality. Describe receiving stream and anticipated effect of treatment plant effluent. Provide a brief description of units involved including basic data (contributing population, wastewater allowances, etc.) which will be used in sizing units.

1.2.1.6. Storm Drainage and Grading. Discuss proposed drainage design. Basic information shall include design storm criteria, rainfall, and infiltration rates with the basis for their selection, method of computing runoff, times of concentration, ponding effects, if any, and other items affecting design discharges.

III-2

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

III-4

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

1.2.1.7. Roads, Streets, Parking, Open Storage, Hardstands and Sidewalks. Discuss geometric features including widths of traffic lanes, shoulders, parking spaces and walks. Also discuss any required signing and striping.

1.2.1.8. Landscaping. State what general type of landscape treatment exists on the overall installation and in the immediate vicinity of the project. This project's landscaping shall be harmonious with adjacent landscape treatments and vegetative communities. Refer to the Base Design Guide or Base Plant List if available. The theme must consider future long range design continuity, compatibility with user needs, and maintenance constraints. Describe how the proposed landscape design satisfies these requirements. State if an irrigation system is authorized and/or required.

1.2.1.9. Dust and Erosion Control. State proposed type and method of providing dust and erosion control, reasons for selection, extent of area treated, etc. If no treatment is proposed, justify omission.

1.2.1.10. Railroads. State type of service for which railroad track will be provided, anticipated volume and type of traffic, and the ruling grade.

1.2.1.11. Fencing. Discuss any required fencing.

1.2.1.12. Include the Preliminary Geotechnical Report

1.2.2. Drawings. (See Chapter II for scale requirements.)

1.2.2.1. Site Plan. Provide site plan(s) showing new and existing building location, access roads, parking, traffic routes, topography, survey control points, bench marks, drainage, sidewalks and demolition requirements. Show finish floor elevations and finish grades at each building. Show existing site features, topographic features and proposed improvements. The drawings shall indicate the revisions which are to be made to existing topographic features and improvements, roads, drainage facilities, etc. Where drainage facilities are to be provided, the direction of flow and point of discharge shall be indicated by

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

appropriate symbols or notes.

1.2.2.2. Utilities Plan. Show existing utility lines; proposed utility lines with tentative line sizes; points of connection to existing utilities; and any rerouting of existing utility lines.

1.2.2.3. Demolition Plan. Provide a separate demolition plan for all existing site features to be removed.

1.3. Architectural/Structural Design.

1.3.1. Design Analysis - Narrative/Calculations.

1.3.1.1. Architectural Motif. State what general type of architectural treatment exists both on the installation, and in the immediate vicinity of the proposed project. Although selected design features of this structure should be in conformance with those exhibited in existing

III-3

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

III-6

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

structures, the design need not be identical. Motif shall follow the most recent, predominant, existing theme of the installation to insure future long range design continuity. Describe how the design satisfies these requirements.

1.3.1.2. Site Orientation. Adapt the building to the size, shape and orientation of the site to include benefits from natural warming and cooling affects afforded by the site. If setbacks are involved, establish the relevance of setback design provisions. State how location of 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 conventional glazing.

1.3.1.3. Energy Conservation. Describe energy saving ideas/features considered and/or included in the project design. All energy saving ideas/features shall be compared against their effect on construction, maintenance and operational costs. Items to consider include:

- a. Various building configurations
- b. Various building orientations

c. Solar "features", including skylights for electrical lighting reduction; increased thermal insulation over AFR 88-15 minimum requirements; shading by landscaping; walls and roof color; optimum window shading orientation and glazing type; etc. For the purposes of this instruction, passive solar "features" should not be considered as a passive solar "system." Solar systems are addressed in AFR 88-15 and appropriate Air Force Engineer Technical Letters (ETL's). Coordinate with mechanical and electrical designers to insure that the target Energy Budget Figure for the facility being designed is satisfied as a minimum. See current Air Force ETL titled "Energy Budget Figures."

1.3.1.4. Economy of Building Construction. In order to apply life cycle cost effectiveness, economic wall and roof systems should be defined as early as possible in the design effort. Provide economic comparison of three (3)

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

roof and wall systems per AFR 88-15 including details of proposed construction types and an analysis to verify the "U" values per current Air Force ETL are satisfied. Provide a narrative discussing the different systems, anticipated life of the functions to be accommodated, and additional supportive information for the system selected. Coordinate with structural and mechanical designers. At least three (3) structural systems must be evaluated in the wall and roof system analyses.

1.3.1.5. Programmed vs. Computed Floor Area. Gross and net areas shall be computed as indicated in Plate 18, Chapter IV. All enclosed space with an average ceiling height of less than seven (7) feet shall be excluded.

1.3.1.6. Finish Schedules. Provide schedules for proposed exterior and interior finishes (if not shown on the drawings). (See Plates 10, 11, 12 and 13, Chapter IV).

III-4

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

III-8

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

1.3.1.7. Fire Protection Summary. Provide a Fire Protection Detail Summary based on the current editions of the National Fire Protection Association (NFPA) Standards and codes in accordance with AFR 88-15. Include any code and criteria exceptions. For Medical Facilities follow AFR 88-50. The Summary will list applicable NFPA paragraph/code number references as well as "required" and "actual" conditions in design. Provide statement of construction type per AFR 88-15, e.g.: Fire-resistive, protected non-combustible, etc. Provide "means of egress" sketch to show that exit requirements of NFPA are satisfied.

1.3.1.8. Fallout Shelter. State whether a fallout shelter has or has not been provided. If fallout protection is required, state protection factor and number of shelter spaces being provided. See AFR 88-15 and DOD Directive 3020.35 reference 14c.

1.3.1.9. Handicapped Data. Follow the "Uniform Federal Accessibility Standards," (7 August 1984 Federal Register) for purposes of determining handicap requirements.

1.3.1.10. Special Requirements for Addition/Alteration Projects.

1.3.1.10.1. Asbestos. If required by your Scope of Work, perform an asbestos survey to determine the presence of asbestos. Identify and quantify all areas that contain asbestos. Asbestos surveys must be performed by certified Industrial Hygienists. If the project does not contain asbestos, so state. Attach the results of the survey as an appendix to the Design Analysis.

1.3.1.10.2. 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 affect existing life safety. State the building construction types and occupancy classification. Provide "means of egress" sketches to identify existing violations and recommended corrective actions.

1.3.1.11. Type and Method of Construction. State whether the proposed facility is Permanent, Semi-Permanent, Temporary, or Protective per AFR 88-15.

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

1.3.2. Drawings. (See Chapter II for scale requirements.)

1.3.2.1. Floor Plans. Provide floor plan for each floor showing: (a) overall dimensions and dimensions of important elements, (b) functional arrangement.

1.3.2.2. Functional Floor Plan. On occasion, prior to development of a full concept submittal, a functional floor plan submittal will be required. If required by your scope of work, the functional floor plan will be prepared as described below (this plan is not required as part of a normal concept submittal):

a. Provide a single line floor plan identifying each of the functions as outlined in the PB and as discussed at the Predesign conference. Rooms shall be sized and arranged as required by the functional requirements. Exit requirements and column spacing shall be considered.

III-5

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

III-10

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

b. Provide a gross area tabulation for each of the functions and for the total building.

c. Provide a narrative description of the proposed functional floor plan describing the rationale behind the A-E's design decisions.

1.3.2.3. Principal Elevations. Provide a minimum of two principal elevations indicating type of material used. Show exterior mechanical and electrical equipment which affects the appearance of the structure.

1.3.2.4. Roof plan. Provide roof plan indicating valley/ridges/slopes.

1.3.2.5. Sections. Show at least one principal section of the floor and roof framing, suspended ceilings, floor-to-floor heights, floor-to-ceiling heights, concealed or open ducts, relation of fenestration to supporting columns or walls, etc. Show building section, one at entry and one typical for each building, showing room and building height and selected structural system.

1.4. Mechanical Design

1.4.1. Design Analysis - Narrative/Calculations. The various aspects of the mechanical design requirements shall be described. The type and extent of the mechanical features and systems under consideration and the designer's recommendations for their design shall be presented. Calculations shall be provided to justify the recommendations made and must be consistent with level of detail involved in a concept submittal.

1.4.1.1. Energy Conservation. Describe energy saving ideas/ features considered and/or included in the project design. All energy saving ideas/features shall be compared against their effect on construction, maintenance and operational costs. Buildings with high internal loads will require special attention to insure energy efficiency. Use of waste heat to assist in heating domestic water and cooling and heating the building will be considered. Other items to consider include:

a. Various types of HVAC systems (for example,

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

dual duct vs. multi-zone vs. variable air volume; water vs. air-cooled condensers; centrifugal vs. reciprocating vs. absorption chillers, air to air or other types of heat recovery systems) and automatic programming devices to shut off or curtail HVAC systems during periods (nights and weekends) when not required.

b. Utilization of existing central heating and/or cooling systems for the new facility if adequate and economically feasible.

c. Active and Passive solar systems if specifically required by your scope of work. See appropriate Air Force ETL's for analysis requirements.

III-6

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

III-12

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

Coordinate with architectural and electrical designers to insure that the target Energy Budget Figure for the facility being designed is satisfied as a minimum. See current Air Force ETL titled "Energy Budget Figures." Coordinate specifically with the architectural designer on heat transmission coefficient (U-value) determination.

1.4.1.2. Design Temperature Parameters. State indoor and outdoor design temperatures for heating and cooling, proposed "U" factors for walls, roofs, floors, etc., personnel load, equipment heat release (if any), outside air or ventilation requirements, and any other special conditions as required by AFR 88-15.

1.4.1.3. HVAC Systems. State type of heating plant and justification for its selection including the capacity, operating pressure and temperature. For ventilating system, state whether it is a gravity or mechanical system. State requirement for outside air, i.e., number of air changes per hour, CFM per person, or other factors. The use of air conditioning and evaporative cooling shall be in accordance with guidelines in AFR 88-15 and applicable Air Force ETL's. State system proposed for use.

1.4.1.4. EMCS. (Energy Monitoring & Control System). Indicate if base-wide EMCS is existing or planned. For existing EMCS identify system in operation and to what extent interfacing will be provided for this project. Current AF policies require the EMCS be terminated at the Data Terminal Cabinet (DTC) for new buildings at bases with an existing EMCS. The actual connection to the Base-Wide System will be done at a later date and shall therefore not be a part of this contract. If a base-wide EMCS is non-existent and not planned, describe feasibility of locally controlled systems for the equipment.

1.4.1.5. Fire Protection. Coordinate with the civil and architectural designers and provide a description of the type of fire protection/suppression proposed for the project. Coordinate with the civil designer on available water flow and pressure for any proposed fire sprinkler systems.

1.4.1.6. Fuel. State type, source and metering arrangements. For natural gas identify if firm or

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over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

interruptible. Indicate adequacy of existing distribution system(s) and excess capacity, if any. State type of stand-by fuel for interruptible gas.

1.4.1.7. Specialty Items.

1.4.1.7.1. Cold Storage Projects. For cold storage projects, indicate room holding temperatures and commodities to be held in cold storage.

1.4.1.7.2. Clean Rooms. Specify cleanliness required and describe system selection and design proposed to achieve compliance.

1.4.1.7.3. Hazardous Waste. Specify EPA approved materials, equipment and systems proposed for use.

III-7

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

III-14

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

1.4.2. Drawings. Provide mechanical site plan showing items such as steam or hot water lines from a central plant, fire lines, storage tanks, fire pumps, etc. If a functional floor plan is submitted, make sure the mechanical room is of sufficient size to accommodate anticipated equipment, piping, valves, etc. and servicing and replacement of same. Show mechanical equipment proposed for exterior location. See Chapter II for scale requirements.

1.5. Electrical Design.

1.5.1. Design Analysis - Narrative/Calculations. The various aspects of the electrical design requirements shall be described and the type and extent of the electrical features and systems under consideration and the designer's recommendations for their design shall be presented. Calculations shall be provided to justify the recommendations made and shall be consistent with the level of detail involved in a concept submittal.

1.5.1.1. Energy Conservation. Describe energy saving ideas/ features considered and/or included in the project design such as various types of lighting systems, automatic programming devices to shut off lights during periods when not needed, switching in the lighting layout to allow occupant control of areas and improvements to base electrical power factors by use of capacitors or synchronous equipment. All energy saving shall be compared against their effect on construction, maintenance and operational costs. Coordinate with architectural and mechanical designers.

1.5.1.2. Circuits. Provide electrical characteristics (phase, voltage, and number of wires) of primary and secondary circuits to be utilized in the project.

1.5.1.3. Primary and Secondary Voltage. State basis for selection of primary and secondary distribution voltages, and overhead or underground construction. Include justification for underground line.

1.5.1.4. Tempest/EMP shielding. For TEMPEST/EMP shielding, if included in project, include a statement that the attenuation requirements for TEMPEST and for EMP will be provided in those rooms or areas described in project book

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

in accordance with DM 4-805-4 (See Chapter V).

1.5.1.5. Communications Prewiring. Describe existing communications system at or near building site and any changes necessary to accommodate new project communication requirements. Include discussion of local area or wide area network requirements, if applicable.

1.5.1.6. Other Systems. Briefly describe need and basis for selection of lightning protection, cathodic protection, intrusion detection, Master Antenna Television (MATV), central sound and fire alarm systems. Include discussion of how these will be tied into existing systems (if applicable).

1.5.2. Drawings. 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. See Chapter II for scale requirements.

III-8

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but there's always enough time to do it
over."

III-16

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

CHAPTER III (cont.)

SECTION 2 - EARLY PRELIMINARY DESIGN

<u>Paragraph</u> <u>Page</u>	<u>Subject</u>
2.0 III-9	Early Preliminary Design Submittal
2.1 III-9	Objective
2.2 III-10	Design Analysis - General Requirements
2.3 III-10	Drawings - General Requirements
2.4 III-10	Civil Design
2.5 III-12	Landscaping Design
2.6 III-12	Architectural Design
2.7 III-14	Structural Design
2.8 III-16	Mechanical Design
2.9 III-18	Electrical Design

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

CHAPTER III (cont.)

SECTION 2 - EARLY PRELIMINARY DESIGN

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

- Design Analysis
- Drawings
- Outline Specifications
- Cost Estimate
- Draft Environmental Permit Matrix (if required by Instructions for Field Personnel Report)
- 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 early 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, Vol. 3. Requirements of the Cost Estimate are provided in the A-E Guide, Vol. 2. Refer also to Chapter II, "Presentation of Data" of this Guide for design analysis format, drawing format, and quality requirements. See appropriate Appendix of this volume for Environmental Permit Matrix and Engineering Considerations and Instructions for Field Personnel Report requirements.

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

- a. Show the User (customer) how the proposed design satisfies his functional and special technical needs, including the minimum requirements stated in this section.
- b. Show all Reviewing Agencies that (1) all previous review

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but there's always enough time to do it over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

comments have been appropriately addressed, (2) the designer's approach to solution of technical aspects of the project is sound and (3) he intends to utilize appropriate controlling technical criteria (such as AFR's, AFM's, ETL's, Guide Specifications, etc.).

c. Provide an outline specification, and drafts of any A-E prepared specifications due to lack of COE guide specification(s) on subject(s).

d. Provide a current estimate of cost, commensurate with the stage of design. Prepare in the form of an Early Preliminary Estimate (Type B). Base the pricing upon the anticipated midpoint date of construction obtained from the COE Project Manager.

III-9

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but there's always enough time to do it
over."

III-19

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

e. This submittal is heavily oriented toward creating the proper architectural treatment and establishing the design of the basic structural, mechanical and electrical systems based on economic analyses. It will show the District that the project has been sufficiently thought-out to enable design to proceed.

2.2. Design Analysis - General Requirements. Build upon the narrative and calculations developed for the concept submittal to satisfy the Early Preliminary submittal requirements. In addition, address the following:

a. Function. Describe the basic functional objective of the proposed facility and its estimated functional life. Discuss your solution to user required room adjacencies and project siting as a minimum.

b. Personnel and Equipment. Describe the range and number of civilian/military personnel and equipment to be accommodated.

c. Criteria. For each discipline, provide listing of all criteria used to establish the design, including reference to Design Instructions, Project Book, appropriate criteria chosen from Chapter V of this manual, and criteria prescribed by the scope of work and/or conference minutes. Summarize and enumerate all deviations from applicable criteria such as military construction criteria, building code, fire codes, life safety code, OSHA, and COE safety manual. Identify deviation, citing source and paragraph, what the criteria requires and nature of deviation, followed by authority granting waiver and date of waiver. Indicate if waiver has not been granted.

d. Economic Summary. For each discipline as hereinafter described provide a description of the economic factors influencing the choice of basic materials, equipment or systems, and an economic analysis which justifies the selection made over other alternatives. (For architectural, structural and mechanical features, a minimum of three (3) alternatives will be analyzed including the selected one.) These economic studies shall consider the initial costs and costs incurred over the projected life of the facility.

2.3. Drawings - General Requirements. Prepare the early

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

preliminary drawings to depict the required information in accordance with requirements hereinafter. If the size and/or complexity of the project requires additional information be presented to supplement the narrative description, show such information. When Office of the Chief of Engineers (OCE) Standard or Site Adaptive Plans are involved, include sufficient standard or site adaptive drawings to permit early preliminary review; these plans shall not be revised other than as required for seismic and site adaptation unless prior approval is obtained. Under no circumstances will an OCE title block be put out or replaced by a Sacramento District title block. (See Plates 4 and 5, Chapter IV.) They are Standard Drawings and any replacement of the title block would destroy their character as a Standard. See Chapter II for a complete discussion of Standard and Site Adaptive drawings.

2.4. Civil Design.

2.4.1. Design Analysis - Narrative/Calculations.

III-10

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

III-21

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

2.4.1.1. Siting. Discuss reasons for facility orientation. Address such factors as prevailing winds, existing structures, adjacent site conditions, solar loads, clearance restrictions and future development areas. Generally state why the building is sited as proposed if it has not been sited by the user.

2.4.1.2. Water Distribution System. Indicate whether additional fire hydrants are needed (see AFM 88-10 Chapter 5/TM5-813-5) and describe the proposed location of each hydrant.

2.4.1.3. Sanitary Sewer System. Where lift stations are required, state type of construction and tentative pump type and size. Indicate controlling elevations and compliance with AFM 88-11, Volume 1/TM 5-814-1 for minimum slopes and sizes. Confirm adequacy of existing sewers to carry additional flow. Discuss nature of industrial wastes. Unless quantity of flow is small and disposal will be by tile field or filtration and evaporation from a pond, include need for data concerning State requirements for pollution control. Provide permit applications as required.

2.4.1.4. Sewage Treatment Plant. Provide a complete description of the nature of waste involved, degree of treatment required, type of treatment plant proposed and anticipated effluent quality.

2.4.1.5. Storm Drainage and Grading. Discuss any changes in the proposed drainage design.

2.4.1.6. Corrosion Mitigation. For each new utility system and/or metallic structure that is buried, submerged, or in contact with either the ground or a substance which may promote corrosivity, a cathodic protection system shall be designed by the A-E. Coordinate with the electrical designer.

2.4.1.7. Roads, Streets, Parking, Open Storage, Hardstand and Sidewalks. The pavement design sections will be furnished by the District in a Geotechnical Report. This report which normally includes a Foundation Report and Pavement Design shall be referenced here and a copy included as an appendix to the Design Analysis.

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

2.4.1.8. Fencing. Describe type and height of fencing and gates, including features such as outriggers, barbed wire or tape and gate controllers.

2.4.1.9. Railroads. State type of service for which railroad tracks will be provided, anticipated volume and type of traffic, and the ruling grade. Discuss proposed type, source, and thickness of ballast, weight of rail, source, treatment, and dimensions of proposed ties. Identify any special subgrade compaction requirements; types of track accessories required, such as turnouts and switches, and the name of the operating agency.

2.4.1.10. Demolition. Describe the extent and type of any demolition required for this project. Discuss if the demolition will involve any hazardous materials such as asbestos and/or PCB's.

III-11

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

III-23

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

2.4.1.11. Hazardous and/or Toxic Waste. Describe the extent of any known or suspected hazardous or toxic waste problems associated with the site, and the remedial measures proposed.

2.4.2. Drawings. (See Chapter II for scale requirements.)

2.4.2.1. Soil Explorations. If available at this stage of design, provide drawings showing the boring locations and logs of borings which will be incorporated into the drawing set by the A/E. (See Plate 3, Chapter IV for instructions on completing the title block for these drawings.)

2.4.2.2. Demolition Plan. Show demolition requirements.

2.4.2.3. Site Plan. Show the facility superimposed on existing topography and reference the source of survey data. Provide sufficient horizontal and vertical control to clearly indicate the proposed siting of the facility.

2.4.2.4. Utility Plan. Show existing and proposed fire hydrants, fencing, and petroleum, oil and lubricants (POL) storage tanks.

2.5. Landscaping Design.

2.5.1. Design Analysis - Narrative/Calculations. See Concept submittal requirements. Also, discuss any unusual climatic or soil conditions or other local factors which may affect the design or selection of plant species.

2.5.2. Drawings. Show general site layout, and delineate all landscape treatment, including turf areas, shrub beds, tree locations, rock or gravel-covered areas, and areas for erosion control. Identify existing features that are not to be disturbed by construction activities. If an irrigation system is authorized, define areas to be watered.

2.6. Architectural Design.

2.6.1. Design Analysis - Narrative/Calculations.

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

2.6.1.1. Equipment Summary: Provide a tabulation of all equipment in the project to show the following: (If none, so state for each subparagraph below.)

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

(2) Government-Furnished - Contractor Installed (GF-CI).

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

2.6.1.2. Occupational Safety and Health Act (OSHA): Designs shall 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 AFR 88-15, Technical Manuals (TM's) and Corps of Engineers Guide Specifications (CEGS). Any conflicts discovered shall be brought in writing to the attention of the PM for resolution.

III-12

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

III-25

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

2.6.1.3. Color Boards. Color boards shall be prepared in accordance with the following:

a. Color Boards shall be submitted in a standard 8-1/2" x 11" three-ring binder. Number of color boards shall be as called for in the project scope. Where special finishes such as carpet or pre-finished textured metal panels are required, samples not less than 8" x 10" shall be submitted with the boards.

b. Actual material samples shall be displayed showing color, texture, pattern, finish, thickness, etc., for all appearance related 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. Color shall be labeled with generic color names.

c. The color board(s) shall consist of all samples mounted on a mat board or equivalent for structural stability.

d. Project title and location (base) shall occur in the lower right-hand corner of each board.

2.6.1.4. Interior Design. If a comprehensive interior design is required by the scope of work, DTL 1110-4-20 "Comprehensive Interior Design Requirements" will be furnished by the COE PM. See Appendix G.

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

a. 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.

b. Building separation distances and

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

access thereto, based on paragraph 2.6.1.5.a. above, and Mil Handbook 1008.

c. 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.

d. 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.

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

III-13

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

III-27

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

f. Operations involving use or storage of flammable and explosive liquids and gases, or accumulation of dusts: Describe type of electrical equipment, lighting fixtures, ventilation and other related fire protection features required to minimize hazard(s).

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

h. "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.

i. 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 Base Civil Engineer. Coordinate with your COE PM.)

2.6.2. Drawings. (See Chapter II for scale requirements.)

2.6.2.1. Floor Plan for each floor showing: 1.) overall dimensions, 2.) functional arrangement, 3.) type of occupancy of all areas, 4.) interior colors and finishes and exterior colors in tabular form. (Plates 10, 11, 12 and 13, Chapter IV.) 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.

2.6.2.1.1. Draw all major equipment to scale.

2.6.2.2. Elevations: Provide an elevation of all four (4) building sides as a minimum. Show exterior mechanical and electrical equipment which affects the appearance of the structure.

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

2.6.2.3. Building Section: Provide at least two (2) complete building cross sections at 90 degrees to each other showing floor and roof framing, suspended ceilings, floor-to-floor heights, concealed or open ducts, relation of fenestration to supporting columns or walls, etc. Due to special needs, other primary transverse or longitudinal sections may be shown.

2.6.2.4. 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.

2.7. Structural Design.

2.7.1. Design Analysis - Narrative/Calculations.

2.7.1.1. Foundation Design: Provide a statement referencing the Geotechnical Report which will be attached as an Appendix to the completed Design Analysis. Regardless if the Geotechnical Report is provided

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

by the COE or the A-E, it will present factual data concerning corrosion control and soil bearing capacities for the various founding methods and may include recommendations for the method or procedure required. It should be recognized that there may be several methods of providing structural support that are acceptable. It is the responsibility of the A-E to select the most appropriate type of founding for each project based on overall economic considerations. The designer will describe the proposed foundation treatment including the depth of excavation, disposition of excavated material, whether in-place foundation will be compacted, whether compacted backfill will be utilized as foundation, whether frost governs the depth of foundation, and whether there is a need for drainage or a vapor barrier. State reason if foundation selected differs from the Geotechnical report.

2.7.1.2. Design Loadings (AFM 88-3, Ch. 1/TM 5-809-1): 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 AFM 88-3, Ch. 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. 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:

a. Major Alterations. Any building for which the cost of renovations or repairs, exclusive of seismic strengthening, exceeds 25 percent of the replacement cost of that building, must be modified to resist the appropriate level of earthquake forces. An appropriate

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

level of earthquake force is defined as that level prescribed in the latest edition of AFM 88-3, Chapter 13. The foregoing does not preclude the use of site specific response spectra if already available, or if deemed appropriate for critical facilities.

b. 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.

c. 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 Air

III-15

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

III-31

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

Force prior to incorporation into the project bid documents.
A minor alteration project's design documentation shall include routine structural narrative and calculations addressing structural modifications.

2.7.1.3. Working Stresses: Indicate selected stress where options are provided. Indicate any deviations from prescribed working stresses, together with justifications.

2.7.1.4. Structural System: Describe the selected structural framing system and the basis for the selection. Provide comparative, informal cost estimates for the system selected versus a minimum of two (2) other alternatives. Coordinate seismic design of anchors or restraints for mechanical and electrical equipment with designers for those systems.

2.7.2. Drawings. (See Chapter II for scale requirements.)

2.7.2.1. 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.

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

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

2.8. Mechanical Design.

2.8.1. Design Analysis - Narrative. Coordinate with architectural and electrical designers on energy conservation and fire protection analysis requirements.

2.8.1.1. Air Conditioning System. Briefly discuss temperature control system using AFR 88-15 requirements and appropriate Air Force ETL's. Direct Digital Controls (DDC) have not yet been approved by the Air Force and shall not be used except for equipment with built-in DDC controls.

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

2.8.1.2. Heating System. State type of heating system, i.e., forced warm air with direct fired furnace or hot water coil, forced hot water or steam with direct fired furnace or hot water coil, forced hot water or steam with direct radiation or unit heaters. State type of heat distribution system outside of buildings, i.e., steam, high temperature hot water, or hot water system and whether it is located above-ground or underground. State classification of underground system per CEGS 15705 (see paragraph on system requirements). Include soil investigations and survey, and type of conduit. Describe type of piping for heating system, insulation of, and if concealed or exposed.

2.8.1.3. Ventilating System. State whether it is a gravity or mechanical system. State requirement for outside air and basis for determination of quantity, i.e., number of air changes per hour, CFM per person, or other factors.

III-16

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

III-33

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

2.8.1.4. Evaporative Cooling Systems. Systems shall be designed in accordance with AFR 88-15. Note whether single or multi-stage process.

2.8.1.5. Other Systems. Include determination and capacity of compressed air, vacuum, or other service piping systems.

2.8.1.6. For cold storage projects, show approximate equipment sizes.

2.8.1.7. Fire Protection Analysis. See Architectural Section for requirements.

2.8.2.Design Analysis - Calculations.

2.8.2.1. Economic Comparison. When specific Air Force criteria does not indicate a preferred method for the various mechanical systems contained in the project, the designer shall consider three (3) alternative systems and base the final selection on a Life Cycle Cost Analysis in accordance with AFR 88-15.

2.8.2.2. HVAC Systems. Include heat gains and losses showing method for handling diversities in the air conditioning load. Provide calculations to verify equipment sizing. Complete draft of Air Force Form 108, "Air Conditioning Load Estimate", and include in Design Analysis. (See Plates 21 and 22 in Chapter IV.)

2.8.2.3. Plumbing Systems. Provide plumbing calculations necessary to determine number of fixtures and hot and cold water requirements. List types of fixtures per Federal Specification WW-P--541 (outfit series) and any others required for the project. State male and female building occupancy. Include description of domestic water heating and storage equipment including capacity, materials, piping types, preliminary pipe sizes and insulation requirements.

2.8.2.4. Energy Budget Figure. Provide Energy Budget Figure calculations in accordance with AFR 88-15, and appropriate Air Force ETL.

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

2.8.3. Drawings. (See Chapter II for scale requirements.)

2.8.3.1. General. Prepare floor plans, sections and details showing major heating, ventilating, and air conditioning equipment layout (chillers, refrigeration compressors, boilers, pumps, condensers or cooling towers, air handling units, fans), air distribution duct layout (may be single line), hoods and other major equipment items required for the facility. Design procedure to be used for support and anchorage or piping and mechanical equipment shall be as required in AFM 88-3 CH 13 (TM 5-809-10), including Section A for essential buildings. Show location of the Data Terminal Cabinet (DTC) for the EMCS (normally in the mechanical room).

2.8.3.2. Plumbing. Show fixture layout, floor and area drains, and plumbing equipment layout (hot water generator, storage tanks, pumps, air compressors, etc.). Provide legend, symbols and abbreviations lists.

III-17

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

III-35

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

2.8.3.3. Fire Sprinkler Systems. Do not show the layout of the sprinkler/suppression system piping and heads on the plans. (The contractor will design the system and provide shop drawings during the construction phase.) Show the riser location(s) and details, and add note at the top of the riser(s) stating "To Sprinkler System".

2.8.3.4. Mechanical Room. Provide mechanical room(s) sufficiently sized to allow for removal of tubes from boilers, chillers and condensers, and for removal of coils and filters from air handling units for maintenance or replacement. To save 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. Piping and valves shall be arranged so that they will not prevent personnel movement within the mechanical room(s). All valves shall be located for ready accessibility. Where necessary, catwalks or permanent ladders shall be furnished for operating and servicing valves and headers. Gages and thermometers shall be of such size, scale and location as to be easily read by operating personnel. If an enclosed outdoor mechanical equipment yard is to be used provide for adequate air movement via openings in CMU walls, screened doors, louvers, etc.

2.8.3.5. Equipment Sizing. In concert with paragraph 2.8.3.4. above, prepare and submit a study of floor space in the mechanical room(s) (including mechanical equipment yards) and roof space on roof plan by selecting the largest and heaviest of three competing makes of each piece of equipment to be installed. Allow ample room for servicing and replacement of equipment. The mechanical designer shall inform the structural designer of the selections used so that the supporting roof structure can be properly designed. Provide catalog cuts of selected equipment in the design analysis.

2.9. Electrical Design.

2.9.1. Design Analysis - Narrative/Calculations.

2.9.1.1. Electrical Load Analysis. Include estimate of total connected load and of demand factors, diversity and resulting kilowatt demand. Provide breakdown of the

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

estimated connected and demand load to 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 power receptacles being provided to energize special equipment. State power factor and size the transformers based on the estimated loads. Indicate voltage drop of service entrance and voltage drop basis for feeders and circuits.

2.9.1.2. Lighting. Describe the proposed standards of design for lighting intensities and the type of lighting fixtures for all interior and exterior areas. Lighting intensities shall be IAW IES Lighting Handbooks unless modified by AFR 88-15. Describe provisions for motor control, standby electric power, grounding, communications, television, and lightning protection, as applicable. Discuss special fixtures for hazardous areas (if applicable).

III-18

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

III-37

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

2.9.1.3. Power Supply. Describe electrical characteristics of power supply to the base, or portion thereof involved in this project, including circuit interrupting requirements and voltage regulation. Verify the adequacy of the existing power supply at the point of take-off. If power source is not adequate, state measures proposed to correct the deficiency. If a new power source or local generation is required, discuss the various schemes and submit cost comparisons for the alternatives.

2.9.1.4. Fire Alarm. Discuss means for transmission of fire alarm signal (if applicable).

2.9.1.5. System Control. Discuss special control, i.e., generator paralleling, switchgear remote control, telemetering, central supervisory control (if applicable).

2.9.1.6. Grounding. Discuss special grounding requirements, i.e., for PMBL's, electronic labs, security communications areas, data processing and TEMPEST/EMP enclosures (if applicable).

2.9.1.7. Hospital Designs. Discuss hospital electrical criteria per NFPA, AFR 88-15, AFR 88-50, and TM 5-838-2 (if applicable).

2.9.1.8. Seismic Considerations. State that support and anchorage design for electrical equipment in seismic areas shall be in accordance with AFM 88-3 Ch 13/TM 5-809-10.

2.9.1.9. Raised Floor Systems. When raised floor systems are required, state that all stanchions and other metal parts of the raised floor shall 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.

2.9.1.10. TEMPEST/EMP Shielding. State the frequency spectrum for TEMPEST/EMP protection. Maximum spectrum/attenuation requirements for TEMPEST/EMP shall be in accordance with current DM 4-805-4 (see Chapter V). On Tempest, verify if low level or high level signal Limited Exclusion Area (LEA) design.

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

2.9.1.11. Cathodic Protection. Discuss Cathodic Protection systems applied to all buried or submerged ferrous piping, fittings, tanks and related facilities. See current Air Force ETL on subject.

2.9.1.11.1. Fire Protection. See Architectural for fire protection analysis requirements.

2.9.2. Drawings. (See Chapter II for scale requirements.)

2.9.2.1. Exterior Electrical Site Plan. Include the following:

- a. Show existing and new electrical lines, both overhead and underground, properly identified.
- b. Show removals and relocations, if any.

III-19

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

III-39

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

c. Indicate electrical characteristics, voltage, phase, conductor size, etc.

d. Show new construction and location of major pieces of electrical equipment such as transformers, switchgear, etc.

e. Indicate the service to the facility and whether it is overhead or underground.

2.9.2.2. Interior Electrical. Provide the following:

a. Floor plans. Show the proposed locations of all major items of electrical equipment, including vaults, transformers, equipment rooms, switchgear, motor control centers, distribution panels, telephone terminal cabinets, and power and lighting panelboards. Coordinate space required for maintenance and future expansion with mechanical drawings and insure that National Electrical Code work space requirements are met.

b. Partial Lighting Layouts. Show a partial layout of typical lighting in the building indicating proposed fixtures and spacing. Locate exterior lighting on plans when applicable. Lighting intensities shall be based upon the requirements of AFR 88-15 and applicable ETL;s, I.E.S. Lighting Handbook, and criteria as applicable.

c. Single-line diagrams (not riser diagrams). Provide for all interior distribution systems. Diagrams of high and low voltage interior electrical distribution and communication systems shall show all of the important features, such as the following:

- (1) Auto transfer switches.
- (2) Emergency generators.
- (3) Emergency systems.
- (4) Major subpanels.

Show that the power to the Fire Alarm Control Panel is

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

connected ahead of the main.

d. Riser Diagrams. Show the proposed riser diagram. Sizes of all conduits, wires, cables, panels, etc. need not be included.

e. Telephone/Communications Plan. Show location and routing of nearest point of service for telephone to the Telephone Terminal Board.

f. TEMPEST/EMP Shielding Penetration Schedule. Prepare preliminary TEMPEST or EMP shielding penetration schedules for both mechanical and electrical penetrations.

g. See AFR 88-15 for conductor requirements. Do not specify "copper only" for bussing and/or conductors on the drawings.

III-20

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

III-41

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

CHAPTER III (cont.)

SECTION 3 - PRELIMINARY DESIGN

<u>Paragraph Page</u>	<u>Subject</u>
3.0 III-21	Preliminary Design Submittal
3.1 III-21	Objective
3.2 III-22	Design Analysis - General Requirements
3.3 III-22	Drawings - General Requirements
3.4 III-22	Civil Design
3.5 III-26	Landscaping Design
3.6 III-26	Architectural Design
3.7 III-27	Structural Design
3.8 III-29	Mechanical Design
3.9 III-29	Electrical Design

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

CHAPTER III (cont.)

SECTION 3 - PRELIMINARY DESIGN

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

- Design Analysis
- Drawings
- Outline or Draft Specifications (See below)
- 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 Sections 1 and 2 in the Preliminary design documents whether or not concept and/or early preliminary submittals were 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, Vol. 3. Requirements of the Cost Estimate are provided in the A-E Guide, Vol. 2. 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.

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

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

b. 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 AFR's, AFM's, ETL's, Guide Specifications, etc.) are being adhered to. Justification

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

for non-compliance with criteria must be provided in the Design Analysis.

c. Provide an outline specification (or draft specifications and marked-up guide specifications if called for in scope of work), and drafts of any A-E prepared specifications due to lack of COE guide specification(s) on subject(s).

d. Provide a current estimate of cost, commensurate with the stage of design. Prepare in the form of a Preliminary Estimate (TYPE B). Base the pricing upon the anticipated midpoint date of construction obtained from the COE Project Manager.

III-21

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

III-44

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

e. This submittal shall verify that proper structural, mechanical and electrical systems are being utilized and that the architectural treatment selected is appropriate. The documents, in general, shall verify that the project has been sufficiently coordinated among design disciplines and thought out to proceed to completion with no major changes in design.

3.2. Design Analysis - General Requirements. Expand upon and/or modify the narrative and calculations developed in the Concept and/or Early Preliminary submittals, as outlined in Sections 1 and/or 2, to satisfy the Preliminary Submittal requirements.

3.2.1. Future expansion. Where projects 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.

3.3. Drawings - General Requirements. Prepare the preliminary drawings to working drawing level to support the information developed in the design analysis, bearing in mind that the design analysis and the preliminary drawings are complementary and that information clearly and completely contained in one need not be repeated in the other.

3.3.1. The project features should not be combined on a minimum number of drawings, but rather, drawings should be partially filled to allow for additional details required for project (final) drawings. If the size and/or complexity of the project requires additional information be presented to supplement the narrative description, show such information.

3.4. Civil Design.

3.4.1. Design Analysis - Narrative. Expand upon the discussion of civil features that was presented in the concept/early preliminary submittals to include the items described below as applicable to the project.

3.4.1.1. Siting. See Early Preliminary (E.P.) submittal requirements.

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over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

3.4.1.2. Water Supply. Include the following:

a. Provide recommended solution to any previously identified water supply problems.

b. Give basic information such as population, capacity factor, per capita allowances, industrial and irrigation requirements, and fire demands.

c. To the extent required for project purposes, provide information on type, condition, and adequacy of existing units such as wells, pumps, reservoirs, etc., and current water use. If these items have already been described in an existing report, give summary statement and appropriate reference. For new sources, include alternatives such as wells and surface supplies. Provide an explanation of factors affecting choice of location, type, diameter, depth, and important related characteristics.

III-22

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

III-46

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

d. In describing proposed work, include functional design concepts basic to selection of unit type, construction, economy of operation, controls, etc. Provide statement of preliminary sizes and capacities of major components, any critical elevations or dimensions, and essential related items as estimated from preliminary calculations.

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

3.4.1.3. Water Distribution. For service lines, distribution main extensions and new distribution systems, state the selected pipe sizes, state the proposed friction coefficient, approximate controlling elevations, special material requirements and any special features of the design such as pressure reducing or regulating valves as determined from preliminary calculations. Also discuss the requirements for pressure release and vacuum relief valves.

3.4.1.4. Water Treatment. Where water treatment is included in the project, the designer shall provide a copy of the water analysis and describe the elements of the design including the capacities and number of units, monitoring equipment and controls. The alternatives considered and the reason for selecting the design over the alternatives shall be discussed demonstrating how the design will correct the objectionable characteristics of the water.

3.4.1.5. Sewerage. Include the following:

a. Sanitary Sewer System: See Early Preliminary submittal requirements.

b. Lift Stations: Develop required size and capacity for any required lift stations.

c. Sewage treatment: Where waste treatment is included in the project, explain the degree of treatment required to meet the applicable discharge standards. A complete description of the nature of the waste shall be

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over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

included. Describe the elements of the design including the capacities and number of units, monitoring equipment and controls. The alternatives 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 shall be described, and in the case of land treatment, a soil testing program shall be developed and described.

3.4.1.6. Drainage: See Early Preliminary submittal requirements.

3.4.1.7. Grading: Describe the grading plan and the controlling slopes which will be used in the design.

III-23

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

III-48

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

3.4.1.8. Roads, Streets, Parking Areas, Open Storage Areas, Hardstand Areas, and Sidewalks: Provide specific data relating to the design such as type, volume, and composition of traffic; vertical and horizontal controls, and class and category of road or street. Discuss handicap parking requirements.

3.4.1.9. Fencing: See Early Preliminary submittal requirements. In addition, describe the gates, and all fencing features such as outriggers, barbed wire or tape and controllers.

3.4.1.10. Dust and Erosion Control: See Early Preliminary submittal requirements.

3.4.1.11. Railroads: See Early Preliminary submittal requirements.

3.4.1.12. National Pollution Discharge Elimination System (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 (See Appendix C, Environmental Considerations). Excepted from this requirement are small drainage storage facilities where no separate permit is issued.

3.4.1.13. 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 Design Analysis. If no changes are required to the analysis, the designer shall include this conclusion in the Design Analysis.

3.4.1.14. Airfield Pavements: The District will furnish the pavement section design consisting of a brief description of foundation explorations, materials investigations, field tests, a statement of values used in pavement design, and basis for selection of pavement sections.

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

3.4.2. Design Analysis - Calculations.

3.4.2.1. Water distribution and service lines.

Furnish the flow requirements, line sizes, friction factors, head loss, water velocities, and line pressures for each pipe material option . Provide fire flow test data or other measurements upon which the calculations are based. Show calculations demonstrating the ability of the water distribution and service lines to deliver water at the required pressure and quantity.

3.4.2.2. Water and Sewage Treatment: List all criteria used for the design of each treatment process and operations. Furnish all calculations showing the design of the processes and operations including the hydraulic and organic loading. Provide a hydraulic profile of the treatment plant.

3.4.2.3. Sewage Collection: Use the most conservative value based on the population or fixture unit method for computing expected flows. Show peak and average expected or measured flows and any factors used in estimated flows. Provide the flows, sizes, slopes and velocities of each line segment.

III-24

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

III-50

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

Required velocities will be based on average and peak flows, not pipes flowing full (See AFM 88-11, Vol. 1/TM 5-814-1). In addition, for lift stations show required head, volume of wet well, cycle times at peak and average flows, and pump controls.

3.4.2.4. Storm drainage: Show all the calculations used for determining the design flows and pipe sizes (including all pipe material options). List rainfall intensity, return period, concentration times for each drainage area and the infiltration factors used. Provide an analysis of each new culvert and of existing culverts which are used in the design. Verify the adequacy of the storm drainage system for the project area. Show the principal water courses and location, size and invert elevation of existing and proposed new drainage facilities including surface ditches, storm sewers and culverts. Provide drainage area maps for systems that drain into or through the project area.

3.4.2.5. Roads, Streets, Parking, Open Storage, Hardstands and Sidewalks. Show design calculations including selection of design wheel loads, material, and type of construction and class of each type of paving. In cases where the design was performed by the District, it is sufficient to append a copy of the "Foundation Report and Pavement Design" or "Geotechnical Report" (prepared by the District) to cover the items in the report. Include all calculations for curbs, alignment, intersection sight distances, stopping and passing sight distances and superelevation.

3.4.2.6. Utility Trench Design. 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 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, shall be included in the

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

supporting data of the trench design. The deletion of any 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 any pipe option must also be narrated in the Design Analysis. Since controlled compaction is required during construction, hydraulic consolidation of bedding or (initial or final) backfill material is not to be allowed. Pipe thrust block design shall be based upon measured or calculated pressures, the foregoing soils data, and approved design methodology as presented in AFM 88-10, Volume 5, Appendix C/TM 5-813-5, Appendix C. Calculations shall be provided in the Design Analysis.

3.4.3. Drawings.

3.4.3.1. Demolition Plan. Provide thicknesses of slabs to be removed and show sufficient dimensioning to properly locate the materials to be removed. Clearly show the full extent of AC pavement to be removed, show all utility lines needing removal, and the sizes of all trees and other objects requiring removal.

III-25

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

III-52

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

3.4.3.2. Grading and Paving Plan: Show new grading contours superimposed on existing topography. Indicate via symbols the different types of paving materials used and show new and existing pavements differently, per Standard Detail S-4, sheet 116 of the Standard Details for Utilities, Foundation, Paving and Railroads.

3.5. Landscaping Design:

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

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

- a. Show proposed special design features such as flagpoles, raised planters, benches, trails and special paving treatments.
- b. A plant schedule listing both the botanical and common names of species to be used.
- c. If an irrigation system is required, provide an irrigation plan showing connection to water service, the main and branch lines, valves and, if an automatic system, the controller location(s).

3.6. Architectural Design.

3.6.1. Design Analysis - Narrative/Calculations. Expand discussion of subjects initiated in earlier submittals and include discussion of the following as applicable to the project:

3.6.1.1. Space Planning. Discuss the following as applicable to the project:

- a. Organization of functional spaces to establish workable adjacency relationship.
- b. Building layout to establish convenient circulation flow for materials, equipment, services and people.

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

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

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

e. Interior parking and service areas.

f. Signage; directional, informational and motivational.

3.6.1.2. Physical Security. Discuss required lock and keying, intrusion detection system, audible and visual alarms (coordinate with electrical designer) restricted access areas, interior guard/canine support and any required interface with local authorities.

III-26

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

III-54

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

3.6.1.3. Tempest/EMP Shielding. Discuss architectural features necessary to insure required shielding attenuation values are not compromised, especially details required for openings and penetrations. Coordinate with electrical designer.

3.6.1.4. Acoustical Design. Discuss any special acoustical wall or ceiling requirements including effects from interior and exterior sound sources as applicable.

3.6.2. Drawings: Continue to develop the drawings initiated in earlier submittals and in addition, provide the following:

3.6.2.1. Roof plan: Indicate mechanical equipment and vents, roof drains, roof slopes, crickets, etc. Cross reference to where flashings and curbs are detailed for roof penetrations, including those for mechanical and electrical features.

3.6.2.2. Reflected ceiling plan: Provide for all buildings except industrial-type buildings containing minimal office space.

3.6.2.2.1. Fire ratings: Show rating of one hour or more for partitions, ceilings, ceiling-roof or ceiling-floor assemblies. This may be shown on the reflected ceiling plan, when provided; in a "REQUIRED FIRE RATING SCHEDULE", listing each room or area to be separated; or in a single line floor plan which indicates only fire partitions and fire walls.

3.7. Structural Design:

3.7.1. Design Analysis - Narrative. Outline and define the structural methods and materials of design and construction and include all criteria and assumptions and calculations on the following items:

3.7.1.1. Foundation Design: Provide a statement referencing the Geotechnical Report which will be attached as an Appendix to the Design Analysis. The Geotechnical Report will normally be provided by the COE. Describe the type of foundation proposed, estimated depth of bearing, allowable bearing values, compaction requirements, and any

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over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

other measures mentioned in the soils report, or 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. See AFM 88-5 CH 2/TM-5-809-2 and C.O.E. 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 six inches of earth or gravel cushion shall be provided.

3.7.1.2. Economic Analysis of Structural Systems:

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 shall be considered in selecting the systems. A portion of the structure large enough to be representative of the entire building shall be designed in sufficient detail to provide for 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

III-27

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

III-56

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

different framing scheme. Investigate various column spacings. For a one story structure, the comparison shall be done for the roof structure. For a multistory facility, one cost comparison shall be presented for the floor system and one for the roof system. Attach the comparison to the Design Analysis as an Appendix. Provide a description of all the candidate solutions and indicate that the most economical has been selected.

3.7.1.3. Design Loadings (AFM 88-3, Ch. 1/TM 5-809-1): Describe the lateral force resisting system by defining the location and number of shear walls, materials to be used for a diaphragm, seismic joint locations, foundation ties, factor of safety for overturning, and any other components of the lateral force resisting system. Provide a statement of live loading to be used, to include floor loads, wind, snow, earthquake, etc., together with data to justify when different from established criteria. Seismic design shall be in accordance with AFM 88-3 CH 13/TM 5-809-10, State the Seismic Zone, K, I, C, and Z values.

3.7.1.4. Working Stresses: Indicate selected stress where options are provided. Indicate any deviations from prescribed working stresses, together with reasons therefor. Describe type and class of material selected and indicate source of stress selected.

3.7.1.5. Blast Design: For structures designed for blast and dynamic loads, list all appropriate design parameters such as, amount, type, TNT equivalent, and location of explosive material in each area for the donor system. Locate explosives in a position that will impose the largest loads on the structure. For the receiver system, describe the personnel, equipment, and any other explosive materials which require 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 blastwall, blastdoor, and frangible element locations to complete the description of the protective construction design approach.

3.7.2. Design Analysis - Calculations. Provide as

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

required by the above paragraphs to support selected design features. Calculations shall be organized and summarized in a Table of Contents. Calculations are to be checked and so noted by signature/initials of the checker.

3.7.3. Drawings.

3.7.3.1. 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.

3.7.3.2. Floor Framing Plan. See Early Preliminary submittal requirements.

3.7.3.3. Roof Framing Plan. See Early Preliminary submittal requirements.

III-28

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

III-58

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

3.8. Mechanical Design.

3.8.1. Design Analysis - Narrative. Expand discussion of subjects initiated in earlier submittals and include discussion of the following as applicable to your project:

a. Control System for HVAC. Design of Control System for HVAC shall be implemented in accordance with AFR 88-15 and ETL 83-1.

b. Petroleum, Oils and Lubricants (POL) 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.

c. Fire Protection. Coordinate with the architectural and electrical designers to ensure all aspects of the fire protection requirements are addressed.

d. Carbon-Dioxide, Aqueous Film Forming Foam (AFFF), Dry-Chemical, Halon, and other special extinguishing systems: Include information justifying the arrangement, size, and coverage of each system.

e. Meters. State type, number and location of utility meters required in accordance with the appropriate Air Force ETL.

3.8.2. Design Analysis - Calculations. Develop previous calculations as necessary to justify the systems selected on the basis of economic and environmental impact. Include air conditioning load calculations, preferably the building peak loads. Detailed room calculations are not required. When the scope of work requires a computer simulation of the building, compare a minimum of three (3) heating and air conditioning systems per AFR 88-15. Variation of the "U" factor from the stated criteria shall also be integrated into the study.

3.8.3. Drawings.

3.8.3.1. Continue development of the floor plans, sections, and details begun in prior submittals.

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over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

3.8.3.2. Prepare a 1/4" or 1/2" scale partial floor plan of all congested areas (such as bathroom areas and mechanical rooms) for clarity and to insure that sufficient room is available for the plumbing, heating and air conditioning equipment.

3.8.3.3. Prepare isometric drawings of all waste and vent piping.

3.8.3.4. Prepare preliminary system schematics and equipment details.

3.9. Electrical Design.

III-29

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over."

III-60

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

3.9.1. Design Analysis - Narrative.

3.9.1.1. Transformer Design: State and justify type of transformer insulation selected. Provide electrical characteristics for the transformer (phase, primary and secondary voltage, number of wires, primary and secondary connection of "delta-wye"). Show characteristics of any subsequent transformation on the load side of the service entrance and a statement of why the particular voltage was selected. Describe alternative systems or equipment considered and reasons for selecting a given system.

3.9.1.2. Economic Analysis. Provide an economic comparison of three (3) alternatives 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 electrical calculations in the Design Analysis. The following items shall be studied:

- a. Transformer types.
- b. Main switch boards.

3.9.1.3. Lighting Fixture Economic Analysis. Provide a 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.

3.9.1.4. Electrical Load Analysis. Show a tabulated estimate of total connected KW load and demand factors, diversity and resulting total demand KW load. Break down the loads to show lighting load, convenience receptacle load, air conditioning loads, heating loads, pump loads, power roof ventilator loads, power receptacle loads for special equipment, and special loads, (such as air compressors, generators, etc.). State the total estimated power factor, the resulting KVA load and size of

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over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

transformers and subsequent transformers (such as dry-type transformers within building), and emergency generator sets as applicable.

3.9.1.5. 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.

3.9.1.6. Hazardous Area Design. Provide a description of the physical limits and components of each hazardous area and the class, division, and group of equipment and wiring.

3.9.1.7. GFCI Equipment. Discuss provisions for GFCI equipment such as generators, including testing requirements.

3.9.1.8. Telephone/Communications System. Discuss provisions for a telephone system relative to use of existing or new telephone cable. Verify if local telephone company must be involved. Define type of communication

III-30

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

III-62

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

system, size of communication equipment rooms, cross-connect closets, number of telephone and LAN outlets, number of pairs of conductor per telephone outlet, and number of pins per telephone and LAN outlet.

3.9.1.9. Other Systems. Discuss the following: Lightning protection, motor control centers, standby electric power, special purpose receptacles and outlets, grounding, D.C. or high frequency. Lightning protection system shall be designed IAW AFM 88-9, Chapter 3 and NFPA 78.

3.9.1.10. Airfield Lighting. 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.

3.9.1.11. Exterior Lighting. For exterior lighting systems provide a statement of requirements for fence lighting, area lighting, building security lighting, parking/street lighting, etc. Include proposed type of luminaire, wattage of lamps, type of lamp beam spread and describe how mounted on poles, buildings, etc. Provide photometric data for area/floodlights and other special luminaires.

3.9.1.12. Cathodic Protection. For cathodic protection systems, provide a description of the location, type, and extent of the system to be installed. State basis for the design proposed.

3.9.1.13. Generating plants: In addition to 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.

3.9.1.14. TEMPEST/EMP Shielding: Indicate which rooms (if not the entire facility) are to receive TEMPEST/EMP shielding.

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

3.9.2. Design Analysis - Calculations.

3.9.2.1. Provide calculations for: short-circuits (all buses and panels), voltage drops for feeders and the worst-case branch circuit, lighting (to within +10% of the design lighting intensity levels), and cathodic protection system(s). Indicate the transformer impedance used to determine A.I.C. ratings of transformers.

3.9.3. Drawings.

3.9.3.1. Floor Plan(s). Provide plans showing the location of inside/outside distribution systems, hazardous areas and TEMPEST/EMP shielded areas.

3.9.3.2. Riser Diagram(s). Provide riser diagrams for Intrusion Detection System (if applicable), telephone prewiring system and fire alarm system to show all components and overlap, if any, with Division 15 Automatic Suppression System.

III-31

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

III-64

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
	3.9.3.3. <u>Means of Egress Sketch</u> . Coordinate with architectural designer in the preparation of the "Location of Exit Signs" (Means of Egress) sketch.	
	3.9.3.4. <u>Elevations</u> . Coordinate with architectural designer in the preparation of facility elevations to insure electrical equipment is properly shown, as applicable.	
	3.9.3.5. <u>Equipment Mounting Details</u> . Provide mounting details for RFI filters, panelboards in computer rooms and powerline filters in TEMPEST/EMP room or area.	
	3.9.3.6. <u>Mounting Heights</u> . Indicate mounting heights of appropriate devices on the symbol list. Symbols and abbreviations shall conform to ANSI/IEEE Standards.	
	3.9.3.7. <u>Lighting Fixtures</u> . Provide detail drawings of lighting fixtures with descriptions if C.O.E. Standard drawing 40-06-04 of lighting fixtures are not utilized.	
	3.9.3.8. <u>Seismic Anchors</u> . Show (or note) seismic anchoring for free-standing electrical equipment including lighting fixtures for facilities located in Seismic Zones 3 & 4.	
	3.9.3.9. <u>Receptacle Grounding System</u> . Insert Figure 16-4, TYPICAL RECEPTACLE GROUNDING SYSTEM IAW AFR 88-15, paragraph 16-8.b.	
	3.9.3.10. <u>Miscellaneous Details</u> . Provide construction details of transformer slab, handhole and manholes.	

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over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter

Paragraph # and Subject

Page

III-32

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

III-66

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

CHAPTER III (cont.)
SECTION 4 - FINAL DESIGN

<u>Paragraph Page</u>	<u>Subject</u>
4.0 III-33	Final Design Submittal
4.1 III-33	Objective
4.2 III-33	Changes to Basic Design
4.3 III-33	Design Analysis - General Requirements
4.4 III-34	Drawings - General Requirements
4.5 III-34	Civil Design
4.6 III-36	Landscaping Design
4.7 III-38	Architectural Design
4.8 III-38	Structural Design
4.9 III-40	Mechanical Design
4.10 III-42	Electrical Design

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over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

CHAPTER III (cont.)

SECTION 4 - FINAL DESIGN

4.0. 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 the scope of work)
- Final Engineering Considerations and Field Personnel Report
- Other Items as Required by the Scope of Work

The designer must include the requirements of SECTIONS 1, 2 and 3 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. The specific requirements for the preparation of the Cost Estimate are contained in A-E Guide, Volume 2. A-E shall also refer to Chapter 2, "Presentation of Data" of this guide for design analysis format and drawing format and quality requirements. See appropriate Appendix of this volume for Environmental Permit Matrix and Engineering Considerations and Instructions for Field Personnel Report requirements.

4.1. 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, Early Preliminary, Preliminary as applicable) and as modified by

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over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

the review comments.

4.2. 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.

4.3. Design Analysis - General Requirements. The Design Analysis prepared for previous submittals shall be expanded and refined into final form to contain that required by SECTIONS 1, 2 and 3 of this chapter plus requirements contained herein.

III-33

"There's never enough time to do it right,
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over."

III-69

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

4.4. Drawings - General Requirements. Expand and fully develop drawings required by Sections 1, 2, and 3 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 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.

4.5. Civil Design.

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

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

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

4.5.3.1. Topography: Provide topographic sheet(s) showing the existing site conditions.

4.5.3.2. Demolition Plan. The demolition plan shall indicate all existing structures, foundations, and

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

pavements, including type, dimensions, and thickness, which will require demolition and removal prior to the project construction. All existing utility lines to be removed or abandoned in place, and all existing trees and shrubs to be removed or saved, shall be indicated, dimensioned, and depth requirement established for all foundation removal. Buried tanks that are not to be completely removed, but abandoned in place, shall be filled with sand. Photographic reproductions of complicated buildings for structures to be demolished may be used to supplement drawings and notes for clarity. Demolished and removed material shall be clearly indicated as going to an existing dump area on the Base, or hauled and deposited off of the base. Material to be salvaged shall be identified and direction given by notes as to how and where it shall be stored or deposited. This specific direction shall be obtained from the BCE through the COE PM. Asbestos and other hazardous materials at the site shall be identified and a safe removal/disposal plan developed.

III-34

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

III-71

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

4.5.3.3. Siting: Show the dimensions of all new work and the relation of new work to existing facilities. The new work will be located by coordinates or other definite means. 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. For airfields, this information must be shown for each separate area of pavement. Clearly locate on-base borrow and spoil areas. Indicate possible future construction using short dashed lines.

4.5.3.4. Grading: Provide a north arrow and show the grading and drainage conditions including swales, direction of drainage, point of discharge, and ditches using notes, symbols, and spot elevations or 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.

4.5.3.5. Plan, Profile, and Sections: 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 a supplement to the plans. Channel cross sections shall show the design flow elevation.

4.5.3.6. Railroads: 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.

4.5.3.7. Paving, and Fencing: Show the location and dimensions of all roads, streets, walks, pads, open storage

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

areas, runways, aprons, taxiways, over-runs, fences and gates. Do not show fence lengths on plan sheets for Lump Sum Bids (See Specification, A-E Guide Volume 3). 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 (where required), location of tie-down anchors, markings and striping. Provide details of parking stalls, handicap parking symbols and signs and traffic signs. Provide a separate signing and striping plan where extensive work of this nature is required.

4.5.3.8. Utilities. Provide the following:

a. Show sizes of all existing and new lines (such as water, sewer, storm drain, gas lines, compressed air lines, nitrogen lines, etc.). Also show all valves, manholes, fire hydrants, service boxes, inlets,

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

culverts, headwalls and cleanouts. Call out existing pipe materials 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. Do not show lengths of utility runs on plan sheets for Lump Sum Bids (See A-E Guide, Volume 3).

b. Profiles shall be provided for wastewater collection lines, storm drain lines, force mains, water supply and distribution lines and petroleum lines where there is a possibility of interference with other utilities. 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 system.

c. 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 in-plant 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."

d. Miscellaneous Details: The A-E shall utilize details contained in the Standard Details for Utilities, Foundations, Paving and Railroads (provided to

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

A-E in Basic Design Criteria Package) as appropriate for items described above.

4.6. Landscaping Design.

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

4.6.2. 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.

III-36

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

III-75

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

4.6.3. Drawings.

4.6.3.1. 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.

4.6.3.2. 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.

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

- a. Common name.
- b. Botanical name.
- c. Quantity of each variety planted.
- d. Height after planting.
- e. Container size and kind of container space pattern. Tree size should be a minimum of 15 gallons to improve survivability.

4.6.3.4. 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. 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, gpm and minimum psi required at each head. Indicate total water requirement and pressure required for the system.

4.6.3.5. Irrigation schedule. Provide an irrigation

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

schedule to include the following:

- a. Type and size of head, gallons per minute (gpm), pressure in pounds per square inch (psi) required and radius.
- b. Type and size of drip emitter.
- c. Type and size of valve.
- d. Type of controller.
- e. Type and size of pipe.
- f. Type of backflow preventor.
- g. Method of tap.

III-37

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

III-77

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

4.6.3.6. 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 or as approved by the COE.

4.7. Architectural Design.

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

4.7.2. Design Analysis - Calculations. Update the floor area calculations IAW Plate 16, Chapter IV, to reflect changes brought about by review comments and/or floor plan changes.

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

a. Caulking joint shapes: Make sure the appropriate joint shapes are included in the caulking and sealant guide specification. Do not duplicate these shapes on the drawings.

b. 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.

c. Door opening schedule: This shall follow sample format indicated on Plate 8, Chapter IV.

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

4.7.4. Color Boards. See prior submittal requirements. Update as necessary based on review comments.

4.8. Structural Design.

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

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

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

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

III-38

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

III-79

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

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

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

4.8.2.4. 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.

4.8.2.5. 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 in a separate binding 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.

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

4.8.3.1. 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.

4.8.3.2. 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.

4.8.3.3. Joints: The location and details of all

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

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.

4.8.3.4. 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.

III-39

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

III-81

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

4.9. Mechanical Design.

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

4.9.2. Design Analysis - Calculations.

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

4.9.2.2. Equipment selection is restricted to regularly cataloged items of domestic manufacture, in commercial service for more than one (1) year, 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 in the design analysis. Do not use proprietary names and model numbers on the drawings or in the specifications.

4.9.2.3. Provide complete tabulation of cooling loads. Psychometric charts for all the air handling systems with cooling are required. In addition, update building block load cooling calculation summary on AF Form 108 (See Chapter IV, Plate 19) "Air Conditioning Load Estimate." If a computer load simulation program was used, transfer the appropriate data and results from the computer print-outs onto the form.

4.9.3. Drawings. Expand and fully develop drawings used in Concept, Early Preliminary 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:

4.9.3.1. Plumbing. Provide the following:

a. Show piping systems in two-dimensional riser diagrams for medical and dental facilities and for

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

multi-story buildings.

b. Provide a schedule of plumbing fixtures and equipment.

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

a. 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.

b. 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.

III-40

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

III-83

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

c. Locate and detail all fire dampers.

d. Provide piping schematics to show all complicated flow processes.

e. Provide a sequence of operation and control description, and control system schematic diagrams on the drawings for all Mechanical Systems IAW AFR 88-15 and appropriate ETL's including ETL 83-1.

4.9.3.3. Fire Protection. Provide the following:

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

b. 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.

c. For detail of sprinkler riser see C.O.E. Standard Mechanical Detail Drawings. Normally, use drawing MFP-2 for wet pipe systems.

d. Show the riser locations on the plans.

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

f. For Hydraulically Calculated Sprinkler Systems show the following information:

(1) Type of hazard.

(2) Minimum area of water demand (normally 3,000 square feet) (MIL-HDBK-1008).

(3) Minimum rate of water application (density) GPM/Sq. ft.

(4) Any special sprinkler head temperature rating or classification.

(5) Minimum hose stream requirements.

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

(MIL-HDBK-1008).

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

4.9.3.4. Energy Monitoring and Control System (EMCS). Provide the following:

a. Provide schematic diagrams, input-output (I/O) summary schedule, and legend and symbols list as per AFR 88-15/AFM 88-36.

III-41

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

III-85

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

b. The EMCS schematic diagrams shall be separate from, and in addition to, the controls systems diagrams as described above in subparagraph 4.9.3.2.e.

c. The designer is required to coordinate selection of points to be monitored with the using agency when completing the I/O summary schedule.

4.10. Electrical Design.

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

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

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

4.10.1.3. Provide an energy impact analysis.

4.10.2. Design Analysis - Calculations.

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

4.10.2.2. 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, para. 7.0, and A-E Guide Volume 3.

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

4.10.3.1. Outside distribution system. Provide the following:

a. Overhead: Show location of new and existing poles, and routing of new lines on an

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but there's always enough time to do it
over."

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

electrical-only site plan. Indicate type and size of existing overhead conductors.

b. 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).

c. 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.

III-42

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

III-87

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

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

e. Distribution System Profiles. For overhead and/or underground distribution projects over 2,000 linear feet in total length, profiles shall be furnished as described in paragraph 4.12g.(2).

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

4.10.3.2. Interior distribution system. Provide the following:

a. 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 AFR 88-15, Section A, paragraph 16-6 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.

b. Single Line Diagram. Provide a one line or single line diagram (not a riser diagram) showing power service entrance location, major equipment and panel locations. State phase and voltage. Where required, show ground fault protection. Provide complete power receptacle arrangement, motor outlets, control diagrams and power equipment. For all electrical equipment list the performance characteristics required, complete schematic diagrams, and a written description of operation of complex control systems.

c. 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

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

<u>Chapter</u>	<u>Paragraph # and Subject</u>	<u>Page</u>
----------------	--------------------------------	-------------

sizes for each circuit, number of poles, and description of each load.

d. 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.

e. 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.

f. 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.

III-43

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but there's always enough time to do it
over."

III-89

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter Paragraph # and Subject Page

g. 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.

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

CHAPTER 3
SUBMITTAL REQUIREMENTS

Chapter

Paragraph # and Subject

Page

III-44

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

III-91

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. SUPPORT DOCUMENT COVER SHEET (BLANK)	PLATE #20
21. AIR FORCE FORM 108 - AIR CONDITIONING LOAD ESTIMATE	PLATE #21
22. SAMPLE COMPLETED AIR FORCE FORM 108	PLATE #22

*“If it hasn’t been reviewed,
it hasn’t been designed.”*

TITLE BLOCK

(COVER SHEET ONLY)

REVISION	DATE	DESCRIPTION	BY	BY
△				
NAME AND ADDRESS OF A-E FIRM UNDER CONTRACT TO CESPK		DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA		
DESIGNED: *	DRAWN: *	CHECKED: *	SUBMITTED: **	STATE
BASE		PROJECT TITLE		
DRAWING TITLE		DRAWING TITLE		
SIGNATURES AFFIXED BELOW INDICATE OFFICIAL RECOMMENDATION AND APPROVAL OF ALL DRAWINGS IN THIS SET AS INDEXED ON THIS SHEET				
APPROVAL RECOMMENDED: COE SIGNATURE CHIEF,	APPROVED: COE SIGNATURE CHIEF, ENGINEERING DIVISION	DATE: COE SUPPLIED		
PREPARED UNDER THE DIRECTION OF		SCALE:	SHEET	SPEC. No.
COE SIGNATURE		COE SIGNATURE	G-1	FILE No.
COL., CORPS OF ENGINEERS, U. S. A.		DISTRICT ENGINEER	1	OF 19

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



TITLE BLOCK

(OTHER THAN COVER SHEET)

CORPS OF ENGINEERS' INITIALS
DESIGNER'S INITIALS

REVISION	DATE	DESCRIPTION	BY	BY
1	25 JAN 88	CHANGED LOCATION OF LOUVERED DOOR	J.N.	C.S.

NAME AND ADDRESS OF A-E FIRM
UNDER CONTRACT TO CESPK

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

DESIGNED: *

DRAWN: *

CHECKED: *

BASE

STATE

PROJECT TITLE
DRAWING TITLE

DISCIPLINE NUMBERING SYSTEM

CONSECUTIVE NUMBERING SYSTEM

DATE APPROVED

DATE WILL BE ADDED LATER BY COE

SCALE

SHEET

FILE NO.

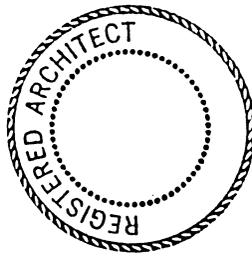
SPEC. No.

A-4

9 OF 19

SUBMITTED: *

A-E FIRM'S
PRINCIPAL'S
STAMP



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

SAMPLE TITLE BLOCK

(COE PREPARED TOPOGRAPHY
OR LOGS OF BORINGS SHEET)

ACTUAL PROJECT FILE NUMBER GOES HERE

REVISION	DATE	DESCRIPTION	BY	BY			
△							
GEOTECHNICAL BRANCH				DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA			
DESIGNED: R.L.T.		GEORGE AIR FORCE BASE		CALIFORNIA			
DRAWN: R.L.T., R.A.W.		RESOURCE MANAGEMENT FACILITY		FY-87			
CHECKED: MDR		LOCATIONS OF BORINGS					
SUBMITTED:		DATE APPROVED:		SCALE:	SPEC. No. 7008		
<i>Charles E. Thompson</i> CHIEF, SOILS DESIGN SECTION		<u>9/14/85</u>		SHEET	FILE No.		
				C-6	230-25-207 ←		
				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	DESCRIPTION	DATE	BY
PREPARED BY: (NAME OF A-E UNDER CONTRACT TO SPK)			
MODIFIED FOR SITE ADAPTATION AT U.S. ARMY ENGINEER DISTRICT, SACRAMENTO CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA			
DIST. SPEC. NO. _____		DATE: _____	
APPROVAL RECOMMENDED: _____		APPROVED: _____	
CHIEF, MILITARY BRANCH _____		CHIEF, ENGINEERING DIVISION _____	
PREPARED UNDER THE DIRECTION OF _____ COL, CORPS OF ENGINEERS U.S.A. _____ DISTRICT ENGINEER			
REVISION	DATE	DESCRIPTION	BY
DESIGNED: J. THOMPSON		BEALE AFB	
DRAWN: D. DUJICAN		UEPH	
CHECKED: R. LOOK		TITLE SHEET	
SUBMITTED: <i>[Signature]</i>		CALIFORNIA	
APPROVED: <i>[Signature]</i>		DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA	
CHIEF, ENGINEERING DIVISION		SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA	
SIGNATURES AFFIXED BELOW INDICATE OFFICIAL RECOMMENDATION AND APPROVAL OF ALL DRAWINGS IN THIS SET AS INDEXED ON THIS SHEET			
APPROVED: <i>[Signature]</i>	DATE: 15 JULIE 1983	SCALE: AS NOTED	SPEC. No. 1234
CHIEF, ENGINEERING DIVISION	BRANCH	SHEET G-1	FILE No. 221-25-476
PREPARED UNDER THE DIRECTION OF		DISTRICT ENGINEER	
FREDERICK J. ROCKWELL		DISTRICT ENGINEER	
COL, CORPS OF ENGINEERS, U. S. A.			

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)

SUBMITTED BY:		DATE APPROVED:	
REVISION	DATE	DESCRIPTION	DATE
MODIFIED FOR SITE ADAPTATION AT		DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA	
DIST. SPEC. NO.			
REVISION	DATE	DESCRIPTION	BY
		DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA	
DESIGNED:	J. THOMPSON	BEALE AFB CALIFORNIA	
DRAWN:	D. DUNCAN	UEPH	
CHECKED:	R. LOOK	FLOOR PLANS	
SUBMITTED		DATE APPROVED	15 JULIE 1963
		SCALE	1/4" = 1'-0"
		SHEET	A-1
		FILE NO.	22-25-476
			17 OF 59
		SPEC NO.	1234

PREVIOUSLY PREPARED PROJECT TITLE BLOCK

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

2" CLEARANCE FOR FUTURE REVISIONS

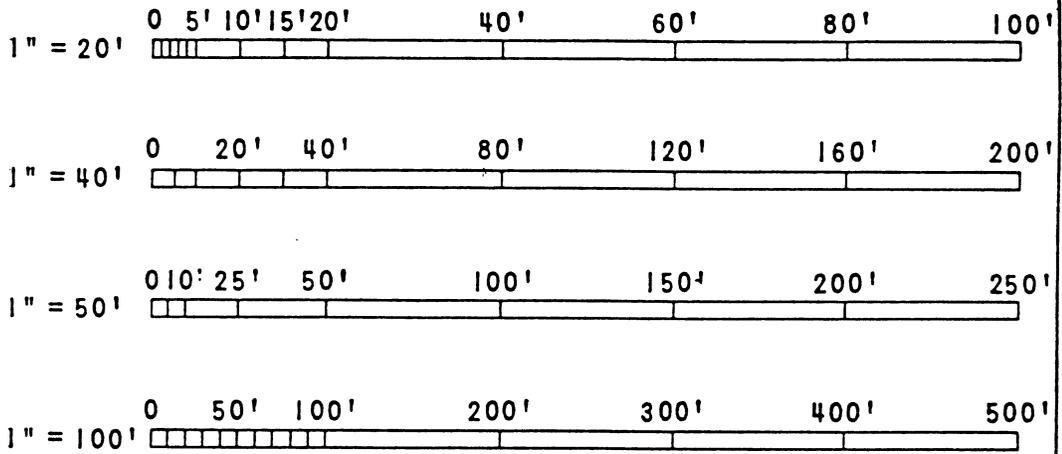
SAMPLE SCHEDULE of DRAWINGS

CONSECUTIVE SHEET NO.	DISCIPLINE SHEET NO.	DRAWING TITLE
1 of 19	G-1	PROJECT TITLE, PROJECT NUMBER, VICINITY MAP, LOCATION PLAN & SCHED. OF DWGS
2 of 19	G-2	LIST OF ABBREVIATIONS
3 of 19	C-1	GRADING PLAN & BUILDING LAYOUT & LEGEND
4 of 19	U-1	UTILITIES (if not shown on CIVIL Sheets)
5 of 19	L-1	LANDSCAPE PLAN & LEGEND
6 of 19	A-1	FLOOR PLAN, LEGEND, FINISH AND DOOR SCHED.
7 of 19	A-2	ELEVATIONS
8 of 19	A-3	BUILDING SECTIONS
9 of 19	A-4	ROOF PLAN, REFLECTED CEILING PLAN & DETAILS
10 of 19	S-1	FOUND. PLAN, FIRST FLR. FRAMING PLAN & LEGEND
11 of 19	S-2	ROOF FRAMING PLAN
12 of 19	S-3	WALL FRAMING & MISC. DETAILS
13 of 19	P-1	PLUMBING PLAN AND LEGEND
14 of 19	M-1	MECHANICAL PLAN AND LEGEND
15 of 19	M-2	EQUIPMENT SCHEDULES & DETAILS
16 of 19	FP-1	FIRE PROTECTION PLAN
17 of 19	E-1	SITE PLAN & LEGEND
18 of 19	E-2	FLOOR PLAN & PANEL SCHEDULE
19 of 19	E-3	RISER DIAGRAMS & DETAILS

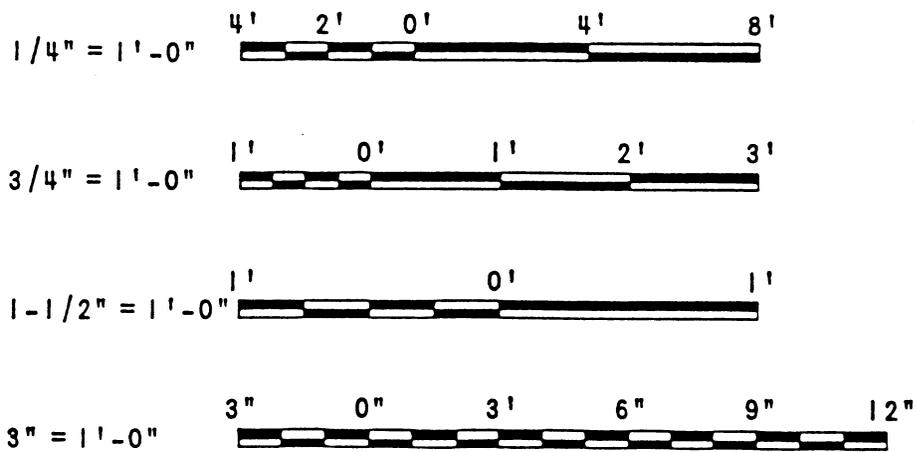
NOTE TO DESIGNER: ALL SCHEDULES OF DRAWINGS PREPARED FOR, AND BY, THE SACRAMENTO DISTRICT OFFICE SHALL BE IN THIS FORMAT AND THE SEQUENCE OF DISCIPLINES SHALL FOLLOW THE ORDER INDICATED. PROVIDE AS MANY DRAWINGS WITHIN EACH DISCIPLINE AS NECESSARY TO COMPLETELY DESCRIBE THE PROJECT. IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT THE CHIEF, DESIGN QUALITY ASSURANCE SECTION ARMY/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

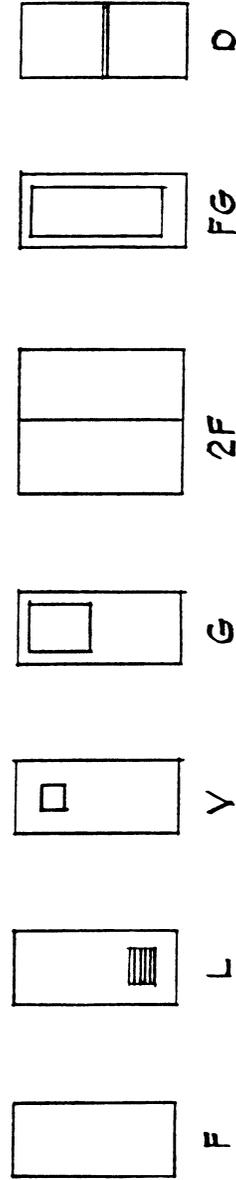
DOOR SCHEDULE												
NO. TYPE	SIZE	MAT.	*TYPE	FIN.	RATING	FRAME **				H.W.	REMARKS	
						MAT.	GAGE	HEAD	JAMB			SILL
1 F	3'-0" x 7'-0" x 1 3/4"	STL	XH	PAINT	3/4 HR	STL	16	6	6	12	1	
2 V	3'-0" x 7'-0" x 1 3/4"	WD S.C.	-	PAINT	-	STL	16	5	5	13	2	
3 FG	3'-0" x 7'-0" x 1 3/4"	ALUM	-	PAINT	-	ALUM	-	4	2	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

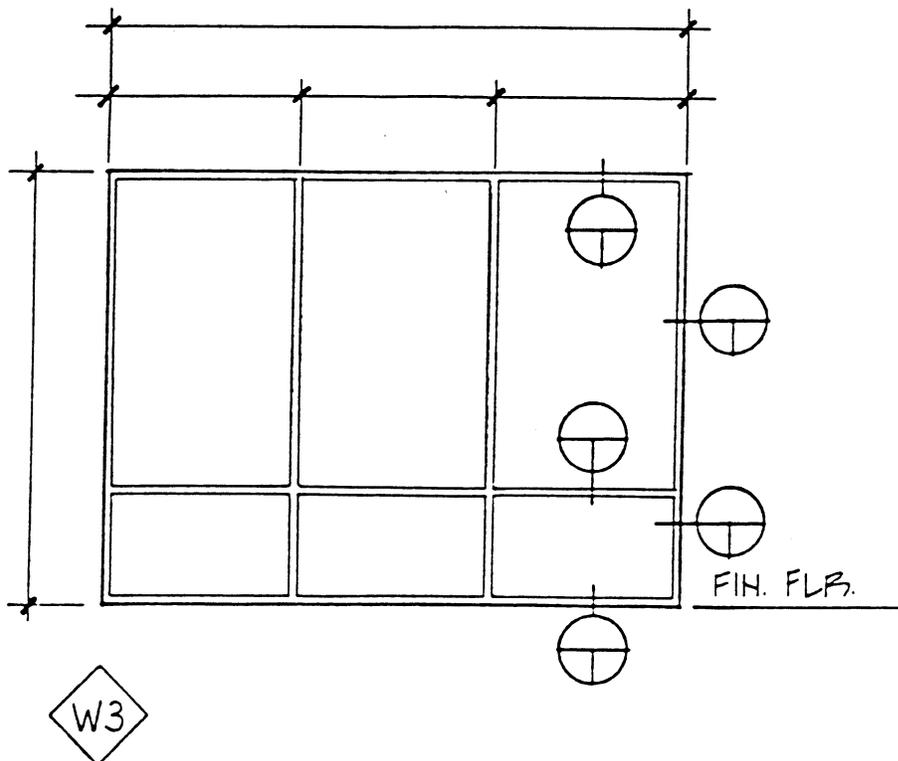
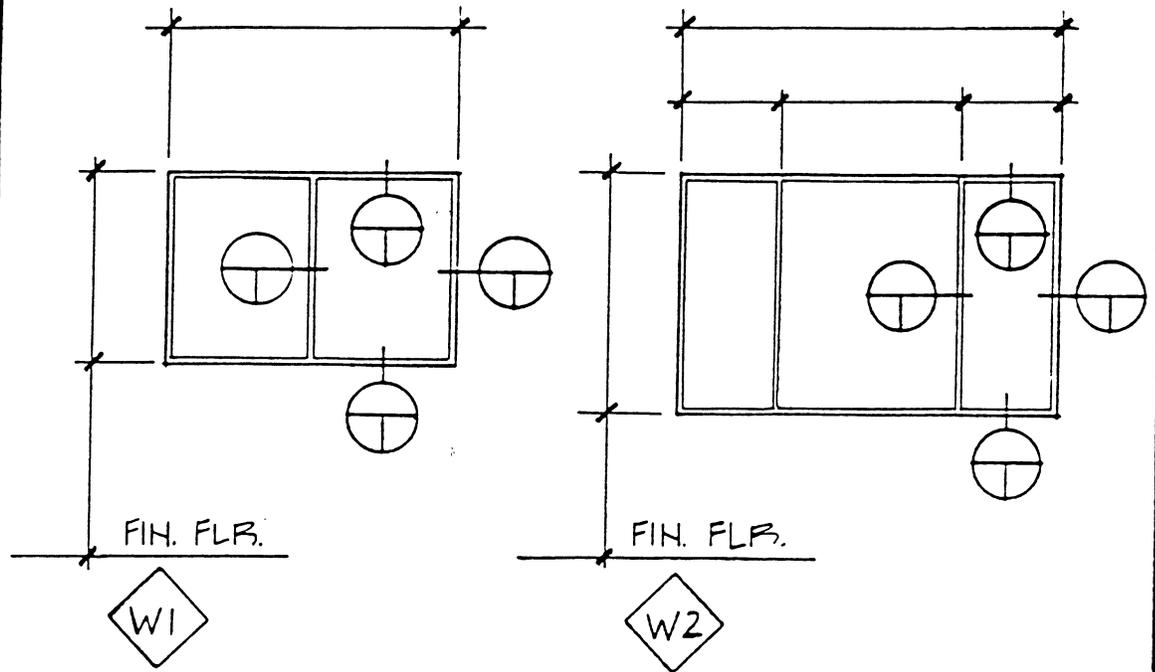
STANDARD = STD, HEAVY = HVY, EXTRA HEAVY = XH

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	PLAM1	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

PLAM: PLASTIC LAMINATE

PLAM 1: Mfg, product #, color

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

COLOR SCHEMES

Scheme 1: Room #101, #108

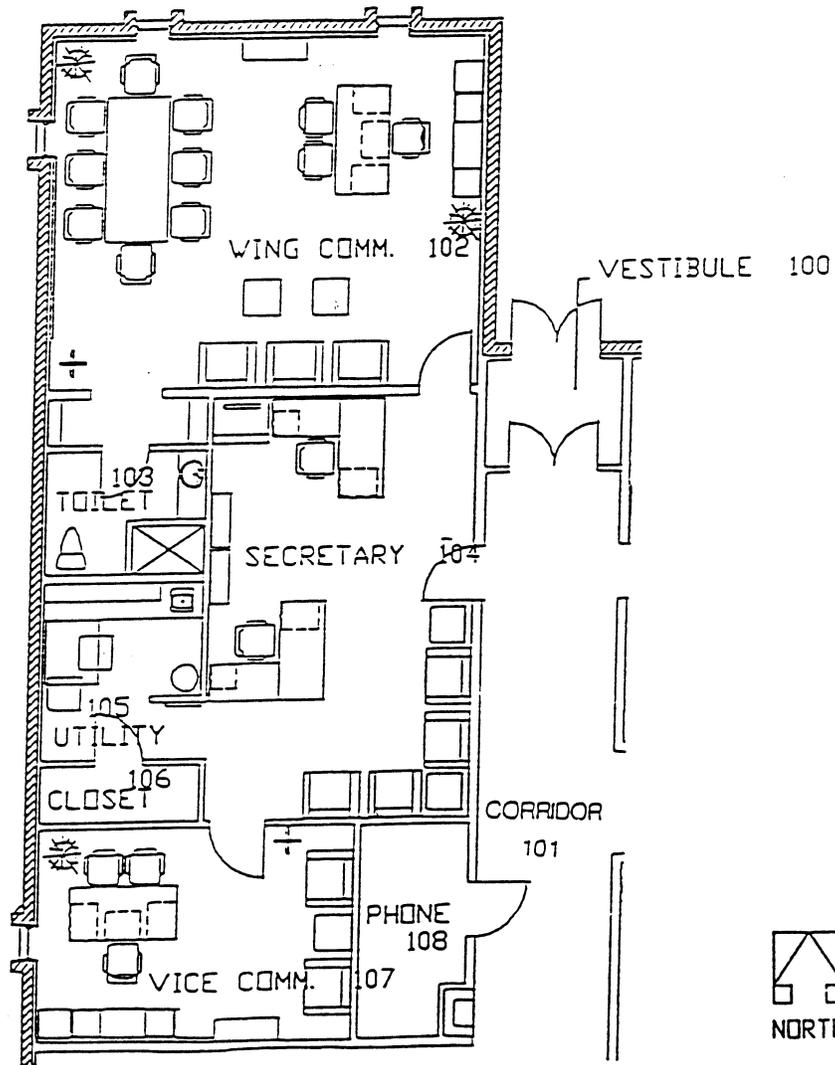
Scheme 2: Room #102

Scheme 3: Room #103, #107

Scheme 4: Room #104

Scheme 5: Room #105, #106

EXAMPLE FLOOR PLAN

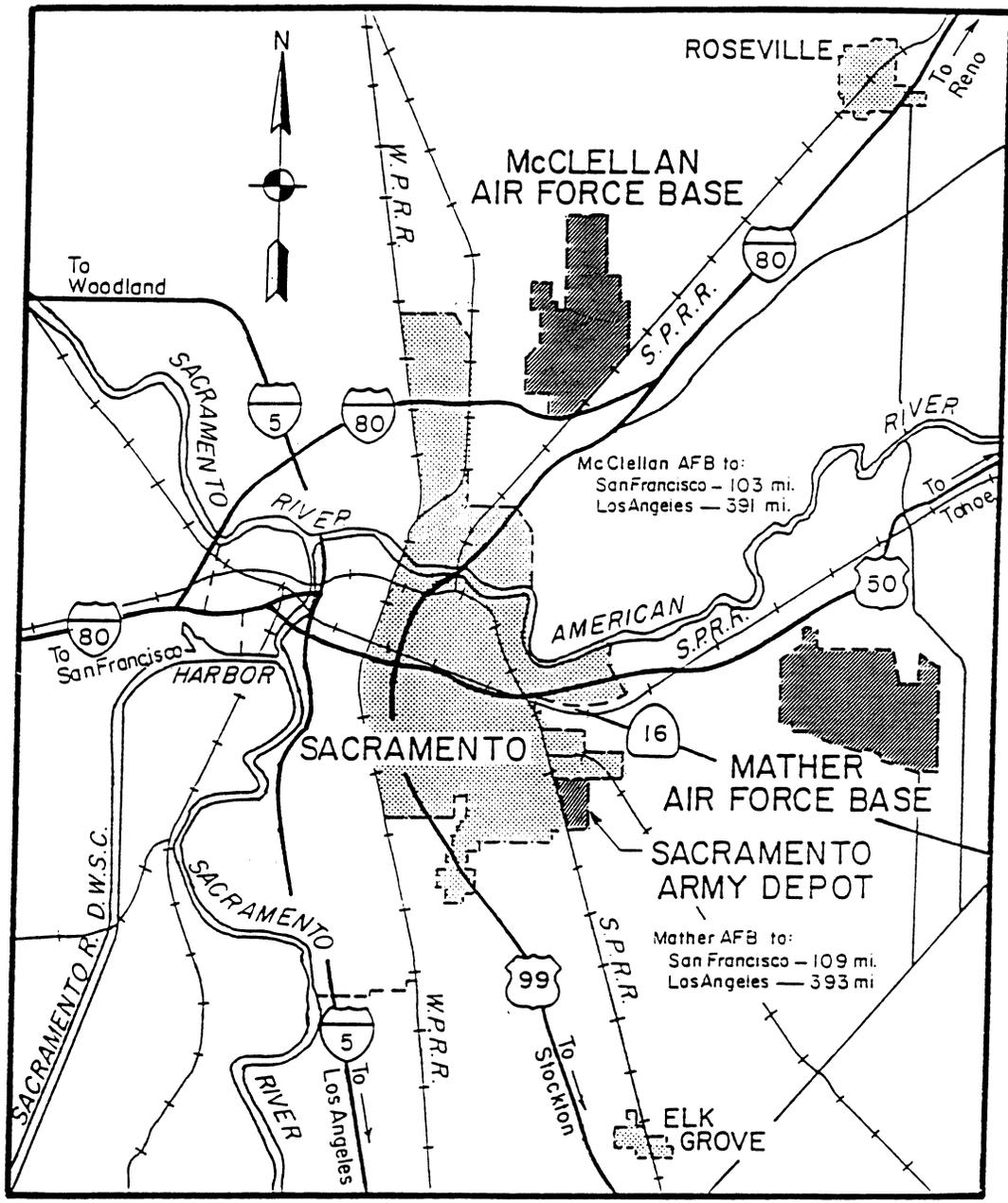


See Interior Finish Schedule and Color Finish Legend on previous pages for example of application.

SAMPLE EXTERIOR COLOR SCHEDULE

E X T E R I O R C O L O R S C H E D U L E				
WALLS	PILASTERS	SOFFITS	DOORS	RAILINGS
CONCRETE MASONRY UNITS 34410 LIGHT GREEN	CONCRETE 34424 GRAY GREEN	STUCCO 34554 LIGHT - YELLOW - GREEN	STEEL 30252 LIGHT TAN - RED	STEEL 30109 DEEP TAN
STOREFRONT FRAMING 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>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.</p>				

SAMPLE VICINITY MAP



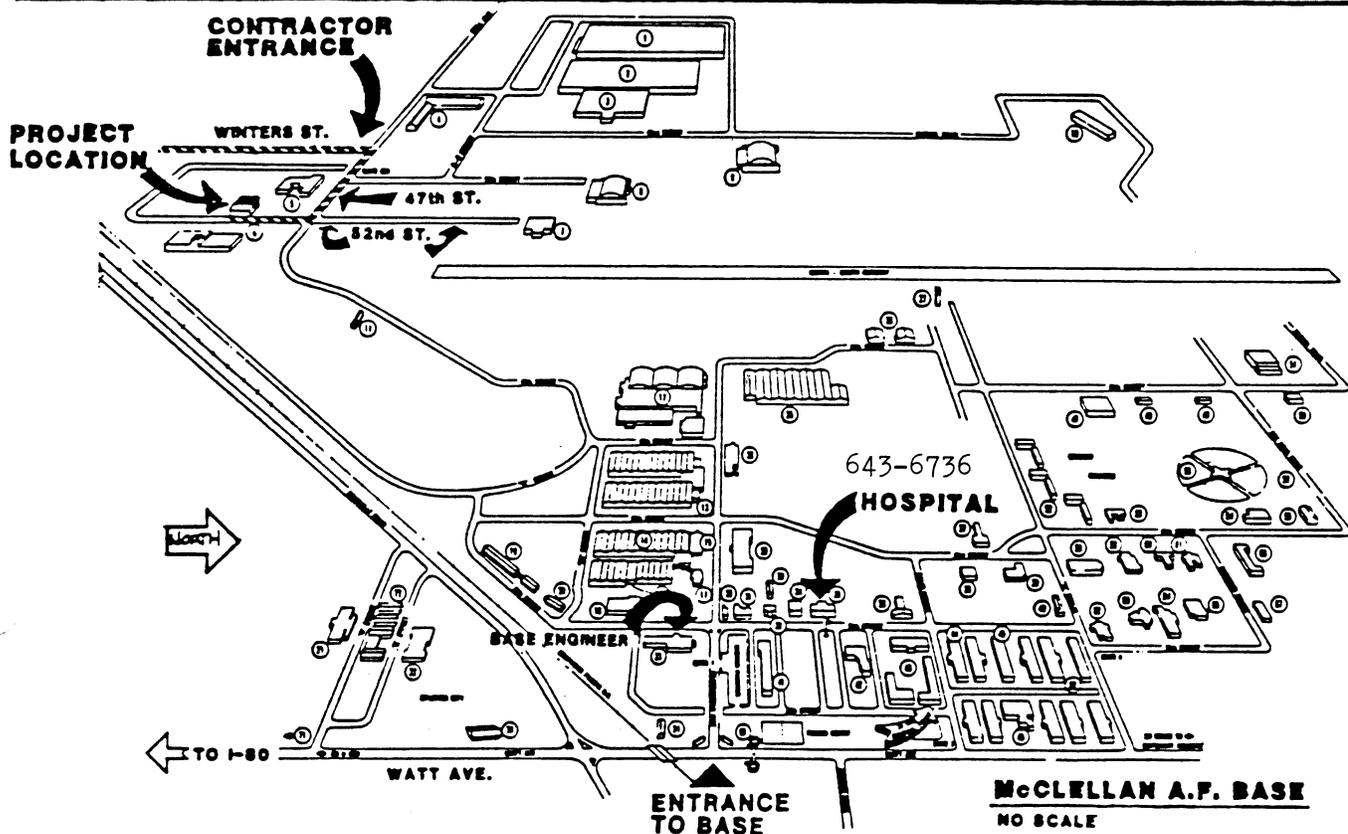
VICINITY MAP



NOTE TO DESIGNER: SEE APPENDIX J FOR ACTUAL VICINITY MAPS FOR THE VARIOUS AIR FORCE INSTALLATIONS SERVED BY THE SACRAMENTO DISTRICT OF THE CORPS OF ENGINEERS.

SAMPLE PROJECT LOCATION MAP

PROJECT LOCATION MAP



CONTRACTOR ACCESS NOTES

1. CONTRACTOR ACCESS TO SITE VIA WINTERS ST. FROM US 850 USE GATE 000 & PROCEED EAST ON 47TH ST. TO 52ND ST. TURN RIGHT ONTO 52ND ST. & PROCEED TO BLOG 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 COOBS.
4. BORROW & DISPOSAL AREAS NOT AVAILABLE ON BASE TO THE CONTRACTOR. REQ'D DISPOSAL WILL OCCUR OFF BASE IN ACCORDANCE W/ LOCAL COOBS.
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. BASE CIVIL ENGR OFFICE
4. SECURITY POLICE OFFICE
5. BASE MEDICAL FACILITY/HOSPITAL (Ph.#)
6. CONTRACTOR EQUIPT YARD
7. BORROW AND DISPOSAL AREA

(IF THERE IS NO BORROW OR DISPOSAL AREA 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 STATUS MATRIX

PROJECT _____

INSTALLATION _____ FY: _____ PN: _____

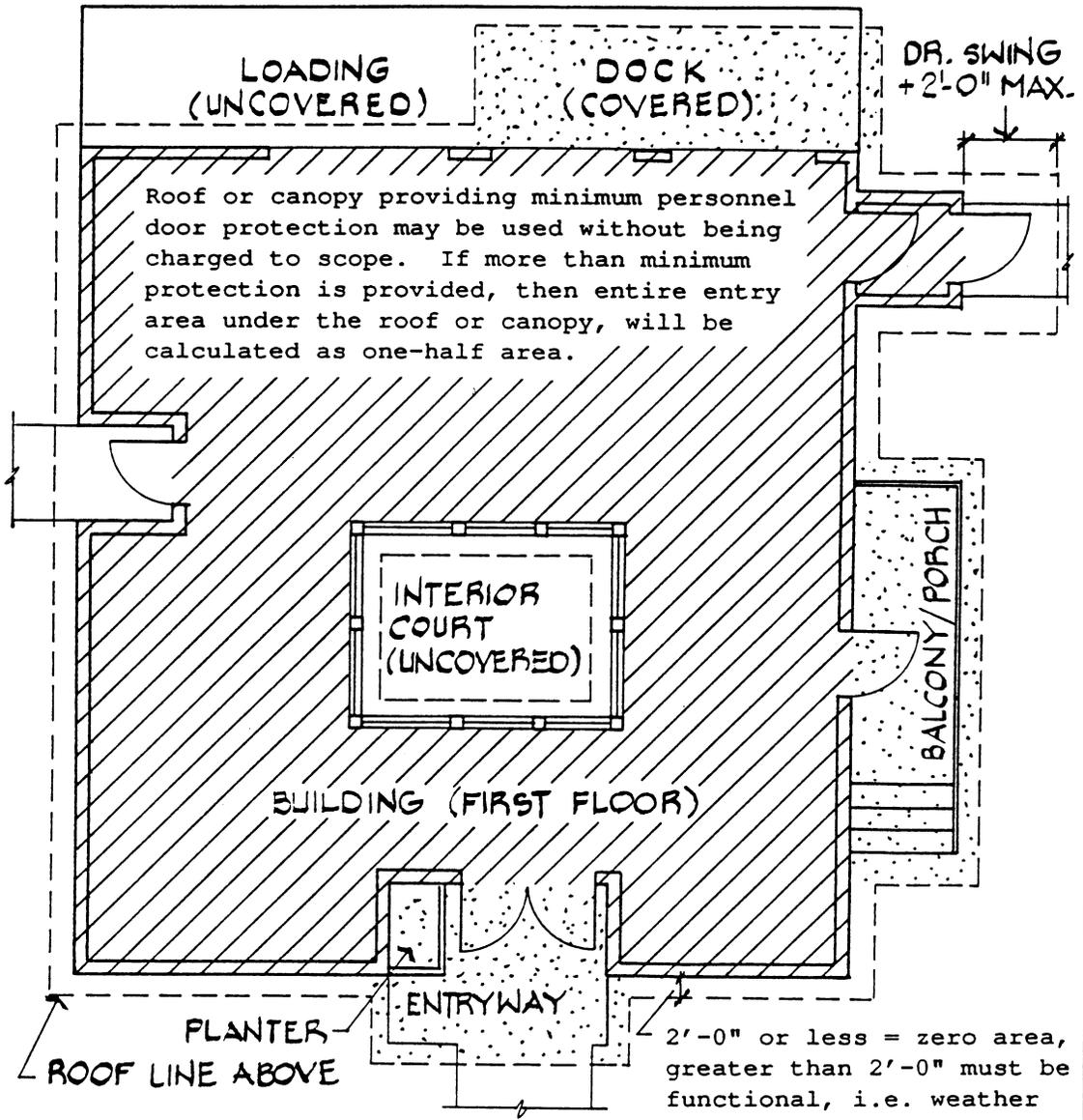
COMPLETED AT _____ 30% _____ 60% PRELIMINARY DESIGN.

TYPE OF PERMIT	PERMITTING ACTION			PERMIT SPECIFICALLY FOR:	LOCAL JURISDICTION CONTACTED AND DATE	PERMIT FEE
	REQ'D Y/N	QTY	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: ARCHEOLOGICAL/CULTURAL RESOURCE CLEARANCE, SHPO COORDINATION, 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.

SAMPLE DOCUMENT COVER SHEET

(Use for all 8½"x11" bound documents. i.e. Design Analysis, Specifications, etc.)



US Army Corps
of Engineers
Sacramento District

COVER SHEET for AIR FORCE PROJECTS

DATE _____

NOTE: All cover sheets shall follow the format below. All entries must be completed by the designer or the project will be returned. A blank is provided as Plate 18 for the A-E's use.

INSTALLATION: Indian Springs AFAF, Nellis A.F.B., Nevada

JOB TITLE: Control Tower
FY 87

PROJECT NUMBER: 73020

DOCUMENT DESCRIPTION: Design Analysis

SACRAMENTO DISTRICT:

DRAWING FILE NUMBER: 229-11*-307

SPECIFICATION NUMBER: 7361

NUMBER OF SHEETS TOTAL: 0 thru 350

NUMBER OF SHEETS BY VOLUME.

VOL. 1 _____

VOL. 2 _____

VOL. 3 _____

REMARKS: Project Manager: Mr. Jerry Piering
AFRCE WR Project Manager: Mr. Ron Mc Robbie
A-E NAC ABKJ

*Note: 01 is used for Log of Borings
11 is used for Design Analysis and Cost Estimate
13 is used for Topo Drawings
25 is used for all other support documents



US Army Corps
of Engineers
Sacramento District

COVER SHEET for AIR FORCE PROJECTS

DATE _____

INSTALLATION: _____

JOB TITLE: _____

PROJECT NUMBER: _____

DOCUMENT DESCRIPTION: _____

SACRAMENTO DISTRICT:

DRAWING FILE NUMBER: _____

SPECIFICATION NUMBER: _____

NUMBER OF SHEETS TOTAL: _____

NUMBER OF SHEETS BY VOLUME.

VOL. 1 _____

VOL. 2 _____

VOL. 3 _____

REMARKS: _____

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			VENTILATION REQ'D	SMOKING PERMITTED	PEOPLE X	$\frac{CFM}{PERSON} =$	
WALL	SF X	X				SMOKING NOT PERMITTED	PEOPLE X	$\frac{CFM}{PERSON} =$	
WALL	SF X	X				AREA	SF X	$\frac{CFM}{SF} =$	
ROOF	SF X	X						REQ'D CFM	
TRANSMISSION GAIN-OTHER						INFILTRATION	CRACK	FT X	$\frac{CFM}{FT} =$
ALL GLASS	SF X	FX			DOORS		Ø X	$\frac{CFM}{DOOR} =$	
PARTITION	SF X	FX						=	
CEILING	SF X	FX						TOTAL CFM	
FLOOR	SF X	FX			EXH FAN			=	
O.A. INFIL	CFM X	FX 1.08						=	
								CFM	
INTERNAL HEAT						TOTAL O.A. THRU COOLING COIL = _____ CFM			
PEOPLE		X			Coordination of cooling design and heating design is essential and a study of the heating estimate should be made at this time.				
POWER		X			APPARATUS DEWPOINT TEMPERATURE				
LIGHTS	WATTS X 3.4	X			ESHF =	$\frac{EQUIV SEN HT}{EQUIV TOTAL HT} = 0. \underline{\quad}$		INDICATED ADP = _____ F. SELECTED ADP = _____ F	
SEN. HT. SUBTOTAL						COIL AIR QUANTITY			
STORAGE CREDIT - SEE NOTE _____						SYSTEM $\Delta T = (1 - \frac{BF}{F}) (TRM - F - TADP - F) =$ _____ F			
ROOM SENSIBLE HEAT						CFM = $\frac{EQUIV SEN HT}{1.08 X F \text{ SELECTED } \Delta T} =$ _____			
SUPPLY DUCT HEAT GAIN	% +	SUPPLY DUCT LEAKAGE	% +	SUPPLY FAN H.P.	ROOM SUPPLY AIR				
O.A.	CFM X	FX	B.F. X 1.08		ROOM SEN HEAT = _____ CFM		1.08 X F SELECTED ROOM ΔT		
EQUIVALENT SENSIBLE HEAT						REHEAT REQ'D _____ BTU/HR - SEE NOTE _____			
LATENT HEAT						NOTES (REF AFM 88-15, ATCH 13)			
INFILTRATION	CFM X	G/LB X 0.68							
PEOPLE		X							
VAPOR TRANSMISSION - SEE NOTE _____									
ROOM LATENT HEAT									
SUPPLY DUCT LEAKAGE GAIN									
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			SUMMARY		CHECK FIGURES		
LAT.	CFM X	G/LB X (1 - BF) X 0.68			S.A. = _____ CFM	S.F./TON = _____	S.A./SF = _____	$\frac{CFM}{TON} =$ _____	
RETURN DUCT HEAT GAIN	% +	RETURN DUCT AIR GAIN	% +	RETURN/SUPPLY FAN H.P.	O.A. = _____ CFM	EXH AIR = _____ CFM	O.A./S.A. = _____	%	
COOLING COIL GRAND TOTAL HEAT						REF EQUIP = _____ TONS			
PUMP H.P. % + PIPING HEAT GAIN									
REF EQUIPMENT GRAND TOTAL HEAT									

AIR CONDITIONING LOAD ESTIMATE				DATE	BASE	ESTIMATOR	PAGE 1 OF 1 PAGES		
BUILDING NO.		SPACE NO.		14 Aug 87		NAFB	RRS		
SPACE USE				Airman Dining Hall		AREA		DAILY OPERATION	
						24,900 SF		16 HR	
ITEM	QUANTITY	GAIN	FACTOR	BTU/HR		DAILY RANGE	38 F	ELEV 1156 FT	
SOLAR GAIN GLASS						ESTIMATE FOR	<input checked="" type="checkbox"/> PEAK LOAD	SUN TIME 1800 HR	
						<input type="checkbox"/> PARTIAL LOAD			
N GLASS	210 SF X	23 X	0.73	3	530	CONDITIONS	DB	WB	
S GLASS	200 SF X	5 X	0.73		730	OUTSIDE	99	72	
E GLASS	610 SF X	23 X	0.73	10	240	ROOM	78	65	
GLASS						DIFFERENCE	21	XXX	
SOLAR & TRANS-WALLS & ROOF						SELECTED ROOM CONDITIONS 78 DB 65 WB 50 % RH			
N WALL	1,180 SF X	8 X	0.15	1	420	OUTSIDE AIR			
S WALL	1,190 SF X	15 X	0.15	2	680	SMOKING 426 PERMITTED	PEOPLE X 5	CFM PERSON = 213-	
E WALL	830 SF X	11 X	0.15	1	370	SMOKING NOT PERMITTED	PEOPLE X	CFM PERSON =	
W WALL	300 SF X	48 X	0.15	2	160	AREA	SF X	CFM SF =	
ROOF	24,900 SF X	35 X	0.05	43	580	VENTILATION REQ'D			
TRANSMISSION GAIN-OTHER						REQ'D CFM			
ALL GLASS	1020 SF X	18 FX	0.73	13	400	CRACK	FT X	CFM FT =	
PARTITION	SF X	FX				DOORS	Ø X	CFM DOOR =	
CEILING	SF X	FX				INFILTRATION			
FLOOR	SF X	FX				TOTAL CFM			
O.A. INFIL	CFM X	FX 1.08				EXH FAN			
INTERNAL HEAT						TOTAL O.A. THRU COOLING COIL = 2130 CFM			
PEOPLE	426 X	215		91	590	Coordination of cooling design and heating design is essential and a study of the heating estimate should be made at this time.			
POWER	49,800 X .2	3.4		33	860	APPARATUS DEWPOINT TEMPERATURE			
LIGHTS	49,800 WATTS X 3.4 X 1.25 X .5			105	830	ESHF =	459,710	EQUIV SEN HT = 78	
Equipment				100	000		591,820	EQUIV TOTAL HT = 0.	
SEN. HT. SUBTOTAL						INDICATED ADP = 53 F. SELECTED ADP = 53 F			
STORAGE CREDIT - SEE NOTE						COIL AIR QUANTITY			
ROOM SENSIBLE HEAT				410 390		SYSTEM AT = (1.08 X 2 BFI) (TRM 78 F-TADP 53 F) = 20 F			
SUPPLY DUCT HEAT GAIN	2	SUPPLY DUCT LEAKAGE 5	SUPPLY FAN H.P. 3	41	040	CFM =	459,710	EQUIV SEN HT = 21,280	
O.A.	213 CFM X	18 FX .2	B.F. X 1.08	8	280	ROOM SUPPLY AIR			
EQUIVALENT SENSIBLE HEAT				459 710		ROOM SEN HEAT = CFM			
LATENT HEAT						1.08 X F SELECTED ROOM AT			
INFILTRATION	CFM X	G/LB X 0.68				REHEAT REQ'D BTU/HR - SEE NOTE			
PEOPLE	426 X	235		100	110	NOTES (REF AFM 88-18, ATCH 13)			
VAPOR TRANSMISSION - SEE NOTE									
Equip	FROM ROOM	LATENT HEAT		20	000				
SUPPLY DUCT LEAKAGE GAIN		10		12	000				
O.A.	2130 CFM X	1 G/LB X .2	B.F. X 0.68		0				
EQUIVALENT LATENT HEAT				132 110					
EQUIVALENT TOTAL HEAT				591 820					
O.A. HEAT									
SEN.	2130 CFM X	18 FX (1.08 BFI) X 1.08		33	130				
LAT.	2130 CFM X	1 G/LB X (1.08 BFI) X 0.68			0				
RETURN DUCT HEAT GAIN	3	RETURN DUCT AIR GAIN	3	59	180	SUMMARY			
RETURN/SUPPLY FAN H.P.				4		S.A. = 21280 CFM			
COOLING COIL GRAND TOTAL HEAT				684 130		CHECK FIGURES			
PUMP H.P.	3	PIPING HEAT GAIN	3	20	500	S.F./TON	= 424	SF/TN	
REF EQUIPMENT GRAND TOTAL HEAT				704 630		O.A.	= 2130 CFM	S.A./SF	= .85
						EXH AIR	= 2130 CFM	O.A./S.A.	= 10 %
						REF EQUIP	= 58.7 TONS		

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 his 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, Vol. 3 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 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 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:

a. 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.

b. 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 Volume 3 of the A-E Guide.

"When all else fails,, read the instructions."

"When all else fails,, read the instructions."

DISCIPLINE/SUBJECT CRITERIA INDEX

CIVIL

SUBJECT	TITLE	CRITERIA REFERENCE NO.	REMARKS
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	
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-1008	
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			
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 bases 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

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
Sports	Planning and Design of Outdoor Sports Facilities	TM 5-803-10/ AFR 88-33
Children's Play	Children's Play Areas and Equipment	TM 5-803-11/ AFM 88-30
	Recreation Facilities	
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 Manual on Uniform Traffic Control Devices for Streets & Highways	AFP 88-40	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	
Pollution			

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 for Fire Protection	Water Supply for Fire Protection	TM 5-813-6/ AFM 88-10, Chap. 6	Supply Treatment and Distribution facilities Prescribes Water Supply requirements for fire protection at Army and Air Force Installations
Special Projects	Water Supply for Special Projects	TM 5-813-7/ AFM 88-10, Chap. 7	For anti-aircraft tactical sites, including family housing, Air Control and Warning Stations and
Reserve			
Treatment	Water Treatment Plant Design Water Supply, Water Treatment	ASCE Manual TM 5-813-3/ AFM 88-10, Vol. 3	Centers N.A.F. COE
WELLS			
	Groundwater Standard for Deep Wells Manual of Water Well Construction Practices Water Well Standards	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

ARCHITECTURAL

SUBJECT	TITLE	CRITERIA REFERENCE NO.	REMARKS
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. Supplement to AEI
	Construction Criteria for Army Facilities	TM 5-800-1	
	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	
	Uniform Building Code	UBC	as modified by Mil-HDBK-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	
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-1008	
	National Fire Protection Association	NFPA 101	N.A.F. COE
	Underwriters Laboratories (UL) Fire Resistance Directory		N.A.F. COE
FIRE AREA LIMITATION	UBC		UBC N.A.F. COE
FIRE PROTECTION	Criteria and Standards for Air Force Construction	AFR 88-15, Chap. 15-H	
	Fire Protection for Facilities Engineering, Design and Construction	MIL-HDBK-1008	

FIRE SEPARATION OF BUILDINGS	Criteria and Standards for Air Force Construction	AFR 88-15, Chap. 1	
	Fire Protection for Facilities Engineering, Design and Construction	MIL-HDBK-1008	
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	BHMA material N.A.F. COE
	Hardware, Builders'	CEGS-08700	Listed in A-E Guide Vol. 3 -Specs.
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	AFP 88-41	
	Comprehensive Interior Design Requirements	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-1008	
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	
PETROLEUM FACILITIES	Petroleum Fuel Facilities	NAVFAC DM-22	
	Petroleum Fuel Facilities	DM 4-805-9	

PHYSICAL FITNESS CENTER	Design Guide - Physical Fitness Centers	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	Listed in A-E Guide Vol. 3-Specs.
	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	

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	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

SUBJECT	TITLE	CRITERIA REFERENCE	NO.	REMARKS
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
	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
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

SUBJECT	TITLE	CRITERIA REFERENCE	NO.	REMARKS
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-1008	
	Mechanical Standard Details		COE, Sacramento District	
HEATING, VENTILATING & 15	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- & AEI
Publication	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.
	Mechanical Refrigeration and Ventilation in Cold Storage Facilities		TM 5-810-3/ AFM 88-8, Chap. 2	N.A.F. COE
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	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
will		Includes Hospitals and Dental Clinics, etc. Additional criteria 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 analysis	Policy and General Standards. Mechanical	AFR 88-15, Chap. 1 & 15	Include economic (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".	
a	Energy Monitoring and Control Systems	TM 5-815-2/ AFM 88-36	Additional guidance on 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		
	AFOSH Standards Safety and Health Requirements	AFOSH 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	
	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	
Family Housing	Family Housing Facilities Criteria	AEI w/chge 1	
	Family Housing Design	AFM 88-25	
be Kitchens and Dishwashing	Mechanical Design; Heating, Ventilation and Air Conditioning	TM 5-810-1, Chap. 4, Para 4.2.b.	Specific criteria will 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	
CHILD CARE	Joint Services Construction Criteria Document for Military Child Development Centers.		Document N.A.F. COE
TACTICAL VEHICLES MAINTENANCE FACILITY	Architectural and Engineering Instructions Tactical Vehicle Maintenance		N.A.F. COE

ELECTRICAL

SUBJECT	TITLE	CRITERIA REFERENCE	NO.	REMARKS
AIRFIELD LIGHTING	Airfield & Airspace Criteria		AFM 86-8	
	Visual Air Navigation Facilities		AFM 88-14	
	FAA Runway and Taxiway Lighting System 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		Military Standards 1542	N.A.F. COE
	Grounding Bonding & Shielding for Common Long Haul/Tactical Comm. Systems		Military Standards 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-HDBK-419	
	COMMUNICATION SYSTEMS	Elect. Comm. Systems Engr., Inside Plant		TM 11-486-4
Elect. Comm. Systems Engr., Outside Plant wire			TM 11-486-5	N.A.F. COE
AFCC Technical Bulletin on Building Cable and Duct Systems			TB 86-07-EZ	Available from 1842nd EEG/EEICS, Scott AFB, 62225-6348
IL	AFCC Tech. Bulletin on Local Area Network User Requirement		TB 85-02-EC	Available from 1842nd EEG/EEICS, Scott AFB, 62225-6348
	Analysis-PCR, Part I			62225-6348
IL	AFCC Tech. Bulletin on Local Area Network Dual Cable Broadband		TB 85-04-EC	Available from 1842nd EEG/EEICS, Scott AFB, 62225-6348
	Coaxial CAble Distribution System			62225-6348

11	AFCC Tech. Bulletin on Broadband Local Area Network, Preliminary Design	TB 85-07-EC	Available from 1842nd EEG/EEICS, Scott AFB,
	and Cost Estimating		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	
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.F. COE
	Criteria & Standards for Air Force Construction	AFR 88-15, Chap. 16, Section B	
ENERGY MONITORING & CONTROL SYSTEMS (EMCS)	Energy Monitoring & Control Systems	TM 5-815-2/ AFM 88-36	
EXPLOSIVE SAFETY	Ordinance Safety Manual	DARCOM-R-385/100	N.A.F. COE
	Explosive Safety Standards	AFR 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	
FIRE ALARM SYSTEM & FIRE PROTECTION	Criteria & Standards for Air Force Construction	AFR 88-15, Chap. 16, Section A	
	Fire Protection for Facilities, Engineering, Design and Construction	MIL-HDBK-1008	
	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	
	Criteria & Standards for Air Force Construction	AFR 88-15, Chap. 16, Section A	
	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 & Co-ordination 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
	Recommended Practice for Design of Reliable Power System (Gold Book)	IEEE Standard 493	N.A.F. COE
INTERIOR INTRUSION PROTECTION SYSTEM (J.SIIDS)	Installation, Operation & Checkout of J-SIIDS Intrusion Detection Systems	TM 5-6350-262-14/14 DM 4-805-6	
LIGHTING FIXTURES & LIGHTING	OCE Lighting Fixtures Standard	Standard DWG. No. 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	1981 Vol. I & II	N.A.F. COE
LIGHTNING 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 ELECTRIC SUPPLY & COMMUNICATION	National Electrical Safety Code	ANSI C2	N.A.F. COE
	Rule for Overhead Elec Line Constr Gen. Ord. 95	G.O. 95	Use 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 Resources Protection Program	AFR 125-37	
	AF Physical Security Program	AFR 207-1	
	Construction for Secure Conference Rooms	AFP 88-26	
	Vaults, Arms, Storage & Secure Storage Areas	DM 4-805-2	
SEISMIC DESIGN	Seismic Design For Buildings	TM 5-809-10/ AFM 88-3, Chap. 13	Refer to Chapters on "Mechanical & Elements"
Electrical			
STATIC ELECTRICITY	Lightning & Static Electricity Protection	TM 5-811-3/ AFM 88-9, Chap. 3	
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	
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

X-RAY & RF SHIELDING/EMP

Tempest/EMP Shielding

DM 4-805-4

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	TM 5-818-7	TM 5-858-1
TM 5-785	(AFR 88-28	TM 5-820-1	TM 5-1300
TM 5-800-1	TM 5-810-3	(AFM 88-5, Ch 1)	TM 5-6350-262-14/14
TM 5-800-3	(AFM 88-8, Ch 2)	TM 5-820-2	TM 9-1300-206
TM 5-803-1	TM 5-810-4	(AFM 88-5, Ch 2)	TM 11-685
TM 5-802-1	(AFM 88-8, Ch 3)	TM 5-820-3	AFM 50-25
TM 5-803-2	TM 810-5	(AFM 88-5, Ch 3)	AFM 86-2
(AFM 19-10)	(AFR 88-8, Ch 4)	TM 5-820-4	AFM 86-6
TM 5-803-4	TM 5-810-6	(AFM 88-5, Ch 4)	AFM 86-8
TM 5-803-5	(AFM 88-8, Ch 5)	TM 5-822-2	AFM 88-4, Ch 5)
(AFM 88-43)	TM 5-810-7	(AFM 8807, Ch 5)	AFM 88-14
TM 5-803-6	(AFM 88-12, Ch 4)	TM 5-822-4	AFM 88-25
TM 5-803-7	TM 5-811-1	(AFM 8807, Ch 4)	AFM 88-45
(AFR 86-14)	(AFM 88-9, Ch 1)	TM 5-822-5	AFM 88-50
TM 5-803-10	TM 5-811-2	(AFM 8807, Ch 3)	AFP 88-40
(AFM 88-33)	(AFM 88-9, Ch 2)	TM 5-822-6	AFP 88-41
TM 5-803-11	TM 5-811-3	(AFM 8807, Ch 1)	AFR 88-15
(AFM 88-30)	(AFM 88-9, Ch 3)	TM 5-822-7	AFR 88-50
TM 5-803-12	TM 5-811-4	(AFM 88-6, Ch 8)	AFR 89-1
TM 5-804-2	(AFM 88-9, Ch 4)	TM 5-822-8	AFR 125-37
TM 5-805-1	TM 5-811-5	(AFM 88-6, Ch 9)	AFR 127-100
(AFM 88-3, Ch 6.)	TM 5-811-6	TM 5-822-9	AFR 207-1
TM 5-805-3	TM 5-811-7	TM 5-823-2	DG 1110-3-104
TM 5-805-4	TM 5-813-1	TM 5-823-3	DG 1110-3-106
(AFM 88-37)	(AFM 88-10, Ch 1)	TM 5-823-4	DG 1110-3-107
TM 5-805-6	TM 5-813-2	TM 5-824-1	DG 1110-3-112
(AFM 88-4, Ch 4)	(AFM 88-10, Ch 2)	(AFM 88-6, Ch 1)	DG 1110-3-119
TM 5-805-7	TM 5-813-3	TM 5-824-3	DG 1110-3-120
(AFM 88-4, Ch 7)	(AFM 88-10, Ch 3)	(AFM 88-6, Ch 3)	DG 1110-3-124
TM 5-805-9	TM 5-813-4	TM 5-824-4	DG 1110-3-126
TM 5-805-12	(AFM 88-10, Ch 4)	TM 5-825-2	DG 1110-3-128
TM 5-805-13	TM 5-813-5	(AFM 88-6, Ch 2)	DG 1110-3-132
(AFM 88-4, Ch)	(AFM 88-10, Ch 5)	TM 5-827-2	DG 1110-3-134
TM 5-805-14	TM 5-813-6	(AFM 88-24, Ch 2)	DG 1110-3-140
TM 5-807-7	(AFM 88-10, Ch 6)	TM 5-827-3	DG 1110-3-144
TM 5-807-10	TM 5-813-7	(AFM 88-24, Ch 3)	DG 1110-3-150
TM 5-809-1	(AFM 88-10, Ch 7)	TM 5-830-2	DM 4-805-1
(AFM 88-3, Ch 1)	TM 5-814-1	(AFM 88-17, Ch 2)	DM 4-805-1
TM 5-809-2	(AFM 88-11, Ch 1)	TM 5-830-3	DM 4-805-4
(AFM 88-3, Ch 2)	TM 5-814-2	(AFM 88-17, Ch 3)	DM 4-805-5
TM 5-809-3	(AFM 88-11, Ch 2)	TM 5-830-4	DM 4-805-9
(AFM 88-3, Ch 3)	TM 5-814-3	(AFM 88-17, Ch 4)	EM 385-1-1
TM 5-809-4	(AFM 88-11, Ch 3)	TM 5-838-2	EM 1110-1-2101
(AFM 88-3, Ch 4)	TM 5-814-4	TM 5-840-2	EM 1110-2-410
TM 5-809-5	(AFM 88-11, Ch 4)	TM 5-841-1	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 1008
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 62
ARCH & ENG INSTR.
STD DETAILS

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 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/Early Preliminary/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 transmitting 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 by 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, and 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 paragraph, "Applicable Publications." All publications listed in the specifications are referenced in paragraph, "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 your 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:

- a. Title Page. List Project title, location and date of report.
- b. 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.
- c. Special Design Considerations. Provide 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:
 - Step-by-step instruction for constructing complex building features, i.e., this needs to be done before that, etc.
 - Critical tolerances
 - Special testing requirements
 - Critical or unusual product and performance specifications such as high pressure, temperatures or capacities.
 - Situations where manufacturer should oversee equipment installation.
 - Long-lead procurement items.
 - Government-furnished equipment.
 - Special operational constraints, i.e., utility outage periods, aircraft runway closures, phasing of work in occupied buildings or other special construction phasing required.
 - Any permits that must be obtained prior to and during construction.
 - Critical safety precautions required, especially in the areas of asbestos, or other minimum quality assurance testing amount/frequency for critical items.
- d. 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.
- e. Schedule of Required Site Visits 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 cover page with 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 insure that the project is designed in full compliance with all environmental regulations applicable to the project. Areas of concern include:

- Air Quality
- Water Quality
- Noise Control
- Solid Waste Disposal
- Hazardous Wastes
- Historic Preservation
- Archaeological Resources
- Threatened and Endangered Species

2.0. Submittal Requirements. The A-E shall provide a listing of all applicable permits licenses and any other authorizations required to Construct and operate the project on an Environmental Permit Matrix (see blank form, instructions for completion, and sample completed form at end of this appendix.) The completion of the 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 permitting or licenses, the A-E shall submit a letter to the COE with the Early Preliminary Submittal certifying the designer's conclusions.

2.1. Concept Submittal Requirements. None.

2.2. Early Preliminary Submittal Requirements. For each permit required, the following information shall be provided on the environmental permit matrix:

- Permitting authority (Federal, State and/or local)
- Type permit/authorization required
- Procedure and time necessary to process permit'
- Fee schedule - to include filing/application fees, charges for actual emissions and fees relative to testing of abatement equipment toward insuring compliance with environmental requirements.
- Data and/or studies required.
- 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.

2.3. 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:

- Solid Waste Disposal
- Sanitary Landfill
- Toxic and Hazardous Waste storage, transportation and disposal
- Wastewater discharge
- Open burning
- Incineration
- Locating, constructing and operating related facilities
- Stationary Source operation
- Noise generation
- Cultural Resource disturbance
- Biological Resource disturbance
- 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.

3.0. Instruction for Completing Environmental Permits Status Matrix

3.1. The purpose of the Matrix is to allow the Air Force to track the status of Environmental permits required for Air Force projects.

3.2. The Matrix is designed to show what was done by the A/E and/or Design Agent.

3.3. The Matrix is designed to establish accountability for determining permitting requirements.

3.4. For the Matrix to work effectively, all items must be completed as follows:

- Project: Title
- Installation: Base
- FY: Fiscal Year of project
- PN: Project Number
- Determination Completed By: Name of individual (and Organization) accountable for the determination.

Specific Items/EOP Evaluated: Indicate specifically which parts of the project, i.e., equipment, e.g., paint spray booth, diesel fuel tank, etc., were examined for permitting requirements. If there are no items which could possibly require permitting, the N/A column should be checked. A statement must also be included. . . as shown on the example.

Permit Required (Y/N/NA): If Yes, indicate in the y column how many permits are required. If no, mark N in column. If the project not impact a specific parameter, mark the explain (as shown on example).

Regulatory Agency Contacted: Identify the regulatory agency contacted. Include regulator's name(s) and dates of contact. the appropriate regulatory contacted, i.e., don't Resources Board to permitting

Ensure agency is expect the Air know about requirements for underground tanks, etc.

Permit Fee: Indicate the amount of dollars which must accompany the permit This should be regulator is

application. determined when the contacted.

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

3.5. Incomplete Matrices (Applications) 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 Sheets contain 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 these blank Data Sheets are on our Electronic Bulletin Board. For access, contact your COE PM.

2.0. Submittal Requirements.

2.1. Concept/Early Preliminary/Preliminary Submittals. No submittal required.

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

DD FORM 1354 DATA SHEET
for Air Force Projects

Date: _____

Instructions to Designer: The information you supply on this data sheet will be utilized by the COB 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 COB Construction Resident Office personnel use.)

FACILITY AND FEATURES WITHIN THE 5' LINE

1. Facility Category Code (from DD Form 1391 or Project Book)(Block #18): _____
2. Facility Title (Project Title)(Block #19): _____
3. Location (i.e. Hill AFB, Utah, McClellan AFB, 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>
890-126	A/C Window Units	Tn or SF
890-125	A/C Plant Less than 5 Ton	Tn or SF
890-121	A/C Plant 5 to 25 Ton	Tn
826-122	A/C Plant 25 to 100 Ton	Tn

b. Fire Protection

<u>Cat. Code</u>	<u>Facility</u>	<u>Unit of Measure</u>
826-123	A/C Plant Over 100 Ton	Tn
821-115	Heating Plant 750 to 3500 MB	MB
821-116	Heating Plant Over 3500 MB	MB
880-211	Closed Head Auto. Sprinklers	SF or Head
880-212	Open Head Deluge System	SF or Head
880-231	CO2 System	EA
880-232	Foam System	EA
880-234	Halon 1301 System	EA
880-233	Other Fire Suppression System	EA
880-222	Manual Fire Alarm System	EA
880-221	Auto. Fire Detection System	SF or EA

c. Security Systems

<u>Cat. Code</u>	<u>Facility</u>	<u>Unit of Measure</u>
872-841	Security Alarm System	EA

d. Emergency Power Systems

<u>Cat. Code</u>	<u>Facility</u>	<u>Unit of Measure</u>
811-147	Electric Emergency Power Generator	KW

Sample:

Cat. Code (Block #18): 880-222 Facility (Block #19): Man Fire Alm Sys No. of Units (Block #20): 1
 Type (Permanent [P], Semi-Permanent [S], Temporary [T]) (Block #21): P Unit of Measure (Block #22): EA
 Total Quantity (Block #23): 10 Pull Stations Cost (Block #24): 12,764 Percent * : 1%
 Remarks (Describe per instructions above) (Block #26): System is manually operated by pull stations which are tied into alarm bells and the fire alarm panels. There are ten pull stations, 3 alarm bells, 2 fire alarm panels and associated wiring.

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 COB 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.

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>
111-111	Runway	SY
112-211	Taxiway	SY
113-321	Apron	SY
116-642	Shoulder, Paved	SY
132-133	Pad, Equipment	SY/BA
851-142	Road, Bridge	LF
851-145	Driveway	SY
851-147	Road	SY/LF
852-262	Vehicle Parking	SY

Sample:

Cat. Code (Block #18): 851-147 Facility (Block #19): Road 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 * : 5%
 Remarks (Describe per instructions above) (Block #26): Consists of 2" bituminous surface course over 6" stabilize 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): _____

* 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 COR 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 COB 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>
135-583	Telephone Duct	LF
135-586	Telephone Pole	LF
136-661	Light, Approach	LF
136-664	Light, Runway	LF
136-666	Light, Airfield	BA
136-667	Light, Taxiway	LF
812-223	Prim Dist Line OH	LF
812-224	Sec Dist Line OH	LF
-	Power Poles	LF
812-225	Prim Dist Line UG	LF
812-226	Sec Dist Line UG	LF
890-187	Utility Vault (4 or more XFMS)	SF
812-926	Ext Area Lighting	BA
813-231	Elec Substation	KV
822-245	Hot Water Mains	LF
822-248	Hot Water Pump Stations	SF
822-265	Steam Heat Mains	LF
822-268	Cond Pump Station	SF
824-464	Gas Mains	LF
831-169	Sewer Septic Tank	KG
832-255	Ind Waste Main	LF
832-266	San Sewer Main	LF
832-267	San Sewer Pump Station	SF
841-166	Water Well	KG
842-245	Water Dist Mains	LF
842-249	Water Pump Station	SF
843-315	Fire Hydrants	BA
871-183	Storm Drain	LF
871-185	Stm Drain Pump Station	SF
890-144	Compressed Air Dist	LF
890-269	Cathodic Protection Sys	BA
890-272	EMCS Field Equip	BA
890-273	EMCS Data Link	BA

Sample:

Cat. Code (Block #18): 832-266 Facility (Block #19): San Sewer Main 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.

* Insert percentage that represents the percent of this item as related to the total project cost shown in item 1 above. This figure will be used by the COB 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 COB 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 Curbs and Gutters and the project has one set of Curbs and Gutters, 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" are 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> (Include the Following)
851-143	Curbs and Gutters	LF	Type, Size, Mat'l, Length
852-289	Sidewalk	SY	Mat'l, Width, Length, Subgrade Mat'l
860-617	Railroad Track	LF	lb. Rail, Length, Turnouts, etc.
871-187	Retaining Wall	SY/LF	Mat'l, Width, Height, Length
872-247	Fence, Security	LF	Type, Height, Length, Gates
872-248	Fence, Interior	LF	Type, Height, Length, Gates
932-681	Site Preparation	SY	Landscaping, Sprinkler Sys
934-277	Erosion Control	CY	Type
821-112	Htg Fuel Stor Tank	EA	Type, Size, Fuel
-	Other Stor Tanks	EA	Type, Size, Mat'l Stored
890-158	Load and Unload Platform	SF	Type, Mat'l, Dimensions

Sample:

Cat. Code (Block #18): 852-289 Facility (Block #19): Sidewalk 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): 7560 SY Cost (Block #24): 55,000 Percent * : 5%
 Remarks (Describe per instructions above) (Block #26): Consists of 17,010 LF of 4' wide, 4" thick class "A" Portland Cement Concrete 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): _____

* 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 COB 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 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 ranch 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 ranch will furnish the following for incorporation by the A-E into the project documents:

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

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

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

d. 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) Demolition (if required).

- (2) Clearing and Grubbing (if required).
- (3) Excavation, Embankment, and Subgrade Preparation.
- (4) Subdrainage system (if required).
- (5) Base materials.
- (6) Surfacing.
- (7) Joint sealing (if required).
- (8) Pavement repairs (if required).

2.0. Geotechnical information - A-E Prepared

Generally, all geotechnical investigations will be conducted by the Corps of Engineers Geotechnical ranch. 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 contract, 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. A-E will discuss results of the geotechnical investigations with CO's Quality Assurance specialists and the District's Geotechnical ranch 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) for inclosure into the contract drawings. Finally, the A-E shall prepare Engineering Consideration's and Instruction for Field Personnel Report also. (See Appendix for information on what to include in this report.)

SURVEYING AND MAPPING REQUIREMENTS

1.0. Surveying and Mapping.

1.1. General. Surveying and mapping are normally performed by the District, and topographic maps and other survey data are provided to A-E. When surveying and mapping are performed by A--E, work shall be accomplished by qualified personnel licensed in such work, in accordance with the following requirements and those contained in DM 4-805-10, "Sacramento District Design Manual for Surveying and Mapping".

1.2. Procedures. In addition to any specific survey requirements prescribed in the scope of work for the project, the following shall also apply:

a. Basic mapping control, "P" lines for route surveys, as-built control, and cadastral surveys shall be conducted to 3rd Order accuracy, both horizontally and vertically, and comply with the standards and Specifications for Geodetic Control Networks (Sept 84). NOAA Federal Geodetic Control Committee.

b. When surveys include legal land surveys or descriptions, work shall be accomplished in accordance with Bureau of Land Management methods and procedures, state statutes where appropriate, and by or under supervision of a professional land surveyor holding a current license issued by the state in which the work is located.

c. All extension of survey control and mapping accomplished by photogrammetric methods and procedures shall comply with the National Map Standards of Accuracy.

d. The A-E shall inform the Government of his proposed methods, procedures, and type of equipment to be used, and the work will be subject to inspection by government personnel. However, the A-E will retain responsibility for the quality of the work within the limits prescribed in the scope of work.

1.3. Topographic Drawings. Topographic and planimetric data shall be plotted to prescribed scale and contour interval on polyester drafting film of approved quality in accordance with Sacramento District Drafting Standards. When specific instructions are not furnished, the following shall apply:

a. Contours shall be shown with fine, solid line. Every fifth (guide) contour shall be somewhat heavier and periodically broken for insertion of the contour elevation. In general, identification of guide contours shall follow a regular pattern to allow for "easy map reading."

b. All survey stations, bench marks, designations, and elevations are to be shown on topographic drawings in accordance with Sacramento District Drafting Standards.

c. Buildings and structures shall be shown with solid lines, omitting cross hatching or complete blanking.

d. Maps and drawings shall be so oriented that north will be toward top of sheet, when practicable, or toward the left of the sheet if top orientation is impractical.

e. Items to appear on all completed topographic drawings are as follows:

- (1) North arrow.
- (2) Grid ticks and values.
- (3) Scale and graphic scale.
- (4) Grid system, projection, and vertical datum with latter referenced to National Geodetic Vertical Datum (NGVD 1929).
- (5) Date aerial photography flown, if applicable.
- (6) Date of ground survey.
- (7) Survey control points, identification, and elevations where appropriate.

Appendix G

COMPREHENSIVE INTERIOR DESIGN (C.I.D.) REQUIREMENTS

PART 1 - Definition

1.0. General. The C.I.D. includes selecting and developing interior building furnishings for an integrated visual design theme which reflects the interior atmosphere desired by the AFRCE. The C.I.D. package must be developed concurrently with the design of the facility and submitted for review with the drawing contract submittal per PART 2 below. The C.I.D. submittal includes:

- a) Statement of Design Objective
- b) Sketches
- c) Representative Furniture Layouts
- d) Sketch Perspectives
- e) Example Color Rendering
- f) Exterior S.I.D. Materials and Finishes
- g) Furnishing Illustration Sheets
- h) Cost Estimates
- i) Prewired Work Station Requirements
- j) Color Boards
- k) Furniture and Furnishings Plan
- l) Color Rendering
- m) Furnishings Placement Lists
- n) Furnishings Contract Specifications
- o) Color Photographs

2.0. Comprehensive Interior Design: Furnishings selected in the C.I.D. generally include, but are not limited to, artwork and wall hangings, drapery and upholstery, furniture and systems furniture, files and other similar items. The use of prewired workstations (systems furniture) is mandatory for all Air Force administrative facilities and areas of 1,000 S.F. or more per ETL 86-12.

3.0. Structural Interior Design (S.I.D.): The C.I.D. requirements include structural interior designs (S.I.D.) items and graphics. The S.I.D. includes interior materials and finishes including color, texture, and patterns normally provided in the Architectural Design Requirements. Items included, but not limited to, are wall and floor finish materials, window and door finishes, glazing and trim materials, as well as paint and stain samples. Since Exterior colors, materials and finishes influence interior selections, exterior materials shall be included as a separate section of the C.I.D.

PART 2 - Submittal Requirements

4.0. Concept Submittal. If a C.I.D is required by the scope of work, see Early Preliminary Submittal requirements below.

5.0. Early Preliminary Submittal. Provide the following:

a) Statement of Design Objectives. Provide a narrative explaining the interior design philosophy of the facility. Where applicable, include desired psychological impact of the interior environment on its inhabitants and proposed method of accomplishing same by using space planning, shapes, forms, color, patterns, textures, fabrics and furnishings. Discuss plans to integrate the visual design disciplines such as architecture, graphic design, and interior design.

b) Sketches. These drawings shall illustrate the major spaces within the facility and shall emphasize form, space and detailing. Color is not required for these sketches.

c) Representative Furniture Layouts. Layouts shall show how major spaces within the facility integrate the C.I.D. and S.I.D. This layout will include a furnishings placement plan for each of the major spaces and a furnishings illustration sheet for each item provided.

d) Sketch Perspectives. Provide a single-line sketch perspective of each major space within the facility showing three dimensional space relationships and furnishings. This requirement is in addition to any single elevation sketches.

e) Example Color Rendering. An example color rendering of a major space shall be provided for approval. The rendering shall be prepared by a

professional renderer. See Appendix H.

f) Exterior S.I.D. Materials and Finishes. Include wall finish material, window and door frames, glazing, and trim materials. Provide paint or stain samples representing color and finish of gravel stops, fascias, hand rails, hardware, ventilation grills, screen walls, penthouses, and other visible materials affecting visual design aesthetics.

g) Furnishings Illustration Sheets. Provide illustrations and material/color samples of upholstery for each furnishing item proposed in the interior design scheme. Illustrations are to be represented by photograph, catalog cut, sketch, or rendering. The material/color samples provided shall be large enough to indicate true patterns, colors, and textures. Format shall be as directed in "Design Instruction for Comprehensive Interior Design, DTL 1110-4-20.

h) Cost Estimates. A furnishings cost estimate for the facility shall be submitted as required by the scope of work, and as directed by DTL 1110-4-20. The estimate shall show class number, fund category, item, quantity, unit cost, and total cost. The designer will use a 10% contingency figure, and freight costs will be broken out as a separate figure on each item.

i) Color Boards. If required at this stage, see Preliminary Design C.I.D. requirements.

j) Prewired Work Station Requirements. Provide Program Management Data Sheet and Acquisitions Cost and Space Requirement Summary Worksheets per ETL 86-12.

6.0. Preliminary Submittal. Update and complete all information provided in previous submittals and provide the following:

a) Color Board. The color board shall depict all C.I.D./S.I.D. materials and finishes. Code and coordinate samples with the finish, color, and graphics schedules of the facility contract documents. Label the material and finish samples with specific color names. Pattern samples shall be large enough to show the full pattern, color, and texture. Furniture samples shall also be located on the furnishing plan. Securely mount samples to the color board modules to withstand long periods of use.

b) Furniture and Furnishings Plan. The foot-print plan will show the furnishings required for the various functions that are to be housed in the facility, and will indicate the adequacy of the size and shape of each space. Standard furniture sizes shall be used to allow maximum flexibility for the final design. Accent walls, graphics, wall hangings and special feature items shall be located on this plan, and all furnishings coded to the "Furnishings Illustration Sheets."

c) Color Rendering. Provide a colored interior perspective rendering of a major space showing three dimensional space relationships, furnishings, color schemes, patterns and materials. The rendering shall be prepared by a professional.

d) Furnishings Placement Lists. Provide a coded floor plan and detailed listing of the furnishings specified for each room. A separate list with coded floor plan shall be provided for each room. Floor plan shall be 1/4" = 1'-0"; 1/8" = 1'-0" scale may be used for large areas only if data is legible at reduced sizes. The plan shall show the following:

1.) Proposed furniture placement or location coded by number and letter to indicate item and finish.

2.) Structural related built-in equipment, identified by name and finish code.

3.) Identifying labels per list headings to allow reviewer, as well as handling and moving personnel to quickly identify, and locate the furniture listed.

4.) For series of rooms calling for the same number of identical furnishings and same finishes, one placement list may be provided for all rooms listed. This list should be duplicated the required number of times to represent each room. Each page will then be numbered in proper sequence with room numbers circled.

e) Furnishings Contract Specifications. When appropriate, the designer shall name a commercial product with desired colors, finishes and detailed functional requirements as a standard to select from. A general nonproprietary disclaimer shall be included to indicate naming the commercial product is not to be restricted to the particular product identified. Any furnishing item selected must have at least three manufacturers available to equal this item. Recommended specification for prewired workstations is included in ETL 86-12.

7.0. Final Submittal. Update and complete all information provided in previous submittals. If a Preliminary submittal was not required, information provided in that section shall be provided with this submittal.

a) Colored Photographs. Provide (5) color photos size (8" x 10"), (3) 35 mm color slides, and a negative (4" x 5") of each of the final renderings. The negatives are to be provided directly to the AFRCE.

Appendix H

RENDERINGS

1.0. Concept Submittal Requirements.

1.1. SINGLE LINE PERSPECTIVE: The perspective shall show the three dimensional aspects of the facility with emphasis on the main building features. The perspective will illustrate the view planned for the final colored rendering for AFRCE approval.

2.0. Early preliminary Submittal Requirement. If a concept submittal was not made, provide the Single Line Perspective described above and the following:

2.1. SAMPLE RENDERING: Provide an 8" x 10" photo colored rendering to be used for the final perspective rendering for AFRCE approval. Provide five (5) copies.

3.0. Preliminary and/or Final Submittal Requirement.

3.1. COLORED PERSPECTIVE RENDERING: A 16" x 20" rendering prepared by a professional architectural renderer showing the view approved in the single line perspective and illustrating the colors and patterns of exterior building materials. Provide original and five (5) copies. These shall be framed and provided with non-glare acrylic glazing as the face protection.

3.2. COLOR PHOTOGRAPHS: Provide (5) color photos (8" x 10") and (4) 35mm color slides of the final rendering with a 4" x 5" negative of each rendering. The negatives are to be provided directly to the AFRCE.

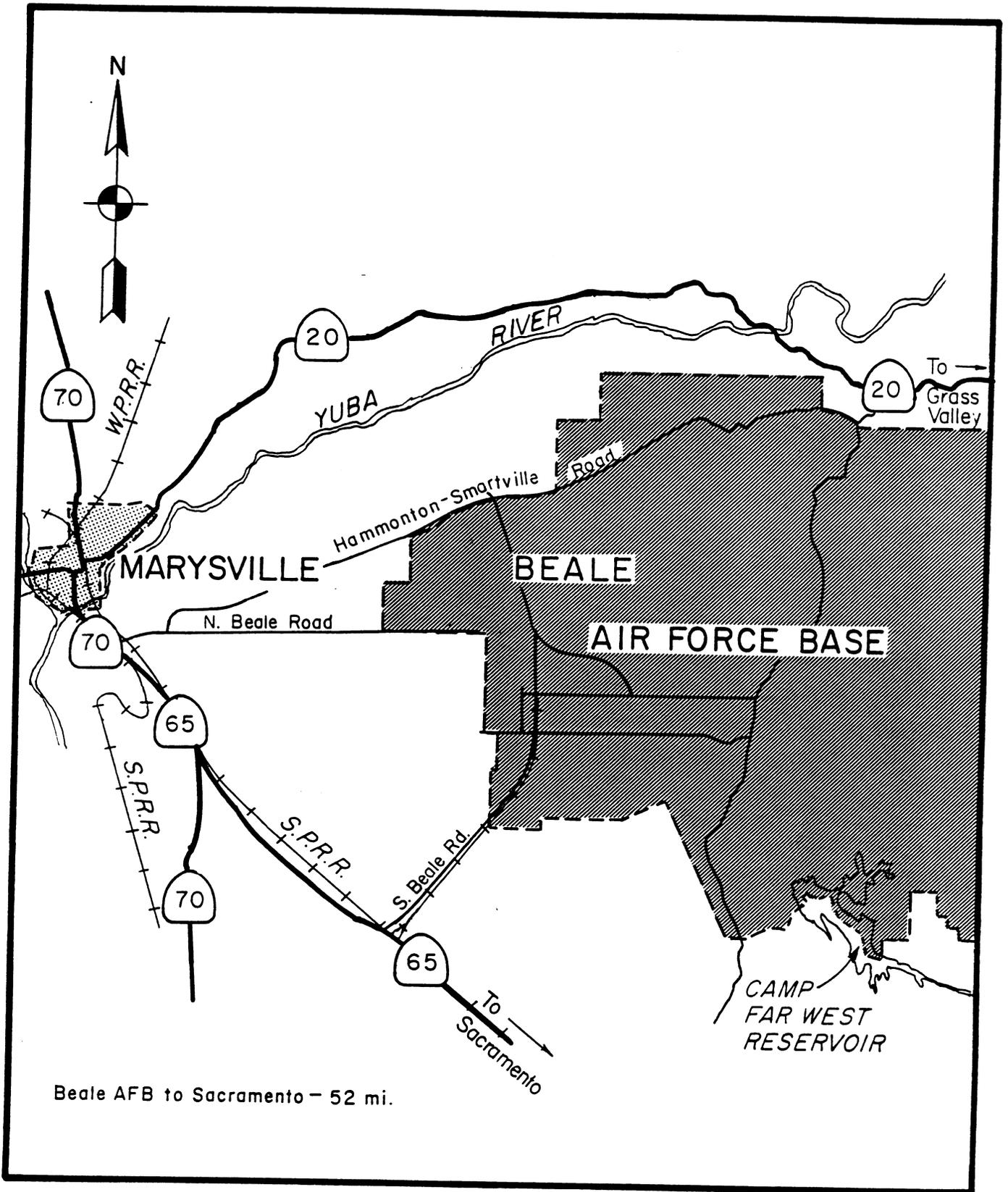
3.3. SITE PHOTOS: Show adjacent sites, buildings and site construction conditions by providing a small scale site plan and 5" x 7" color photos (6 minimum) viewing 360 degrees around the building site. Code and locate photo views on site plan. Provide 5" x 7" close-up frontal views of significant buildings that can be viewed from the site. Rehab and additions shall also show all elevations of existing buildings.

Appendix I

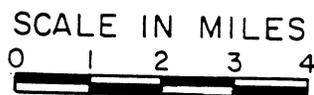
AIR FORCE INSTALLATION VICINITY MAPS

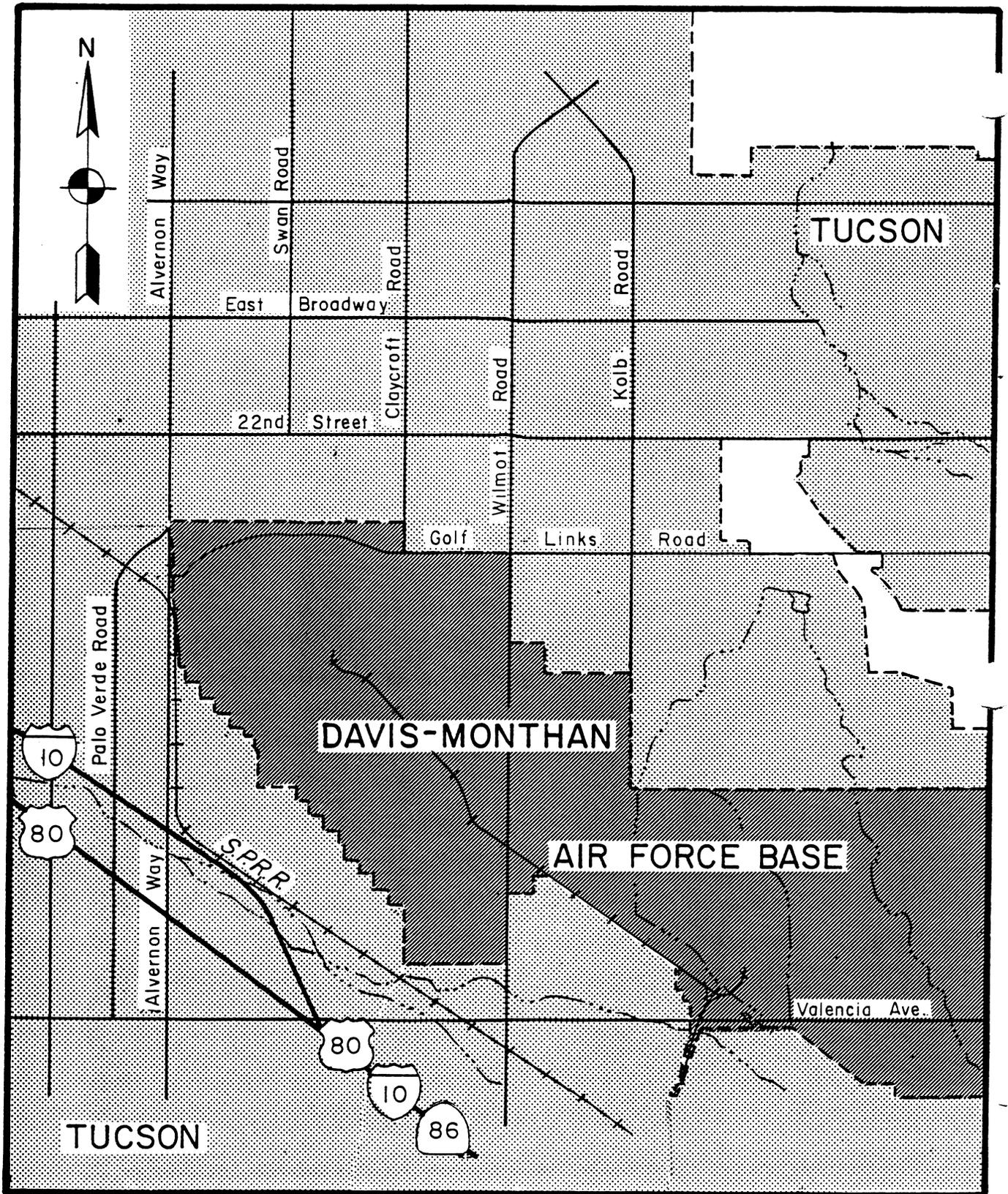
1.0. General. To provide continuity of product, standard vicinity maps have been prepared for the below listed Air Force installations served by the Sacramento District. These shall be utilized (traced, etc.) on all Air Force projects. See Chapter II for information on vicinity map location in project drawings.

Beale AFB
Davis-Monthan AFB
Edwards AFB
George AFB
Hill AFB
Luke AFB
March AFB
Mather AFB
McClellan AFB
Nellis AFB
Norton AFB
Vandenberg AFB
Williams AFB



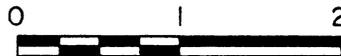
VICINITY MAP

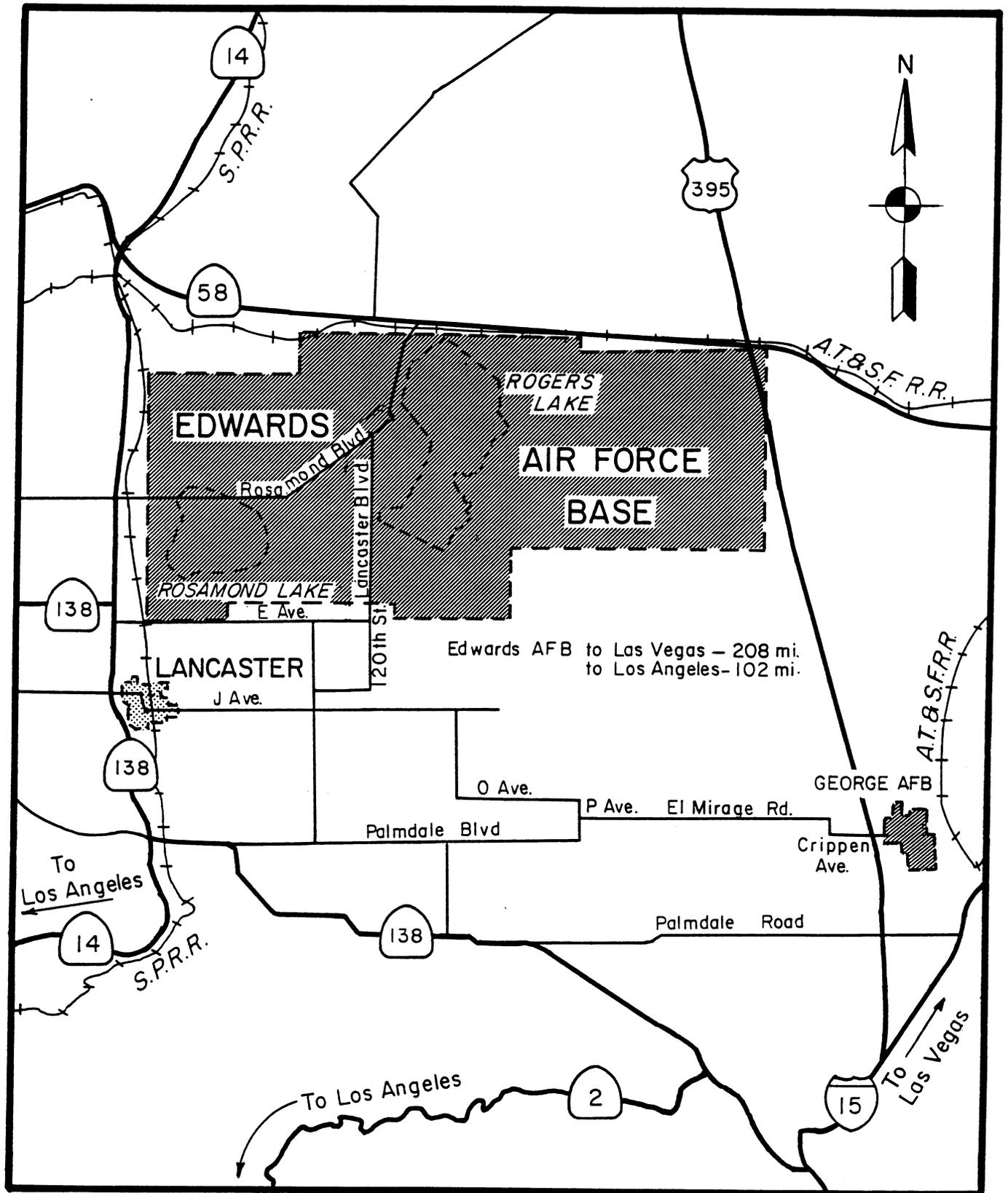




VICINITY MAP

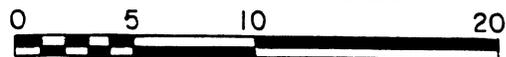
SCALE IN MILES

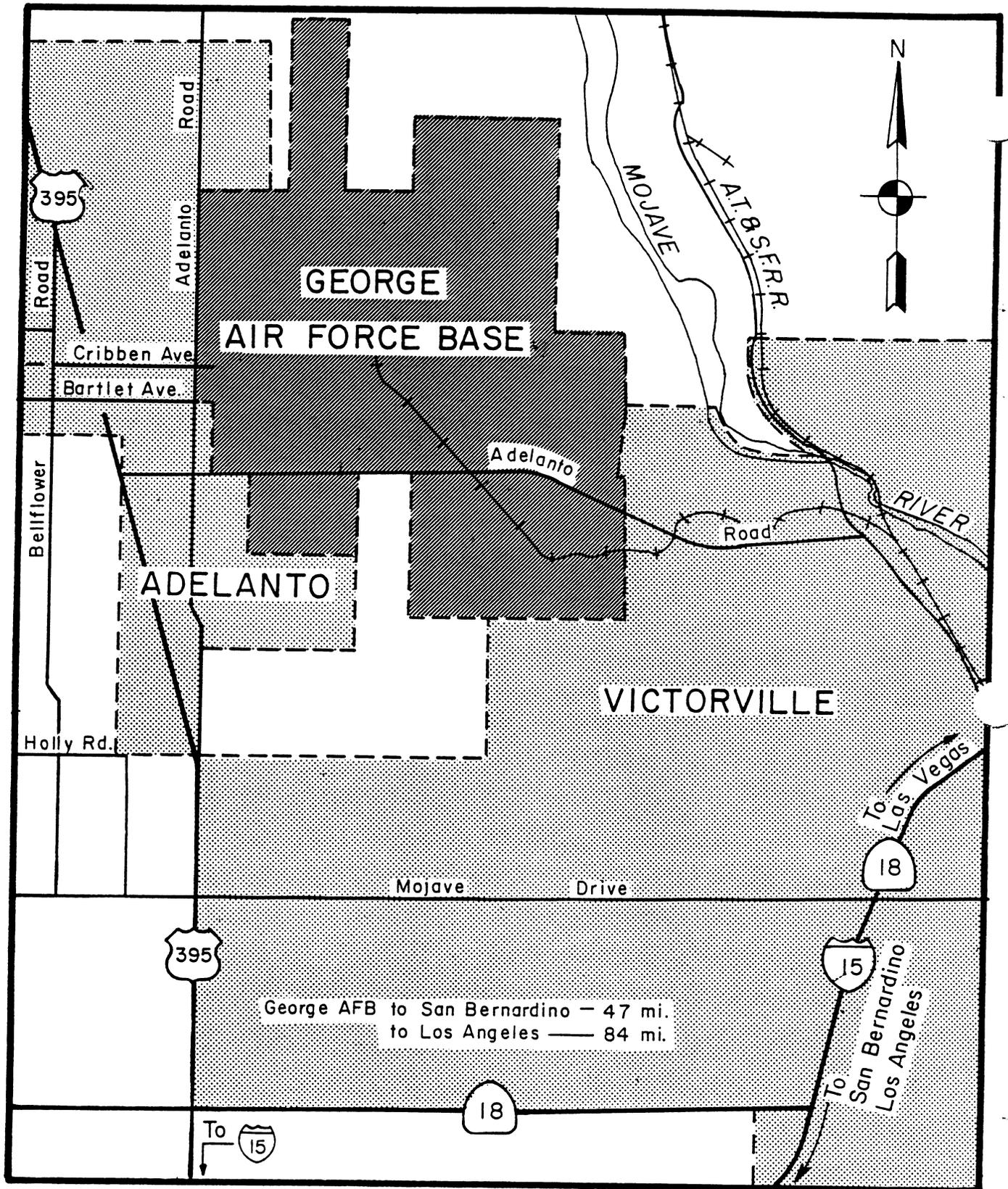




VICINITY MAP

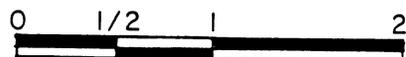
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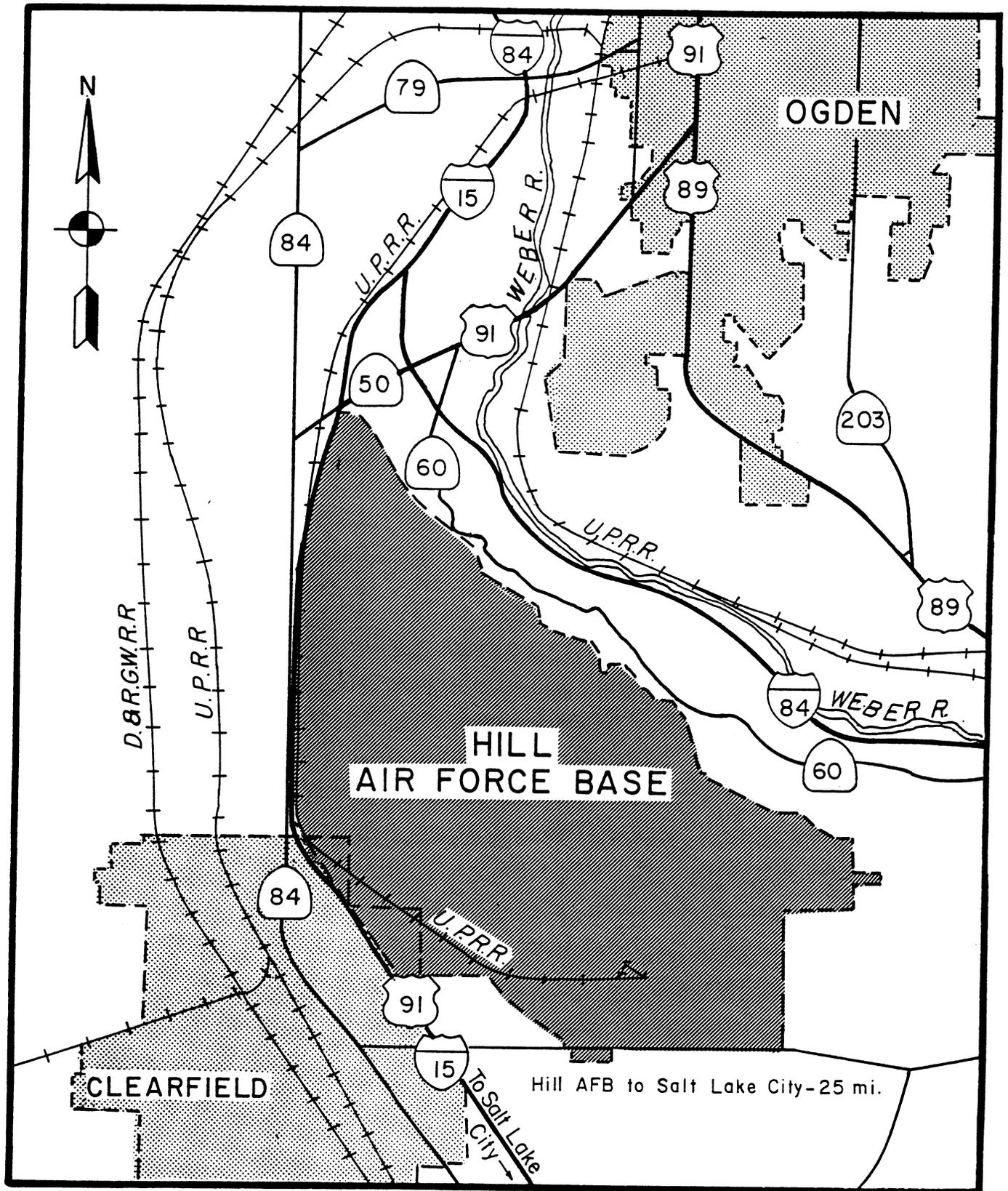




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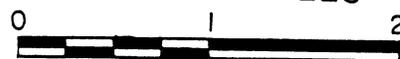
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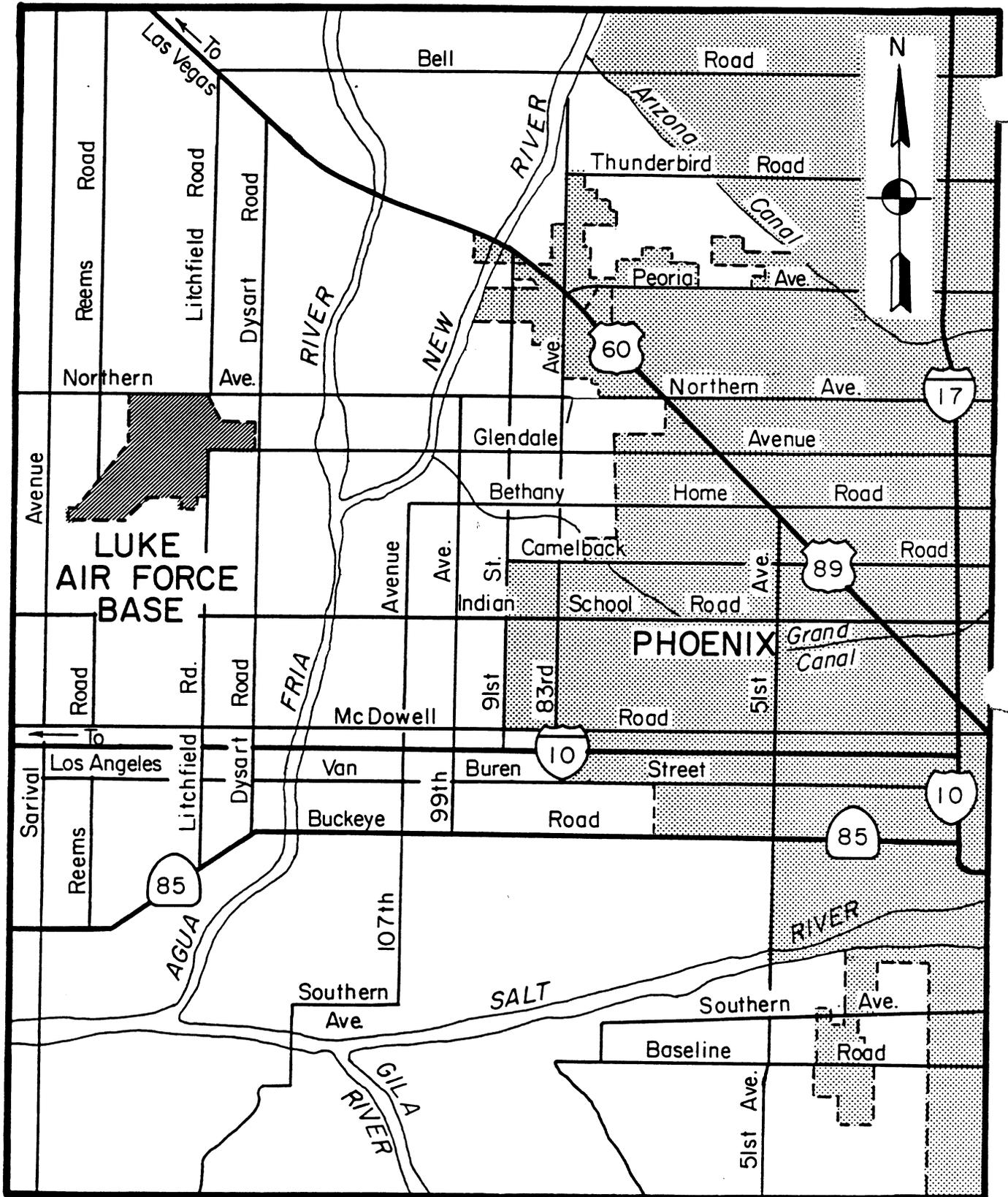




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SCALE IN MILES

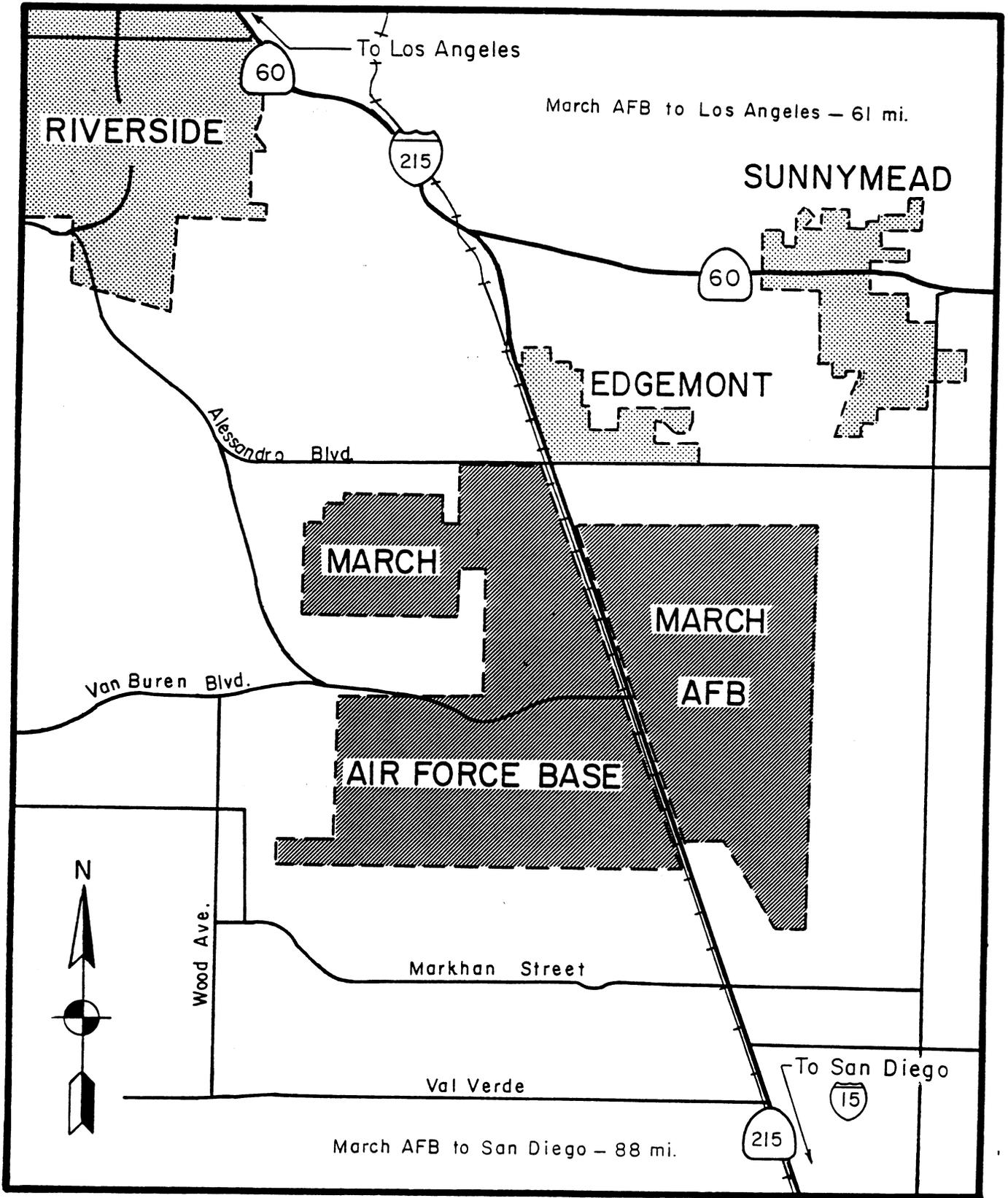




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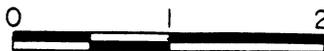
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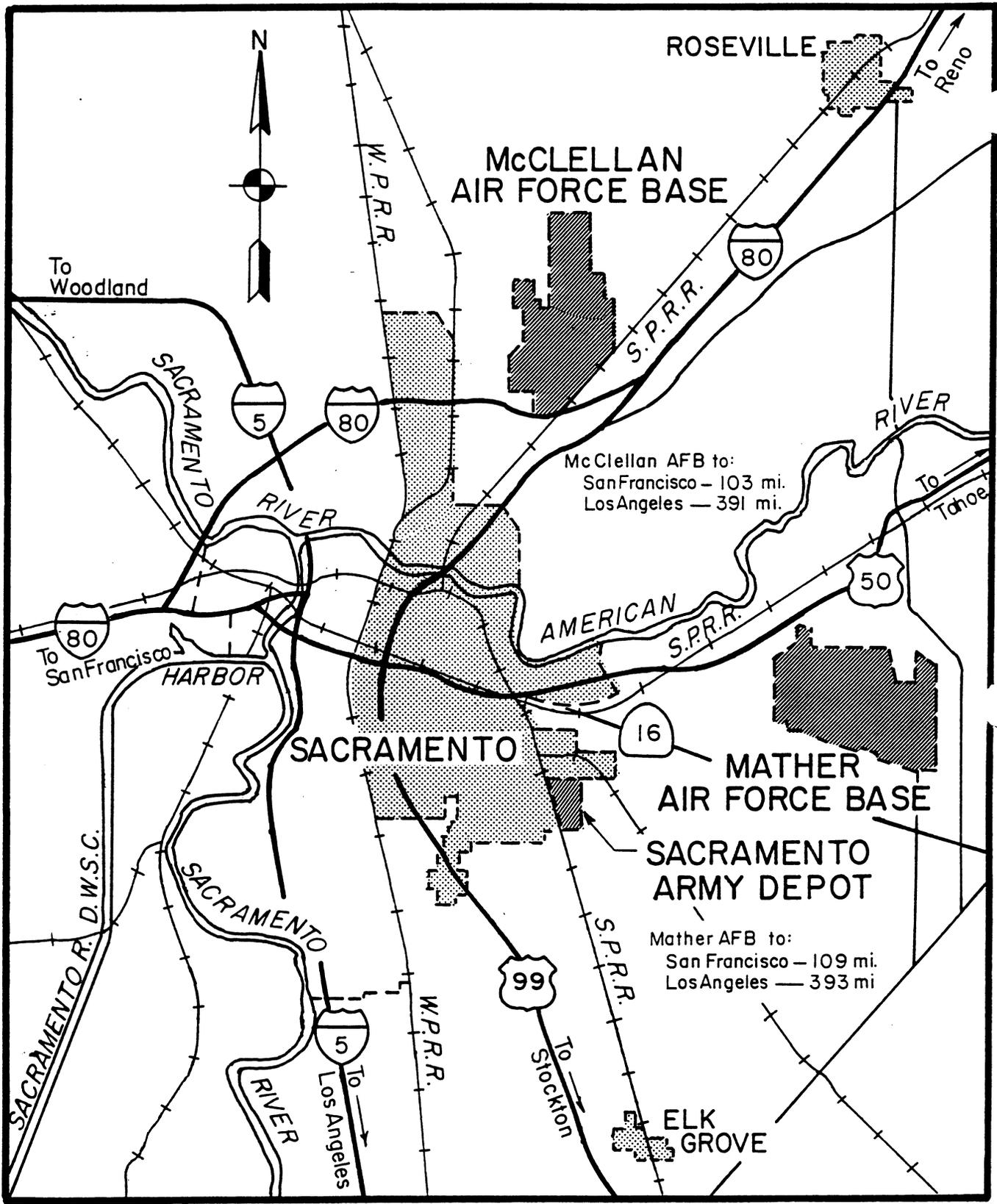




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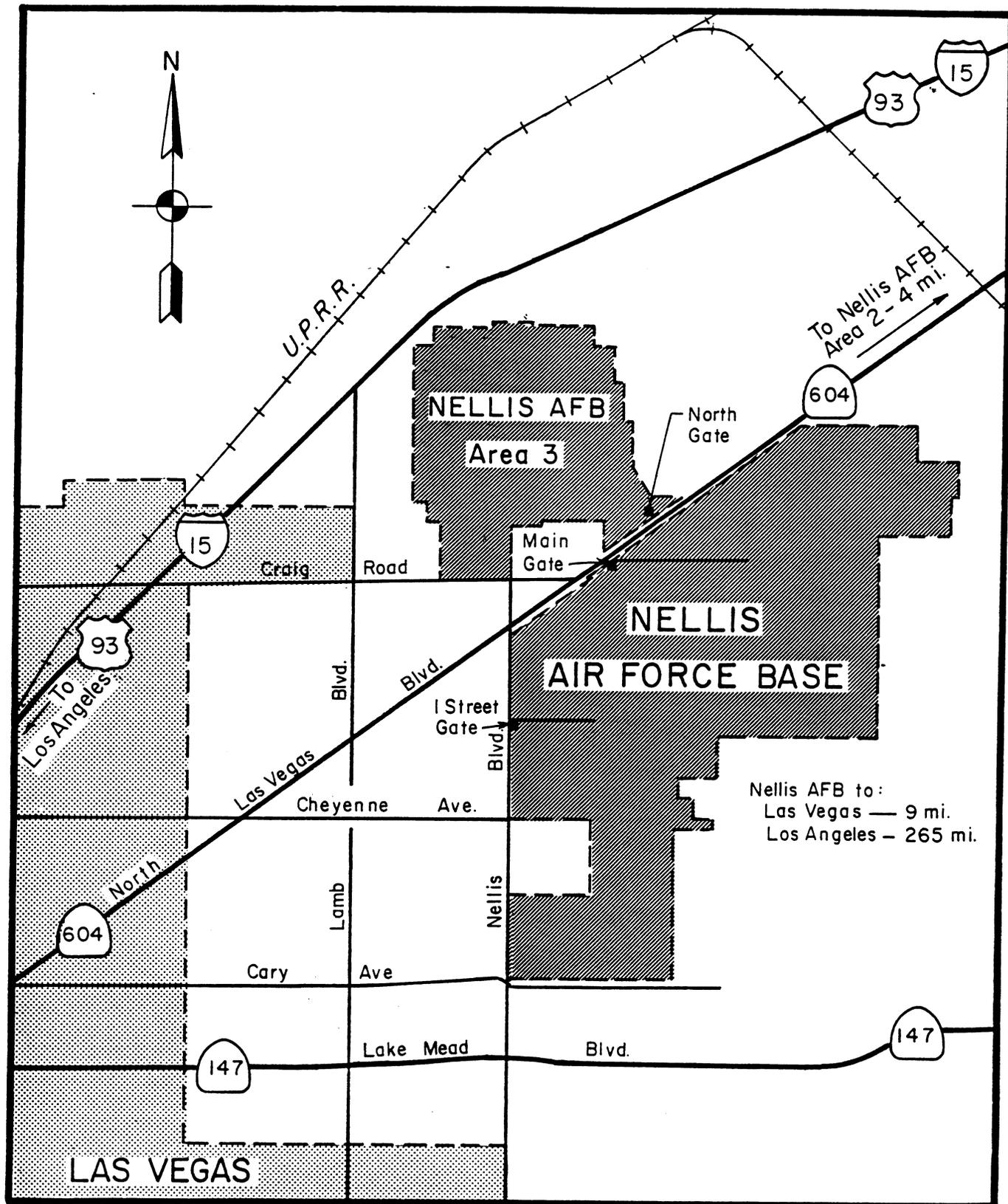
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VICINITY MAP



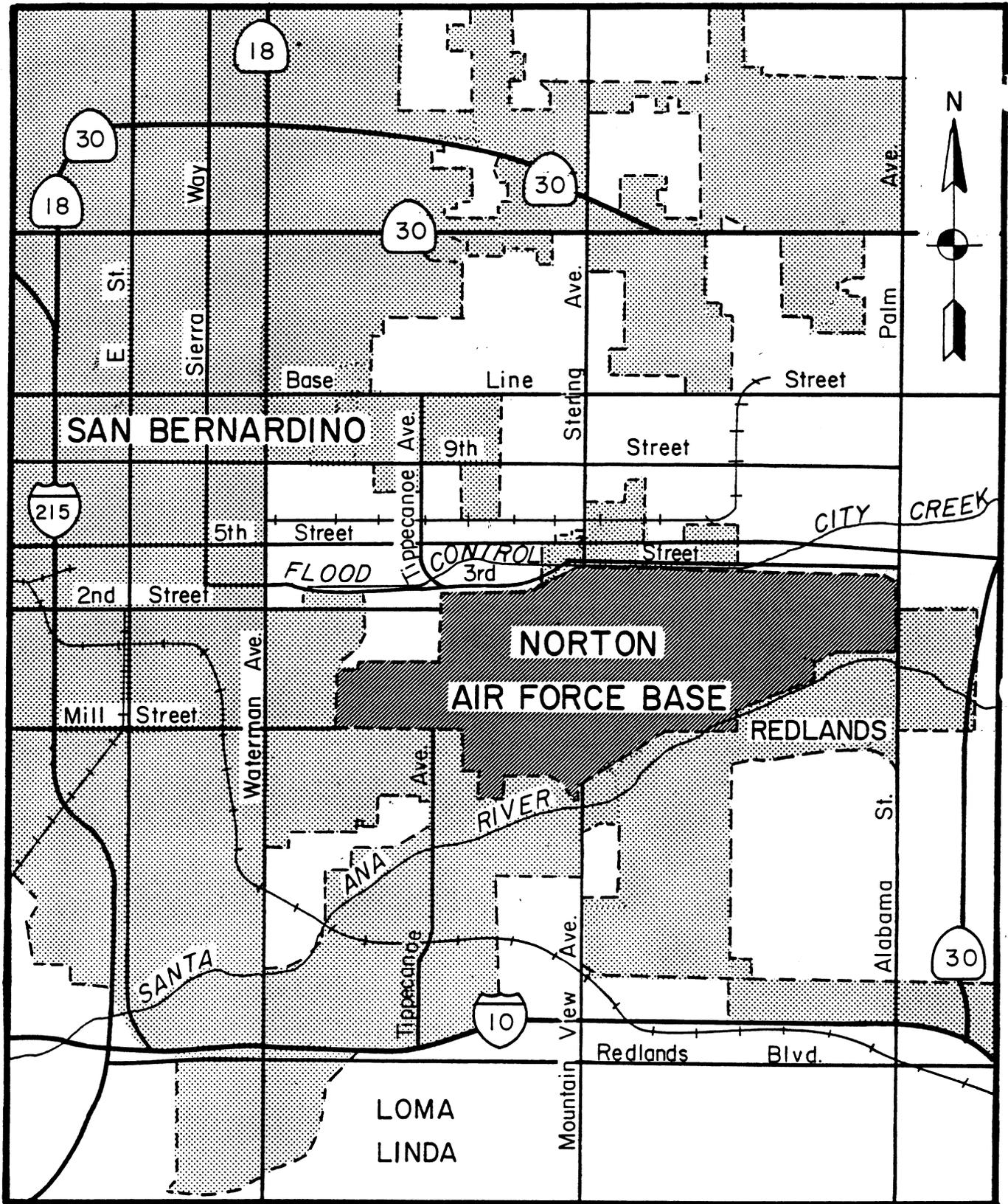


Nellis AFB to:
 Las Vegas — 9 mi.
 Los Angeles — 265 mi.

VICINITY MAP

SCALE IN MILES

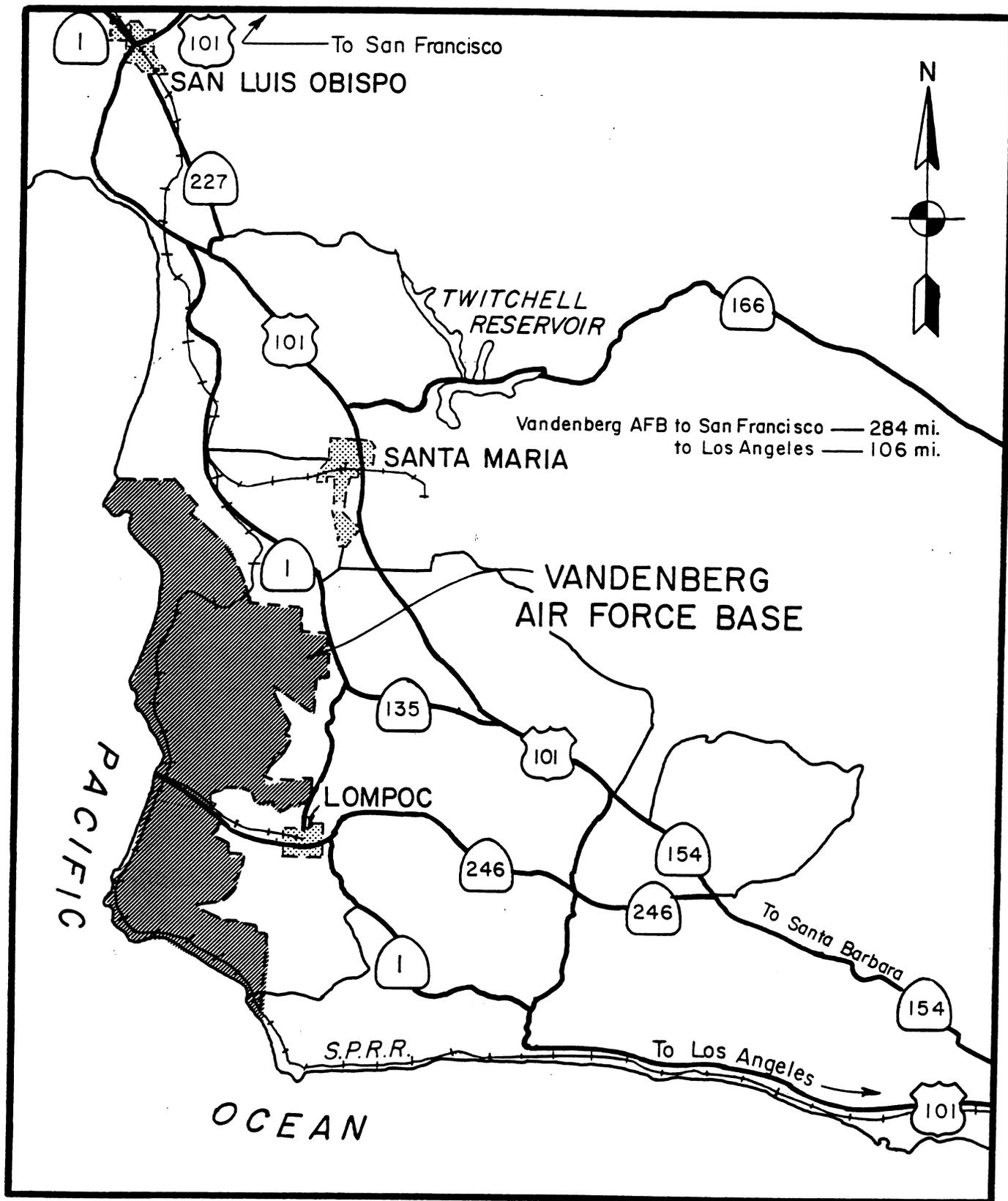




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SCALE IN MILES

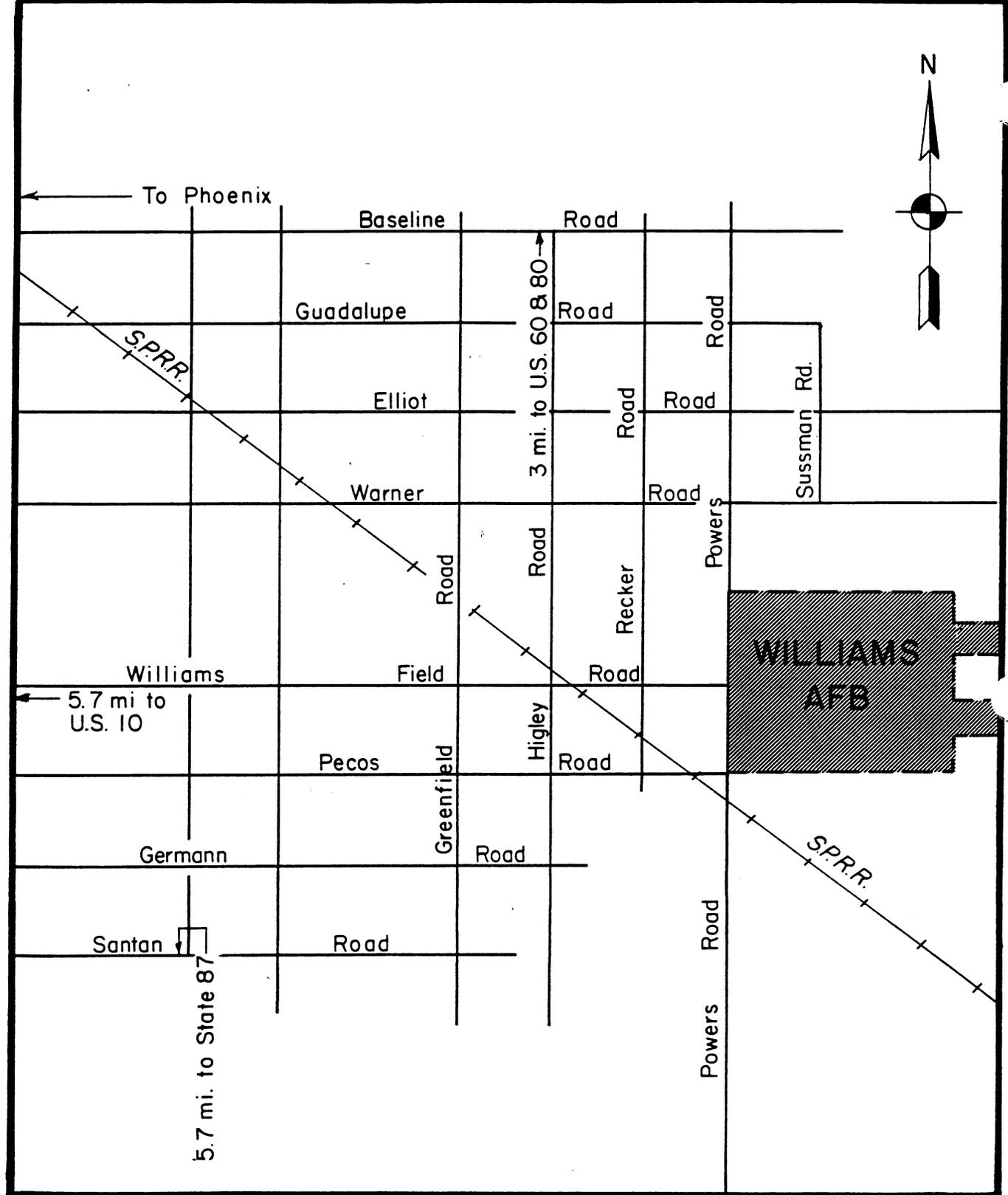




VICINITY MAP

SCALE IN MILES





VICINITY MAP

SCALE IN MILES

