

CHAPTER B-2

SOILS

INDEX

Para. No. Title No.	Page
3.1 GENERAL	B-2-1
3.1.1 Soils Section	B-2-1
3.1.2 Chapter Description.....	B-2-1
3.1.3 Foundation Report.....	B-2-1
3.1.4 Field Tests	B-2-1
3.1.5 Preliminary Foundation Report	B-2-1
3.1.6 Determination of Foundation Investigations	B-2-1
3.2 APPLICABLE PUBLICATIONS.....	B-2-2
3.3 PRECONCEPT SUBMITTAL REQUIREMENTS	B-2-2
3.4 CONCEPT/EARLY PRELIMINARY (35%) DESIGN SUBMITTAL REQUIREMENTS.....	B-2-2
3.4.1 Design Analysis	B-2-2
3.4.2 Design Drawings.....	B-2-2
3.5 SIXTY PERCENT (60%) SUBMITTAL REQUIREMENTS	B-2-3
3.6 PRELIMINARY (60%) DESIGN SUBMITTAL REQUIREMENTS	B-2-3
3.7 FINAL (100%) DESIGN SUBMITTAL REQUIREMENTS.....	B-2-3
3.8 CORRECTED FINAL SUBMITTAL REQUIREMENTS.....	B-2-3
3.9 TECHNICAL REQUIREMENTS	B-2-3
3.9.1 Deep Foundations	B-2-3
3.9.2 Earth Liners.....	B-2-3
3.9.3 Cathodic Protection and Grounding Systems.....	B-2-3
3.9.4 Permanent Water Well Design and Construction.....	B-2-4
3.9.5 Structures.....	B-2-4
3.9.6 Pavements	B-2-4
3.9.7 General Earthwork and Special Features.....	B-2-4

CHAPTER B-2

SOILS

3.1 GENERAL.

3.1.1 *Soils Section.* The Soils Section is responsible for the foundation design of all structures within the Savannah District military boundary. This section provides the Architect-Engineer (A-E) all foundation reports associated with military design and construction.

3.1.2 *Chapter Description.* This chapter describes requirements pertaining to foundation design and presents data that can be expected in the Foundation Design Analysis Report. This chapter also lists the specific requirements of submittal stages for geotechnical design features. The Savannah District Corps of Engineers will inform the A-E in the Specific Instructions portion of the contract whether subsurface investigation testing and a foundation design analysis report are required. When required, the Savannah District's Geotechnical and Materials Branch will accomplish subsurface investigations, materials testing, and a Foundation Report.

3.1.3 *Foundation Report.* The foundation report will be furnished the A-E when drilling and testing is completed. The foundation report will be based on a final site plan and data furnished by the A-E on SAS Form Letter 363. Any change in siting or changes to the basic information furnished in the SAS FL 363 shall be reported immediately as these changes will likely affect the Foundation Report. The Foundation Report will include the allowable soil bearing value, minimum depth to the base of footing, depth of the groundwater table, special foundation requirements, waterproofing measures, and marked-up specifications. The foundation report is not limited to the above information and may direct types of foundation to be used at the site, various soil parameters for retaining wall design, critical soil parameters, instrumentation requirements, special construction procedures, required compaction efforts, excavation and drainage requirements, dewatering specifications, borrow area usage, CBR and modules of subgrade values, and any other pertinent foundation information. The analysis may include several alternatives for the solution to a given problem. If this is the case, the A-E then has the latitude of using the solution most compatible with his design. The Foundation Report will be furnished the A-E at the time to proceed with final design or as soon thereafter as practicable.

3.1.4 *Field Tests.* Specialty field tests, such as pH measurements, resistivity testing, in-place bearing tests and percolation tests will be included with the Foundation Report as applicable for use in design by the A-E. Request for soil percolation tests should be made by the A-E through the Savannah District Project Manager.

3.1.5 *Preliminary Foundation Report.* A preliminary foundation report based on available data in the area can be furnished the A-E if requested, but is subject to change pending results of the subsurface investigation, soils testing, and the final Foundation Report.

3.1.6. *Determination of Foundation Investigations.* The Savannah District Geotechnical and Materials Branch, Soils Section, will determine:

3.1.6.1 The location of borings (including depth of holes) based on the adequacy of the detailed site plan.

3.1.6.2 The location of any required field tests. It should be emphasized that soil borings and testing of soil samples are usually conducted during the concept (early preliminary) or preliminary stages and are based on a firm siting of the proposed structures. After completion of the soil borings, the Savannah District will furnish the location of the soil borings which the A-E will locate on the Grading Plan (C-plate(s)). The soil boring sheets will be placed on full size drawing sheets and scanned to electronic format and added to the drawing set. The AE should save space on the index and drawing numbering for these at the end of the C-plates.

3.2 APPLICABLE PUBLICATIONS.

AFM 88-3 (CHAPTER 7)	Procedures for Foundation Design of Buildings and Other Structures
TM 5-822-5	Flexible Pavement for Roads, Streets, Walks, and Open Storage Areas
TM 5-822-6	Rigid Pavement for Roads, Streets, Walks and Open Storage Areas
TM 5-822-7	Standard Practice for Concrete Pavements
TM 5-822-8	Bituminous Pavements - Standard Practice

3.3 PRECONCEPT SUBMITTAL REQUIREMENTS.

No requirements for 10% design.

3.4 CONCEPT/EARLY PRELIMINARY (35%) DESIGN SUBMITTAL REQUIREMENTS.

3.4.1 *Design Analysis.*

a. Provide a completed SAS Form Letter 363 (Exhibit B-2-1) for each structure involved in the contract. (The foundation analysis report will be based on information presented in this form along with other data requested on the form.) Provide column and wall loads for the existing building when there is a planned building addition.

b. Incorporate recommendations presented in the Preliminary Foundation Report or Final Foundation Report if it has been provided at this design stage.

3.4.2 *Design Drawings.*

a. Provide one copy of the site plan in Microstation PC Format to the Savannah District's Geotechnical and Materials Branch, Attention: Chief, Soils Section, for the purpose of locating borings. This site plan shall be of sufficient detail to include locations of all proposed structures, roads, parking areas and contours, as well as any existing features such as buildings, fences, roads, parking areas and existing contours. The site plan shall also include the state plane coordinate system for the particular state in which the project is located. Finished floor elevations, of all structures and finished grade elevations shall be indicated. When there is a building addition, the A-E shall provide a plan, which will locate the existing footings and columns. This plan shall also include the depths of existing footings.

b. Locate borings and field test symbols on an applicable grading plan (C- plate(s)) if locations have been provided by the Savannah District Office during concept design. A note "See complete logs of borings on the plates at the end of Civil section of drawings" will be placed on the boring location plan. Add the appropriate symbol to legend. The symbols shown on Exhibit B-2-2 will be used to identify borings on military projects in lieu of symbols shown in the Savannah District Drafting Standard. The soil boring sheets will be placed on full size drawing sheets and scanned to electronic format and added to the drawing set. The AE should save space on the index and drawing numbering for these at the end of the C-plates.

3.5 **SIXTY PERCENT (60%) SUBMITTAL REQUIREMENTS.**

See Volume 1 for submittal requirements.

3.6 **PRELIMINARY (60%) DESIGN SUBMITTAL REQUIREMENTS.** Comply with comments on the Concept/Early Preliminary (35%) review.

3.7 **FINAL (100%) DESIGN SUBMITTAL REQUIREMENTS.**

- a. Comply with comments on the Preliminary (60%) design review.
- b. Return the marked-up specifications provided by the Savannah District Office along with A-E prepared specifications for final review.
- c. Include drawings and specifications prepared by the Savannah District Office in the Index for drawings and Table of Contents for specifications.

3.8 **CORRECTED FINAL SUBMITTAL REQUIREMENTS.**

Comply with comments on Final (100%) Design Review.

3.9 **TECHNICAL REQUIREMENTS.**

3.9.1 *Deep Foundations.* The Foundation report will provide recommendations for the type of deep foundation system to be used (piling, caissons, etc.), the size and length of the piling, and the allowable bearing capacity of each pile. The A-E shall determine the number of piles, actual spacing, and the pile cap design.

3.9.2 *Earth Liners.* Savannah District Office will provide the A-E with the overall geologic conditions, the insitu and constructed permeabilities that can be obtained using native materials and stabilizing agents, liner thicknesses, and slope stabilization requirements. The A-E will be required to apply for all necessary permits. As part of the permitting process he will be required to determine the classification of the material to be contained, the permeability necessary to contain the material, and the size and functional configuration of the containment area.

3.9.3 *Cathodic Protection and Grounding Systems.* Savannah District Office will perform all pH tests, salinity tests, resistivity measurements, etc., required to design corrosion control and grounding systems. The raw field data will be provided in the Foundation Report without interpretation or recommendations. The A-E shall design all corrosion control and grounding systems required for the project and shall advise the appropriate Savannah District Project Manager immediately if additional field data is required.

3.9.4 *Permanent Water Well Design and Construction.* The A-E will be required to determine the functional location of the well, to verify the liter per minute (or gpm) requirements of the facility, to verify future demands planned for the well, and to determine the pump size, type and setting after receipt of aquifer test data. Savannah District Office will prepare all drawings and specifications (Section 02671 WATER WELL or 02672 WATER WELLS as appropriate) required to construct the well based upon information supplied by the A-E. In some cases, Savannah District Office will construct the actual well during the design stage of the project.

3.9.5 *Structures.* The Foundation Report will recommend the type of foundation system to be used, the allowable bearing capacity, the depth of placement for the footings, and the floor slab preparation. The A-E shall size all footings, grade beams, slabs, etc., utilizing the recommendations and restrictions presented in the Foundation Report. Earthwork specification for the structures will be prepared by Savannah District Office. (See Chapter A-2, STRUCTURAL, for further design requirements).

3.9.6 *Pavements.* The Foundation Report will recommend for pavement subgrades the allowable design CBR and modulus of subgrade reaction parameters along with the required compaction effort. Guidance will be offered on the types of base course materials available in the area and design strengths. The A-E shall design all pavement types, thicknesses, geometry and locations, and prepare all pavement material specifications. (See Chapter B-2, SITE DEVELOPMENT, for deviations or exceptions.)

3.9.7 *General Earthwork and Special Features.* The Foundation Report will recommend undercutting requirements, fill and backfill placement procedures, types of equipment to use, and outline earthwork procedures for special features such as retaining walls, embankment construction, earth covering of structures, basements, buried and mounded

tanks, utilities, etc. Savannah District Office will prepare all appropriate earthwork specifications:

02221/S	EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS;
02225/S	EARTHWORK FOR ROADWAYS, RAILROADS, AIRFIELDS, AND SITE GRADING FOR BUILDINGS;
02210/S	GRADING; and
02222/S	EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS)

Savannah District Office Specifications for the general conditions and assist the A-E in the preparation of specifications for any special features.

Note that these are Savannah District Guide Specifications rather than CEGS guide specifications.

CHAPTER B-2

SOILS

EXHIBITS

B-2-1	SAS FL 363 Foundation Data
B-2-2	Subsurface Exploration Symbols

FOUNDATION DATA

□

Project Title: _____

FY- _____ , L.I. _____ ,

Location: _____

A-E Firm: _____ A-E

Phone No. _____

1. The following information is furnished relative to the foundation analysis for the subject project. (A separate CESAS FL 363 should be completed for each structure involved in the project.)

a. Type of structural system: (Brief Statement)

b. General Scope: _____ ft. x _____ ft _____ no stories _____ .
(Check applicable blocks below)

- | | |
|--|---|
| <input type="checkbox"/> Slab-on Grade | <input type="checkbox"/> Basement Walls |
| <input type="checkbox"/> Crawl Space | <input type="checkbox"/> (1) Fixed at 1st Floor |
| <input type="checkbox"/> Retaining Walls | <input type="checkbox"/> (2) Fixed at Footings |
| <input type="checkbox"/> Areas Recessed below F.F. (Provide with info for Item 2. below) | |

c. Type of Foundation: (Check applicable blocks and fill in loads)

- | | |
|---|--|
| <input type="checkbox"/> Mat. Foundation | <input type="checkbox"/> Approx. Max. Load on Mat. Foundation _____ K/SF |
| <input type="checkbox"/> Spread Footings | <input type="checkbox"/> Approx. Max. Col. Load _____ Kips |
| <input type="checkbox"/> Wall Footings | <input type="checkbox"/> Approx. Max. Wall Load _____ K/ft. |
| <input type="checkbox"/> Foundation Walls | <input type="checkbox"/> Grade Beams |
| <input type="checkbox"/> Rolled Edge Slab | <input type="checkbox"/> Combined Footings (See Item 2. below) |
| <input type="checkbox"/> Piles | <input type="checkbox"/> Underpinning (See Item 2. below) |

d. Other:

- | | |
|--|--------------------|
| <input type="checkbox"/> Pre-Engineered Building | Yes _____ No _____ |
| <input type="checkbox"/> Basement and/or Crawl Space Elevation _____ | MSL |
| <input type="checkbox"/> Finished Floor Elevation _____ | MSL |

2. Specific information and/or details pertinent to the foundation analysis are provided attached to this form.

3. Attached is one reproducible copy (Sepia or Cronaflex) of the detail site plan and a plan showing the location of columns and walls. (If the maximum column load exceeds 100 Kips or the maximum wall load exceeds 3 K/ft., the individual load, dead and live, for each footing shall be provided on the location plan of columns and walls.)

4. Boring locations will be determined by Savannah District personnel.

A-E Representative

Date

SUBSURFACE EXPLORATION SYMBOLS

CONTINUOUS SPLITSPOON BORING

CS

AUGER BORING

A



TEST PIT

TP

