



REPLY TO
ATTENTION OF:

**DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343**

2 September 2011

Contracting Division

**SUBJECT: MATOC Request for Proposal for Task Order Request Number W912HP-11-X-5001.
Project Number 78497, SOF Motor Pool & Building Addition, JSOC/SOLSE, Fort Bragg, NC.
AMENDMENT 0001**

1. In accordance with Local Clause 52.216-4008, Multiple Award Fair Opportunity Task and Delivery Order Contracts, subject project is being offered to all Offerors in the MATOC pool, as identified below, giving each fair opportunity to compete for this action by issuance of this Request for Proposal (RFP) letter. Any Offeror who does not wish to be considered for this particular task order is requested to notify this office in writing, within two (2) calendar days of receipt of this letter, indicating reason for non-participation. Those who do wish to compete must submit a proposal by the date and time indicated in paragraph 12 below, and in accordance with the criteria specified herein.

CAUTION: Offerors shall insert a price on all numbered items of the Task Order Pricing Schedule (Attachment 1). Failure to do so may result in rejection of an Offeror's proposal.

3. Technical inquiries are to be submitted via Bidder Inquiry in ProjNet at www.projnet.org/projnet
Bidder Inquiry Key: 2J3Z3H-C6RWIM. All questions regarding this RFP must be submitted in writing via aforementioned method no later than 10 calendar days prior to the date established for receipt

of proposals as shown in paragraph 12. The Government reserves the right to not respond to questions/inquiries received after this date.

4. If an Offeror believes the requirements in this RFP contain an error, omission, or are otherwise unsound; the offeror shall immediately notify the Contracting Officer in writing, to include supporting rationale. Such communication may be submitted via the POC identified in paragraph 11 below.

5. This project is located at the Fort Bragg, North Carolina. The work consists of furnishing all labor, equipment, transportation, and materials necessary to perform all work in strict accordance with these specifications, schedules, Drawings, and other contract documents. The scope of work of this contract includes, but is not limited to, the following specific items of work: Architectural, Mechanical, Telecommunication, Fire Protection, Plumbing and Electrical.

6. Wage Decisions **NC100032** dated **3/12/2010** and **NC100009** dated **03/12/2010** apply to CLIN 0001 of attached Task Order Pricing Schedule (Attachment 1). Offerors are reminded that wage determinations are subject to change prior to award. All proposed pricing shall include the most current wage rates. All offerors are encouraged to review wage rates established by the Department of Labor prior to submitting proposals.

7. In accordance with FAR Clause 52.249-4001ALT 1 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER the following weathers days are applicable to this task order:

Workdays Based on 5-Day Work Week

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
10	9	6	4	4	6	8	7	4	4	5	9

8. In accordance with FAR Clause 52.228-1, Bid Guarantee, Offerors are required to submit a bid bond with their proposal. The amount of the bid guarantee shall be **20%** percent of the bid price or **\$3,000,000.00**, whichever is less. Bid bonds must be submitted in original form and contain original signatures. Photocopied, facsimile, scanned or otherwise mechanically reproduced bid bonds will not be accepted. Failure to submit a proper bid bond may be cause for rejection of an Offeror's proposal.

9. Proposals shall specify an acceptance period of no less than 60 calendar days from due date of proposals. Proposals which provide less than this period, or which fail to specify an acceptance period at all, may be rejected.

10. In accordance with FAR Clause 52.237-2, Site Visit (Construction), a site visit has been scheduled and will be held **August 29, 2011; at 2:00 p.m.** Location is TBD. Please contact Ms. Debbie Willis at (910) 251-4029 with any questions regarding this site visit.

To get access to the Security Area all contractors (no exceptions) must call and provide Social Security and E-verify document in advance, at least 72 hours to: **Mr. Jim Dunn, Security Manager, at 910-643-0831. If not available please call: Mr. Andy Potter 910-643-5434 or email PotterA@aosa.army.mil**

11. In accordance with FAR Provision 52.222-23, Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity for Construction, minority participation goals are **26.2%** for each trade and female participation goal is **6.9% with the covered area being Cumberland County.**

12. Proposals shall be organized and tabbed in accordance with Appendix A, General Proposal Submission and Tabbing Requirements. Proposals shall be signed by a duly authorized official of the Offeror's company and are **required no later than 02:00 P.M. local time on 14 September 2011.** Refer to Appendix A for numbers of copies. Proposals shall be submitted by the date and time specified to the following address:

**U.S. Army Corps of Engineers
Wilmington District
ATTN: Andrew Fiske
69 Darlington Ave.
Wilmington, North Carolina 28403**

ELECTRONIC PROPOSAL SUBMISSION, TO INCLUDE E-MAIL AND FACSIMILE TRANSMISSIONS, IS NOT AUTHORIZED.

HAND CARRIED PROPOSAL SUBMISSION, except for delivery by Federal Express and United Parcel Service, IS NOT AUTHORIZED.

Proposals must be delivered by U.S. Mail, including U.S. Express Mail, Federal Express or United Parcel Service. All proposals must be clearly identified with the contractor's name and address. To ensure timely and proper handling, the lower left corner of the outermost wrapper should indicate the following:

Request for Proposal No: W912HP-11-X-5001

Due Date of Proposal: 02:00 P.M. local time

Time by which Proposals are due: 14 September 2011

Title of Project: SOF Motor Pool & Building Addition, JSOC/SOLSE, Fort Bragg, NC.

The Government will not be responsible for proposals delivered to any location or to anyone other than those designated to receive proposals on its behalf. Offerors are responsible for ensuring that proposals are submitted so as to reach the office designated for receipt of proposals.

13. In accordance with FAR Clause 52.215-1, Instructions to Offerors—Competitive Acquisitions, the Government reserves the right to make award without discussions. Therefore, Offerors should submit their best technical and price terms in their initial offer and not automatically assume that they will have an opportunity to participate in discussions, if later determined to be in the best interests of the Government, or to submit a revised offer. Discussions, if held, may be held with only the highest rated Offerors or Offeror.

14. Basis for Award and Evaluation Criteria. Award will be based on price and price only. Proposals must meet the minimum criteria (plans and specs) stated in the task order RFP in order to be eligible for award. The Government reserves the right to reject any and all offers. Offerors are reminded to include their best price terms in their initial offer and not to automatically assume they will have an opportunity to participate in discussions or be asked to submit a revised offer.

Pricing for the Task Order shall be completed and submitted on the Task Order Pricing Schedule—Schedule B (Attachment 1) of the request for proposal.

Supplemental Price Breakdown. If deemed necessary to evaluate the price proposals, the Government's will request a Phase 2 price breakdown of the Contract Line items in a sealed envelope marked "Phase 2 Price Breakdown Information", in Excel format. The Government will provide details on where and how to send the breakdown. This information will not be needed sooner than three working days after the proposal submission due date. This information may be required for the initial Task Order proposal and, if requested, for any revised proposals. This information is not an opportunity for a firm to revise its non-price or price proposal.

Price will not be rated or scored, but will be evaluated for fairness and reasonableness through the use of a price analysis. The price evaluators will also check for appearance of unbalanced line item prices. Firms are cautioned to distribute direct costs, such as material, labor, equipment, subcontracts, etc. and to evenly distribute indirect costs, such as job overhead, home office overhead, bond, etc., to the appropriate contract line items. Both parties shall presume that field overhead costs through the proposed contract duration are inclusive in the offered price for the contract.

If deemed necessary, the supplemental price breakdown information will be used to assist the Government in performing the price evaluations described above.

The Government will make award to the lowest priced offeror who is deemed responsive, responsible and whose proposed price has been determined to be fair and reasonable.

15. If you have any questions, please contact Andrew Fiske at (910) 251-4700 or the undersigned at (910) 251-4424.



Danny Kissam
Contracting Officer

ATTACHMENT 1

W912HP-11-X-5001

SOF Motor Pool & Building Addition, JSOC/SOLSE

**FORT BRAGG, NORTH CAROLINA
PROJECT NUMBERS 78497
TAB A—SCHEDULE B
CONTRACT LINE ITEM SCHEDULE**

CLIN	DESCRIPTION	QTY	U/M	AMOUNT
0001	CONSTRUCT SOF BLDG ADDITION, JSOC/SOLSE, FORT BRAGG, NC	1	LUMP SUM	
TOTAL BASE OFFER FOR ITEMS 0001				\$ _____
0002	(OPTIONAL ITEM 1) CONSTRUCT 788 SQ YARDS OF 6-IN. THICK CONCRETE PAVING JSOC/SOLSE, FORT BRAGG, NC	1	LUMP SUM	
TOTAL OPTIONAL BID ITEM 1				\$ _____
0003	(OPTIONAL ITEM 2) CONSTRUCT 588 SQ YARDS OF 6-IN. THICK CONCRETE PAVING JSOC/SOLSE, FORT BRAGG, NC	1	LUMP SUM	
TOTAL OPTIONAL BID ITEM 2				\$ _____
0004	(OPTIONAL ITEM 3) CONSTRUCT 456 SQ YARDS OF 6-IN. THICK CONCRETE PAVING JSOC/SOLSE, FORT BRAGG, NC	1	LUMP SUM	
TOTAL OPTIONAL BID ITEM 3				\$ _____
TOTAL LINE ITEMS 0001 THROUGH 0004				\$ _____

Contract Duration in Calendar Days
After the Notice to Proceed is received
Not to Exceed 365 Days for Base Bid.

_____ Days

EVALUATION OF OPTIONS

Except when it is determined in accordance with FAR 17.206(b) not to be in the Government's best interests, the Government will evaluate offers for award purposes by adding the total price for all options to the total, price for the basic requirement. Evaluation of options will not obligate the Government to exercise the option(s).

THE GOVERNMENT RESERVES THE RIGHT TO EXERCISE ANY OR ALL OF THE BID OPTION ITEMS WITHIN 120 CALENDAR DAYS AFTER CONTRACT AWARD.

NOTES FOR CONTRACT LINE ITEM (CLIN) SCHEDULE

1. In accordance with FAR Clause, 52.211-10, Commencement, Prosecution, and Completion of Work, the Contractor shall commence work within 10 calendar days after receipt of notice to proceed, shall prosecute the work diligently and shall complete all work ordered under this task order within **365** calendar days after receipt of notice to proceed. **AWARD OF THIS TASK ORDER SHALL NOT CONSTITUTE NOTICE TO PROCEED. A SEPARATE NOTIFICATION SHALL BE PROVIDED.**

2. **THE MAGNITUDE OF THE CONSTRUCTION PROJECT: “The estimated price is between \$1,000,000 and \$5,000,000.”**

3. In accordance with FAR Clause 52.211-12, Liquidated Damages-Construction, liquidated damages in the amount of: **\$690.00** per day shall be assessed if the Contractor fails to complete the work within the time specified in this task order.

4. Wage Decision **NC100032** dated **3/12/2010** and **NC100009** dated **03/12/2010** apply to this task order and are attached.

ATTACHMENT 2

WAGE RATES

General Decision Number: NC100032 03/12/2010 NC32

Superseded General Decision Number: NC20080032

State: North Carolina

Construction Type: Building

County: Cumberland County in North Carolina.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes and apartments up to and including 4 stories)

Modification Number 0 Publication Date 03/12/2010

SUNC1994-001 10/24/1994

Table with 3 columns: Job Title, Rates, Fringes. Rows include Bricklayer, Carpenter, Cement mason/concrete finisher, Electrician, Glazier, Insulator/asbestos worker, Ironworker, Laborer, Painter, Plumber, Roofer, Sheet metal worker.

Soft floor layer.....\$ 12.00
Truck driver.....\$ 7.25
HVAC-Heating & A/C Mechanic.....\$ 9.26

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

In the listing above, the "SU" designation means that rates listed under the identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an

interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

_Motor grader.....	\$ 7.25	
_Roller.....	\$ 7.25	
_Scraper-pan.....	\$ 7.25	
_Tractor.....	\$ 7.25	
_Trenching.....	\$ 7.25	
_Well driller.....	\$ 7.25	
Truck driver.....	\$ 7.25	
Boilermakers:		
_All other work.....	\$ 16.20	4.105
_Storage tank erection/repair.....	\$ 12.96	4.105
Fence Installers.....	\$ 7.25	
MANHOLE BUILDER.....	\$ 7.25	
TV & Grouting Technicians.....	\$ 9.21	

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.
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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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END OF GENERAL DECISION

APPENDIX A

GENERAL PROPOSAL SUBMISSION AND TABBING REQUIREMENTS

Volume I: Offerors shall submit one (1) original hard copy and one (1) duplicate of TAB A and TAB B. Proposals shall be organized and tabbed as follows:

TAB A – Schedule B, Task Order pricing. See ATTACHMENT 1

TAB B – Bid Bond—submit in accordance with FAR clause 52.228-1, Bid Guarantee. This item is not rated. However, the Government will review the bid bond for legal sufficiency. Any bid bond found to be legally insufficient may render an offer ineligible for award.

Wilmington Contracting Division

SECTION 01 33 00 – SUBMITTAL PROCEDURES

Delete existing ATTACHMENT 1 ENG FROM 4288 (Page10 of 13) in its entirety and replace with enclosed revised like-numbered Page.

SECTION 13 49 19 – METAL BUILDING SYSTEMS

Delete existing Page 17 AND Page 18 in their entirety and replace with enclosed revised like-numbered Pages.

SECTION 31 00 00 – EARTHWORK

Delete Page 1 THRU Page 29 in their entirety and replace with like-numbered Pages.

NOTE:

Text that is added or revised by this amendment is replaced in its entirety and underlined and/or printed in bold and/or stamped appropriately.

The text changes may have necessitated reformatting of subsequent text or pages. If this is the case, those pages have also been issued as amended pages but are not underlined or bold text.

(End of Summary of Changes)

Encls

(As stated)

established foundation dimensions, and proceed with fabricating structural framing. Do not proceed without verifying field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.

1.8.2.2 Established Dimensions for Metal Panels

Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements, or allow for field trimming metal panels. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.8.2.3 Verification Record

Verify locations of all framing and opening dimensions by field measurements before metal panel fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION

Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete".

Coordinate installation of fire suppression system equipment supports piping and supports and accessories, which are specified in Division 21 - FIRE SUPPRESSION.

Coordinate installation of plumbing system equipment supports piping and supports and accessories, which are specified in Division 22 - PLUMBING.

Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leak-proof, secure, and non-corrosive installation.

1.10 WARRANTY

1.10.1 Building System Warranty

Furnish manufacturer's no-dollar-limit warranty for the metal building system. The warranty period is to be no less than **10 years** from the date of acceptance of the work and be issued directly to the Government. The warranty must provide that if within the warranty period, the metal building system shows evidence of deterioration resulting from defective materials and/or workmanship, correcting of any defects is the responsibility of the metal building system manufacturer. Repairs that become necessary because of defective materials and workmanship while metal building system is under warranty are to be performed within 32 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within 32 hours of notification will constitute grounds for having emergency repairs performed by others and will not void the warranty.

1.10.2 Roof System Weather-Tightness Warranty

Furnish manufacturer's no-dollar-limit warranty for the metal panel

system. The warranty period is to be no less than **10 years** from the date of acceptance of the work and be issued directly to the Government.

The warranty is to provide that if within the warranty period the roof panel system shows evidence of corrosion, perforation, rupture, lost of weather-tightness or excess weathering due to deterioration of the panel system resulting from defective materials and correction of the defective workmanship is to be the responsibility of the metal building system manufacturer.

Repairs that become necessary because of defective materials and workmanship while roof panel system is under warranty are to be performed within 24 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform temporary repairs within 24 hours of notification will constitute grounds for having emergency repairs performed by others and not void the warranty. Immediate follow-up and completion of permanent repairs must be performed within 2 days from date of notification.

1.10.3 Roof and Wall Panel Finish Warranty

Furnish manufacturer's no-dollar-limit warranty for the metal panel system. The warranty period is to be no less than **10 years** from the date of acceptance of the work and be issued directly to the Government.

The warranty is to provide that if within the warranty period the metal panel system shows evidence of checking, delaminating cracking, peeling, chalk in excess of a numerical rating of eight, as determined by ASTM D 4214 test procedures; or change colors in excess of five CIE or Hunter units in accordance with ASTM D 2244 or excess weathering due to deterioration of the panel system resulting from defective materials and finish or correction of the defective workmanship is to be the responsibility of the metal building system manufacturer.

Liability under this warranty is exclusively limited to replacing the defective coated materials.

Repairs that become necessary because of defective materials and workmanship while roof and wall panel system is under warranty are to be performed within 32 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within 32 hours of notification will constitute grounds for having emergency repairs performed by others and not void the warranty.

PART 2 PRODUCTS

2.1 STRUCTURAL FRAMING MATERIALS

2.1.1 W-Shapes

ASTM A 992/A 992M; ASTM A 572/A 572M or ASTM A 529/A 529M.

2.1.2 Channel, Angles, M-Shapes and S-Shapes

ASTM A 36/A 36M; ASTM A 572/A 572M or ASTM A 529/A 529M.

2.1.3 Plate and Bar

ASTM A 36/A 36M.

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SECTION 31 00 00

EARTHWORK

PART 1 GENERAL

1.1 CRITERIA FOR BIDDING

Base bids on the following criteria:

- a. Surface elevations are as indicated.
- b. Pipes or other artificial obstructions, except those indicated, will not be encountered. There has been no investigation conducted to determine whether subsurface piping systems contain or are insulated with asbestos containing materials (ACM). Common ACM includes asbestos-cement pipe (aka transite pipe), tarry mastic or rubbery sealant on asbestos-cement pipe joints, T's, and on other connections. Single and double walled piping systems for steam, chilled water, and even condensate/return lines have been known to be insulated with friable and non-friable asbestos. Steam pits have been insulated with ACM or still contain some remnants or partially abated ACM insulation. Some older communication conduit and electrical conduit may contain both friable and non-friable asbestos insulation. The Contractor shall be aware that encountering ACM in or on any of these products is not a change of site conditions. The Contractor shall be aware of the specific state requirement for removing and disposing of subsurface ACM containing materials, or materials contaminated with asbestos materials.
- c. Ground water elevations indicated by the boring logs were those existing at the time subsurface investigations were made and do not necessarily represent ground water elevations at the time of construction.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

- | | |
|--------------|--|
| AASHTO T 180 | (2009) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop |
| AASHTO T 224 | (2001; R 2004) Standard Method of Test for Correction for Coarse Particles in the Soil Compaction Test |

ASTM INTERNATIONAL (ASTM)

ASTM C 136	(2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 33/C 33M	(2008) Standard Specification for Concrete Aggregates
ASTM D 1140	(2000; R 2006) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(2007) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(2009) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³) (2700 kN-m/m ³)
ASTM D 2216	(2010) Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 2434	(1968; R 2006) Permeability of Granular Soils (Constant Head)
ASTM D 2487	(2006e1) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2937	(2004) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 422	(1963; R 2007) Particle-Size Analysis of Soils
ASTM D 4318	(2005) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 600/4-79/020	(1983) Methods for Chemical Analysis of Water and Wastes
EPA SW-846.3-3	(1999, Third Edition, Update III-A) Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

1.3 DEFINITIONS

1.3.1 Satisfactory Materials

1.3.1.1 Earthwork, Roadwork, and Utilities Systems (except beneath buildings)

Satisfactory materials comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC. Satisfactory materials for grading comprise stones less than 8 inches, except for fill material for pavements and railroads which comprise stones less than 3 inches in any dimension.

1.3.1.2 Beneath Buildings

a. Natural In Situ Soil: Satisfactory materials for natural in situ soil supporting building foundations and/or slabs shall be limited to materials classified in ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, and SP-SC and shall be free of trash, debris, roots or other organic matter, frozen material, and stones larger than 3 inches in any dimension.

b. Foundation Fill or Backfill: Satisfactory materials for fill or backfill supporting building foundations and/or slabs shall be limited to materials classified in ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, and SP-SC and shall be free of trash, debris, roots or other organic matter, frozen material, and stones larger than 3 inches in any dimension.

c. Fill or Backfill Adjacent to Walls: Satisfactory materials for fill or backfill adjacent to walls shall be limited to cohesionless, free draining materials classified in ASTM D 2487 as GW, GP, GM, SW, SP, SM, SP-SM, and shall be free of trash, debris, roots or other organic matter, frozen material, and stones larger than 3 inches in any dimension.

1.3.2 Unsatisfactory Materials

1.3.2.1 Earthwork, Roadwork, and Utilities Systems (except beneath buildings)

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. Notify the Contracting Officer when encountering any contaminated materials.

1.3.2.2 Beneath Buildings

a. Natural In Situ Soil: Unsatisfactory materials for supporting building foundations and/or slabs shall be materials classified in ASTM D 2487 as Pt, OH, and OL and any other materials not defined as satisfactory. The Contracting Officer shall be notified of any contaminated materials.

b. Foundation Fill or Backfill: Unsatisfactory materials for fill or backfill supporting building foundations and/or slabs shall be materials classified in ASTM D 2487 as Pt, OH, OL, CH, and MH.

c. Fill or Backfill Adjacent to Walls: Unsatisfactory materials for fill or backfill adjacent to walls shall be materials classified in accordance with ASTM D 2487 as Pt, OH, OL, GC, SC, CL, CH, ML, MH, GP-, GW-GM, GC, GP-GC, GM-GC, SW-SM, SC, SW-SC, SP-SC, CL, ML, and CL-ML.

d. Wet or Soft Materials: Materials determined by the Contracting Officer as too wet or too soft to provide a stable subgrade, foundation, or fill will be classified as unsatisfactory regardless of classification. However, if such materials do meet the appropriate ASTM D 2487 classification, the Contractor shall at no additional cost to the Government, recondition the materials.

1.3.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Perform testing, required for classifying materials, in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

1.3.4 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum density. Since ASTM D 1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve as a percentage of the maximum density in accordance with AASHTO T 180 and corrected with AASHTO T 224. To maintain the same percentage of coarse material, use the "remove and replace" procedure as described in NOTE 8 of Paragraph 7.2 in AASHTO T 180.

1.3.5 Topsoil

Material suitable for topsoils obtained from offsite areas and/or onsite excavations is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

1.3.6 Hard/Unyielding Materials

Hard/Unyielding materials comprise weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" with stones greater than 3 inch in any dimension or as defined by the pipe manufacturer, whichever is smaller. These materials usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.3.7 Unstable Material

Unstable materials are too wet to properly support the utility pipe, conduit, or appurtenant structure.

1.3.8 Select Granular Material

1.3.8.1 General Requirements

Select granular material consist of materials classified as GW, GP, SW, SP, by ASTM D 2487 where indicated. The liquid limit of such material must not exceed 35 percent when tested in accordance with ASTM D 4318. The plasticity index must not be greater than 20 percent when tested in accordance with ASTM D 4318, and not more than 35 percent by weight may be finer than No. 200 sieve when tested in accordance with ASTM D 1140. Provide a minimum coefficient of permeability of 0.002 feet per minute when tested in accordance with ASTM D 2434.

1.3.8.2 California Bearing Ratio Values

Conform the combined material to the following sieve analysis:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
2 1/2 inches	100
No. 4	40 - 85
No. 10	20 - 80
No. 40	10 - 60
No. 200	5 - 25

1.3.9 Initial Backfill Material

Initial backfill consists of select granular material or satisfactory materials free from rocks 3 inches or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller. When the pipe is coated or wrapped for corrosion protection, free the initial backfill material of stones larger than 3 inches in any dimension or as recommended by the pipe manufacturer, whichever is smaller.

1.3.9.1 Maximum Dry Density

The maximum dry density is expressed as the maximum density obtained when the soil is compacted in accordance with ASTM D 1557, abbreviated as laboratory maximum density.

1.4 SYSTEM DESCRIPTION

Subsurface soil boring logs are shown on the drawings. The subsoil investigation report is available upon request and can be obtained from the Savannah District through the Savannah District Project Manager. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

1.4.1 Common Excavation

Include common excavation with the satisfactory removal and disposal of all materials not classified as rock excavation.

1.4.2 Dewatering Work Plan

Submit procedures for accomplishing dewatering work.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Shoring; G

Dewatering Work Plan

Submit 15 days prior to starting work.

SD-03 Product Data

Utilization of Excavated Materials
Opening of any Excavation or Borrow Pit
Shoulder Construction

Procedure and location for disposal of unused satisfactory material. Proposed source of borrow material. Advance notice on the opening of excavation or borrow areas. Advance notice on shoulder construction for rigid pavements.

SD-04 Samples

Tracer Wire; G, RE

Sample of tracer wire, including manufacturer's descriptive technical literature, specifications, and installation instructions. Sample and information shall be submitted at least 60 days prior to the initial installation of any tracer wire.

SD-06 Test Reports

Testing; G, RE
Borrow Site Testing; G, RE

Within 24 hours of conclusion of physical tests, 2 copies of test results, including calibration curves and results of calibration tests. Results of testing at the borrow site.

SD-07 Certificates

Testing; G, RE

Qualifications of the Corps validated commercial testing laboratory or the Contractor's validated testing facilities.

Compliance; G, RE

Certificates of compliance indicating conformance with specified requirements shall be furnished for capillary water barrier materials.

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR OFFSITE SOILS

Test offsite soils brought in for use as backfill for Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and full Toxicity Characteristic Leaching Procedure (TCLP) including ignitability, corrosivity and reactivity. Backfill shall contain a maximum of 100 parts per million (ppm) of total petroleum hydrocarbons (TPH) and a maximum of 10 ppm of the sum of Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and shall pass the TCL test. Determine TPH concentrations by using EPA 600/4-79/020 Method 418.1. Determine BTEX concentrations by using EPA SW-846.3-3 Method 5030/8020. Perform TCLP in accordance with

EPA SW-846.3-3 Method 1311. Provide Borrow Site Testing for TPH, BTEX and TCLP from a composite sample of material from the borrow site, with at least one test from each borrow site. Do not bring material onsite until tests have been approved by the Contracting Officer.

2.2 BURIED WARNING AND IDENTIFICATION TAPE

Provide metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inches minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Provide permanent color and printing, unaffected by moisture or soil.

Warning Tape Color Codes

Red:	Electric
Yellow:	Gas, Oil; Dangerous Materials
Orange:	Telephone and Other Communications
Blue:	Water Systems
Green:	Sewer Systems
White:	Steam Systems
Gray:	Compressed Air

2.2.1 Warning Tape for Metallic Piping

Provide acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.003 inch and a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

2.2.2 Detectable Warning Tape for Non-Metallic Piping

Provide polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.004 inch, and a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Manufacture tape with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.3 DETECTION WIRE FOR NON-METALLIC PIPING

Insulate a single strand, solid copper detection wire with a minimum of 12 AWG.

2.4 MATERIAL FOR RIP-RAP

Provide Bedding material Filter fabric and rock conforming to these requirements of the erosion and sediment control plans..

2.5 CAPILLARY WATER BARRIER

Provide capillary water barrier of clean, poorly graded crushed rock, crushed gravel, or uncrushed gravel placed beneath a building slab with or without a vapor barrier to cut off the capillary flow of pore water to the

area immediately below. Conform to ASTM C 33/C 33M for fine aggregate grading with a maximum of 3 percent by weight passing ASTM D 1140, No. 200 sieve or coarse aggregate Size 57, 67, or 77.

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Where indicated or directed, strip topsoil to a depth of 4 inches. Spread topsoil on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Keep topsoil separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Remove from any surplus of topsoil from excavations and gradings from the site.

3.2 GENERAL EXCAVATION

Perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Perform the grading in accordance with the typical sections shown and the tolerances specified in paragraph FINISHING. Transport satisfactory excavated materials and place in fill or embankment within the limits of the work. Excavate unsatisfactory materials encountered within the limits of the work below grade and replace with satisfactory materials as directed. Include such excavated material and the satisfactory material ordered as replacement in excavation. Dispose surplus satisfactory excavated material not required for fill or embankment in areas approved for surplus material storage or designated waste areas. Dispose unsatisfactory excavated material in designated waste or spoil areas. During construction, perform excavation and fill in a manner and sequence that will provide proper drainage at all times. Excavate material required for fill or embankment in excess of that produced by excavation within the grading limits from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

3.2.1 Ditches, Gutters, and Channel Changes

Finish excavation of ditches, gutters, and channel changes by cutting accurately to the cross sections, grades, and elevations shown on drawing sheets. Do not excavate ditches and gutters below grades shown. Backfill the excessive open ditch or gutter excavation with satisfactory, thoroughly compacted, material to grades shown. Dispose of excavated material as shown or as directed, except in no case allow material be deposited within maximum 4 feet from edge of a ditch. Maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.2.2 Drainage Structures

Make excavations to the lines, grades, and elevations shown, or as directed. Provide trenches and foundation pits of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Do not disturb the bottom of the excavation when concrete or masonry is to be placed in an excavated area. Do not excavate to the final grade level until just before the concrete or masonry is to be placed.

3.2.3 Drainage

Provide for the collection and disposal of surface and subsurface water encountered during construction. Completely drain construction site during periods of construction to keep soil materials sufficiently dry. Construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed.

3.2.4 Dewatering

Control groundwater flowing toward or into excavations to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. Do not permit French drains, sumps, ditches or trenches within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Take control measures by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, maintain the water level continuously, at least 3 feet below the working level. Operate dewatering system continuously until construction work below existing water levels is complete. Submit performance records weekly. Measure and record performance of dewatering system at same time each day by use of observation wells or piezometers installed in conjunction with the dewatering system. Relieve hydrostatic head in pervious zones below subgrade elevation in layered soils to prevent uplift.

3.2.4.1 Control of Water

Where ground water is encountered, dewatering by the use of well points or other approved methods will be required to the extent that excavations are performed in the dry. If after dewatering, localized wet or soft areas remain, the areas shall be dried by aerating or other satisfactory means; or at the Contractor's option and at no additional cost to the Government, localized soft areas may be undercut and replaced with compacted suitable materials in accordance with the specifications. Dewatering of excavations will be maintained until the excavation is backfilled and fill material is placed to within 1 foot of finished floor or top of pavement elevation. Dewatering of utility excavations will be maintained until pipe and conduit are placed and tested and the trench backfilled.

3.2.4.2 Dewatering Work Plan

At least 45 days prior to beginning excavation, compaction or fill placement, the Contractor shall submit for review and comment a plan describing and showing the proposed method(s) of dewatering to satisfy the requirement that water levels be maintained a minimum three feet beneath all working levels during excavation and compaction operations to the Contracting Officer. The information to be submitted shall include but not

be limited to the following:

- a. Drawings indicating locations for interceptor underdrain trenches, sumps, well points, pumps and discharge lines.
- b. Details of interceptor underdrain trench or well points, if used.
- c. Description of drainage pipe or tubing and gradations of filter materials.
- d. Types and capacities of pumps.
- e. The impact of pump, power supply or other failures and proposed backup plan or system for such failures.

Comments on the dewatering method(s) proposed by the Contractor will only be with respect to the basic principles of the method(s) the Contractor intends to employ. Approval of the plans submitted shall not in any way be considered to relieve the Contractor from full responsibility for complete and adequate design and performance of the dewatering method(s) employed.

3.2.5 Trench Excavation Requirements

Excavate the trench as recommended by the manufacturer of the pipe to be installed. Slope trench walls below the top of the pipe, or make vertical, and of such width as recommended in the manufacturer's printed installation manual. Provide vertical trench walls where no manufacturer's printed installation manual is available in accordance with the requirements of the most recent version of US Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1. Shore trench walls more than 4 feet high, cut back to a stable slope, or provide with equivalent means of protection for employees who may be exposed to moving ground or cave in accordance with the requirements of the most recent version of US Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1.. Shore vertical trench walls more than 4 feet high. Excavate trench walls which are cut back to at least the angle of repose of the soil. Give special attention to slopes which may be adversely affected by weather or moisture content. Do not exceed the trench width below the pipe top of 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter, and do not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, provide redesign, stronger pipe, or special installation procedures by the Contractor. The Contractor is responsible for the cost of redesign, stronger pipe, or special installation procedures without any additional cost to the Government.

3.2.5.1 Bottom Preparation

Grade the bottoms of trenches accurately to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Excavate bell holes to the necessary size at each joint or coupling to eliminate point bearing. Remove stones of 3 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, to avoid point bearing.

3.2.5.2 Removal of Unyielding Material

Where overdepth is not indicated and unyielding material is encountered in the bottom of the trench, remove such material 4 inches below the required

grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

3.2.5.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, remove such material to the depth as directed by the Contracting Officer, and replace it to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the Contractor is responsible for excavating the resulting material and replacing it without additional cost to the Government.

3.2.5.4 Excavation for Appurtenances

Provide excavation for manholes, catch-basins, inlets, or similar structures of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown.. Clean rock or loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Remove unstable material as specified above. When concrete or masonry is to be placed in an excavated area, take special care not to disturb the bottom of the excavation. Do not excavate to the final grade level until just before the concrete or masonry is to be placed.

3.2.5.5 Jacking, Boring, and Tunneling

Unless otherwise indicated, provide excavation by open cut except that sections of a trench may be jacked, bored, or tunneled if, in the opinion of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly compacted in such sections.

3.2.6 Underground Utilities

The Contractor is responsible for movement of construction machinery and equipment over pipes and utilities during construction. Perform work adjacent to non-Government utilities as indicated in accordance with procedures outlined by utility company. Excavation made with power-driven equipment is not permitted within two feet of known Government-owned utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Contracting Officer. Immediately report any and all damage to utility lines or subsurface construction immediately to the Contracting Officer.

3.2.7 Structural Excavation

Excavations shall conform to the dimensions and elevations indicated for each structure and footing except as specified, and shall include trenching for utility and foundation drainage systems - as applicable - to a point 5 feet beyond the structure line. Excavations shall extend a sufficient distance from walls and footings to allow for removal and placing of forms. Excavations below indicated depths shall not be permitted except for removal of unsatisfactory material. Ensure that footing subgrades have been inspected and approved by the Contracting Officer prior to concrete placement.

3.3 SELECTION OF BORROW MATERIAL

Select borrow material to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Obtain borrow material from approved private sources as approved by the Contracting Officer. Unless otherwise provided in the contract, the Contractor is responsible for obtaining the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling from the owners. Unless specifically provided, do not obtain borrow within the limits of the project site without prior written approval. Consider necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon related operations to the borrow excavation.

3.4 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

Except as otherwise permitted, provide adequate drainage during excavation of borrow pits and other excavation areas. Transport overburden and other spoil material to designated spoil areas or otherwise dispose of as directed. Provide neatly trimmed and drained borrow pits after the excavation is completed. Ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

3.5 SHORING

3.5.1 General Requirements

Submit a Shoring and Sheet piling plan for approval 15 days prior to starting work. Submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheet piling of excavations. Finish shoring, including sheet piling, and install as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Remove shoring, bracing, and sheet piling as excavations are backfilled, in a manner to prevent caving.

3.6 GRADING AREAS

Where indicated, divide work into grading areas within which satisfactory excavated material will be placed in embankments, fills, and required backfills. Do not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing. Place and grade stockpiles of satisfactory, unsatisfactory and wasted materials as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. Clear, grub, and seal by rubber-tired equipment, the ground surface at stockpile locations. Stockpile excavated satisfactory and unsatisfactory materials separately. Protect stockpiles of satisfactory materials from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, remove and replace such material with satisfactory material from approved sources.

3.7 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Do not excavate to final grade until just before concrete is to be placed. Roughen the level surfaces, and cut the sloped surfaces, as indicated, into rough steps or benches to provide a satisfactory bond. Protect shales from

slaking and all surfaces from erosion resulting from ponding or water flow.

3.8 GROUND SURFACE PREPARATION

3.8.1 General Requirements

Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up to a depth of 8 inches; pulverized; moistened or aerated as necessary to plus or minus 2.5 percent of optimum moisture; thoroughly mixed; and compacted to at least 92 percent laboratory maximum density as determined using ASTM D 1557. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well suited to the soil being compacted.. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

3.8.1.1 Subgrade Preparation for Building Sites

Unsatisfactory material in surfaces to received fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Contracting Officer. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to tehthe specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to plus or minus 2.5 percent of optimum moisture. Minimum subgrade density shall be as specified in paragraph FILLING AND BACKFILLING.

3.8.1.2 Stripping and Special Compaction

During subsurface investigations, unsuitable soils for building and pavement subgrades were encountered. The unsuitable soils consist of extremely loose to medium silty and clayey sands and clayey sands and include highly plastic clays and silts. Undercutting a minimum depth of 2.0 feet below the design finished grade over the entire areas beneath proposed buildings, hardstands and paved parking is required The foundation soils within the limits of the building construction shall have the top 6 inches stripped away. The stripping of the soil shall extend 5 feet beyond the outside limits of the building. . After undercutting, After stripping, the exposed subgrade shall be compacted to the required density specified in paragraph FILLING AND BACKFILLING FOR BUILDINGS. The exposed excavation subgrade shall be backfilled with satisfactory soils in compacted lifts as specified in paragraph FILLING AND BACKFILLING. Satisfactory excavated soils may be used as fill or backfill. Soils that are too wet but otherwise meet the requirements for satisfactory fill shall be adjusted for proper moisture or replaced with acceptable backfill at the contractor's option, and at no additional cost to the government.

3.8.2 Frozen Material

Do not place material on surfaces that are muddy, frozen, or contain frost. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Moisten material as necessary to plus or minus 2.5 percent of optimum moisture to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.

3.9 UTILIZATION OF EXCAVATED MATERIALS

Dispose of unsatisfactory materials removed from excavations into designated waste disposal or spoil areas as directed by the Contracting Officer. Use satisfactory material removed from excavations, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. Do not waste any satisfactory excavated material without specific written authorization. Dispose of satisfactory material, authorized to be wasted, in designated areas approved for surplus material storage or designated waste areas as directed. Clear and grub newly designated waste areas on Government-controlled land before disposal of waste material thereon. Stockpile and use coarse rock from excavations for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. Do not dispose of excavated material in such a manner as to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

3.10 BURIED TAPE AND DETECTION WIRE

3.10.1 Buried Warning and Identification Tape

Provide buried utility lines with utility identification tape. Bury tape 1.5 ft below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

3.10.2 Buried Detection Wire

Bury detection wire directly above non-metallic piping at a distance not to exceed 12 inches above the top of pipe. Extend the wire continuously and unbroken, from manhole to manhole. Terminate the ends of the wire inside the manholes at each end of the pipe, with a minimum of 3 feet of wire, coiled, remaining accessible in each manhole. Furnish insulated wire over its entire length. Install wires at manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal. For force mains, terminate the wire in the valve pit at the pump station end of the pipe.

3.11 MOISTURE CONTENT

Satisfactory materials in each layer of fill shall contain the amount of moisture within the limits specified below. Materials that are not within the specified limits after compaction shall be reworked regardless of density. The moisture content after compaction shall be as uniform as practicable throughout any one layer and shall be within the limits of 2.5 percentage points above optimum moisture content and 2.5 percentage points below optimum moisture content. Materials which are too wet shall be disked, harrowed, plowed, bladed, or otherwise manipulated to reduce the moisture content to within the specified limits. Materials which are too

dry shall be broken up, sprinkled, and thoroughly mixed to bring the moisture content uniformly up to within specified limits of moisture content specified above, the Contractor shall either adjust the moisture content to bring it within the specified limits or remove it from the fill.

3.12 GENERAL EARTHWORK

3.12.1 Earth Embankments

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 8 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 92 percent laboratory maximum density. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.12.2 Subgrade Preparation

3.12.2.1 Proof Rolling

Proof rolling of areas to be paved shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which could promote degradation of an otherwise acceptable subgrade. Proof roll the existing subgrade beneath areas to be paved, with six two passes of a dump truck loaded with 6 cubic yards of soil 15 ton, pneumatic-tired roller. Operate the roller or truck in a systematic manner to ensure the number of passes over all areas, and at speeds between 2 1/2 to 3 1/2 mph. Notify the Contracting Officer a minimum of 3 days prior to proof rolling. Proof rolling shall be performed in the presence of the Contracting Officer. Rutting or pumping of material shall be undercut and replaced with satisfactory material compacted as specified in paragraph 3.12.2.4 Subgrade for Pavements, at the direction of the Contracting Officer.

3.12.2.2 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to satisfy specified compaction and moisture requirements. Materials shall be moistened or aerated as necessary to plus or minus 2.5 percent of optimum moisture. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Low areas resulting from removal of unsatisfactory material shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. When the subgrade is in cut, the top 8 inches of subgrade shall be scarified, windrowed, moistened or aerated as necessary to plus or minus 2.5 percent of optimum moisture, thoroughly blended, reshaped, and compacted. The elevation of the finish subgrade shall not vary more than 0.05 foot from the established grade and cross section.

3.12.2.3 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well suited to the soil being compacted. See subgrade compaction requirements in paragraph 3.8.1.2.

3.12.2.4 Subgrade for Pavements

Subgrade for pavements shall be compacted to at least 95 percent laboratory maximum density for the depth below the subgrade of 12 inches in fill or backfill and 8 inches in undisturbed native soil or cut.

3.12.2.5 Subgrade for Shoulders

Subgrade for shoulders shall be compacted to at least 92 percent laboratory maximum density for a depth of 8 inches below finish grade. In areas where the shoulder is to be grassed the top 8 inches shall be compacted to a density of at least 92 percent laboratory maximum density.

3.12.3 Shoulder Construction

Shoulders shall be constructed of satisfactory excavated or borrow material or as otherwise shown or specified. Shoulders shall be constructed as soon as possible after adjacent paving is complete, but in the case of rigid pavements, shoulders shall not be constructed until permission of the Contracting Officer has been obtained. The entire shoulder area shall be compacted to at least the percentage of maximum density as specified in paragraph SUBGRADE PREPARATION above, for specific ranges of depth below the surface of the shoulder. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well suited to the soil being compacted. Shoulder construction shall be done in proper sequence in such a manner that adjacent ditches will be drained effectively and that no damage of any kind is done to the adjacent completed pavement. The completed shoulders shall be true to alignment and grade and shaped to drain in conformity with the cross section shown.

3.13 FILLING AND BACKFILLING FOR BUILDINGS

3.13.1 General

Filling and backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed and the excavation cleaned of trash and debris. Backfill shall not be placed in areas that are wet, muddy, contain organic materials or are otherwise unacceptable to the Contracting Officer. Satisfactory materials shall be used in bringing fills and backfills to the lines and grades indicated and for replacing unsatisfactory materials. Satisfactory material shall be free from roots and other organic matter, trash, debris, frozen materials, and stones larger than 3 inches in any dimension. Where pipe and/or utility lines are coated or wrapped for protection against corrosion, the backfill material up to an elevation of 2 feet above sewer lines and 1 foot above other utility lines shall be free from stones larger than 1 inch in any dimension.

3.13.2 Placement

Satisfactory materials shall be placed in horizontal layers not exceeding 8 inches in loose thickness, or 4 inches in loose thickness where hand-operated compactors are used. After placing, each layer shall be plowed, disked, or otherwise broken up, moistened or aerated as necessary, thoroughly mixed and compacted as specified. Backfill shall be brought to the indicated finish grade. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in loose thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls less than 7 days after completion of each compaction. Each layer shall be thoroughly and uniformly blended throughout its entire thickness by diskings.

3.13.3 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, smooth-drum vibratory rollers or other approved equipment well suited to the soil being compacted. Generally, sheepsfoot rollers are best suited for compacting cohesive material while smooth-drum vibratory rollers are best suited for compacting cohesionless materials. In areas inaccessible to heavy equipment, or where in the opinion of the Contracting Officer, use of heavy equipment may cause damage to pipes, conduits, or structures, approved power-driven hand tampers suitable for the material being compacted shall be used. Each layer of fill and backfill shall be compacted to not less than the percentage of maximum density specified below.

	<u>Percent Laboratory Maximum Density</u>
<u>Fill, Embankment, and Backfill</u>	
Under structures, steps, paved areas, and in trenches	92
Beside structures, footings, and walls	92
Under sidewalks and grassed areas	85
Subgrade (Top of Fill, Embankment, and Backfill)	
Under building slabs, steps, paved areas, and footings, top 300mm (12 inches)	92
Under sidewalks and grassed areas, top 150 mm (6 inches)	85
Subgrade (Undisturbed Native Soil or Cut)	
Under building slabs, steps, paved areas, and footings, top 200mm (8 inches)	92
Under sidewalks and grassed areas, top 150 mm (6 inches)	85

Approved compacted subgrades that are disturbed by the Contractor's operations or adverse weather shall be scarified and recompact to the required density prior to further construction thereon. Recompaction over underground utilities and heating lines shall be by hand tamping. For compacted subgrades and/or any lift of fill or backfill that fails to meet the specified density and/or moisture requirements, the entire subgrade and/or entire lift of fill shall be broken up to a minimum depth of 8 inches, pulverized, the moisture content adjusted as necessary, and recompact to the specified density, even if this action requires the removal and replacement of subsequently placed satisfactory lifts of fill. Tests on recompact areas shall be performed to determine conformance with specification requirements. Lifts of fill placed without being field density tested will not be accepted as satisfactory under any circumstances

3.14 BACKFILLING AND COMPACTION FOR UTILITIES SYSTEM

Backfill material shall consist of satisfactory material, select granular material, or initial backfill material as required. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 92 percent maximum density, unless otherwise specified.

3.14.1 Trench Backfill

Trenches shall be backfilled to the grade shown. The trench shall be backfilled to 2 feet above the top of pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during the pressure test. The trench shall not be backfilled until all specified tests are performed.

3.14.1.1 Replacement of Unyielding Material

Unyielding material removed from the bottom of the trench shall be replaced with select granular material or initial backfill material.

3.14.1.2 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation with select granular material placed in layers not exceeding 6 inches loose thickness.

3.14.1.3 Initial Backfill

Initial backfill material shall be placed and compacted with approved tampers to a height of at least 1 foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe.

3.14.1.4 Final Backfill

The remainder of the trench, except for special materials for roadways and paved areas shall be filled with satisfactory material. Backfill material shall be placed and compacted as follows:

- a. Roadways and paved areas: Backfill shall be placed up to the required elevation as specified. Water flooding or jetting methods of compaction will not be permitted.
- b. Sidewalks, Turfed or Seeded Areas, and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 1 foot loose thickness, and compacted to 85 percent maximum density. Compaction by water flooding or jetting will not be permitted. This requirement shall also apply to all other areas not specifically designated above.

3.14.2 Backfill for Appurtenances

After the manhole, catchbasin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 7 days, place backfill in such a manner that the structure is not damaged by the shock of falling earth. Deposit the backfill material, compact it as specified for final backfill, and bring up the backfill evenly on all sides of the structure to prevent eccentric loading and excessive stress.

3.15 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

3.15.1 Gas Distribution

Excavate trenches to a depth that will provide a minimum 24 inch of cover.

3.15.2 Water Lines

Excavate trenches to a depth that provides a minimum cover of 30 inches from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe beneath unpaved areas, and 36 inches beneath paved areas. For fire protection yard mains or piping, an additional 6 inches of cover is required.

3.15.3 Heat Distribution System

Free initial backfill material of stones larger than 1/4 inch in any

dimension.

3.15.4 Electrical Distribution System

Provide a minimum cover of 24 inches from the finished grade to direct burial cable and conduit or duct line, unless otherwise indicated.

3.15.5 Rip-Rap Construction

Construct rip-rap on filter fabric in accordance with the erosion and sediment control plan in the areas indicated. Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.1 foot.

3.15.5.1 Stone Placement

Place rock for rip-rap on prepared bedding material to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the rip-rap throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above. For grouted rip-rap, hand-place surface rock with open joints to facilitate grouting and do not fill smaller spaces between surface rock with finer material. Provide at least one "weep hole" through grouted rip-rap for every 50 square feet of finished surface. Provide weep holes with columns of bedding material, 4 inches in diameter, extending up to the rip-rap surface without grout.

3.15.5.2 Grouting

Prior to grouting, wet rip-rap surfaces. Grout rip-rap in successive longitudinal strips, approximately 10 feet in width, commencing at the lowest strip and working up the slope. Distribute grout to place of final deposit and work into place between stones with brooms, spades, trowels, or vibrating equipment. Take precautions to prevent grout from penetrating bedding layer. Protect and cure surface for a minimum of 7 days.

3.16 FINISHING

Finish the surface of excavations, embankments, and subgrades to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for graded areas within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades specified in paragraph SUBGRADE PREPARATION. Finish gutters and ditches in a manner that will result in effective drainage. Finish the surface of areas to be turfed from settlement or washing to a smoothness suitable for the application of turfing materials. Repair graded, topsoiled, or backfilled areas prior to acceptance of the work, and re-established grades to the required elevations and slopes.

3.16.1 Subgrade and Embankments

During construction, keep embankments and excavations shaped and drained. Maintain ditches and drains along subgrade to drain effectively at all times. Do not disturb the finished subgrade by traffic or other operation. Protect and maintain the finished subgrade in a satisfactory condition until ballast, subbase, base, or pavement is placed. Do not

permit the storage or stockpiling of materials on the finished subgrade. Do not lay subbase, base course, ballast, or pavement until the subgrade has been checked and approved, and in no case place subbase, base, surfacing, pavement, or ballast on a muddy, spongy, or frozen subgrade.

3.16.2 Capillary Water Barrier

Place a capillary water barrier under concrete floor and area-way slabs grade directly on the subgrade and compact with a minimum of two passes of a hand-operated plate-type vibratory compactor.

3.16.3 Grading Around Structures

Construct areas within 5 feet outside of each building and structure line true-to-grade, shape to drain, and maintain free of trash and debris until final inspection has been completed and the work has been accepted.

3.17 PLACING TOPSOIL

On areas to receive topsoil, prepare the compacted subgrade soil to a 2 inches depth for bonding of topsoil with subsoil. Spread topsoil evenly to a thickness of 4 inch and grade to the elevations and slopes shown. Do not spread topsoil when frozen or excessively wet or dry. Obtain material required for topsoil in excess of that produced by excavation within the grading limits from offsite areas.

3.18 TESTING

Perform testing by a Corps validated commercial testing laboratory or the Contractor's validated testing facility. If the Contractor elects to establish testing facilities, do not permit work requiring testing until the Contractor's facilities have been inspected, Corps validated and approved by the Contracting Officer. Determine field in-place density in accordance with ASTM D 1556 and ASTM D 2937, Drive Cylinder Method shall be used for soft, fine-grained, cohesive soils. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, remove the material, replace and recompact to meet specification requirements. Perform tests on recompacted areas to determine conformance with specification requirements. Appoint a registered professional civil engineer to certify inspections and test results. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.18.1 Fill and Backfill Material Gradation

One test per 200 cubic yards of stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM D 422 and ASTM D 1140 (wash 0.003 inches, without hydrometer). Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318. Classification of soils shall be in accordance with ASTM D 2487. Moisture content shall be determined in accordance with ASTM D 2216.

3.18.2 Compaction

Compaction tests shall be performed by the test procedure presented in ASTM D 1557. Adequate testing shall be conducted to establish at least

five points with at least one point falling within plus or minus 1.5 percentage points of the plotted optimum moisture content.

3.18.3 Tests Required to be conducted on Material Prior to Placement

3.18.3.1 General

All material from required excavations and borrow shall be tested prior to incorporation into the permanent work. The tests shall be performed on samples representative of the various materials to be utilized. Samples shall be carefully selected to represent the full range of materials to be used as fill and/or backfill. The following minimum number of tests shall be performed on the materials prior to the placement of the materials in the work. Additional tests of these types shall be performed when materials of different classification or compaction characteristics are encountered to determine the properties of the materials. The Contracting Officer reserves the right to direct additional testing as required.

3.18.3.2 Classification Tests

Classification tests shall be performed to determine the acceptability of materials in accordance with paragraph MATERIALS. Such tests on materials proposed for use as fill and/or backfill shall be performed prior to their use. Sufficient classification tests shall be performed to define the full range of all materials proposed for use. A minimum of two classification tests from each on-site or off-site location identified as a borrow source shall be performed on each material classified as satisfactory for use. The Contracting Officer may at any time require additional classification tests to confirm material acceptability.

3.18.3.3 Compaction Tests

Compaction tests shall be performed prior to commencement of construction in order to determine the moisture-density relationships of all satisfactory materials proposed for use as fill and/or backfill. For each compaction test performed, an associated or companion classification test and moisture content test shall be performed. Compaction tests shall be performed in sufficient number to establish the full range of maximum dry density and optimum water content. A minimum of 8 compaction tests shall be performed on materials classified as satisfactory for use. Samples for these tests shall not be obtained from the same locations. The Contracting Officer reserves the right to direct where samples for additional compaction tests are obtained. In the event that the compaction characteristics of materials having the same classification vary appreciably, additional compaction tests shall be performed.

3.18.3.4 Moisture Content Tests

Moisture content tests shall be performed on all materials proposed for use as fill and/or backfill to determine their suitability for use in accordance with paragraph Moisture Content. Moisture content tests shall be performed in sufficient number to determine the full range of moisture contents. Moisture content test shall be performed for each compaction test and as required to determine acceptability of material prior to placement. At a minimum, two moisture content tests shall be performed on each material classified as satisfactory for use from each on-site or off-site location identified as a borrow source.

3.18.4 Tests Required During Placement

3.18.4.1 In-Place Density Tests for General Earthwork

- a. One test per 10,000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.
- b. One test per 100 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.
- c. One test per 100 linear feet, or fraction thereof, of each lift of embankment or backfill for roads.
- d. One test per 7,500 square feet, or fraction thereof, of subgrade in native soil or cut in all area, excluding roads.
- e. One test per 50 linear feet, or fraction thereof, of subgrade in embankment or backfill, and in native soil or cut in roads.

3.18.4.2 In-Place Test for Buildings

Acceptance of the compacted materials shall be determined by the results of field in-place density tests. Density tests in randomly selected locations shall be performed in the material and at the minimum frequency specified below:

<u>Material Type</u>	<u>Location of Material</u>	<u>Minimum Test Frequency</u>
Fill, embankment and backfill	Beneath Structures, to the 5 ft (1.5 m) building line	One test per lift for each increment or fraction of 4000 square feet
Fill and backfill	Areas beside structures, footings, walls, and areas enclosed by grade beams that are compacted by hand operated compaction equipment	One test per foot of depth per each increment or fraction of 200 square feet, or for each 50 linear feet of long narrow (i.e. less than 3 feet wide) fills 150 linear feet or more
Subgrade	Under building slabs on grade and pave areas	One test per each increment or fraction of 2500 square feet
Subgrade	Under footings	One test per every fifth column footing and for each increment or fraction of 75 linear feet of wall footing

3.18.4.3 In-Place Density Tests for Utility Systems

Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one field density test per lift of backfill for every 150 linear feet, or fraction thereof, of installation

shall be performed.

3.18.4.4 Moisture Content

In the stockpile(s), excavation, or borrow areas, a minimum of two tests, each with a one-point or two-point compaction test, shall be performed per day per type of material or source of material being placed during stable weather conditions. During unstable weather, tests shall be made as dictated by the local conditions to ensure the moisture content of the placed materials is within the specified limits.

3.18.4.5 Optimum Moisture and Laboratory Maximum Density

One representative test shall be performed per 200 cubic yards of fill, embankment, and backfill, or when any change in material occurs which may affect the optimum moisture content of laboratory maximum density.

3.18.4.6 Time and Location of Tests

The Government reserves the right to specify the location of any test. Whenever there is doubt as to the adequacy of the testing or validity of results, the Contracting Officer may direct that additional tests be performed, at no additional cost to the Government. The field density tests shall be performed at times and locations which will assure the specified compaction is being obtained throughout each lift for all materials placed. Additional field density tests shall be performed in areas where the Contracting Officer determines there is reason to doubt the adequacy of the natural subgrade.

3.18.4.7 Field Density Control

The results of field density tests shall be compared to results of compaction tests performed as required elsewhere in these specifications by the use of the appropriate procedures described in the following paragraphs.

3.18.5 Compaction Control

For fine grained (clayey and silty) soils and for sands with appreciable fines such that normal shaped compaction curves are obtained, results of all compaction tests shall be plotted on a common plot as a family of curves. For each field density test performed, a one-point compaction test, with additional points as needed, shall be performed on the same material on which the field density test was conducted. The one-point compaction test shall be performed on the dry side of the optimum moisture content. For comparison of field density data to the proper laboratory compaction test results, the procedures for the one-point and/or two-point compaction control methods as described in paragraph Compaction Procedure, shall be used. Compaction curves plotted on the family of curves shall be of such a scale that the optimum moisture content can be interpreted to the nearest 0.1 percent and the maximum dry density can be interpreted to the nearest 0.5 pounds per cubic foot. When a one-point test plots outside the range of the family of curves, an additional five-point compaction test shall be performed.

3.18.6 Compaction Procedures

3.18.6.1 General

The following paragraphs describe methods of relating field density data to

desired or specified values. Compaction control of soils requires comparison of fill water content and/or dry density values obtained in field density tests with optimum water content and/or maximum dry density. At a minimum, control shall be in accordance with the One-Point Compaction Method. Where conditions require, the Two-Point Compaction Method shall be used.

3.18.6.2 One-Point Compaction Method

The material from the field density test is allowed to dry to a water content on the dry side of estimated optimum, and then compacted using the same equipment and procedures used in the five-point compaction test. Thorough mixing is required to obtain uniform drying; otherwise, results obtained may be erroneous. The water content and dry density of the compacted sample are determined and then used to estimate its optimum water content and maximum dry density as illustrated in Figure 1 at the end of this section. In Figure 1, the line of optimums is well defined and the compaction curves are approximately parallel to each other, consequently, the one-point compaction method could be used with a relatively high degree of confidence. However, in Figure 2 at the end of this section, the curves are not parallel to each other and in several instances will cross if extended on the dry side. Consequently, the correct curve cannot be determined from the one-point method; therefore, the two-point compaction method should be used. The one-point method should be used only when the data define a relatively good line of optimums.

3.18.6.3 Two-Point Compaction Method

In the two-point test, one sample of material from the location of the field density test is compacted at the fill water content if thought to be at or on the dry side of optimum water content (otherwise, reduced by drying to this condition) using the same equipment and procedures used in the five-point compaction test. A second sample of material is allowed to dry back about 2 to 3 percentage points dry of the water content of the first sample and then compacted in the same manner. At least one point shall fall within 3 percent of the line of optimum. After compaction, the water contents and dry densities for the two samples are determined. The results are used to identify the appropriate compaction curve for the material being tested as shown in Figure 2 at the end of this section. The data shown in Figure 2 warrant the use of the two-point compaction test because the five-point compaction curves are not parallel. Using point A only, as in the one-point test method, would result in appreciable error as the shape of the curve would not be defined. The estimated compaction curve can be more accurately defined by two compaction points.

3.18.7 Tolerance Tests for Subgrades

Perform continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION during construction of the subgrades.

3.18.8 Displacement of Sewers

After other required tests have been performed and the trench backfill compacted to the finished grade surface, inspect the pipe to determine whether significant displacement has occurred. Conduct this inspection in the presence of the Contracting Officer. Inspect pipe sizes larger than 36 inches, while inspecting smaller diameter pipe by shining a light or laser between manholes or manhole locations, or by the use of television cameras passed through the pipe. If, in the judgment of the Contracting Officer,

the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, replace or repair the defects as directed at no additional cost to the Government.

3.19 DISPOSITION OF SURPLUS MATERIAL

Surplus material or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber shall be wasted in Government disposal area or removed from Government property as directed by the Contracting Officer. indicated.

3.20 PROTECTION

Settlement or washing that occurs in graded, topsoiled, or backfilled areas prior to acceptance of the work, shall be repaired and grades reestablished to the required elevations and slopes.

-- End of Section --