

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

PAGE OF PAGES

1

2. AMENDMENT/MODIFICATION NO.

0003

3. EFFECTIVE DATE

08/28/01

4. REQUISITION/PURCHASE REQ. NO.

5. PROJECT NO. (If applicable)

6. ISSUED BY

CODE

7. ADMINISTERED BY (If other than Item 6)

CODE

JACKSONVILLE DISTRICT OFFICE
U.S. ARMY CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FL 32232-0019
KATHIE DUKE 904-232-3713

ANTILLES OFFICE
U.S. ARMY CORPS OF ENGINEERS (CESAJ-DS)
400 FERNANDEZ JUNCOS AVENUE
SAN JUAN, PR 00901-3299

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)

(✓)

9A. AMENDMENT OF SOLICITATION NO.

DACW17-01-B-0015

×

9B. DATED (SEE ITEM 11)

13 JULY 2001

10A. MODIFICATION OF CONTRACTS/ORDER NO.

10B. DATED (SEE ITEM 13)

CODE

FACILITY CODE

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers tended.

is extended,

is not ex-

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(✓) A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor is not, is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

RIO GRANDE DE MANATI, BARCELONETA, PUERTO RICO

ALL CHANGES MADE BY THIS AMENDMENT ARE SPECIFIED ON THE ATTACHED PAGE. ANY ENCLOSURES ACCOMPANYING THIS AMENDMENT SHOULD BE INSERTED INTO THE PLANS AND/OR SPECIFICATIONS AS APPLICABLE. DESCRIPTIVE CHANGES: SPECIFICATIONS AND DRAWINGS SHOULD BE ADEQUATELY MARKED TO INDICATE ANY DESCRIPTIVE CHANGES THAT HAVE BEEN MADE.

THE BID OPENING DATE FOR THIS PROJECT HAS BEEN EXTENDED TO 11 SEPTEMBER 2001 AND THE TIME FOR BID OPENING HAS BEEN CHANGED TO 11:00 AM

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

(Signature of person authorized to sign)

BY Cynthia S. Jones
(Signature of Contracting Officer)

29 Aug 01

SF 30 CONTINUATION SHEET

1. SPECIFICATIONS:

A. Either asterisks appear before and after the line or lines where revisions have been made to the text on the enclosed revised or added pages or the text changes have been updated with additions noted with underlined text and deletions noted with line/cross-outs, and pertain only to changes made by this amendment.

B. 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 marked with asterisks or underlined text and line/cross-outs.

STANDARD FORM 30 Am #0003 ADDED.

SECTION 00010:

SF1442 (Standard Form 1442), DELETE page 00010-1 and REPLACE with the attached revised page 00010-1.

BID SCHEDULE, DELETE Pages 00010-3, 00010-4, and 00010-8 and REPLACE with the attached revised pages.

SECTION 01000: PAGE 01000-G, CORE BORING LOGS AND LABORATORY DATA; ADD Pages TP-MAN-1, -2, -3, AND -4.

SECTION 02331: EMBANKMENT CONSTRUCTION AND CHANNEL EXCAVATION; DELETE SECTION 02331 (Pages 1-25) and REPLACE with the attached revised SECTION 02331 (Pages 1-25).

SECTION 02371: WIRE MESH GABIONS; DELETE SECTION 02371 (Pages 1-12) and REPLACE with the attached revised SECTION 02371 (Pages 1-12).

SECTION 16050: RELOCATION OF POWER AND TELEPHONE LINES; DELETE SECTION 16050 (Pages 1-5) and REPLACE with the attached revised SECTION 16050 (Pages 1-5).

DESCRIPTIVE SPECIFICATION CHANGES: The following changes are descriptive changes to the specifications. Specifications should be adequately marked to indicate that they have been changed.

SECTION 00800: PARA 52.211-10, SPECIAL CONTRACT REQUIREMENTS; CHANGE "730 calendar days" to read "900 calendar days".

2. DRAWINGS:

D.O. File No. 101-37,063 dated November 1995 in 133 Sheets + Cover:

DESCRIPTIVE DRAWING CHANGES: The following changes are descriptive changes to the drawings. Drawings should be adequately marked to indicate that they have been changed. Drawings furnished to the Contractor in accordance with Contract Clause entitled "CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS" will be revised to reflect the revisions made descriptively herein.

Drawing No. 10/4; ZONES C/5 and D/5: CHANGE "Select Fill" to read "Embankment Fill".

Drawing 10/8; Zone D-3, within access road R-O-W next to the EB20 Point Number, add pointer with note stating "Septic Tank System to be removed by others".

Drawing No. 60/5: CHANGE all references to "SOD" to read "GABION MATTRESS".

SOLICITATION, OFFER, AND AWARD <i>(Construction, Alteration, or Repair)</i>		1. SOLICITATION NO. DACW17-01-B-0015	2. TYPE OF SOLICITATION <input checked="" type="checkbox"/> SEALED BID (IFB) <input type="checkbox"/> NEGOTIATED (RFP)	3. DATE ISSUED 7/13/01	PAGE OF PAGES
IMPORTANT - The "offer" section on the reverse must be fully completed by offeror.					
4. CONTRACT NO.		5. REQUISITION/PURCHASE REQUEST NO. W32CS5-0062-3055		6. PROJECT NO.	
7. ISSUED BY US ARMY CORPS OF ENGINEERS JACKSONVILLE DISTRICT PO BOX 4970 ATTN: CESAJ-CT-C JACKSONVILLE, FL 32232-0012		CODE	8. ADDRESS OFFER TO ANTILLES CONSTRUCTION OFFICE U.S. ARMY CORPS OF ENGINEERS 400 FERNANDEZ JUNCOS AVENUE SAN JUAN, PUERTO RICO 00901-3299		
9. FOR INFORMATION CALL		A. NAME KATHIE B. DUKE		B. TELEPHONE NO. (Include area code) (NO COLLECT CALLS) 904-232-3713	

SOLICITATION

NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS (Title, identifying no., date):

RIO GRANDE DE MANATI, BARCELONETA, PUERTO RICO
DRAWINGS: D.O. FILE # 101-37,063, DATED NOVEMBER 1995 IN 124 PAGES PLUS COVER

DESCRIPTION OF WORK: THE PROJECT WORK INCLUDES CHANNEL EXCAVATION USING BACKHOES, TRUCKS, SHOVELS AND BULLDOZERS, LEVEE CONSTRUCTION, INSTALLATION OF CULVERTS, CONSTRUCTION OF HIGHWAY RAMPS, AND UTILITY RELOCATIONS. LEVEE CONSTRUCTION WILL REQUIRE HAULING BORROW FILL FROM BORROW AREAS LOCATED AWAY FROM THE PROJECT, THEREFORE, EXTENSIVE USE OF HIGHWAY TRUCKS IS ANTICIPATED. THIS IS A FLOOD CONTROL PROJECT TO PROTECT TOWNS NEAR THE MANATI RIVER.

MAGNITUDE OF CONSTRUCTION: OVER \$10,000,000.00

THIS SOLICITATION IS BEING ADVERTISED AS 100% SMALL BUSINESS SET-ASIDE. ALL ELIGIBLE BUSINESSES ARE ENCOURAGED TO PARTICIPATE.

YOU MUST BE REGISTERED IN THE CENTRAL CONTRACTOR REGISTRATION IN ORDER TO BE ELIGIBLE TO RECEIVE AN AWARD FROM THIS SOLICITATION. CALL 1-888-227-2423 FOR INFORMATION.

* 11. The Contractor shall begin performance within 30 calendar days and complete it within 900 calendar days after receiving *

award, notice to proceed. This performance period is mandatory, negotiable. (See See Section 00800.)

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS? <i>(If "YES," indicate within how many calendar days after award in Item 12B.)</i>	12B. CALENDAR DAYS
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	10

13. ADDITIONAL SOLICITATION REQUIREMENTS:

* A. Sealed offers in original and 0 copies to perform the work required are due at the place specified in Item 8 by 1100 (hour) local time *

* 09/11/01 (date). If this is a sealed bid solicitation, offers will be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due. *

B. An offer guarantee is, is not required.

C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.

D. Offers providing less than 60 calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.

SECTION 00010

SUPPLIES OR SERVICES AND PRICES/COSTS
RIO GRANDE DE MANATI, BARCELONETA, PUERTO RICO

<u>LINE ITEM</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
0001	MOBILIZATION AND DEMOBILIZATION (SEE SECTION 00800)	1	LUMP SUM		\$ _____
0002	CLEARING AND GRUBBING	1	LUMP SUM		\$ _____
0003	UPSTREAM CHANNEL EXCAVATION (ESTIMATED QUANTITY)	110,000	CUBIC METER	\$ _____	\$ _____
0004	DOWNSTREAM CHANNEL EXCAVATION (ESTIMATED QUANTITY)	56,000	CUBIC METER	\$ _____	\$ _____
0005	<u>FILL: LEVEE / RIVERBED / FARM ROAD</u> <u>(TOTAL ESTIMATED QUANTITY: 888,000 CUBIC METERS)</u>				
0005AA	FILL FROM PROJECT EXCAVATIONS (ESTIMATED QUANTITY)	166,000	CUBIC METER	\$ _____	\$ _____
*0005AB	FILL FROM BORROW AREA (ESTIMATED QUANTITY)	266,000	CUBIC METER	\$ _____	\$ _____ *
*0005AC	FILL FROM COMMERCIAL QUARRY (SEE NOTE (5)) (ESTIMATED QUANTITY)	456,000	CUBIC METER	\$ _____	\$ _____ *
0006	NOT USED				
0007	WEST LEVEE INTERIOR DRAINAGE CHANNEL EXCAVATION (ESTIMATED QUANTITY)	24,000	CUBIC METER	\$ _____	\$ _____
0008	EAST LEVEE INTERIOR DRAINAGE CHANNEL EXCAVATION (ESTIMATED QUANTITY)	36,000	CUBIC METER	\$ _____	\$ _____
0009	EAST OXBOW FILL (RIVER BED) (ESTIMATED QUANTITY)	124,000	CUBIC METER	(SEE NOTE (6))	(SEE NOTE (6))
0010	FILL OF EXISTING RIVER BED ALONG EAST LEVEE (ESTIMATED QUANTITY)	51,000	CUBIC METER	(SEE NOTE (6))	(SEE NOTE (6))
0011	SELECT RIVER PLUG FILL (ESTIMATED QUANTITY)	31,000	CUBIC METER	\$ _____	\$ _____
0012	FARM ROAD RAMP FILL (SEE NOTE (7)) (ESTIMATED QUANTITY)	4,000	CUBIC METER	(SEE NOTE (6))	(SEE NOTE (6))
0013	<u>CULVERTS:</u>				
0013AA	CULVERT 1	1	LUMP SUM		\$ _____
0013AB	CULVERT 2	1	LUMP SUM		\$ _____
0013AC	CULVERT 1A	1	LUMP SUM		\$ _____
0013AD	CULVERT 2A	1	LUMP SUM		\$ _____

SECTION 00010

SUPPLIES OR SERVICES AND PRICES/COSTS
RIO GRANDE DE MANATI, BARCELONETA, PUERTO RICO

<u>LINE ITEM</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
*0014	GEOTEXTILE FABRIC ON CHANNEL (Est. Quantity)	24,200	SQUARE METER	\$ _____	\$ _____ *
*0015	228 mm GABION MATTRESS ON CHANNEL (ESTIMATED QUANTITY)	21,400	SQUARE METER	\$ _____	\$ _____ *
*0016	GEOTEXTILE FABRIC ON LEVEE (ESTIMATED QUANTITY)	17,750	SQUARE METER	\$ _____	\$ _____ *
*0017	228 mm GABION MATTRESS ON LEVEE (ESTIMATED QUANTITY)	15,950	SQUARE METER	\$ _____	\$ _____ *
0018	TELEPHONE/CABLE LINE RELOCATION WORK (SEE NOTE (4))	1	LUMP SUM		\$157,970.00
0019	POWER LINE RELOCATIONS BY PREPA (SEE NOTE (4))	1	LUMP SUM		\$49,593.00
0020	UTILITY COORDINATION	1	LUMP SUM		\$ _____
0021	<u>RAISE MANHOLES AND INSTALL NEW TOPS:</u>				
0021AA	RELOCATION #1	1	LUMP SUM		\$ _____
0021AB	RELOCATION #2	1	LUMP SUM		\$ _____
0022	<u>ROAD RAMPS - PR 681:</u>				
0022AA	SELECT EMBANKMENT FILL (ESTIMATED QUANTITY)	23,600	CUBIC METER	\$ _____	\$ _____
0022AB	CRUSHED GRAVEL OR CRUSHED STONE BASE, GRADING A (ESTIMATED QUANTITY)	6,200	SQUARE METER	\$ _____	\$ _____
0022AC	HOT PLANT MIX, BITUMINOUS SURFACE COURSE, MIX TYPE S-1 (.05 meter thickness) (ESTIMATED QUANTITY)	6,000	SQUARE METER	\$ _____	\$ _____
0022AD	HOT PLANT MIX, BITUMINOUS SURFACE COURSE, MIX TYPE S-1 (.10 meter thickness) (ESTIMATED QUANTITY)	3,300	SQUARE METER	\$ _____	\$ _____
0022AE	HOT PLANT MIX, BITUMINOUS SURFACE COURSE. MIX TYPE B-1 (ESTIMATED QUANTITY)	2,800	SQUARE METER	\$ _____	\$ _____
0022AF	TRAFFIC SIGNS	1	LUMP SUM		\$ _____
0022AG	PAVEMENT MARKINGS	1	LUMP SUM		\$ _____
0022AH	MAINTENANCE OF TRAFFIC	1	LUMP SUM		\$ _____
0022AJ	CLEARING, GRUBBING AND STRUCTURE REMOVAL	1	LUMP SUM		\$ _____

SECTION 00010

SUPPLIES OR SERVICES AND PRICES/COSTS
RIO GRANDE DE MANATI, BARCELONETA, PUERTO RICO

<u>LINE ITEM</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
------------------	--------------------	-----------------	-------------	-------------------	--------------

- NOTES:
- (1) ALL BIDS MUST BE FOR THE ENTIRE WORK AND MUST HAVE EACH BLANK SPACE COMPLETED.
 - (2) FAILURE TO COMPLETE AND RETURN ALL REQUIRED SUBMISSIONS (SF 1442, SECTION 00010, AND SECTION 00600) COULD RENDER YOUR BID NONRESPONSIVE.
 - (3) SEE SECTION 00100, "INSTRUCTIONS, CONDITIONS AND NOTICES TO OFFERORS."
 - * (4) DETERMINATION OF THE LOW BIDDER WILL BE MADE USING THE PRICES SHOWN IN BID ITEMS 0018 AND 0019 OF THIS SECTION. PRICES SHOWN ARE BASED ON ESTIMATES FURNISHED TO THE GOVERNMENT BY THE RELOCATION AUTHORITIES. SEE SECTION 16050 OF THE SPECIFICATIONS. ACTUAL WORK WILL BE ACCOMPLISHED BY THE UTILITY COMPANIES. PAYMENT FOR THE WORK WILL BE MADE BASED ON INVOICES RECEIVED FROM THE RESPECTIVE UTILITY COMPANIES *
 - (5) THE CONTRACTOR SHALL NOT EXCEED THE AMOUNT OF THIS LINE ITEM UNTIL FILL TAKEN FROM LINE ITEMS 0005AA AND 0005AB HAS BEEN DEPLETED.
 - (6) THE ESTIMATED QUANTITIES SHOWN FOR BID ITEM NUMBERS 0009, 0010 and 0012 ARE INCLUDED IN THE TOTAL ESTIMATED QUANTITY FOR LINE ITEM NUMBER 0005. ALL COSTS FOR THESE LINE ITEMS SHALL BE INCLUDED IN LINE ITEM NUMBER 0005, "FILL: LEVEE/RIVERBED/FARM ROAD".
 - (7) REAL ESTATE CERTIFICATIONS HAVE NOT BEEN OBTAINED FOR THE WORK ASSOCIATED WITH LINE ITEMS 0012, "FARM ROAD RAMP"; 0032, "BOAT RAMP"; AND 0033, "SELECT EMBANKMENT FILL BOAT RAMP ACCESS ROAD". IF CERTIFICATIONS HAVE NOT BEEN OBTAINED PRIOR TO THE TIME FOR ISSUANCE OF THE NOTICE TO PROCEED, THE WORK INVOLVED WITH THESE LINE ITEMS WILL BE OMITTED FROM THE NOTICE TO PROCEED. IF, AT A LATER TIME, REAL ESTATE CERTIFICATIONS ARE OBTAINED, A SEPARATE NOTICE TO PROCEED WILL BE ISSUED FOR THE WORK. IF NOTICE TO PROCEED FOR THESE ITEMS IS DELAYED FOR AN UNREASONABLE PERIOD, CONTRACT ADJUSTMENTS, IF ANY, SHALL BE MADE IN ACCORDANCE WITH THE SUSPENSION OF WORK CLAUSE OF THE CONTRACT. OFFERORS SHOULD PLAN THEIR WORK SO THAT, IN THE EVENT NOTICE TO PROCEED FOR THESE ITEMS IS WITHHELD, THEY CAN PROCEED WITH OTHER WORK WITHOUT DELAY AND WITHOUT ADDITIONAL COST TO THE GOVERNMENT. IF THE GOVERNMENT IS UNABLE TO OBTAIN THE REQUIRED REAL ESTATE CERTIFICATIONS WITHIN A REASONABLE PERIOD OF TIME, THESE ITEMS WILL BE DELETED FROM THE CONTRACT AND THE CONTRACT PRICE WILL BE ADJUSTED IN ACCORDANCE WITH THE CHANGES CLAUSE OF THE CONTRACT. IF NOTICE TO PROCEED FOR ANY OR ALL OF THESE ITEMS IS DELAYED, THE CONTRACTING OFFICER SHALL DETERMINE WHETHER THE PERIOD OF DELAY IS REASONABLE OR UNREASONABLE.

TEST PIT LOG

PROJECT
RIO GRANDE DE MANATI FLOOD CONTROL

LOCATION

Barceloneta, Puerto Rico

EXCAVATION EQUIPMENT

Trackhoe (320 L Caterpillar)

LOGGED BY

Geologist Michael Martinez

DATE EXCAVATED
8/27/2001

SURFACE ELEVATION

N/A

TEST PIT LOCATION

EXCAVATION DEPTH [feet]
10

ELEV. [m]	DEPTH [feet]	LEGEND	SAMPLE	DESCRIPTION AND CLASSIFICATION	
0				Muck, Gray, Moist, Mixed with Limestone Fragments (Silt Size to Coarse Pebbles). Strong Acid Reaction, Roots.	15
				LIMESTONE, Hard, Unweathered, Slightly Crystalline in Some Areas, Massively Bedded, Light Tan to White.	8
10				Excavation time: 2 hours and 40 minutes using a Trackhoe. High resistance to abrasion during excavation. Percentage of cobbles and boulders were approximately 15% and 5% respectively. Size of such fragments ranged between 9 to 11 cm and 32 cm respectively. Note: Percentage of cobbles and boulders are based on field visual observation.	10

File # 3000-01

GEOCONSULT
San Juan, Puerto Rico

TEST PIT NO. TP-MAN-1

TEST PIT LOG

PROJECT: RIO GRANDE DE MANATI FLOOD CONTROL

LOCATION: Barceloneta, Puerto Rico

EXCAVATION EQUIPMENT: Trackhoe (320 L Caterpillar)

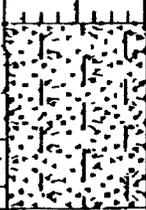
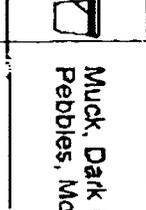
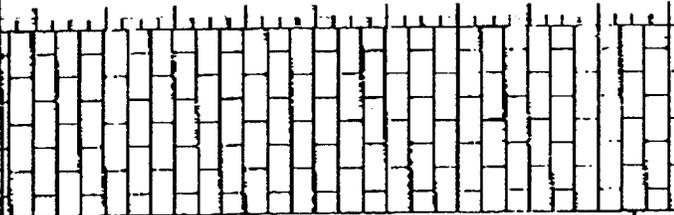
LOGGED BY: Geologist Michael Martinez

DATE EXCAVATED: 8/27/2001

SURFACE ELEVATION: N/A

TEST PIT LOCATION

EXCAVATION DEPTH (feet): 13.5

ELEV. (m)	DEPTH (feet)	LEGEND	SAMPLE	DESCRIPTION AND CLASSIFICATION	W
0	0			Muck, Dark Grayish Brown, Moist, Mixed with 10% Subangular to Angular Limestone Pebbles, Moderate Acid Reaction, Roots.	17
	2			LIMESTONE, Hard to Very Hard, Slightly Weathered, Slightly Crystalline in Some Areas, Massively Bedded, Light Tan.	9
	13.5			Excavation time: 3 hours using Trackhoe. High resistance to abrasion during excavation. Percentage of cobbles and boulders were approximately 15% and 1% respectively. Size of such fragments ranged between 10 cm and 32 cm respectively. Note: Percentage of cobbles and boulders are based on field visual observation.	

TEST PIT LOG

PROJECT
RIO GRANDE DE MANATI FLOOD CONTROL

LOCATION

Barceloneta, Puerto Rico

EXCAVATION EQUIPMENT
Trackhoe (320 L Caterpillar)

LOGGED BY

Geologist Michael Martinez

DATE EXCAVATED

8/28/2001

SURFACE ELEVATION

N/A

TEST PIT LOCATION

EXCAVATION DEPTH (feet)

12

ELEV. [m]	DEPTH [feet]	LEGEND	SAMPLE	DESCRIPTION AND CLASSIFICATION	W
0	0			Muck, Very Dark Brown, Moist, Mixed with 5% Subangular to Angular Coarse Limestone Pebbles. Moderate Acid Reaction, Roots.	30
6	6			LIMESTONE, Medium, Moderately Weathered, Slightly Crystalline in Some Areas. Some Caliche is Present, Massively Bedded, Light Tan.	7
12	12			Change in Color from Light Tan to Yellowish Orange. Excavation time: 2 hours using Trackhoe. Medium resistance to abrasion during excavation. Percentage of cobbles and boulders were approximately 15% and 1% respectively. Size of such fragments ranged between 8 to 12 cm and 32 cm respectively.	7

Note: Percentage of cobbles and boulders are based on field visual observation.

File # 3000-01

GEOCONSULT
San Juan, Puerto Rico

TEST PIT NO. TP-MAN-3

TEST PIT NO. TP-MAN-4

TEST PIT LOG

PROJECT **RIO GRANDE DE MANATI FLOOD CONTROL**

LOCATION

Barceloneta, Puerto Rico

EXCAVATION EQUIPMENT

Trackhoe (320 L Caterpillar)

LOGGED BY

Geologist Michael Martinez

DATE EXCAVATED

8/28/2001

SURFACE ELEVATION

N/A

TEST PIT LOCATION

EXCAVATION DEPTH [feet]

10.3

ELEV. [m]	DEPTH [feet]	LEGEND	SAMPLE	DESCRIPTION AND CLASSIFICATION	W
0	0				
0.5	0.5			Muck, Very Dark Brown, Moist, Mixed with 5% Subangular to Angular Coarse Limestone Pebbles, Moderate Acid Reaction, Roots.	
				LIMESTONE, Very Hard, Unweathered, Slightly Crystalline in Some Areas, Massively Bedded, Light Tan to White. A Cavity was Found at 6 ft. It is 6" Wide and Approximately 1.5' Long with a Minimum Depth of 25 ft. A Slight Cold Breeze Flows Through the Cavity. No Evidence of Water Flow Through the Cavity was Found.	
				Excavation time: 2 hours and 30 minutes using a Trackhoe. High resistance to abrasion during excavation. Percentage of cobbles and boulders were approximately 20% and 1% respectively. Size of such fragments ranged between 8 to 10 cm and 32 cm respectively.	7
				Note: Percentage of cobbles and boulders are based on field visual observation.	
10.3					

File # 3000-01

GEOCONSULT
San Juan, Puerto Rico

TEST PIT NO. TP-MAN-4

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

02331

EMBANKMENT CONSTRUCTION AND CHANNEL EXCAVATION

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 DEFINITIONS
 - 1.2.1 Satisfactory Materials
 - 1.2.2 Unsatisfactory Materials
 - 1.2.3 Backfill
 - 1.2.4 Excavation
 - 1.2.5 Classification of Soils
 - 1.2.5.1 Cohesionless and Cohesive Materials
- 1.3 GENERAL CONDITIONS
 - 1.3.1 Lines and Grades
 - 1.3.2 Conduct of the Work
 - 1.3.3 Materials
 - 1.3.4 Haul Roads
 - 1.3.5 Road Ramps and Boat Ramp Access
 - 1.3.6 Slides and Foundation Failures
 - 1.3.7 Protection of Existing Man-Made Facilities and Natural Features
 - 1.3.8 Drainage
- 1.4 SUBMITTALS
- 1.5 REGULATORY REQUIREMENTS
- 1.6 PERMITS
- 1.7 PROJECT SITE CONDITIONS
 - 1.7.1 Protection of Cultural and Natural Resources
 - 1.7.2 Protection of Existing Man-Made Facilities and Natural Features
 - 1.7.3 Historical, Archeological, and Cultural Resources
 - 1.7.4 Subsurface Data

PART 2 PRODUCTS

- 2.1 HAUL ROAD MATERIALS
- 2.2 TYPES OF FILL MATERIALS
 - 2.2.1 Excavation Materials
 - 2.2.1.1 Pilot Channel Excavation
 - 2.2.1.2 East Borrow Area

PART 3 EXECUTION

- 3.1 CLEARING
- 3.2 GRUBBING
- 3.3 REMOVAL OR PLUGGING OF ABANDONED PIPE AND CONDUITS
- 3.4 SHORING, SHEETING, AND BRACING
- 3.5 DEWATERING AND DIVERSION
- 3.6 EXCAVATION
 - 3.6.1 Flood Control Pilot Channels
 - 3.6.2 Over Excavation

- 3.6.2.1 Outside the Limits Indicated
- 3.6.2.2 Within the Limits Indicated
- 3.6.3 Structures
- 3.6.4 Ditches
- 3.6.5 Slopes and Surcharges
- 3.6.6 East Borrow Area
- 3.6.7 Riprap and Bedding
- 3.6.8 Rock
- 3.7 TOLERANCES
- 3.8 SLIDES
- 3.9 STOCKPILES
- 3.10 SURFACE DRAINAGE OF COMPLETED AREAS
- 3.11 MAINTENANCE OF WORK
 - 3.11.1 Debris Removal
- 3.12 DISPOSITION OF EXCAVATED MATERIALS
 - 3.12.1 Satisfactory Materials
 - 3.12.2 Unsatisfactory Materials
- 3.13 PREPARATION OF FOUNDATION, PARTIAL FILL SURFACES AND ABUTMENTS
 - 3.13.1 Earth
 - 3.13.2 Benching
- 3.14 PLACEMENT AND SPREADING
 - 3.14.1 General
 - 3.14.1.1 Gradation and Distribution
 - 3.14.1.2 Foundations and Partial Embankment Fills
 - 3.14.1.3 Equipment Traffic
 - 3.14.2 Placement of Embankment and Backfill Against Rock
 - 3.14.3 Placement of Embankment and Backfill Against Structures
 - 3.14.4 Select Fill
 - 3.14.5 Embankment Fill
 - 3.14.6 Channel Fill
- 3.15 MOISTURE CONTROL
 - 3.15.1 General
 - 3.15.1.1 Insufficient Moisture for Suitable Bond
 - 3.15.1.2 Excessive Moisture for Suitable Bond
 - 3.15.1.3 Drying Wet Material
 - 3.15.1.4 Increasing Moisture in Dry Material
 - 3.15.2 Select Fill
 - 3.15.3 Embankment Fill and Channel Fill
- 3.16 COMPACTION
 - 3.16.1 Compaction Equipment
 - 3.16.1.1 Tamping Rollers
 - 3.16.1.2 Rubber-tired Rollers
 - 3.16.1.3 Hand Operated Compactors
 - 3.16.1.4 Sprinkling Equipment
 - 3.16.1.5 Miscellaneous Equipment
 - 3.16.2 Compaction of Channel Fill
 - 3.16.3 Compaction of Embankment Fill
 - 3.16.4 Compaction of Select Fill
 - 3.16.5 Compaction Adjacent to Structures and Utilities
- 3.17 FIELD QUALITY CONTROL
 - 3.17.1 Clearing and Grubbing
 - 3.17.1.1 Clearing
 - 3.17.1.2 Grubbing
 - 3.17.2 Excavation
 - 3.17.3 Embankment
 - 3.17.3.1 General
 - 3.17.3.2 Materials Testing
 - 3.17.3.3 Testing by the Government
 - 3.17.3.4 Reporting

- 3.18 PUERTO RICO HIGHWAY 681 GEOMETRY
- 3.19 PUERTO RICO HIGHWAY 681 DETOUR GEOMETRY
- 3.20 PUERTO RICO HIGHWAY 682 GEOMETRY
- 3.21 PUERTO RICO HIGHWAY 684 GEOMETRY
- 3.22 PUERTO RICO HIGHWAY 684 DETOUR GEOMETRY
- 3.23 BOAT RAMP ACCESS GEOMETRY
- 3.24 FARM ROAD CROSSOVER GEOMETRY

-- End of Section Table of Contents --

02331

EMBANKMENT CONSTRUCTION AND CHANNEL EXCAVATION

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 43 (1988; R 1995) Sizes of Aggregate for Road and Bridge Construction

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33 (1999) Concrete Aggregates

ASTM D 422 (1963; R 1998) Particle-Size Analysis of Soils

ASTM D 698 (1991; R 1998) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))

ASTM D 1556 (1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D 1557 (1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))

ASTM D 2167 (1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method

ASTM D 2216 (1998) Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 2487 (1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D 2922 (1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D 2937 (1994) Density of Soil in Place by the Drive-Cylinder Method

ASTM D 3017 (1996) Water Content of Soil and Rock in

Place by Nuclear Methods (Shallow Depth)

ASTM D 4253	(1993; R 1996) Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D 4254	(1991; R 1996) Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 4643	(1993) Determination of Water (Moisture) Content of Soil by the Microwave Oven Method
ASTM D 5195	(1991; R 1996) Density of Soil and Rock In-Place Below the Surface by Nuclear Methods

ENGINEERING MANUALS (EM)

EM 385-1-1	(1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual
------------	---

1.2 DEFINITIONS

1.2.1 Satisfactory Materials

Select Fill. Materials acceptable for select fill include any materials classified by ASTM D 2487 as GW, GP, SW, and SP. Materials classified by ASTM D 2487 as GM, GC, SM, and SC with less than 15 percent of the material passing the No. 200 sieve shall also be acceptable for select fill.

Embankment Fill. Materials acceptable for embankment fill include any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, CL and ML.

Channel Fill. Materials acceptable for channel fill include any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, CL and ML. Stones up to 450 millimeters in any dimension may be used as channel fill up to elevation -1.5 meters. Above elevation -1.5 meters, stones no larger than 150 millimeters in any dimension may be included as channel fill material.

1.2.2 Unsatisfactory Materials

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 stones larger than 100 millimeters in any dimension.~~ Stones larger than 100 millimeters in any dimension shall not be used as embankment fill and select fill. The Contracting Officer shall be notified of any contaminated materials.

1.2.3 Backfill

Backfill as used in this section is defined as that fill material which cannot be placed around or adjacent to a structure until the structure is completed or until a specified time interval has elapsed after completion.

1.2.4 Excavation

Excavation shall consist of removal of material to the lines and grades shown on the drawings, or as otherwise directed or approved by the Contracting Officer and as described in paragraph EXCAVATION in PART 3 EXECUTION of this section.

1.2.5 Classification of Soils

Materials used to construct the embankments and for backfills shall be classified in accordance with ASTM D 2487 (Unified Soil Classification System).

1.2.5.1 Cohesionless and Cohesive Materials

Cohesionless materials shall 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.

1.3 GENERAL CONDITIONS

1.3.1 Lines and Grades

The embankment and backfill shall be constructed to the lines, grades, and cross sections indicated on the drawings, unless otherwise directed by the Contracting Officer. The Government reserves the right to increase or decrease the foundation widths and embankment slopes or to make such other changes in the embankment or backfill sections as may be deemed necessary to produce a safe structure. Changes in quantities resulting from such revisions will not constitute justification for change in contract unit prices, except as provided for in the Variations in Estimated Quantities Clause. Increases in height of section, made to compensate for settlement or consolidation of the embankment material subsequent to the completion of the embankment, will not exceed 5 percent of the height above the foundation at the levee centerline indicated. The end slopes and side slopes of partial fill sections shall not be steeper than one vertical on three horizontal, unless otherwise shown on the drawings.

1.3.2 Conduct of the Work

The Contractor shall maintain and protect the embankment and backfill in a satisfactory condition at all times until final completion and acceptance of all work under the Contract. If, in the opinion of the Contracting Officer, the hauling equipment causes horizontal shear planes or slicken sides, rutting, quaking, heaving, cracking, or excessive deformation of the embankment or backfill, the Contractor shall limit the type, load, or travel speed of the hauling equipment on the embankment or backfill. The Contractor may be required to remove, at the Contractor's expense, any embankment material placed outside of prescribed slope lines. Any approved embankment or backfill material which is lost in transit or rendered unsuitable after being placed in the embankment or backfill and before final acceptance of the work shall be replaced by the Contractor in a satisfactory manner and no additional payment will be made therefor. The Contractor shall excavate and remove from the embankment or backfill any

material which is unsatisfactory and shall also dispose of such material and refill the excavated area as directed, all at no cost to the Government.

1.3.3 Materials

Materials for the construction of those features requiring "Embankment Fill" and/or "Channel Fill" may be obtained from the provided borrow source, the required excavations and/or a commercial source selected by the Contractor and approved by the Contracting Officer. All roots, limbs, and wood fragments shall be removed from embankment materials. Materials containing sod, other organic or perishable material, trash and debris shall not be used in the embankment. The Contractor shall submit to the Contracting Officer the source or sources from which the Contractor intends to obtain the "Select Fill" required for this contract. If a source is selected other than a commercial quarry or other commercial entity from which earth or rock material will be directly purchased and where the Contractor or the Contractor's subcontractor will perform the borrow excavation, a written statement will be provided to the Contracting Officer indicating permission to utilize the area. It shall be the responsibility of the Contractor to obtain the necessary permits which may be required for excavation and reclamation of the borrow area.

1.3.4 Haul Roads

Haul roads shall be located and constructed as approved by the Contracting Officer. Prior to the commencement of construction the contractor shall submit for approval a site plan detailing the location of all haul roads within the project limits. The limits of the borrow haul road shall be clearly marked in the field using construction fencing or similar methods approved by the Contracting Officer. Areas on each side of the borrow haul road corridor shall not be disturbed. Haul roads shall be constructed to maintain the intended traffic, be free draining, and be maintained in good condition throughout the contract period. Any haul road which crosses any creek or drainage channel shall be constructed, and maintained by the Contractor so as to not flood either upstream areas by restricting stream flows or flood downstream areas by the release of any stored water in the event that the crossing fails for any cause. All haul roads within the right-of-way that will remain as public thoroughfares after construction shall be cleaned daily and maintained in the preconstruction condition. All costs associated with these haul roads shall be considered as a subsidiary obligation of the Contractor.

1.3.5 Road Ramps and Boat Ramp Access

Road ramps and boat ramp access shall be constructed as shown on the contract drawings by placement of a select fill as specified in paragraph 3.14: PLACEMENT AND SPREADING.

1.3.6 Slides and Foundation Failures

When sliding occurs in any part of the embankment and backfills prescribed in this section after they have been placed, but prior to final acceptance of all work under the contract, the Contractor shall repair the slide as directed by the Contracting Officer. When the slide is caused through the fault of the Contractor, the repair shall be made at no cost to the Government. When the slide is not the fault of the Contractor, an equitable adjustment in the contract price shall be made pursuant to the Section 00700 Contract Clause CHANGES to cover the cost of the repairs.

1.3.7 Protection of Existing Man-Made Facilities and Natural Features

Embankment construction shall be conducted in such a manner as to avoid damage to trees left standing and trees outside the embankment areas, existing buildings, man-made facilities and natural features, with due regard to the safety of employees and others, and in compliance with EM 385-1-1.

1.3.8 Drainage

The Contractor shall not block or restrict the flow in a natural drain, existing culvert, ditch or channel at any time without obtaining prior written approval from the Contracting Officer. This approval shall not relieve the Contractor from responsibility for any damage caused by the Contractor's work. The Contractor shall monitor the river flow and provide sufficient free discharge areas so that conditions are not worsened upstream or downstream by possible floods during construction. Surface water shall be directed away from excavations and construction sites so as to prevent erosion and undermining of foundations. Diversion ditches, dikes, and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site and the area immediately surrounding the site and affecting operations at the site shall be continually and effectively drained.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals having an "FIO" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Surveys; G|ED.

Surveys and payment cross-sections shall be submitted for progress payments. Cross sections shall be displayed at a 5 to 1 vertical exaggeration and submitted no later than 3 calendar days after completion of the survey.

SD-08 Statements

Excavation and Dewatering; G|ED.

Submit a written excavation plan 60 days prior to the beginning of any excavation. Approval of the detailed plan shall be obtained from the Contracting Officer prior to starting the work. If necessary, the plan shall be modified as required to meet field conditions, and the modifications shall be approved prior to use. As a minimum, the plan shall contain, the following:

- a. Proposed methods for preventing interference with, or damage to, existing underground or overhead utility lines, trees designated to remain and other man-made facilities or natural features designated to remain within or adjacent to the construction rights-of-way.
- b. Provision for coordinating the work with other Contractors working

in the construction rights-of-way or on facilities crossing or adjacent to this work.

c. The proposed methods for controlling surface and ground water in the borrow areas and required excavations. The Contractor shall submit a dewatering plan for the construction of Culvert No. 1, Culvert No. 2, the Downstream Pilot Channel river plug and the East Levee from Station 19+25 to Station 20+10 and Station 25+80 to Station 32+01 along the East Levee alignment.

d. Stockpiling plan for embankment material before it is transported to the project site showing locations, stockpile heights, slopes, limits, and drainage around the stockpile areas.

e. A complete listing of the equipment to be used for excavation and to transport the excavated material.

f. The Contractor's proposals for conserving arable land and for making optimum use of available borrow, including the Contractor's proposed methods for grading the bottom of the borrow areas after completing use of the borrow areas.

g. The Contractor's proposed road pattern, and plan for implementing dust control measures.

Borrow Areas; G|RE.

Submit a written statement to the Government not later than 10 days after receipt of Notice to Proceed indicating the Contractor's intention to use the specified Government-furnished borrow area, commercial borrow area(s) or a combination of these borrow areas.

Plan of Operations; G|RE.

Thirty (30) days prior to commencement of haul road construction or placing embankment and backfill which ever is earlier, the contractor shall submit for approval a Plan of Operations for accomplishing all embankment and backfill construction and for the location and construction of haul roads. This plan shall include but not be limited to the Contractor's proposed sequence of construction for embankment and backfill items, and methods and types of equipment to be utilized for all embankment and backfill operations, including transporting, placing, and compaction. This plan shall also include the names and addresses of the commercial testing labs or engineering firms which will perform the soil testing and inspection and describe how all required soils testing will be performed.

SD-18 Records

Contractor-Furnished Rights-of-way for Drainage; G|RE.

If private property is to be used for drainage, submit written evidence that the right has been obtained from the property owner for drainage on the owner's property. Written evidence shall consist of an authenticated copy of the easement under which the Contractor acquired the property rights and access thereto, prepared and executed in accordance with applicable Commonwealth and local requirements.

1.5 REGULATORY REQUIREMENTS

The regulatory requirements listed below form a part of this specification to the extent referenced.

1.6 PERMITS

In accordance with Contract Clause PERMITS AND RESPONSIBILITIES, the Contractor shall obtain all necessary permits required for disposal, borrow area excavation, stockpiling, hauling and erosion control, and pay all fees associated with permitting and compliance.

1.7 PROJECT SITE CONDITIONS

1.7.1 Protection of Cultural and Natural Resources

All work and Contractor operations shall comply with the requirements of Section 01410 ENVIRONMENT PROTECTION and with the requirements of this section.

1.7.2 Protection of Existing Man-Made Facilities and Natural Features

Trees within the clearing area shall be felled in such a manner as to avoid damage to trees left standing and trees outside the clearing area, existing buildings, man-made facilities and natural features, with due regard to the safety of employees and others, and in compliance with EM 385-1-1. Excavation shall be conducted in such a manner as to avoid damage to trees left standing and trees outside the clearing and excavation area, existing buildings, man-made facilities and natural features, with due regard to the safety of employees and others, and in compliance with EM 385-1-1. Existing utility lines that are shown on the drawings or the locations of which are made known to the Contractor prior to excavation and that are to be retained shall be protected from damage during excavation. When utility lines that are to be removed are encountered within the area of operations, the Contractor shall notify the applicable utility companies in sufficient time for measures to be taken to prevent interruption of the services.

1.7.3 Historical, Archeological, and Cultural Resources

Historical, archeological, and cultural resources within the Contractor's work limits may exist. If, during construction activities, the Contractor observes items that may have historical or archeological value, such observations shall be reported immediately to the Contracting Officer so that appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in the destruction of these resources and shall prevent his employees from trespassing on or otherwise damaging such resources.

1.7.4 Subsurface Data

Subsurface soil boring logs are included in these specifications. These data represent subsurface information at the boring locations; however, variations may exist in the subsurface between boring locations. Groundwater levels indicated on the soil boring logs were levels found at the time of exploration. The groundwater table can vary significantly depending on time of year, variation from normal precipitation, and river stage or tide level. The material recovered from the core borings is available for inspection by prospective bidders at the U.S. Army Corps of Engineers' Building, 400 Fernandez Juncos Avenue, Stop 7 1/2, San Juan, Puerto Rico, 00901-3299, during the entire bid period, and prospective

bidders are strongly urged to examine the material and assure themselves that they have made the best possible evaluation of the subsurface conditions. Bidders shall form their own conclusions from this examination prior to submission of their bids. Bidders shall record their core examination visit in a record book maintained at the inspection site.

PART 2 PRODUCTS

2.1 HAUL ROAD MATERIALS

Haul road materials shall be any satisfactory material as defined in the paragraph "DEFINITIONS" above.

2.2 TYPES OF FILL MATERIALS

2.2.1 Excavation Materials

2.2.1.1 Pilot Channel Excavation

Materials to be removed as a part of the required channel excavations are primarily clays classified by ASTM D 2487 as CH and CL. ~~Materials sampled within the limits of Borrow Area No. 1 were classified as ML, with varying amounts of sand and limestone fragments.~~

2.2.1.2 East Borrow Area

Materials sampled within the limits of the East Borrow Area were classified as medium to very hard Limestone. Ripping may be required for the most economical removal of this material. It should also be noted that processing will be required in order to meet the particle size limitations specified for embankment fill and select fill.

PART 3 EXECUTION

3.1 CLEARING

In addition to the embankment footprint area, clearing operations shall be performed within the limits of the existing channel that will be dewatered to receive fill material. For further information, see Section 02230.

Within the limits of the existing channel, grubbing operations will not be required. For further information, see Section 02230.

3.2 GRUBBING

Refer to Section 02230.

3.3 REMOVAL OR PLUGGING OF ABANDONED PIPE AND CONDUITS

Abandoned pipes and conduits shall be removed to the limits shown on the drawings.

3.4 SHORING, SHEETING, AND BRACING

Shoring, sheeting, and bracing shall be installed where required for the protection of existing natural features and man-made facilities, for the safety of workers and the public, in compliance with EM 385-1-1, and to insure the integrity of the embankment. Shoring, sheeting and bracing shall not be used in lieu of the required excavation slopes. Shoring,

sheeting, and bracing shall be adequately designed and properly installed to withstand anticipated loads. Shoring, sheeting and bracing shall be planned and designed by a registered professional engineer. All shoring, sheeting and bracing shall be removed as embankment and backfill operations progress.

3.5 DEWATERING AND DIVERSION

The following work shall be performed in the dry:

- a. The construction of Culvert No. 1.
- b. The construction of Culvert No. 2.
- c. The Downstream Pilot Channel river plug.
- d. The East Levee from Station 19+25 to Station 20+10 and from Station 25+80 to Station 32+01.
- e. The Channel Fill operation between East Levee Station 26+00 and Downstream Pilot Channel Station 0+00.

~~The Downstream Pilot Channel river plug and Culvert No. 1 shall also be constructed in the dry.~~ Surface and groundwater control shall be accomplished in coordination with the required excavation and/or embankment construction activities. Surface and/or groundwater control may necessitate the use of temporary diversion ditches, cofferdams and/or dewatering by the use of pumping. Methods for the care of surface water and for controlling the surface and groundwater levels shall be subject to approval of the Contracting Officer.

3.6 EXCAVATION

3.6.1 Flood Control Pilot Channels

Excavation consists of the removal, hauling, stockpiling, and disposal of all materials encountered within the limits of the required excavation for the flood control pilot channel. Transitions in bottom width shall be uniform and constructed to the dimensions shown on the drawings. The excavated slopes and the channel bottom shall be left as smooth as skillful use of excavating equipment will permit. No excavation shall be performed outside the indicated rights-of-way. All excavation shall be performed in a manner to provide proper drainage at all times and to permit recovery of the maximum amount of suitable material for use in levee fill. Unsuitable material and excess suitable material shall be placed in the disposal areas shown on the drawings. All disposed material shall be spread to a uniform thickness, shall be graded to drain, and shall have exterior slopes no steeper than 1 vertical on 3 horizontal. Material placed outside of the indicated limits disposal area for the operational convenience of the Contractor shall be removed and placed in the disposal areas prior to completion of this contract.

3.6.2 Over Excavation

3.6.2.1 Outside the Limits Indicated

Over excavation outside the limits of the foundations of levees or structures shall be backfilled to grade with similar over excavated material or satisfactory material and compacted to a density of at least that of the surrounding material.

3.6.2.2 Within the Limits Indicated

Over excavation within the limits of the foundations of levees or structures shall be backfilled to grade in accordance with paragraph PREPARATION OF FOUNDATION, PARTIAL FILL SURFACES AND ABUTMENTS in this Section, Part 3.

3.6.3 Structures

Excavations for structures shall conform to the dimensions and elevations indicated for each structure and the construction thereof shall be performed in a dewatered state. Over excavation below required invert elevations or as indicated in the contract documents shall be backfilled with select fill material at no additional cost to the Government. The water table shall be maintained a minimum of 0.3 meters below the required excavation bottom until any foundation preparation and initial lifts have been completed. As construction progresses, the water table shall be maintained a minimum of 0.3 meters below the backfill placement levels.

3.6.4 Ditches

Drainage ditches shall be excavated at the locations and to the lines and grades shown on the drawings and in accordance with paragraph TOLERANCES in this Section, Part 3.

3.6.5 Slopes and Surcharges

Temporary excavation slopes for any channel, structure excavation, or other required excavation shall not be steeper than the specified finished slope or the specified construction slope, as applicable, and subject to the approval of the Contracting Officer. This may be accomplished by benching the temporary slope so that the average slope is not steeper than the specified slope. In addition, no temporary, permanent, or construction slope shall be surcharged with excavated or stockpiled material or with heavy construction equipment which would have the same effect as the surcharge material. The toe of stockpiled material shall be maintained a minimum distance back from the top of the finished excavation equal to the depth of the excavation. The maximum height of such stockpile without causing instability of the excavation slope shall be determined by the Contractor. Any slide or other adverse conditions caused by failure of the Contractor to maintain these conditions shall be considered the responsibility of the Contractor and remedial measures shall be at the Contractor's expense.

3.6.6 FortunaEast Borrow Area

The borrow area shall be excavated to obtain satisfactory material within the lines and grades as shown on the drawings. The permissible depth(s) in the borrow area are indicated on the drawings. Any excavation below the depths and slopes specified herein or shown on the drawings shall be backfilled by the Contractor, at the Contractor's expense, to the specified permissible excavation line, with satisfactory material as specified by the Contracting Officer to a density of at least that of the surrounding material. Borrow area shall be drained and kept dry during excavation. Where possible, unsatisfactory materials in borrow area shall not be removed.

3.6.7 Riprap and Bedding

Excavations for riprap and bedding shall be performed at the locations and to the lines and grades shown.

3.6.8 Rock

Rock and other hard foundation materials shall be cleaned of loose debris prior to fill placement. Loose disintegrated rock and thin strata shall be removed. Rock excavation will not be measured for payment. Rock excavation will not be paid as a separate bid item.

3.7 TOLERANCES

A tolerance of 152 mm below and 0 mm above the prescribed grade will be allowed in the excavation for channels and ditches. A tolerance of 76 mm below the prescribed grade will be allowed in the excavation for gabion placement.

All embankments and backfills shall be constructed to the grades, lines, and cross-sections shown on the drawings. At all points a tolerance of 152 mm above and 0 mm below the prescribed grade will be permitted in the final dressing, provided that any excess material is so distributed that the crown of the levee drains and that there are no abrupt humps or depressions in any surfaces.

3.8 SLIDES

In case sliding occurs in any part of the excavations prescribed in this section after they have been excavated, but prior to final acceptance of all work under the contract, the Contractor shall repair the slide as directed by the Contracting Officer. In case the slide is caused through the fault of the Contractor, it shall be repaired at no cost to the Government. In case the slide is due to no fault of the Contractor, an equitable adjustment in the contract price will be made for the repairs in accordance with the Section 00700 Contract Clause CHANGES.

3.9 STOCKPILES

Provisions of paragraph EXCAVATION, subparagraph SLOPES AND SURCHARGES in this Section, Part 3, are applicable to all stockpiled materials. Upon completion of construction operations, all remaining stockpiled material shall be removed and disposed of by the disposal methods specified in paragraph DISPOSITION OF EXCAVATED MATERIALS in this Section, Part 3.

3.10 SURFACE DRAINAGE OF COMPLETED AREAS

The areas shown on the drawings designated as "GRADE FOR SURFACE DRAINAGE", the borrow areas, and the finished embankment areas shall be graded to the lines and grades shown on the drawings. The surface shall be free from sharp ridges, gullies, potholes, sinkholes, and any other surface irregularities. A tolerance of 152 mm above and 0 mm below the prescribed grade will be allowed provided that the surface drains in the direction as indicated on the drawings.

3.11 MAINTENANCE OF WORK

3.11.1 Debris Removal

The Contractor shall maintain all ditch and channel excavations free from leaves, brush, sticks, trash, and other debris until final acceptance of all work under the contract at no additional cost to the Government.

3.12 DISPOSITION OF EXCAVATED MATERIALS

3.12.1 Satisfactory Materials

Satisfactory excavated material shall be incorporated in the appropriate zones of the embankment. Satisfactory material shall consist of material as defined in paragraph DEFINITIONS, subparagraph SATISFACTORY MATERIALS in this Section, Part 1. When direct placement is not practicable, satisfactory material from the excavation may be stockpiled for subsequent use in parts of the work for which it is specified herein and/or as indicated on the drawings. Satisfactory materials in excess of the quantity necessary to construct backfills and embankments shall be disposed of as specified for unsatisfactory materials.

3.12.2 Unsatisfactory Materials

Unsatisfactory materials shall be as defined in paragraph DEFINITIONS, subparagraph UNSATISFACTORY MATERIALS in this Section, Part 1. Unsatisfactory materials from the excavations prescribed in this section shall be permanently disposed of by placing in the disposal areas shown on the drawings. The material shall be shaped so that its surface is free from abrupt changes in grade and shall be sloped to drain.

3.13 PREPARATION OF FOUNDATION, PARTIAL FILL SURFACES AND ABUTMENTS

3.13.1 Earth

After all clearing has been completed and prior to the placement of any fill material, the sides of stump holes, and other similar cavities or depressions shall be broken down so as to flatten out the slopes, and the sides of the cut or hole shall be scarified to provide bond between the foundation material and the fill. Unless otherwise directed, each depression shall be filled with the same material type that is to be placed immediately above the foundation. The fill shall be placed in layers, moistened, and compacted in accordance with the applicable provisions of paragraphs PLACEMENT AND SPREADING, MOISTURE CONTROL, and COMPACTION, in this Section, Part 3, for the specific material type. Materials which cannot be compacted by roller equipment because of inadequate clearances shall be compacted with power tampers in accordance with the paragraph COMPACTION in this Section, Part 3, for the specific material type. After filling of depressions and immediately prior to placement of fill material for any section of the embankment, the foundation of such section shall be loosened thoroughly by scarifying, plowing, discing or harrowing to a minimum depth of 152 mm. Scarifying, plowing, discing or harrowing will not be required in inundated areas. No separate payment will be made for loosening and rolling the foundation area, the abutment area, or the surfaces of partial fill sections, but the entire cost thereof shall be included in the applicable contract price for fill.

3.13.2 Benching

Fill material placed against any non-horizontal slope shall be benched into the existing slope to ensure that the placement and compaction of the fill material is accomplished in horizontal layers. The vertical face cut into the existing embankment or slope resulting from the benching operation shall be a minimum of 610 mm in height but shall not exceed 915 mm in height.

3.14 PLACEMENT AND SPREADING

3.14.1 General

Prior to the placement of fill material on the prepared foundation surface, the Contractor shall notify the Government that the foundation is ready to receive fill. No fill shall be placed on any part of the embankment foundation until such areas have been inspected and given final approval by the Contracting Officer.

3.14.1.1 Gradation and Distribution

The gradation and distribution of materials throughout each placement lift of the levee shall be such that the embankment will be free from lenses, pockets, streaks, and layers of material differing substantially in texture or gradation from surrounding material of the same class. If lenses, pockets, or layers of materials differing substantially in texture or gradation from surrounding material occur in the spread material, the layer shall be mixed by harrowing or any other approved method to blend the materials. During the placing and spreading process, the Contractor shall maintain at all times a force of workers adequate to remove all roots, debris, and oversize stone from all embankment materials. ~~All stones and rock fragments larger than 75 mm in any dimension shall be removed from the fill.~~

3.14.1.2 Foundations and Partial Embankment Fills

The foundations and all partial embankments receiving fills shall be kept thoroughly drained. Placing operations will be such as to avoid mixing of materials from adjacent sections as much as practicable.

3.14.1.3 Equipment Traffic

Equipment traffic on any embankment zone shall be routed to distribute the compactive effort as much as practicable. Ruts formed in the surface of any layer of spread material will be filled before that material is compacted. If, in the opinion of the Contracting officer, the compacted surface of any layer of material is too smooth to bond properly with the succeeding layer, the surface shall be loosened by scarifying or other approved methods before material from the succeeding layer is placed.

3.14.2 Placement of Embankment and Backfill Against Rock

All rock surfaces upon which or against which embankment materials are to be placed shall be cleaned in accordance with paragraph EXCAVATION, subparagraph ROCK. In restricted areas where material can not be placed in large lifts with normal spreading and compaction equipment material shall be spread in lifts not exceeding 100 mm and compacted with mechanical hand tampers, vibrating plates, or other approved methods and equipment.

3.14.3 Placement of Embankment and Backfill Against Structures

No embankment or backfill shall be placed on or against concrete less than 7 days after placement or 70 percent of the design strength, without prior approval of the Contracting Officer. Crawler-type tractors, vibratory equipment and other similar compaction equipment shall not be used within 1.2 meter of any completed or partially completed structure. Compaction within 1.2 meter of completed or partially completed structures shall be accomplished by the use of mechanical hand tampers, vibrating plates, or other approved methods and equipment. The Contractor shall ensure that

compaction operations do not damage any existing utilities. Any damage caused by the Contractor's operation shall be repaired at the Contractor's expense.

3.14.4 Select Fill

Select fill material shall be placed and spread in layers not more than 250 mm in uncompacted thickness, except that within 1.2 meter of structures, the uncompacted layer thickness shall be reduced to 150 mm. Layers should be started full out to the slope stakes and shall be carried substantially horizontal and parallel to the levee centerline with sufficient crown or slope to provide satisfactory drainage during construction.

3.14.5 Embankment Fill

Embankment fill material shall be placed and spread in layers not more than 200 mm in uncompacted thickness, except that within 1.2 meter of structures, the uncompacted layer thickness shall be reduced to 100 mm. Layers should be started full out to the slope stakes and shall be carried substantially horizontal and parallel to the levee centerline with sufficient crown or slope to provide satisfactory drainage during construction.

3.14.6 Channel Fill

In inundated areas, layer thickness control and compaction shall begin as soon as sufficient material has been placed above the water surface to safely support tracked equipment. At this point, channel fill material shall be placed and spread in layers not more than 300 mm in uncompacted thickness, except that within 1.2 meters of structures, the uncompacted layer thickness shall be reduced to 200 mm. In non-inundated areas, channel fill material shall be placed and spread in layers not more than 300 mm in uncompacted thickness, except that within 1.2 meters of structures, the uncompacted layer thickness shall be reduced to 200 mm.

3.15 MOISTURE CONTROL

3.15.1 General

The materials in each layer of the fill shall contain the amount of moisture, within the limits specified below or as directed by the Contracting Officer, necessary to obtain the required compaction. Material that is not within the specified moisture content limits after compaction shall be reworked to obtain the specified moisture content, regardless of density. It should be noted that much of the material to be removed as a part of the ~~required~~ Pilot Channel excavations contain natural moisture contents in excess of the optimum moisture contents indicated in these specifications. As a result, the Contractor should expect that extra time and effort will be required (discing, harrowing, etc.) in lowering the moisture content of the excavated suitable material prior to compaction.

3.15.1.1 Insufficient Moisture for Suitable Bond

If the top or contact surfaces of a partial fill section become too dry to permit suitable bond between these surfaces and the additional fill to be placed thereon, the Contractor shall loosen the dried materials by scarifying or discing to such depths as may be directed by the Contracting Officer, shall dampen the loosened material to an acceptable moisture content, and shall compact this layer in accordance with the applicable

requirements of the paragraph COMPACTION in this Section, Part 3.

3.15.1.2 Excessive Moisture for Suitable Bond

If the top or contact surfaces of a partial fill section become too wet to permit suitable bond between these surfaces and the additional fill to be placed thereon, the wet material shall be scarified and permitted to dry, assisted by discing or harrowing, if necessary, to such depths as may be directed by the contracting officer. The material shall be dried to an acceptable moisture content, and shall be compacted in accordance with the applicable requirements of the paragraph COMPACTION in this Section, Part 3.

3.15.1.3 Drying Wet Material

Material that is too wet shall be spread on the embankment and permitted to dry by discing or harrowing, if necessary, until the moisture content is reduced to an amount within the specified limits.

3.15.1.4 Increasing Moisture in Dry Material

The moisture content of material that is too dry, will be adjusted on the levee embankment. The Contractor will add water to the fill material and by harrowing, or other approved methods, work the moisture into the material until a uniform distribution of moisture within the specified limits is obtained. Water applied on a layer of fill on the levee embankment shall be accurately controlled in amount so that free water will not appear on the surface during or subsequent to rolling. Should too much water be added to any part of the embankment, the rolling on that section of the embankment shall be delayed until the moisture content of the materials is reduced to an amount within the specified limits. If it is impracticable to obtain the specified moisture content by wetting or drying the material on the fill, the Contractor may be required to pre-wet or dry back the material at the source of excavation or in the borrow area.

3.15.2 Select Fill

The moisture content after compaction shall be within the limits of 3 percentage points above optimum to 3 percentage points below optimum moisture content as determined by ASTM D 1557.

3.15.3 Embankment Fill and Channel Fill

The moisture content after compaction shall be within the limits of 7 percentage points above optimum to 6 percentage points below optimum moisture content as determined by ASTM D 698.

3.16 COMPACTION

3.16.1 Compaction Equipment

Compaction equipment shall conform to the following requirements and shall be used as prescribed in subsequent paragraphs.

3.16.1.1 Tamping Rollers

Tamping rollers shall be as follows:

- a. Towed-Tamping rollers shall consist of a heavy duty double drum unit, with a drum diameter not less than 1.5 m, and an individual drum

length of not less than 1.5 m. The drums shall be capable of being ballasted with water or a combination of sand and water. Each drum shall have staggered feet uniformly spaced over the cylindrical surface such as to provide approximately three tamping feet for each 0.19 square meter of drum surface. The tamping feet shall be 175 to 225 mm in clear projection from the cylindrical surface of the roller and shall have a face area of not less than 3226 square mm nor more than 4516 square mm. The roller shall be equipped with cleaning fingers, so designed and attached as to prevent the accumulation of material between the tamping feet, and these cleaning fingers shall be maintained at their full length throughout the periods of use of the roller. The weight of the roller shall not be less than 5200 kg per meter of linear drum length weighted, and shall not be more than 2975 kg per meter of drum length empty. The two drums comprising one roller unit shall be yoked such that they will oscillate when traversing uneven surfaces. The design and operation of the tamping roller shall be subject to the approval of the Contracting Officer who shall have the right at any time during the prosecution of the work to direct such repairs to the tamping feet, minor alterations in the roller and variations in the weight as may be found necessary to secure optimum compaction of the earth fill materials. The Contractor may be required to add ballast to the roller to the maximum capacity specified by the manufacturer of the roller. The roller shall be drawn by a crawler-type or a rubber-tired tractor at a speed not to exceed 5.6 kilometers per hour. The use of the rubber-tired tractor shall be discontinued if the tires leave ruts that prevent uniform compaction by the tamping roller. If tamping rollers are used in tandem, not more than two rollers in tandem will be permitted and in such case, one trip of the tandem rollers over any surface will be considered as two passes. When tamping rollers are used in tandem, the tamping foot spacing shall be offset so that the circumferential rows on the rear drums are in line with the mid-point of the circumferential rows on the forward drums.

b. Self-propelled - Self-propelled tamping rollers may be used in lieu of tractor drawn tamping rollers provided the foot pressure on the tamping feet of the self-propelled roller are approximately the same as the foot pressure on the towed roller. For self-propelled rollers steered with rubber-tired wheels, the tire pressure shall not exceed 2.8 kg per square cm. Self-propelled rollers shall be operated at speeds not exceeding 5.6 kilometers per hour. The Contracting Officer has the authority to limit or eliminate the use of self-propelled rollers if they are found to cause shearing or laminations of the compacted fill.

3.16.1.2 Rubber-tired Rollers

Rubber-tired rollers shall have a minimum of four wheels equipped with pneumatic tires. The tires shall be of such size and ply as to be capable of being operated at tire pressures between 550 and 690 kPa at an 11,340 kg wheel load. The roller wheels shall be located abreast and so designed that each wheel will carry approximately equal load in traversing uneven ground. The spacing of the wheels shall be such that the distance between the nearest edges of adjacent tires will not be greater than 50 percent of the rated tire width of a single tire at the operating pressure for an 11,340 kg wheel load. The roller shall be provided with a body suitable for ballast loading such that the load per wheel may be varied, as directed by the Contracting Officer, from 8,165 to 11,340 kilograms. The roller shall be towed at a speed not to exceed 8 kilometers per hour. The

character and efficiency of this equipment shall be subject to the approval of the Contracting Officer.

3.16.1.3 Hand Operated Compactors

Compaction of material, in areas where it is impracticable to use a roller or tractor compaction shall be performed by the use of approved hand operated power compactors.

a. Power Tampers: Power tampers shall be hand operated equipment capable of compacting material in confined areas. The compactors shall be either an internal combustion or pneumatic activated tamper. Tampers shall have sufficient weight and striking power to produce the specified compaction. The character and efficiency of this equipment shall be subject to the approval of the Contracting Officer.

b. Vibratory Plate Compactor: Vibratory compactors operated by hand in confined areas shall utilize the oscillating cam principal and shall deliver an impact of not less than 9,000 Newtons at a rate of approximately 2000 impulses per minute. The character and efficiency of this equipment shall be subject to the approval of the Contracting Officer.

3.16.1.4 Sprinkling Equipment

Sprinkling equipment shall consist of tank trucks, pressure distributors or other equipment designed to apply water uniformly and in controlled quantities to variable width of surface.

3.16.1.5 Miscellaneous Equipment

Scarifiers, disks, spring-tooth or spike-tooth harrows, spreaders, and other equipment shall be suitable for use in embankment construction and approved by the Contracting Officer. Equipment used for blending fill material shall be capable of penetrating the full loose lift thickness of the specific material type.

3.16.2 Compaction of Channel Fill

After a layer of material has been dumped and spread, it shall be harrowed to break up and blend the fill materials and to obtain uniform moisture distribution. Harrowing shall be performed with a heavy disk plow or other approved harrow. When the moisture content and the condition of the layer are satisfactory, the lift shall be compacted to a minimum of 90 percent of the maximum dry density as determined by the Contractor in accordance with ASTM D 698. In areas which are not accessible by roller, the fill shall be placed in layers not more than 200 mm in uncompacted depth and compacted with an approved hand operated compactor to a density equal to that obtained in other areas which are accessible to rollers. Dumping, spreading, sprinkling, and compacting may be performed at the same time at different points along a section when there is sufficient area to permit these operations to proceed simultaneously. Compaction equipment shall be operated such that the strip being traversed by the roller shall overlap the rolled adjacent strip by not less than 1 meter.

3.16.3 Compaction of Embankment Fill

After a layer of material has been dumped and spread, it shall be harrowed to break up and blend the fill materials and to obtain uniform moisture

distribution. Harrowing shall be performed with a heavy disk plow, or other approved harrow, to the full depth of the layer. When the moisture content and the condition of the layer are satisfactory, the lift shall be compacted to a minimum of 95 percent of the maximum dry density as determined by the Contractor in accordance with ASTM D 698. In areas which are not accessible by roller, the fill shall be placed in layers not more than 100 mm in uncompacted depth and compacted with an approved hand operated compactor to a density equal to that obtained in other areas which are accessible to rollers. Dumping, spreading, sprinkling, and compacting may be performed at the same time at different points along a section when there is sufficient area to permit these operations to proceed simultaneously. Compaction equipment shall be operated such that the strip being traversed by the roller shall overlap the rolled adjacent strip by not less than 1 meter.

3.16.4 Compaction of Select Fill

After a layer of material has been dumped and spread, it shall be harrowed to break up and blend the fill materials and to obtain uniform moisture distribution. Harrowing shall be performed with a heavy disk plow, or other approved harrow, to the full depth of the layer. When the moisture content and the condition of the layer are satisfactory, the lift shall be compacted to a minimum of 95 percent of the maximum dry density as determined by the Contractor in accordance with ASTM D 1557. In areas which are not accessible by roller, the fill shall be placed in layers not more than 100 mm in uncompacted depth and compacted with an approved hand operated compactor to a density equal to that obtained in other areas which are accessible to rollers. Dumping, spreading, sprinkling, and compacting may be performed at the same time at different points along a section when there is sufficient area to permit these operations to proceed simultaneously. Compaction equipment shall be operated such that the strip being traversed by the roller shall overlap the rolled adjacent strip by not less than 1 meter.

3.16.5 Compaction Adjacent to Structures and Utilities

Heavy equipment for spreading and compacting fill shall not be operated within 1 meter of structures or utilities, except as otherwise specified herein. Material within 1 meter shall be compacted using appropriate hand operated compactors specified herein.

3.17 FIELD QUALITY CONTROL

3.17.1 Clearing and Grubbing

The Contractor shall establish and maintain quality control for clearing and grubbing operations to assure compliance with contract requirements, and maintain records of the quality control for all construction operations including but not limited to the items indicated below. These records, as well as the records of corrective actions taken, shall be furnished to the Government in accordance with Section 01451 CONTRACTOR QUALITY CONTROL.

3.17.1.1 Clearing

Station to station limits, transverse clearing limits from applicable centerline; percentage of area complete; types of materials cleared.

3.17.1.2 Grubbing

Station to station limits, transverse grubbing limits from applicable centerline; percentage of area complete; type of material; filling of grubbed holes.

3.17.2 Excavation

The Contractor shall establish and maintain quality control for excavation operations to assure compliance with contract requirements, and maintain records of the Contractor's quality control for all construction operations including but not limited to the following:

- a. Lines, grades and tolerances,
- b. Segregation of materials,
- c. Disposal and/or stockpiling of materials,
- d. Unsatisfactory materials,
- e. Conditions that may induce seepage or weaken the foundation or embankment,
- f. Stability of excavations.

Records of inspections and tests, as well as the records of corrective actions taken, shall be furnished to the Government in accordance with Section 01451 CONTRACTOR QUALITY CONTROL.

3.17.3 Embankment

3.17.3.1 General

The Contractor shall establish and maintain field quality control for foundation preparation, embankment and backfill operations to assure compliance with contract requirements and maintain detailed records of field quality control for all operations including but not limited to the following:

- a. Earthwork Equipment
Type, size, number of units and suitability for construction of the prescribed work.
- b. Foundation Preparation
Methods of preparing the in-situ soils in advance of embankment and backfill construction and methods for providing drainage of the foundation and partially completed fills.

3.17.3.2 Materials Testing

The contractor shall perform sufficient testing to insure that the fill is being constructed as specified. The testing program specified below shall be considered the minimum acceptable frequency of testing. This does not relieve the Contractor from the responsibility of performing additional testing, if required to ensure compliance with these specifications.

- a. Soil Classification Tests

Soil classification tests shall be performed in accordance with ASTM D 2487. One initial classification test shall be required for each different classification of material to be utilized as fill or backfill. As prescribed in ASTM D 2487, grain size analyses in accordance with ASTM D 422 and Atterberg limits (if necessary, depending on the cohesive nature of the soil) in accordance with ASTM D 4318 shall be performed on each different classification. The Contractor shall submit additional tests for every 15,300 cubic meters of select, embankment or backfill material. Soil classification tests shall be performed on the in-situ foundation material as required to determine the acceptability of the in-situ soils. Additional tests will be required if noticeable changes in the material occur.

b. Cohesive Material Testing

(1) Moisture Density Relationships. The moisture-density relations for each different classification of cohesive material utilized shall be determined in accordance with ASTM D 698. Prior to placing any fill material containing cohesive material, a minimum of (5) five-point standard compaction tests shall be performed on representative samples of the material to be used as fill. During fill placement a minimum of one additional moisture-density test shall be performed for every 11,500 cubic meters placed. Additional tests will be required each time a new material is encountered. The moisture-density curves will be compiled to form a family of curves which will be utilized to estimate optimum properties (maximum dry density and optimum moisture content) to be used with field density test.

(2) Water (Moisture) Content Tests. Determination of water content shall be performed in accordance with ASTM D 2216. ASTM D 4643 may be used when rapid moisture content results are needed. All rapid results obtained by ASTM D 4643 shall be confirmed by a test on a duplicate sample performed in accordance with ASTM D 2216. In the event of disagreement between the results, ASTM D 2216 shall govern. One water content test will be performed for each 11,500 cubic meters of material placed or each lift of material whichever is less. These test will be in addition to the water content tests performed in conjunction with in-place density tests. Backfill and fill not meeting the required specifications for water content shall be retested after corrective measures have been applied.

(3) In-place Density Testing for Cohesive Materials. The in-place density of the cohesive materials shall be determined in accordance with ASTM D 1556 or ASTM D 2167. At least one (1) in-place density test shall be performed on each lift of material or every 7.500 cubic meters of completed fill whichever is more frequent with the horizontal locations randomly staggered in the fill. For use with the family of curves to determine the optimum properties of the material a two-point compaction test shall be performed in conjunction with each in-place density. A portion of the soil from the in-place field density test and soil obtained immediately adjacent to the field density test location shall be used for a two-point compaction test. The minus 19 mm portion of the soil shall be subjected to compactive effort using a 152 mm compaction mold in accordance with the procedures presented in ASTM D 698. Fill not meeting the required specifications for

in-place density shall be retested after additional compaction has been completed.

c. Cohesionless Material Testing

(1) Compaction Tests. The Contractor shall run not less than one (1) relative density test for every 3,000 cubic meters of cohesionless fill in accordance with ASTM D 4253 and ASTM D 4254.

(2) In-Place Density Tests. The in-place density of the cohesionless materials shall be determined in accordance with ASTM D 1556. The Contractor shall not run less than one (1) field in-place density test on every other lift of material placed. Horizontal locations shall be randomly staggered in the fill.

(3) Water (Moisture) Content Test. Determination of water content shall be performed in accordance with ASTM D 2216. ASTM D 4643 may be used when rapid moisture content results are needed. All rapid results obtained by ASTM D 4643 shall be confirmed by a test on a duplicate sample performed in accordance with ASTM D 2216. In the event of disagreement between the results, ASTM D 2216 shall govern. One water content test will be performed for each 10,000 cubic meters of material placed, or each lift of material, whichever is less. These tests will be in addition to the water content tests performed in conjunction with in-place density tests. Backfill and fill not meeting the required specifications for water content shall be retested after corrective measures have been applied.

d. Additional Testing

The Contracting Officer may request additional tests if there is reason to doubt the adequacy of the compaction, or special compaction procedures are being used, or materials change or if the Contracting Officer determines that the Contractor's testing is inadequate or the Contractor is concentrating backfill and fill operations in a relatively small area.

3.17.3.3 Testing by the Government

During the life of this contract, the Government or its contractors will perform quality assurance tests.

3.17.3.4 Reporting

On a daily basis, the Contractor shall furnish the inspection records and all material testing results, the quantity of fill placed, as well as the records of corrective action taken, in accordance with Section 01451 CONTRACTOR QUALITY CONTROL.

3.18 PUERTO RICO HIGHWAY 681 GEOMETRY

See APPENDIX 02331-A at the end of this Section (4 pages).

3.19 PUERTO RICO HIGHWAY 681 DETOUR GEOMETRY

See APPENDIX 02331-B at the end of this Section (7 pages).

3.20 PUERTO RICO HIGHWAY 682 GEOMETRY

See APPENDIX 02331-C at the end of this Section (5 pages).

3.21 PUERTO RICO HIGHWAY 684 GEOMETRY

See APPENDIX 02331-D at the end of this Section (4 pages).

3.22 PUERTO RICO HIGHWAY 684 DETOUR GEOMETRY

See APPENDIX 02331-E at the end of this Section (3 pages).

3.23 BOAT RAMP ACCESS GEOMETRY

See APPENDIX 02331-F at the end of this Section (2 pages).

3.24 FARM ROAD CROSSOVER GEOMETRY

See APPENDIX 02331-G at the end of this Section (3 pages).

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02371

WIRE MESH GABIONS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 GENERAL REQUIREMENTS
- 1.3 SUBMITTALS
- 1.4 DESCRIPTION

PART 2 PRODUCTS

- 2.1 MATERIALS
 - 2.1.1 PVC COATED GALVANIZED STEEL WIRE MESH GABIONS
 - 2.1.1.1 PVC-Coated Galvanized Steel Twisted Wire Mesh Gabions
 - 2.1.1.2 PVC-Coated Galvanized Steel Welded Wire Mesh Gabions
 - 2.1.2 Alternative Wire Fasteners for Gabions
 - 2.1.2.1 General
 - 2.1.2.2 Wire Fasteners Materials
 - 2.1.2.3 Testings
 - 2.1.3 Stone Fill
 - 2.1.3.1 Quality
 - 2.1.3.2 Gradation

PART 3 EXECUTION

- 3.1 FOUNDATION PREPARATION
- 3.2 GEOTEXTILE PLACEMENT
- 3.3 FABRICATION
 - 3.3.1 PVC-Coated Galvanized Steel Wire Mesh Gabions
- 3.4 ASSEMBLY AND INSTALLATION
 - 3.4.1 Precaution for PVC-Coated Materials
 - 3.4.2 Gabion Units

-- End of Section Table of Contents --

SECTION 02371

WIRE MESH GABIONS

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 90/A 90M	(1995a) Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
ASTM A 185	(1990a) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 239	(1989) Locating the Thinnest Spot in a Zinc (Galvanized) Coating on Iron or Steel Articles by the Preece Test (Copper Sulfate Dip)
ASTM A 313/A 313M	(1995a) Stainless Steel Spring Wire
ASTM A 428/A 428M	(1995) Weight (Mass) of Coating on Aluminum-Coated Iron or Steel Articles
ASTM A 641/A 641M	(1997) Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A 764	(1990) Steel Wire, Carbon, Drawn Galvanized and Galvanized at Size for Mechanical Springs
ASTM A 809	(1995) Aluminum Coated (Aluminized) Carbon Steel Wire
ASTM A 818	(1991; R 1996) Coppered Carbon Steel Wire
ASTM A 853	(1993) Steel Wire, Carbon, for General Use
ASTM B 6	(1987) Zinc
ASTM B 117	(1990) Salt Spray (Fog) Testing
ASTM D 412	(1987) Rubber Properties in Tension
ASTM D 638	(1990) Test Method for Tensile Properties of Plastics
ASTM D 638M	(1997) Test Method for Tensile Properties

	of Plastics (Metric)
ASTM D 746	(1979; R 1987) Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D 792	(1986) Specific Gravity (Relative Density) and Density of Plastics by Displacement
ASTM D 1242	(1987) Resistance of Plastic Materials to Abrasion
ASTM D 1499	(1984; R 1990) Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Plastics
ASTM D 2240	(1986) Rubber Property - Durometer Hardness
ASTM D 2287	(1981; R 1988) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM G 23	(1990) Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials

1.2 GENERAL REQUIREMENTS

The work under this specification includes furnishing, assembling, filling, and tying open wire mesh rectangular compartmented gabions placed on a prepared surface of geotextile as specified herein, and in accordance with the lines, grades, and dimensions shown on the drawings or otherwise established in the field by the Contracting Officer.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals having an "FIO" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Stone Source Information; G|ED

The Contractor shall be responsible for all arrangements in obtaining the gabion stone specified in this contract. The Contractor shall submit within 10 days after the Notice to Proceed the name of the proposed source or sources the Contractor intends to use for this material. The submittal shall include a letter stating that the Contractor has verified that the source, or sources which the Contractor plans to use will be able to produce, either solely or collectively, the quantity and quality of stone specified in this contract. The letter must include a list of the source or sources from which the Contractor plans to obtain the stone. The Government reserves the right to revoke approval and reject any or all material furnished from any source at any time during the course of the contract if and when it is determined by the Contracting Officer that such material does not conform to the gradation or quality specified. For each

stone source used, the Contractor shall submit a "Stone Source Information" form containing the kind of information shown on the sample form appended near the end of Section 01000 GENERAL REQUIREMENTS.

SD-13 Certificates

Gabions; FIO|ED.

Alternative Wire Fasteners for Gabions; FIO|ED.

For each shipment of wire materials to the site, the Contractor shall furnish the Contracting Officer, in duplicate, a manufacturer's certificate or affidavit signed by a legally authorized official from the company manufacturing the gabion units and wire fasteners, that all material contained within that shipment meets the composition, physical, and manufacturing requirements stated in this specification.

SD-14 Samples

Stone Fill; G|RE.

Representative samples of all stone chosen for fill shall be submitted for approval prior to the delivery of any such material to the work site. All samples shall be obtained by the Contractor under the supervision of the Contracting Officer's Representative (COR). Cost of obtaining and delivering the samples shall be at the expense of the Contractor.

1.4 DESCRIPTION

Gabion units shall consist of compartmented rectangular basket containers filled with stone. Twisted or welded wire mesh shall be used. Baskets shall be fabricated from extruded or extruded and bonded polyvinyl chloride (PVC) galvanized steel wire formed into a nonraveling mesh.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 PVC COATED GALVANIZED STEEL WIRE MESH GABIONS

The Contractor has the option to install steel twisted wire mesh gabions (subparagraph "PVC-Coated Galvanized Steel Twisted Wire Mesh Gabions" below) or steel welded wire mesh gabions (subparagraph "PVC-Coated Galvanized Steel Welded Wire Mesh Gabions" below). Unless approved by the Contracting Officer, the option selected must be used exclusively on this contract.

2.1.1.1 PVC-Coated Galvanized Steel Twisted Wire Mesh Gabions

PVC-coated gabion basket units shall be of nonraveling construction, fabricated from a double-twisted hexagonal mesh of hot dipped galvanized steel wire coated with a nominal thickness of 0.5486 mm and a minimum thickness of 0.381 mm of extruded or extruded and bonded PVC. The steel core wire used shall be galvanized and PVC-coated prior to fabrication into mesh. Mesh openings shall be hexagonal in shape and uniform in size measuring approximately 64 by 83 mm. The gabion mesh wires shall be wrapped around the selvage wire no less than 1 1/2 times and shall interconnect with adjacent mesh wires. The core wire of all gabion diaphragm and frame components shall equal or exceed ASTM A 641/A 641M and ASTM A 853, and possess soft tensile strength of 415 MPa with a tolerance

of minus 14 MPa. The galvanized wire shall have a Finish 5 Class 3 zinc coating, indicated in ASTM A 641/A 641M. The weight of coating shall be determined by ASTM A 90/A 90M. The grade of zinc used for coating shall be High Grade or Special High Grade as prescribed in ASTM B 6, Table 1. ~~The uniformity of coating shall equal or exceed four 1 minute dips by Preece Test, as determined by ASTM A 239.~~ Coated wire used for lacing or as internal connecting wire within basket cells may be of soft tensile strength. As an alternative to lacing, wire fasteners may be used. All wire used shall meet the following nominal minimum requirements:

PVC-COATED GALVANIZED WIRE

TYPE OF WIRE	DIAMETER AFTER COATING (mm)	WITH PVC COATING (mm)	COATING WEIGHT (g/sq m)	TENSILE STRENGTH (MPa)
Mesh Wire	2.21	3.226	215	415
Selvage Wire	2.667	3.683	260	415
Lacing Wire or Internal Connecting Wire	2.21	3.226	215	415

Gabion mesh and connections require the following minimum strength:

STRENGTH	NEWTONS PER LINEAR METER
Wire mesh strength (pulled parallel to wire twists)	29,000 <u>33,600</u>
Wire mesh strength (pulled perpendicular to wire twists)	13,000 <u>13,100</u>
Connection of selvage wire to mesh	17,500 <u>10,200</u>
Connection of end panel to base	14,500
Connection of diaphragm	8,750

The initial properties of the PVC coating shall meet the following requirements:

Specific Gravity:	In the range of 1.30 to 1.34, ASTM D 2287 and ASTM D 792.
Tensile Strength:	Not less than 20.55 MPa, ASTM D 412
Modulus of Elasticity:	Not less than 18.62 MPa at 100 percent strain, ASTM D 412.
Brittleness Temperature:	Shall be at least 10 deg C below the minimum temperature at which the gabions will be handled or placed, but not higher than 10 deg C, ASTM D 746.
Resistance to Abrasion:	The percentage of the weight loss shall

be less than 12 percent, ASTM D 1242, Method B at 200 cycles, using CSI-A-Abrader with an abrasive tape, 80 grit.

Salt Spray Test: Period of test not less than 3,000 hours, ASTM B 117.

Exposure to Ultraviolet Light: Period of test not less than 3,000 hours, using apparatus type E and at 63 deg C, ASTM D 1499 and ASTM G 23

After the salt spray test and exposure to ultraviolet light as specified above, the PVC coating shall not show cracks, blister, split, nor noticeable change of color. In addition, the specific gravity, tensile strength, modulus of elasticity, and resistance to abrasion shall not change more than 6 percent, 25 percent, 25 percent, and 10 percent respectively from their initial values.

2.1.1.2 PVC-Coated Galvanized Steel Welded Wire Mesh Gabions

Fusion-bonded PVC-coated gabion basket units shall be of nonraveling construction and fabricated from a welded square wire mesh. The size of mesh openings shall be approximately 38 by 75 mm. All steel wire used shall be welded and fabricated into mesh prior to galvanization. The galvanized steel wire shall have a nominal thickness of 0.5486 mm and a minimum thickness of 0.381 mm of PVC coating. The welded joints of the wire mesh shall conform to ASTM A 185. The core wire of all gabion diaphragm and frame components shall equal or exceed ASTM A 641/A 641M and ASTM A 853, and possess soft tensile strength of 415 MPa with a tolerance of minus 14 MPa. The galvanized wire shall have a Finish 5, Class 3, zinc coating, indicated in ASTM A 641/A 641M. The weight of coating shall be determined by ASTM A 90/A 90M. The grade of zinc used for coating shall be High Grade or Special High Grade as prescribed in ASTM B 6, Table 1. The uniformity of coating shall equal or exceed four 1-minute dips by Preece Test, as determined by ASTM A 239. Coated wire used for lacing or as internal connecting wire within basket cells may be of soft tensile strength. As an alternative to lacing, wire fasteners may be used. All wire used shall meet the following nominal minimum requirements:

PVC-COATED GALVANIZED WIRE

TYPE OF WIRE	DIAMETER AFTER COATING (mm)	WITH PVC COATING (mm)	TENSILE STRENGTH MPa
Mesh Wire	2.21	3.226	415
Lacing Wire on Internal Connecting Wire	2.21	3.226	415

The properties of PVC coating shall meet the following requirements:

Specific Gravity: In the range of 1.25 to 1.30, ASTM D 792.

Tensile Strength: Not less than 15.69 MPa, ASTM D 638M.

Modulus of Elasticity: Not less than 8.79 MPa at 100 Strain,

ASTM D 638M.

Elongation at Break Point: 290 percent, ASTM D 638M.

Hardness: Shore "A" not less than 82, ASTM D 2240.

Brittleness Temperature: Shall be at least 10 deg C below the minimum temperature at which the gabions will be handled or placed, but not higher than 10 deg C, ASTM D 746.

Resistance to Abrasion: The percentage of the weight loss shall be less than 12 percent, ASTM D 1242, Method B at 200 cycles, CSI-A Abrader Tape, 80 Grit.

Salt Spray Test: Shall have no effect after 3,000 hours, ASTM B 117.

Exposure to Ultraviolet Light: Period of test not less than 3,000 hours, using apparatus Type E and at, 63 degrees C, ASTM D 1499 and ASTM G 23.

After the salt spray test and exposure to ultraviolet light as specified above, PVC coating shall not show cracks, blister, split, nor noticeable change of color. In addition, the specific gravity, tensile strength, and resistance to abrasion shall not change more than 6 percent, 25 percent, and 10 percent respectively from their initial values.

2.1.2 Alternative Wire Fasteners for Gabions

2.1.2.1 General

Subject to approval of the Contracting Officer, wire fasteners including interlocking fasteners, ring fasteners, twist ties, and spiral binders may be used in lieu of lacing wire. When seeking such approval, the Contractor shall demonstrate to the satisfaction of the Contracting Officer:

- a. That the proposed fastener system can consistently produce a joint with a strength of ~~21-000~~10,200 N/m when tested in accordance with subparagraph PULL-APART RESISTANCE TEST located in paragraph MATERIALS, subparagraph Alternative Wire Fasteners for Gabions, subsubparagraph Testings in this Section, Part 2;
- b. That the proposed fastener system does not cause damage to the protective coating on the wire;
- c. That the Contractor has the proper equipment and trained employees to correctly install the fasteners; and
- d. That proper installation can be readily verified by visual inspection.

The Contractor shall provide a complete description of the fastener system, including the number of fasteners required, the number and size of wires that fastener is capable of properly joining, and a description of a properly installed fastener, including drawings or photographs if necessary. A properly installed fastener shall meet the same requirements as that specified for the fasteners in the subparagraph SALT SPRAY TEST

located in paragraph MATERIALS, subparagraph Alternative Wire Fasteners for Gabions, subsubparagraph Testings in this Section, Part 2. If gages or other aids are needed to verify the proper installation of the fasteners, the Contractor shall furnish the Government such gages or aids, in such number as may reasonably be required, for the use of Government inspectors.

If more than one wire fastener is proposed (e.g. different gage or length of wire) for different joints, the fasteners shall be readily distinguishable. Alternate wire fasteners shall not be used to join more wires, or larger wires, than for which they were tested and approved. As a minimum, a fastener shall be installed at each mesh opening at the location where mesh wire meets selvage or edge wire. Alternate wire fasteners shall not be used to close basket lids unless specifically approved for that purpose. When seeking approval to use alternate wire fasteners to close basket lids, the Contractor shall demonstrate to the satisfaction of the Contracting Officer that the fasteners can be properly installed on a properly filled gabion without stretching the gabion to the point that the gabion, or the protective wire coating, is damaged.

2.1.2.2 Wire Fasteners Materials

Stainless steel fasteners shall be used with PVC-coated gabions. Stainless steel wire fasteners shall conform to ASTM A 313/A 313M (302 grade). Twist tie or spiral binder fasteners shall meet the requirements of lacing wires as specified in paragraph MATERIALS, subparagraphs PVC-COATED GALVANIZED STEEL TWISTED WIRE MESH GABIONS or PVC-COATED GALVANIZED STEEL WELDED WIRE MESH GABIONS in this Section, Part 2. Use of extruded or extruded and bonded PVC-coated twist tie fasteners shall be prohibited for gabions with PVC-coated wire.

2.1.2.3 Testings

Test records made within 5 years by certified laboratories and Government agencies will be used to determine the acceptability of wire fasteners. Samples of wire fasteners with their certified test records shall be submitted at least 60 days in advance to the Contracting Officer for approval. The Government reserves the right to test additional samples to verify the submitted test records at the Government's expense. When the first test results indicate that the fasteners do not meet the specified requirements, the additional test will be at the Contractor's expense. The fasteners will be rejected after two tests failing to meet the requirements. All types of fasteners including fasteners made of stainless steel shall be subject to the salt spray test and pull-apart resistance test.

a. Salt Spray Test - A set of two identical rectangular gabion panels, each with a width about 10-1/2 mesh openings along a selvage wire, shall be jointed by properly installed wire fasteners along the two selvage wires so that each fastener confines two selvage and two mesh wires. If the fasteners are also to be used to joint two individual empty gabion baskets, two additional selvage wires which are each mechanically wrapped with mesh wires shall be included so that each fastener confines four selvage and four mesh wires. The set of the jointed panels shall be subject to salt spray test, ASTM B 117, for a period of not less than 48 hours. At the end of the test, the fasteners, the selvage, or mesh wires confined by the fasteners shall show no rusty spots on any part of the surface excluding the cut ends. A properly installed fastener shall meet the following requirements:

- (1) Each interlocking fastener shall be in a locked and closed

position.

(2) Each ring fastener shall be closed, and the free ends of the fastener shall overlap a minimum of 25 mm.

(3) Each twist tie shall be closed and maintain a minimum of two full turns.

(4) The spiral binder shall be crimped at both ends.

b. Pull-Apart Resistance Test - A new set of the jointed panels, which are prepared by the same method as specified in the salt spray test but without being subject to the 48-hour salt spray test, shall be mounted on a loading machine with grips or clamps such that the panels are uniformly secured along the full width. The grips or clamps shall be designed to transmit only tension forces. The load will then be applied at a uniform rate of 220 N/s until failure occurs. The failure is defined as when the maximum load is reached and a drop of strength is observed with subsequent loading or the opening between any two closest selvage wires, applicable to a fastener confining either two or four selvage wires, becomes greater than 50 mm at any place along the panel width. The strength of the jointed panels at failure shall have a minimum of ~~20,500~~10,200 N/m.

2.1.3 Stone Fill

2.1.3.1 Quality

Stone shall be durable and of suitable quality to ensure permanence in the structure and shall weigh not less than 2560 kg/cubic meter. It shall be free of cracks, seams, and other defects that would tend to increase unduly its deterioration from natural causes or reduce its size to that which could not be retained in the gabion baskets. The inclusion of more than 5% by weight of dirt, sand, clay, and rock fines will not be permitted. Gabion stone may be tested by the Government during construction if the COR determines that testing is necessary. If such tests are deemed necessary, the testing will be performed at a materials testing laboratory in Puerto Rico to be determined by the COR at the Government's expense. The Contractor shall obtain, under the supervision of the COR, and deliver to the laboratory at the Contractor's expense, samples consisting of at least five (5) pieces of riprap not to exceed 45 kg each piece and at least 45 kg of bedding stone in the gradation specified. Tests to which the material may be subjected to are petrographic analysis, specific gravity, LA abrasion, sulfate soundness, absorption, wetting and drying, and freezing and thawing. Stone will be inspected for quality, shape, and/or gradation during loading at the source and unloading at the work site prior to placement.

2.1.3.2 Gradation

Stone fill used in the gabions shall be a well-graded mixture with sizes ranging between 76 and 127 mm, based on US Standard square mesh sieves. No stone shall have a minimum dimension less than 76 mm and a maximum dimension greater than 127 mm in any direction. The ratio of the maximum dimension to the minimum dimension shall not be greater than two.

PART 3 EXECUTION

3.1 FOUNDATION PREPARATION

After excavation or stripping to the extent indicated on the drawings or as directed by the Contracting Officer, all remaining loose or otherwise unsuitable materials shall be removed. All depressions shall be carefully backfilled to grade. If pervious materials are encountered in the foundation depressions, the areas shall be backfilled with free-draining materials. Otherwise, the depressions shall be backfilled with suitable materials from adjacent required excavation, or other approved source, and compacted to a density at least equal to that of the adjacent foundation. Any buried debris protruding from the foundation that will impede the proper installation and final appearance of the gabion layer shall also be removed, and the voids carefully backfilled and compacted as specified above. Immediately prior to placing the material, the prepared foundation surface shall be inspected by the Contracting Officer, and no material shall be placed thereon until that area has been approved.

3.2 GEOTEXTILE PLACEMENT

Geotextile material shall be placed as specified in SECTION 02378 GEOTEXTILES USED AS FILTERS.

3.3 FABRICATION

3.3.1 PVC-Coated Galvanized Steel Wire Mesh Gabions

Gabions shall be fabricated in such a manner that the sides, ends, lid, and diaphragms can be assembled at the construction site into rectangular baskets of the sizes specified and shown on the drawings. Gabions shall be of single unit construction, i.e., the base, lid, ends, and sides shall be either woven into a single unit, or one edge of these members connected to the base section of the gabion in such a manner that the minimum strengths of the wire mesh and connections as stated in paragraph MATERIALS of Part 2 in this Section are met. Where the length of the gabion exceeds one and one-half its horizontal width, the gabion shall be equally divided by diaphragms, separate from the base, made of the same mesh and gage as the body of the gabions, ~~into cells whose length does not exceed the horizontal width~~ and attached to the base with either a continuous wire or fasteners placed every 127 mm, as approved by the COR. The gabion shall be furnished with the necessary diaphragms ~~secured~~ attached in proper position ~~onto~~ the base (at 0.91m on center) in such a manner that no additional tying at this ~~junction~~ connection will be necessary. For twisted wire gabions, all perimeter edges of the mesh forming the gabion shall be securely selvaged by wrapping the most terminals around the selvage wire not less than 1.5 times so that the joints formed by ~~tying the selvages~~ this connection have at least the strengths as specified in paragraph MATERIALS of Part 2 in this Section. In addition, the selvaged edges shall be so wrapped and reinforced with the mesh ends that the selvage wire will not be deformed locally about the lacing wire or wire fasteners when baskets are filled or during lid closing. Lacing wire, connecting wire, and/or wire fasteners shall be supplied in sufficient quantity for securely fastening all diaphragms and edges of the gabion. Pleating the base of the gabion to form the diaphragms is prohibited.

3.4 ASSEMBLY AND INSTALLATION

3.4.1 Precaution for PVC-Coated Materials

If PVC-coated materials are required, no work shall take place using these materials unless the ambient temperature and the temperature of the PVC

materials are at least 10 deg C above the brittleness temperature of the PVC materials.

3.4.2 Gabion Units

Empty gabion units shall be assembled individually and placed on the approved surface to the lines and grades as shown on the drawings or as directed by the Contracting Officer, with the sides, ends, and diaphragms erected in such a manner to ensure the correct position of all creases and that the tops of all sides are level. Filling of gabion units in one place and then transporting them to their final position in the work will not be permitted. A row of gabion units shall be placed first and then successively constructed toward the top of the slope or the back of the structure. All gabion units shall be properly staggered as shown on the drawings. Finished gabion structure shall have no gaps along the perimeter of the contact surfaces between adjoining gabion basket units. All adjoining empty gabion units shall be connected by lacing wire/or wire fasteners along the perimeter of their contact surfaces in order to obtain a monolithic structure. Lacing of adjoining basket units shall be accomplished by continuous stitching with alternating single and double loops at intervals of not more than 125 mm, and a half hitch shall be included at every double loop. All lacing wire terminals shall be securely fastened. Wire fasteners may be used in lieu of lacing wire for forming individual baskets and joining empty baskets together prior to stone filling. All joining shall be made through selvage-to-selvage or selvage-to-edge wire connection; mesh-to-mesh or selvage-to-mesh wire connection is prohibited except in the case where baskets are offset or stacked and selvage-to-mesh or mesh-to-mesh wire connection would be necessary. Wire fasteners shall not be used to tie or join stone-filled baskets, unless approved by the Contracting Officer. Each wire fastener shall be properly installed and closed as specified in subparagraph SALT SPRAY TEST located in paragraph MATERIALS, subparagraph ALTERNATIVE WIRE FASTENERS FOR GABIONS, subsubparagraph TESTING. As a minimum, a fastener shall be installed at each mesh opening at the location where mesh wire meets selvage or edge wire. The initial line of basket units shall be placed on the prepared filter layer surface and partially filled to provide anchorage against deformation and displacement during filling operations. After adjoining empty basket units are set to line and grade and common sides with adjacent units thoroughly laced or fastened, they shall be placed in tension and stretched to remove any kinks from the mesh and to a uniform alignment. The stretching of empty basket units shall be accomplished in such a manner as to prevent any possible unraveling. Stone filling operations shall carefully proceed with placement by hand or machine so as not to damage the PVC wire coating, to assure a minimum of voids between the stones, and the maintenance of alignment throughout the filling process. Undue deformation and bulging of the mesh shall be corrected prior to further stone filling. To avoid localized deformation, the basket units in any row are to be filled in stages consisting of maximum 300 mm courses, and at no time shall any cell be filled to a depth exceeding 300 mm more than the adjoining cell. The maximum height from which the stone may be dropped into the basket units shall be 1 m. For gabion units in excess of 0.61 m in height, two uniformly spaced internal connecting wires shall be placed between each stone layer in all front and side gabion units, connecting the back and the front faces of the compartments. Connecting wires or alternatively the preformed stiffeners shall be looped around two twisted wire mesh openings or a welded wire joint at each basket face and the wire terminals shall be securely twisted to prevent their loosening. Along all exposed faces, the outer layer of stone shall be carefully placed and arranged by hand to ensure a neat and

compact appearance. The last layer of stone shall be uniformly overfilled 25 to 50 mm to compensate for the future settlement in rock but still allow for the proper closing of the lid and to provide an even surface that is uniform in appearance. Final adjustments for compaction and surface tolerance shall be done by hand. Lids shall be stretched tight over the stone fill using only an approved lid closing tool, until the lid meets the perimeter edges of the front and end panels. Using crowbars or other single point leverage bars for lid closing shall be prohibited. The lid shall then be tightly tied with lacing wire, or with wire fasteners if approved by the Contracting Officer, along all edges, ends, and internal cell diaphragms by continuous stitching with alternating single and double loops at intervals of not more than 125 mm, and a half hitch shall be included at every double loop. Special attention shall be given to see that all projections or wire ends are turned into the baskets. Where shown on the drawings or as directed by the Contracting Officer, or where a complete gabion unit cannot be installed because of space limitations, the basket unit shall be cut, folded, and wired together to suit existing site conditions. The mesh must be cleanly cut and the surplus mesh cut out completely, or folded back and neatly wired to an adjacent gabion face. The assembling, installation, filling, lid closing, and lacing of the reshaped gabion units shall be carried out as specified above.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16050

RELOCATION OF POWER AND TELEPHONE/CABLE LINES

PART 1 GENERAL

- 1.1 SCOPE
- 1.2 REFERENCES
- 1.3 SUBMITTALS
- 1.4 COORDINATION
- 1.5 PREPA Point of Contact
- 1.6 PRTC Point of Contact
 - 1.6.1 CATV POINT OF CONTACT

PART 2 PRODUCTS

- 2.1 STANDARD PRODUCTS
- 2.2 MATERIALS

PART 3 EXECUTION

- 3.1 OUTAGES
- 3.2 COMPONENTS
- 3.3 RELOCATION WORK
 - 3.3.1 General
- 3.4 POWER LINE RELOCATION WORK
 - 3.4.1 General
 - 3.4.2 Station 20+82 West
 - 3.4.3 Station 20+61 West
 - 3.4.4 Station 13+67 West
 - 3.4.5 Station 1+38 West
 - 3.4.6 Station 4+48 West
 - 3.4.7 Station 7+65 East
- 3.5 TELEPHONE/CABLE LINE RELOCATION WORK
 - 3.5.1 General
 - 3.5.2 Station 20+61 East
 - 3.5.3 Station 10+00 East
- 3.6 GUARANTEE

-- End of Section Table of Contents --

-- End of Section --

SECTION 16050

RELOCATION OF POWER AND TELEPHONE/CABLE LINES

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of relocating overhead utility lines and underground utility lines as specified, as shown on the drawings and as required by the respective utility companies: Puerto Rico Electric Power Authority (PREPA), ~~and~~ Puerto Rico Telephone Company (PRTC), and Liberty Cable Company (CATV).

1.2 REFERENCES

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

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (1997) National Electrical Safety Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1999) National Electrical Code

PUERTO RICO ELECTRIC POWER AUTHORITY (PREPA)

PREPA Manual de Normas de Distribucion Urbana

PREPA Manual de Normas - Construccion de Lineas de Transmision

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals having an "FIO" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-08 Statements

Utility Construction Plans; G|EN.

The contractor shall submit utility construction plans to include coordination documentation for approval to the respective utility companies prior to construction. Construction plans shall be prepared in accordance with each utility company's respective rules, regulations, and standards. Local utility standard details to be used may be obtained from the respective utility companies. A copy of each utility-approved Construction Plan shall be submitted to the Contracting Officer.

1.4 COORDINATION

The Contractor shall coordinate the proposed relocation with the respective utility companies: PREPA, PRTC and CATV. The Contractor shall become familiar with the utility companies' technical and scheduling requirements, advance planning and notices, and relocation costs. The Contractor shall coordinate relocation work relocation work required by this section with other parts of the specifications. Initial coordination efforts provided the following preliminary scheduling requirement which the Contractor shall verify.

<u>Utility</u>	<u>Advance Notice</u>	<u>Construction</u>
PREPA	60 days	30 days
PRTC	60 days	20 days

1.5 PREPA Point of Contact

PREPA point of contact is Engineer Eli Francisco Ramos, PREPA District Engineer, Telephone No. (787) 854-2273.

1.6 PRTC Point of Contact

PRTC point of contact is Engineer Juan Pratts, PRTC Department Metro Area, Puerto Rico, Telephone No. (787) 749-2483.

1.6.1 CATV POINT OF CONTACT

CATV point of contact is Angel Manuel Ortiz, Telephone No. (787) 285-0240 or (787) 285-4047.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Material and equipment shall be standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

2.2 MATERIALS

All materials for permanent and temporary relocation of power lines and telephone lines shall be provided by the respective utility company.

PART 3 EXECUTION

3.1 OUTAGES

Power and Telephone outages shall be controlled by the respective utility company. The Contractor shall schedule the energization and de-energization of circuits as needed during construction with the respective utility company.

3.2 COMPONENTS

During construction warning signs, high voltage, porcelain enameled steel or approved equal shall be provided as required by the respective utility company.

3.3 RELOCATION WORK

3.3.1 General

All power and telephone utility relocations, permanent and temporary, shall be performed by the respective utility company. The Contractor shall field check and verify the underground and overhead utility lines. The Contractor shall plan and discuss the work details and timing with the respective utility companies to determine advance notice requirements, clearances, and energizations and de-energizations of lines. All work as indicated shall be done in close coordination with the local utility companies. All work shall be according to local rules and regulations, ANSI and NFPA. In case of conflict, the most stringent rule shall govern.

3.4 POWER LINE RELOCATION WORK

3.4.1 General

The work described in this paragraph and as shown on the drawings shall be performed by PREPA. The Contractor shall be responsible for planning and coordinating all relocation work with the utility company for timely relocation causing no delay to the project. It shall be the Contractor's responsibility to protect existing power lines during construction. Any damage shall be repaired by the Contractor at no cost to the Government or PREPA. Levee construction work shall be phased in with PREPA relocation. The Contractor shall coordinate clearing and grubbing in the construction area well in advance of construction. Drawing 85/1 shows the general vicinity of the utility conflicts. The proposed power line relocations are as shown on drawings 85/2 through 85/5. The power line locations are approximate only and shall be field verified by the Contractor.

3.4.2 Station 20+82 West

A 4.16 kV power line parallel to and south of highway 682 crosses the proposed levee at station 20+82. This line will require a lift in elevation. Existing low-wire elevation is 6.43 meters. Provide two class H-4 concrete poles with hardware, one on either side of the roadway and elevate power line.

3.4.3 Station 20+61 West

Two 4.16 kV power lines join at a pole located at station 20+61 of the proposed levee. These lines will require a lift in elevation. Existing low-wire elevation is 6.46 meters. Provide two class H-4 concrete poles with hardware, one on either side of the roadway and elevate power line.

3.4.4 Station 13+67 West

A 4.16 kV power line approaches the proposed levee from the East at Station 13+67. Existing low-wire elevation is 10.44 meters. Provide two class H-4 concrete poles with hardware, one on either side of the roadway and relocate power line.

3.4.5 Station 1+38 West

A 38 kV power line crosses the proposed levee at station 1+38. Existing low-wire elevation is 9.35 meters. Provide two class H-4 concrete poles with hardware, one on either side of the roadway and relocate power line.

3.4.6 Station 4+48 West

A 4.16 kV power line crosses the proposed levee at station 4+48. Existing low-wire elevation is 5.63 meters. Provide two class H-4 concrete poles with hardware, one on either side of roadway and relocate powerline.

3.4.7 Station 7+65 East

A 4.16 kV power line crosses the proposed levee at station 7+65. Existing low-wire elevation is 7.06 meters. Provide two class H-4 concrete poles with hardware, one on either side of the roadway and relocate power line.

3.5 TELEPHONE/CABLE LINE RELOCATION WORK

3.5.1 General

The work described in this paragraph and as shown shall be performed by ~~PRTC~~ the respective utility company. PRTC/CATV shall relocate the telephone /cable lines sharing PREPA's poles as shown on the drawings. All alterations of telephone/cable lines shall be performed by ~~PRTC~~the respective utility company. PRTC/CATV will provide new telephone/cable lines and related hardware as necessitated. The telephone/cable line locations are approximate only and shall be field verified by the Contractor. The Contractor shall coordinate with PRTC/CATV for timely relocation, identification of phone/cable lines, etc. It shall be the Contractor's responsibility to protect existing telephone/cable lines during construction. Any damage shall be repaired by the Contractor at no cost to the Government or PRTC/CATV. Construction work shall be phased in with PRTC/CATV relocation. The Contractor shall coordinate PRTC/CATV requirements with construction work.

3.5.2 Station 20+61 East

A 300 X 24 gauge, 200 X 24 gauge and a fiber-optic telephone line crosses at Station 20+61 of the proposed levee sharing PREPA power poles. These lines will require a lift in elevation in conjunction with PREPA's power line relocation. Existing low-wire elevation is 6.46 meters.

3.5.3 Station 10+00 East

A 600 X 22 gauge telephone line crosses at Station 10+00 of the proposed levee. These lines will require relocation in conjunction with PREPA's relocation.

3.6 GUARANTEE

The respective utility companies shall be responsible for any material and workmanship guarantees.

-- End of Section --