

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE N/A PAGE OF PAGES 1 2

2. AMENDMENT/MODIFICATION NO. 0003 3. EFFECTIVE DATE 16 AUGUST 1999 4. REQUISITION/PURCHASE REQ. NO. 5. PROJECT NO. (If applicable)

6. ISSUED BY LOS ANGELES DISTRICT, COE CODE CESPL-CT-P (L. CARVAJAL) 7. ADMINISTERED BY (If other than Item 6) CODE P.O. BOX 532711
LOS ANGELES, CA 90053-2325

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP code) (X) 9A. AMENDMENT OF SOLICITATION NO. DACW09-99-B-0009
X 9B. DATED (SEE ITEM 11) 26 AUG 99 (BID OPENING)
10A. MODIFICATION OF CONTRACT/ORDER NO. N/A
10B. DATED (SEE ITEM 13) N/A

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 is extended, is not extended. 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 ACKNOWLEDGEMENT 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.

(X) 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 ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO 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.)
BLUE DIAMOND DETENTION BASIN, CLARK COUNTY, NEVADA
* THE BID OPENING DATE IS HEREBY CHANGED FROM AUGUST 24, 1999 TO AUGUST 26, 1999.
*Revisions: Par. 3.2 of Section 02150; Par. 3.2, 3.4.3 of Section 02241; Par. 3.2.3, 3.3.1.1, 3.3.2.1, 3.3.2.2, 3.3.2.3 3.3.4.2, 3.6 of Section 02250; Par. 1.1, 1.2.1, 1.2.3, 1.3.1, 1.3.6, 1.3.7, 1.4.1, 3.4.5.3, 2.5.6.1, 2.6.1, 2.7.3, 3.2.2.3(f), 3.2.2.4(a), 3.4.4, 3.5.1, 3.5.2, 3.7.1, 3.8.1 of Section 03360

----- CONTINUED ON BACK OF PAGE -----

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 (Signature of Contracting Officer)

**BLUE DIAMOND DETENTION BASIN, CLARK COUNTY, NEVADA.
IFB NO. DACW09-99-B-0009, Standard Form 30, Amendment #0003
(Continued)**

- **Addition:** Par. 3.7.1.3
- **Replacements:** Par. 3.7.1.1 and 3.7.1.2
- **Deletions:** Par. 2.2 and 2.2.1
- **Replace** Section 00010 with "Enclosure to Amendment #3".
- **Revised Drawings:** Dwg. No. (District File No.):
196/490, 196/491, 196/504, 196/511, 196/547 (all Rev. `B')

Section Descriptions

- § 02150, Clear Site and Removal Obstructions
- § 02241, Aggregate Base Course
- § 02250, Fills and Subgrade Preparations
- § 03360, Roller-Compacted Concrete (RCC)
- "Enclosure to Amendment #3", Instructions, Conditions, and Notices to Bidders

--- END OF DOCUMENT ---

ENCLOSURE TO AMENDMENT #3

SOLICITATION, OFFER, AND AWARD (Construction, Alteration, or Repair)	1. SOLICITATION NO. DACW09-99-B-0009	2. TYPE OF SOLICITATION <input checked="" type="checkbox"/> SEALED BID (IFB) <input type="checkbox"/> NEGOTIATED (RFP)	3. DATE ISSUED 07/12/99	PAGE OF PAGES
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IMPORTANT - The "offer" section on the reverse must be fully completed by offeror.

4. CONTRACT NO.	5. REQUISITION/PURCHASE REQUEST NO. W81EYN-9040-9609	6. PROJECT NO. Blue Diamond
7. ISSUED BY LOS ANGELES DISTRICT, COE CESPL-CT-P (L. CARVAJAL) P. O. BOX 532711 LOS ANGELES CA 90053-2375	CODE SPLCTC02	8. ADDRESS OFFER TO SPLCOAV US ARMY CORPS OF ENGINEERS NELLIS AFB RESIDENT OFFICE 4551 DEVLIN DRIVE BLDG 867 NELLIS AFB NV 89191
9. FOR INFORMATION CALL:	A. NAME LUCY CARVAJAL C02	B. TELEPHONE NO. (Include area code) (NO COLLECT CALLS) (213) 452-3240

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):

BLUE DIAMOND DETENTION BASIN, CLARK COUNTY, NEVADA

The estimated cost of this acquisition is in excess of \$10,000,000.00

Please be advised that this procurement may be delayed, cancelled or revised at any time during the solicitation, evaluation and/or final award process.

11. The Contractor shall begin performance within * 10 calendar days and complete it within * 390 calendar days after receiving * Section 00800
 award, notice to proceed. This performance period is mandatory, negotiable. (See _____.)

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS?
 (If "YES," indicate within how many calendar days after award in Item 12B.)

YES NO

12B. CALENDAR DAYS

010

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 1:00 PM (hour) local time 08/26/99 (date). If this is a sealed bid solicitation, offers must 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.

ENCLOSURE TO AMENDMENT #1

14. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)	15. TELEPHONE NO. (Include area code)
Cage Code: _____ Duns No. _____ CODE FACILITY CODE	16. REMITTANCE ADDRESS (Include only if different than Item 14)

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within _____ calendar days after the date offers are due. (Insert any number equal to or greater than the minimum requirements stated in Item 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)

AMOUNTS ▶

Refer to Section 00010, page 00010-3, Price Schedule

18. The offeror agrees to furnish any required performance and payment bonds.

19. ACKNOWLEDGMENT OF AMENDMENTS

(The offeror acknowledges receipt of amendments to the solicitation - give number and date of each)

AMENDMENT NO.	DATE								

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (Type or print)	20B. SIGNATURE	20C. OFFER DATE
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AWARD (To be completed by Government)

21. ITEMS ACCEPTED:

22. AMOUNT	23. ACCOUNTING AND APPROPRIATION DATA
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24. SUBMIT INVOICES TO ADDRESS SHOWN IN (4 copies unless otherwise specified)	ITEM	25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO
		<input type="checkbox"/> 10 U.S.C. 2304(c) () <input type="checkbox"/> 41 U.S.C. 253(c) ()

26. ADMINISTERED BY CODE	27. PAYMENT WILL BE MADE BY
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CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

28. NEGOTIATED AGREEMENT (Contractor is required to sign this document and return _____ copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all work, requisitions identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications incorporated by reference in or attached to this contract.

29. AWARD (Contractor is not required to sign this document.) Your offer on this solicitation, is hereby accepted as to the items listed. This award consummates the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.

30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN (Type or print)	31A. NAME OF CONTRACTING OFFICER (Type or print)
30B. SIGNATURE	31B. UNITED STATES OF AMERICA
30C. DATE	BY
	31C. AWARD DATE

INFORMATION TO OFFERORS OR QUOTERS

Section A - Cover Sheet

1. SOLICITATION NUMBER

DACW09-99-B-0009

2. (X one)

X

a. SEALED BID

b. NEGOTIATED (RFP)

c. NEGOTIATED (RFQ)

INSTRUCTIONS

NOTE THE AFFIRMATIVE ACTION REQUIREMENT OF THE EQUAL OPPORTUNITY CLAUSE WHICH MAY APPLY TO THE CONTRACT RESULTING FROM THIS SOLICITATION.

You are cautioned to note the "Certification of Non-Segregated Facilities" in the solicitation. Failure to agree to the certification will render your reply nonresponsive to the terms of solicitations involving awards of contracts exceeding \$25,000 which are not exempt from the provisions of the Equal Opportunity clause.

"Fill-ins" are provided on the face and reverse of Standard Form 18 and Parts I and IV of Standard Form 33, or other solicitation documents and Sections of Table of Contents in this solicitation and should be examined for applicability.

See the provision of this solicitation entitled either "Late Bids, Modifications of Bids or Withdrawal of Bids" or "Late Proposals, Modifications of Proposals and Withdrawals of Proposals."

When submitting your reply, the envelope used must be plainly marked with the Solicitation Number, as shown above and the date and local time set forth for bid opening or receipt of proposals in the solicitation document.

If NO RESPONSE is to be submitted, detach this sheet from the solicitation, complete the information requested on reverse, fold, affix postage, and mail. NO ENVELOPE IS NECESSARY.

Replies must set forth full, accurate, and complete information as required by this solicitation (including attachments). The penalty for making false statements is prescribed in 18 U.S.C. 1001.

3. ISSUING OFFICE (Complete mailing address, including Zip Code)

LOS ANGELES DISTRICT, COE
 CESPL-CT-P (L. CARVAJAL)
 P. O. BOX 532711
 LOS ANGELES CA 90053-2325

4. ITEMS TO BE PURCHASED (Brief description)

BLUE DIAMOND DETENTION BASIN, CLARK COUNTY, NEVADA

5. PROCUREMENT INFORMATION (X and complete as applicable)

X	a. THIS PROCUREMENT IS UNRESTRICTED
	b. THIS PROCUREMENT IS A _____% SET-ASIDE FOR ONE OF THE FOLLOWING (X one). (See Section C of the Table of Contents in this solicitation for details of the set-aside.)
	(1) Small Business
	(2) Labor Surplus Area Concerns
	(3) Combined Small Business/Labor Area Concerns

6. ADDITIONAL INFORMATION

BID WILL INCLUDE:

- A. COMPLETED AND SIGNED SF-1442 AND PRICE SCHEDULE (SECTION 00010);
- B. COMPLETED REPRESENTATIONS & CERTIFICATIONS (SECTION 00600);
- C. BID GUARANTEE;
- D. ACKNOWLEDGEMENT OF AMENDMENTS, IF ANY AMENDMENTS WERE ISSUED;
- G. ANY OTHER DOCUMENTS REQUIRED BY THE SOLICITATION.

COMPLETE DETAILS FOR PROPER SUBMISSION OF BIDS ARE FOUND IN SECTIONS 00100 & 00600.

7. POINT OF CONTACT FOR INFORMATION

a. NAME (Last, First, Middle Initial) LUCY CARVAJAL C02	b. ADDRESS (Include Zip Code) LOS ANGELES DISTRICT, COE CESPL-CT-P (L. CARVAJAL) P. O. BOX 532711 LOS ANGELES CA 90053-2325
c. TELEPHONE NUMBER (Include Area Code and Extension) (NO COLLECT CALLS) (213) 452-3240	

Enclosure to Amendment #3

8. REASONS FOR NO RESPONSE (X all that apply)			
<input type="checkbox"/>	a. CANNOT COMPLY WITH SPECIFICATIONS	<input type="checkbox"/>	b. CANNOT MEET DELIVERY REQUIREMENT
<input type="checkbox"/>	c. UNABLE TO IDENTIFY THE ITEM(S)	<input type="checkbox"/>	d. DO NOT REGULARLY MANUFACTURE OR SELL THE TYPE OF ITEMS INVOLVED
<input type="checkbox"/>	e. OTHER (Specify)		
9. MAILING LIST INFORMATION (X one)			
<input type="checkbox"/>	YES	<input type="checkbox"/>	NO
WE DESIRE TO BE RETAINED ON THE MAILING LIST FOR FUTURE PROCUREMENT OF THE TYPE OF ITEM(S) INVOLVED.			
10. RESPONDING FIRM			
a. COMPANY NAME		b. ADDRESS (Include ZIP Code)	
c. ACTION OFFICER			
(1) Typed or Printed Name (Last, First, Middle Initial)		(2) Title	(3) Signature
			(4) Date Signed (YYMMDD)

DD Form 1707 Reverse, MAR 89

FOLD

FOLD

FOLD

FOLD

FROM

AFFIX
STAMP
HERE

SOLICITATION NUMBER DACW09-99-B-0009	
DATE (YYMMDD) 99/08/26	LOCAL TIME 1:00 PM

*

TO LOS ANGELES DISTRICT, COE
CESPL-CT-P (L. CARVAJAL)
P. O. BOX 532711
LOS ANGELES CA 90053-2325

* Denotes Change
Enclosure to Amendment No. 0003

ENCLOSURE TO AMENDMENT #3

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ENCLOSURE TO AMENDMENT #3

SECTION 00100

INSTRUCTIONS, CONDITIONS, AND NOTICES TO BIDDERS

1 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY REFERENCE (FEB 1998)

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. The offeror is cautioned that the listed provisions may include blocks that must be completed by the offeror and submitted with its quotation or offer. In lieu of submitting the full text of those provisions, the offeror may identify the provision by paragraph identifier and provide the appropriate information with its quotation or offer. Also, the full text of a solicitation provision may be accessed electronically at these addresses:

<http://www.arnet.gov/far>
<http://farsite.hill.af.mil>
<http://www.dtic.mil/dfars>

(End of provision)

2 52.211-2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE DOD INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) AND DESCRIPTIONS LISTED IN THE ACQUISITION MANAGEMENT SYSTEMS AND DATA REQUIREMENTS CONTROL LIST, DOD 5010.12-L (AUG 1998)

(a) Copies of specifications, standards, and data item descriptions cited in this solicitation may be obtained for a fee by submitting a request to the--Department of Defense Single Stock Point (DoDSSP), Building 4, Section D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Telephone (215) 697-2667/2179, Facsimile (215) 697-1462.

(b) Order forms, pricing information, and customer support information may be obtained--

(1) By telephone at (215) 697-2667/2179; or

(2) Through the DoDSSP Internet site at <http://www.dodssp.daps.mil>.

(End of provision)

3 52.214-1 SOLICITATION DEFINITIONS--SEALED BIDDING (JUL 1987)

"Government" means United States Government.

"Offer" means "bid" in sealed bidding.

"Solicitation" means an invitation for bids in sealed bidding.

(End of provision)

4 52.214-3 AMENDMENTS TO INVITATIONS FOR BIDS (DEC 1989)

(a) If this solicitation is amended, then all terms and conditions which are not modified remain unchanged.

(b) Bidders shall acknowledge receipt of any amendment to this solicitation (1) by signing and returning the amendment, (2) by identifying the amendment number and date in the space provided for this purpose on the form for submitting a bid, (3) by letter or telegram, or (4) by facsimile, if facsimile bids are authorized in the solicitation. The Government must receive the acknowledgment by the time and at the place specified for receipt of bids.

(End of provision)

5 52.214-4 FALSE STATEMENTS IN BIDS (APR 1984)

ENCLOSURE TO AMENDMENT #3

Bidders must provide full, accurate, and complete information as required by this solicitation and its attachments. The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

(End of provision)
(R 2-201(b)(xiii))
(R 1-2.201(a)(11))

6 52.214-5 SUBMISSION OF BIDS (MAR 1997)

(a) Bids and bid modifications shall be submitted in sealed envelopes or packages (unless submitted by electronic means) (1) addressed to the office specified in the solicitation, and (2) showing the time and date specified for receipt, the solicitation number, and the name and address of the bidder.

(b) Bidders using commercial carrier services shall ensure that the bid is addressed and marked on the outermost envelope or wrapper as prescribed in subparagraphs (a) (1) and (2) of this provision when delivered to the office specified in the solicitation.

(c) Telegraphic bids will not be considered unless authorized by the solicitation; however, bids may be modified or withdrawn by written or telegraphic notice.

(d) Facsimile bids, modifications, or withdrawals, will not be considered unless authorized by the solicitation.

(e) Bids submitted by electronic commerce shall be considered only if the electronic commerce method was specifically stipulated or permitted by the solicitation.

(End of provision)

7 52.214-6 EXPLANATION TO PROSPECTIVE BIDDERS (APR 1984)

Any prospective bidder desiring an explanation or interpretation of the solicitation, drawings, specifications, etc., must request it in writing soon enough to allow a reply to reach all prospective bidders before the submission of their bids. Oral explanations or instructions given before the award of a contract will not be binding. Any information given a prospective bidder concerning a solicitation will be furnished promptly to all other prospective bidders as an amendment to the solicitation, if that information is necessary in submitting bids or if the lack of it would be prejudicial to other prospective bidders.

(End of provision)
(R SF 33A, Para 3, 1978 JAN)

8 52.214-7 LATE SUBMISSIONS, MODIFICATIONS, AND WITHDRAWALS OF BIDS (MAY 1997)

(a) Any bid received at the office designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before award is made and it--

(1) Was sent by registered or certified mail not later than the fifth calendar day before the date specified for receipt of bids (e.g., a bid submitted in response to a solicitation requiring receipt of bids by the 20th of the month must have been mailed by the 15th);

(2) Was sent by mail (or telegram or facsimile, if authorized) or hand-carried (including delivery by a commercial carrier) if it is determined by the Government that the late receipt was due primarily to Government mishandling after receipt at the Government installation;

(3) Was sent by U.S. Postal Service Express Mail Next Day Service-Post Office To Addressee, not later than 5:00 P.M. at the place of mailing two working days prior to the date specified for receipt of bids. The term "working days" excludes weekends and U.S. Federal holidays; or

(4) Was transmitted through an electronic commerce method authorized by the solicitation and was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of bids.

(b) Any modification or withdrawal of a bid is subject to the same conditions as in paragraph (a) of this provision.

ENCLOSURE TO AMENDMENT #3

(c) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent either by registered or certified mail is the U.S. or Canadian Postal Service postmark both on the envelope or wrapper and on the original receipt from the U.S. or Canadian Postal Service. Both postmarks must show a legible date or the bid, modification, or withdrawal shall be processed as if mailed late. "Postmark" means a printed, stamped, or otherwise placed impression (exclusive of a postage meter machine impression) that is readily identifiable without further action as having been supplied and affixed by employees of the U.S. or Canadian Postal Service on the date of mailing. Therefore, bidders should request the postal clerk to place a legible hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

(d) The only acceptable evidence to establish the time of receipt at the Government installation is the time/date stamp of that installation on the bid wrapper or other documentary evidence of receipt maintained by the installation.

(e) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent by U.S. Postal Service Express Mail Next Day Service-Post Office to Addressee is the date entered by the post office receiving clerk on the "Express Mail Next Day Service-Post Office to Addressee" label and the postmark on the envelope or wrapper and on the original receipt from the U.S. Postal Service. "Postmark" has the same meaning as defined in paragraph (c) of this provision, excluding postmarks of the Canadian Postal Service. Therefore, bidders should request the postal clerk to place a legible hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

(f) Notwithstanding paragraph (a) of this provision, a late modification of an otherwise successful bid that makes its terms more favorable to the Government will be considered at any time it is received and may be accepted.

(g) Bids may be withdrawn by written notice or telegram (including mailgram) received at any time before the exact time set for receipt of bids. If the solicitation authorizes facsimile bids, bids may be withdrawn via facsimile received at any time before the exact time set for receipt of bids, subject to the conditions specified in the provision entitled "Facsimile Bids." A bid may be withdrawn in person by a bidder or its authorized representative if, before the exact time set for receipt of bids, the identity of the person requesting withdrawal is established and the person signs a receipt for the bid.

(h) If an emergency or unanticipated event interrupts normal Government processes so as to cause postponement of the scheduled bid opening, and urgent Government requirements preclude amendment of the solicitation or other notice of an extension of the opening date, the time specified for receipt of bids will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.

(End of provision)

9 52.214-17 This Clause was not used.

10 52.214-18 PREPARATION OF BIDS--CONSTRUCTION (APR 1984)

(a) Bids must be (1) submitted on the forms furnished by the Government or on copies of those forms, and (2) manually signed. The person signing a bid must initial each erasure or change appearing on any bid form.

(b) The bid form may require bidders to submit bid prices for one or more items on various bases, including--

- (1) Lump sum bidding;
- (2) Alternate prices;
- (3) Units of construction; or
- (4) Any combination of subparagraphs (1) through (3) above.

(c) If the solicitation requires bidding on all items, failure to do so will disqualify the bid. If bidding on all items is not required, bidders should insert the words "no bid" in the space provided for any item on

ENCLOSURE TO AMENDMENT #3

which no price is submitted.

(d) Alternate bids will not be considered unless this solicitation authorizes their submission.

(End of provision)
(R SF 22, Para 5, 1978 FEB)

11 52.214-19 CONTRACT AWARD--SEALED BIDDING--CONSTRUCTION (AUG 1996)

(a) The Government will evaluate bids in response to this solicitation without discussions and will award a contract to the responsible bidder whose bid, conforming to the solicitation, will be most advantageous to the Government, considering only price and the price-related factors specified elsewhere in the solicitation.

(b) The Government may reject any or all bids, and waive informalities or minor irregularities in bids received.

(c) The Government may accept any item or combination of items, unless doing so is precluded by a restrictive limitation in the solicitation or the bid.

(d) The Government may reject a bid as nonresponsive if the prices bid are materially unbalanced between line items or subline items. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated in relation to cost for other work, and if there is a reasonable doubt that the bid will result in the lowest overall cost to the Government even though it may be the low evaluated bid, or if it is so unbalanced as to be tantamount to allowing an advance payment.

(End of provision)

12 52.214-34 SUBMISSION OF OFFERS IN THE ENGLISH LANGUAGE (APR 1991)

Offers submitted in response to this solicitation shall be in the English language. Offers received in other than English shall be rejected.

(End of provision)

13 52.214-35 SUBMISSION OF OFFERS IN U.S. CURRENCY (APR 1991)

Offers submitted in response to this solicitation shall be in terms of U.S. dollars. Offers received in other than U.S. dollars shall be rejected.

(End of provision)

14 52.216-1 TYPE OF CONTRACT (APR 1984)

The Government contemplates award of a Firm Fixed Price contract resulting from this solicitation.

(End of provision)

15 52.222-23 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY FOR CONSTRUCTION (FEB 1999)

(a) The offeror's attention is called to the Equal Opportunity clause and the Affirmative Action Compliance Requirements for Construction clause of this solicitation.

(b) The goals for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participation | Goals for female participation for
for each trade | each trade

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-----|-----
13.9%	6.9%

These goals are applicable to all the Contractor's construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is actually performed. Goals are published periodically in the Federal Register in notice form, and these notices may be obtained from any Office of Federal Contract Compliance Programs office.

(c) The Contractor's compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on (1) its implementation of the Equal Opportunity clause, (2) specific affirmative action obligations required by the clause entitled "Affirmative Action Compliance Requirements for Construction," and (3) its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. The Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

(d) The Contractor shall provide written notification to the Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, within 10 working days following award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the--

- (1) Name, address, and telephone number of the subcontractor;
- (2) Employer's identification number of the subcontractor;
- (3) Estimated dollar amount of the subcontract;
- (4) Estimated starting and completion dates of the subcontract; and
- (5) Geographical area in which the subcontract is to be performed.

(e) As used in this Notice, and in any contract resulting from this solicitation, the "covered area" is Clark County, Nevada.

(End of provision)
(R 7-2003.14(d) 1978 SEP)

16 52.225-13 NOTICE OF BUY AMERICAN ACT REQUIREMENT--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS ACT AND NORTH AMERICAN FREE TRADE AGREEMENT (MAY 1997)

(a) Offerors are required to comply with the requirements of Federal Acquisition Regulation (FAR) clause 52.225-15, Buy American Act--Construction Materials Under Trade Agreements Act and North American Free Trade Agreement, of this solicitation. The terms defined in FAR clause 52.225-15 have the same meaning in this provision.

(b) Offerors should request a determination regarding the inapplicability of the Buy American Act in time to allow determination before submission of offers. For evaluation of a request for a determination regarding the inapplicability of the requirements of the Buy American Act prior to the time set for receipt of offers, the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-15 shall be included in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act prior to submission of its offer, or has not received a response to a request made prior to submission of its offer, the information and supporting data shall be included in the offer.

(c) Evaluation of offers.

- (1) For evaluation of offers, (unless agency regulations specify a higher percentage) the Government will add to the offered price 6 percent of the cost of any foreign construction material proposed for exception from the requirements of the Buy American Act based on claimed unreasonable cost of domestic construction materials in accordance with paragraph (b)(4)(i) of FAR clause 52.225-15.
- (2) If the evaluation of offers results in a tie between an offer

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including such foreign construction material excepted on the basis of unreasonable cost, as evaluated, and an offer including solely domestic construction material or other foreign construction material, listed in the solicitation at paragraph (b)(3) of FAR clause 52.225-15, or subsequently excepted in accordance with paragraphs (b)(4)(ii) or (iii) of FAR clause 52.225-15, award shall be made to the offeror that submitted the latter offer.

(d) Alternate offers.

(1) When an offer includes foreign construction material not listed by the Government in the solicitation at paragraph (b)(3) of FAR clause 52.225-15, offerors also may submit alternate offers based on use of equivalent domestic construction material.

(2) If alternate offers are submitted, a separate Standard Form 1442 shall be submitted for each alternate offer, and a separate price comparison table, prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-15, shall be submitted for each offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception to apply.

(3) If the Government determines that a particular exception requested under paragraph (c) of FAR clause 52.225-15 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic construction material, and the offeror shall be required to furnish such domestic construction material.

(i) In sealed bid procurements, any offer based on use of that particular foreign construction material shall be rejected as nonresponsive.

(ii) In negotiated procurements, any offer based on use of that particular foreign construction material may not be accepted unless revised during negotiations.

(End of provision)

17 52.228-1 BID GUARANTEE (SEP 1996)

(a) Failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

(b) The bidder shall furnish a bid guarantee in the form of a firm commitment, e.g., bid bond supported by good and sufficient surety or sureties acceptable to the Government, postal money order, certified check, cashier's check, irrevocable letter of credit, or, under Treasury Department regulations, certain bonds or notes of the United States. The Contracting Officer will return bid guarantees, other than bid bonds, (1) to unsuccessful bidders as soon as practicable after the opening of bids, and (2) to the successful bidder upon execution of contractual documents and bonds (including any necessary coinsurance or reinsurance agreements), as required by the bid as accepted.

(c) The amount of the bid guarantee shall be 20% percent of the bid price or \$3,000,000.00, whichever is less.

(d) If the successful bidder, upon acceptance of its bid by the Government within the period specified for acceptance, fails to execute all contractual documents or furnish executed bond(s) within 10 days after receipt of the forms by the bidder, the Contracting Officer may terminate the contract for default.

(e) In the event the contract is terminated for default, the bidder is liable for any cost of acquiring the work that exceeds the amount of its bid, and the bid guarantee is available to offset the difference.

(End of provision)

18 52.233-2 SERVICE OF PROTEST (AUG 1996)

(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from

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Mrs. Mary B. Workman
c/o Lucia A. Carvajal
USAED-Los Angeles
P. O. Box 532711
Los Angeles, CA 90053-2325

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.
(End of provision)

19 52.236-27 SITE VISIT (CONSTRUCTION) (FEB 1995)

(a) The clauses at 52.236-2, Differing Site Conditions, and 52.236-3, Site Investigation and Conditions Affecting the Work, will be included in any contract awarded as a result of this solicitation. Accordingly, offerors or quoters are urged and expected to inspect the site where the work will be performed.

(b) Site visits may be arranged during normal duty hours by contacting:
Name: Rob Caskie Address: Las Vegas Resident Office, 4551 Delvin Dr., Bldg 867, Nellis AFB, NV 89191 Telephone: 702.252.4160. The site visit will be held on July 20, 1999 at 10:00 AM at Blue Diamond Road (Highway 160), about 3.5 miles west of Buffalo Drive, Las Vegas, Nevada.
(End of provision)

20 52.0-4010 INQUIRIES

Perspective bidders/offerors should submit inquiries related to this solicitation by writing or calling the following (collect calls will not be accepted):

(1) For inquiries of a contractual nature (solicitation requirements, interpretation of contractual language) call:
Lucy Carvajal
213.452.3240

For bid results only, call (213) 452-3235.

(2) All technical questions on the specification or drawings will be submitted in writing to:
Address:

Lucy Carvajal USAED-Los Angeles, P. O. Box 532711, Los Angeles, CA 90053-2325 213.452.4187

(3) Please include the solicitation number, project title and location of project with your questions. Written inquiries must be received by this office not later than 14 calendar days prior to bid opening date/date set for receipt of offers.

(4) Oral explanations or instructions are not binding. Any information given to a bidder/offeror which impacts the bid/offer will be given in the form of a written amendment to the solicitation.

21 52.0-4023 SAFETY REQUIREMENTS

The bidder's attention is directed to the latest version of U.S Army Corps of Engineers Safety and Health Manual, EM 385-1-1, which will be strictly enforced. This publication may be obtained from the US Army Engineer District, Los Angeles, ATTN: Safety Office, P.O. Box 532711, Los Angeles, California 90053-2325.

22 52.1-4004 BID RESULTS

The telephone number for bid results after the opening is Area Code (213) 452-3235.

23 52.209-4501 CONTRACTOR RESPONSIBILITY, PRE-AWARD SURVEY

In order to determine a contractor's responsibility for purposes of

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contract award in accordance with FAR Part 9, a statement regarding previous experience in performing comparable work, information related to their business organization, financial resources, and/or plant to be used in performing the work is required. After the bid opening, the Government will request this information and set a due date for its submission.

24 52.214-4002 DIRECTIONS FOR SUBMITTING BIDS

(a) Envelopes containing bids, bid guarantees, etc., must be sealed, marked and addressed as follows:

TO: US ARMY ENGINEER DISTRICT, LOS ANGELES
Nellis AFB Resident Office
4551 Delvin Drive, Bldg. 867
Nellis AFB, NV 89191

AMD #3 Bid under IFB No. DACW09-99-B-0009 Bid Opening Date: August 26, 1999 at 1:00 PM

(b) Hand carried bids shall be deposited at US Army Engineer District, Los Angeles, Nellis AFB Resident Office 4551 Delvin Drive, Bldg. 867 Nellis AFB, NV 89191 prior to the time and date set for opening of bids.

(c) Telegraphic Modifications to Bids should be addressed to:

US Army Engineer District, Los Angeles
Nellis AFB Resident Office
4551 Delvin Drive, Bldg 867
Nellis AFB, NV 89191

25 52.214-4500 ARITHMETIC DISCREPANCIES EFARS 52.214-5000

(a) For the purpose of initial evaluation of bids, the following will be utilized in resolving arithmetic discrepancies found on the face of the bidding schedule as submitted by bidders:

- (1) Obviously misplaced decimal points will be corrected;
- (2) Discrepancy between unit price and extended price, the unit price will govern;
- (3) Apparent errors in extension of unit prices will be corrected;
- (4) Apparent errors in addition of lump sum and extended prices will be corrected.

(b) For the purpose of bid evaluation, the Government will proceed on the assumption that the bidder intends his bid to be evaluated on the basis of the unit prices, the totals arrived at by resolution of arithmetic discrepancies as provided above and the bid will be so reflected on the abstract of bids.

(c) These correction procedures shall not be used to resolve any ambiguity concerning which bid is low.

(End of statement)

26 52.214-4583 TELEGRAPHIC BIDS/OFFERS

TELEGRAPHIC BIDS/OFFERS ARE NOT ACCEPTABLE

Any telegram to modify or withdraw a bid/offer sent to this office must be physically delivered to the office designated for receipt of bid/offer by the date and time set for bid opening/receipt of proposals.

No one from this office will be dispatched to the local telegraph office to pick up any telegram for any reason.

27 52.214-4584 FACSIMILE BIDS/OFFERS

Facsimile bids/offers, modifications thereto, or cancellations of bids/offers will not be accepted.

28 52.214-4598 EVALUATION FOR AWARD

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The Government contemplates award of one contract to the responsive, responsible bidder who submits the low bid for the base requirement, exclusive of option items, identified on the bid schedule.

29 52.219-4003 SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING

Offerors are cautioned that failure to comply in good faith with the CONTRACT CLAUSE entitled (1) "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns, FAR 52-219-8" and (2) Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan, FAR 52.219-9 (Alternate I)," when applicable, will be a material breach of contract. In order to assist prime contractors in developing a source list of Small and Small Disadvantaged Business Concerns, you are encouraged to contact Minority Contractor Associations, the Minority Business Development Agency, and the appropriate General Business Service Centers in your standard Metropolitan Statistical Area, addresses of which may be obtain from:

Write: US Army Engineer District, Los Angeles
ATTN: CESPL-DD-B
P.O. Box 532711
Los Angeles, California 90053-2325
Telephone: Daniel Hanas
Small and Disadvantaged Business Utilization
Specialist
Area Code (213) 452-3937

30 52.228-4506 INDIVIDUAL SURETIES IN SUPPORT OF BID BONDS

Bidder/offerors utilizing individual sureties in support of a bid bond shall include a Standard Form (SF) 28 (Affidavit of Individual Surety), accompanied by a pledge of acceptable assets from each person acting as an individual surety, and include these with the SF 24 (Bid Bond), and the bid itself (see clause titled "Pledges of Assets," FAR 52.228-11).

Pledges of acceptable assets shall be in the form of (1) evidence of an escrow account and/or (2) a recorded lien on real estate. If this is an RFP, failure to provide required documentation described herein may cause the offeror to be deemed "unacceptable".

31 52.228-4507 BID GUARANTEE FORM AND AMOUNT

When bids/proposals exceed \$100,000, the offeror shall furnish a separated bid guarantee in accordance with the solicitation provision titled "Bid Guarantee", FAR 52.228-1. In accordance with FAR 28.101-2 the bid guarantee amount shall be a least 20 percent of the "bid price" but shall not exceed \$3 million. When the penal sum is expressed as a percentage, a maximum dollar limitation may be stated. If there are option line items on the Pricing Schedule (Schedule B), the term "bid price" is hereby defined as the total bid not to include any amount for line items designated as "options". In bids/proposals that contain "additives", the "bid price" is defined as the total of all bid items including additive line items.

FAR 28.106-1 states that a Standard Form (SF) 24 shall be used for the bid bond. In accordance with FAR 28.202(a)(1), corporate sureties utilized must appear on the list contained in the Department of Treasury Circular 570 titled "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and Acceptable Reinsuring Companies."

32 52.232-4002 MANDATORY INFORMATION FOR ELECTRONIC FUNDS TRANSFER PAYMENT

1. Reference Federal Acquisition Regulation (FAR) Clause 52.232-33 "Payment by Electronic Funds Transfer--Central Contractor Registration"
2. Payment for any award resulting from this solicitation shall be made by

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Electronic Funds Transfer (EFT) after 1 June 1999.

3. The Deposit Form and Instructions required to process payments for EFT can be found at http://www.fc.usace.army.mil/Direct/dir_d.html or obtained from the Contract Specialist handling this solicitation.

4. A statement will be sent to the vendor detailing the amount and effective date of payments made by direct deposit.

5. All information on a vendor's Direct Deposit will be maintained in each Contracting Office's database; therefore, the Direct Deposit form need only be submitted once for contracts awarded by the Los Angeles District, unless the vendor is using another company name or "Doing Business As" name.

(End of Provision)

END OF SECTION 00100

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DIVISION 02 - SITE WORK

SECTION 02150

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-- End of Section Table of Contents --

SECTION 02150

CLEAR SITE AND REMOVE OBSTRUCTIONS

PART 1 GENERAL

1.1 ENVIRONMENTAL PROTECTION

All work and Contractor operations shall comply with the requirements of Sections 01130 ENVIRONMENTAL PROTECTION and 02200 EXCAVATION.

1.2 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 REQUIREMENTS

3.1.1 General

Except as otherwise specified, and/or indicated, areas to be cleared will be limited to actual excavation areas, and areas on which fills and/or structures are to be placed. The removal of trees, shrubs, turf, and other vegetation outside of these areas shall be held to a minimum and care shall be exercised not to damage any trees, shrubs, turf, or vegetation which can be left in place.

3.1.2 Existing Structures and Obstructions

The Contractor shall clear and grub the site, fill, and excavation areas, and remove and dispose of all existing structures and obstructions for project construction, except as those structures which are identified to be protected in place as shown on the drawings. Obstructions which are designed or specified to be removed but which are not designated or specified to be removed by others shall be removed by the Contractor. Except as otherwise specified, obstructions designated to be removed by others will be removed in sufficient time to preclude interference with the Contractor's operations.

3.1.3 Clearing

Trees smaller than 38 millimeters in diameter and other vegetation, except as specified, shall be cut off 0.15 meters below the indicated subgrade or ground level whichever is lower. Other vegetation shall be cut off flush or slightly below the original ground surface. Clearing operations shall be conducted so as to prevent damage to trees, structures, and installations under construction, or to remain in place, and to provide for the safety of employees and others. All rubbish, waste dumps, and debris areas shall be cleared.

3.1.4 Grubbing

Grubbing shall consist of removing all trees, stumps, roots, logs, and other objectionable vegetable matter in the required fills, foundation

areas, and all excavation areas. In grubbing out stumps and roots, all roots or other timber more than 38 millimeters in diameter shall be removed to 1 meter below the depth of the required excavation or existing ground level, whichever is lower. Trees and stumps shall be pulled, not cut off.

3.1.5 Environmental Assessment Requirements

The Contractor shall notify the contracting Officer 14 calendar days prior to start of clearing and grubbing activities in accordance with Section 01200 GENERAL REQUIREMENTS, Paragraph 3.9.5.4.

3.2 DISPOSAL OF CLEARED, GRUBBED, AND REMOVED MATERIAL

All material removed, except material specified and/or indicated to be salvaged, is designated as scrap, shall become the property of the Contractor and shall be removed from the site. Unsuitable materials from clearing operations may be temporarily used for diversion and control of water. Disposal shall be in accordance with the requirements of Section 01130 ENVIRONMENTAL PROTECTION.

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DIVISION 02 - SITE WORK

SECTION 02241

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SECTION 02241

AGGREGATE BASE COURSE

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 C 127	(1988; R 1993) Specific Gravity and Absorption of Coarse Aggregate
ASTM C 128	(1993) Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	(1989) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1995a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (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 4318	(1993) Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

1.2 DEFINITIONS

1.2.1 Aggregate Base

Aggregate base as used herein is well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction.

1.2.2 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated

hereinafter as percent laboratory maximum density.

1.3 GENERAL

The work specified herein consists of the construction of an aggregate base course. The work shall be performed in accordance with this specification and shall conform to the lines, grades, notes and typical sections shown in the plans. Sources of all materials shall be selected well in advance of the time that materials will be required in the work.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Plant, Equipment, Machines, and Tools; FIO.

List of proposed equipment to be used in performance of construction work including descriptive data.

SD-09 Reports

Sampling and Testing; FIO. Field Density; FIO.

Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 24 hours after the tests are performed. Certified copies of test results for approval not less than 30 days before material is required for the work.

SD-18 Records

Waybills and Delivery Tickets; FIO. Coarse Aggregate; FIO.

Copies of waybills and delivery tickets during the progress of the work. Certified waybills and delivery tickets for all materials actually used. A notification stating which type of coarse aggregate is to be used.

1.5 WAYBILLS AND DELIVERY TICKETS

Copies of waybills and delivery tickets shall be submitted during the progress of the work. Before the final payment is allowed, waybills and certified delivery tickets shall be furnished for all aggregates actually used in the construction.

1.6 WEATHER LIMITATIONS

Base shall not be constructed when the atmospheric temperature is less than 2 degrees C. Base shall not be constructed on subgrades that are frozen or contain frost. If the temperature falls below 2 degrees C, completed areas shall be protected against any detrimental effects of freezing.

1.7 PLANT, EQUIPMENT, MACHINES, AND TOOLS

1.7.1 General Requirements

Plant, equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in satisfactory working condition at all times. Other compacting equipment may be used in lieu of that specified, where it can be demonstrated that the results are equivalent. The equipment shall be adequate and have the capability of producing the results specified.

1.7.2 Steel-Wheeled Rollers

Steel-wheeled rollers shall be the self-propelled type weighing not less than 9 metric tons, with a minimum weight of 135 kilograms per millimeter width of rear wheel. Wheels of the rollers shall be equipped with adjustable scrapers. The use of vibratory rollers is optional.

1.7.3 Pneumatic-Tired Rollers

Pneumatic-tired rollers shall have four or more tires, each loaded to a minimum of 13,600 kilograms and inflated to a minimum pressure of 1035 kPa. The loading shall be equally distributed to all wheels, and the tires shall be uniformly inflated. Towing equipment shall also be pneumatic-tired.

1.7.4 Sprinkling Equipment

Sprinkling equipment shall consist of tank trucks, pressure distributors, or other approved equipment designed to apply controlled quantities of water uniformly over variable widths of surface.

1.7.5 Tampers

Tampers shall be of an approved mechanical type, operated by either pneumatic pressure or internal combustion, and shall have sufficient weight and striking power to produce the compaction required.

1.7.6 Straightedge

The Contractor shall furnish and maintain at the site, in good condition, one 3.05 meter straightedge for use in the testing of the finished surface. Straightedge shall be made available for Government use. Straightedges shall be constructed of aluminum or other lightweight metal and shall have blades of box or box-girder cross section with flat bottom reinforced to ensure rigidity and accuracy. Straightedges shall have handles to facilitate movement on pavement.

1.8 STOCKPILING MATERIALS

Materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at locations designated. Before stockpiling of material, storage sites shall be cleared, and sloped to drain. Materials obtained from different sources shall be stockpiled separately.

1.9 SAMPLING AND TESTING

1.9.1 General Requirements

Sampling and testing shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor. No work requiring testing shall be permitted until the facilities have been inspected and approved. The first inspection shall be at the expense of the Government.

Cost incurred for any subsequent inspection required because of failure of the facilities to pass the first inspection will be charged to the Contractor. Tests shall be performed in sufficient numbers and at the locations and times directed to insure that materials and compaction meet specified requirements. Copies of test results shall be furnished to the Contracting Officer within 24 hours of completion of tests.

1.9.2 Test Results

Results shall verify that materials comply with this specification. When a material source is changed, the new material will be tested for compliance.

When deficiencies are found, the initial analysis shall be repeated and the material already placed shall be retested to determine the extent of unacceptable material. All in-place unacceptable material shall be replaced or modified as directed by the Contracting Officer.

1.9.3 Sampling

Aggregate samples for laboratory tests shall be taken in accordance with ASTM D 75.

1.9.4 Sieve Analysis

Before starting work, at least one sample of material shall be tested in accordance with ASTM C 136 and ASTM D 422 on sieves conforming to ASTM E 11.

After the initial test, a minimum of one analysis shall be performed for each 1000 metric tons of material placed, with a minimum of three analyses for each day's run until the course is completed.

1.9.5 Liquid Limit and Plasticity Index

One liquid limit and plasticity index shall be performed for each sieve analysis. Liquid limit and plasticity index shall be in accordance with ASTM D 4318.

1.9.6 Laboratory Density

Tests shall provide a moisture-density relationship for the aggregate. Tests shall be conducted in accordance with ASTM D 1557.

1.9.7 Wear Tests

Wear tests shall be performed in accordance with ASTM C 131. One test shall be run per 1000 square meters of completed base course. A minimum of one test per aggregate source shall be run.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aggregates

Aggregates shall consist of stone, crushed stone, crushed gravel, angular sand, or other approved material. Aggregates shall be durable and sound, free from lumps of clay, organic matter, objectionable coatings, and other foreign material. Material retained on a 4.75 mm sieve shall be known as coarse aggregate and that passing the 4.75 mm sieve shall be known as binder material.

2.1.1.1 Coarse Aggregate

Only one type of coarse aggregate shall be used on the project. Coarse aggregates, consisting of angular fragments of uniform density and quality, shall have a percentage of wear not to exceed 50 percent after 500 revolutions when tested in accordance with ASTM C 131. The amount of flat and elongated particles shall not exceed 30 percent. A flat particle is one having a ratio of width to thickness greater than 3, and an elongated particle is one having a ratio of length to width greater than 3.

a. Crushed Gravel: Crushed gravel shall be manufactured from gravel particles 50 percent of which by weight are retained on the maximum size gradation sieve specified.

b. Crushed Stone: Crushed stone retained on each sieve specified shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are adjacent, the angle between the planes of the fractures must be at least 30 degrees to count as two fractured faces.

2.1.2 Binder Material

Binder material shall consist of screenings, angular sand, or other finely divided mineral matter processed or naturally combined with the coarse aggregate. Liquid-limit and plasticity-index requirements shall apply to any component that is blended to meet the required gradation and shall also apply to the completed course. The portion of any component or of the completed course passing the 0.075 mm sieve shall be either nonplastic or have a plasticity index as specified below:

Percentage by Weight Passing No. 200 Sieve	Plasticity Index Maximum
0.1 to 3.	15
3.1 to 4.	12
4.1 to 5.	9
5.1 to 8.	6
8.1 to 10.	4

2.1.3 Gradation

Requirements for gradation specified shall apply to the completed base course. The aggregates shall have a 25 millimeter (1 inch) maximum size and shall be continuously graded within the following limits:

Sieve Designation	Percentage by Weight Passing Square-mesh Sieve (a) (b)
25.0 mm	100
19.0 mm	90-100
4.75 mm	35-65
1.18 mm	15-40

Sieve Designation	Percentage by Weight Passing Square-mesh Sieve	
	(a)	(b)
0.075 mm	2-10	

(a) Particles having diameters less than 0.02 millimeter shall not be in excess of 3 percent by weight of the total sample tested.

(b) The values are based on aggregates of uniform specific gravity, and the percentages passing the various sieves are subject to appropriate correction in accordance with ASTM C 127 and ASTM C 128 when aggregates of varying specific gravities are used.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

When the base is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 OPERATION OF AGGREGATE SOURCES

Materials to be used for production of aggregates may be obtained from on-site or off-site sources. The contractor is responsible for selecting the source of materials such that all specified physical properties are met by the selected source.

3.3 PREPARATION OF UNDERLYING COURSE

3.3.1 General Requirements

Before constructing aggregate base course, the previously constructed underlying course shall be cleaned of foreign substances. Surface of underlying course shall meet the specified compaction and surface tolerances. Subgrade shall conform to Section 02250 FILLS AND SUBGRADE PREPARATION. Ruts or soft, yielding spots that may appear in the underlying course, areas having inadequate compaction, and deviations of the surface from requirements specified shall be corrected. For cohesionless underlying materials containing sands, sand gravels, or any other cohesionless material in harmful quantities, the surface shall be mechanically stabilized with aggregate prior to placement of the aggregate course. Stabilization may be accomplished by mixing base course material into the underlying course and compacting by approved methods. Properly compacted material will be considered as part of the underlying course and shall meet all requirements for the underlying course. Finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until base course is placed.

3.3.2 Grade Control

Underlying material shall be excavated to sufficient depth for the required base course thickness so that the finished base course with the subsequent surface course will meet the fixed grade. Finished and completed area shall conform to the lines, grades, cross section, and dimensions indicated.

3.4 INSTALLATION

3.4.1 Mixing and Placing

Materials shall be mixed by the stationary plant, traveling plant, or road mix method and placed in such a manner as to obtain uniformity of the aggregate base course material and at a uniform optimum water content for compaction. The Contractor shall make such adjustments in mixing or placing procedures or in equipment to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to ensure a satisfactory base course.

3.4.2 Edges of Base Course

Approved material shall be placed along edges of aggregate base course in such quantities as will compact to thickness of the course being constructed, or to the thickness of each layer in a multiple layer course, allowing in each operation at least a 300 mm width of the shoulder to be rolled and compacted simultaneously with rolling and compacting of each layer of base course.

3.4.3 Compaction

Each layer of aggregate base course including shoulders shall be compacted. Water content shall be maintained at optimum. Density of compacted mixture shall be at least 100 percent of laboratory maximum density. **Where aggregate base course is used as structural foundation material and other areas as required, the density of compacted mixture shall be at least 95 percent of laboratory maximum density.** Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. Areas inaccessible to the rollers shall be compacted with mechanical tampers, and shall be shaped and finished by hand methods.

3.4.4 Layer Thickness

Compacted thickness of the aggregate course shall be as indicated. No layer shall be in excess of 200 mm nor less than 75 mm in compacted thickness.

3.4.5 Finishing

The surface of the top layer shall be finished to grade and cross section shown. Finished surface shall be of uniform texture. Light blading during compaction may be necessary for the finished surface to conform to the lines, grades, and cross sections. Should the surface for any reason become rough, corrugated, uneven in texture, or traffic marked prior to completion, such unsatisfactory portion shall be scarified, reworked, recompacted, or replaced as directed.

3.4.5.1 Smoothness

Surface of each layer shall show no deviations in excess of 9.5 mm when tested with the 3.05 meter straightedge. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting, as directed.

3.4.5.2 Thickness Control

Compacted thickness of the base course shall be within 12.7 mm of the thickness indicated. Where the measured thickness is more than 12.7 mm deficient, such areas shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 12.7 mm thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 7 mm of the thickness indicated.

3.5 FIELD QUALITY CONTROL

3.5.1 Field Density

Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2167. Calibration curves and calibration test results shall be furnished within 24 hours of the conclusion of the tests. At least one field density test shall be performed for each 1000 square meters (yards) of each layer of base material.

3.5.2 Smoothness

Measurements for deviation from grade and cross section shown shall be taken in successive positions parallel to the road centerline with a 3.05 meter straightedge. Measurements shall also be taken perpendicular to the road centerline at 15 meter intervals.

3.5.3 Thickness

Thickness of the base course shall be measured at intervals in such a manner as to ensure one measurement for each 500 square meters of base course. Measurements shall be made in 75 mm diameter test holes penetrating the base course.

3.6 TRAFFIC

Completed portions of the area may be opened to traffic, provided there is no marring or distorting of the surface by the traffic. Heavy equipment shall not be permitted except when necessary to construction, and then the area shall be protected against marring or damage to the completed work.

3.7 MAINTENANCE

The aggregate base course shall be maintained in a satisfactory condition until accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact.

3.8 DISPOSAL OF UNSATISFACTORY MATERIALS

Removed in-place materials that are unsuitable for the base course material that is removed for the required correction of defective areas, and waste material and debris shall be disposed of as directed.

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SECTION 02250

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SECTION 02250

FILLS AND SUBGRADE PREPARATION

1.1 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 D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft ³ (2,700 kN-m/m))
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil, and Rock
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

1.1 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES.

SD-01 Data

Moisture-density relations; GA.

Moisture-density relations shall be determined by the Contractor, in accordance with the requirements in paragraph LABORATORY CONTROL.

Survey Data; FIO.

The settlement monument survey data shall be provided to the Contracting Officer for review to determine the need for further, in accordance with the requirements in paragraph SETTLEMENT MONITORING.

SD-04 Drawings

Settlement Monument Plan; FIO.

The settlement monument plan along with the plan to protect the monument during construction shall be provided by the Contractor as required in paragraph SETTLEMENT MONITORING.

SD-09 Reports

Field Density Tests; FIO.

Field density tests shall be performed by the Contractor. The Contractor shall submit reports as required in paragraph CONTROL.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 COMPACTION EQUIPMENT

Compaction shall be accomplished by tamping roller, rubber tired roller vibratory compactor or mechanical tampers. All equipment, tools, and machines shall be maintained in satisfactory working condition at all times. Compaction equipment shall be suitable for consistently producing uniform soil densities.

3.2 GENERAL REQUIREMENTS FOR COMPACTED FILLS AND COMPACTED BACKFILLS

3.2.1 Control

Moisture-density relations shall be established by the Contractor. The soil used for each maximum density test shall be classified in accordance with ASTM D 2487 and shall include a particle size analysis in accordance with ASTM D 422. At least one five point maximum density test shall be made for every 10 field density tests. Field density tests shall be performed by the Contractor at the frequency established in paragraph FIELD CONTROL, and in such locations to insure that the specified density is being obtained. Moisture-density relations and field densities shall be reported on approved forms. One copy of density data less dry weight determinations shall be provided on the day each test is taken. The completed test reports shall be provided with the Contractor Quality Control Report on the work day following the test.

3.2.1.1 Laboratory Control

Moisture-density relations shall be established by the Contractor. One moisture-density relation shall be made for each classification, blend or change in classification of soil materials encountered. Approval of moisture-density relations shall be obtained prior to the compacting of any material in the work. The moisture-density relations shall be determined in a laboratory in accordance with ASTM D 1557.

- a. The desired amount of mixing water will be added for each compaction test specimen, mixed well, and the mixture will be placed in a container with an airtight cover and allowed to cure for 24 hours. A shorter curing time may be allowed where tests show that shortening the curing time will not affect the results.

3.2.1.2 Field Control

Field in-place density shall be determined in accordance with ASTM D 1556. The field moisture content shall be determined in accordance with ASTM D

2216. Determination of in-place densities using the nuclear method (ASTM D 2922) may be used to supplement the sand cone density tests (ASTM D 1556). When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. At least one adjacent sand cone test shall be performed for every five nuclear density tests performed. If field density tests determined by the nuclear method vary by more than 0.5 kilonewtons per cubic meter from comparison sand-cone tests, and are consistently high or low, adjustment of the calibration curve is necessary.

a. In-Place Densities

(1) One test per 750 cubic meters, for the first 7,500 cubic meters of material and one test for each 1,500 cubic meters thereafter, or fraction thereof, shall be made of each lift of fill or backfill areas compacted by other than hand-operated machines. At least one test shall be made in each 0.6 meter layer of compacted fill or backfill processed as a unit and not less than one test shall be made in each area.

(2) One test per 400 cubic meters, or fraction thereof, shall be made of each lift of fill or backfill areas compacted by hand-operated machines.

3.2.1.2.1 Test Logs

The Contractors CQC shall maintain a log of all tests which will be updated and submitted to the Contracting Officer on a weekly basis. The test log shall include: Test number (if retest, shall include retest number), date, feature of work, station and offset, weight of wet soil, weight of dry soil, percent of compaction, optimum moisture content, maximum dry unit weight, soil classification, in-place density test methods either sand-cone or nuclear densimeter.

3.3 Settling of Fills or Backfills with Water

Settling of fills or backfills with water will not be permitted.

3.4 Fill Material

Fill material shall be obtained from the basin excavation, foundation excavation or stockpiles. Materials considered unsatisfactory for use as compacted fill include but are not limited to those materials containing roots and other organic matter, trash, debris, oversize chunks or clumps of cemented material. Fill material shall contain no stone whose greatest dimension is more than 3/4 the lift thickness. The contractor shall be expected to break-down, crush, or otherwise process the excavated material for use as fill material due to the cementation of in-situ soil. Materials classified in ASTM D 2487 as MH, CH, Pt, OH, and OL are also considered unsuitable for use as compacted fill. **Material for compacted fill behind concrete structures shall contain less than 30 percent by weight passing the 0.075 mm sieve and shall contain no stone larger than 75 millimeters.**

3.5 Placement

Fill material shall not be placed against concrete which has not been in place at least 14 days or until the concrete has attained a strength of 17.2 megapascals when tested in accordance with the Section 03301

CAST-IN-PLACE STRUCTURAL CONCRETE. Heavy equipment shall not be operated over pipes and buried structures until at least 0.6 meters of fill material has been placed and compacted over them. Material from the top of the pipe or buried structure to 0.6 meters above pipe or buried structure shall be compacted by mechanical tampers or other equipment approved by the Contracting Officer. Compacted fill and backfill shall be placed with suitable equipment in horizontal layers which before compaction, shall not exceed 0.3 meters in depth for rubber-tired or vibratory rollers, 0.2 meters in depth for tamping rollers, and 0.1 meters in depth when mechanical tampers are used. The Contractor may vary the layer thickness within these limits for most efficient operations. Material containing stones shall be placed in a manner to prevent the stones from striking the concrete structures and to prevent the formation of voids.

3.6 Moisture Content

Material shall have a uniform moisture content while being placed and compacted. Water shall be added at the source, if required, or by sprinkling each layer of material during placement. Uniform distribution of moisture shall be obtained by disking, harrowing, or otherwise manipulating the soil during and after time water is added. Material containing an excess of moisture shall be manipulated with suitable implements to facilitate maximum aeration and shall be permitted to dry to the proper consistency before being compacted. Fill shall have a maximum moisture content of not more than 2 percent above optimum and a minimum moisture content of not less than 2 percent below optimum.

3.7 Compaction

No layer of fill shall be compacted before the practicable uniform moisture content has been obtained. Scarified areas shall be compacted as specified for the fill placed thereon. Rollers will not be permitted to operate within 0.3 meters of outlet conduit or structure walls or over buried structures until the compacted fill over the top of the structures has reached a depth of 0.6 meters. Compaction equipment shall be so operated that structures are not damaged nor overstressed during compaction operations. Mechanical tampers shall be used for compaction of fill material adjacent to structures where rolling equipment is impracticable for use in compaction.

3.8 COMPACTED FILL

3.8.1 Dam Embankment

3.8.1.1 Preparation for Placing

Before placing material for dam embankment, the foundation surface shall be cleared of all existing obstructions, vegetation and debris. Within the dam embankment footprint, the following shall be removed: (1) the upper 1.5 meters of foundation soil within the footprint of dam embankment within the main and tributary washes, (2) the upper 0.610 meters of foundation soil within the footprint of the dam embankment outside of the main and tributary washes', (3) material shall be removed in accordance with Section 02150 CLEAR SITE AND REMOVE OBSTRUCTIONS and Section 02200 EXCAVATION. The inspection trench and the banks of the existing wash shall be excavated as shown on the plans and in accordance with Section 02200 EXCAVATION. Unsuitable or unstable (too wet) material not meeting the requirements for fill material shall be removed where directed. **The existing surfaces, including the excavated inspection trench and banks and the areas beneath**

the outlet and basin bypass conduits within the footprint of the dam embankment, shall be scarified to a depth of 0.15 meters and proofrolled by four passes of the compaction equipment before placing the fill. Sloped ground surfaces steeper than one vertical to four horizontal, on which fill or compacted backfill is to be placed, shall be stepped in such a manner that the compaction equipment will bear on the full depth of the layer.

3.8.1.2 Compaction

Each layer of the materials shall be compacted to not less than 95 percent of maximum density, per ASTM D 1557.

3.8.1.3 Settlement

The Contractor shall delay RCC placement between STA 2+10.903 and STA 7+69.097 for a maximum settlement period of 60 days after embankment in that area reaches full height in order to monitor anticipated settlement of the embankment. The Contractor shall install three surface settlement monuments at STA 4+00.000, STA.5+00.000, and STA.7+00.000; the location with respect to the dam centerline will be determined by the Contracting Officer.

3.8.1.4 Settlement Monitoring

The monuments shall be surveyed by the Contractor within 24 hours of installation and the elevation surveyed on a weekly basis. The survey data shall be provided to the Contracting Officer for review to determine the need for further monitoring. If the survey data indicates there is inconsequential settlement, the Contracting Officer may approve RCC placement between STA 2+10.903 and STA 7+69.097 before the 60 day settlement period expires. A settlement monument plan including typical details of the surface settlement monuments along with the plan to protect the monument during construction shall be provided by the Contractor for review not less than 14 calendar days prior to installation of the monument.

3.8.1.5 Settlement Monument Protection Plan

The location of the settlement monument shall be clearly marked and readily visible (red flagged) to equipment operators. In the event of damage to settlement monument or extension resulting from equipment operating within the specified area, the Contractor shall immediately notify the Contracting Officer and shall be responsible for restoring the settlement monument to working order.

3.8.1.6 Regrading of Embankment Crest

If the dam embankment crest settles as anticipated, the embankment shall be regraded to the lines and grades indicated after the settlement period is completed.

3.8.2 Compacted Fill, Basin

3.8.2.1 Preparation for Placing

The foundation for the compacted fill to be placed in the basin, compacted fill for the outlet conduit and compacted fill for the basin bypass conduit shall be cleared of all existing obstructions, vegetation and debris. Any trash or debris shall be removed in accordance with Section 02150 CLEAR SITE AND REMOVE OBSTRUCTIONS and Section 02200 EXCAVATION. Unsuitable or

unstable (too wet) material not meeting the requirements for fill material shall be removed where directed. The existing surfaces for the compacted fill in the basin shall be proofrolled by four passes of the compaction equipment. The subgrade for the outlet conduit and basin bypass conduit shall be prepared in accordance with paragraph: Subgrade Preparation. Material for compacted fill behind the outlet conduit walls and cut slopes and up to 0.60 meters above the top of conduit shall contain less than 30 percent by weight passing the 0.075 mm sieve and shall contain no stone larger than 75 millimeters.

3.8.2.2 Limitations on Equipment

The gross weight of any piece of equipment, or the combined weight of any combinations of equipment coupled together, used to place, moisten and/or compact fill behind and within 1.2 meters of outlet conduit walls shall not exceed 16 000 kilograms, including dynamic forces produced by vibratory equipment. Equipment used to compact the fill behind the outlet and basin bypass conduit walls shall be of such size as to be capable of operating in the area between the cut slope and the wall.

3.8.2.3 Compaction

Each layer of fill behind the outlet conduit and basin bypass conduit walls and below the invert slabs through the dam embankment shall be compacted to not less than 95 percent of maximum density, per ASTM D 1557. Trench backfill around the basin by-pass conduit outside the dam embankment and fill placed in the basin shall be compacted to not less than 90 percent of maximum density, per ASTM D 1557.

3.8.3 Filter Material

3.8.3.1 Preparation for Placing

Foundation for the filter material shall be cleared of all existing obstructions, vegetation and debris. Any trash or debris shall be removed in accordance with Section 02150 CLEAR SITE AND REMOVE OBSTRUCTIONS and Section 02200 EXCAVATION. Unsuitable or unstable (too wet) material not meeting the requirements for fill material shall be removed where directed.

The existing surfaces shall be scarified to a depth of 0.15 meters and proofrolled by four passes of the compaction equipment before placing the filter material. The subgrade for Filter Material shall be prepared in accordance with paragraph SUBGRADE PREPARATION.

3.8.3.2 Material

Filter material shall be processed from materials obtained from the required excavations or may be obtained from commercial sources. Filter material gradation shall be in accordance with SECTION 02710 SUBDRAINAGE SYSTEM.

3.8.3.3 Placement and Compaction

Filter material shall be spread by motor graders or other approved means in approximately horizontal layers to the lines and grades indicated on the plans, the thickness of the layers before compaction shall not be more than 0.3 meters, the entire surface of the layer shall be compacted by not less than four complete passes of the 9-ton vibratory roller. Each trip of the roller shall overlap the adjacent trip not less than 0.3 meters. The finished surface of the filter material shall not vary more than 12.5

millimeters above or below the indicated grades.

3.8.4 Drain Material

3.8.4.1 Material

Drain material shall be processed from materials obtained from the required excavations or may be obtained from commercial sources. Filter material gradation shall be in accordance with SECTION 02710 SUBDRAINAGE SYSTEM.

3.8.4.2 Placement and Compaction

Drain materials shall be spread over the filter material by motor graders or other approved means in approximately horizontal layers to the lines and grades indicated on the plans, the thickness of the layers before compaction shall not be more than 0.3 meters, the entire surface of the layer shall be compacted by not less than 4 complete passes of the 9-ton vibratory roller. Each trip of the roller shall overlap the adjacent trip not less than 0.3 meters. **Mechanical tampers shall be used for compaction of Drain materials over and adjacent to the drainage conduits.** The finished surface of the drain material layers shall not vary more than 12.5 millimeters above or below the indicated grades.

3.9 BACKFILL

3.9.1 Structural Backfill

3.9.1.1 Location

Structural backfill shall consist of all fill against and/or around concrete structures.

3.9.1.2 Material

Structural backfill material shall be obtained from the required excavation as approved by the Contracting Officer. In general, the best material available will be designated as backfill and fill about structures. Backfill may consist of sand, gravelly sand, and silty sands. Organic material, silt, clay, broken concrete or pavement, boulders and other objectionable material shall not be used. Backfill for structures shall not contain any stones larger than 75 millimeters.

3.9.1.3 Placing

Structural backfill material shall not be placed against concrete which has not been in place at least 14 days or until the concrete has attained a strength of 17.2 megapascals when tested in accordance with Section 03301 CAST-IN PLACE STRUCTURAL CONCRETE. Backfill shall be placed in 0.1 meter layers.

3.9.1.4 Compaction

Compaction shall be not less than 95 percent of maximum density, per ASTM D 1557.

3.10 BACKFILL, TOE

Backfill, Toe shall consist of suitable material from the required excavation. Stone with a maximum size of 0.2 meters may be used. Nesting

of material shall be avoided. Broken concrete, asphalt, or chunks of cemented material shall not be permitted. Stones larger than 0.1 meters in the backfill shall not be allowed within 0.3 meters of the roller compacted concrete surface. Compaction of backfill, toe will not be required other than that obtained by the controlled movement of construction equipment.

3.11 SUBGRADE PREPARATION

Subgrade preparation shall include subgrade preparation for the outlet works conduit, basin bypass conduit, and for areas to receive aggregate base course paving for access roads, maintenance roads and turnarounds. All trash and debris shall be removed in accordance with Section 02150 CLEAR SITE AND REMOVE OBSTRUCTIONS and Section 02200 EXCAVATION. After the outlet conduit has been excavated to rough grade, the entire subgrade for the outlet conduit invert, bypass conduit invert and other area indicated above shall be moisture conditioned and proofrolled by 4 passes of the compaction equipment and trimmed to a uniform grade and smoothed with a steel-wheeled roller to make the subgrade ready to receive concrete. If the subgrade is disturbed by the Contractor's operations or is overexcavated, or is soft or yielding, the subgrade shall be restored to grade and compacted to a density of 95 percent of maximum density, per ASTM D 1557. The finished surface of the subgrade shall not be more than 12.5 millimeters from the indicated grade at any point when tested with a 3 meter straightedge.

3.12 SOIL STABILIZER

Soil Stabilizer shall be placed on all exposed excavation and fill surfaces after construction is completed. The soil stabilizer shall be a mixture of plaster and natural cellulose fiber mulch. The cellulose fiber mulch shall be produced from grinding clean, whole wood chips, or fiber produced from ground newsprint with a labeled ash content not to exceed 7 percent. The plaster shall consist of natural occurring high purity processed gypsum and additives. The gypsum shall be produced from a mined or quarried source. The gypsum shall be processed to be composed of a crushed, dry calcium sulfate hemihydrate having a purity of not less than 88 percent. The gypsum and additives shall be furnished either in bags or bulk and be accompanied by bills of lading and shipping invoices. The shipping invoices for the gypsum shall state the gypsum's purity content, dry weight, and source of manufacture. Processed gypsum which has become partially air set, lumpy or caked shall not be used. The plaster/cellulose fiber mulch shall be applied at a rate of 6.725 tonnes of plaster mixed with 2.242 tonnes of fiber per hectare. The plaster/cellulose fiber mulch stabilizer shall formulate a protective crust-like barrier within 4 to 8 hours after application. Application of the plaster/cellulose fiber mulch stabilizer will not be permitted when weather conditions are unsuitable for concrete placement in accordance with Section 03301 CAST-IN-PLACE STRUCTURAL CONCRETE.

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SECTION 03360

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SECTION 03360

ROLLER-COMPACTED CONCRETE (RCC)

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.

ACI INTERNATIONAL (ACI)

- ACI 305R (1991) Hot Weather Concreting
ACI 347R (1994) Guide to Formwork for Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM C 33 (1993) Concrete Aggregates
ASTM C 117 (1990) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131 (1989) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136 (1995a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 150 (1995) Portland Cement
ASTM C 171 (1992) Sheet Materials for Curing Concrete
ASTM C 172 (1990a) Sampling Freshly Mixed Concrete
ASTM C 174 (1987; R 1991) Measuring Length of Drilled Concrete Cores
ASTM C 566 (1989) Total Moisture Content of Aggregate by Drying
ASTM C 618 (1994a) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C 1040 (1993) Density of Unhardened and Hardened Concrete in Place by Nuclear Methods
ASTM D 1556 (1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557 (1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/cu.m.)

ASTM D 3017	(1991) Water Content of Soil and Rock in Place By Nuclear Method (Shallow Depth)
ASTM D 4318	(1993) Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D 4791	(1995) Flat or Elongated Particles in Coarse Aggregate

CORPS OF ENGINEERS (COE)

COE CRD-C 53	(1991a) Consistency of No-Slump Concrete Using the Modified Vebe Apparatus
COE CRD-C 55	(1991) Within-Batch Uniformity of Freshly Mixed Concrete
COE CRD-C 100	(1975) Method of Sampling Concrete Aggregate and Aggregate Sources, and Selection of Material for Testing
COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete

FEDERAL SPECIFICATIONS (FS)

FS CCC-C-467	(Rev C) Cloth, Burlap, Jute or Kenaf
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NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44	(1994) NIST Handbook 44: Specifications, Tolerances, and other Technical Requirements for Weighing and Measuring Devices
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NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100	(1990) Concrete Plant Standards
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STATE OF NEVADA, DEPARTMENT OF TRANSPORTATION,
MATERIALS TESTING DIVISION (NDOT)

NDOT T230C	(Rev C) Method of Test for Determining the Percent of Fractured Faces
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1.2 PRECONSTRUCTION TESTING AND MIXTURE-PROPORTIONING STUDIES

1.2.1 RCC Aggregate Sampling and Testing

The aggregate sources listed in Section 03301 paragraph CONCRETE AGGREGATE SOURCES have been tested and at the time testing was performed were capable of producing materials of a quality required for this project. Samples from any **off-site** source selected, whether listed or not listed, consisting of not less than 70 kilograms of each size of coarse aggregate and 35 kilograms of fine aggregate, and taken under the supervision of the Contracting Officer in accordance with COE CRD-C 100 shall be delivered to a local materials testing laboratory selected by the Government within 15 days after Notice to Proceed. **Should the Contractor elect to use on-site**

material, sampling and testing of the material shall not occur until at least 50 percent of the RCC aggregate is produced. Samples shall be taken under the supervision of the Contracting Officer in accordance with COE CRD-C 100 and shall be delivered to a local materials testing laboratory selected by the Government within 45 days after Notice to Proceed. Quantities of materials required shall be determined by the Government. Sampling, shipment, and testing of samples shall be at the Contractor's expense. Sixty (60) days will be required to complete evaluation of the aggregates. All quality assurance testing will be performed by the Government in accordance with the applicable COE CRD-C or ASTM test methods. Tests to which aggregate may be subjected are specific gravity, absorption, soft particles, L.A. abrasion, and any test necessary to demonstrate that the aggregate is of a quality that is at least equivalent to those sources listed herein and meeting the requirements of ASTM C33. The Government test data and other information on aggregate quality of those **off-site** sources listed in Section 03301 paragraph CONCRETE AGGREGATE SOURCES are included in the Design Memorandum and are available for review in the district office. Quality assurance testing of aggregates by the Government does not relieve the Contractor of quality control requirements.

1.2.2 Cementitious Materials and Admixtures

At least 60 days in advance of submitting samples for mixture proportioning studies, the Contractor shall notify the Contracting Officer of the source, brand name, type, and quantity of all materials (other than aggregates) to be used in the manufacture and curing of the concrete.

1.2.3 Materials for RCC Mixture-Proportioning Studies

At least 60 days in advance of the time when placing of concrete is expected to begin, samples of representative materials proposed for this project and meeting all the requirements of this specification shall be delivered to the laboratory listed below by the Contractor at his expense.

US Army Engineer Waterways Experiment Station
 Structures Laboratory, Concrete Division
 3909 Halls Ferry Road
 Vicksburg, MS 39180

Samples of aggregates shall be taken under the supervision of the Contracting Officer in accordance with COE CRD-C 100, accompanied by test reports indicating conformance with grading and quality requirements specified. Samples of materials other than aggregates shall be representative of those proposed for the project and shall be submitted accompanied by manufacturer's test reports indicating compliance with applicable specified requirements. Quantities of materials required shall be as follows:

MATERIAL	QUANTITY
Aggregate	2,000 kgs
Cement	400 kgs
Pozzolan	200 kgs
Washed Concrete Sand	300 kgs

Mixture-proportioning studies will be made by the Government at its expense.

1.3 TESTING DURING CONSTRUCTION BY THE GOVERNMENT

1.3.1 General

The Government will sample and test cementitious materials, admixtures, aggregates, and concrete during construction as considered appropriate to determine compliance with the specifications. The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples. Samples of aggregates will be obtained at the point of batching in accordance with COE CRD-C 100. Consistency of the RCC will be determined by the Government using the modified Vebe apparatus in accordance with paragraph CONSISTENCY OF RCC. Compression test specimens of **batch RCC mixture and in-place RCC** will be made and tested by the Government. Density of the compacted RCC will be checked by the Government as considered appropriate.

1.3.2 Aggregates Sampling and Testing

Testing performed by the Government will not relieve the Contractor of his responsibility for testing under paragraph CONTRACTOR QUALITY CONTROL. During construction, aggregates will be sampled for acceptance testing as delivered to the mixer to determine compliance with specification provisions. The Contractor shall provide necessary facilities and labor for the ready procurement of representative samples under Government supervision. The Government will test such samples at its expense using the specified COE CRD-C and ASTM methods.

1.3.3 Cementitious Materials

Cement or pozzolan will be sampled at the mill, shipping point, or site of the work by the Government. A list of prequalified cement sources and prequalified pozzolan sources is available from the Commander and Director, U.S. Army Engineer Waterways Experiment Station (CEWES-SC-MP), 3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199. If tests prove that a material which has been delivered is unsatisfactory, it shall be promptly removed from the site of the work. Cementitious materials that have not been used within 6 months after being tested will be retested by the Government at the expense of the Contractor when directed by the Contracting Officer.

1.3.4 Prequalified Cement Sources

Cement shall be delivered and used directly from a mill of a producer designated as a prequalified source for the type of cement being used. Samples of cement for quality-assurance testing will be taken at the project site or cement-producing plant by the Contracting Officer for testing at the expense of the Government. A copy of the mill tests from the cement manufacturer shall be furnished for each lot.

1.3.5 Prequalified Pozzolan Sources

Pozzolan shall be delivered and used directly from a producer designated as a prequalified source. Samples of pozzolan for check testing will be taken at the project site by the Contracting Officer for testing at the expense of the Government. A copy of the test results from the pozzolan manufacturer shall be furnished for each lot.

1.3.6 Nonprequalified Cement Sources

Cement, if not from a prequalified source, will be sampled and tested by or under the supervision of the Government and at its expense. No cement shall be used until notice has been given by the Contracting Officer that test results are satisfactory. In the event of failure, the cement may be resampled and tested at the request of the Contractor and at the Contractor's expense. The fill gate or gates of the sampled bin will be sealed and kept sealed until shipment from the bin has been completed. Sealing of the fill gate or gates and of conveyances used in shipment will be done by or under the supervision of the Government. Conveyances will not be accepted at the site of the work unless received with all seals intact. If tested cement is rehandled at transfer points, the extra cost of inspection will be at the Contractor's expense. The cost of testing cement excess to project requirements will also be at the Contractor's expense and will be deducted from payments due the Contractor at a rate of **\$1750 per test**.

1.3.7 Nonprequalified Pozzolan Sources

Pozzolan, if not from a prequalified source, will be sampled at the source or at the site of the work and will be stored in sealed bins pending completion of acceptance tests. Pozzolan may be resampled at the site when determined necessary. All sampling and testing will be performed by and at the expense of the Government. Release for shipment and approval for use will be based on compliance with 7-day lime-pozzolan strength requirements and other physical, chemical, and uniformity requirements for which tests can be completed by the time the 7-day lime-pozzolan strength test is completed. Release for shipment and approval for use on this basis will be contingent on continuing compliance with the other requirements of the specifications. If test results of a bin fail, the contents may be resampled and tested at the Contractor's expense. The Government will supervise or perform the unsealing and resealing of bins and shipping conveyances. If tested pozzolan is rehandled at transfer points, the extra cost of inspection will be at the Contractor's expense. The cost of testing excess pozzolan in excess of project requirements will be at the Contractor's expense at a rate of **\$1650 per test**. The amount will be deducted from payment to the Contractor.

1.4 CONSTRUCTION TOLERANCES

1.4.1 General

Except as supplemented or modified below, tolerances shall be as required in SECTION 03301.

- a. The thickness of compacted lifts of RCC shall be within plus or minus 50 mm of that specified.
- b. The elevation of the surfaces of RCC lifts upon which subsequent RCC or conventional concrete is placed shall not vary more than 150 mm from the design elevation, except that the elevation of the top three lifts of the dam shall be within 60 mm of that shown.
- c. The allowable variation from lines and grades of the step face (measured in any direction) shall be minus zero (0) (no under build allowed) and plus 50 mm.**
- d. Tolerances for exposed surfaces of spillway ogee concrete and any other conventional concrete that interfaces with the RCC shall be in accordance with SECTION 03301.

1.5 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Batch Plant; GA.

Details and data on the concrete plant shall be submitted prior to plant assembly for review by the Contracting Officer for conformance with the requirements of paragraph BATCH PLANT. Final acceptance of any piece of plant is subject to satisfactory performance during operations.

Mixers; GA.

The make, type, capacity, and number of the concrete mixers proposed for use shall be submitted, prior to installation, for review by the Contracting Officer for conformance with the requirements of paragraph MIXERS.

Transporting and Conveying Equipment; FIO. Spreading and Remixing Equipment ; FIO. Compaction Equipment; GA.

A listing of the equipment proposed for transporting, handling, depositing, spreading, and compacting the concrete shall be submitted for review by the Contracting Officer before concrete placement begins. The data submitted shall include site drawings or sketches with locations of equipment and placement site.

SD-08 Statements

Aggregate and Concrete Production; GA.

Descriptions and details for all methods and operations proposed for aggregate and concrete operations including daily and weekly production rates, shall be submitted for review and approval for conformance with specifications.

Joint Cleanup and Waste Disposal; FIO.

The method and equipment proposed for joint cleanup and waste disposal shall be submitted for review by the Contracting Officer before concrete placement begins for conformance with paragraph JOINTS.

Curing; GA.

The curing media and methods to be used shall be submitted for review to the Contracting Officer before concrete placement begins for conformance with paragraph CURING AND PROTECTION.

Vertical Facings; FIO.

Details of the Contractors construction methods and equipment shall be submitted for review within 60 days after Notice to Proceed.

1.6 MATERIAL DELIVERY, STORAGE, AND HANDLING

1.6.1 Cementitious Materials

1.6.1.1 Transportation

When bulk cement or pozzolan is not unloaded from primary carriers directly into weather-tight hoppers at the batching plant, transportation from the railhead, mill, or intermediate storage to the batching plant shall be accomplished in adequately designed weather-tight trucks, conveyors, or other means that will protect the material from exposure to moisture.

1.6.1.2 Storage

Cementitious materials shall be furnished in bulk. Immediately upon receipt at the site of the work, all cementitious materials shall be stored in a dry, weather-tight, and properly ventilated structure. All storage facilities shall permit easy access for inspection and identification. Sufficient materials shall be in storage for at least two operating days to sustain continuous operation of the mixing plant while the RCC is being placed. In order that cement may not become unduly aged after delivery, the Contractor shall use any cement that has been stored at the site for 60 days or more before using cement of lesser age.

1.6.2 Aggregate Storage

Fine aggregate and each size of coarse aggregate shall be stored in separate size groups, in free-draining stockpiles, adjacent to the batch plant and in such a manner as to prevent the intermingling of size groups or the inclusion of foreign materials in the aggregate. Aggregate shall remain in free-draining storage for at least 24 hours immediately prior to use. Sufficient fine and coarse aggregate shall be maintained at the site at all times to permit continuous uninterrupted RCC placement.

PART 2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

2.1.1 Portland Cement

Portland cement shall conform to ASTM C 150, Type V, low alkali.

2.1.2 Pozzolan

Pozzolan shall conform to ASTM C 618, Class F, with loss on ignition limited to 6 percent.

2.1.3 Temperature of Cementitious Materials

The temperature of the cementitious materials as delivered to the site shall not exceed 65 degrees C.

2.2 CURING MATERIALS

Burlap shall conform to FS CCC-C-467

2.3 WATER

Water for washing aggregates and for mixing and curing concrete shall be

free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances and shall comply with COE CRD-C 400.

2.4 AGGREGATES

2.4.1 Source of Materials

Borrow materials for production of RCC aggregates may be obtained from the required excavation or from off-site sources. The contractor shall make all arrangements, and secure all necessary permits for the procurement, furnishing and transporting aggregates from off-site sources.

2.4.2 Particle Shape

The shape of the particles of the fine aggregate and of the coarse aggregate shall be generally spherical or cubical. The quantity of flat and elongated particles at a length-to-width or width-to-thickness ratio greater than 3 in the separated size groups of coarse aggregate, as defined and determined by ASTM D 4791, shall not exceed 25 percent in any size group.

2.4.3 Deleterious Substances

The maximum plasticity index for RCC aggregate materials shall be limited to 3 when determined in accordance with ASTM D 4318.

2.4.4 Resistance to Abrasion

Coarse aggregate, used in production of RCC, shall not show more than 45 percent loss after 500 revolutions when tested in accordance with ASTM C 131.

2.4.5 Fractured Faces

Coarse aggregate, used in production of RCC, will have a minimum 50 percent fractured faces when tested in accordance with NDOT T230C.

2.4.6 Aggregate Gradation

Aggregate samples will be prepared for RCC mix design studies. The Government will use the specified gradations for use in preparation of mixture proportioning studies.

2.4.6.1 RCC Gradation

The aggregate base to be used for RCC construction, when tested in accordance with ASTM C 117 and ASTM C 136, shall conform to the gradation indicated below:

Standard Sieve Size	Percent Passing by Weight
25 mm	100
19 mm	90 - 100
4.75 mm	35 - 65
1.18 mm	15 - 40
0.075 mm	2 - 10

2.5 RCC MIXTURE PROPORTIONING

2.5.1 Composition

RCC mixture will be proportioned by the Contracting Officer. RCC shall be composed of cementitious materials, water, aggregates. **The cementitious material shall be portland cement, or portland cement in combination with pozzolan.**

2.5.2 Proportions

The proportions of all materials entering the RCC, as determined from the mixture proportioning studies, will be furnished to the Contractor by the Contracting Officer. The mixture proportions shall be changed by the Contractor during construction as directed by the Contracting Officer's representative. Adjustments will be made to the batch weights including cement, pozzolan, and water to maintain the necessary consistency to prevent segregation within the RCC and allow full compaction as determined.

Frequent changes to the batch weights shall be considered usual and can be expected to occur frequently during the course of each day's placement depending on such variables as humidity, wind velocity, temperature, and cloud cover. Such changes will be as directed. The Contractor will be responsible for adjusting the aggregate weights to compensate for changes in aggregate moisture contents.

2.5.3 Cementitious Material Content

The total cementitious material content of the RCC will range from an approximate minimum of 150 to an approximate maximum of 250 kilograms per cubic meter, expressed as equivalent portland cement content (by absolute volume). If the contractor elects to use a pozzolan, it shall be furnished and will be proportioned to be between fifteen and thirty percent by absolute volume of the total cementitious material.

2.5.4 Consistency of RCC

The Contracting Officer will determine at the placement site on a continuing basis the proper consistency necessary for adequate hauling, spreading, and compacting and will direct all necessary changes to achieve the proper RCC consistency. Changes will be directed based on visual examination of the RCC during the spreading and compaction process and on the Vebe time when it varies outside the range considered ideal for compaction, as determined by the Government using the modified Vebe apparatus, in accordance with COE CRD-C 53.

2.6 BEDDING MORTAR

2.6.1 General

Bedding mortar is to be used for achieving bond between RCC lifts as indicated in paragraph JOINTS. No surfaces to receive a bedding mortar shall be covered with RCC until the prepared surface has been approved and that acceptance has been recorded on an approved checkout form. In no case will the bedding mortar be allowed to dry from the sun and wind.

2.6.2 Bedding Mortar Mix

The bedding mortar mix design will be developed by the government and will conform to the following general requirements. Aggregate for bedding mortar shall conform to the requirements of ASTM C 33, for washed concrete

sand.

Parameter

Slump	200-250 mm
Cement Content	250-300 kg/m ³
Minimum Compressive Strength	15 Mpa (28 days)

2.6.3 Installation

Bedding mortar shall be spread over the lift joint and other horizontal contact surfaces before placement of the next RCC lift. The bedding mortar shall be spread so that the maximum thickness of bedding does not exceed 12 mm, and the average thickness determined by dividing the volume used by the area covered is approximately 6 mm. Bedding mortar placements shall be controlled to prevent bleeding of the mortar through the RCC. The bedding mortar shall be covered with the designated RCC mix within **15 minutes** after placement of the bedding mortar. Consolidation of the bedding mortar will not be required. Serrated rakes creating small windrows of mortar or other approved devices shall be used for mortar application.

PART 3 EXECUTION

3.1 STOCKPILING OF MATERIAL

3.1.1 General

Whether obtained from the required excavation or off-site commercial sources, aggregates shall not be transported directly to the mixing plant. The aggregates shall be stockpiled on firm ground drained and leveled, free of debris, trash, organic materials, and other objectionable or deleterious material. Stockpiles shall be constructed in layers not exceeding 1 meter in thickness. Ramps formed for the construction of stockpiles shall be made of the same material as that being stockpiled, and will be considered a part of the stockpile. Aggregates taken from the stockpile for RCC production shall be removed from the stockpile in such a manner that material from several layers of the stockpile are combined in each sample and the gradation of the aggregate obtained is representative of that used in the mix design tests.

3.2 EQUIPMENT

3.2.1 Capacity

The concrete plant, conveying, placing, compaction, and cleanup systems shall have a capacity of at least 100 cubic meters per hour.

3.2.2 Concrete Plant

The concrete plant shall be a batch or a continuous mixing plant.

3.2.2.1 Location

The concrete plant shall be located on project site, subject to the approval of the Contracting Officer.

3.2.2.2 Bins and Silos

Separate bins, compartments, or silos shall be provided for each size or classification of aggregate and for each of the cementitious materials. The compartments shall be of ample size and so constructed that the various materials will be maintained separately under all working conditions. All compartments containing bulk cement or pozzolan shall be separated from each other by a free-draining air space. The cement and pozzolan bins shall be equipped with filters which allow air passage but preclude the venting of cement or pozzolan into the atmosphere. All filling ports shall be clearly marked with a permanent sign stating the contents.

3.2.2.3 Batch Plant

The batch plant requirements should meet the following requirements.

a. Batchers - Aggregate shall be weighed in separate weigh batchers with individual scales or may be batched cumulatively. Bulk cement and other cementitious materials shall each be weighed on a separate scale in a separate weigh batcher. Water shall be measured by weight or by volume. It shall not be weighed or measured cumulatively with another ingredient. Ice shall be measured separately by weight. Admixtures shall be batched separately and shall be batched by weight or by volume in accordance with the manufacturers recommendations.

b. Water Batcher - A suitable water-measuring and batching device shall be provided that will be capable of measuring and batching the mixing water within the specified tolerances for each batch. The mechanism for delivering water to the mixers shall be free from leakage when the valves are closed. The filling and discharge valves for the water batcher shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. When a water meter is used, a suitable strainer shall be provided ahead of the metering device.

c. Admixture Dispensers - A separate batcher or dispenser shall be provided for the admixture. The plant shall be equipped with the necessary calibration devices that will permit convenient checking of the accuracy of the dispensed volume of the particular admixture. The batching or dispensing devices shall be capable of repetitively controlling the batching of the admixtures to the accuracy specified. Piping for liquid admixtures shall be free from leaks and properly valved to prevent backflow or siphoning. The dispensing system shall include a device or devices that shall detect and indicate the presence or absence of the admixture or provide a convenient means of visually observing the admixture in the process of being batched or discharged. The system shall be capable of ready adjustment to permit varying the quantity of admixture to be batched. The dispenser shall be interlocked with the batching and discharge operations so that each admixture is added separately to the batch in solution in a separate portion of the mixing water in a manner to ensure uniform distribution of the admixtures throughout the batch during the required mixing period. Storage and handling of admixtures shall be in accordance with the manufacturer's recommendations.

d. Moisture Control - The plant shall be capable of ready adjustment to compensate for the varying moisture content of the aggregates and to change the masses of the materials being batched.

e. Scales - Adequate facilities shall be provided for the accurate

measurement and control of each of the materials entering each batch of concrete. The weighing equipment and controls shall conform to the applicable requirements of NIST HB 44, except that the accuracy shall be within 0.2 percent of the scale capacity. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring device. Each weighing unit shall include a visible indicator that shall indicate the scale load at all stages of the weighing operation and shall show the scale in balance at zero load. The weighing equipment shall be arranged so that the concrete plant operator can conveniently observe the indicators.

f. Operation and Accuracy - The weighing operation of each material shall conform to requirements of NRMCA CPMB 100. The weigh batchers shall be so constructed and arranged that the sequence and timing of batcher discharge gates can be controlled to produce a ribboning and mixing of the aggregates, water, admixtures, and cementitious materials as the materials pass through the charging hopper into the mixer. The plant shall include provisions to facilitate the inspection of all operations at all times. Delivery of materials from the batching equipment shall be within the following limits of accuracy:

MATERIAL	PERCENT OF REQUIRED MASS
Cementitious materials	0 to +2
Water	±1
Each individual aggregate size group.....	±2

When water or chemical admixtures are measured by volume, they shall meet the same tolerance percent as stated in the chart.

g. Interlocks - Batchers and mixers shall be interlocked so that:

- (1) The charging device of each batcher cannot be actuated until all scales have returned to zero balance within plus or minus 0.2 percent of the scale capacity and each volumetric device has reset to start or has signaled empty.
- (2) The charging device of each batcher cannot be actuated if the discharge device is open.
- (3) The discharge device of each batcher cannot be actuated if the charging device is open.
- (4) The discharge device of each batcher cannot be actuated until the indicated material is within the allowable tolerances.
- (5) Admixtures are batched automatically and separately with the water.
- (6) The mixers cannot be discharged until the required mixing time has elapsed.

h. Recorder - An accurate recorder or recorders shall be provided and shall conform to the following detailed requirements:

- (1) The recorder shall produce a graphical or digital record on a single visible chart or tape of the weight or volume of each material in the batchers at the conclusion of the batching cycle. The record shall be produced prior to delivery of the materials to the mixer. After the batchers have been discharged, the recorder shall show the return to empty condition.
 - (2) A graphical recording or digital printout unit shall be completely housed in a single cabinet that shall be capable of being locked.
 - (3) The chart or tape shall be so marked that each batch may be permanently identified and so that variations in batch weights of each type of batch can be readily observed. The chart or tape shall be easily interpreted in increments not exceeding 0.5 percent of each batch weight.
 - (4) The chart or tape shall show time of day at intervals of not more than 15 minutes.
 - (5) The recorder chart or tape shall become the property of the Government.
 - (6) The recorder shall be placed in a position convenient for observation by the concrete plant operator and the Government inspector.
 - (7) The recorded weights or volumes when compared to the weights or volumes actually batched shall be accurate within plus or minus 2 percent.
- i. Batch Counters - The plant shall include devices for automatically counting the total number of batches of all concrete batched and the number of batches of each preset mixture.
- j. Batch Plant Trial Operation - Not less than 7 days prior to commencement of placing the test section, a test of the batching and mixing plant shall be made in the presence of a representative of the Contracting Officer to check operational adequacy. The number of full-scale concrete batches required to be produced in trial runs shall be as directed, will not exceed 20, and shall be proportioned as directed by the Contracting Officer. All concrete produced in these tests shall be wasted or used for purposes other than inclusion in structures covered by this specification. All deficiencies found in plant operation shall be corrected to the satisfaction of the Contracting Officer prior to the start of concrete placing operations. No separate payment will be made to the Contractor for labor or materials required by provisions of this paragraph. Mixer uniformity testing, in accordance with paragraph CONTRACTOR QUALITY CONTROL, will be performed by the government near the end of this trial operation period. The Contractor shall notify the Contracting Officer of the trial operation not less than 7 days prior to the start of the trial operation.
- k. Protection - The weighing, indicating, recording, and control equipment shall be protected against exposure to dust, moisture, and vibration so that there is no interference with proper operation of the equipment.

3.2.2.4 Continuous Mixing Plant

A continuous mixing plant(s) shall be capable of producing RCC of the same quality and uniformity as would be produced in a conventional batch plant and shall be capable of producing a uniform continuous product (at both maximum and minimum production rates) that is mixed so that complete intermingling of all ingredients occurs without balling, segregation, and wet or dry portions.

a. Operation and Accuracy - An electronic control system shall be provided. The control system shall have the capability of changing mixtures instantaneously, producing any of the mixtures at a variable rate, and tracking a mixture change to a hopper or a conveyor system. The control panel shall display for each ingredient the designed formula values and the instantaneous percentage values and shall record the instantaneous values at a preset time interval or on demand with a multiple copy printer/recorder. The recorder shall note formula changes and shall print total quantities of each ingredient and total amounts produced on command. There shall be weighing devices (belt scale or other) for continuous weighing of individual ingredients and total ingredients. The plant control shall not require manual devices to adjust the material flow. The plant shall be capable of total manual control operation for a single product at a limited production for short-time durations in the event of loss of electronic control. The electronic control system shall incorporate modular replaceable components to reduce down time in the event of control system malfunction. An inventory shall be maintained of such replaceable components. The fine aggregate shall have a device that monitors its moisture content immediately prior to dispensing into the mixing plant dispensing system. The accuracy of the plant dispensing systems shall be within the following limits:

Cementitious Materials.....	0 to +2 percent
Water	±1 percent
Each individual aggregate size group.....	±2 percent

The continuous feeders for each of the ingredients shall be calibrated as per the manufacturer's specifications. Devices and tools shall be maintained at the plant location to check the feeder's calibration at the Contracting Officer's request. A technician shall be provided that is skilled in calibration of the feed devices and the maintenance and repair of the plant control system. The technician shall be available within 30 minutes notice during all scheduled plant operations. The technician could be one or more of the Contractor's personnel.

b. Cement, Pozzolan, and Aggregate Feed - Cement, pozzolan, and aggregates shall be uniformly, continuously, and simultaneously fed (at the proper ratios and quantity for the mixture required) into the mixer by belt, auger, vane feeder, or other acceptable method. The feed bins or silos for each ingredient shall be kept sufficiently full and shall be of sufficient size to ensure a uniform flow at a constant rate for a specific mixture. The feed bins shall have a low-level indicator that both warns the operator and can shut the plant down if insufficient material is available for a uniform and continuous flow.

c. Water and Admixture Dispensers - The liquid-dispensing devices shall be capable of metering and dispensing within the specified

requirements. The liquid valves shall be free from leakage in the closed position. The dispensers shall have attachments and/or be installed in such a manner that will permit convenient checking of their accuracy. Plumbing shall be leak-free and properly valved to prevent backflow and siphoning. The dispenser shall be interlocked with the electronic plant control and shall warn the operator and shut down the plant if insufficient liquid is available. Separate nozzles for each liquid shall be properly located at the mixer to assure uniform distribution of each liquid to the materials entering the mixer.

d. Continuous Mixer(s) - The continuous mixer(s) shall have proper introduction of ingredients as specified by the manufacturer and shall not be charged in excess of the manufacturer's recommended capacity. Mixer(s) shall be capable of combining the materials into a uniform homogeneous mixture and of discharging this mixture without segregation. The mixer(s) shall operate at the blade speed designated by the manufacturer and shall be capable of changing retention time of the ingredients in the mixer. This should be accomplished by manually resetting the mixer(s) blade angles. Mixing time (ingredient retention time in the mixer) shall be predicated upon the uniformity, homogeneity, and consistency of the resultant mixture. Samples for uniformity testing shall be taken at 2-minute intervals and tested as per COE CRD-C 55. The mixer(s) shall be maintained in satisfactory operating condition and mixer blades shall be kept free of hardened concrete. Should mixer(s) at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired. Suitable facilities shall be provided for obtaining representative samples of concrete for testing. All necessary platforms, shelters, tools, labor, and equipment shall be provided for obtaining samples.

e. Segregation - A means shall be used to reduce and minimize segregation and waste which would otherwise result from the continuous stream of concrete being fed into the batch haul devices (concrete buckets, dump trucks, etc.). The equipment shall retain the concrete between tracks or other means of transport to prevent the need for stopping the mixer. These devices could include, but not be limited to, small-volume conveyor discharge hopper with a large gate that is automatically opened on a timed interval, thereby dumping a series of small batches into larger batch hoppers, trucks, or truck beds.

f. Trial operation - Not less than 7 days prior to commencement of concrete placing, a test of the plant shall be made in the presence of a representative of the Contracting Officer to check operational adequacy. The number of cubic meters required to be produced in trial runs shall be as directed, but will not exceed 100 cubic meters and shall be proportioned as directed by the Contracting Officer. All concrete produced in these tests shall be wasted or used for purposes other than inclusion in structures covered by this specification. All deficiencies found in plant operation shall be corrected to the satisfaction of the Contracting Officer prior to the start of concrete placing operations. Mixer uniformity tests by the Government will be performed near the end of this trial period. No separate payment will be made to the Contractor for labor or materials required by provisions of this paragraph. The Contractor shall notify the Contracting Officer of the trial operation not less than 7 days prior to the start of the trial operation.

g. Protection - The weighing, indicating, recording, and control equipment shall be protected against exposure to dust, moisture, and vibration so

that there is no interference with proper operation of the equipment.

h. Discharge Hopper - The pugmill mixer shall be equipped with a discharge hopper having a capacity of at least 20 metric ton. The hopper shall be equipped with dump gates to assure rapid and complete discharge without segregation.

3.2.3 Mixers

Mixers shall be stationary mixers or pugmill mixers. Mixers may be batch or continuous mixing. Each mixer shall combine the materials into a uniform mixture and discharge this mixture without segregation. Mixers shall not be charged in excess of the capacity recommended by the manufacturer on the nameplate. Excessive overmixing requiring additions of water will not be permitted. The mixers shall be maintained in satisfactory operating condition, and mixer drums shall be kept free of hardened concrete. Mixer blades or paddles shall be replaced when worn down more than 10 percent of their depth when compared with the manufacturer's dimension for new blades. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired or replaced.

3.2.3.1 Pugmill Mixers

A batch or continuous mixing twin-shaft pugmill mixer shall be capable of producing RCC of the same quality and uniformity as would be produced in a conventional plant that meets all the requirements of these specification. All pugmill mixers shall meet the requirements of paragraph CONTINUOUS MIXING PLANT.

3.2.3.2 Mixer Uniformity Requirements

All mixers shall be tested by the Government in accordance with this paragraph and in accordance with COE CRD-C 55. When regular testing is performed, the RCC shall meet the limits of any three of the four applicable uniformity requirements. When abbreviated testing is performed, the concrete shall meet only those requirements listed for abbreviated testing. The initial mixer evaluation test shall be a regular test and shall be performed prior to the start of concrete placement. The concrete proportions used for the evaluation shall contain the largest size aggregate on the project and shall be as directed by the Contracting Officer. Regular testing shall consist of performing all tests on three batches of concrete. The range for regular testing shall be the average of the ranges of the three batches. Abbreviated testing shall consist of performing the required tests on a single batch of concrete. The range for abbreviated testing shall be the range for one batch. Mixer evaluations shall be performed by the Government. The Contractor shall provide labor and equipment as directed by the Contracting Officer to assist the Government in performing the tests.

PARAMETER	REGULAR TESTS	ABBREVIATED TESTS
	ALLOWABLE MAXIMUM RANGE FOR AVERAGE OF 3 BATCHES	ALLOWABLE MAXIMUM RANGE FOR 1 BATCH
Coarse aggregate, percent	6.0	6.0
Compressive strength at 7 days	10.0	10.0
Water content, percent	1.5	1.5

PARAMETER	REGULAR TESTS	ABBREVIATED
	ALLOWABLE	TESTS
	MAXIMUM RANGE FOR	ALLOWABLE
	AVERAGE OF 3 BATCHES	MAXIMUM RANGE
		FOR 1 BATCH
Consistency, modified Vebe, second	7.0	--

A regular test will be performed before concrete production begins and when the Contractor requests a reduced mixing time. An abbreviated test shall be performed every 3 months when concrete is being placed. If a mixer fails the abbreviated test, a regular test will be performed. Cost of testing when the Contractor requests a reduced mixing time will be paid by the Contractor.

3.2.4 Sampling Facilities

3.2.4.1 Sampling Concrete

The Contractor shall provide suitable facilities and labor for obtaining representative samples of concrete in accordance with ASTM C 172 for Contractor quality control and Government quality assurance testing.

3.2.4.2 Sampling Aggregates

Suitable facilities shall be provided for readily obtaining representative samples of aggregates for test purposes immediately prior to the material entering the mixer.

3.2.5 Transporting and Conveying Equipment

The transporting and conveying equipment shall conform to the following requirements.

The concrete mixtures (RCC, bedding mortar, concrete, and any other concrete that will interface with the RCC) shall be conveyed from the plant mixer(s) to placement as rapidly and as continuously as practical by methods which limit segregation, contamination, and surface drying. The RCC shall be conveyed from the mixing plant to the structure by means of main-line conveyor, end-dump truck, or a combination thereof.

3.2.6 Spreading and Remixing Equipment

The spreading and remixing equipment shall conform to the following requirements:

The primary spreading procedure shall be accomplished by track dozer. The dozers shall be equipped with well maintained grousers. The equipment shall be maintained in good operating condition. The equipment shall not leak or drip oil, grease, or other visible contaminants onto the RCC surface. All equipment used for spreading and remixing that leaves the surface of the structure for maintenance or repairs or, for any other reason, must be cleaned of all contaminants by an approved method before returning to the structure surface. Under no conditions shall a dozer or other tracked vehicle be operated on other than fresh uncompacted RCC except to facilitate startup operations for each lift and by approved procedures.

3.2.7 Compaction Equipment

The compaction equipment shall conform to the following requirements.

3.2.7.1 Primary Rollers

Self-propelled vibratory rollers shall be used for primary rolling and shall be double-drum. They shall transmit a dynamic impact to the surface through a smooth steel drum by means of revolving weights, eccentric shafts, or other equivalent methods. The compactor shall have a minimum gross mass of 9000 kg and shall produce a minimum dynamic force of 60 000 N/m of drum width. The operating frequency shall be variable in the approximate range of 1,700 to 3,000 cycles per minute. The amplitude shall be adjustable between 0.4 and 1.0 mm. The roller shall be capable of full compaction in both forward and reverse directions. The roller shall be operated at speeds not exceeding 0.7 m/s. Within the range of the operating capability of the equipment, the Contracting Officer may direct or approve variations to the frequency, amplitude, and speed of operation which result in the specified density at the fastest production rate.

3.2.7.2 Small Vibratory Rollers

Small vibratory rollers shall be used to compact the RCC where the larger vibratory rollers specified above cannot maneuver. The rollers shall compact the RCC to the required density and shall be so demonstrated during construction of the test section. Small vibratory rollers cannot compact the RCC to the same density and thickness as the primary rollers; therefore, when small rollers are used, total lift thickness of the RCC layer or lift shall be reduced to not over 150 mm uncompacted thickness to permit adequate compaction. Rollers shall have independent speed and vibration controls and shall be capable of a wide range of speed adjustments.

3.2.7.3 Tampers (Rammers)

The tampers shall compact the RCC to the required density and shall be so demonstrated during construction of the test section. Tampers cannot compact the RCC to the same density and thickness as the primary rollers; therefore, when tampers are used, thickness of each RCC layer that is to be compacted shall be reduced to not more than 150 mm uncompacted thickness to assure adequate compaction.

3.2.8 Nuclear Density Gauge

Tests to determine the density of both the uncompacted and compacted RCC shall be made by the Contractor using a two-probe nuclear density gauge supplied by the Contractor. The nuclear density gauge shall meet the applicable requirements of ASTM C 1040. The gauge shall be capable of taking readings along a horizontal path between the probes at 50-mm increments from 50 mm from the surface to 600 mm below the surface. The gauge and operator shall be made available to the Government until completion of all RCC production at no additional cost. The Contractor shall obtain all permits and certifications for the equipment and the operators.

3.2.9 Calibration

Nuclear gauges shall have been factory calibrated within 6 months of RCC placement. The Contractor shall construct, at no additional costs to the Government, three conventional concrete test blocks using RCC aggregate

materials, and with dimensions 300 mm larger than the gauge dimensions. The concrete shall be formulated to have densities of approximately 2100, 2300, and 2600 kg/cu m using the RCC materials and so far as possible, similar relative proportions. Completed blocks shall be weighed and measured to determine unit weight. Gauge calibration constants shall be adjusted for performance on these blocks at least 7 days prior to the evaluation of test strips. The Contractor shall remedy any inconsistencies in gauge performance prior to the start of RCC placement. After the start of RCC placement, gauges shall be field recalibrated against cast blocks every 24 hours.

3.3 SUBGRADE PREPARATION

Previously constructed underlying material shall be conditioned as specified in Section 02250 FILLS AND SUBGRADE PREPARATION. The existing subgrade, other than specified fills, shall be scarified, conditioned to optimum moisture content, and compacted to at least 90 percent of maximum density in accordance with ASTM D 1557 for a depth of least 300 mm. In all cases prior to placing RCC, deficiencies in the underlying material shall be corrected, and the surface shall be cleaned and moistened, as directed. The surface of the underlying material will be approved by the Contracting Officer.

3.4 PREPARATION FOR PLACING

3.4.1 Placing Schedule

Before starting RCC production, a detailed schedule shall be submitted indicating intended daily and weekly production rates that, when followed, will meet the beginning and ending specified RCC production dates. After initiation of RCC production, the Contractor's schedule shall be updated and adjusted on a weekly basis for the duration of the RCC placement. If it becomes apparent for any reason that the Contractor is not pursuing a schedule that will meet the specified RCC production dates, actions necessary to increase the production rate shall be taken so that production is once again on schedule.

3.4.2 RCC Orientation Session

Prior to or in conjunction with the construction of the RCC test section, supervisors and all other Contractor personnel which are expected to participate in the production of RCC for this job (including laborers, equipment operators, foremen, and QC and inspection staff) shall participate in a 2-hour orientation session organized by the Contracting Officer. The Contractor shall provide a facility suitable for slide and videotape presentation. The intent is to orient all individuals on the goals of the RCC placement process, provide clarification of specification requirements if requested, and be provided orientation as to what constitutes good construction practices. Additional orientation sessions will also be made available to, and shall be attended by, all new Contractor personnel who are subsequently hired and that will be involved with the production of the RCC.

3.4.3 Aggregate Production Schedule

Aggregate production and initial stockpiling shall begin and shall be producing acceptable material by not later than 60 days in advance of the time when placement of the RCC test section is expected to begin. At least 50 percent of all RCC aggregates for each size group necessary for the

completed RCC construction shall be manufactured and stockpiled prior to start of placement of RCC.

3.4.4 RCC Test Section

Prior to placement of any RCC, the Contractor shall construct a test section at the job site. The purpose of the test section is to demonstrate the suitability of the Contractor's equipment, methods, and personnel. The test section shall consist of not less than two adjacent paving lanes, at least 20 meters in length. The section shall be constructed to at least the depth of 6 lifts. The lane width shall be 3.5 meters. The test section shall contain at least one fresh longitudinal construction joint, one cold transverse joint, one longitudinal cold construction joint which has stood overnight before completion, and one surface to be treated with bedding mortar. The site of the test section shall be approved by the Contracting Officer. After evaluation and assessment of the test section by the Contracting Officer, the Contractor shall dispose of the test section in an approved manner. Under no circumstances shall the test section be incorporated into or become a part of the permanent RCC structure. The test section shall demonstrate sustained plant production rates, and batching, mixing, transporting, spreading, compaction procedures, curing and preparation of construction joints. It shall also demonstrate the vertical face construction method along one side (formed), the sloped face construction method along another side (unformed), procedures for foundation preparation, procedures for placement of bedding mortar, rolling pattern, joint preparation, rolling method for both fresh and cold construction joints, start-up and finishing procedures, testing methods, and plant operations. Variable amplitudes of the roller shall be used as approved in different areas to identify the optimum amplitude. Rolling pattern of the vibratory roller may be varied as approved to determine the best pattern. Variations in mixture proportions other than water shall be made if directed. The test section shall be placed in portions as directed by the Government. The Contractor shall vary the water content, as necessary, to arrive at the appropriate content, subject to the approval of the Contracting Officer's Representative. The mixing plant shall be operated and calibrated prior to placing the test section. The Contractor shall use the same equipment, materials, and construction techniques on the test section as will be used in all subsequent work. The Contractor shall not begin RCC operations for the main structure until testing and evaluations by the Government have been completed, and it has been demonstrated to the satisfaction of the Contracting Officer that all specification requirements were met. **Following completion of test section construction, ten (10) calendar days shall be allowed for testing and evaluation.** If the Contractor does not meet requirements as specified, an additional test section or sections shall be constructed at no additional cost to the Government. Test sections unacceptable to the Contracting Officer shall be removed at the Contractor's expense. The Contractor shall provide twelve (12) 152.4 mm diameter cores to the Government from points selected in the test section by the Government **7 days** after completion of the test section. The date of the test section construction shall be provided at least 7 days in advance.

3.4.5 Weather

If unusual adverse weather, such as heavy rain, severe cold, high winds, heavy snow, etc., occurs or is forecast to occur during placement, the placement operation shall be suspended until conditions improve.

3.4.5.1 Placing During Cold Weather

Placement shall be discontinued when the air temperature reaches 5 degrees C and is falling and shall not be resumed until the air temperature reaches 2 degrees C and is rising. No RCC shall be placed on any surface containing frost or frozen material. Provision shall be made to protect the RCC from freezing during the specified curing period. Mixing water and/or aggregates shall be heated, as necessary, to produce RCC having a temperature between 10 degrees C and 30 degrees C as placed. Methods and equipment for heating shall be as approved. The aggregates shall be free of ice, snow, and frozen lumps before entering the mixer. Covering and other means shall be provided for maintaining the RCC at a temperature of at least 10 degrees C for not less than 72 hours after placing and at a temperature above freezing for the remainder of the curing period. RCC damaged by freezing shall be removed and replaced as directed.

3.4.5.2 Placing During Rain

RCC shall not be placed during rainfall of 5 mm/hr or more. During periods of lesser rainfall, placement of RCC may continue if, in the opinion of the Contracting Officer, no damage to the RCC is occurring. Work shall commence only after excess free surface water and contaminated paste or RCC have been removed and the surface has gained sufficient strength (no less than 4 hours after the RCC placement was suspended) to prevent rutting, pumping, intermixing of rainwater with the RCC, or other damage to the RCC.

When the RCC surface has been contaminated or damaged in any manner, the RCC surface shall be washed to break up and remove laitance and/or mud-like coatings from the surface. Any undercut coarse aggregate shall be removed. All waste shall be removed and disposed of in an approved manner.

3.4.5.3 Placing During Hot Weather

During periods of hot weather when the maximum daily air temperature is likely to exceed 30 degrees C; or when the combination of ambient conditions will produce evaporation rates of 1.0 kg/sq m/hr or more, when calculated in accordance with Figure 2.1.5 of ACI 305R; the following precautions shall be **taken**. The underlying material shall be sprinkled with water immediately before placing the RCC. The RCC shall be placed at the coolest temperature practicable, and in no case shall the temperature of the RCC when placed exceed 32 degrees C. The aggregates and/or mixing water shall be cooled as necessary. The finished surfaces of the newly laid RCC shall be kept damp by applying a waterfog or mist, not streams of water, with approved spraying equipment until the RCC is covered by the curing medium. When heat or wind is determined excessive by the Contracting Officer, the Contractor shall immediately take such additional measures as necessary to protect the RCC surface. Such measures shall consist of wind screens, more effective fog sprays, and similar measures commencing immediately after placement. If these measures are not effective, placement shall be immediately stopped until satisfactory conditions exist.

3.4.6 Surface Preparation

3.4.6.1 Cleaning

All lift surfaces including any RCC or bedding mortar shall be cleaned prior to placing any additional concrete thereon. After cleaning, bedding concrete and bedding mortar are to be used specifically for achieving bond between different types of concrete eliminating and preventing segregation or voids along margins or RCC placements. No surfaces to receive bedding

mortar shall be covered with RCC until the prepared surfaces have been accepted in writing and that acceptance has been recorded on an approved checkout form. All surfaces upon which RCC, structural concrete or any bedding mortar or bedding mix is placed shall be moist (but contain no visible free water). Prior to placing any concrete adjacent to the RCC and/or the ogee section, the surface shall be clean and free of loose, or unkeyed rock; all mud and silt accumulations; laitance; puddles or ponds of free surface water; coatings; and any other detrimental materials. High-pressure water jetting, and/or wet sandblasting, followed by mild high-volume, low-pressure washing, shall be used on all hardened RCC surface (cold joints) as necessary for the removal of laitance, coatings, stains, or other difficult-to-remove contaminants. High-volume low-pressure water washing and/or water jetting may be used for removal of loose materials.

3.4.6.2 High-Volume Low-Pressure Washing

Washing of loose materials can be accomplished with high-volume low-pressure water washing and/or air water jetting using equipment of similar design to that used in large-scale foundation cleanups. The air-water jets shall have 40-mm nozzles, a water supply of at least 2 L/s, and compressed air at the jet of 550 to 850 kPa. The low-pressure water jets shall have 25-mm nozzles available and a capacity of at least 13 L/s for truck-mounted devices.

3.4.6.3 High-Pressure Water Jet

A stream of water under a pressure of not less than 10.3 MPa for RCC shall be used for cleaning all cold joint surfaces, or surfaces with laitance, mortar coatings, stains, or other difficult-to-remove contaminants. There shall be no undercutting of coarse-size aggregates. Aggregate particles that are undercut shall be removed.

3.4.6.4 Wet Sandblasting

This method may be used when the RCC has reached sufficient strength to prevent undercutting of coarse aggregate particles. Wet sandblasting shall be continued until all accumulated laitance, coatings, stain, or other difficult-to-remove contaminants are removed. Wet sandblasting may be used in lieu of or in combination with the high-pressure water jet.

3.4.6.5 Waste Disposal

Any waste water employed in cutting, washing, and rinsing of concrete surfaces, and any other surface water shall not stain, or affect exposed surfaces of the structure(s) or damage the environment of the project area.

3.5 PLACING

3.5.1 Procedures

Placement of RCC shall be of such depth that when compacted, the surface will conform with cross section, grade, and contour indicated. Each lift shall be completed in its entirety across the full surface of the mass. As the advancing edge of the lift progresses, the exposed leading edges shall be kept "live" by progressively placing out from the advancing edge in a sloping and uniform fan-like manner. The interval between batch plant mixing and final RCC compaction shall be no greater than 45 minutes for 300 mm lifts. Placing of mixture shall be as nearly continuous as possible,

with an absolute minimum of stops and starts; speed of placing shall be controlled, to permit proper rolling. The timing of placement shall be controlled so that RCC mixtures shall be placed and rolled within the time limit specified in paragraph COMPACTION. Placing shall be discontinued during rain except for light mists which do not cause intermixing of cement and water slurry on the surface. Placing shall be done in a pattern so that curing water from previous placements will not pose a runoff problem on the fresh surface. The contractor shall use care to minimize the production of cold joints.

3.5.2 Bedding Mortar

The bedding mortar shall be applied to the existing surface following any required cleanup. The bedding mortar shall be applied not more than 15 minutes ahead of RCC placement, unless otherwise approved. The bedding mortar shall be used between different RCC placements where cold joints occur, between conventional concrete and RCC, **ogee crest, approach apron, stilling basin apron, end sill**, and other locations as directed or as shown in the drawings. The bedding mortar shall have an average thickness after application of between 6 and 12 mm and shall cover 100 percent of the lift area.

3.5.3 Lift Thickness

The total lift thickness after final compaction by the vibratory roller shall not exceed 300 mm.

3.5.4 Depositing, Spreading, and Remixing

After the RCC has been deposited, the RCC shall be spread by dozers into gently sloping layers, approximately 150 mm thick, that will, after final compaction of the several layers by the vibratory roller, result in the specified lift thickness. During the spreading process, the dozer operators shall continuously work the RCC surfaces with the dozer blade and grousers in a manner to remix any RCC that may contain pockets of segregated material and to compact the material. All surfaces of each layer shall receive at least two passes with the grousers. The dozers shall be operating continuously during the spreading process, even if this action results in more than two passes. In no case shall the RCC, or bedding mortar be allowed to dry. Under no conditions shall a dozer or other tracked vehicle be operated on other than fresh uncompacted RCC except at the start of each lift placement to facilitate startup operations, and then only by an approved procedure. No RCC shall be placed on a previous lift which has not met specification. Unacceptable material shall be removed.

3.6 COMPACTION

Compaction shall be accomplished by self-propelled, vibratory, steel-wheeled rollers and rubber-tired rollers. Rolling shall begin within 10 minutes of spreading and, except for fresh joints, rolling shall be completed within 45 minutes of start of mixing, except during hot or dry weather conditions, as described in paragraph Placing During Hot Weather. In hot or dry weather, rolling shall begin within 5 minutes of spreading and, except for joints, rolling shall be completed within 30 minutes of start of mixing. Delays in rolling freshly laid mixture will not be permitted. Rollers shall not be operated in the vibratory mode when not moving. The frequency and amplitude of vibration shall be varied, as needed or directed, within the range specified in paragraph EQUIPMENT.

After initial vibratory rolling, preliminary tests and examination of density, grade, smoothness, and surface texture shall be made by the Contractor under the supervision of the Contracting Officer. Before rolling is continued, deficiencies shall be corrected so that the finished surface will conform to requirements for grade, surface texture, and smoothness specified herein. Further smoothness checks shall be as directed by the Contracting Officer. Rolling shall be continued with the vibratory roller in vibratory mode, if necessary, until wet field density of not less than 95 percent of the "Target Density" is attained. Nuclear density testing shall be performed in accordance with paragraph CONTRACTOR QUALITY CONTROL. Surfaces of roller drums and wheels shall be kept clean at all times. Vibratory rolling beyond that specified above will not be permitted.

3.6.1 RCC Compaction

RCC layers shall be compacted to at least 95 percent of the Optimum Compaction Density (OCD). The Optimum Compaction Density (OCD) will be determined during placement of demonstration strips using the supplied mix design and Contractor supplied aggregates, materials, and equipment. Density shall be measured using a nuclear density meter and a sand cone. Nuclear density meter and sand cone tests shall be conducted in accordance with ASTM C 1040 and ASTM D 1556 respectively. Compacted RCC which indicates soft or yielding materials shall be tested immediately with the nuclear meter for moisture and density. If test results confirm that the RCC moisture content exceeds that specified, the soft or yielding area(s) will be removed and replaced by the Contractor at no additional cost to the Government. Upon completion of the OCD demonstration strip(s) the Government shall provide the Contractor with procedural placement requirements and the Contractor shall proceed with RCC production placement.

3.6.1.1 Determination of Optimum Compaction Density (OCD)

The OCD method will be used to determine the requirement for achieving minimum density. All OCD determinations shall be performed by the Contractor in the presence of the Contracting Officer. The OCD will be invalid if material proportions, including water, are outside the designated ranges. OCD demonstration strip compaction will commence no later than 10 minutes after mixing of the RCC.

3.6.1.2 Initial Determination of OCD

The initial OCD value will be determined during placement of RCC demonstration strip(s). The density of the RCC shall be determined for every one (1) or two (2) passes of compaction equipment, concurrently on the same demonstration strip in 2 locations. Compaction shall continue until the change in density decreases significantly. The OCD shall be the average maximum recorded density. A variation in OCD from the two locations of more than 32 kgs/m^3 shall invalidate the test and require that another test set be performed. The number of roller passes to achieve OCD shall be a guide to the equipment operators of the required compaction necessary to achieve OCD.

3.6.2 Operation of Rollers and Tampers

Speed of rollers shall be slow enough at all times to avoid displacement of the RCC but in no case more than 2.5 km/hr. Displacement of RCC resulting from reversing direction of roller or from any other cause shall be immediately corrected. Alternate passes of the roller shall be varied

slightly in length and shall overlap sufficiently to provide full coverage over the surface. Additional rollers shall be furnished if RCC density specified is not attained and/or if placing operations are getting ahead of rolling. In no case shall the Contractor allow placing operations be altered without approval of the Contracting Officer's Representative. Places inaccessible to large vibratory rollers shall be thoroughly compacted with walk-behind rollers and hand-tampers to the required density, using multiple thin lifts, as necessary. Additional field density tests shall be made for those areas by the Contractor and may also be made by the Government.

3.6.3 Rolling Pattern

Rolling shall commence at the outer edge of the lane abutting either a bulkhead, previously compacted RCC, or a construction joint. On subsequent placement, rolling shall begin at the previously compacted material. If there will be a subsequent lane placed along an edge and the joint will be constructed as a "fresh" joint, the roller shall go no closer to the outer edge until the subsequent lane is placed. If there will be a subsequent lane and the joint will be treated as a "cold" construction joint, or if the edge will be the final edge of the RCC, the outer 450 mm shall be rolled after rolling of the center of the lane. If the edge abuts a previously placed strip, either as a "fresh" joint or as a "cold" joint, the uncompacted joint area shall be rolled after the center of the lane. This joint area shall be given additional passes of the vibratory roller and rubber-tired roller, as necessary, to produce the specified compaction in the joint area. Approved hand-finishing operations shall be used as necessary to produce a tight surface at the joint. The rolling pattern shall be used consistently throughout production.

3.7 JOINTS

Joints shall conform to the details indicated and shall be perpendicular to the finished grade of the RCC. Joints shall be straight and continuous from edge to edge. Construction joints shall be made to ensure continuity in smoothness and grade between old and new sections of RCC, as specified hereinafter. All joints shall have the same texture, full-depth density, and smoothness as specified for other sections. Regardless of age, contact surfaces of previously constructed strips that have become coated with dust, sand, or other objectionable material shall be cleaned by brushing or cut back with approved power saw, as directed.

3.7.1 Lift Joints

The entire RCC shall be placed with sufficient continuity so that it hardens and acts as one monolithic structure without discontinuous joints or potential planes of separation. All lift joints shall be kept clean, uncontaminated, free from ponded water, and continuously moist until placement of the succeeding RCC. Regular lift-joint treatment and maintenance applies to subsequent lifts placed within 2 hours of the previous lift and shall include:

- a. Moisture Condition. Maintaining 100 percent of each compacted lift-joint surface continuously moist by application of water.**
- b. Removing all loose contaminants or deteriorated RCC by low pressure washing and vacuuming, and**
- c. Exception for Hot Weather Conditions. During periods of hot**

weather as defined in Paragraph: Placing During Hot Weather, the time period for regular lift joint treatment shall be reduced to 1-hour. After 1 hour, the requirements of 3.7.1.1 shall apply.

3.7.1.1 Subsequent Lift Placed Within 2 to 4 Hours

If Lift joints that have not hardened or dried and are less than 4 hours old shall be given the regular lift-joint treatment:

a. Moisture Condition. Maintaining 100 percent of each compacted lift-joint surface continuously moist by application of water.

b. Air Jetting. Removing all loose contaminants or deteriorated RCC by high pressure, high volume air jetting and vacuuming. The air-jetting is intended is to be applied so that only the loose surface skin or mortar is removed and there is no undercutting of coarse-aggregate particles. The surface shall be completely free of all loose material and ponded water prior to placement of the subsequent lift.

c. Exception for Hot Weather Conditions. During periods of hot weather as defined in Paragraph: Placing During Hot Weather, the time period for regular lift joint treatment shall be reduced to 2-hours. After 2 hours, the requirements of 3.7.1.2 shall apply.

3.7.1.2 Subsequent Lift Placed Within 4-8 Hours

When placement of the overlying lift does not occur within 4 hours the surface prior to placement shall be treated by air-water cutting.

a. The air pressure used in the jet shall be 620 to 760 kPa (90 to 110 psi), and the water pressure shall be just sufficient to bring the water into effective influence of the air pressure. After cutting, the surface shall be washed and rinsed until the wash water is no longer cloudy. Surfaces shall be inspected and approved by the Contracting Officer.

b. During periods of hot weather as defined in Paragraph: Placing During Hot Weather, the time period shall be reduced to 4-hours. After 4-hours the requirements of 3.7.1.3 shall apply.

3.7.1.3 Subsequent Lift Placed More Than 8 Hours

When placement of the overlying lift does not occur within 8 hours the surface prior to placement shall be treated by air-water cutting as indicated in the paragraph: Subsequent Lift Placed 4-8 Hours Later and the application of a bonding layer. During periods of hot weather as defined in Paragraph: Placing During Hot Weather, the time period shall be reduced to 4-hours.

3.7.2 Longitudinal Construction Joints

Any construction joints in which the edge of the initial strip has exceeded the time requirements given in paragraph PLACING shall be considered "cold joints" and shall be trimmed by sawing the edge of the hardened soil-cement or RCC with a power concrete saw, not earlier than 12 hours age. The sawcut shall be at least 150 mm from the original edge, and more if necessary to produce an acceptable joint. The sawcut shall be full depth of the RCC and shall produce a face within 15 degrees of vertical, free of all loose or uncompacted material. The outer portion shall be removed

carefully to prevent any damage to the sawed face. If damage occurs, the edge shall be resawed.

3.7.3 Transverse Construction Joints

When a transverse construction joint is required, the roller shall pass over the end of the freshly placed RCC. In these cases, the previously placed materials shall be cut with a power concrete saw to full depth of the lift, as specified above, and the excess material removed. When necessary, the fresh mixture shall be hand finished at the joints. Additional rolling shall be used to assure that specified full-depth density and surface finish is attained.

3.8 CURING AND PROTECTION

3.8.1 General

Temporarily exposed surfaces of RCC that will be in contact with succeeding layers of RCC shall be kept continuously moist by moist curing method described hereinafter until placement of the subsequent layer. Curing of permanently exposed surfaces shall begin immediately after compaction and shall continue for at least 14 days. When wood or metal forms are left in place during curing, the forms shall be kept continuously wet. RCC shall be cured and protected from premature drying, extremes in temperature, rapid temperature change, freezing, mechanical damage and exposure to rain or flowing water. The Contractor shall have all equipment needed for adequate curing and protection on hand and ready to install before actual placement begins. The curing medium and method, or the combination of mediums and methods used, shall be approved by the Contracting Officer. The RCC shall be protected from the damaging effects of rain for 12 hours and flowing water for 14 days.

3.8.2 Moist Curing

RCC will be moist cured by maintaining all surfaces continuously, not periodically, wet for the duration of the entire curing period. Water for curing shall comply with the requirements of paragraph: WATER. If water is used which stains or discolors RCC surfaces which are to be permanently exposed, the surfaces shall be cleaned to the satisfaction of the Contracting Officer. Horizontal surfaces may be cured by covering with a minimum uniform thickness of 150 mm of continuously saturated sand. Temporarily exposed surfaces may not be cured by saturated sand. Horizontal construction joints may be allowed to dry for twelve hours immediately prior to the placing of the following lift.

3.8.3 Truck Applications

Water trucks shall be used, as necessary, to keep surfaces wet at all times until a sprinkler system, wet burlap covering, or final curing method is implemented. The water truck shall be supplemented, as necessary, by mists from hand-held hoses. The truck operator shall be positioned so he is capable of seeing the spray at all times. The spray shall be capable of easy direction, either by attachment to the front of the truck so it can be directed by steering the truck or by other approved means. All spray nozzles both on the trucks and the hand held hoses shall be of a type that produces a true fog spray without any concentrated streams of water. The mist shall not be applied in a channelized or pressurized manner that in any way erodes the surface of the RCC. It shall also be applied at a rate which does not cause ponding at the surface. Trucks shall not be allowed

to drop visible oil or other contaminants on the surface. If trucks must leave the surface, the tires shall be washed free of dirt or other foreign material before returning to the surface. Water truck wheel loads shall not exceed 2000 kg and shall be such that no cracking or other damage to the RCC is caused.

3.8.4 Sprinkler System

An approved sprinkler system consisting of pipe lines and rotating or other approved type of sprinklers may be used. Sprinklers shall deliver a fine mist of water and shall not cause any erosion to the surface of the RCC. The sprinkler system shall cover all portions of the RCC surface, and keep the surface wet at all times.

3.8.5 Burlap

Burlap covers shall consist of two or more layers of burlap having a combined weight of 4736 gm per square meter in a dry condition. Burlap shall be either new or shall have been used only for curing RCC or conventional portland cement concrete. Burlap strips shall have a length after shrinkage of at least 300 mm greater than necessary to cover the entire width and edges of the RCC. Mats shall overlap each other at least 150 mm. Mats shall be thoroughly wetted before placing and shall be kept continuously wet and in intimate contact with the surface and edges of the area for the entire specified curing period.

3.8.6 Cure Water Runoff Control

Any water applied to the surface of the RCC or burlap during curing that is in excess of the amount needed to keep the surface of the RCC continuously wet shall be controlled from running onto the base course and causing ponding on the base course or saturation of the base or subbase material.

3.8.7 Protection of RCC

After final rolling of the RCC, no vehicular traffic, except for pneumatic-tired water spray trucks or other curing equipment having wheel loads not exceeding 2000 kg shall be permitted on the RCC until the end of the curing period. No traffic or equipment shall be allowed on the surface that will cause any damage to the surface. Plastic sheeting meeting the requirements of ASTM C 171 shall be provided and kept readily available to cover RCC less than 12 hours old if rainfall occurs.

3.9 FORMED VERTICAL FACINGS FOR RCC SPILLWAY

The vertical faces of the RCC spillway are to be constructed using a form similar to conventional concrete forms as shown and specified in the drawings. The vertical facings system shall be demonstrated on one side of the RCC test section.

3.9.1 Forms for Vertical Facing

Vertical and near-vertical facings shall be as shown in the drawings. The contract drawings are based on designs whereby all vertical and near-vertical faces are constructed at the same time and placement rate of each RCC lift. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the Contractor. The formwork shall be designed for loads, lateral pressure, and allowable stresses in accordance with Chapter 1 of ACI 347R. Forms shall have sufficient

strength to withstand the pressure resulting from placement and vibration of the RCC and shall have sufficient rigidity to maintain specified tolerances. The required sequence of construction operations after all forms and surface preparations have been approved is: place the uncompactd RCC (at the specified lift thickness) at full width against the forms; using dozer action, spread each thin RCC layer abutting against the forms, compact the RCC using the vibratory roller except the step edge shall be compacted with a hand-held tamper or vibrating plate compactor. Extreme care shall be taken to assure all time restrictions are met and to prevent the occurrence of any openwork, honeycombing, or voids at the formed RCC surface. The Contractor's construction techniques and equipment used including form anchor capability shall be satisfactorily demonstrated during construction of the test section.

3.10 SPILLWAY/PCC OGEE INTERFACE

3.10.1 RCC Spillway Approach and PCC Ogee Section

The ogee section shall be constructed as shown and in accordance with the requirements in SECTION 03301. Prior to placing the PCC ogee above and against the RCC spillway, the RCC surface contact shall be scarified to a depth of at least 50-mm using a spike tooth equipment. The scarified surface shall then be cleaned using a high pressure water spray or other method approved by the Contracting Officer to completely remove all loose material and ponded water. Bedding mortar shall be applied over the scarified RCC surface prior to concrete placement.

3.11 FINISHING SURFACE FOR RCC SPILLWAY WALLS AND CUTOFF SECTION

After compaction to the required lines and grades as shown in the drawings, RCC surfaces shall be reasonably smooth with no trimming allowed. Finishing of the RCC surface shall be conducted at the completion of each days production.

3.12 CONTRACTOR QUALITY CONTROL

3.12.1 General

The following tests and inspections shall be the responsibility of the Contractor and shall be performed by an approved commercial testing laboratory or by approved Contractor personnel:

- a. Calibration of mixing plant.
- b. Sampling, gradation, and quality testing of aggregates during construction.
- c. Aggregate moisture tests.
- d. Moisture-density testing.
- e. Field density and moisture testing.
- f. Coring to provide specimens for the Government to determine RCC thickness, including filling the core holes as directed.
- g. Inspection during placing.

Based upon the results of these tests, the Contractor shall take the action

and submit reports as required below, and any additional tests to ensure that the requirements of these specifications are met. Any test results requested by the Government for review shall be provided to the Government immediately, and all results of every test by the Contractor shall be furnished to the Government on a daily basis, not later than the day after the test or inspection is made. All core drilling shall be performed by skilled personnel experienced in such work. Verification tests of materials, RCC, and finished structural elements, if made by the Government, shall in no way relieve the Contractor from the testing requirements specified herein.

3.12.2 Inspection Details and Frequency of Testing

The following number of tests will be the minimum acceptable for each type of operation:

3.12.2.1 Calibration of Mixing Plant

a. Batch-Mixing Plants: Accuracy of the batching equipment shall be checked for each type of cementitious material and aggregate at the beginning of operations and at least once for every 10 shifts in the presence of the Contracting Officer's representative. Such checks shall also be made whenever there are variations in properties of the fresh RCC which could be the result of batching errors. Standard test weights accurate to plus or minus 0.1 percent shall be provided for checking plant scales.

b. Continuous-Mixing Plants: Accuracy of proportioning of the continuous-mixing plant shall be checked for each cementitious material every day at the beginning of operations and for each aggregate at the beginning of construction and after every 10 shifts. The accuracy of proportioning shall be checked by simultaneously securing timed samples of the cementitious materials and the combined aggregate as they are fed to the mixer and weighing each as appropriate.

c. Mixing Time: Mixing time of the pug mill shall be checked at the direction of the Government. Unless otherwise required, determination of mixing time shall be by weight method using the following formula:

Mixing time in seconds = pug mill dead capacity in kg; pug mill output in kg per second

3.12.2.2 Sampling, Sieve Analysis, and Quality of Aggregate

a. Sampling: Sampling and testing of aggregates during construction shall be performed by an approved commercial testing laboratory using appropriate Corps of Engineers and ASTM test methods.

b. Sieve Analysis: A sieve analysis on the fine and coarse aggregates as delivered to the mixer shall be made by the Contractor at the specified frequency. Before starting work, at least one sample of aggregate shall be tested in accordance with ASTM C 136 and ASTM C 117. The aggregate shall not be used unless results verify that the aggregate complies with the specified gradation and tolerances. After the initial test, a minimum of one analysis shall be performed for each 400 cubic meters or portion thereof of RCC material placed each shift. When deficiencies are found, the rate of testing shall be increased as directed. When two consecutive tests show the aggregate to be deficient in grading, the mixing operation shall be stopped until

acceptable material is furnished for delivery to the mixer.

c. Aggregate Quality Tests: During construction, the Contractor shall test for quality the aggregates used for RCC construction. Tests shall consist of Los Angeles abrasion, clay lumps, and specific gravity determination. Tests for quality shall be performed at least once for each 4 000 cubic meters of placed RCC and otherwise when there may be a visual change in the aggregate.

3.12.2.3 Aggregate Moisture Tests

At the beginning of the day and as otherwise directed by the Contracting Officer, the Contractor shall perform moisture content tests on the coarse and fine aggregates in accordance with ASTM C 566.

3.12.2.4 Field Density Testing

a. Calibration Blocks for the Nuclear Density Gauge: Calibration blocks shall be fabricated by the Contractor with RCC materials and proportions representative of those to be used during construction. The blocks shall be used each day before paving begins to calibrate the full-depth readings of the nuclear density gauges used by the Contractor and the Government. The blocks shall be fabricated before the test section construction begins. The blocks size shall be a minimum of 450 mm by 450 mm by the maximum thickness of one lift, plus 25 mm. The blocks shall be compacted to between 98 and 100 percent of the maximum wet density, which will be determined by the Government in accordance with ASTM D 1557. The moisture content of the RCC used to fabricate the blocks may be increased just enough to facilitate compaction of the mixture, as long as the proportions of the dry materials remain constant and the required density is achieved. The blocks shall be measured and weighed to determine the actual density (unit weight) and shall be used to check the calibration of the nuclear density gauge. After drilling a hole in the block to accommodate the nuclear density gauge probe, three full depth nuclear density gauge tests shall be performed in the direct transmission mode and the results averaged. This average nuclear density gauge reading shall be compared with the measured unit weight of the blocks and the difference used as a correction factor for all readings taken that day. All measuring and weighing of the test blocks and all calibration checking of the density gauge shall be performed in the presence of a representative of the Contracting Officer. Calibration checks of the density gauge shall be made at the beginning of construction every day. The calibration block shall be available for use by the Government as needed.

b. Field Density and Moisture Testing: Field density tests shall be performed on the RCC in accordance with ASTM C 1040 as soon as possible, but within 30 minutes, after the completion of vibratory rolling. Only wet density shall be used for evaluation. The test shall be performed using a single probe nuclear density gauge operating in the direct transmission mode so density of the full depth of the RCC can be measured. Each test shall include readings at depths of 75, 150, 225 and 300 mm; however, only the deepest reading shall be used to evaluate the density. Both wet and dry densities shall be reported, and all individual readings shall be reported. The moisture content shall be determined in accordance with ASTM D 3017 at the same depths. The wet field density shall also be reported as a percentage of the "Target Density," maximum laboratory wet density as determined for that

lot in accordance with ASTM D 1557. All holes left in the RCC as a result of nuclear density testing by both the Government and the Contractor shall be filled by the Contractor with a cement grout, as directed.

c. Frequency of Field Density and Moisture Testing: At least one field density test shall be performed for each 30 m of paving lane of each layer of RCC and at least one for each 30 m of longitudinal and transverse construction joint. Additional tests shall be made as directed, particularly during start-up and when problems with attaining required density occur.

3.12.2.5 Coring Specimens to Determine Thickness

Cores shall be drilled by the Contractor from points in the RCC within 7 days after placement. A minimum of three cores per days placement will be taken from locations selected in a random fashion by the Contracting Officer. Cores shall be 150 mm diameter. Additional cores shall be drilled by the Contractor if required as specified in paragraph Thickness. Refilling of core holes shall be performed with portland cement mortar, using materials and procedures directed. Cores shall become the property of the Government and may be tested for strength determination or other properties as considered appropriate.

3.12.2.6 Inspection During Placing

The Contractor's Quality Control organization shall supervise all placing operations and shall be responsible for measuring and recording RCC temperature, ambient temperature, weather conditions, time of placement, yardage placed, and method and location of placement.

a. Cold-Weather Placing: At least once during each shift, an inspection shall be made of all areas subject to cold-weather protection. Deficiencies shall be noted. During removal of protection, the RCC, and ambient temperature shall be measured at least hourly.

b. Hot-Weather Placing and Initial Curing at All Times: When the maximum daily air is likely to exceed 30 degrees C, the Contractor shall take and record the temperature of the RCC mixture at 30-minute intervals during hot-weather placement. The surface of the subgrade shall be inspected to assure that it is sprinkled with water immediately before the RCC is placed and any deficiencies noted. Regardless of ambient temperature, the finished RCC shall be inspected to assure that it is kept damp until the curing medium is applied and any deficiencies noted and immediately brought to the attention of the Contracting Officer's representative. Immediate steps shall be taken to correct any deficiencies.

c. Curing Operation: The curing operation shall be inspected to assure that the surface of the RCC is kept very moist (or wet) continuously until the end of the curing period.

3.12.3 Action Required

3.12.3.1 Mixing Plant

Whenever it is found that either the weighing or the batching accuracy does not comply with specification requirements, the plant shall be shut down

until necessary adjustments or repairs have been made. Discrepancies in recording shall be corrected immediately.

3.12.3.2 Aggregate Grading and Quality

- a. Grading: When the amount passing any sieve is outside the specification limits or tolerances, the aggregate shall be immediately resampled and retested. If the second sample fails on the same sieve, that fact shall be reported to the Contracting Officer and immediate steps shall be taken to correct the grading.
- b. Quality: When the aggregate fails to meet the specification limits for Los Angeles abrasion, clay lumps and friable particles, lightweight pieces, other soft particles, and specific gravity, the Contracting Officer shall be notified immediately and approved corrective action shall be taken.

3.12.3.3 Field Density and Moisture Testing

If any nuclear density gauge reading is below 95 percent, another test shall be performed within a 1.5 to 2.5 m radius of the previous testing location. If this adjacent reading is also below the density requirements, the Contracting Officer shall be notified immediately, and additional vibratory roller passes shall be made across the full lane width between the last testing location that produced an acceptable reading and the placement operations. If additional vibratory roller passes cause the density to decrease or cause the surface texture and appearance to deteriorate in the opinion of the Contracting Officer, the paving operation shall be discontinued until appropriate adjustments are made to the moisture content of the mixture, to placement operations, rolling procedures, or other operations to assure that the specified density and surface requirements can be achieved.

3.12.3.4 Thickness Evaluation

The thickness of the RCC will be determined by the Contractor on the basis of measurements made on cores drilled by the Contractor from locations outlined in paragraph CONTRACTOR QUALITY CONTROL. Measurements of individual cores will be performed in accordance with ASTM C 174. When the measurement of any core indicates that the RCC is deficient in thickness by 12.7 mm or more, additional cores shall be drilled by the Contractor at 8 m intervals, on all sides of the deficient core until the cores indicate that the deficiency in thickness is less than 12.7 mm. When cores indicate a deficiency in thickness of less than 12.7 mm those, areas may be accepted provided the average thickness for the days placement, of the particular material, represented by the core is at least the specified thickness. When cores indicate a deficiency in thickness of 12.7 mm or more, the area represented by that core shall be removed and replaced with RCC of the specified thickness at no additional cost to the Government. If the Contractor believes that the cores and measurement taken are not sufficient to indicate fairly the actual thickness of the RCC, additional cores shall be taken and will be measured provided the Contractor shall bear the extra cost of drilling the cores.

3.12.3.5 Inspection

- a. Temperature Protection: The Contracting Officer shall be notified whenever the RCC temperature during the period of protection or protection removal fails to comply with the specifications, and

immediate steps shall be taken to correct the situation. Regardless of the ambient temperature, when the temperature of the RCC mixture exceeds 32 degrees C, mixing and placing shall be stopped and the Contracting Officer notified.

b. Curing Operation: The Contracting Officer shall be notified when any RCC surface is allowed to dry before the end of the curing period, and immediate steps shall be taken to correct the situation.

c. Reports: All results of tests conducted at the project site shall be reported daily and shall be delivered to a designated representative of the Contracting Officer. During periods of cold weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failure and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all Contractor quality control records at any time.

-- End of Section --