

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE	OF	PAGES
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2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. <i>(If applicable)</i>
6. ISSUED BY	CODE	7. ADMINISTERED BY <i>(If other than Item 6)</i>	CODE

8. NAME AND ADDRESS OF CONTRACTOR <i>(No., street, county, State and ZIP Code)</i>	(X)	9A. AMENDMENT OF SOLICIATION NO.
		9B. DATED <i>(SEE ITEM 11)</i>
		10A. MODIFICATION OF CONTRACT/ORDER NO.
		10B. DATED <i>(SEE ITEM 11)</i>
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 _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment your 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 ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: <i>(Specify authority)</i> THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES <i>(such as changes in paying office, appropriation date, etc.)</i> SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER <i>(Specify type of modification and authority)</i>

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.)*

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 <i>(Type or print)</i>	16A. NAME AND TITLE OF CONTRACTING OFFICER <i>(Type or print)</i>
15B. CONTRACTOR/OFFEROR	16B. UNITED STATES OF AMERICA
15C. DATE SIGNED	16C. DATE SIGNED
<i>(Signature of person authorized to sign)</i>	<i>(Signature of Contracting Officer)</i>

Item 14. Continued.

CHANGES TO BIDDING SCHEDULE

1. Bidding Schedule: Replace the Bidding Schedule, pages 00010-3 through 00010-5, with the accompanying new Bidding Schedule, bearing the notation " ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. W9126G-05-R-0004."

CHANGES TO DOCUMENTS 00 - INTRODUCTORY, BIDDING, AND CONTRACT REQUIREMENTS

2. Replace Section "00100 - Proposal Submission Instructions, Conditions, Notice to Offerors, Basis of Award, and Local Instructions," with the accompanying new Section 00100, bearing the notation "W9126G-05-R-0004, AM#1."

CHANGES TO THE SPECIFICATIONS

3. Replacement Sections - Replace the following sections with the accompanying new sections of the same number and title, bearing the notation " ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. W9126G-05-R-0004:"

00103	SITE VISIT/PRE-BID MEETING
01000	CONSTRUCTION SCHEDULE
01520	GOVERNMENT FIELD OFFICE
02220	DEMOLITION
02753A	CONCRETE PAVEMENT FOR AIRFIELDS AND OTHER HEAVY-DUTY PAVEMENTS
16535	AIRFIELD LIGHTING

CHANGES TO THE DRAWINGS

4. Replacement Drawings.- Replace the drawing listed below with the attached new drawing of the same number, bearing the notation "AM #0001":

gi000.cal	GI-000 1	COVER SHEET
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END OF AMENDMENT

Hazardous Cargo Loading Apron
 England Air Park, Alexandria, Louisiana

Solicitation No. W9126G-05-R-0004

BIDDING SCHEDULE
 (To be attached to SF 1442)

Item No.	Description	Quantity	Unit	Unit Price	Amount
<u>AM #0001</u>					
<u>0001</u>	All work complete, including utilities, and exclusive of all other work listed separately.	1	LS	***	\$ _____
<u>0002</u>	8-inch Concrete Pavement	23,300	SY	_____	\$ _____
<u>0003</u>	14-inch Concrete Pavement	31,500	SY	_____	\$ _____
<u>0004</u>	15-inch Concrete Pavement	44,800	SY	_____	\$ _____
<u>0005</u>	Reinforcing for Concrete Pavement	64,000	LBS	_____	\$ _____
<u>0006</u>	Repair and repave haul route (refer to Sheet GC-100)	1	LS	***	\$ _____
<u>0007</u>	Mobilization and Demobilization (See Sections 01000 CONSTRUCTION SCHEDULE and 01722 MOBILIZATION AND DEMOBILIZATION)	1	LS	***	\$ _____
<u>0008</u>	Final Record Drawings	1	LS	***	\$ <u>28,750.00</u>

AM #0001

PROJECT COMPLETION TIME*

0009 Completion Time for all work (NOT to exceed the maximum time stated in Section 01000 CONSTRUCTION SCHEDULE)

PROJECT COMPLETION TIME _____ Calendar days

*(Note: See Section 01000, Construction Duration)

TOTAL \$ _____

Hazardous Cargo Loading Apron
England Air Park, Alexandria, Louisiana

Solicitation No. W9126G-05-R-0004

BIDDING SCHEDULE

NOTES:

1. ARITHMETIC DISCREPANCIES (EFARS 14.407-2)

(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) In case of discrepancy between unit price and extended price, the unit price will govern;
- (3) Apparent errors in extension of unit prices will be corrected; and
- (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.

2. If a modification to a bid based on unit prices is submitted, which provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price in the bid schedule must be stated. If it is not stated, the bidder agrees that the lump sum adjustment shall be applied on a pro rata basis to every unit price in the bid schedule.

3. Bidders must bid on all items.

4. Costs attributable to Division 01 - General Requirements are assumed to be prorated among bid items listed.

ACCOMPANYING AMENDMENT NO. 0001 TO SOLICITATION NO. W9126G-05-R-0004

Hazardous Cargo Loading Apron
England Air Park, Alexandria, Louisiana

Solicitation No. W9126G-05-R-0004

BIDDING SCHEDULE

NOTES: (cont)

5. For the purpose of this solicitation, the word "item" shall be considered to mean "schedule" as used in Provision 52.214-0019, CONTRACT AWARD--SEALED BIDDING--CONSTRUCTION, in Section 00100 INSTRUCTIONS, CONDITIONS, AND NOTICES TO BIDDERS.

6. ABBREVIATIONS

For the purpose of this solicitation, the units of measure are represented as follows:

LBS (pounds)
LS (lump sum)
SY (square yards)

END OF BIDDING SCHEDULE

SECTION 00100

PROPOSAL SUBMISSION INSTRUCTIONS, CONDITIONS, NOTICE TO OFFERORS, BASIS OF AWARD, AND LOCAL INSTRUCTIONS

Hazardous Cargo Loading Apron

PERFORMANCE PRICE TRADE-OFF

1. PROPOSAL OVERVIEW. This Request for Proposal (RFP) solicits **Hazardous Cargo Loading Apron**, England Airpark, Louisiana. The purpose of the Source Selection plan is to establish a uniform evaluation procedure for the technical evaluation of proposals by the Source Selection Evaluation Board (SSEB) and the development of the Best Value Decision by the Source Selection Authority (SSA) using the Trade-Off Process (See Federal Acquisition Regulation 15.101-1). In as much as the proposal shall describe the capability of the Offeror to perform any resulting contract, the proposal should be specific and complete in every detail. The proposal should be prepared simply and economically, providing a straightforward and concise description of capabilities to satisfactorily perform the contract. The proposal should be practical, legible, clear, and coherent. Local Instructions, including Federal Acquisition Regulation (FAR) Provisions are annotated at the end of this section.

1.1 Proposal Submissions and the Trade-Off Process. This process permits tradeoffs among cost or price and non-cost factors and allows the Government to accept other than the lowest priced proposal. Offerors submit their past performance and capability information for review and consideration by the Government. Relative weights among technical factors are provided in paragraph 5 Evaluation Factors and Weights. The SSEB reviews, evaluates, and rates the proposals against the source selection criteria in the RFP. Concurrently, the Government analyzes price proposals of Offerors. Price will not be rated, but will be a factor in establishing the competitive range prior to discussions (if held) and in making the final best value determination for award. The SSA compares proposals to one another and determines the best value for the Government. The perceived benefits of the higher priced proposal shall merit the additional cost, and the rationale for tradeoffs must be documented.

2. PROPOSAL SUBMISSION INSTRUCTIONS

2.1 Who May Submit. Any legally organized Offeror may submit a proposal.

2.2 Where to Submit. Offerors shall submit their proposals to the Fort Worth District at the address shown in Block 7 of the Standard Form 1442.

2.3 Submission Deadline. Proposals shall be received by the Fort Worth District no later than the time and date specified in Block 13 of Standard Form 1442.

2.4 General Requirements.

2.4.1 In order to effectively and equitably evaluate all proposals, the Contracting Officer must receive information containing sufficient detail to allow review and evaluation by the Government. Proposal clarity, organization, and cross-referencing are mandatory. Failures to submit and organize proposals as requested may adversely affect an Offeror's evaluation. Offerors should provide sufficient detail and clearly define all items required in this section. The Contracting Officer may remove any Offeror from further consideration during any phase of the procurement if the Offeror fails to meet the submittal requirements of the RFP or to reduce the competitive range for purposes of efficiency pursuant to FAR 15.306(c)(2).

2.4.2 Tabs. Proposal shall be organized and tabbed as shown in paragraph 2.5 Submission Format.

2.4.3 Size of Printed Matter Submissions.

2.4.3.1 Written proposal materials shall be submitted in standard three ring loose-leaf binders. Proposals shall be tabbed and labeled in a manner to afford easy identification from a Table of Contents. Font size shall not be less than 10 point. Each page shall be identified with the appropriate page number centered at the bottom of the page. Sheet size of the proposal contents shall be 8-1/2 inches x 11 inches where sheets are prepared specifically for this proposal; however, if drawings, charts, or other graphics are submitted, sheets no larger than 11 inches x 17 inches and folded to 8-1/2 inches x 11 inches shall be used. 11 x 17 inch sheets will be counted as 4 single-sided or 2 double-sided pages. **Volume II, Technical Proposal, shall not exceed 50**

pages (50 single-sided or 25 double-sided sheets), excluding the Table of Contents. The Government will not review any information submitted in an appendix or attachment to the proposal. The Offeror must comply with the page limitation. The Offeror shall not submit verbatim sections of this solicitation as part of their proposal. Offers that do not meet these requirements may be subject to rejection.

2.4.3.2 The proposals shall contain a detailed table of contents. If more than one binder is used, the complete table of contents shall be included in each. A cover sheet identifying the Offeror (name, address, point of contact) project description, and solicitation number shall be provided. The second sheet shall be a Table of Contents. Offers that violate these rules unnecessarily delay the evaluation process and may be rejected by the Government after the initial evaluation without receiving any further consideration. The Government will not evaluate any information beyond the page limitation noted above.

2.4.3.3 Proposal revisions shall be submitted as page replacements with revised text readily identifiable, e.g., bold face print or underlining. The source of the revision, e.g., Error, Omission, or Clarification, or amendment shall be included and be annotated for each revision. Proposal replacement pages shall be numbered, shall be clearly marked "REVISED", shall show the date of revision, shall be submitted in appropriate number of copies (e.g., if two (2) copies of the original page was required, then two (2) copies of the revised page will also be required, and shall be a different color than the original pages they are to replace.

2.4.4 Number of Copies. Offerors shall submit an original and one (1) hard copy of Volume I and an original and five (5) hard copies of Volume II of their Proposal in both **hard copy and electronic format**. Within three (3) days of contract award, the awardee shall submit both volumes, updated to include all revisions, in electronic format on a CD-ROM.

2.5 Submission Format.

2.5.1 The Proposal will be tabbed and submitted in a three ring binders in the following format:

VOLUME I

TAB A – SF 1442, completed and signed by an authorized person from the company or team

TAB B – Section 00010 – Supplies or Services and Price/Costs Schedule

TAB C – Section 00600 – Representations and Certifications

TAB D – PROPOSAL DATA SHEET – See the format provided in this Section. Ensure to include Offeror's telephone number, FAX number, e-mail address and DUNS number. Duns number will be used to access CCASS data.

TAB E – Bid Bond (Standard Form 24)

TAB F – Pre Award Information (e.g. Bank and Supplier References)

In accordance with FAR 9.103(a) "... contracts shall be awarded to responsible prospective contractors only." To be determined responsible, a prospective contractor must meet the standards at FAR 9.104 that requires a prospective contractor to have adequate financial resources to perform the contract or the ability to obtain them. As an aid in assessing responsibility, the offeror shall notify their bank/suppliers that the Corps of Engineers may contact them, and shall authorize the bank/suppliers to release the following information regarding the Offeror's account. If their bank requires a written authorization, Offerors shall provide that authorization with their proposal.

Name and telephone number of bank's point of contact
Number of year's business has been conducted with each bank
Types of open accounts (checking, loans, etc.)
Balance of current accounts (the banks will provide a "range of figures" for this information, such as, medium five-figures range)
Means by which loans are secured and if paid as agreed
Point of contact and telephone number of three (3) different suppliers

For the purpose of evaluating the preaward survey information submitted hereunder:

Preaward survey data will be evaluated and scored, as it relates to the probability of the offeror successfully accomplishing the proposed effort.

The Government will use pre-award survey data provided by the offeror and data obtained from other sources to perform this assessment.

TAB G – Subcontracting Plan – FOR LARGE BUSINESS OFFERORS ONLY. Subcontracting Plan shall be prepared in accordance with FAR 52.219-9. A sample plan and format are contained at the end of this document.

NOTE: For the information of Large Business Offerors, the Fort Worth District’s assigned subcontracting goals are listed at the end of this section under Local Instructions.

VOLUME II – Technical Proposal

THE TECHNICAL PROPOSAL SHALL NOT INCLUDE ANY COST INFORMATION AND SHALL NOT EXCEED 50 PAGES (AS ANNOTATED ABOVE). ALL INFORMATION SHALL BE PROVIDED WITHIN THESE TABBED SECTIONS AND SHALL NOT BE INCLUDED AS AN APPENDIX OR ATTACHMENT).

TAB 1 – FACTOR 1: CONSTRUCTION PAST PERFORMANCE (Worksheet & Questionnaire Provided)

TAB 2 – FACTOR 2: CORPORATE RELEVANT SPECIALIZED EXPERIENCE (Worksheet Provided)

TAB 3 – FACTOR 3: MANAGEMENT EFFECTIVENESS (No Worksheet Provided)

TAB 4 – FACTOR 4: CONSTRUCTION DURATION (No Worksheet Provided)

3. TECHNICAL PROPOSAL SUBMISSION REQUIREMENTS.

3.1 FACTOR 1: CONSTRUCTION PAST PERFORMANCE (VOLUME II, TAB 1). Offerors shall be evaluated on construction projects completed (or substantially completed) in the last five years **that are same/similar in nature to the project requirements solicited under this RFP.** The Offeror’s past performance will be evaluated to determine technical capability to perform the proposed contract and how well it satisfied its customers. The information presented in the Offeror’s submittal, together with that from other sources available to the Government will comprise the input for evaluation of this factor. The following elements will be evaluated:

- Quality of Construction
- Timeliness of Performance
- Customer Satisfaction
- Subcontractor Management
- Documentation
- Safety Record

3.1.1 Offeror’s Submission Requirements.

3.1.1.1 Past Performance Information Sheets. Offerors shall complete and provide Past Performance Information on no more than five completed (or substantially complete) projects that reflect prior past performance in the construction elements referenced in paragraph 3.1 above. It is the Government’s preference that each project listed in Factor 2, “Corporate Specialized Relevant Experience” have a completed Past Performance Information Sheet as required for past performance under Factor 1. Experience given with no past performance information associated with it **implies** that the offeror may have performed poorly on those projects. The examples should be similar to this solicitation in project type and scope. As a minimum, the contractor shall provide the data specified in the attached “Construction Past Performance Information” Sheet. For each project submitted, offerors are encouraged to attach the following supporting documentation to the construction past performance information sheet, ensuring that you do not exceed the proposal page limitation:

- For Corps of Engineer contracts, provide a copy of the signed CCASS (Construction Contract Administration Support System) evaluation issued at the completion of the project.
- For non-Corps of Engineer contracts, provide a copy of the performance rating issued by the contracting agent.

- Awards, letters or other forms of recognition relevant to the submitted project that demonstrate the offeror's performance capabilities and customer satisfaction.

3.1.1.2 Past Performance Questionnaires. Offeror's shall identify the completed projects (or substantially complete) as described above to be used for reference and evaluation purposes and provide a questionnaire to the Point of Contact for each project listed. A sample Past Performance Evaluation Questionnaire is included at the end of this section. When completed, these forms shall be mailed, faxed or e-mailed to the Fort Worth District Contract Specialist identified in the sample transmittal letter provided. It is the contractor's responsibility to ensure that the reference documentation is provided, as the Government may not make additional requests for past performance information from the references. The evaluation form shall be provided to the Contract Specialist directly from the reference.

3.1.1.3 Safety Record. The offeror shall submit either OSHA Form 300 or 300a showing the incident rates for their firm for all projects within the past three years. This form, in Microsoft Excel format, can be downloaded from the Internet at:

<http://www.osha.gov/recordkeeping/new-osha300form1-1-04.xls>

http://www.nccrimecontrol.org/HR/OSHA_Form_300.doc

http://www.dir.ca.gov/dosh/dosh_publications/oshalog300.pdf

This data is to be converted using the following formula for each of the three years:

Number of Lost Time Accidents for the year (Column H on Form 300 or 300A) x 200,000 divided by Man-Hours Worked that Year (from Form 300A) = Incident Rate for the Year

The contractor, for each of the past 3 years using the appropriate OSHA Form data, shall calculate these incident rates. These calculations shall be presented on a separate sheet of paper for each year with the mathematical average of all 3 years.

If the Offeror has a safety incentives program, information shall be submitted describing this program. The description of the safety incentives program shall include as a minimum a description of what benefits the firm has seen by implementing the program, benefits to the customer and a description of how the program is administered.

3.1.1.4 Other Sources. The Government may contact sources other than those provided by the Offeror for information with respect to past performance. These other sources may include, but are not limited to, CCASS, telephone interviews with organizations familiar with the Offeror's performance, and Government personnel with personal knowledge of the Offeror's performance capability.

3.1.1.5 New Companies and Joint Ventures. New companies and joint ventures entering the marketplace (without relevant company experience) are reminded that they, along with all other offerors, may submit past performance information for key personnel, using the attached "Construction Past Performance Information" sheets. If such information is submitted, how long key personnel stayed on their assigned projects and how well they managed their portion of the referenced projects shall be used to judge past performance, along with any other information regarding such key personnel from any other sources the Government may choose to contact. If no such information regarding key personnel is given, then the new company or joint venture shall be given a neutral rating.

3.1.2 Evaluation. The Government will evaluate the Offeror's responsiveness to the solicitation regarding past performance using the sources identified above. New Companies and Joint Ventures shall be evaluated on their own past performance, including the performance of key personnel as noted in 3.1.1.4, above, to determine the company's ability to perform satisfactorily under the elements of evaluation.

Offerors may be provided an opportunity to address any negative past performance information about which the Offeror has not previously had an opportunity to respond. The Government treats an Offeror's lack of past performance as having no positive or negative evaluation significance. The Government will evaluate past performance based on the elements listed below:

- **Quality of Construction.** Based on all information available, the Government will assess the quality of the actual construction undertaken and the standards of workmanship exhibited by the Offeror.

- **Timeliness of Performance.** The Government will evaluate all information available with respect to the Offeror completing past projects within the scheduled completion times.
- **Customer Satisfaction.** The Government will evaluate all information available with respect to the Offeror's past customer satisfaction, cooperation with customers, and interaction on past projects.
- **Subcontractor Management.** The Government will evaluate all information available with respect to the Offeror's management of subcontractors, including mitigation of conflicts and resolution of disputes at the lowest level. For large businesses, the Government will also evaluate compliance with subcontracting plans.
- **Documentation.** The Government will evaluate all information available with respect to the Offeror's level of meeting customer satisfaction on timeliness and quality of the documentation, reports, and other written materials completed by the Offeror on past projects.
- **Safety Record.** Offerors who have lost time incident rates below the target rate of 1.00 and a documented safety incentive program will receive a more favorable evaluation. If the average incident rate exceeds the target rate the Offeror is encouraged to submit an explanation of what they have done to improve their safety record.

3.2 FACTOR 2: CORPORATE RELEVANT SPECIALIZED EXPERIENCE (VOLUME II, TAB 2).

Offerors shall be evaluated on at least three, but no more than five construction projects successfully completed or in progress in the last five years that demonstrate the Offeror's specialized experience in the construction of similar construction projects. For this proposal, similar projects are projects that meet the following criteria:

Furnish detailed examples of Offeror's experience of similar type work required by this solicitation, both for Government agencies and private industry. Examples shall show relevance of experience to those construction type methods required by the Technical Specifications. Offeror shall also state his experience on airfield pavement projects.

3.2.1 Offeror's Submission Requirements. Offerors shall submit project information for construction projects that reflect specialized experience in the construction elements referenced in paragraph 3.2 above. It is the Government's preference that each project listed in Factor 2, "Corporate Specialized Relevant Experience", have a completed Past Performance Information Sheet as required for past performance under Factor 1. Experience given with no past performance information associated with it leads the Government to believe that the offeror may have performed poorly on those projects. The examples should be similar to this solicitation in project type and scope. As a minimum, the contractor shall provide the data specified in the attached "Corporate Relevant Specialized Experience" Sheet. If the Offeror represents the combining of two or more companies for the purpose of this RFP, each company shall list project examples. The experience of individuals will not be credited under this factor.

3.2.2 New Companies and Joint Ventures. If offeror represents the combining of two or more companies for the purpose of this RFP, the proposal shall clearly identify the contractual responsibilities of each firm and the work to be performed by each; describe the nature of the association; indicate whether the firms have experience working together in construction ventures, including how long and how many projects. In addition, each company including joint ventures shall list their Government contract experience. Provide a copy of the commitment letter of the firms or the joint venture agreement. Prior to award of any contract, a copy of the Joint Venture Agreement will be required. If approval of the Joint Venture Agreement is required by the Small Business Administration, failure to timely provide an approved SBA Joint Venture Agreement may prevent award of a contract.

3.2.3 Evaluation. The Government will review the example construction projects provided by the Offeror to evaluate and rate the recent relevant specialized experience of the Offeror with similar projects. The example construction projects should closely resemble the scope, size, and complexity of the project identified in this solicitation. The Government will place a higher value on experience with similar projects executed with the Corps of Engineers or other DoD Components. If the Offeror cannot provide suitable relevant experience and the evaluators consider that the information provided indicates that the Offeror has no relevant experience, a determination will be made as to the risk this lack of corporate experience presents to the Government and the proposal will be evaluated accordingly.

3.3 FACTOR 3: MANAGEMENT EFFECTIVENESS (VOLUME II, TAB 3) The Government will evaluate the Offeror's management effectiveness by considering the Offeror's understanding and capability of successfully managing the project to completion. The following elements will be evaluated:

- Organizational Chart or Structure and Key Personnel Resumes.

- Preliminary Quality Control Plan (QC Plan).
- Contract Closeout Plan.
- Small and Small Disadvantaged Business Utilization.

3.3.1 Offeror's Submission Requirements.

3.3.1.1 Organizational Chart or Structure and Key Personnel Resume Information. Provide an organizational chart that clearly shows lines of authority and communication chain of the organization, including key personnel. "Key personnel" are defined as, but not limited to, Project Manager, Site Superintendent, Project Scheduler, and Quality Control System Manager. (Ref: Sections 01320F and 01451 for minimum qualifications). Qualifications for the Project Manager are listed below. **Offeror shall provide key personnel resume information that includes as a minimum, the following:**

- Name and Title
- Specific assignment on this project
- Name of Firm (If different from Offeror)
- Number of years with this firm/with other firms
- Education .Degree(s)/year/specialization
- Active registration: number/state/year
- Specific experience, including dates, and qualifications relevant to this project

Offerors are encouraged to provide descriptive analysis of why they feel their key personnel meet the criteria for key personnel experience.

3.3.1.1.1 Qualification Requirements for Project Manager (PM): List previous experience on managing construction contracts similar in size, construction type and complexity with 5 years minimum experience as a PM. Include dates and durations of PM duties on the projects.

3.3.1.2. Preliminary Quality Control Plan (QC Plan). Provide preliminary plan for quality control of all work. After award, the successful Offeror will be required to expand this preliminary plan to comply with contract requirements for Quality Control. The preliminary plan must address the following as a minimum:

3.3.1.2.1. QC organizational chart identifying the chain of command of the QC organization, number of individuals and disciplines of qualified QC staff.

3.3.1.2.2 Authority and functions of the QC Manager and each key QC position.

3.3.1.2.3 Maintenance of As-builts: Describe procedures for maintaining up-to-date plans and specifications on the job site and for preparation and submittal of as-builts. Include narrative describing document control and production of electronic "as-built" drawings and their transfer to the Government.

3.3.1.2.4 Deficiency or discrepancy tracking system and correction procedures.

3.3.1.2.5 System for tracking Requests for Information submitted to the Government.

3.3.1.2.6 The plan and procedures for the Contractor's completion inspection, prior to the joint inspection with the Government QA personnel.

3.3.1.3 Contract Closeout Plan. A Closeout Plan shall be furnished in a brief structured time scale schedule reflecting the planned activities during the final 90 days of the contract activity. Minimum items to be included:

3.3.1.3.1 Testing of equipment and systems.

3.3.1.3.2 Equipment instruction and training schedules.

3.3.1.3.3 O&M Manuals completion schedule and transfer.

3.3.1.3.4 As-built drawings completion schedule and transfer.

3.3.1.3.5 Pre-final inspection procedures and correction of deficiencies.

3.3.1.3.6 Warranty data submission and planned implementation.

3.3.1.3.7 Closeout of administrative deficiencies.

3.3.1.4 Small and Small Disadvantaged Business Utilization. ALL OFFERORS are required to provide a narrative discussion of their plan, as well as provide the information requested in the below table, for utilization of small and small disadvantaged businesses. At a minimum, the narrative shall discuss:

3.3.1.4.1 Goals for subcontracting with small and small disadvantaged businesses in sufficient detail to allow Government evaluators to determine that these goals are realistic, justifiable, positive, and in accordance with the Government’s policy to maximize opportunities for these types of businesses.

3.3.1.4.2 The extent to which small disadvantaged businesses, and where appropriate, historically black colleges and universities/minority institutions (HBCU/MI) have been identified for participation as part of the Offeror’s team.

3.3.1.4.3 The Offeror’s past and present commitment to providing subcontracting opportunities and encouragement to small and small disadvantaged businesses.

3.3.1.4.4 The Offeror must complete the following table as part of their proposal to express in percentage what they plan to execute as a prime contractor and what they plan to subcontract for this project.

	*Percentage
Self Perform (Prime Contractor)	%
Subcontracted Work:	
- Small and Small Business Disadvantaged Business	%
- HCBU/MI	%
Total:	100%

3.3.2 Evaluation.

3.3.2.1 Organizational Chart or Structure and Key Personnel Resumes.

3.3.2.1.1 The organizational chart will be evaluated for chain of command, lines of communication and logical management structure.

3.3.2.1.2 The Government will review the key personnel provided by the Offeror to evaluate and rate the recent experience of the key personnel in similar projects. Resumes will be evaluated for qualifications and relevant technical experience to this project. The key personnel example projects should closely resemble the project identified in this solicitation.

3.3.2.2 Quality Control Plan. The Quality Control (QC) Plan will be evaluated for staffing and practices that ensure all services required by this solicitation are performed and provided in a manner that meets the project requirements.

3.3.2.3 Closeout Plan. The Offeror’s closeout plan will be reviewed and evaluated to determine the Offeror’s understanding of the RFP’s close out requirements. Particular emphasis will be placed on O&M Manual production, Installation Staff training methods, final acceptance process, and warranty procedures.

3.3.2.4 Small and Small Disadvantaged Business Utilization. The Government will evaluate narratives provided for the following elements. Greater detail and specificity will be given greater credit than general statements and commitments:

3.3.2.4.1 The extent to which the goals for subcontracting with small and small disadvantaged businesses are realistic,

justifiable, positive, and in accordance with the Government's policy to maximize opportunities for these types of businesses.

3.3.2.4.2 The extent to which small disadvantaged businesses, and where appropriate, historically black colleges and universities/minority institutions (HBCU/MI) have been identified for participation as part of the Offeror's team.

3.3.2.4.3 The Offeror's past commitment to providing subcontracting opportunities and encouragement to small and small disadvantaged businesses.

3.4 FACTOR 4: CONSTRUCTION DURATION (VOLUME II, TAB 4). The Government's requirement is that all work on this project be completed within (*See Section 01000, Construction Schedule*) days of Notice to Proceed, inclusive of all review periods and Government phasing requirements specified. Offeror may propose a completion period of lesser duration; however, any such proposals for a completion period of lesser duration must include the same time periods for review and phasing as are included in this request for proposals. If the Government accepts a proposal for a completion period of lesser duration, and such proposal alters the time periods for review and phasing, the contract shall be read to include the original periods for review and phasing. Completion periods of significantly lesser duration may be rated as more advantageous to the Government. **If a completion period of lesser duration is proposed and accepted by the Government, the accepted completion period will replace the original construction schedule listed under Section 01000. In addition, if a completion period of lesser duration is proposed, the Bid Schedule must reflect pricing information for the lesser proposed completion period.** Offers who propose completion of the work beyond the maximum completion period specified above, will be rated unsatisfactory for this factor.

3.4.1 Offeror's Submission Requirements. Offerors must provide a proposed schedule to show how the contractor intends to perform the work within the proposed construction duration. This shall be shown in a time-scaled [Gantt Chart] summary network, which shall be between 50-100 activities.

3.4.2 Evaluation. This factor will be evaluated by reviewing the submitted scheduling documents. Completion periods of significantly lesser duration may be rated as more advantageous to the Government. Offers who propose completion of the work beyond the maximum completion period specified above, will be rated unsatisfactory for this factor. The total contract duration in calendar days, must be reflected on the Chart.

4. EVALUATION STANDARDS. Evaluation criteria (factors) will be rated using the following adjectival descriptions. Evaluators will apply the appropriate adjective to each criterion rated. The evaluator's narrative explanation must clearly establish that the Offeror's submittal meets the definitions established below. As each criteria is evaluated an assessment of Risk will be made. The "Proposal Risk Assessment" ratings are applicable to all criteria except Past Performance. Past Performance Risk is rated using the "Past Performance Risk Assessment" ratings listed below.

4.1 Rating Adjectives

4.1.1 OUTSTANDING - Information submitted demonstrates Offeror's potential to significantly exceed performance or capability standards. The Offeror has clearly demonstrated an understanding of all aspects of the requirements to the extent that timely and highest quality performance is anticipated. The Offeror possesses exceptional strengths that will significantly benefit the Government. The Offeror's qualifications meet the fullest expectations of the Government. The Offeror has convincingly demonstrated that the RFP requirements have been analyzed, evaluated, and synthesized into approaches, plans, and techniques that, when implemented, should result in highly effective and efficient performance under the contract. An assigned rating of "outstanding" indicates that, in terms of the specific factor, the submittal contains no significant weaknesses, deficiencies or disadvantages. Offeror very significantly exceeds most or all solicitation requirements.

4.1.2 ABOVE AVERAGE - Information submitted demonstrates Offeror's potential to exceed performance or capability standards. Offeror possesses one or more strengths that will benefit the Government. The areas in which the Offeror exceeds the requirements are anticipated to result in a high level of efficiency, productivity, or quality. The Offeror's qualifications are responsive with minor weaknesses, but no major weaknesses noted. An assigned rating of "Above Average" indicates that, in terms of the specific factor, any weaknesses noted are minor and should not seriously affect the offeror's performance. The submittal demonstrates that the requirements of the RFP are well understood and the approach will likely result in a high quality of performance. A rating of "Above Average" is used when there are no indications of exceptional features or innovations that could prove to be beneficial, or conversely, weaknesses that could diminish the quality of the effort. Disadvantages are minimal. The submittal contains excellent features that will likely produce results very beneficial to

the Government. Offeror fully meets all RFP requirements and significantly exceeds many of the RFP requirements. Response exceeds a "Satisfactory" rating.

4.1.3 SATISFACTORY (Neutral) - Information submitted demonstrates Offeror's potential to meet performance or capability standards. Offeror presents an acceptable solution and meets minimum standard requirements. Offeror possesses few or no advantages or strengths. The Offeror's proposal contains weaknesses in several areas that are offset by strengths in other areas. Offeror meets all RFP requirements, presents a complete and comprehensive proposal, exemplifies an understanding of the scope and depth of the task requirements, and displays understanding of the Government's requirements. Offeror's response exceeds a "Marginal" rating. No significant advantages or disadvantages. In the case of no past performance on the part of the Offeror, a SATISFACTORY rating will be assigned for Past Performance.

4.1.4 MARGINAL - Information submitted demonstrates Offeror's potential to marginally meet performance or capability standards necessary for minimal but acceptable contract performance. The submittal is not adequately responsive or does not address the specific factors. The assignment of a rating of "Marginal" indicates that mandatory corrective action would be required to prevent significant deficiencies from affecting the overall project. The Offeror's qualifications demonstrate an acceptable understanding of the requirements of the RFP and the approach will likely result in an adequate quality of performance. Offeror displays low probability of success, although the submittal has a reasonable chance of becoming at least acceptable. Offeror's response exceeds an "Unsatisfactory" rating. Significant disadvantages.

4.1.5 UNSATISFACTORY – Information submitted fails to meet performance or capability standards necessary for acceptable contractor performance. The Offeror's interpretation of the Government's requirements is so superficial, incomplete, vague, incompatible, incomprehensible, or incorrect as to be Unsatisfactory. The submittal does not meet the minimum requirements of the RFP; requirements could only be met with major changes to the submittal. There is no reasonable expectation that acceptable performance would be achieved. The Offeror's qualifications have many deficiencies and/or gross omissions; fail to provide a reasonable, logical approach to fulfilling much of the Government's requirements; and, fail to meet many of the minimum requirements. The Offeror's qualifications are so unacceptable that it would have to be completely revised in order to attempt to make them acceptable. Very significant disadvantages.

4.2 Proposal Risk Assessment (Applicable to all factors except Past Performance)

4.2.1 LOW RISK – Proposal weaknesses have little potential to cause disruption of schedule, increase in cost, or degradation of performance. Normal contractor effort and normal Government monitoring will probably minimize any difficulties.

4.2.2 MODERATE RISK – Proposal has weaknesses that can potentially cause some disruption of schedule, increase in cost, or degradation of performance. However, special contractor emphasis and close Government monitoring will probably minimize difficulties.

4.2.3 HIGH RISK – Proposal has weaknesses that have the potential to cause serious disruption of schedule, increase in cost, or degradation of performance even with special contractor emphasis and close Government monitoring.

4.3 Past Performance Risk Assessment (Applicable only to Past Performance)

4.3.1 LOW RISK – Based on offeror's past performance record, essentially no doubt exists that the offeror will successfully perform the required effort.

4.3.2 MODERATE RISK – Based on the offeror's past performance record, some doubt exists that the offeror will successfully perform the required effort.

4.3.3 HIGH RISK – Based on the offeror's past performance record, extreme doubt exists that the offeror will successfully perform the required effort.

4.3.4 UNKNOWN RISK – No relevant performance record is identifiable upon which to base a meaningful performance risk prediction. A search was unable to identify any relevant past performance information for the offeror or key team members/subcontractors or their key personnel. This is neither a negative or positive assessment.

5. TECHNICAL EVALUATION WEIGHTS

5.1 Relative Importance Definition. For the purpose of this evaluation, the following terms will be used to establish the relative importance of the technical factors and subfactors.

- **Significantly More Important:** The criterion is at least two times greater in value than another criterion.
- **More Important:** The criterion is greater in value than another criterion but less than two times greater.
- **Equal:** The criterion is of the same value or nearly the same as another criterion.

5.2 PRICE is approximately equal in importance to ALL TECHNICAL FACTORS when combined.

5.3 Weight among technical factors (listed in descending order of importance):

FACTOR 1: CONSTRUCTION PAST PERFORMANCE: This factor is more important than Factors 2 and Factors 3 and significantly more important than Factor 4.

FACTOR 2 CORPORATE RELEVANT SPECIALIZED EXPERIENCE: This factor is equal in importance to Factor 3 and is more important than Factor 4.

FACTOR 3: MANAGEMENT EFFECTIVENESS: This factor is equal in importance to Factor 2 and is more important than Factor 4.

FACTOR 4: CONSTRUCTION DURATION. This factor is less in importance to the above factors.

6. PRICE.

6.1 The Government will perform a price analysis on all proposals received. Price analysis will be performed in accordance with FAR 15.404-1, to determine completeness, reasonableness, and understanding of the work. The evaluation will determine the adequacy of the offer in fulfilling the requirements of the proposal. Completeness addresses the extent to which the elements of the price proposal are consistent with the requirements of the RFP. Reasonableness will be established using historical price information, price competition information, the IGE, and any other pricing tools necessary.

6.2 Price will not be scored, but will be a factor in establishing the competitive range prior to discussions (if held) and in making the final best value determination for award.

7. EXCEPTIONS. Exceptions to the contractual terms and conditions of the solicitation (e.g., standard company terms and conditions) may result in a determination to reject a proposal.

8. RESTRICTIONS. Failure to submit all the data in the format indicated in this solicitation may be cause for determining a proposal incomplete and, therefore, not considered for evaluation, and for subsequent award.

9. PROPOSAL EVALUATION.

9.1 Each member of the Government evaluation team (Source Selection Evaluation Board) will independently consider all information provided in the proposal. Worksheets are provided on the following pages, which the evaluators will use to review and rate the individual proposals.

9.2 Once these individual analyses are completed, the team will meet and determine a rating for each of the evaluation factors by consensus decision.

9.3 The evaluation team will document strengths (e.g., advantages), weaknesses (e.g., disadvantages), and other comments (e.g., deficiency and/or clarification) to support the rating for each factor, as well as the overall rating. Documentation and comments are required for all ratings.

9.4 This final overall rating, along with ratings on individual factors, will be provided to the Contracting Officer/Source Selection Authority for the best value decision.

10. BASIS FOR AWARD

10.1 Proposals must meet the criteria stated in the RFP in order to be eligible for award, to include responsiveness, technical acceptability and responsibility.

10.2 In order to determine which proposal represents the best overall value, the Government may compare proposals to one another. The Government will award a contract to the responsible Offeror whose technical submittal and price proposal contains the combination of those criteria described in this document offering the best overall value to the Government. Best value will be determined by a comparative assessment of proposals against all source selection criteria in this RFP.

10.3 As technical ratings and relative advantages and disadvantages become less distinct, differences in price between proposals are of increased importance in determining the most advantageous proposal. Conversely, as differences in price become less distinct, differences in rating and relative advantages and disadvantages between proposals are of increased importance to the determination. In the event that the technical and cost/price proposals become more equivalent for two or more large businesses, the subcontracting plan will become more significant and may become the determining factor for award.

10.4 The Government reserves the right to accept other than the lowest priced offer. The right is also reserved to reject any and all offers. The basis of award will be a conforming offer, the price or cost of which may or may not be the lowest. If other than the lowest offer, it must be sufficiently more advantageous than the lowest offer to justify the payment of additional amounts. Any award price must be determined to be fair and reasonable.

10.5 Offerors are reminded to include their best technical and price terms in their initial offer and not to automatically assume that they will have an opportunity to participate in discussions or be asked to submit a revised offer. The Government may make award of a conforming proposal without discussions, if deemed to be within the best interests of the Government.

10.6 The Government intends to award a contract without discussions based on initial proposals received; therefore, the proposals shall contain the offeror's best terms from a cost and technical standpoint. However, the Government reserves the right to conduct discussions in accordance with FAR 52.215-1. Should discussions be necessary after evaluations, the Government will establish a competitive range of the offerors that are the most highly rated. The Government reserves the right to address any pertinent issues in the proposals.

VOLUME I – TAB D

PROPOSAL DATA SHEET

1. Name of Firm:	
2. Address:	
3. Phone:	
4. Fax:	
5. E-mail:	
6. Duns # (used for accessing CCASS)	
7. If a joint venture or contractor-subcontractor association of firms, list the individual firms and briefly describe the nature of the association.	
Firm 1:	
Firm 2:	
Firm 3:	
Nature of Association:	
8. AUTHORIZED NEGOTIATORS. FAR 52.215-11 The Offeror represents that the following persons are authorized to negotiate on its behalf with the Government in connection with this Request for Proposals (RFP).	
9. Name of Person Authorized to Negotiate:	
10. Negotiator's Address:	
11. Negotiator's Telephone:	
12. Negotiator's E-mail:	

VOLUME II – TAB 1

FACTOR 1: CONSTRUCTION PAST PERFORMANCE INFORMATION

Provide the following information in accordance with Evaluation factor 3.1

1. Project Title:	
2. Location:	
3. Contract number:	
4. Procuring activity:	
5. Procurement Point of Contact and Telephone Number:	
6. Address and telephone number of owner/customer:	
7. Type of Project (private sector, Government, planned unit development, etc.):	
8. General Nature of the Contract:	
9. Award Date:	
10. Original Contract Amount:	
11. Final Contract Amount:	
12. Original Completion Date:	
13. Final Completion Date:	
14. Explanation for any differences between original and final contract costs and completion dates:	
15. Total number of Manhours including all subcontractor:	
16. Total number of Lost Time Accidents including all Subcontractors:	

**SAMPLE TRANSMITTAL LETTER
AND
PAST PERFORMANCE EVALUATION QUESTIONNAIRE**

Date: _____

To: _____

We have listed your firm as a reference for work we have performed for you as listed below. Our firm has submitted a proposal under a project advertised by the U.S. Army Corps of Engineers, Fort Worth District. In accordance with Federal Acquisition Regulations (FAR), an evaluation of our firm's past performance will be completed by the Corps of Engineers. Your candid response to the attached questionnaire will assist the evaluation team in this process.

We understand that you have a busy schedule and your participation in this evaluation is greatly appreciated. Please complete the enclosed questionnaire as thoroughly as possible. Space is provided for comments. Understand that while the responses to this questionnaire may be released to the offeror, FAR 15.306 (e)(4) prohibits the release of the names of the persons providing the responses. Complete confidentiality will be maintained. Furthermore, a questionnaire has also been sent to _____ of your organization. Only one response from each office is required. If at all possible, we request that you individually answer this questionnaire and then coordinate your responses with that of _____, to develop a consensus on one overall response from your organization.

Please send your completed questionnaire to the following address to arrive NOT LATER THAN _____ *[DATE]* _____:

U.S. Army Engineer District, Fort Worth
ATTN: CESWF-CT-C (Kenneth Carleton)
819 Taylor Street, Rm 2A19
Fort Worth, TX 76102

The questionnaires can also be faxed to Kenneth Carleton, Fort Worth District Contract Specialist at FAX 817-886-6407 or emailed to Kenneth.Carleton@swf02.usace.army.mil. If you have questions regarding the attached questionnaire, or require assistance, please contact Kenneth Carleton at 817-886-1084. Thank you for your assistance.

Hazardous Cargo Loading Apron

PAST PERFORMANCE EVALUATION QUESTIONNAIRE

Upon completion of this form, please send directly to the U.S. Army Corps of Engineers in the enclosed addressed envelope or fax [or e-mail] to (817) 886-6407, ATTN: Kenneth Carleton. Do not return this form to our offices. Thank you.

1. Contractor/Name & Address (City and State):

2. Type of Contract: Fixed Price _____ Cost Reimbursement _____

Other (Specify) _____

3. Title of Project/Contract Number: _____

4. Description of Work: (Attach additional pages as necessary)

5. Complexity of Work: High _____ Mid _____ Routine _____

6. Location of Work: _____

7. Date of Award: _____

8. Status: Active _____ (provide percent complete)

Complete _____ (provide completion date)

9. Name, address and telephone number of Contracting Officer's Technical Representative:

10. QUALITY OF CONSTRUCTION:

Evaluate the contractor's performance in complying with contract requirements, quality achieved and overall technical expertise demonstrated.

Outstanding Quality	
Above Average Quality	
Satisfactory Quality	
Marginal Quality	
Unsatisfactory or Experienced Significant Quality Problems	

Remarks: _____

11. TIMELINESS OF PERFORMANCE:

To what extent did the contractor meet the contract and/or individual task order schedules if the contract was an indefinite delivery type contract?

Completed Substantially Ahead of Schedule (Outstanding)	
Completed Ahead of Schedule (Above Average)	
Completed on Schedule with Minor Delays Under Extenuating Circumstances (Satisfactory)	
Completed Behind Schedule (Marginal)	
Experienced Significant Delays without Justification (Unsatisfactory)	

Remarks: _____

12. CUSTOMER SATISFACTION:

To what extent were the end users satisfied with:

	Quality	Cost	Schedule
Exceptionally Satisfied (Outstanding)			
Highly Satisfied (Above Average)			
Satisfied (Satisfactory)			
Somewhat Dissatisfied (Marginal)			
Highly Dissatisfied (Unsatisfactory)			

Remarks: _____

13. SUBCONTRACTOR MANAGEMENT

How well did the contractor manage and coordinate subcontractors, suppliers, and the labor force?

Outstanding management and coordination of subcontractors	
Above Average management and coordination of subcontractors	
Satisfactory management and coordination of subcontractors	
Marginal management and coordination of subcontractors	
Unsatisfactory management and coordination of subcontractors	

Remarks: _____

14. SAFETY

How well did the Contractor implement and maintain its Accident Prevention Program? Did it have an effective safety incentive program? Were there excessive lost time accidents?

Outstanding Documentation	
Above Average Documentation	
Satisfactory Documentation	
Marginal Documentation	
Unsatisfactory Documentation	

Remarks: _____

15. DOCUMENTATION

To what extent were the contractor's reports and documentation accurate, complete and were they submitted in a timely manner?

Outstanding Documentation	
Above Average Documentation	
Satisfactory Documentation	
Marginal Documentation	
Unsatisfactory Documentation	

Remarks: _____

16. IF GIVEN THE OPPORTUNITY, WOULD YOU WORK WITH THIS CONTRACTOR AGAIN?

Yes _____ No _____ Not Sure _____

VOLUME II – TAB 2

FACTOR 2: CORPORATE SPECIALIZED RELEVANT EXPERIENCE.

Provide the following information in accordance with Evaluation factor 3.2

1. Project Title:	
2. Location:	
3. Contract number:	
4. Nature of involvement in this project, i.e. General Contractor, subcontractor, designer:	
5. Procuring activity:	
6. Procurement point of contact and telephone number:	
7. List dates of construction start and completion or percent complete if construction is in progress:	
8. Address of building(s):	
9. Name, address and telephone number of owner:	
10. Indicate type of project (private sector, Government, planned unit development, etc.):	
11. Total cost:	
12. Technical relevancy to this project (i.e. type of foundation, roof and structure as related to the technical specifications):	

Proposal Evaluation Worksheet (SAMPLE)

Proposal Evaluation Worksheet						
(SAMPLE)						
RFP No.						
Evaluator's Name:				Offeror's Name:		
Evaluation Factor:	Factor 1 Construction Past Performance (Volume II, TAB 1)					
Factor Rating: (Place X in Column)	Outstanding	Above Average	Satisfactory	Marginal	Unsatisfactory	
Factor Risk: (Place X in Column)	Low		Medium		High	
Rating Rationale:	(Include supporting rationale for the ratings.)					
Strengths:	(Precede the strength with an (S) if it identifies a significant strength.)					
Weaknesses:	(Precede the weakness with an (S) if it identifies a significant weakness.)					
Deficiencies:	(List all areas where the contractor fails to meet minimum requirements of the solicitation)					
Uncertainties:	(Any aspect of the proposal for which the intent of the offeror is unclear because there may be more than one way to interpret the offer.)					

Proposal Evaluation Worksheet (SAMPLE)

Proposal Evaluation Worksheet					
(SAMPLE)					
RFP No.					
Evaluator's Name:		Offeror's Name:			
Evaluation Factor:	Factor 2 Corporate Relevant Specialized Experience (Volume II, TAB 2)				
Factor Rating: (Place X in Column)	Outstanding	Above Average	Satisfactory	Marginal	Unsatisfactory
Factor Risk: (Place X in Column)	Low		Medium		High
Rating Rationale:	(Include supporting rationale for the ratings.)				
Strengths:	(Precede the strength with an (S) if it identifies a significant strength.)				
Weaknesses:	(Precede the weakness with an (S) if it identifies a significant weakness.)				
Deficiencies:	(List all areas where the contractor fails to meet minimum requirements of the solicitation)				
Uncertainties:	(Any aspect of the proposal for which the intent of the offeror is unclear because there may be more than one way to interpret the offer.)				

Proposal Evaluation Worksheet (SAMPLE)

Proposal Evaluation Worksheet					
(SAMPLE)					
RFP No.					
Evaluator's Name:		Offeror's Name:			
Evaluation Factor:	Factor 3 Management Effectiveness (Volume II, TAB 3)				
Factor Rating: (Place X in Column)	Outstanding	Above Average	Satisfactory	Marginal	Unsatisfactory
Factor Risk: (Place X in Column)	Low		Medium		High
Rating Rationale:	(Include supporting rationale for the ratings.)				
Strengths:	(Precede the strength with an (S) if it identifies a significant strength.)				
Weaknesses:	(Precede the weakness with an (S) if it identifies a significant weakness.)				
Deficiencies:	(List all areas where the contractor fails to meet minimum requirements of the solicitation)				
Uncertainties:	(Any aspect of the proposal for which the intent of the offeror is unclear because there may be more than one way to interpret the offer.)				

Proposal Evaluation Worksheet (SAMPLE)

Proposal Evaluation Worksheet					
(SAMPLE)					
RFP No.					
Evaluator's Name:		Offeror's Name:			
Evaluation Factor:	Factor 4 Construction Duration (Volume II, TAB 4)				
Factor Rating: (Place X in Column)	Outstanding	Above Average	Satisfactory	Marginal	Unsatisfactory
Factor Risk: (Place X in Column)	Low	Medium		High	
Rating Rationale:	(Include supporting rationale for the ratings.)				
Strengths:	(Precede the strength with an (S) if it identifies a significant strength.)				
Weaknesses:	(Precede the weakness with an (S) if it identifies a significant weakness.)				
Deficiencies:	(List all areas where the contractor fails to meet minimum requirements of the solicitation)				
Uncertainties:	(Any aspect of the proposal for which the intent of the offeror is unclear because there may be more than one way to interpret the offer.)				

Proposal Evaluation
Summary Rating Chart
(SAMPLE)

RFP No.			
Evaluator's Name:		Offeror's Name:	
Factor No.	Description	Factor Rating	Factor Risk
1	Construction Past Performance		
2	Corporate Relevant Specialized Experience		
3	Offeror Management Effectiveness		
4	Construction Duration		
Overall Rating / Overall Risk			

Comments:

Proposal Evaluation Consensus Chart (SAMPLE)

RFP No.						
Evaluator's Name:			Offeror's Name:			
Factor No.	Description	Board Member 1	Board Member 2	Board Member 3	Board Member 4	Consensus
1	Construction Past Performance	Factor Rating Factor Risk	Factor Rating Factor Risk	Factor Rating Factor Risk	Factor Rating Factor Risk	Factor Rating Factor Risk
2	Corporate Relevant Specialized Experience	Factor Rating Factor Risk	Factor Rating Factor Risk	Factor Rating Factor Risk	Factor Rating Factor Risk	Factor Rating Factor Risk
3	Offeror Management Effectiveness	Factor Rating Factor Risk	Factor Rating Factor Risk	Factor Rating Factor Risk	Factor Rating Factor Risk	Factor Rating Factor Risk
4	Construction Duration	Factor Rating Factor Risk	Factor Rating Factor Risk	Factor Rating Factor Risk	Factor Rating Factor Risk	Factor Rating Factor Risk
Overall Rating Overall Risk		Rating Risk	Rating Risk	Rating Risk	Rating Risk	Rating Risk

Board Member 1

Board Member 2

Board Member 3

Board Member 4

*The Overall Rating must have supporting documentation in the form of a "Consensus - Proposal Evaluation Worksheet" document to support overall rating and overall risk.

Instructions to Offerors

LOCAL INSTRUCTIONS

PROJECT INFORMATION

- a. For technical information regarding plans and specifications contact Fort Worth District Office, Corps of Engineers, Fort Worth, Texas, telephone, 817/886-1886, Norma Edwards.
- b. For information regarding bidding procedures or bonds, contact Kenneth R. Carleton via telephone 817/886-1084; via email kenneth.carleton@swf02.usace.army.mil, or visit Room 2A19, 819 Taylor Street, Fort Worth, Texas 76102. Collect calls not accepted.
- c. Offers will NOT be publicly opened. Information concerning the status of the evaluation and/or award will NOT be available after receipt of proposals.

GENERAL NOTICES

- a. In the technical specifications wherever the term "stabilized aggregate base course" is used, or wherever a reference is made to a section entitled "Stabilized Aggregate Base Course," it shall be deemed to mean "Aggregate Base Course."
- b. Offerors must provide full, accurate, and complete information as required by this solicitation and its attachments. The penalty for making false statements in Offers is prescribed in 18 USC 1001. (FAR 52.214-4)
- c. The Affirmative Action Requirement of the Equal Opportunity Clause may apply to any contract resulting from this RFP.

FACSIMILE OFFERS

For the purposes of this solicitation, Facsimile Offers for Original submission of proposals are NOT authorized. If during the course of the evaluation phase it is determined by the Contracting Officer to allow submission of facsimile documents, these specific documents will be identified at that time.

In the event that facsimile documents will be allowed, a fax number will be provided.

This facsimile number will be available for use by all bidders and offerors on a "first come, first served" basis and is, therefore, subject to heavy use for long periods of time. Accordingly, bidders/offerors are cautioned that "last minute" bids/offers may be received late due to heavy message traffic. The government assumes no responsibility for such late bids/offers.

BID GUARANTEE

Reference the provision 52.228-1, Bid Guarantee. **Facsimile Bonds are not acceptable.**

OFFEROR'S QUALIFICATIONS

Pursuant to FAR 9.1, as an evaluation criteria, the offeror will be requested by the Government to submit a statement regarding his previous experience in performing comparable work, his business and technical organization, financial resources, and plant available to be used in performing the work.

NOTICE REGARDING POTENTIAL EMPLOYMENT ON MILITARY INSTALLATION

If the work called for by this request for proposal is located on a military installation, offerors should check with post/base security to determine if potential employees will be allowed on the base/post to seek employment.

SMALL BUSINESS SUBCONTRACTING PLAN

- a. This notice applies to Large Businesses only.
- b. Reference FAR 52.219-9, SMALL BUSINESS SUBCONTRACTING PLAN. The bidder/offeror shall take into consideration only those subcontracts that he/she will award when preparing the subcontracting plan required by the FAR.
- c. The Contracting Officer will NOT make award under this solicitation without an APPROVED subcontracting plan.
- d. To be approved, the plan must contain at a minimum, the eleven elements set forth in FAR 52.219-9, paragraph (d). Pursuant to AFARS 19.705-4(d), your plan will be reviewed and scored in accordance with AFARS Appendix DD to ensure it clearly represents your firm's ability to carry out the terms and conditions set forth in the contract clauses.
- e. Subcontracting Plan Floors. These are the minimum percentages of subcontracted dollars that will be approved. The current floors for Fiscal Year 2003 are as follows:

Small Business (SB)	41.3%
Small Disadvantages Business (SDB)	15.8%
Women-Owned Small Business (WOSB)	5.6%
Historically Underutilized Business Zone Small Business (HUBZone)	7.5%
Service-Disabled Veteran-Owned Small Business (SVOSB)	1.0
Historically Black Colleges & Universities/Minority Institutions (JBCU/MI)	13.9%

(This % is based on % of total contract dollars obligated to Institutes of Higher Learning (HE).)

- f. Current copies of Standard Form 294 and 295 can be found at [http://contacts.gsa.gov/webforms.nsf/\(formslist\)?openform&count=1000&category=Standard+Forms&expandview](http://contacts.gsa.gov/webforms.nsf/(formslist)?openform&count=1000&category=Standard+Forms&expandview).
- g. Contractors may post subcontracting opportunities at the Small Business Administration's SubNet: <http://web.sba.gov/subnet/index.cfm>.

AMENDMENTS TO THIS REQUEST FOR PROPOSALS (RFP)

All amendments to this RFP will be made through the use of the Internet. No additional media (CD ROMS, Floppy Disks, Faxes, or paper) will be provided unless the Government determines that it is necessary. Contractors may view/download this solicitation and all amendments from the Internet after solicitation issuance at the following Internet address: <https://ebs.swf02.usace.army.mil/ebs/AdvertisedSolicitations.asp>. All offerors are required to check the Ft. Worth District Contracting Division website daily to be notified of any changes to this solicitation.

ESTIMATED CONSTRUCTION COST

The estimated cost of the proposed construction is more than \$10,000,000 (FAR 36.204 Disclosure of the Magnitude of Construction Projects).

SPECIAL NOTICE CONCERNING INDIVIDUAL SURETIES

The Security interest, including pledged assets as set forth in the FAR 52.228-11, PLEDGES OF ASSETS, and executed Standard Form 28 entitled "AFFIDAVIT OF INDIVIDUAL SURETY" shall be furnished with the bond. Failure to provide with the bid bond a pledge of assets (security interest) in accordance with FAR 28.203-1 will result in rejection of a bid that is bonded by individual sureties.

PARTNERING

In order to accomplish this contract, the government is encouraging the formation of a cohesive partnership with the contractor and its subcontractors. This partnership would strive to draw on the strengths of each organization in an effort to achieve a quality project done right the first time, within budget, and on schedule. This partnership would be bilateral in make-up and

participation would be totally voluntary. Any cost associated with effectuating this partnership will be agreed to by both parties and will be shared equally with no change in contract price.

PRINCIPAL CONTRACTING OFFICER

The Contracting Officer who signs this contract will be the Principal Contracting Officer for this contract. However, any Contracting Officer assigned to the Fort Worth District, contracting within his or her authority, may take formal action on this contract when a contract action needs to be taken and the Principal Contracting Officer is unavailable.

FAR PROVISIONS

52.204-6 DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER (JUN 99)

(a) Contractor identification is essential for complying with statutory contract reporting requirements. Therefore, the offeror is requested to enter, in the block with its name and address on the Standard Form 33 or similar document, the annotation "DUNS" followed by the DUNS number which identifies the offeror's name and address exactly as stated in the offer.

(b) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one. A DUNS number will be provided immediately by telephone at no charge to the offeror. For information on obtaining a DUNS number, the offeror, if located within the United States, should call Dun and Bradstreet at 1-800-333-0505. The offeror should be prepared to provide the following information:

- (1) Company name.
- (2) Company address.
- (3) Company telephone number.
- (4) Line of business.
- (5) Chief executive officer/key manager.
- (6) Date the company was started.
- (7) Number of people employed by the company.
- (8) Company affiliation.

(c) Offerors located outside the United States may obtain the location and phone number of the local Dun and Bradstreet Information Services office from the Internet Home Page at <http://www.customerservice@dnb.com/>. If an offeror is unable to locate a local service center, it may be e-mailed to Dun and Bradstreet at globalinfo@dnb.com.

(End of provision)

252.204-7001 COMMERCIAL AND GOVERNMENT ENTITY (CAGE) CODE REPORTING. (AUG 1999)

(a) The offeror is requested to enter its CAGE code on its offer in the block with its name and address. The CAGE code entered must be for that name and address. Enter "CAGE" before the number.

(b) If the offeror does not have a CAGE code, it may ask the Contracting Officer to request one from the Defense Logistics Information Service (DLIS). The Contracting Officer will—

- (1) Ask the Contractor to complete section B of a DD Form 2051, Request for Assignment of a Commercial and Government Entity (CAGE) Code;
- (2) Complete section A and forward the form to DLIS; and

(3) Notify the Contractor of its assigned CAGE code.

(c) Do not delay submission of the offer pending receipt of a CAGE code.

(End of provision)

52.211-6 BRAND NAME OF EQUAL (AUG 1999)

(a) If an item in this solicitation is identified as "brand name or equal," the purchase description reflects the characteristics and level of quality that will satisfy the Government's needs. The salient physical, functional, or performance characteristics that "equal" products must meet are specified in the solicitation.

(b) To be considered for award, offers of "equal" products, including "equal" products of the brand name manufacturer, must-

(1) Meet the salient physical, functional, or performance characteristic specified in this solicitation;

(2) Clearly identify the item by-

(i) Brand name, if any; and

(ii) Make or model number;

(3) Include descriptive literature such as illustrations, drawings, or a clear reference to previously furnished descriptive data or information available to the Contracting Officer; and

(4) Clearly describe any modifications the offeror plans to make in a product to make it conform to the solicitation requirements. Mark any descriptive material to clearly show the modifications.

(c) The Contracting Officer will evaluate "equal" products on the basis of information furnished by the offeror or identified in the offer and reasonably available to the Contracting Officer. The Contracting Officer is not responsible for locating or obtaining any information not identified in the offer.

(d) Unless the offeror clearly indicates in its offer that the product being offered is an "equal" product, the offeror shall provide the brand name product referenced in the solicitation.

(End of provision)

52.211-14 NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE. (SEPT 1990)

Any contract awarded as a result of this solicitation will be **DO** rated order certified for national defense use under the Defense Priorities and Allocations System (DPAS) (15 CFR 700), and the Contractor will be required to follow all of the requirements of this regulation. [*Contracting Officer check appropriate box.*]

(End of provision)

52.0211-0002 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 (DEC 1999)

Copies of specifications, standards, and data item descriptions cited in this solicitation may be obtained--

(a) From the ASSIST database via the Internet at <http://assist.daps.mil>; or

(b) By submitting a request to the--Department of Defense Single Stock Point (DoDSPP), Building 4, Section D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Telephone (215) 697-2667/2179, Facsimile (215) 697-1462.

(End of provision)

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)

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)

52.215-1 INSTRUCTIONS TO OFFERORS--COMPETITIVE ACQUISITION (MAY 2001)

(a) Definitions. As used in this provision--

“Discussions” are negotiations that occur after establishment of the competitive range that may, at the Contracting Officer's discretion, result in the offeror being allowed to revise its proposal.

In writing, writing, or written means any worded or numbered expression that can be read, reproduced, and later communicated, and includes electronically transmitted and stored information.

“Proposal modification” is a change made to a proposal before the solicitation's closing date and time, or made in response to an amendment, or made to correct a mistake at any time before award.

“Proposal revision” is a change to a proposal made after the solicitation closing date, at the request of or as allowed by a Contracting Officer as the result of negotiations.

“Time”, if stated as a number of days, is calculated using calendar days, unless otherwise specified, and will include Saturdays, Sundays, and legal holidays. However, if the last day falls on a Saturday, Sunday, or legal holiday, then the period shall include the next working day.

(b) Amendments to solicitations. If this solicitation is amended, all terms and conditions that are not amended remain unchanged. Offerors shall acknowledge receipt of any amendment to this solicitation by the date and time specified in the amendment(s).

(c) Submission, modification, revision, and withdrawal of proposals. (1) Unless other methods (e.g., electronic commerce or facsimile) are permitted in the solicitation, proposals and modifications to proposals shall be submitted in paper media in sealed envelopes or packages (i) addressed to the office specified in the solicitation, and (ii) showing the time and date specified for receipt, the solicitation number, and the name and address of the offeror. Offerors using commercial carriers should ensure that the proposal is marked on the outermost wrapper with the information in paragraphs (c)(1)(i) and (c)(1)(ii) of this provision.

(2) The first page of the proposal must show--

(i) The solicitation number;

(ii) The name, address, and telephone and facsimile numbers of the offeror (and electronic address if available);

(iii) A statement specifying the extent of agreement with all terms, conditions, and provisions included in the solicitation and agreement to furnish any or all items upon which prices are offered at the price set opposite each item;

(iv) Names, titles, and telephone and facsimile numbers (and electronic addresses if available) of persons authorized to negotiate on the offeror's behalf with the Government in connection with this solicitation; and

(v) Name, title, and signature of person authorized to sign the proposal. Proposals signed by an agent shall be accompanied by evidence of that agent's authority, unless that evidence has been previously furnished to the issuing office.

(3) Submission, modification, or revision, of proposals.

(i) Offerors are responsible for submitting proposals, and any modifications, or revisions, so as to reach the Government office designated in the solicitation by the time specified in the solicitation. If no time is specified in the solicitation, the time for receipt is 4:00 p.m., local time, for the designated Government office on the date that proposal or revision is due.

(ii)(A) Any proposal, modification, or revision received at the Government office designated in the solicitation after the exact time specified for receipt of offers is "late" and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late offer would not unduly delay the acquisition; and--

(1) If it was transmitted through an electronic commerce method authorized by the solicitation, it 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 proposals; or

(2) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of offers and was under the Government's control prior to the time set for receipt of offers; or

(3) It is the only proposal received.

(B) However, a late modification of an otherwise successful proposal that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.

(iii) Acceptable evidence to establish the time of receipt at the Government installation includes the time/date stamp of that installation on the proposal wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

(iv) If an emergency or unanticipated event interrupts normal Government processes so that proposals cannot be received at the office designated for receipt of proposals by the exact time specified in the solicitation, and urgent Government requirements preclude amendment of the solicitation, the time specified for receipt of proposals 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.

(v) Proposals may be withdrawn by written notice received at any time before award. Oral proposals in response to oral solicitations may be withdrawn orally. If the solicitation authorizes facsimile proposals, proposals may be withdrawn via facsimile received at any time before award, subject to the conditions specified in the provision at 52.215-5, Facsimile Proposals. Proposals may be withdrawn in person by an offeror or an authorized representative, if the identity of the person requesting withdrawal is established and the person signs a receipt for the proposal before award.

(4) Unless otherwise specified in the solicitation, the offeror may propose to provide any item or combination of items.

(5) Offerors shall submit proposals in response to this solicitation in English, unless otherwise permitted by the solicitation, and in U.S. dollars, unless the provision at FAR 52.225-17, Evaluation of Foreign Currency Offers, is included in the solicitation.

(6) Offerors may submit modifications to their proposals at any time before the solicitation closing date and time, and may submit modifications in response to an amendment, or to correct a mistake at any time before award.

(7) Offerors may submit revised proposals only if requested or allowed by the Contracting Officer.

(8) Proposals may be withdrawn at any time before award. Withdrawals are effective upon receipt of notice by the Contracting Officer.

(d) Offer expiration date. Proposals in response to this solicitation will be valid for the number of days specified on the solicitation cover sheet (unless a different period is proposed by the offeror).

(e) Restriction on disclosure and use of data. Offerors that include in their proposals data that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, shall--

(1) Mark the title page with the following legend: This proposal includes data that shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed--in whole or in part--for any purpose other than to evaluate this proposal. If, however, a contract is awarded to this offeror as a result of--or in connection with-- the submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting contract. This restriction does not limit the Government's right to use information contained in this data if it is obtained from another source without restriction. The data subject to this restriction are contained in sheets [insert numbers or other identification of sheets]; and

(2) Mark each sheet of data it wishes to restrict with the following legend: Use or disclosure of data contained on this sheet is

subject to the restriction on the title page of this proposal.

(f) Contract award. (1) The Government intends to award a contract or contracts resulting from this solicitation to the responsible offeror(s) whose proposal(s) represents the best value after evaluation in accordance with the factors and subfactors in the solicitation.

(2) The Government may reject any or all proposals if such action is in the Government's interest.

(3) The Government may waive informalities and minor irregularities in proposals received.

(4) The Government intends to evaluate proposals and award a contract without discussions with offerors (except clarifications as described in FAR 15.306(a)). Therefore, the offeror's initial proposal should contain the offeror's best terms from a cost or price and technical standpoint. The Government reserves the right to conduct discussions if the Contracting Officer later determines them to be necessary. If the Contracting Officer determines that the number of proposals that would otherwise be in the competitive range exceeds the number at which an efficient competition can be conducted, the Contracting Officer may limit the number of proposals in the competitive range to the greatest number that will permit an efficient competition among the most highly rated proposals.

(5) The Government reserves the right to make an award on any item for a quantity less than the quantity offered, at the unit cost or prices offered, unless the offeror specifies otherwise in the proposal.

(6) The Government reserves the right to make multiple awards if, after considering the additional administrative costs, it is in the Government's best interest to do so.

(7) Exchanges with offerors after receipt of a proposal do not constitute a rejection or counteroffer by the Government.

(8) The Government may determine that a proposal is unacceptable if the prices proposed are materially unbalanced between line items or subline items. Unbalanced pricing exists when, despite an acceptable total evaluated price, the price of one or more contract line items is significantly overstated or understated as indicated by the application of cost or price analysis techniques. A proposal may be rejected if the Contracting Officer determines that the lack of balance poses an unacceptable risk to the Government.

(9) If a cost realism analysis is performed, cost realism may be considered by the source selection authority in evaluating performance or schedule risk.

(10) A written award or acceptance of proposal mailed or otherwise furnished to the successful offeror within the time specified in the proposal shall result in a binding contract without further action by either party.

(11) The Government may disclose the following information in postaward debriefings to other offerors:

(i) The overall evaluated cost or price and technical rating of the successful offeror;

(ii) The overall ranking of all offerors, when any ranking was developed by the agency during source selection;

(iii) A summary of the rationale for award; and

(iv) For acquisitions of commercial items, the make and model of the item to be delivered by the successful offeror.

(End of provision)

52.215-20 REQUIREMENTS FOR COST OR PRICING DATA OR INFORMATION OTHER THAN COST OR PRICING DATA. (OCT 1997)

(a) *Exceptions from cost or pricing data.*

(1) In lieu of submitting cost or pricing data, offerors may submit a written request for exception by submitting the information described in the following paragraphs. The Contracting Officer may require additional supporting information, but only to the extent necessary to determine whether an exception should be granted, and whether the price is fair and reasonable.

(i) *Identification of the law or regulation establishing the price offered.* If the price is controlled under law by periodic rulings, reviews, or similar actions of a governmental body, attach a copy of the controlling document, unless it was previously submitted to the contracting office.

(ii) *Commercial item exception.* For a commercial item exception, the offeror shall submit, at a minimum, information on prices at which the same item or similar items have previously been sold in the commercial market that is adequate for evaluating the reasonableness of the price for this acquisition. Such information may include-

(A) For catalog items, a copy of or identification of the catalog and its date, or the appropriate pages for the offered items, or a statement that the catalog is on file in the buying office to which the proposal is being submitted. Provide a copy or describe current discount policies and price lists (published or unpublished), e.g., wholesale, original equipment manufacturer, or reseller. Also explain the basis of each offered price and its relationship to the established catalog price, including how the proposed price relates to the price of recent sales in quantities similar to the proposed quantities;

(B) For market-priced items, the source and date or period of the market quotation or other basis for market price, the base amount, and applicable discounts. In addition, describe the nature of the market;

(C) For items included on an active Federal Supply Service Multiple Award Schedule contract, proof that an exception has been granted for the schedule item.

(2) The offeror grants the Contracting Officer or an authorized representative the right to examine, at any time before award, books, records, documents, or other directly pertinent records to verify any request for an exception under this provision, and the reasonableness of price. For items priced using catalog or market prices, or law or regulation, access does not extend to cost or profit information or other data relevant solely to the offeror's determination of the prices to be offered in the catalog or marketplace.

(b) *Requirements for cost or pricing data.* If the offeror is not granted an exception from the requirement to submit cost or pricing data, the following applies:

(1) The offeror shall prepare and submit cost or pricing data and supporting attachments in accordance with Table 15-2 of FAR 15.408.

(2) As soon as practicable after agreement on price, but before contract award (except for unpriced actions such as letter contracts), the offeror shall submit a Certificate of Current Cost or Pricing Data, as prescribed by FAR 15.406-2.

(End of provision)

52.216-1 TYPE OF CONTRACT (APR 1984)

The Government contemplates award of a **firm-fixed priced Design/Construction contract** resulting from this solicitation.

(End of clause)

52.217-5 EVALUATION OF OPTIONS (JUL 1990)

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

(b) The Government may reject an offer as nonresponsive if it is materially unbalanced as to prices for the basic requirement and the option quantities. An offer is unbalanced when it is based on prices significantly less than cost for some work and prices that are significantly overstated for other work.

(End of provision)

52.225-12 NOTICE OF BUY AMERICAN ACT/BALANCE OF PAYMENTS PROGRAM REQUIREMENT CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS. (FEB 2000)

(a) *Definitions.* "Construction material," "designated country construction material," "domestic construction material," "foreign construction material," and "NAFTA country construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act-Balance of Payments Program-Construction Materials under Trade Agreements" (Federal Acquisition Regulation (FAR) clause 52.225-11).

(b) *Requests for determination of inapplicability.* An offeror requesting a determination regarding the inapplicability of the Buy American Act or Balance of Payments Program should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required

by paragraphs (c) and (d) of FAR clause 52.225-11 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act or Balance of Payments Program before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) *Evaluation of offers.*

(1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act or Balance of Payments Program, based on claimed unreasonable cost of domestic construction materials, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(4)(i) of FAR clause 52.225-11.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) *Alternate offers.*

(1) When an offer includes foreign construction material, other than designated country or NAFTA country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit an alternate offer based on use of equivalent domestic, designated country, or NAFTA country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic, designated country, or NAFTA country construction material, and the offeror shall be required to furnish such domestic, designated country, or NAFTA country construction material. An offer based on use of the foreign construction material for which an exception was requested-

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

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

**US Army Engineer District, Fort Worth
ATTN: CESWF-CT-C, Rm. 2A19
819 Taylor Street/PO Box 17300
Fort Worth, TX 76102-0300**

(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)

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

(a) The clauses at 52.236-2, Differing Site Conditions, and 52.236-3, Site Investigations and Conditions Affecting the Work, will be included in any contract awarded as a result of this solicitation. Accordingly, offerors 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: Denny Dodge, 337 531-2933, or
C. Breck Graves, 337 531-2933, or

Address: England Economic & Industrial Development District
1611 Arnold Drive
Alexandria, LA 71303
Telephone: 830 298-3334

A pre-proposal meeting/site visit will be held on Tuesday, November 16th, 2004. See Section 00103, AM #0001 for additional information.

Prospective Offerors are encouraged to submit, in writing, any questions they desire to be discussed and answered. Your questions may be submitted to the following:

By FAX: (817) 886-6407 (Attn: Kenneth Carleton)

By Mail:
US Army Corps of Engineer District, Fort Worth
ATTN: CESWF-CT-C (Attn: Kenneth. Carleton)
Post Office Box 17300,
819 Taylor Street, Room 2A19
Fort Worth, Texas 76102-0300

By Email: kenneth.carleton@swf02.usace.army.mil.

(End of Provision)

52.236-28 PREPARATION OF PROPOSALS--CONSTRUCTION (OCT 1997)

(a) Proposals 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 proposal must initial each erasure or change appearing on any proposal form.

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

(1) Lump sum price;

(2) Alternate prices;

(3) Units of construction; or

(4) Any combination of paragraphs (b)(1) through (b)(3) of this provision.

(c) If the solicitation requires submission of a proposal on all items, failure to do so may result in the proposal being rejected without further consideration. If a proposal on all items is not required, offerors should insert the words "no proposal" in the space provided for any item on which no price is submitted.

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

(End of provision)

52.252-5 AUTHORIZED DEVIATIONS IN PROVISIONS (APR 1984)

(a) The use in this solicitation of any Federal Acquisition Regulation (48 CFR Chapter 1) provision with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the provision.

The use in this solicitation of any Defense Federal Acquisition Regulation Supplement (DFARS) (48 CFR Chapter 2) provision with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

(End of Section 00100)

**SMALL BUSINESS CONCERN, VETERAN-OWNED, SMALL DISADVANTAGED
BUSINESS CONCERNS, WOMEN-OWNED SMALL BUSINESS CONCERNS,
AMERICAN VETERAN-OWNED SMALL BUSINESS, HISTORICALLY BLACK
COLLEGES AND UNIVERSITIES/MINORITY INSTITUTIONS, AND HUBZone
SMALL BUSINESS CONCERN
SUBCONTRACTING PLAN**

DATE: _____

CONTRACTOR: _____

ADDRESS: _____

SOLICITATION/CONTRACT NUMBER: _____

DESCRIPTION: _____

Our firm has established a Policy to afford Small Business concerns, Small Disadvantaged Business concerns, Women-Owned Small Business concerns, Historically Black Colleges and Universities/Minority Institutions, and HUBZone Small Business concerns, opportunities to participate in all contracts with the Department of Defense or any other entities both public and private. In most instances HBCU/MI are not applicable to construction contracts, but will be included through out this plan with the intent to involve them whenever possible. The following, together with any attachments, is hereby submitted as a Subcontracting Plan to satisfy the applicable requirements of Public Law 99-661, Section 1207 and Public Law 100-180, Section 806.

1. The total estimated dollar value of all planned subcontracting (to all types of business concerns) under this contract for the Base Bid and all Options is \$_____.

(a) **BASE BID ONLY:** The following percentage goals (expressed in terms of a percentage of total planned subcontracting dollars) and dollar amounts are applicable to the contract cited above or to the contract awarded under the solicitation cited.

(i) Small Business concerns (SB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are SB.

(ii) Small Disadvantaged Business concerns (SDB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are small concerns owned and controlled by socially and economically disadvantaged individuals and appear on the Small Business Administration's Procurement and Marketing and Access Network (PRO-Net). (<http://pro-net.sba.gov>) This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(iii) Women-Owned Small Business concerns (WOSB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are WOSB. This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(iv) Historically Black Colleges and Universities/Minority Institutions (HBCU/MI): _____% or \$_____ of total planned subcontracting dollars under this contract will go to HBCU's who are an institution determined by the Secretary of Education to meet the requirements of 34 CFR 608.2, the term also includes any nonprofit research institution that was an integral part of such a college or university before November 14, 1986; or MI's who are an institution of higher education meeting the requirements of Section 1046(3) of the Higher Education Act of 1965 (20 U.S.C. 1135d-5(3)) which, includes a Hispanic-serving institution of higher education as defined in Section 316(b)(1) of the Act (20 U.S.C. 1059c(b)(1)). This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(v) HUBZone Small Business concerns: _____% or \$_____ of total planned subcontracting dollars under this contract will go to subcontractors who are small business concerns located in a historically underutilized business zone which is an area located within one or more qualified census tracts, qualified non-metropolitan counties, or lands within the external boundaries of an Indian reservation and appear on the Small Business Administration's Procurement and Marketing and Access Network (PRO-Net). (<http://pro-net.sba.gov>) This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

The following principal products and/or services will be subcontracted under the Base Bid of this contract, and the distribution among SB, SDB, WOSB, HBCU/MI, and HUBZone SB is as follows:

Subcontractor Name	Product/Service	SB	SDB	WOSB	HBCU/MI	HUB Zone

[Attach additional sheets if necessary]

(b) **OPTION 1 ONLY:** *(You must include a separate goal for each option)* The following percentage goals (expressed in terms of a percentage of total planned subcontracting dollars) and dollar amounts are applicable to the contract cited above or to the contract awarded under the solicitation cited.

(i) Small Business concerns (SB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are SB.

(ii) Small Disadvantaged Business concerns (SDB): _____% or \$_____ of total planned subcontracting dollars under this contract will awarded to subcontractors who are small concerns

owned and controlled by socially and economically disadvantaged individuals and appear on the Small Business Administration’s Procurement and Marketing and Access Network (PRO-Net). (<http://pro-net.sba.gov>) This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(iii) Women-Owned Small Business concerns (WOSB): _____% or \$_____ of total planned subcontracting dollars under this contract will be awarded to subcontractors who are WOSB. This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(iv) Historically Black Colleges and Universities/Minority Institutions (HBCU/MI): _____% or \$_____ of total planned subcontracting dollars under this contract will go to HBCU’s who are an institution determined by the Secretary of Education to meet the requirements of 34 CFR 608.2, the term also includes any nonprofit research institution that was an integral part of such a college or university before November 14, 1986; or MI’s who are an institution of higher education meeting the requirements of Section 1046(3) of the Higher Education Act of 1965 (20 U.S.C. 1135d-5(3)) which, includes a Hispanic-serving institution of higher education as defined in Section 316(b)(1) of the Act (20 U.S.C. 1059c(b)(1)). This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

(v) HUBZone Small Business concerns: _____% or \$_____ of total planned subcontracting dollars under this contract will go to subcontractors who are small business concerns located in a historically underutilized business zone which is an area located within one or more qualified census tracts, qualified non-metropolitan counties, or lands within the external boundaries of an Indian reservation and appear on the Small Business Administration’s Procurement and Marketing and Access Network (PRO-Net). (<http://pro-net.sba.gov>) This percentage is included in the percentage shown under 1.(a)(i) above, as a subset.

The following principal products and/or services will be subcontracted under Option 1 of this contract, and the distribution among SB, SDB, WOSB, HBCU/MI, and HUBZone SB is as follows:

Subcontractor Name	Product/Service	SB	SDB	WOSB	HBCU/MI	HUB Zone

[Attach additional sheets if necessary]

(c) The following method was used in developing subcontract goals (i.e., statement explaining how the product and service areas to be subcontracted were established, how the areas to be subcontracted to SB, SDB, WOSB, HBCU/MI, and HUBZone SB were determined, and how SB, SDB, WOSB, HBCU/MI, and HUBZone SB capabilities were determined, to include identification of source lists utilized in making that determination).

(d) Indirect and over head costs have have not been included in the goals specified in l(a) and l(b).

(e) If “have” is checked, explain the method used in determining the proportionate share of indirect and overhead Cost to be allocated as subcontracts to SB, SDB, WOSB, HBCU/MI, and HUBZone SB.

2. The following individual will administer the subcontracting program:

Name: _____
Title: _____
Telephone: _____
Fax: _____

This individual’s specific duties, as they relate to the firm’s subcontracting program are as follows:

General overall responsibility for this company’s Small Business Program, the development, preparation and execution of individual subcontracting plans and for monitoring performance relative to contractual subcontracting requirements contained in this plan, including but not limited to:

(a) Developing and maintaining bidders lists of SB, SDB, WOSB, HBCU/MI, and HUBZone SB from all possible sources.

(b) Ensuring that procurement packages are structured to permit SB, SDB, WOSB, HBCU/MI, and HUBZone SB to participate to the maximum extent possible.

(c) Assuring inclusion of SB, SDB, WOSB, HBCU/MI, and HUBZone SB in all solicitations for products or services, which they are capable of providing.

(d) Reviewing solicitations to remove statements, clauses, etc., which may tend to restrict or prohibit SB, SDB, WOSB, HBCU/MI, and HUBZone SB participation.

(e) Ensuring periodic rotation of potential subcontractors on bidders' lists.

(f) Ensuring that the bid proposal review board documents its reasons for rejecting low bids submitted by SB, SDB, WOSB, HBCU/MI, and HUBZone SB.

(g) Ensuring the establishment and maintenance of records of solicitations and subcontract award activity.

(h) Attending or arranging for attendance of company counselors at Business Opportunity Workshops, Minority Business Enterprise Seminars, Trade Fairs, etc.

(i) Conducting or arranging for conduct of motivational training for purchasing personnel pursuant to the intent of Public Laws 99-661 and 100-180.

(j) Monitoring attainment of proposed goals.

(k) Preparing and submitting periodic subcontracting reports required.

(l) Coordinating contractor's activities during the conduct of compliance reviews by Federal Agencies.

(m) Coordinating the conduct of contractor's activities involving its SB, SDB, WOSB, HBCU/MI, and HUBZone SB subcontracting program.

(n) Additions to (or deletions from) the duties specified above are as follows:

3. The following efforts will be taken to assure that SB, SDB, WOSB, HBCU/MI, and HUBZone SB will have an equitable opportunity to compete for subcontracts:

(a) Outreach efforts will be made as follows:

(i) Contacts with minority and small business trade associations

(ii) Contacts with business development organizations

(iii) Attendance at small and minority business procurement conferences

(iv) Sources will be requested from SBA's PRO-Net system.

(b) The following internal efforts will be made to guide and encourage buyers:

(i) Workshops, seminars and training programs will be conducted

(ii) Activities will be monitored to evaluate compliance with this subcontracting plan.

(c) SB, SDB, WOSB, HBCU/MI, and HUBZone SB source lists, guides and other data identifying SB, SDB, WOSB, HBCU/MI, and HUBZone SB will be maintained and utilized by buyers in soliciting subcontracts.

(d) Additions to (or deletions from) the above listed efforts are as follows:

4. The contractor agrees that the clause entitled Utilization of Small, HUBZone Small, Small Disadvantaged, and Women-Owned Small Business concerns will be included in all subcontracts, which offer further subcontracting opportunities, and all subcontractors except small business concerns who receive subcontracts in excess of \$500,000 (\$1,000,000 for construction of any public facility) will be required to adopt and comply with a subcontracting plan similar to this one. Such plans will be reviewed by comparing them with the provisions of Public Law 95-507, and assuring that all minimum requirements of an acceptable subcontracting plan have been satisfied. The acceptability of percentage goals shall be determined on a case-by-case basis depending on the supplies/services involved, the availability of potential SB, SDB, WOSB, HBCU/MI, and HUBZone SB contractors, and prior experience. Once approved and implemented, plans will be monitored through the submission of periodic reports, and/or, as time and availability of funds permit, periodic visits to subcontractors facilities to review applicable records and subcontracting program progress.

5. The contractor agrees to submit such periodic reports and cooperate in any studies or surveys as may be required by the contracting agency or the Small business Administration in order to determine the extent of compliance by the bidder with the subcontracting plan and with the clause entitled Utilization of Small, HUBZone Small, Small Disadvantaged, and Women Owned Small Business concerns, contained in the contract.

6. The contractor agrees that he will maintain at least the following types of records to document compliance with this subcontracting plan:

(a) SB, SDB, WOSB, HBCU/MI, and HUBZone SB lists, guides and other data identifying SB, SDB, WOSB, HBCU/MI, and HUBZone SB vendors.

(b) Organizations contacted for SB, SDB, WOSB, HBCU/MI, and HUBZone SB sources.

(c) On a contract-by-contract basis, records on all subcontract solicitations over \$100,000, indicating on each solicitation (1) whether SBs were solicited, and if not, why not; (2) whether SDBs were solicited, and if not, why not; (3) whether WOSBs were solicited, and if not, why not; (4) whether HBCU/MI concerns were solicited and if not, why not; (5) whether HUBZone SBs were solicited and if not, why not; and (6) reasons for the failure of solicited SB, SDB, WOSB, HBCU/MI, and HUBZone SBs to receive the subcontract award.

(d) Records to support other outreach efforts: Contacts with Minority and Small Business Trade Associations, etc. Attendance at small and minority business procurement conferences and trade fairs.

(e) Records to support internal activities to guide and encourage buyers: Workshops, seminars, training programs, etc. Monitoring activities to evaluate compliance.

(f) On a contract-by-contract basis, records to support subcontract award data to include name and address or subcontractor.

(g) Records to be maintained in addition to the above are as follows:

Signed: _____
Typed Name: _____
Title: _____
Date: _____

AFARS -- Appendix DD

Subcontracting Plan Evaluation Guide

June 1, 1996

Part 1 -- Introduction

DD-100 Purpose.

The guide provides a methodology for uniform and consistent evaluation of subcontracting plans within the Army. It is designed to facilitate compliance with the mandates of Public Law to increase opportunities for small and small disadvantaged businesses.

DD-101 Applicability.

Except for subcontracting plans for commercial items, use this guide to review all subcontracting plans, including those submitted in response to the conditions described in FAR 19.705-2(d) and DFARS 219.705-2(d). See 19.708(b)(1) for special notices to be inserted in the solicitation regarding submission of subcontracting plans. A copy of the completed evaluation shall be included in the contract file.

DD-102 Goals.

Contracting officers must place special emphasis on negotiating reasonable goals in subcontracting plans. The goals must be realistic, challenging and attainable. The plan must demonstrate a real commitment to, and an active involvement in, providing subcontracting opportunities for small and small disadvantaged businesses.

DD-103 Scoring.

Score subcontracting plans in the context of the particular procurement. For instance, in smaller dollar value contracts, it may be impracticable or not cost effective for offerors to take the type of actions that may be appropriate in contracts for larger dollar values. However, in such cases, offerors must still address each element of the guide and discuss what they intend to do regarding each element. Contracting officers shall then assign appropriate point scores.

DD-104 Modification of Guide.

The evaluation guide and scoring system shall not be modified without the approval of the PARC. This approval authority may not be delegated.

DD-105 Use of Preaward Surveys.

For contracts administered by the Defense Contract Management Agency (DCMA), information needed to assess contractor compliance with subcontracting plans in current and previous contracts may be obtained by requesting a preaward survey in accordance with FAR 9.106.

Part 2 -- Scoring System

Point Points Range Assigned

0-5 1. Policy statement or evidence of internal guidance to company buyers recognizing commitment to Pub.L. 99-661, Section 1207, and Pub.L. 100-180, Section 806.

0 No written policy statement in plan.

1-2 Plan includes a general policy, but no evidence of recognition of special emphasis being placed on subcontracting with SDBs, HBCUs and MIs as a result of Pub.L.s.

3-5 Definitive corporate and management commitment evidenced in individual plan and master plan by specifically referencing the Pub.L.s.

Point Points Range Assigned

0-10 2. Efforts to broaden SB and SDB active vendor base.(FAR 19.704(a), 52.219-9(d), DFARS Subpart 219.5, 219.704(a)(1), 219.705 and 252.219-7003)

0 Description of efforts merely parrots requirements of FAR to maintain listing of vendors.

1-2 Contains evidence that effort is directed at increasing subcontracts to SBs and SDBs for non-complex and general housekeeping supplies or services normally awarded to firms already in existing vendor base.

3-10 Addresses efforts to increase the number of SB and SDB sources awarded subcontracts, establishes plans to use competition restricted to SDBs and gives details about how plans to use competition restricted to SDBs will be accomplished. (DFARS 219.705-4 and Subpart 219.5)

Note: After scoring the plan to this point, if zero points have been assigned for Element 2, proceed to Item 3, Outreach. If one or more points have been assigned for this Element 2, proceed to evaluation of the subelements labeled “minus 2” and

“minus 3” to determine if points assigned so far must be reduced. Do not reduce points already assigned to less than zero. (No negative points are to be entered under “Points Assigned” for any Element.) These negative scores are additive; if both of the subelements apply, then minus five points are assessed to reduce points already assigned under this element 2.

minus 2 Includes efforts described above which rate 1-2 or 3-10 points but, when it would be appropriate, does not address effort to involve HBCUs and MIs in performing the contract for which the subcontracting plan is submitted. (DFARS 219.704(a)(1) and 219.705-4(d))

minus 3 Includes efforts described above which rate 1-2 or 3-10 points but does not address effort to identify and overcome obstacles which may prohibit award to HBCU and MI sources currently in vendor base.

Point Points
Range Assigned

0-10 3. Outreach (ongoing and planned actions) (FAR 19.704(a), 19.705-4, 52.219-9(d) and 52.219-9(e), DFARS 219.705).

0 No mention of outreach.

1-4 Describes efforts to work with organizations in FAR 52.219-9(d)(11)(iv) to identify potential sources or items not traditionally awarded to SB or SDB firms. (FAR 52.219-9(d)(11)(iv) and 52.219-9(e))

5-10 Indicates intent to conduct reviews to determine the competence, ability, experience and capacity available in SB or SDB firms and to provide technical assistance to SBs and SDBs or explains why such reviews or technical assistance are not appropriate. (FAR 19.705-4(c) and 52.219-9(e))

Note: After scoring the plan to this point, if zero points have been assigned for Element 3, proceed to Item 4, Description of supplies and services. If one or more points have been assigned for this Element 3, proceed to evaluation of the subelement labeled “minus 3” to determine if points assigned so far must be reduced. Do not reduce points already assigned to less than zero. (No negative points are to be entered under “Points Assigned” for any Element.)

minus 3 Fails to indicate the extent to which HBCU and MI participation will be considered and facilitated in performing the contract for which the subcontracting plan is submitted, or fails to indicate other efforts to increase HBCU and MI participation in future DoD acquisitions. (DFARS 219.705-4(d))

Point Points
Range Assigned

0-10 4. Describes supplies and services to be subcontracted and planned for subcontracting to SBs, SDBs, HBCUs and MIs. (FAR 19.705-4(d), 52.219-9(d)(3), 52.219-9(e) and DFARS 219.705).

0 No mention.

1-4 Generic list of routine supplies and services included in materials listing for the specific contract.

5-7 Indicates intent to review major product/system components and key project elements of R&D, construction, service and spare parts contracts for subcontracting to SBs, SDBs, HBCUs and Mis. (FAR 19.705-4(d)(3) and (4), 52.219-9(e)(1) and (2) and DFARS 219.705)

8-10 Substantive plan actually targets specific SBs, SDBs, HCBUs and MIs for review to determine their competence, ability, experience and capacity and identifies specific components or major portions of the acquisition for consideration of SB, SDB, HBCU or MI competition. Also, indicates intent to work with large business subcontractors for major subsystems or key project elements to ensure “flowdown” of this philosophy. (FAR 19.705-4(d) and DFARS 219.705)

Point Points
Range Assigned

0-15 5. Describes specific efforts, based on results of efforts described in Elements No. 3 and No. 4 to ensure that SB, SDB, HBCU and MI concerns have equitable opportunity to participate in acquisitions. (FAR 19.704(a), 19.705-4, 52.219-9(d) and DFARS 219.705).

0 No mention.

1-4 Description of efforts merely parrots FAR 19.704(a)(3) and (6) and 52.219-9(d)(8).

5-8 Describes how the company intends to evaluate its own SB and SDB award performance and program effectiveness against the established goals, both company-wide and for the individual plan being negotiated. (FAR 19.704(a)(1) and (6) and 52.219-9(d)(11)(v))

9-12 Includes SBs, SDBs, HBCUs and MIs by name as members of original team for producing specific major components or subassemblies, providing a major service or performing a significant portion of the effort. (DFARS 219.705-2(d))

13-15 Describes special efforts to establish long-range relationships with SBs, SDBs, HBCUs and MIs, including leader-follower techniques, when appropriate. (FAR 19.705-4(d)(4) and DFARS 219.705-2(d))

Point Points
Range Assigned

0-40 6. Development of percentage goal is based on planned subcontracting which is challenging, yet realistic. (FAR 19.705-4(d), DFARS 219.704(a)(1) and 219.705-4).

0 Fails to include a specific goal for subcontracting with SBs, SDBs, HBCUs and MIs or proposes zero percent goal without substantive justification.

1-5 Sets small business goal of less than 10 percent and/or SDB/HBCU/MI goal of two percent or less with no significant justification.

6-10 Sets goals of less than 10 percent (SB) and 2 percent (SDB), but contractor shows evidence of reasonable effort, including use of set-asides, to involve Sbs, SDBs, HBCUs or MIs in non-traditional areas.

11-20 Sets goals of over 10 percent (SB) and 2 percent (SDB) and also identifies specific SB, SDB, HBCU or MI concerns planned to be subcontractors, including the item or service or effort to be subcontracted. Indicates extent to which firms have participated in proposal preparation or otherwise indicates extent to which subcontracting to these firms may reasonably be assured. Goals are realistic in view of actions stated in other portions of the plan and make-or-buy plan, if applicable.

21-30 Same as for 11-20 points, but proposed percent of goal is reasonable in comparison with prior experience, yet indicates reasonable effort to improve on past experience in terms of dollars, number of SDBs, HBCUs, and MIs involved, and movement into area without previous SDB, HBCU or MI involvement.

31-40 Same as 21-30 points, but includes evidence that if SBs, universities or institutions other than HBCUs or MIs are performing on a major component or subassembly, providing a major service or performing on a key project element, SDBs, HBCUs and MIs will also be given an opportunity to perform. Also, the percentage of the SDB, HBCU, MI goal compares favorably with the percentage of SB goal, consistent with the Government-wide goals of 20 percent to SB with five percent to SDB, or is otherwise explained, and the plan includes a forecast for improvement. (The SB and SDB goals in the subcontracting plan should approximate the ratio between the SB and SDB Government-wide goals.)

Point Points
Range Assigned

0-10 7. Past performance. Extent to which the company has historically been successful in establishing realistic, yet challenging, goals and achieving them. Consider DCMC comments on prime contractor's justifications for prior failure to achieve goals. To avoid penalizing the contractor when there has been no previous defense contract, assign 10 points. (FAR 19.705-4(d)(1) and (d)(2)(iii), 19.706 and DFARS 219.706).

8. Other regulatory and statutory requirements.

If any of the following are answered "NO," the plan is not acceptable and must be revised to comply prior to award:

Does the plan have --

A. A separate goal for SB and SDB? (FAR 19.704(a)(1) and FAR 52.219-9(d)(1) and (2))

YES NO

B. A separate goal for the basic contract and, if applicable, each option? (FAR 19.704(c))

YES NO

C. The name of the company employee responsible for administration of plan and employee's duties? (FAR 19.704(a)(2) and 52.219-9(d)(7))

YES NO

D. A statement affirming intent to comply with subcontracting "flowdown" provisions? (FAR 19.704(a)(4) and 52.219-9(d)(10))

YES NO

E. A statement affirming willingness to cooperate in studies and to provide reports? (FAR 19.704(a)(5) and 52.219-9(d)(10))

YES NO

F. A statement that indirect costs are either included or excluded from the proposed goals and, if included, how they will be prorated? (FAR 52.219-9(d)(6))

YES NO

G. A description of efforts to ensure that SBs and SDBs have an equitable opportunity to participate in the acquisition? (FAR 52.219-9(d)(8))

YES NO

H. A recitation of the types of records maintained to demonstrate procedures adopted to comply with the requirements and goal in the plan? (FAR 52.219-9(d)(11))

YES NO

SECTION 00103

SITE VISIT/PRE-BID MEETING
AM #0001

PART 1 GENERAL

1.1 SITE VISIT/PRE-BID MEETING

A pre-bid meeting/site visit will be held [AM #0001] on Tuesday, November 16, 2004 at 9:00 a.m. The meeting will be held in the Small Conference Room on the 2nd Floor of the Administration Building. The address is England Economic & Industrial Development District, 1611 Arnold Drive, Alexandria, Louisiana 71303. The Point of Contact (POC) is Denny Dodge (337) 531-2933, the Alternate POC is Breck Graves, (337) 531-2933. Pursuant to Contract Clause "FAR 52.236-3, Site Investigation and Conditions Affecting the Work," and the Site Visit Clause in Section 00100 INSTRUCTIONS, CONDITIONS, AND NOTICES TO OFFERORS, prospective offerors will be permitted to inspect the site where services are to be performed and to satisfy themselves as to all general and local conditions that may affect the cost of performance of the Contract to the extent such information is reasonably obtainable. The meeting will address the following:

Coordination with the England Airpark Authority to ensure compliance with their regulations and requirements;

Coordination regarding the four simultaneous construction projects at England Airpark so disruption to other construction, business and personnel is kept to a minimum;

Authorization of some Contractors to obtain gate access keys due to weekend work.

Offerors are urged and expected to inspect the site where the work will be performed.

In no event will a failure to inspect the site constitute grounds for withdrawal of a proposal after receipt of proposal or for a claim after award of the contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 01000

CONSTRUCTION SCHEDULE
AM #0001

PART 1 GENERAL

1.1 SCHEDULE

Commence, prosecute, and complete the work under this contract in accordance with the following schedule and Section 00700 CONTRACT CLAUSES COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK and LIQUIDATED DAMAGES:

Item of Work	Commencement of Work (calendar days)	Completion of Work (calendar days)	Liquidated Damages per calendar day
((1) All work except establishment of turf	Duration starts 20 days after contract award or when NTP is given by the Contracting Officer, whichever occurs first	510	\$ 1,500.00
(2) Establishment of Turf	*	*	---

AM #0001

a. Construction Duration

The contract duration stated above for Work Item 1 is the maximum duration until contract award. If the Government accepts a proposal for a completion period of lesser duration, and such proposal alters the time periods for review and phasing, the contract shall be read to include the original periods for review and phasing. If a completion period of lesser duration is proposed and accepted by the Government, the accepted completion period will replace the original construction schedule listed under Section 01000. If an alternate completion period is proposed, the Bid Schedule must reflect pricing information for the alternate proposed completion period.

b. Liquidated damages are not accumulative.

*Establishment of Turf

Planting and maintenance for turfing shall be in accordance with Sections 02916 MULCHING FOR EROSION CONTROL, 02919 TOPSOILING, 02922A SODDING, and 02925 ESTABLISHMENT OF TURF . No payment will be made for establishment of turf until all requirements of the section are adequately performed and accepted, as determined by the Contracting Officer.

1.2 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER (OCT 1989)
(ER 415-1-15)(52.0001-4038 1/96)

a. This provision specifies the procedure for determination of time extensions for unusually severe weather in accordance with the contract clause entitled "Default: (Fixed Price Construction)." In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

(1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

(2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the contractor.

b. The following schedule of monthly anticipated adverse weather delays due to precipitation and temperature is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities. Wind is not considered in the Monthly Anticipated Adverse Weather Calendar Day Schedule.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY
WORK DAYS BASED ON (5) DAY WORK WEEK

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	5	4	4	5	6	5	4	4	4	4	5

c. Upon acknowledgment of the Notice to Proceed (NTP) and continuing throughout the contract, the contractor will record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the contractor's scheduled work day.

The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of

each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph "b", above, the Contracting Officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the contract clause entitled "Default (Fixed Price Construction)."

AM #0001

1.3 CONTRACTOR REQUIREMENT

Contractors are required to film the haul route before the beginning of this project in order to document the condition of the road before start of construction. The Contractor will provide a duplicate copy of the film to the Contracting Officer or the Contracting Officer's Representative before start of construction.

1.4 LABOR CONSIDERATIONS

There will be five simultaneous runway construction projects at England Airpark which may impact the labor pool substantially.

1.5 WORK RESTRICTIONS

The Contractor will be working adjacent to and on active aircraft taxiways, runways, and support areas. The Contractor shall take care not to interfere or detrimentally affect the operation of the airfield runway or other facilities. Airfield operations must be maintained at all time. Airfield operations cannot tolerate typical construction dust and flying debris. The Contractor must include in his Demolition Plan and Environmental Protection Plan procedures with intensive control measures to minimize dust and ensure that flying debris is eliminated. The Contractor shall anticipate short periodic delays as well as extended periods as noted below to accommodate airfield operations. The Contractor shall comply with all airfield safety and operational requirements. All workers shall wear reflectorized bright red/orange high-visibility safety vests when working adjacent to taxiways and runways.

(If applicable) While working adjacent to active taxiways and runways, the Contractor's foreman in charge of the workers shall have a radio and be in constant communications with the airfield tower. The Contractor-supplied hand-held radios shall be equal to model #M-RK I, 900MHz Ericsson EDACS Portable Radio and shall be on Frequency (to be programmed by DOIM). The Contractor shall provide one additional operational radio for communications with the control tower for use by the Government's Quality Assurance Representative. The Contractor shall pay \$32.00 per month per radio for Airtime for the length of the Contract or a total of \$ 2000 for total airtime to England Airpark DOIM. The radios will be turned in to the Government at the end of the Contract.

Superintendence Of Subcontractors

If a Contractor works more than one shift per day, a superintendent and QC staff shall be onsite at all times during construction (See SECTION 01451 CONTRACTOR QUALITY CONTROL).

1.5.1 Working Hours

Work hours are 6 a.m. to 6 p.m. Monday thru Friday. Due to time constraints for contract completion, it may be necessary to work 7 days a week, 24 hours a day. The work hours will be coordinated with the Contracting Officer and England Airpark Authority.

1.5.2 Security Requirements

The Contractor shall restrict access to the construction site.

Contractor personnel must be US citizens, naturalized, or possess a work visa.

Contractor personnel shall wear visible Contractor-furnished employee identification badges while physically on the Installation. Each badge shall include as a minimum, the company name, employee name, photograph, Contract Title, Contract Number, and the expiration date of the badge. See Section 01500 TEMPORARY CONSTRUCTION FACILITIES for additional requirements.

Workers shall meet at the gate to obtain access to the facility.

Employee parking is limited. Parking will be coordinated by the Contractor and England Airpark Authority.

The Contractor will be required to provide security at the Entrance Gate **for all hours worked** before or beyond the 6 a.m. to 6 p.m. time frame. England Airpark will provide security during normal working hours (6 a.m. to 6 p.m.) In addition, the Contractor will assign a security person to man the gate on Sunday if work is done on Sunday.

Any general or specific threat to the safety of those working or living at England Airpark could result in longer waiting times at the access points to England Airpark.

1.6 UTILITIES

1.6.1 Payment for Utility Services

Water and electricity are available from Government-owned and operated systems and will be charged to the Contractor at rates as provided in Contract Clause 52.236.14 AVAILABILITY AND USE OF UTILITY SERVICES.

1.6.2 Coordination

For Contractor Telephone Service, the Contractor shall coordinate with ITBC and the local phone company for contractor telephone service during construction.

1.6.3 Outages

The Contractor shall coordinate all requests for utility outages with the Contracting Officer and England Airpark Authority in writing 7 days prior to date of requested outage:

- a. Water, gas, steam, and sewer outages shall be held to a maximum duration of 2 hours unless otherwise approved in writing.
- b. Electrical outages shall have a maximum duration of 2 hours.

1.7 STREET CLOSINGS

The Contractor shall coordinate all requests for street closings with the Contracting Officer in writing 14 days prior to date of requested outage:

- a. One lane traffic shall be maintained at all times (except that a total closing may be allowed for specific 8-hour periods).
- b. The final street repair shall be completed within 14 days after the start of any street crossing. Any part of the street returned to service prior to final repair shall be maintained smooth with hot-mix cold-lay surface course.
- c. Open cuts across paved roads and streets for utility crossings will not be allowed. Utility crossings will be accomplished by boring or jacking procedures only.

1.8 PAYMENT FOR MOBILIZATION AND DEMOBILIZATION (DFAR 252.236-7004)(DEC 1991)

(a) The Government will pay all costs for the mobilization and demobilization of all of the Contractor's plant and equipment at the contract lump sum price for this Item.

- (1) 60 percent of the lump sum price upon completion of the Contractor's mobilization at the work site.
- (2) The remaining 40 percent upon completion of demobilization.

(b) The Contracting Officer may require the Contractor to furnish cost data to justify this portion of the bid if the Contracting Officer believes that the percentages in paragraphs (a)(1) and (2) of this clause do not bear a reasonable relation to the cost of the work in this contract.

- (1) Failure to justify such price to the satisfaction of the Contracting Officer will result in payment, as determined by the Contracting Officer, of-
 - (i) Actual mobilization costs at completion of mobilization;
 - (ii) Actual demobilization costs at completion of demobilization; and
 - (iii) The remainder of this item in the final payment under this contract.
- (2) The Contracting Officer's determination of the actual costs in paragraph (b)(1) of this clause is not subject to appeal.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 01520

GOVERNMENT FIELD OFFICE
AM #0001

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.

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI 700 ARI 700 (1999; Apx C) Specifications for
Fluorocarbon and Other Refrigerants

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

IESNA RP-1 (1993) Office Lighting

INTERNATIONAL CODE COUNCIL (ICC)

ICC Building Code (2000) International Building Code

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Government Field Office; G, RE

Provide manufacturer catalog data, specifications, and shop drawings for approval, verifying all dimensions, fixtures and equipment. Note all deviations on drawings.

PART 2 PRODUCTS

2.1 GOVERNMENT FIELD OFFICE

The Contractor shall furnish and set up complete, including tie-downs and connection to existing utilities, ready to use at the project site and in a location designated by the Contracting Officer, an office for use by the Government during the life of the Contract. The project office shall be a relocatable modular building or trailer, be weatherproof, have a minimum

floor area of 1,200 square feet, have four offices, common area, conference room, and toilet facilities. Provide connecting doors between the rooms, exterior doors for each room, sufficient number of adjustable windows for each room for adequate light and ventilation, and a battery-operated smoke detector alarm for each room. Conference room shall be large enough for the conference table and 10 chairs and the equipment specified below. The offices and conference room shall have interior doors to the common area. Equip with hot water heater, overhead lighting in accordance with IESNA RP-1 standards, and have adequate air conditioning, heating, and potable water supply. The walls and ceiling of the project office shall be insulated and the interior and exterior walls shall be of a prefinished material. The building shall be constructed of wood, metal or other acceptable construction materials and shall be designed in accordance with the ICC Building Code. Install a light fixture on the exterior beside the main door. The windows and doors shall be screened and the doors provided with dead bolt type locksets. Exterior door hinge pins shall be non-removable. The windows shall be openable and be securely fastened from the inside. Glass panels in windows shall be protected by bars or heavy mesh screens to prevent easy access to the building through these panels. In warm weather, air conditioning capable of maintaining the office at 50 percent relative humidity and a room temperature 20 degrees F below the outside temperature when the outside temperature is 95 degrees F, shall be furnished. If window-style air conditioner(s) is used, the refrigerant shall be one of the fluorocarbon gases that is in accordance with ARI 700 and has an Ozone Depletion Potential (ODP) of less than or equal to 0.05. Provide a mail slot in the door or a lockable mail box mounted on the surface of the door. Provide individual lines for each phone and the fax machine. Provide computer access for e-mail and to the Internet. Furnished equipment shall be equipped with cords, cables, cartridges, etc. and be ready to use upon start of construction. Equip the office with the following:

Conference Room:

- conference table with minimum 10 padded chairs
- lockable supply locker for office supplies
- bookcase (minimum 60 inches tall, 32 inches wide, and 15 inches deep)
- microwave (1 cu. foot) and microwave stand
- refrigerator (19 cu. ft.)
- coffee maker (10 or 12 cup)
- fax machine with memory (Canon FAX-L775 or copier with similar features)
- marker board (3 feet by 6 feet)
- projection screen
- plans table (48 inch by 30 inch work area - minimum)

- 5 lines
- 2 modems
- scanner
- telephones
- One telephone with conference call/speaker capability

Telephone Company will run cable to the trailer

Each Office:

- desk with three drawers and middle drawer (48 inch by 30 inch work area - minimum)
- height adjustable swivel chair
- stool for plans table
- plans rack for full size plans
- 3-drawer lockable file cabinet
- small bookcase (approximately 40 inches tall, 30 inches wide and 12 inches deep)
- bulletin board or marker board (approximately 3 feet by 2.5 feet)

AM #0001

- Dell Optiplex GX 270, with 2.5 GHz computer, 19 inch monitor, 2 hardware based modems, 3.5 inch drive, 50 GB hard drive, 512 megs of RAM, 20X CD read/write drive, PS2 ports, Windows XP pro, Microsoft Office 2000, Primavera version 3.1 or current version.

Common Area:

- HP DeskJet 600 Color Printer with bi-directional printer cable
- copy machine (Canon NP 3325 or a copier with similar features)
- digital camera (Sony CD Mavica MVC-CD500)
- water fountain with cooler
- main entrance door should have a covered entrance (minimum 6 feet by 6 feet)

2.1.1 Manufacturer

Manufacturer shall be regularly engaged in the construction and on-site erection of relocatable modular buildings or trailers.

2.1.2 Utilities

Exterior utilities shall be permanently installed to the modular unit and connected with existing utilities. Exposed utilities shall be insulated to prevent freezing. Utilities shall be connected and disconnected in accordance with local codes and to the satisfaction of the Contracting Officer. Contractor shall be responsible for the cost of all utility usage except telephone. The Government will provide the telephone equipment and service to the Government Field Office.

2.1.3 Vehicular Access and Parking

The Contractor shall provide improved access road and parking area for five vehicles adjacent to the Government Field Office.

PART 3 EXECUTION

3.1 ERECTION

Erect the building in accordance with building manufacturer's written recommendations at a location designated by the Contracting Officer. Securely anchor trailer(s) to the ground at all four corners to guard

against movement during high winds. Water and weather proof the unit and make ready for use within 30 days after Contract Notice to Proceed.

3.2 JANITORIAL SERVICES

Provide weekly janitorial services, trash collection, and building maintenance during the life of the Contract.

3.3 MAINTENANCE AND REPAIR

The Contractor shall be responsible for maintenance and repair of the office during the life of the Contract.

3.4 RELOCATION

The Contractor shall be responsible for relocating the Government Field Office should it be required to accommodate the sequence of construction. The relocation will be at no expense to the Government.

3.5 OWNERSHIP AND DISPOSITION

The office, including all furniture and equipment, shall remain the property of the Contractor at completion of the construction. The Contractor shall remove the unit and all associated equipment and utilities after the Government vacates the office.

-- End of Section --

SECTION 02220

DEMOLITION

09/03

AMENDMENT NO. 0001

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 within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A10.6 (1990; R 1998) Safety Requirements for Demolition Operations

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI Guideline K (1997) Containers for Recovered Fluorocarbon Refrigerants

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 61-SUBPART M National Emission Standard for Asbestos

40 CFR 82 Protection of Stratospheric Ozone

49 CFR 173.301 Shipment of Compressed Gases in Cylinders and Spherical Pressure Vessels

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

U.S. DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25 (June 2000) Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M Requisitioning and Issue Procedures

[AM#1] _____

1.2 GENERAL REQUIREMENTS

Do not begin demolition until authorization is received from the Contracting Officer. Remove rubbish and debris from the project site daily; do not allow accumulations on airfield pavements. The work includes demolition, and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, the work shall be performed in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections. In the interest of conservation, salvage shall be pursued to the maximum extent possible (in accordance with Section 01572A CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT, if applicable; salvaged items and materials shall be disposed of as specified.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Demolition plan; G, RO

Notifications; G, RO

Submit proposed demolition and removal procedures to the Contracting Officer for approval before work is started.

SD-11 Closeout Submittals

Receipts;

Receipts or bills of lading, as specified.

1.4 REGULATORY AND SAFETY REQUIREMENTS

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," safety requirements shall conform with ANSI A10.6.

1.4.1 Notifications

1.4.1.1 General Requirements

Furnish timely notification of demolition projects to Federal, State,

regional, and local authorities in accordance with 40 CFR 61-SUBPART M. Notify the State's environmental protection agency and the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61-SUBPART M.

1.5 DUST AND DEBRIS CONTROL

Prevent the spread of dust and debris on airfield pavements and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to aircraft.

1.6 PROTECTION

1.6.1 Traffic Control Signs

Where pedestrian, driver and aircraft safety is endangered in the area of removal work, use traffic barricades with flashing lights. Anchor barricades in a manner to prevent displacement by jet or prop blast. Notify the Contracting Officer prior to beginning such work.

1.6.2 Existing Work

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition or removal work. Repairs, reinforcement, or structural replacement must have Contracting Officer approval.

1.6.3 Weather Protection

For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of existing roofing is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas so as to ensure effectiveness and to prevent displacement.

1.6.4 Trees

Trees within the project site which might be damaged during demolition, and which are indicated to be left in place, shall be protected by a 6 foot high fence. The fence shall be securely erected a minimum of 5 feet from

the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the work under this contract shall be replaced in kind or as approved by the Contracting Officer.

1.6.5 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, shall remain standing without additional bracing, shoring, or lateral support until demolished, unless directed otherwise by the Contracting Officer. The Contractor shall ensure that no elements determined to be unstable are left unsupported and shall be responsible for placing and securing bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.6.6 Protection of Personnel

During the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.7 BURNING

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

1.8 FOREIGN OBJECT DAMAGE (FOD)

Aircraft and aircraft engines are subject to FOD from debris and waste material lying on airfield pavements. Remove all such materials that may appear on operational aircraft pavements due to the Contractor's operations. If necessary, the Contracting Officer may require the Contractor to install a temporary barricade at the Contractor's expense to control the spread of FOD potential debris. The barricade shall consist of a fence covered with a fabric designed to stop the spread of debris; anchor the fence and fabric to prevent displacement by winds or jet/prop blasts. Remove barricade when no longer required.

1.9 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair items to be relocated which are damaged or replace damaged items with new undamaged items as approved by the Contracting Officer.

1.10 REQUIRED DATA

Demolition plan shall include procedures for coordination with other work in progress, a disconnection schedule of utility services, and airfield lighting, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. The procedures shall provide for safe conduct of the work in accordance with EM 385-1-1.

1.11 ENVIRONMENTAL PROTECTION

The work shall comply with the requirements of Section 01355 ENVIRONMENTAL PROTECTION and Section 01670A RECYCLED / RECOVERED MATERIALS.

1.12 USE OF EXPLOSIVES

Use of explosives will not be permitted.

1.13 AVAILABILITY OF WORK AREAS

Contractor may work in the project limits at all times. Contractor will only be allowed to work from 2245 hours to 0645 hours within 160 feet of the centerline of Taxiway A. England Airpark and the Contracting Officer retain the right to restrict working in any and all areas due to unforeseen conditions affecting the operation of Alexandria International Airport.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Structures

Existing structures indicated shall be removed to 6 feet below grade. Interior walls, other than retaining walls and partitions, shall be removed to 6 feet below grade. Sidewalks, curbs, gutters and street light bases shall be removed as indicated.

3.1.2 Utilities and Related Equipment

Remove existing utilities as indicated and uncovered by work, and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area. Remove meters and related equipment and deliver to a location on the station in accordance with instructions of the Contracting Officer. If utility lines are encountered that are not shown on drawings, contact the Contracting Officer for further instructions.

3.1.3 Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs including base courses as indicated to a depth of 60 inches below new finish grade. Refer to Section 02221 PAVEMENT REMOVAL and Section 02222 AIRFIELD PAVEMENT REMOVALS for additional requirements related to demolition of existing pavement. Provide neat sawcuts at limits of pavement removal as indicated.

3.1.4 Concrete

Saw concrete along straight lines to a depth of not less than 2 inches. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete.

3.1.5 Airfield Lighting

Remove existing airfield lighting as indicated and terminate in a manner satisfactory to the Contracting Officer. Remove edge lights, associated transformers and signs as indicated and deliver to a location on the station in accordance with instructions of the Contracting Officer.

3.1.6 Air Conditioning Equipment

Remove air conditioning equipment without releasing chlorofluorocarbon refrigerants to the atmosphere in accordance with the Clean Air Act Amendment of 1990. Recover all refrigerants prior to removing air conditioning equipment and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)." Turn in salvaged Class I ODS refrigerants as specified in paragraph, "Salvaged Materials and Equipment."

3.1.7 Cylinders and Canisters

Remove all fire suppression system cylinders and canisters and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)."

3.1.8 Locksets on Swinging Doors

The Contractor shall remove all locksets from all swinging doors indicated to be removed and disposed of. Contractor shall give the locksets to the Contracting Officer after their removal.

3.2 FILLING

Holes, open basements and other hazardous openings shall be filled in accordance with Section 02300 EARTHWORK.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

Except where specified in other sections or as indicated on the drawings, all materials and equipment removed, and not reused, shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition and removal procedures, and authorization by the Contracting Officer to begin demolition. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

3.3.2 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting ARI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall be removed from Government property and disposed of in accordance with 40 CFR 82. Products, equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) shall be disposed of in accordance with 40 CFR 82.

3.3.2.1 Special Instructions

Each container shall have in it no more than one type of ODS. A warning/hazardous label shall be applied to the containers in accordance with Department of Transportation regulations. All cylinders including but not limited to fire extinguishers, spheres, or canisters containing an ODS shall have a tag with the following information:

- a. Activity name and unit identification code
- b. Activity point of contact and phone number
- c. Type of ODS and pounds of ODS contained
- d. Date of shipment

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3.3.2.2 Fire Suppression Containers

Fire suppression system cylinders and canisters with electrical charges or initiators shall be deactivated prior to shipment. Also, safety caps shall be used to cover exposed actuation mechanisms and discharge ports on these special cylinders.

3.3.3 Transportation Guidance

Shipment of all ODS containers shall be in accordance with [AM#1] all state and local requirements.

3.4 CLEANUP

Debris and rubbish shall be removed from basement and similar excavations. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

3.4.1 Debris and Rubbish

Debris and rubbish shall be removed from basement and similar excavations. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

-- End of Section --

SECTION 02753A

CONCRETE PAVEMENT FOR AIRFIELDS AND OTHER HEAVY-DUTY PAVEMENTS
01/02

AMENDMENT NO. 0001

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 211.1 (1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete

ACI 214.3R (1988; R 1997) Simplified Version of the Recommended Practice for Evaluation of Strength Test Results of Concrete

ACI 305R (1999) Hot Weather Concreting

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182 (1991; R 1996) Burlap Cloth Made from Jute or Kenaf

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 184/A 184M (2001) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement

ASTM A 185 (1997) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement

ASTM A 497 (1999) Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement

ASTM A 53/A 53M (2002) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 615/A 615M (2003a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM A 616/A 616M (1996a) Rail-Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM A 617/A 617M	(1996a) Axle-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM C 1064/C 1064M	(1999) Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1077	(1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 117	(2003) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 123	(1998) Lightweight Particles in Aggregate
ASTM C 1260	(1994) Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C 131	(2003) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(2001) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 142	(1997) Clay Lumps and Friable Particles in Aggregates
ASTM C 143/C 143M	(2000) Slump of Hydraulic Cement Concrete
ASTM C 150	(1999a) Portland Cement
ASTM C 172	(1999) Sampling Freshly Mixed Concrete
ASTM C 174/C 174M	(1997) Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C 192/C 192M	(2000) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1997e1) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(2000) Air-Entraining Admixtures for Concrete
ASTM C 295	(1998) Petrographic Examination of Aggregates for Concrete
ASTM C 31/C 31M	(2000e1) Making and Curing Concrete Test Specimens in the Field

ASTM C 33 (2002a) Concrete Aggregates

ASTM C 39/C 39M (2001) Compressive Strength of Cylindrical Concrete Specimens

ASTM C 470/C 470M (1998) Molds for Forming Concrete Test Cylinders Vertically

ASTM C 494/C 494M (1999ae1) Chemical Admixtures for Concrete

ASTM C 618 (2000) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete

ASTM C 78 (1994) Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading)

ASTM C 881 (1999) Epoxy-Resin-Base Bonding Systems for Concrete

ASTM C 94/C 94M (2000e2) Ready-Mixed Concrete

ASTM C 989 (1999) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars

ASTM D 1752 (1984; R 1996e1) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

ASTM D 3665 (2002) Random Sampling of Construction Materials

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44 (1997) NIST Handbook 44: Specifications, Tolerances, and other Technical Requirements for Weighing and Measuring Devices

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100 (1996) Concrete Plant Standards

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION (CDT)

CDT Test 526 (2002) Test Method for Operation of California Profilograph and Evaluation of Profiles

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 100 (1975) Method of Sampling Concrete

	Aggregate and Aggregate Sources, and Selection of Material for Testing
COE CRD-C 104	(1980) Method of Calculation of the Fineness Modulus of Aggregate
COE CRD-C 114	(1997) Test Method for Soundness of Aggregates by Freezing and Thawing of Concrete Specimens
COE CRD-C 119	(1991) Standard Test Method for Flat or Elongated Particles in Coarse Aggregate
COE CRD-C 130	(1989) Scratch Hardness of Coarse Aggregate Particles
COE CRD-C 143	(1962) Specifications for Meters for Automatic Indication of Moisture in Fine Aggregate
COE CRD-C 171	(1995) Standard Test Method for Determining Percentage of Crushed Particles in Aggregate
COE CRD-C 300	(1990) Specifications for Membrane-Forming Compounds for Curing Concrete
COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete
COE CRD-C 521	(1981) Standard Test Method for Frequency and Amplitude of Vibrators for Concrete
COE CRD-C 55	(1992) Test Method for Within-Batch Uniformity of Freshly Mixed Concrete

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-DTL-24441/20	(Rev. A) Paint, Epoxy-Polyamide, Green Primer, Formula 150, Type III
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1.2 SYSTEM DESCRIPTION

This section is intended to stand alone for construction of concrete (rigid) pavement. However, where the construction covered herein interfaces with other sections, the construction at each interface shall conform to the requirements of both this section and the other section, including tolerances for both.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office

that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment; G, RE

a. Details and data on the batching and mixing plant prior to plant assembly including manufacturer's literature showing that the equipment meets all requirements specified herein.

b. A description of the equipment proposed for transporting concrete mixture from the central mixing plant to the paving equipment at least 7 days prior to start of paving unless otherwise specified.

c. At the time the materials are furnished for the mixture proportioning study, a description of the equipment proposed for the placing of the concrete mixture, method of control, and manufacturer's literature on the paver and finisher, together with the manufacturer's written instructions on adjustments and operating procedures necessary to assure a tight, smooth surface on the concrete pavement, free of tears and other surface imperfections, including excessive paste on the surface. The literature shall show that the equipment meets all details of these specifications.

Proposed Techniques; G, RE

a. A description of the placing and protection methods proposed prior to construction of the test section, if concrete is to be placed in or exposed to hot or cold weather conditions.

b. A detailed plan of the proposed paving pattern showing all planned construction joints. No deviation from the jointing pattern shown on the drawings shall be made without written approval of the Ft Worth District District Geotechnical Branch.

c. Data on the curing media and methods to be used.

Mixture Proportioning Studies; G, RE

The results of the Contractor's mixture proportioning studies along with a statement giving the maximum nominal coarse aggregate size and the proportions of all ingredients that will be used in the manufacture of concrete at least 14 days prior to commencing concrete placing operations. Aggregate quantities shall be based on the mass in a saturated surface dry condition. The statement shall be accompanied by test results from an independent commercial testing laboratory, inspected by the Government, and approved in writing, showing that mixture proportioning studies have been made with materials proposed for the project and that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used

in the mixture proportions without additional tests to show that the quality of the concrete is satisfactory.

Delivery, Storage, and Handling of Materials;

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

SD-06 Test Reports

Sampling and Testing; G,RE

Certified copies of laboratory test reports, including all test data, for cement, pozzolan, aggregate, admixtures, and curing compound proposed for use on this project. These tests shall be made by an approved commercial laboratory or by a laboratory maintained by the manufacturers of the materials. No material shall be used until notice of acceptance has been given. Materials may be subjected to check testing by the Government from samples obtained at the manufacturer, at transfer points, or at the project site.

1.4 MEASUREMENT AND PAYMENT

1.4.1 Measurements

1.4.1.1 Concrete

The quantity of concrete to be paid for will be the area of concrete in square yards, per depth indicated on the drawings including monolithic curbs, thickened edges, and other special joints, where required, placed in the completed and accepted pavement. Additional concrete required for thickened edges, undercut headers or other special joints is considered subsidiary to the unit price per square yard, and no additional compensation will be paid to the Contractor for these or similar items. Concrete will be measured in place in the completed and accepted pavement only within the neat line dimensions shown in the plan and cross section. No deductions will be made for any void, or other structure extending into or through the pavement slab, measuring 1 square yard or less in area. No other allowance for concrete will be made unless placed in specified locations in accordance with written instructions previously issued by the Contracting Officer.

1.4.1.2 Mixture Proportions By Contractor

The Contractor shall be responsible for the mixture proportions of cementitious materials and chemical admixtures; no separate measurement or payment will be made for any cementitious material, including pozzolan, or for any chemical admixture.

1.4.1.3 Steel Reinforcement

Steel reinforcement for concrete pavement shown on the plans as reinforced will be measured by the [AM#1]pound. The quantity of steel reinforcement measured will be equal to the number of pounds of reinforcement required by the drawings or as directed by the Contracting Officer. No additional payment will be made for steel reinforcement used in laps, wasted, or used for the convenience of the Contractor.

1.4.1.4 Dowels and Tie Bars

The quantity of dowels and tie bars used in the work will not be measured for payment but will be considered as a subsidiary obligation of the Contractor, covered under the price per square yard for concrete.

1.4.1.5 Joint Materials

The quantity of expansion joint filler, slip joint filler, and inserts for contraction joints will not be measured for payment but will be considered as a subsidiary obligation of the Contractor, covered under the price per square yard for concrete. Joint sealing materials are covered in Section 02760A FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS or Section 02762A COMPRESSION JOINT SEALS FOR CONCRETE PAVEMENTS.

1.4.2 Payments

1.4.2.1 Concrete

The quantity of concrete measured as specified above will be paid for at the contract unit price when placed in completed and accepted pavements. Payment shall be made at the contract price for square yard for the scheduled item, with necessary adjustments as specified in paragraph ACCEPTABILITY OF WORK AND PAYMENT ADJUSTMENTS. Payment will constitute full compensation for furnishing all materials, equipment, plant and tools, and for all labor and other incidentals necessary to complete the concrete pavement, except for other items specified herein for separate payment.

1.4.2.2 Steel Reinforcement

[AM#1]The reinforcing steel measured as specified above will be paid for at the contract unit price per pound of reinforcement used in the concrete pavements, which includes all costs of furnishing and placing the reinforcing steel in the concrete pavements.

1.5 ACCEPTABILITY OF WORK AND PAYMENT ADJUSTMENTS

Concrete samples shall be taken by the Contractor in the field to determine the slump, air content, and strength of the concrete. Test beams and test cylinders shall be made for determining conformance with the strength requirements of these specifications and, when required, for determining the time at which pavements may be placed into service. Any pavement not meeting the requirement for 'specified strength' shall be removed and replaced at no additional cost to the Government. The air content shall be determined in accordance with ASTM C 231. Slump tests shall be made in

accordance with ASTM C 143/C 143M. Test beams and cylinders shall be molded and cured in accordance with ASTM C 31/C 31M and as specified below.

Steel molds shall be used for molding the beams specimens. Molds for cylinder test specimens shall conform to ASTM C 470/C 470M. The Contractor shall furnish all materials, labor, and facilities required for molding, curing, testing, and protecting test specimens at the site and in the laboratory. Laboratory curing facilities for test specimens shall include furnishing and operating water tanks equipped with temperature-control devices that will automatically maintain the temperature of the water at 73 plus or minus 5 degrees F. The Contractor shall furnish and maintain at the site boxes or other facilities suitable for storing the specimens while in the mold at a temperature of 73 plus or minus 10 degrees F. Tests of the fresh concrete and of the hardened concrete specimens shall be made by and at the expense of the Contractor.

1.5.1 Pavement Lots

Appropriate adjustment in payment for individual lots of concrete pavement will be made in accordance with the following paragraphs. No such adjustment in payment will be made for any material other than concrete. A lot will be that quantity of construction that will be evaluated for compliance with specification requirements. A lot will be equal to 1000 square yards of production. In order to evaluate thickness, each lot will be divided into four equal sublots. Grade and surface smoothness (and condition) determinations will be made on the lot as a whole. However, any pavement not meeting the required 'specified strength' shall be removed and replaced at no additional cost to the Government. Strength will be evaluated, but will not be considered for payment adjustment. Edge slump requirements will be applied to each individual slab into which the primary paving lanes are divided by transverse joints, and will not be considered for payment adjustment. Samples for determining aggregate grading for fine aggregate and each size of coarse aggregate shall be taken as the aggregate bins discharge into the weigh hoppers. Results of tests on aggregates shall be used to control aggregate production and concreting operations, as specified in paragraph TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL, but will not be used for payment adjustment. Samples for determining air content and slump and for fabricating strength specimens shall be taken in accordance with ASTM C 172 during or immediately following delivery of the concrete at the paving site and deposition of the concrete immediately in front of the paver or transfer spreader. Results of strength tests shall be used to control concreting operations, but will not be used for payment adjustment. Cores for thickness determination shall be drilled and evaluated as specified. Location of all samples shall be as directed and will be deliberately selected on a truly random basis, not haphazard, using commonly recognized methods of assuring randomness, employing randomizing tables or computer programs, in accordance with ASTM D 3665.

1.5.2 Acceptance of Lots

When a lot of material fails to meet the specification requirements, that lot will be accepted at a reduced price or shall be removed and replaced. The lowest computed percent payment determined for any pavement characteristic (i.e., thickness, grade, and surface smoothness) discussed

below shall be the actual percent payment for that lot. The actual percent payment will be applied to the bid price and the quantity of concrete placed in the lot to determine actual payment.

1.5.3 Evaluation

The Contractor shall provide facilities for and, where directed, personnel to assist in obtaining samples for any Government testing, all at no additional cost to the Government. Such testing will in no way relieve the Contractor of any specified testing responsibilities. The Contractor shall provide all sampling and testing required for acceptance and payment adjustment at its expense. Such sampling and testing shall be performed by a commercial testing laboratory inspected by the Government and approved in writing. The laboratory performing the tests shall be on-site and shall conform with ASTM C 1077. The individuals who sample and test concrete or the constituents of concrete as required in this specification shall be certified as American Concrete Institute (ACI) Concrete Field Testing Technicians, Grade I, or shall have otherwise demonstrated to the satisfaction of the Contracting Officer other training providing knowledge and ability equivalent to the ACI minimum requirements for certification. The individuals who perform the inspection of concrete shall be certified as ACI Concrete Construction Inspector, Level II, or have otherwise demonstrated to the satisfaction of the Contracting Officer other training providing knowledge and ability equivalent to the ACI minimum requirements for certification. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and at least once per year thereafter for conformance with ASTM C 1077.

1.5.4 Additional Sampling and Testing

The Contracting Officer reserves the right to direct additional samples and tests for any area which appears to deviate from the specification requirements. Testing in these areas will be in addition to the subplot or lot testing, and the requirements for these areas will be the same as those for a subplot or lot, but shall be at no additional cost to the Government.

1.5.5 Air Content Tests

Air content of the concrete shall be controlled as specified in paragraph TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL and will not be considered for payment adjustment.

1.5.6 Slump Tests

Slump of the concrete shall be controlled as specified in paragraph TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL and will not be considered for payment adjustment.

1.5.7 Surface Smoothness

The Contractor shall use both of the following methods to test and evaluate surface smoothness of the pavement. All testing shall be performed in the presence of the Contracting Officer's representative. Detailed notes shall be kept of the results of the testing and a copy furnished to the

Government immediately after each day's testing. The profilograph method shall be used for all longitudinal and transverse testing, except where the runs would be less than 200 feet in length and at the ends where the straightedge shall be used. Where drawings show required deviations from a plane surface (crowns, drainage inlets, etc.), the surface shall be finished to meet the approval of the Contracting Officer.

1.5.7.1 Smoothness Requirements

- a. Straightedge Testing: The finished surfaces of the pavements shall have no abrupt change of 1/8 inch or more, and all pavements shall be within the limits specified in Table 1 when checked with an approved 12 foot straightedge.

TABLE 1
 STRAIGHTEDGE SURFACE SMOOTHNESS--PAVEMENTS

Pavement Category	Direction of Testing	Limits Inches
Runways and Taxiways	Longitudinal	1/8
	Transverse	1/4
All Other Airfield and Helicopter Paved Areas	Longitudinal	1/4
	Transverse	1/4
Tank Hardstands, Parking Areas, Open Storage Areas	Longitudinal	1/4
	Transverse	1/4

- b. Profilograph Testing: The finished surfaces of the pavements shall have no abrupt change of 1/8 inch or more, and all pavement shall have a Profile Index not greater than specified in Table 2 when tested with an approved California-type profilograph. If the extent of the pavement in either direction is less than 200 feet, that direction shall be tested by the straightedge method and shall meet requirements specified for such.

TABLE 2
 PROFILOGRAPH SURFACE SMOOTHNESS--PAVEMENTS

Pavement Category	Direction of Testing	Maximum Specified Profile Index Inch per mile
Runways	Longitudinal	7
	Transverse	9
Taxiways	Longitudinal	9
	Transverse	(Use Straightedge)

TABLE 2
 PROFILOGRAPH SURFACE SMOOTHNESS--PAVEMENTS

Pavement Category	Direction of Testing	Maximum Specified Profile Index Inch per mile
All Other Airfield and Helicopter Paved Areas	Longitudinal	9
	Transverse	9
Tank Hardstands, Parking Areas, Open Storage Areas Straightedge)	Longitudinal	(Use Straightedge)
	Transverse	11(Use

1.5.7.2 Testing Method

After the concrete has hardened sufficiently to permit walking thereon, but not later than 36 hours after placement, the surface of the pavement in each entire lot shall be tested by the Contractor in such a manner as to reveal all surface irregularities exceeding the tolerances specified above.

However, transverse profilograph testing of multiple paving lanes shall be performed at the timing directed. Separate testing of individual sublots is not required. If any pavement areas are ground, these areas shall be retested immediately after grinding. The entire area of the pavement shall be tested in both a longitudinal and a transverse direction on parallel lines. The transverse lines shall be 15 feet or less apart, as directed. The longitudinal lines shall be at the centerline of each paving lane shown on the drawings, regardless of whether the Contractor is allowed to pave two lanes at a time, and at the 1/8th point in from each side of the lane. Other areas having obvious deviations shall also be tested. Longitudinal testing lines shall be continuous across all joints. Transverse testing lines for pilot lanes shall be carried to construction joint lines and for fill-in lanes shall be carried 24 inches across construction joints, and the readings in this area applied to the fill-in lane. Straightedge testing of the longitudinal edges of slipformed pilot lanes shall also be performed before paving fill-in lanes as specified in paragraph "Edge Slump and Joint Face Deformation".

- a. Straightedge Testing: The straightedge shall be held in contact with the surface and moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length and measuring the maximum gap between the straightedge and the pavement surface, in the area between these two high points.
- b. Profilograph Testing: Profilograph testing shall be performed using approved equipment and procedures described in CDT Test 526. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must-grind" bumps and

the Profile Index for the pavement. The "blanking band" shall be 0.2 inches wide and the "bump template" shall span 1 inch with an offset of 0.4 inch. The profilograph shall be operated by an approved, factory-trained operator on the alignments specified above. A copy of the reduced tapes shall be furnished the Government at the end of each day's testing.

1.5.7.3 Payment Adjustment for Smoothness

- a. Straightedge Testing: Location and deviation from straightedge for all measurements shall be recorded. When between 5.0 and 10.0 percent and less than 15.0 percent of all measurements made within a lot exceed the tolerance specified in paragraph "Smoothness Requirements" above, after any reduction of high spots or removal and replacement, the computed percent payment based on surface smoothness will be 95 percent. When more than 10.0 percent and less than 15.0 percent of all measurements exceed the tolerance, the computed percent payment will be 90 percent. When between 15.0 and 20.0 percent of all measurements exceed the tolerance, the computed percent payment will be 75 percent. When 20.0 percent or more of the measurements exceed the tolerance, the lot shall be removed and replaced at no additional cost to the Government. Regardless of the above, any small individual area with surface deviation which exceeds the tolerance given above by more than 50 percent shall be corrected by grinding to meet the specification requirements above or shall be removed and replaced at no additional cost to the Government.
- b. Profilograph Testing: Location and data from all profilograph measurements shall be recorded. When the Profile Index of a lot exceeds the tolerance specified in paragraph "Smoothness Requirements" above by 1.0 inch per mile but less than 2.0 inches per mile, after any reduction of high spots or removal and replacement, the computed percent payment based on surface smoothness will be 95 percent. When the Profile Index exceeds the tolerance by 2.0 inches per mile but less than 3.0 inches per mile, the computed percent payment will be 90 percent. When the Profile Index exceeds the tolerance by 3.0 inches per mile but less than 4.0 inches per mile, the computed percent payment will be 75 percent. When the Profile Index exceeds the tolerance by 4.0 inches per mile or more, the lot shall be removed and replaced at no additional cost to the Government. Regardless of the above, any small individual area with surface deviation which exceeds the tolerance given above by more than 5.0 inches per mile or more, shall be corrected by grinding to meet the specification requirements above or shall be removed and replaced at no additional cost to the Government.
- c. Bumps ("Must Grind" Areas): Any bumps ("must grind" areas) shown on the profilograph trace which exceed 0.4 inch in height shall be reduced by grinding in accordance with subparagraph "Areas Defective In Plan Grade Or Smoothness" until they do not exceed 0.3 inch when retested. Such grinding shall be tapered in all directions to provide smooth transitions to areas not requiring

grinding. Areas of textured pavement shall be retextured in accordance with the subparagraph listed above. At the Contractor's option, pavement areas including ground areas may be rechecked with the profilograph in order to record a lower Profile Index.

1.5.8 Edge Slump and Joint Face Deformation

The following requirements on testing and evaluation of edge slump and joint face deformation apply only to pavements 10 inches or more in thickness. Use of slip-form paving equipment and procedures that fail to consistently provide edges within the specified tolerances on edge slump and joint face deformation shall be discontinued and the pavements shall be constructed by means of standard paving procedures using fixed forms. Slabs having more than the allowable edge slump shall be removed and replaced as specified in subparagraph "Excessive Edge Slump" before the adjacent lane is placed. Edge slump and joint face deformation will not be applied to payment adjustment.

1.5.8.1 Edge Slump

When slip-form paving is used, not more than 15.0 percent of the total free edge of any slab of the pavement, as originally constructed, shall have an edge slump exceeding 1/4 inch, and no slab shall have an edge slump exceeding 3/8 inch as determined in accordance with the measurements as specified in paragraph "Determination of Edge Slump". (The total free edge of the pavement will be considered to be the cumulative total linear measurement of pavement edge originally constructed as non-adjacent to any existing pavement; i.e., 100 feet of pilot lane, a paving lane originally constructed as a separate lane, will have 200 feet of free edge; 100 feet of fill-in lane will have no free edge, etc.,). The area affected by the downward movement of the concrete along the pavement edge shall not exceed 18 inches back from the edge.

1.5.8.2 Joint Face Deformation

In addition to the edge slump limits specified above, the vertical joint face shall have a surface within the maximum limits shown below:

Offset from Straightedge Applied Longitudinally To Pavement Surface 1 Inch Back From Joint Line	Offset From Straightedge Applied Longitudinally to Vertical Face	Offset From Straightedge Applied Top to Bottom Against the Joint Face	Abrupt Offset in Any Direction	Offset of Joint Face From True Vertical	
Airfield Pavement	1/8 inch	1/4 inch	3/8 inch	1/8 inch	1 inch per 12 inches
All other Pavement	1/4 inch	All other items same as airfield pavement.			

Offset from Straightedge Applied Longitudinally To Pavement Surface 1 Inch Back From Joint Line	Offset From Straightedge Applied Longitudinally to Vertical Face	Offset From Straightedge Applied Top to Bottom Against the Joint Face	Abrupt Offset in Any Direction	Offset of Joint Face From True Vertical
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1.5.8.3 Determination of Edge Slump

Immediately after the concrete has hardened sufficiently to permit walking thereon, the pavement surface shall be tested by the Contractor in the presence of a representative of the Contracting Officer. Testing shall be performed with a straightedge to reveal irregularities exceeding the edge slump tolerance specified above. The edge slump shall be determined at each free edge of each slipformed paving lane constructed. The straightedge shall be placed transverse to the direction of paving and the end of the straightedge located at the edge of the paving lane. Measurements shall be made at 5 to 15 foot spacings, as directed, commencing at the header where paving was started. Initially measurements shall be made at 5 foot intervals in each lane. When no deficiencies are present, the Contracting Officer may approve an increase in the interval. When any deficiencies exist, the interval will be returned to 5 feet. In no case shall the interval exceed 15 feet. In addition to the transverse edge slump determination above, the Contractor, at the same time, shall check the longitudinal surface smoothness of the joint on a continuous line 1 inch back from the joint line using the straightedge advanced one-half its length for each reading. Other tests of the exposed joint face shall be made as directed to ensure that a uniform, true vertical joint face is attained. These tests shall include longitudinal straightedge testing of the vertical face and vertical testing of the face for both smoothness and angle. The measurements shall be made by the Contractor, shall be properly referenced in accordance with paving lane identification and stationing, and a report given to the Contracting Officer within 24 hours after measurement is made. The report shall also identify areas requiring replacement in accordance with paragraph "Excessive Edge Slump" as well as the cumulative percentage of total free edge of pavement constructed to date which has an edge slump exceeding 1/4 inch.

1.5.8.4 Excessive Edge Slump

When edge slump exceeding the limits specified above is encountered on either side of the paving lane, additional straightedge measurements shall be made, if required, to define the linear limits of the excessive slump. The concrete for the entire width of the paving lane within these limits of excessive edge slump or joint deformation shall be removed and replaced in conformance with paragraph REPAIR, REMOVAL, REPLACEMENT OR SLABS. Partial slabs removed and replaced shall extend across the full width of the pavement lane, parallel to the transverse joints, and both the section of the slab removed and the section remaining in place shall have a minimum length of 10 feet to the nearest scheduled transverse joint. If less than

10 feet remains, the entire slab shall be removed and replaced. Adding concrete or paste to the edge or otherwise manipulating the plastic concrete after the sliding form has passed, or patching the hardened concrete, shall not be used as a method for correcting excessive edge slump.

1.5.9 Plan Grade

1.5.9.1 Plan Grade Tolerances

The finished surfaces of pavements shall conform, within the tolerances shown below, to the lines, grades, and cross sections shown. The finished surfaces of airfield runway, taxiway, and apron pavements shall vary not more than 1/2 inch above or below the plan grade line or elevation indicated. The surfaces of other pavements shall vary not more than 3/4 inch. Plan grade shall be checked on the lot as a whole and when more than 5.0 and less than 10.0 percent of all measurements made within a lot are outside the specified tolerance, the computed percent payment for that lot will be 95 percent. When more than 10.0 percent are outside the specified tolerances, the computed percent payment for the lot will be 75 percent. However, in any areas where the deviation from grade exceeds the specified tolerances by 50 percent or more, the deficient area shall be removed and replaced at no additional cost to the Government. However, the above deviations from the approved grade line and elevation will not be permitted in areas where closer conformance with the planned grade and elevation is required for the proper functioning of appurtenant structures. The finished surfaces of new abutting pavements shall coincide at their juncture.

1.5.9.2 Grade Conformance Tests

Each pavement category shall be checked by the Contractor for conformance with plan grade requirements. For the purpose of making grade conformance tests, the pavements will be subdivided into the same lots used for all other payment adjustment items. Within 5 days after paving of each lot, the finished surface of the pavement area in each lot shall be tested by the Contractor, in the presence of a representative of the Contracting Officer, by running lines of levels at intervals corresponding with every longitudinal and transverse joint to determine the elevation at each joint intersection. The results of this survey shall be recorded and a copy given to the Government at the completion of the survey of each lot.

1.5.10 Flexural Strength

Each lot of pavement will be evaluated for acceptance in accordance with the following procedures. The Contractor shall be responsible for all testing required herein. Testing shall be performed by an approved commercial laboratory. Results of strength tests will not be used for payment adjustment.

1.5.10.1 Sampling and Testing

One composite sample of concrete from each subplot shall be obtained in accordance with ASTM C 172 from one batch or truckload. Test cylinders, 6 x 12 in. shall be fabricated and cured in accordance with ASTM C 31/C 31M;

and tested in accordance with ASTM C 39/C 39M. Two test cylinders per subplot (8 per lot) shall be fabricated and cured for compressive strength, and two tested at 14-day age and two at 28-day age. The remaining four shall be tested at the ages directed. At the same time 2 additional test cylinders per subplot to be used for CQC tests shall be fabricated and cured; and tested as specified in paragraph TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL. Two beams for flexural strength shall be fabricated and cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 78 for every 2500 square yards of concrete. These shall be tested at the ages directed.

1.5.10.2 Computations

The following computations shall be performed:

- a. Average the eight 14-day compressive strength tests for the lot and also compute the standard deviation(s) for the eight tests.
- b. Convert the 14-day average compressive strength for the lot to equivalent 90-day average flexural strength for the lot, using the Correlation Ratio determined during mixture design studies.
- c. Report results of strength tests to the Contracting Officer daily. These values will be used for acceptance, but will not be used for payment adjustment.

1.5.11 Thickness

Each lot of pavement will be evaluated for acceptance and payment adjustment in accordance with the following procedure. The Contractor shall be responsible for drilling the cores, measuring the cores in the presence of the Contracting Officer's representative, and for filling the core holes as directed.

1.5.11.1 Drilling, Measuring, and Computations

Two cores, between 3 and 6 in. in diameter, shall be drilled from the pavement, per subplot (8 per lot). The Contractor shall fill the core holes with concrete containing an expanding admixture, as directed. The cores shall be evaluated for thickness of the pavement in accordance with ASTM C 174/C 174M. The pavement thickness from the 8 cores for the lot shall be averaged and the standard deviation for the 8 thickness measurements shall be computed.

1.5.11.2 Evaluation and Payment Adjustment for Thickness

Using the Average Thickness of the lot, the computed percent payment for thickness shall be determined by entering the following table:

Pavements Over 8 inches In Thickness

Deficiency in Thickness Determined by Cores Inches	Computed Percent Payment for Thickness
0.00 to 0.24	100
0.25 to 0.49	75
0.50 to 0.74	50
0.75 or greater	0

Pavements 8 inches or Less In Thickness

Deficiency in Thickness Determined by Cores Inches	Computed Percent Payment for Thickness
0.00 to 0.24	100
0.25 to 0.49	65
0.50 or greater	0

Where 0 percent payment is indicated, the entire lot shall be removed and replaced at no additional cost to the Government. Where either of the two cores from a subplot show a thickness deficiency of 0.75 inch or greater, two more cores shall be drilled in the subplot and the average thickness of the four cores computed. If this average shows a thickness deficiency of 0.75 inch or more the entire subplot shall be removed.

1.5.12 Partial Lots

When operational conditions cause a lot to be terminated before the specified four sublots have been completed, the following procedure shall be used to adjust the lot size and number of tests for the lot. Where three sublots have been completed, they shall constitute a lot and acceptance criteria adjusted accordingly. Where one or two sublots have been completed, they shall be incorporated into the next lot or the previous lot, as directed, and the total number of sublots shall be used and acceptance criteria adjusted accordingly.

1.5.13 Areas Defective in Plan Grade or Smoothness

In areas not meeting the specified limits for surface smoothness and plan grade, high areas shall be reduced to attain the required smoothness and grade, except as depth is limited below. High areas shall be reduced either by hand rubbing the freshly finished concrete with a silicon carbide brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 14 days or more old. Rubbing with a silicon carbide brick and water shall be discontinued as soon as contact with the coarse aggregate is

made, and all further necessary reduction shall be accomplished by grinding the hardened concrete with a surface-grinding machine after it is 14 days old. The area corrected by grinding the surface of the hardened concrete shall not exceed 5 percent of the area of any integral slab, and shall not exceed 1 percent of the total area of any subplot. The depth of grinding shall not exceed 1/4 inch. All pavement areas requiring plan grade or surface smoothness corrections in excess of the limits specified above, shall be removed and replaced in conformance with paragraph REPAIR, REMOVAL, REPLACEMENT OF SLABS. In pavement areas given a wire comb or tined texture, areas exceeding 25 square feet that have been corrected by rubbing or grinding shall be retextured by transverse grooving using an approved grooving machine of standard manufacture. The grooves shall be 1/8 inch deep by 1/4 inch wide on 2 inch centers and shall be carried into, and tapered to zero depth within the non-corrected surface, or shall match any existing grooves in the adjacent pavement. All areas in which rubbing or grinding has been performed will be subject to the thickness tolerances specified in paragraph Thickness. Any rubbing or grinding performed on individual slabs with excessive deficiencies shall be performed at the Contractor's own decision without entitlement to additional compensation if eventual removal of the slab is required.

1.6 ACCEPTABILITY OF WORK

The materials and the pavement itself will be accepted on the basis of tests made by the Government and by the Contractor's approved commercial laboratory or the supplier's approved laboratory, all as specified herein. The Government may, at its discretion, make check tests to validate the results of the Contractor's testing. If the results of the Government and Contractor tests vary by less than 2.0 percent, of the Government's test results, the results of the Contractor's tests will be used. If the results of the Government and Contractor tests vary by 2.0 percent or more, but less than 4.0 percent, the average of the two will be considered the value to be used. If these vary by 4.0 percent or more, each sampling and testing procedure shall be carefully evaluated and both the Government and the Contractor shall take another series of tests on duplicate samples of material. If these vary by 4.0 percent or more, the results of the tests made by the Government shall be used and the Government will continue check testing of this item on a continuous basis until the two sets of tests agree within less than 4.0 percent on a regular basis. Testing performed by the Government will in no way at any time relieve the Contractor from the specified testing requirements.

1.7 PRECONSTRUCTION TESTING OF MATERIALS

The Contractor shall not be entitled to any additional payment or extension of time because of delays caused by sampling and testing additional sources, or samples, necessitated by failure of any samples.

1.7.1 Aggregates

Aggregates shall be sampled by the Contractor in the presence of a Government representative. Samples shall be obtained in accordance with COE CRD-C 100 and of the size indicated therein, or larger if specified in paragraph Testing Sequence Deleterious Materials -- Airfields Only and

shall be representative of the materials to be used for the project. Testing of samples shall be the responsibility of the Contractor and shall be performed by an approved commercial laboratory. Test results shall be submitted 30 days before commencing paving. No material shall be used unless test results show that it meets all requirements of these specifications.

1.7.2 Chemical Admixtures

The Contractor shall provide satisfactory facilities for ready procurement of adequate test samples. All sampling and testing of an admixture will be by and at the expense of the Government. Tests will be conducted with materials proposed for the project. An air-entraining admixture that has been in storage at the project site for longer than 6 months or that has been subjected to freezing will be retested at the expense of the Contractor when considered appropriate and shall be rejected if test results are not satisfactory.

1.7.3 Curing Compound

The Contractor shall provide satisfactory facilities for ready procurement of adequate test samples. The sampling and testing will be by and at the expense of the Government.

1.7.4 Epoxy-Resin Material

At least 30 days before the material is used, the Contractor shall submit certified copies of test results showing that the specific lots or batches from which the material will be furnished to this project have been tested by the manufacturer and that the material conforms to the requirements of these specifications. When epoxy resin arrives at the job site, the Contractor shall assist the Government to sample the material. The Government will test the sample or will retain it in storage for possible future testing, as considered appropriate.

1.7.5 Cements, Pozzolans, and GGBF Slag

Preconstruction sampling and testing of cement, pozzolan, and GGBF slag shall conform to the requirements specified for sampling and testing during construction except that test results showing that each material meets specification requirements shall be available at least 5 days before start of paving operations.

1.8 TESTING BY CONTRACTOR DURING CONSTRUCTION

1.8.1 Contractor's Testing Requirements

During construction, the Contractor shall be responsible for sampling and testing aggregates, cementitious materials (cement and pozzolan), and concrete to determine compliance with the specifications. All sampling and testing shall be performed by an approved commercial laboratory, or for cementitious materials, the manufacturer's laboratory. Samples of aggregate shall be obtained as the bins discharge into the weigh hopper. Samples of concrete shall be obtained at the point of delivery to

the paver. The Government will sample and test concrete and ingredient materials as considered appropriate. The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples. Testing by the Government will in no way relieve the Contractor of the specified testing requirements.

1.8.2 Cementitious Materials

Cement and pozzolan will be accepted on the basis of manufacturer's certification of compliance, accompanied by mill test reports showing that the material in each shipment meets the requirements of the specification under which it is furnished. No cementitious material shall be used until notice of acceptance has been given by the Contracting Officer. Cementitious material may be subjected to check testing by the Government from samples obtained at the mill, at transfer points, or at the project site.

1.9 QUALIFICATIONS

All Contractor Quality Control personnel assigned to concrete construction shall be American Concrete Institute (ACI) Certified Workmen in one of the following grades (or shall have approved written evidence of having completed similar qualification programs):

Concrete Field Testing Technician, Grade I
Concrete Laboratory Testing Technician, Grade I or II
Concrete Construction Inspector, Level II

The foreman or lead journeyman of the finishing crew shall have similar qualification for ACI Concrete Flatwork Technician/Finisher, or equal. Written documentation shall be furnished for each workman in the above groups.

1.10 TEST SECTION

At least 10 days but not more than 60 days prior to construction of the concrete pavement, a test section shall be constructed as part of the production paving area at an outer edge of the project. If part of the production paving area, the test section will be allowed to remain in place, if meeting all specification requirements and will be paid for as part of the production pavement. There will be no separate payment for the test section or sections and the cost of the materials, and the construction, including removal and disposal of the test section, will be considered a subsidiary cost of constructing the project. The Contractor shall notify the Contracting Officer at least 5 days in advance of the date of test section construction. The test section shall consist of one paving lane at least 400 feet long and shall be constructed to a thickness of 15 inches. The lane width shall be the same as that required for use in the project. The test section shall contain at least one transverse construction joint. If keyed or doweled longitudinal construction joints are required in any of the production pavements, they shall be installed full length along one side of the test strip throughout the test section. If both keys and dowels are required, each shall be installed in half of the test section. Two separate days shall be used for construction of the

test section. The Contractor shall use the test section to develop and demonstrate to the satisfaction of the Contracting Officer the proposed techniques of mixing, hauling, placing, consolidating, finishing, curing, start-up procedures, testing methods, plant operations, and the preparation of the construction joints. Variations in mixture proportions other than water shall be made if directed. The test section shall be placed as approved by the Government. The Contractor shall vary the water content, as necessary, to arrive at the appropriate content. The mixing plant shall be operated and calibrated prior to start of 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. Base course preparation, concrete production, placing, consolidating, curing, construction of joints, and all testing shall be in accordance with applicable provisions of this specification. The Contractor shall construct the test section meeting all specification requirements and being acceptable to the Contracting Officer in all aspects, including surface texture. Failure to construct an acceptable test section will necessitate construction of additional test sections at no additional cost to the Government. Any test sections unacceptable to the Contracting Officer shall be removed at the Contractor's expense. If the Contractor proposes to use slipform paving and is unable to construct an acceptable test section, or if the slipform paving equipment and procedures are found to be unable to produce acceptable pavement at any time, the slipform paving equipment shall be removed from the job and the construction completed using stationary side forms and equipment compatible with them. The Contractor shall provide four cores at least 6 inch diameter and 2 beams at least 6 by 32 inches by full depth (or 4 beams at least 6 by 20 inches by full depth) cut from points selected in the test section by the Government, 5 days after completion of the test section. The Contractor shall trim the beams to dimensions directed before delivery for inspection and testing, as considered appropriate. Production paving may be started immediately after the results of 7-day tests of the cores (and the sawed beams) have been approved and after approval of the test section. Contractor's personnel, including paving superintendents, paving foremen, equipment operators, and batch plant operators, used for constructing the test section shall be used all other airfield concrete paving operations on this project. Contractor shall not vary the paving personnel from those used for constructing the test section without written authorization from the Government's Contracting Officer. The Government reserves the right to request additional test sections be constructed in the event of superintendent or foremen changes, or if production paving fails to meet the project requirements. Additional test sections due to Contractor personnel changes or the Contractor's failure to meet project requirements shall be constructed in accordance with the project requirements and at no additional cost to the Owner.

1.11 DELIVERY, STORAGE, AND HANDLING OF MATERIALS

1.11.1 Bulk Cementitious Materials

All cementitious material shall be furnished in bulk. The temperature of the cementitious material, as delivered to storage at the site, shall not exceed 150 degrees F.

1.11.1.1 Transportation

When bulk cementitious material 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 cementitious material from exposure to moisture.

1.11.1.2 Storage Requirements

Immediately upon receipt at the site of the work, cementitious materials shall be stored in a dry and properly ventilated structure. All storage facilities shall be subject to approval and shall allow easy access for inspection and identification. Sufficient cementitious materials shall be in storage to sustain continuous operation of the concrete mixing plant while the pavement is being placed. To prevent cement from becoming unduly aged after delivery, any cement that has been stored at the site for 60 days or more shall be used before using cement of lesser age.

1.11.1.3 Separation of Materials

Separate facilities shall be provided which will prevent any intermixing during unloading, transporting, storing, and handling of each type of cementitious material.

1.11.2 Aggregate Materials

1.11.2.1 Storage

Aggregate shall be stored at the site of the batching and mixing plant avoiding breakage, segregation, or contamination by foreign materials. Each size of aggregate from each source shall be stored separately in free-draining stockpiles. Fine aggregate and the smallest size coarse aggregate shall remain in free-draining storage for at least 24 hours immediately prior to use. Sufficient aggregate shall be maintained at the site at all times to permit continuous uninterrupted operation of the mixing plant at the time concrete pavement is being placed.

1.11.2.2 Handling

Aggregate shall be handled avoiding segregation or degradation. Vehicles used for stockpiling or moving aggregate shall be kept clean of foreign materials. Tracked equipment shall not be allowed on coarse aggregate stockpiles. Stockpiles shall be built up and worked avoiding segregation in the piles and preventing different sizes of aggregate from being mixed during storage or batching. Aggregate shall not be stored directly on ground unless a sacrificial layer is left undisturbed and unused.

1.11.3 Other Materials

Reinforcing bars and accessories shall be stored above the ground on platforms, skids, or other supports. Other materials shall be stored avoiding contamination and deterioration. Chemical admixtures which have

been in storage at the project site for longer than 6 months or which have been subjected to freezing shall not be used unless retested and proven to meet the specified requirements. The Contractor shall ensure that materials can be accurately identified after bundles or containers are opened.

1.12 EQUIPMENT

All plant, equipment, tools, and machines used in the work shall be maintained in satisfactory working conditions at all times.

1.12.1 Batching and Mixing Plant

1.12.1.1 Location of Batching and Mixing Plant

The batching and mixing plant shall be located on project site as indicated on the drawings. There shall be operable telephonic or radio communication between the batching plant and the placing site at all times concreting is taking place.

1.12.1.2 Type and Capacity of Batching and Mixing Plant

The batching and mixing plant shall be a stationary-type plant. The plant shall be designed and operated to produce concrete within the specified tolerances, and shall have a capacity of at least 250 cu. yd. per hour. The batching plant shall conform to the requirements of NRMCA CPMB 100 and as specified; however, rating plates attached to batch plant equipment are not required.

1.12.1.3 Equipment Requirements

The batching controls shall be either semiautomatic or automatic. Semiautomatic batching system shall be provided with interlocks. Separate bins or compartments shall be provided for each size group of aggregate and each cementitious material. Aggregates shall be weighed either in separate weigh batchers with individual scales or cumulatively in one weigh batcher on one scale, provided the fine aggregate is weighed first. Aggregate shall not be weighed in the same batcher with cementitious material. If both cement and pozzolan are used, they may be batched cumulatively, provided portland cement is batched first. Water shall not be weighed or measured cumulatively with another ingredient. Water batcher filling and discharging valves shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. An accurate mechanical device for measuring and dispensing each chemical admixture shall be provided. Each dispenser shall be interlocked with the batching cycle and discharged automatically to obtain uniform distribution throughout the batch in the specified mixing period. Different chemical admixtures shall not be combined before introduction in water and cement. The plant shall be arranged to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for obtaining representative samples of aggregates from each bin or compartment.

1.12.1.4 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 shall conform to the applicable requirements of NIST HB 44, except that the accuracy shall be within 0.2 percent of 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 springless dial, which shall indicate the scale load at all stages of the weighing operation or shall include a beam scale with a beam balance indicator that will show the scale in balance at zero load and at any beam setting. The indicator shall have an over and under travel equal to at least 5 percent of the capacity of the beam. Approved electronic digital indicators and load cells may also be used. The weighing equipment shall be arranged to allow the concrete plant operator to conveniently observe the dials or indicators.

1.12.1.5 Batching Tolerances

The following tolerances shall apply.

<u>Materials</u>	<u>Percentage of Required Mass</u>
Cement (and Pozzolan)	plus or minus 1
Aggregate	plus or minus 2
Water	plus or minus 1
Admixture	plus or minus 3

For volumetric batching equipment for water and admixtures, the above numeric tolerances shall apply to the required volume of material being batched. Concentrated admixtures shall be uniformly diluted, if necessary, to provide sufficient volume per batch to ensure that the batchers will consistently operate within the above tolerance.

1.12.1.6 Moisture Control

The plant shall be capable of ready adjustment to compensate for the varying moisture contents of the aggregates and to change the quantities of the materials being batched. An electric moisture meter complying with the provisions of COE CRD-C 143 shall be provided for measuring of moisture in the fine aggregate. The sensing element shall be arranged so that measurement is made near the batcher charging gate of the fine aggregate bin or in the fine aggregate batcher.

1.12.1.7 Recorders

A graphic or digital recorder conforming to the requirements of NRMCA CPMB 100 shall be furnished and kept operational at the batching plant.

1.12.2 Concrete Mixers

Mixers shall be stationary mixers. Truck mixers shall not be used for mixing or transporting paving concrete. Mixers shall be capable of combining the materials into a uniform mixture and of discharging this mixture without segregation. The mixers shall not be charged in excess of the capacity recommended by the manufacturer. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer. The mixers shall be maintained in satisfactory operating condition, and the 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 or paddles.

1.12.2.1 Stationary, Central Plant, Mixers

Stationary, central plant mixers shall conform to the requirements of ASTM C 94. The mixer shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4 inch (19 mm) or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth. Mixers shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed.

1.12.2.2 Mixing Time and Uniformity

- a. Stationary Mixers: For stationary mixers, before uniformity data are available, the mixing time for each batch after all solid materials are in the mixer, provided that all of the mixing water is introduced before one-fourth of the mixing time has elapsed, shall be 1 minute for mixers having a capacity of 1 cubic yard. For mixers of greater capacity, this minimum time shall be increased 20 seconds for each additional 1.33 cubic yard or fraction thereof. After results of uniformity tests are available, the mixing time may be reduced to the minimum time required to meet uniformity requirements; but if uniformity requirements are not being met, the mixing time shall be increased as directed. Mixer performance tests at new mixing times shall be performed immediately after any change in mixing time. When regular testing is performed, the concrete shall meet the limits of any five of the six uniformity requirements listed in Table 4, below. When abbreviated testing is performed, the concrete shall meet only those requirements listed for abbreviated testing. The concrete proportions used for uniformity tests shall be as used on the project. Regular testing shall consist of performing all six 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 three required tests on a single batch of concrete. The range for abbreviated testing shall be the range for one batch. If more than one mixer is used and all are identical in terms of make, type, capacity, condition, speed of rotation, etc., the results of tests on one of

the mixers shall apply to the others, subject to the approval of the Contracting Officer. All mixer performance (uniformity) testing shall be performed by the Contractor in accordance with COE CRD-C 55 and with paragraph titled TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL.

TABLE 4
 UNIFORMITY REQUIREMENTS--STATIONARY MIXERS

Parameter	Regular Tests Allowable Maximum Range for Average of 3 Batches	Abbreviated Tests Allowable Maximum Range for 1 Batch
Unit weight of air-free mortar, lb/cubic ft	2.0	2.0
Air content, percent	1.0	--
Slump, inches	1.0	--
Coarse aggregate, percent	6.0	6.0
Compressive strength at 7 days, percent	10.0	10.0
Water content, percent	1.5	--

1.12.3 Transporting Equipment

Concrete shall be transported to the paving site in nonagitating equipment conforming to ASTM C 94/C 94M or in approved agitators. All transporting equipment shall be designed and operated to deliver and discharge the required concrete mixture completely without segregation.

1.12.4 Transfer and Spreading Equipment

Equipment for transferring concrete from the transporting equipment to the paving lane in front of the paver shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will transfer and spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently. The travelling surge hopper shall be a specially manufactured, self-propelled transfer-placer which will operate in front of the paver and accept the concrete from the transporting equipment outside the paving lane, store it as necessary, and feed it out evenly across the lane in front of the paver at a depth which permits the paver to operate efficiently. The capacity shall be such that concrete is always available in front of the paver, to prevent the need for stopping the paver. It shall be designed to always discharge the oldest concrete remaining in the hopper before the fresher concrete.

1.12.5 Paver-Finisher

The paver-finisher shall be a heavy-duty, self-propelled machine designed specifically for paving and finishing high quality pavement. The paver-finisher shall weigh at least 2200 lb. per foot of lane width, and shall be powered by an engine having at least 6.0 horsepower per foot of lane width. The paver-finisher shall spread, consolidate, and shape the plastic concrete to the desired cross section in one pass. The mechanisms for forming the pavement shall be easily adjustable in width and thickness and for required crown. In addition to other spreaders required by paragraph Transfer and Spreading Equipment, the paver-finisher shall be equipped with a full width knock-down auger or paddle mechanism, capable of operating in both directions, which will evenly spread the fresh concrete in front of the screed or extrusion plate. Immersion vibrators shall be gang mounted at the front of the paver on a frame equipped with suitable controls so that all vibrators can be operated at any desired depth within the slab or completely withdrawn from the concrete, as required. The vibrators shall be automatically controlled so that they will be immediately stopped as forward motion of the paver ceases. The spacing of the immersion vibrators across the paving lane shall be as necessary to properly consolidate the concrete, but the clear distance between vibrators shall not exceed 30 inches. Spud vibrators shall operate at a frequency of not less than 8000 impulses per minute and an amplitude of not less than 0.03 inch and tube vibrators at a frequency of not less than 5000 impulses per minute and an amplitude of not less than 0.03 inch, as determined by COE CRD-C 521. The paver-finisher shall be equipped with a transversely oscillating screed or an extrusion plate to shape, compact, and smooth the surface and shall so finish the surface that no significant amount of hand finishing, except use of cutting straightedges, is required. The screed or extrusion plate shall be constructed to provide adjustment for crown in the pavement. The entire machine shall provide adjustment for variation in lane width or thickness and to prevent more than 8 inches of the screed or extrusion plate extending over previously placed concrete on either end when paving fill-in lanes. Machines that cause displacement of properly installed forms or cause ruts or indentations in the prepared underlying materials and machines that cause frequent delays due to mechanical failures shall be replaced as directed.

1.12.5.1 Paver-Finisher with Fixed Forms

The paver-finisher shall be equipped with wheels designed to keep it aligned with the forms and to spread the load so as to prevent deformation of the forms.

1.12.5.2 Slipform Paver-Finisher

The slipform paver-finisher shall be automatically controlled and crawler mounted with four padded tracks so as to be completely stable under all operating conditions. The paver-finisher shall finish the surface and edges so that no edge slump beyond allowable tolerance occurs. Horizontal alignment shall be electronically referenced to a taut wire guideline. Vertical alignment shall be electronically referenced on both sides of the paver to a taut wire guideline, to an approved laser control system, or,

only where permitted by paragraph Slipform Paving, to a ski operating on a completed lane. Suitable moving side forms shall be provided that are adjustable and will produce smooth, even edges, perpendicular to the top surface and meeting specification requirements for alignment and freedom from edge slump.

1.12.5.3 Longitudinal Mechanical Float

A longitudinal mechanical float shall be specially designed and manufactured to smooth and finish the pavement surface without working excess paste to the surface. It shall be rigidly attached to the rear of the paver-finisher or to a separate self-propelled frame spanning the paving lane. The float plate shall be at least 5 feet long by 8 inches wide and shall automatically be oscillated in the longitudinal direction while slowly moving from edge to edge of the paving lane, with the float plate in contact with the surface at all times.

1.12.5.4 Nonrotating Pipe Float

A pipe float if used, shall be a nonrotating pipe 6 to 10 inches in diameter and sufficiently long to span the full paving width when oriented at an angle of approximately 60 degrees with the centerline. The pipe float shall be mounted on a self-propelled frame that spans the paving lane. No means of applying water to the surface shall be incorporated in the pipe float.

1.12.5.5 Other Types of Finishing Equipment

Clary screeds or other rotating tube floats, or bridge deck finishers, shall not be allowed on the project. Concrete finishing equipment of types other than specified above may be demonstrated on a test section outside the production pavement if approved in writing. If the Contracting Officer's representative decides from evaluation of the test section that the equipment is better than the specified finishing equipment, its use will be permitted as long as it continues to perform better than the specified equipment.

1.12.6 Curing Equipment

Equipment for applying membrane-forming curing compound shall be mounted on a self-propelled frame that spans the paving lane. The reservoir for curing compound shall be constantly mechanically (not air) agitated during operation and shall contain means for completely draining the reservoir. The spraying system shall consist of a mechanically powered pump which will maintain constant pressure during operation, an operable pressure gauge, and either a series of spray nozzles evenly spaced across the lane to give uniformly overlapping coverage or a single spray nozzle which is mounted on a carriage which automatically traverses the lane width at a speed correlated with the forward movement of the overall frame. All spray nozzles shall be protected with wind screens. Any hand-operated sprayers allowed by paragraph Membrane Curing shall be compressed air supplied by a mechanical air compressor. If the curing machine fails to apply an even coating of compound at the specified rate, it shall immediately be replaced.

1.12.7 Texturing Equipment

Texturing equipment shall be as specified below. Before use, the texturing equipment shall be demonstrated on a test section, and the equipment shall be modified as necessary to produce the texture directed.

1.12.7.1 Fabric Drag

A fabric drag shall consist of a piece of material as long as the lane width securely attached to a separate wheel mounted frame spanning the paving lane or to one of the other similar pieces of equipment. Width of the material shall provide 12 to 18 inches dragging flat on the pavement surface. Length shall be at least equal to the width of the slab plus 24 inches. The material shall be clean, reasonably new burlap, completely saturated with water before attachment to the frame and always resaturated before start of use and kept clean and saturated during use. Burlap shall conform to AASHTO M 182, Class 3 or 4. The fabric material shall be an approved artificial turf fabricated of a plastic material, and shall be a type that has proved satisfactory for this use in previous pavement construction.

1.12.7.2 Deep Texturing Equipment

Texturing equipment shall consist of a comb with spring wire tines forming a drag at least 4 feet long. This drag shall be mounted in a wheeled frame spanning the paving lane and so constructed that the drag is mechanically pulled in a straight line across the paving lane perpendicular to the centerline.

1.12.8 Sawing Equipment

Equipment for sawing joints and for other similar sawing of concrete shall be standard diamond-type concrete saws mounted on a wheeled chassis which can be easily guided to follow the required alignment. Blades shall be diamond tipped. If demonstrated to operate properly, abrasive blades may be used. Wheel saws shall be saws with large diameter tungsten carbide tipped blades mounted on a heavy-duty chassis which will produce a saw kerf at least 1-1/2 inch wide. All saws shall be capable of sawing to the full depth required.

1.12.9 Straightedge

The Contractor shall furnish and maintain at the job site, in good condition, one 12 foot straightedge for each paving train for testing the hardened portland cement concrete surfaces. These straightedges shall be constructed of aluminum or magnesium alloy and shall have blades of box or box-girder cross section with flat bottom, adequately reinforced to insure rigidity and accuracy. Straightedges shall have handles for operation on the pavement.

1.12.10 Profilograph

The Contractor shall furnish a 25 foot profilograph for testing the finished pavement surface. The profilograph shall produce a record on tape

of the results of testing the pavement surface and shall automatically mark the Profile Index of each section tested as well as indicate and measure each "must grind" point, all in accordance with CDT Test 526 and as required by paragraph Surface Smoothness.

PART 2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

Cementitious materials shall be portland cement, or only portland cement in combination with pozzolan and shall conform to appropriate specifications listed below. Temperature of cementitious materials as supplied to the project shall not exceed 150 degrees F.

2.1.1 Portland Cement

Portland cement shall conform to ASTM C 150, Type I except that the maximum amount of C3A in Type I cement shall be 15 percent, low-alkali, including false set requirements.

2.1.2 Pozzolan (Fly Ash and Silica Fume)

2.1.2.1 Fly Ash

Fly ash shall conform to ASTM C 618, Class C or F, including the optional requirements in Tables 1A and 2A. Class F fly ash, when used to mitigate alkali-aggregate reactivity, shall have a Calcium Oxide (CaO) content of less than 8 percent. The Contractor shall comply with EPA requirements in accordance with Section 01670A RECYCLED / RECOVERED MATERIALS.

2.1.3 Ground Granulated Blast-Furnace (GGBF) Slag

Ground Granulated Blast-Furnace Slag shall conform to ASTM C 989, Grade 120.

2.2 AGGREGATES

2.2.1 Aggregate Sources

Fine and coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with ASTM C 1260. Both coarse aggregate size groups shall be tested if from different sources. Test results shall have a measured expansion equal to or less than 0.08 percent at 16 days after casting. Should the test data indicate an expansion greater than 0.08 percent, the aggregate(s) shall be rejected, or additional testing, using a modified version of ASTM C 1260, shall be performed by the Contractor as described below. ASTM C 1260 shall be modified as follows to include one of the following options:

- a. Utilize the Contractor's proposed low alkali portland cement and Class F fly ash in combination for the test proportioning. Class F fly ash shall contain less than 8 percent Calcium Oxide (CaO), and the replacement amount shall be determined from laboratory trial mixes, but shall not exceed 20 percent by weight of the total cementitious material.. The quantity shall be

determined that will meet all the requirements of these specifications and which will lower the expansion equal to or less than 0.08 percent at 16 days after casting.

b. Utilize the Contractor's proposed low alkali portland cement and ground granulated blast furnace (GGBF) slag in combination for the test proportioning. GGBF slag shall be used in the range of 40 to 50 percent of the total cementitious material by mass. The quantity shall be determined that will meet all the requirements of these specifications and which will lower the expansion equal to or less than 0.08 percent at 16 days after casting.

If any of the above options does not lower the expansion equal to or less than 0.08 percent at 16 days after casting, the aggregate(s) shall be rejected and the Contractor shall submit new aggregate sources for retesting. The results of the testing shall be submitted to the Contracting Officer for evaluation and acceptance.

2.2.2 Coarse Aggregate

Coarse aggregate shall have a satisfactory service record of at least 5 years successful service in three paving projects or, if a new source is used, shall meet the requirements when tested for resistance to freezing and thawing.

2.2.2.1 Material Composition

Coarse aggregate shall consist of crushed gravel, or crushed stone. Crushed gravel shall contain not less than 75 percent of crushed particles by mass in each sieve size, as determined by COE CRD-C 171.

2.2.2.2 Quality

Aggregates as delivered to the mixers shall consist of clean, hard, uncoated particles meeting the requirements of ASTM C 33 and other requirements specified herein. Coarse aggregate shall be washed. Washing shall be sufficient to remove dust and other coatings.

2.2.2.3 Particle Shape Characteristics

Particles of the coarse aggregate shall be generally spherical or cubical in shape. The quantity of flat and elongated particles in any size group shall not exceed 20 percent by weight as determined by COE CRD-C 119. A flat particle is defined as one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3.

2.2.2.4 Size and Grading

The nominal maximum size of the coarse aggregate shall be 1.5 inches and shall meet the size groups below. When the nominal maximum coarse size is greater than 1 inch, the aggregates shall be furnished in two size groups as follows:

Nominal Maximum Size Inches	Size Group
3/4	ASTM C 33 --No. 67 (No. 4 to 3/4 inch)
1-1/2	ASTM C 33 --No. 4 (3/4 to 1-1/2 inch)

The grading of the coarse aggregate within the separated size groups shall conform to the requirements of ASTM C 33, Sizes 67 and 4 as delivered to the mixer.

2.2.2.5 Deleterious Materials - Airfield Pavements

The amount of deleterious material in each sieve size of coarse aggregate shall not exceed the limits shown in Table 5 below, determined in accordance with the test methods shown.

TABLE 5
LIMITS OF DELETERIOUS MATERIALS IN COARSE AGGREGATE
FOR AIRFIELD PAVEMENTS
Percentage by Mass

Materials	Areas with Minor Popouts Severe Weather
Clay lumps and friable particles (ASTM C 142)	2.0
Shale (a) (ASTM C 295)	1.0
Material finer than 0.075 mm (No. 200 sieve) (b) (ASTM C 117)	1.0
Lightweight particles (c) (ASTM C 123)	0.5
Clay ironstone (d) (ASTM C 295)	1.0
Chert and cherty stone (less than 2.40 Mg/cubic meter density SSD (2.40 Sp. Gr.)) (e) (ASTM C 295)	1.0

TABLE 5
 LIMITS OF DELETERIOUS MATERIALS IN COARSE AGGREGATE
 FOR AIRFIELD PAVEMENTS
 Percentage by Mass

Materials	Areas with Minor Popouts	Severe Weather
Claystone, mudstone, and siltstone (f) (ASTM C 295)	1.0	
Shaly and argillaceous limestone (g) (ASTM C 295)	1.0	
Other soft particles COE CRD-C 130	1.0	
Total of all deleterious substances exclusive of material finer than 0.075 mm (No. 200 sieve)	3.0	

- a. Shale is defined as a fine-grained, thinly laminated or fissile sedimentary rock. It is commonly composed of clay or silt or both. It has been indurated by compaction or by cementation, but not so much as to have become slate.
- b. Limit for material finer than 0.075 mm (No. 200 sieve) will be increased to 1.5 percent for crushed aggregates if the fine material consists of crusher dust that is essentially free from clay or shale.
- c. The separation medium shall have a density of 2.0 Mg/cubic meter (Sp. Gr. of 2.0). This limit does not apply to coarse aggregate manufactured from blast-furnace slag unless contamination is evident.
- d. Clay ironstone is defined as an impure variety of iron carbonate, iron oxide, hydrous iron oxide, or combinations thereof, commonly mixed with clay, silt, or sand. It commonly occurs as dull, earthy particles, homogeneous concretionary masses, or hard-shell particles with soft interiors. Other names commonly used for clay ironstone are "chocolate bars" and limonite concretions.
- e. Chert is defined as a rock composed of quartz, chalcedony or opal, or any mixture of these forms of silica. It is variable in color. The texture is so fine that the individual mineral grains are too

small to be distinguished by the unaided eye. Its hardness is such that it scratches glass but is not scratched by a knife blade. It may contain impurities such as clay, carbonates, iron oxides, and other minerals. Other names commonly applied to varieties of chert are: flint, jasper, agate, onyx, hornstone, porcellanite, novaculite, sard, carnelian, plasma, bloodstone, touchstone, chrysoprase, heliotrope, and petrified wood. Cherty stone is defined as any type of rock (generally limestone) that contains chert as lenses and nodules, or irregular masses partially or completely replacing the original stone.

- f. Claystone, mudstone, or siltstone, is defined as a massive fine-grained sedimentary rock that consists predominantly of indurated clay or silt without laminations or fissility. It may be indurated either by compaction or by cementation.
- g. Shaly limestone is defined as limestone in which shale occurs as one or more thin beds or laminae. These laminae may be regular or very irregular and may be spaced from a few inches down to minute fractions of an inch. Argillaceous limestone is defined as a limestone in which clay minerals occur disseminated in the stone in the amount of 10 to 50 percent by weight of the rock; when these make up from 50 to 90 percent, the rock is known as calcareous (or dolomitic) shale (or claystone, mudstone, or siltstone).

2.2.2.6 Testing Sequence Deleterious Materials -- Airfields Only

The size of the sample shall be at least 200 pounds for the 3/4 to 1-1/2 inch size and 25 pounds for the No. 4 to 3/4 inch coarse aggregate and 10 pounds for the fine aggregate. The Contractor shall provide facilities for the ready procurement of representative test samples. Samples shall be taken and tested by and at the expense of the Contractor, using appropriate Corps of Engineers laboratory and ASTM test methods. Additional tests and analyses of aggregates at various stages in the processing and handling operations may be made by the Government at the discretion of the Contracting Officer. Such Government testing will not relieve the Contractor of any of its testing responsibilities. The testing procedure on each sample of coarse aggregate for compliance with limits on deleterious materials shall be as follows:

Step 1: Test approximately one-fifth of sample for material finer than the No. 200 sieve.

Step 2: Wash off material finer than No. 200 sieve from the remainder of the sample and recombine the remainder with material retained on the No. 200 sieve from Step 1.

Step 3: Test remaining full sample for clay lumps and friable particles and remove.

Step 4: Test remaining full sample for lightweight particles and remove, and then for chert and/or cherty stone with SSD density of less than 2.40 Mg/cubic meter (Sp. Gr. 2.40) and remove.

Step 5: Test remaining sample for clay-ironstone, shale, claystone, mudstone, siltstone, shaly and/or argillaceous limestone, and remove.

Step 6: Test approximately one-fifth of remaining full sample for other soft particles.

Determination of deleterious materials listed in Steps 4 and 5 shall be performed by an individual specifically trained in petrographic identification. The individual selected to perform the identification of these deleterious materials shall be subject to approval and, at least 10 days before any individual is proposed to commence this type of work, the Contractor shall submit a written resume, of the individual's training and experience for approval by the Government's Laboratory. The Contractor will not be entitled to any extension of time or additional payment due to any delays caused by the testing, evaluation, or personnel requirements.

2.2.2.7 Resistance to Freezing and Thawing

Coarse aggregate not having a satisfactory demonstrable service record shall have a durability factor of 50 or more when subjected to freezing and thawing in concrete in accordance with COE CRD-C 114.

2.2.2.8 Resistance to Abrasion

Coarse aggregate shall not show more than 40 percent loss when subjected to the Los Angeles abrasion test in accordance with ASTM C 131.

2.2.3 Fine Aggregate

Fine aggregate shall have a service record of at least 5 years satisfactory service in three paving projects or, if a new source is used, shall meet the requirements for resistance to freezing and thawing.

2.2.3.1 Composition

Fine aggregate shall consist of the minus 9.5 mm (3/8-inch) material from reclaimed Portland cement concrete or a combination of crushed reclaimed concrete blended with sand. If insufficient fine aggregate is available from the recycling process, the additional material may be natural sand, manufactured sand or a combination thereof meeting all requirements specified. Irrespective of the source from which it is obtained, all fine aggregate shall be composed of clean, hard durable particles. Each type of fine aggregate shall be stockpiled and batched separately. Any degree of contamination will be cause for the rejection of the entire Stockpile.

2.2.3.2 Particle Shape

Particles of the fine aggregate shall be generally spherical or cubical in shape.

2.2.3.3 Grading

Grading of the fine aggregate, as delivered to the mixer, shall conform to

the requirements of ASTM C 33. In addition, the fine aggregate, as delivered to the mixer, shall have a fineness modulus of not less than 2.50 nor more than 3.00. The grading of the fine aggregate also shall be controlled so that the fineness moduli of at least nine of every set of ten consecutive samples of the fine aggregate, as delivered to the mixer, will not vary more than 0.15 from the average fineness moduli of all samples previously taken. The fineness modulus shall be determined by COE CRD-C 104.

2.2.3.4 Deleterious Material

The amount of deleterious material in the fine aggregate shall not exceed the following limits by mass:

<u>Material</u>	<u>Percentage by Mass</u>
Clay lumps and friable particles ASTM C 142	1.0
Material finer than 0.075 mm (No. 200 sieve) ASTM C 117	3.0
Lightweight particles ASTM C 123 using a medium with a density of 2.0 Mg/cubic meter (Sp. Gr. of 2.0))	0.5
Total of all above	3.0

2.2.3.5 Resistance to Freezing and Thawing

Fine aggregate not having a satisfactory demonstrable service record shall have a durability factor of 50 or more when subjected to freezing and thawing in concrete in accordance with COE CRD-C 114.

2.3 CHEMICAL ADMIXTURES

2.3.1 Air-Entraining Admixtures

The air-entraining admixture shall conform to ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entraining admixture shall be in a solution of suitable concentration for field use.

2.3.2 Accelerator

An accelerator shall be used only when specified in paragraph SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES and shall not be used to reduce the amount of cementitious material used. Accelerator shall conform to ASTM C 494/C 494M, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

2.3.3 Retarder

A retarding admixture shall meet the requirements of ASTM C 494/C 494M, Type B, except that the 6-month and 1-year compressive strength tests are waived. The use of the admixture is at the option of the Contractor, but shall not be used to reduce the amount of cementitious material.

2.3.4 Water-Reducer

A water-reducing admixture shall meet the requirements of ASTM C 494/C 494M, Type A or D except that the 6-month and 1-year compressive strength tests are waived. The admixture may be added to the concrete mixture only when its use is approved or directed, and only when it has been used in mixture proportioning studies to arrive at approved mixture proportions.

2.4 CURING MATERIALS

2.4.1 Membrane Forming Curing Compound

Membrane forming curing compound shall be a white pigmented compound conforming to COE CRD-C 300.

2.4.2 Burlap

Burlap used for curing shall conform to AASHTO M 182, Class 3 or 4. Materials shall be new or shall be clean materials never used for anything other than curing concrete.

2.4.3 Impervious Sheet Materials

Polyethylene sheet shall not be used.

2.5 WATER

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

2.6 JOINT MATERIALS

2.6.1 Expansion Joint Material

Expansion joint filler shall be a preformed material conforming to ASTM D 1752 Type II. Expansion joint filler shall be 3/4 inch thick.

2.7 REINFORCING

All reinforcement shall be free from loose, flaky rust, loose scale, oil, grease, mud, or other coatings that might reduce the bond with concrete. Removal of thin powdery rust and tight rust is not required. However, reinforcing steel which is rusted to the extent that it does not conform to the required dimensions or mechanical properties shall not be used.

2.7.1 Reinforcing Bars and Bar Mats

Reinforcing bars shall conform to ASTM A 615/A 615M, billet-steel, Grade 60. Bar mats shall conform to ASTM A 184/A 184M. The bar members shall be billet steel.

2.7.2 Welded Wire Fabric

Welded steel wire fabric shall conform to ASTM A 185.

2.7.3 Deformed Wire Fabric

Welded deformed steel wire fabric shall conform to ASTM A 497.

2.8 DOWELS AND TIE BARS

2.8.1 Dowels

Dowels shall be single piece bars fabricated or cut to length at the shop or mill before delivery to the site. Dowels shall be free of loose, flaky rust and loose scale and shall be clean and straight. Dowels may be sheared to length provided that the deformation from true shape caused by shearing does not exceed 0.04 inch on the diameter of the dowel and does not extend more than 0.04 inch from the end of the dowel. Dowels shall be plain (non-deformed) steel bars conforming to ASTM A 615/A 615M, Grade 40 or 60; ASTM A 616/A 616M, Grade 50 or 60; or ASTM A 617/A 617M, Grade 40 or 60; or shall be steel pipe conforming to ASTM A 53/A 53M, extra strong, as indicated. If split dowels are proposed for use, a complete description of the materials and installation procedures shall be submitted for approval at least 15 days before start of construction. Paint for dowels shall conform to MIL-DTL-24441/20.

2.8.2 Tie Bars

Tie bars shall be deformed steel bars conforming to ASTM A 615/A 615M, ASTM A 616/A 616M, or ASTM A 617/A 617M, Grade 60, and of the sizes and dimensions indicated. Deformed rail steel bars and high-strength billet or axle steel bars, Grade 60 or higher, shall not be used for bars that are bent and straightened during construction.

2.9 EPOXY RESIN

All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C 881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

- a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.
- b. Material for use as patching materials for complete filling of spalls, wide cracks, and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.
- c. Material for use for injecting cracks shall be Type IV, Grade 1.
- d. Material for bonding freshly mixed portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

2.10 SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES

2.10.1 Specified Flexural Strength

Specified flexural strength, R, for concrete is 650 psi at 90 days, as determined by tests made in accordance with ASTM C 78 of beams fabricated and cured in accordance with ASTM C 192/C 192M or as determined by equivalent flexural strength for acceptance as specified in paragraph, Flexural Strength. Maximum allowable water-cementitious material ratio is 0.45. The water-cementitious material ratio will be the equivalent water-cement ratio as determined by conversion from the weight ratio of water to cement plus pozzolan, silica fume, and ground granulated blast furnace slag by the mass equivalency method described in ACI 211.1. The concrete shall be air-entrained with a total air content of 5 plus or minus 1.5 percentage points, at the point of placement. Air content shall be determined in accordance with ASTM C 231. The maximum allowable slump of the concrete at the point of placement shall be 2 inches for pavement constructed with fixed forms. For slipformed pavement, at the start of the project, the Contractor shall select a maximum allowable slump which will produce in-place pavement meeting the specified tolerances for control of edge slump.

2.10.2 Concrete Temperature

The temperature of the concrete as delivered shall conform to the requirements of paragraphs, Paving in Hot Weather and Paving in Cold Weather. Temperature of concrete shall be determined in accordance with ASTM C 1064/C 1064M.

2.10.3 Concrete Strength for Final Acceptance

The strength of the concrete will be considered acceptable when the average equivalent 90-day Flexural strengths for each lot are above the 'Specified Flexural Strength' as determined by correlation with 14-day compressive strength tests specified in paragraph MIXTURE PROPORTIONS BY CONTRACTOR for 90-day flexural Strength, and no individual set (2 cylinders per subplot) in the lot are 25 psi or more below the equivalent 'Specified Flexural Strength'. If any lot or subplot, respectively, fails to meet the above criteria, the lot or subplot shall be removed and replaced at no additional cost to the Government. This is in addition to and does not replace the average strength required for day-to-day CQC operations as specified in paragraph Average Flexural Strength Required for Mixtures.

2.11 MIXTURE PROPORTIONS BY CONTRACTOR

2.11.1 Composition

Concrete shall be composed of cementitious material, water, fine and coarse aggregates, and admixtures. The cementitious material shall be portland cement, or only portland cement in combination with pozzolan, ground granulated blast-furnace slag. Fly ash, if used with non alkali-reactive aggregates, shall consist of not less than 15 percent of the cementitious material by mass and not more than 25 percent. GGBF slag, if used with non alkali-reactive aggregates, shall consist of not less than 20 percent of

the cementitious material by mass and not more than 50 percent. If Class F fly ash or GGBF slag is required to mitigate potential alkali-aggregate reactivity, the percentage by mass determined from the modified ASTM C 1260 testing shall be used in the mixture proportioning studies. The total cementitious material content shall be at least 517 lb./cu. yd.. Admixtures shall consist of air entraining admixture and may also include, as approved retarder or water-reducing admixture. If water-reducer is used, it shall be used only at the dosage determined during mixture proportioning studies. High range water-reducing admixtures and admixtures to produce flowable concrete shall not be used.

2.11.2 Concrete Proportioning Studies, Pavement Concrete

Trial design batches, mixture proportioning studies, and testing requirements shall be the responsibility of the Contractor. Mixture proportioning studies shall be performed by a commercial laboratory, inspected by the Government, and approved in writing. The laboratory performing the mixture proportioning shall conform with ASTM C 1077. Strength requirements during mixture proportioning studies shall be based on flexural strength as determined by test specimens fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 78. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use on the project and shall be accompanied by the manufacturer's or producer's test reports indicating compliance with these specifications. Trial mixtures having proportions, slumps, and air content suitable for the work shall be based on methodology described in ACI 211.1, modified as necessary to accommodate flexural strength.

2.11.2.1 Water-Cement Ratio

At least three different water-cement ratios, which will produce a range of strength encompassing that required on the project, shall be used. The maximum allowable water-cement ratio required in paragraph Maximum Water-Cement Ratio will be the equivalent water-cement ratio as determined by conversion from the mass ratio of water to cement plus pozzolan, silica fume, and ground granulated blast furnace (GGBF) slag by the weight equivalency method as described in ACI 211.1. In the case where silica fume or GGBF slag is used, the mass of the silica fume and GGBF slag shall be included in the equations in ACI 211.1 for the term P, which is used to denote the mass of pozzolan. Laboratory trial mixtures shall be proportioned for maximum permitted slump and air content.

2.11.2.2 Trial Mixture Studies

Separate sets of trial mixture studies shall be made for each combination of cementitious materials and each combination of admixtures proposed for use. No combination of either shall be used until proven by such studies, except that, if approved in writing and otherwise permitted by these specifications, an accelerator or a retarder may be used without separate trial mixture study. Separate trial mixture studies shall also be made for concrete for any placing method proposed which requires special properties.

The temperature of concrete in each trial batch shall be reported. Each mixture shall be designed to promote easy and suitable concrete placement,

consolidation and finishing, and to prevent segregation and excessive bleeding. Concrete proportioning studies shall be performed using the following procedures:

2.11.2.3 Mixture Proportioning for 90-day Flexural Strength

The following step by step procedure shall be followed:

- a. Fabricate all beams and cylinders for each mixture from the same batch or blend of batches. Fabricate and cure all beams and cylinders in accordance with ASTM C 192/C 192M, using 6 x 6 inch beams and 6 x 12 inch cylinders.
- b. Test beams in accordance with ASTM C 78, cylinders in accordance with ASTM C 39/C 39M.
- c. Fabricate and cure test beams from each mixture for 7, 14, 28 and 90-day flexural tests; 6 beams to be tested per age.
- d. Fabricate and cure test cylinders from each mixture for 7, 14, 28 and 90-day compressive strength tests; 6 cylinders to be tested per age.
- e. Using the average strength for each w/c at each age, plot all results from each of the three mixtures on separate graphs for w/c versus:

7-day flexural strength

14-day flexural strength

28-day flexural strength

90-day flexural strength

7-day compressive strength

14-day compressive strength

28-day compressive strength

90-day compressive strength

- f. From these graphs select a w/c that will produce a mixture giving a 90-day flexural strength equal to the required strength determined in accordance with paragraph "Average Flexural Strength Required for Mixtures".
- g. Using the above selected w/c, select from the graphs the expected 7, 14, 28 and 90-day flexural strengths and the expected 7, 14, 28 and 90-day compressive strengths for the mixture.
- h. From the above expected strengths for the selected mixture determine the following Correlation Ratios:
 - (1) Ratio of the 14-day compressive strength of the selected mixture to the 90-day flexural strength of the mixture (for acceptance).
 - (2) Ratio of the 7-day compressive strength of the selected

mixture to the 90-day flexural strength of the mixture (for CQC control).

- i. If there is a change in materials, additional mixture design studies shall be made using the new materials and new Correlation Ratios shall be determined.
- j. No concrete pavement shall be placed until the Contracting Officer has approved the Contractor's mixture proportions.

2.11.3 Contractor Quality Control for Average Flexural Strength

The Contractor's day to day production shall be Controlled (CQC) in accordance with the criteria herein, in the following subparagraphs, and in par. 'Concrete Strength Testing for CQC'. This is entirely different from the acceptance requirements of par. 'Concrete Strength for Final Acceptance', and it is mandatory that both sets of requirements must be met. If at any time, the 'equivalent average 90-day flexural strength', for any lot, as determined by correlation with results of 7-day compressive test specimens, is 69 psi or more below the 'required equivalent average 90-day flexural strength', as specified below, the paving operation shall be stopped and the Contractor shall take necessary steps to improve the mixture proportioning, materials, or the batching and mixing to increase the strength. The paving operations shall not recommence until the Contracting Officer has approved the Contractor's Proposed changes in writing.

2.11.3.1 Average CQC Flexural Strength Required for Mixtures

In order to ensure meeting, the strength requirements specified in paragraph SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES, during production, the mixture proportions selected during mixture proportioning studies and used during construction shall produce a required average CQC flexural strength exceeding the specified strength, R, by the amount indicated below. This required average CQC flexural strength, Ra, will be used only for CQC operations as specified in paragraph TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL and as specified in the previous paragraph. During production, the required Ra shall be adjusted (increased or decreased), as appropriate and as approved, based on the standard deviation of equivalent 90-day strengths being attained during paving.

- a. From Previous Test Records: Where a concrete production facility has previous test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214.3R. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected, shall represent concrete produced to meet a specified flexural strength or strengths within 150 psi of the 90-day flexural strength specified for the proposed work, and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two specimens made from the same sample of concrete and tested at 90 days. Required average CQC flexural strength, Ra, used as the basis for selection of concrete proportions shall be the value

from the equation that follows, using the standard deviation as determined above:

$$R_a = R + 1.34S$$

Where: S = standard deviation
R = specified flexural strength
R_a = required average flexural strength

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and a modification factor from the following table:

NUMBER OF TESTS	MODIFICATION FACTOR FOR STANDARD DEVIATION
15	1.16
20	1.08
25	1.03
30 or more	1.00

- b. Without Previous Test Records: When a concrete production facility does not have sufficient field strength test records for calculation of the standard deviation, the required average strength, R_a, shall be determined by adding 15 percent to the specified flexural strength, R.

PART 3 EXECUTION

3.1 PREPARATION FOR PAVING

Before commencing paving, the following shall be performed. Surfaces to receive concrete shall be prepared as specified below. If used, forms shall be in place, cleaned, coated, and adequately supported. Any reinforcing steel needed shall be at the paving site. All transporting and transfer equipment shall be ready for use, clean, and free of hardened concrete and foreign material. Equipment for spreading, consolidating, screeding, finishing, and texturing concrete shall be at the paving site, clean and in proper working order. All equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the paving site, in proper working condition, and in sufficient amount for the entire placement. When hot, windy conditions during paving appear probable, equipment and material shall be at the paving site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

3.2 CONDITIONING OF UNDERLYING MATERIAL

3.2.1 General Procedures

Underlying material, base course, upon which concrete is to be placed shall

be clean, damp, and free from debris, waste concrete or cement, frost, ice, and standing or running water. Prior to setting forms or placement of concrete, the underlying material shall be well drained and shall have been satisfactorily graded and uniformly compacted in accordance with the applicable Section of these specifications. The surface of the subgrade or base course shall be tested as to crown, elevation, and density in advance of setting forms or of concrete placement using slip-form techniques. High areas shall be trimmed to proper elevation. Low areas shall be filled and compacted to a condition similar to that of surrounding grade, or filled with concrete monolithically with the pavement. Where low areas are filled with concrete, the areas shall be marked, as approved, and cores for thickness determinations as required by paragraph, Flexural Strength and Thickness shall not be drilled in those areas. Any underlying material disturbed by construction operations shall be reworked and recompact to specified density immediately in front of the paver. If a slipform paver is permitted and is used, the same underlying material under the paving lane shall be continued beyond the edge of the lane a sufficient distance and shall be thoroughly compacted and true to grade to provide a suitable trackline for the slipform paver and firm support for the edge of the paving lane. Where an open-graded granular base is required under the concrete, the Contractor shall select paving equipment and procedures which will operate properly on the base course without causing displacement or other damage.

3.2.2 Traffic on Underlying Material

After the underlying material has been prepared for concrete placement, no equipment shall be permitted thereon. Subject to specific approval, crossing of the prepared subgrade or base course at specified intervals for construction purposes may be permitted, provided rutting or indentations do not occur; however, if traffic has been allowed to use the prepared subgrade or base course, the surface shall be reworked and reprepared to the satisfaction of the Contracting Officer before concrete is placed.

3.3 WEATHER LIMITATIONS

3.3.1 Placement and Protection During Inclement Weather

The Contractor shall not commence placing operations when heavy rain or other damaging weather conditions appear imminent. At all times when placing concrete, the Contractor shall maintain on-site sufficient waterproof cover and means to rapidly place it over all unhardened concrete or concrete that might be damaged by rain. Placement of concrete shall be suspended whenever rain or other damaging weather commences to damage the surface or texture of the placed unhardened concrete, washes cement out of the concrete, or changes the water content of the surface concrete. All unhardened concrete shall be immediately covered and protected from the rain or other damaging weather. Any pavement damaged by rain or other weather shall be completely removed and replaced at the Contractor's expense as specified in paragraph, Repair, Removal, Replacement of Slabs.

3.3.2 Paving in Hot Weather

When the ambient temperature during paving is expected to exceed 90 degrees

F, the concrete shall be properly placed and finished in accordance with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064/C 1064M. Cooling of the mixing water or aggregates or placing in the cooler part of the day may be required to obtain an adequate placing temperature. An approved retarder may be used to facilitate placing and finishing. Steel forms and reinforcing shall be cooled as approved prior to concrete placement when steel temperatures are greater than 120 degrees F. Transporting and placing equipment shall be cooled or protected if necessary to maintain proper concrete-placing temperature. Concrete shall be placed continuously and rapidly at a rate of not less than 100 feet of paving lane per hour. The finished surfaces of the newly laid pavement shall be kept damp by applying a fog spray (mist) with approved spraying equipment until the pavement is covered by the curing medium. If necessary, wind screens shall be provided to protect the concrete from an evaporation rate in excess of 0.2 lb./square foot per hour, as determined by method shown in Figure 2.1.5 of ACI 305R.

Maximum Allowable Concrete Placing Temperature

Relative Humidity, Percent, During Time of Concrete Placement	Maximum Allowable Concrete Temperature in Degrees F
Greater than 60	90
40-60	85
Less than 40	80

3.3.3 Prevention of Plastic Shrinkage Cracking

During hot weather with low humidity, and particularly with appreciable wind, the Contractor shall develop and institute measures to prevent plastic shrinkage cracks from developing. Particular care shall be taken if plastic shrinkage cracking is potentially imminent and especially if it has developed during a previous placement. Periods of high potential for plastic shrinkage cracking can be anticipated by use of Fig. 2.1.5 of ACI 305R. In addition to the protective measures specified in the previous paragraph, the concrete placement shall be further protected by erecting shades and windbreaks and by applying fog sprays of water, sprinkling, ponding, or wet covering. When such water treatment is stopped, curing procedures shall be immediately commenced. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin as directed, after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry.

3.3.4 Paving in Cold Weather

Special protection measures, as submitted and approved, and as specified herein, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air at the placing site and the temperature of surfaces to receive concrete shall be not less 40 degrees F. However, placement may begin when both the

ambient temperature and the temperature of the underlying material are at least 35 degrees F and rising. When the ambient temperature is less than 50 degrees F, the temperature of the concrete when placed shall be not less than 50 degrees F nor more than 75 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Upon written approval, chemical admixture conforming to ASTM C 494/C 494M Type C or E may be used provided it contains no calcium chloride. Calcium chloride shall not be used at any time. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period. Pavement damaged by freezing shall be completely removed and replaced at the Contractor's expense as specified in paragraph REPAIR, REMOVAL, REPLACEMENT OF SLABS.

3.4 CONCRETE PRODUCTION

Batching, mixing, and transporting equipment shall have a capacity sufficient to maintain a continuous, uniform forward movement of the paver of not less than 2.5 feet per minute. Concrete shall be deposited in front of the paver within 45 minutes from the time cement has been charged into the mixing drum, except that if the ambient temperature is above 90 degrees F, the time shall be reduced to 30 minutes. No water shall be added to the concrete after it is batched. Every load of concrete delivered to the paving site shall be accompanied by a batch ticket from the operator of the batching plant. Tickets shall be on approved forms and shall show at least the mass, or volume, of all ingredients in each batch delivered, and the time of day. Tickets shall be delivered to the placing foreman who shall keep them on file and deliver them to the Government weekly.

3.4.1 Batching and Mixing Concrete

The batching and mixing equipment and the operation thereof shall conform to the requirements of paragraph EQUIPMENT and as specified herein. All equipment shall be kept clean and in operable condition at all times. Scale pivots and bearings shall be kept clean and free of rust. Any equipment which fails to perform as specified shall immediately be removed from use until properly repaired and adjusted, or replaced.

3.4.2 Transporting and Transfer - Spreading Operations

The transporting and transfer equipment and the operation thereof shall conform to the requirements of paragraph EQUIPMENT and as specified herein. All equipment shall be kept clean and in operable condition at all times. Non-agitating equipment shall be used only on smooth roads and for haul time less than 15 minutes at all times during the work day. No transporting equipment shall be allowed to operate on the prepared and compacted underlying material in front of the paver-finisher. Equipment shall be allowed to operate on the underlying material only if approved in writing and only if no damage is done to the underlying material and its degree of compaction. Any disturbance to the underlying material that does occur shall be corrected, as approved, before the paver-finisher or the

deposited concrete reaches the location of the disturbance and the equipment shall be replaced or procedures changed to prevent any future damage. An approved transfer spreader shall be used to transfer the concrete from hauling equipment outside the paving lane and to spread it evenly and strike it off to approximate grade in front of the paver-finisher. A travelling surge hopper shall be used to accept the concrete from the transporting equipment, store it as necessary, and feed it evenly across the paving lane at a depth which permits the paver to operate efficiently and at a rate that permits the paver to have a continuous forward movement. Concrete shall be deposited as close as possible to its final position in the paving lane. All equipment shall be operated to discharge and transfer concrete without segregation. In no case shall dumping of concrete in discrete piles be permitted. No transfer or spreading operation which requires the use of front-end loaders, dozers, or similar equipment to distribute the concrete will be permitted. All batching and mixing, transporting, transferring, paving, and finishing shall be properly coordinated and controlled such that the paver-finisher has a continuous forward movement at a reasonably uniform speed from beginning to end of each paving lane, except for inadvertent equipment breakdown. Failure to achieve this shall require the Contractor to halt operations, regroup, and modify operations to achieve this requirement.

3.5 PAVING

3.5.1 General Requirements

The paving and finishing equipment and the operation thereof shall conform to the requirements of paragraph EQUIPMENT and as specified herein. All equipment shall be kept clean and properly operable at all times. Pavement shall be constructed with paving and finishing equipment utilizing rigid fixed forms or by use of slipform paving equipment. Paving and finishing equipment and procedures shall be capable of constructing paving lanes of the required width at a rate of at least 100 feet of paving lane per hour on a routine basis. Paving equipment and its operation shall be controlled, and coordinated with all other operations, such that the paver-finisher has a continuous forward movement, at a reasonably uniform speed, from beginning to end of each paving lane, except for inadvertent equipment breakdown. Workmen with foreign material on their footwear or construction equipment that might deposit foreign material shall not be permitted to walk or operate in the plastic concrete.

3.5.2 Consolidation

Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. Gang-mounted vibrator spuds shall be spaced so as to thoroughly consolidate the entire paving lane, but not more than 30 inch spacing, and with the outside vibrators not more than 12 inches from the edge of the lane. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than 2 inches. The vibrators or any tamping units in front of the paver shall be automatically controlled so that they shall be stopped immediately as forward motion ceases. Excessive vibration shall

not be permitted. If the vibrators cause visible tracking in the paving lane, the paving operation shall be stopped and equipment and operations modified to prevent it. Concrete in small, odd-shaped slabs or in isolated locations inaccessible to the gang-mounted vibration equipment shall be vibrated with an approved hand-operated immersion vibrator. Vibrators shall not be used to transport or spread the concrete. Hand-operated vibrators shall not be operated in the concrete at one location for more than 20 seconds. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) shall require the immediate stopping of the paving operation and approved adjustment of the equipment or procedures.

3.5.3 Operation

When the paver approaches a header at the end of a paving lane, a sufficient amount of concrete shall be maintained ahead of the paver to provide a roll of concrete which will spill over the header. The amount of extra concrete shall be sufficient to prevent any slurry that is formed and carried along ahead of the paver from being deposited adjacent to the header. The spud vibrators in front of the paver shall be brought as close to the header as possible before they are lifted. Additional consolidation shall be provided adjacent to the headers by hand-manipulated vibrators. When the paver is operated between or adjacent to previously constructed pavement (fill-in lanes), provisions shall be made to prevent damage to the previously constructed pavement. Transversely oscillating screeds and extrusion plates shall overlap the existing pavement the minimum possible, but in no case more than 8 inches. These screeds or extrusion plates shall be electronically controlled from the previously placed pavement so as to prevent them from applying pressure to the existing pavement and to prevent abrasion of the pavement surface. The overlapping area of existing pavement surface shall at all times be kept completely free of any loose or bonded foreign material as the paver-finisher operates across it. When the paver travels on existing pavement, approved provisions shall be made to prevent damage to the existing pavement. Pavers using transversely oscillating screeds shall not be used to form fill-in lanes that have widths less than a full width for which the paver was designed or adjusted.

3.5.4 Required Results

The paver-finisher, and its gang-mounted vibrators, together with its operating procedures shall be adjusted and operated and coordinated with the concrete mixture being used to produce a thoroughly consolidated slab throughout, true to line and grade within specified tolerances. The screed or the extrusion plate shall be properly adjusted to produce a pavement surface true to line and grade. Any necessary adjustment to compensate for surging behind the screed or for inadequate height of surface after paving shall be carefully made and checked frequently. The paver-finishing operation shall produce a surface finish free of irregularities, tears, voids of any kind, and any other discontinuities. It shall produce only a very minimum of paste at the surface; never more than 3/32 inch cover over the top layer of coarse aggregate. The paver-finisher shall make only one pass across the pavement; multiple passes will not be permitted. The

equipment and its operation shall produce a finished surface requiring no hand finishing other than the use of cutting straightedges, except in very infrequent instances. If any equipment or operation fails to produce the above results, the paving shall be stopped, the equipment shall be replaced or properly adjusted, the operation shall be appropriately modified, or the mixture proportions modified, in order to produce the required results before recommencing paving. No water, other than true fog sprays (mist) as specified in paragraph, Prevention of Plastic Shrinkage Cracking, shall be applied to the concrete or the concrete surface during paving and finishing.

3.5.5 Fixed Form Paving

Paving equipment for fixed-form paving and the operation thereof shall conform to the requirements of paragraph EQUIPMENT, all requirements specified above under paragraph PAVING and as specified herein.

3.5.5.1 Forms for Fixed-Form Paving

- a. Forms shall be steel, except that wood forms may be used for curves having a radius of 150 feet or less, and for fillets. Forms shall be equal in depth to the edge thickness of the slab as shown on the drawings. Forms shall be in one piece for the full depth required, except as permitted below. Under no conditions shall forms be adjusted by filling or excavating under the forms to an elevation other than the bottom of the pavement slab. Where the project requires several different slab thicknesses, forms may be built up with metal or wood to provide an increase in depth of not more than 25 percent. The required form depth may be obtained by securely bolting or welding to the bottom of the form a tubular metal section of the proper thickness or by securely bolting wood planks to the bottom of the form. The tubular metal section or wood planks shall completely cover the underside of the base of the form and shall extend beyond the edge of the base a sufficient distance to provide the necessary stability. The base width of the one-piece form, or built-up form, shall be not less than eight-tenths of the vertical height of the form, except that forms 8 inches or less in vertical height shall have a base width not less than the vertical height of the form. Forms shall not be built-up by adding to the top. The top surface of each form section shall not vary more than 1/16 inch in 12 feet from a true line. The face of the form shall not vary more than 3/16 inch in 12 feet from a true plane. Forms with battered top surfaces or distorted faces or bases shall be removed from the project. Where keyway forms are required, they shall be rigidly attached to the main form so no displacement can take place. Metal keyway forms shall be tack-welded to steel forms. Keyway forms shall be so aligned that there is no variation over 1/4 inch either vertically or horizontally, when tested with a 12 foot template after forms are set, including tests across form joints.
- b. Steel forms shall be furnished in sections not less than 10 feet in length, except that on curves having a radius of 150 feet or less, the length of the sections shall be 5 feet unless the sections are flexible or curved to the proper radius. Each 10 foot

length of form shall be provided with at least three form braces and pin sockets so spaced that the form will be rigidly braced throughout its length. Lock joints between form sections shall be free from play or movement. Forms shall be free of warps, bends, or kinks.

- c. Wood forms for curves and fillets shall be made of well-seasoned, surfaced plank or plywood, straight, and free from warp or bend. Wood forms shall be adequate in strength and rigidly braced.
- d. The forms shall be set on firm material cut true to grade so that each form section when placed will be firmly in contact with the underlying layer for its entire length and base width. Underlying material shall be thoroughly compacted and trimmed to grade before forms are set in place. Setting forms on blocks or on built-up spots of underlying material will be not permitted under any condition. The form sections shall be staked into position and tightly locked together. The length of pins and quantity provided in each section shall be sufficient to hold the form at the correct line and grade. When tested with a straightedge, the top of the installed form shall conform to the requirements specified for the finished surface of the concrete, and the longitudinal axis of the upstanding leg shall not vary more than 1/4 inch from the straightedge. Conformity to the alignment and grade elevations shown on the drawings shall be checked and necessary corrections shall be made immediately prior to placing the concrete. Forms shall be set well in advance of concrete placement. The forms shall be cleaned and oiled each time before concrete is placed. No concrete shall be placed until setting of forms has been checked and approved by the CQC team.
- e. Forms for overlay pavements and for other locations where forms must be set on existing pavements shall be held securely in place with stakes or by other approved methods. Holes in existing pavements for form stakes shall be carefully drilled by methods which will not crack or spall the existing pavement. After use, the holes shall be filled as directed. Any method which does not hold the form securely or which damages the existing pavement shall be immediately discontinued. Prior to setting forms for paving operations, the Contractor shall demonstrate his proposed form setting procedures at an approved location and shall not proceed further until the proposed method is approved.

3.5.5.2 Form Removal

Forms shall remain in place at least 12 hours after the concrete has been placed. When conditions are such that the early strength gain of the concrete is delayed, the forms shall be left in place for a longer time, as directed. Forms shall be removed by procedures that do not injure the concrete. Bars or heavy metal tools shall not be used directly against the concrete in removing the forms. Any concrete found to be defective after form removal shall be repaired promptly, using procedures specified hereinafter or as directed.

3.5.6 Slipform Paving

3.5.6.1 General

Paving equipment for slipform paving and the operation thereof shall conform to the requirement of paragraph EQUIPMENT, all requirements specified above in subparagraphs, General, Consolidation, Operation, and Required Results, and as specified herein. The slipform paver shall shape the concrete to the specified and indicated cross section, meeting all tolerances, in one pass. The slipform paver shall finish the surface and edges so that only a very minimum isolated amount of hand finishing is required. If the paving operation does not meet the above requirements and the specified tolerances, the operation shall be immediately stopped, and the Contractor shall regroup and replace or modify any equipment as necessary, modify paving procedures or modify the concrete mix, in order to resolve the problem. The slipform paver shall be automatically electronically controlled from a taut wire guideline for horizontal alignment and on both sides from a taut wire guideline for vertical alignment, except that electronic control from a ski operating on a previously constructed adjoining lane shall be used where applicable for either or both sides. Automatic, electronic controls for vertical alignment shall always be used on both sides of the lane. Control from a slope-adjustment control or control operating from the underlying material shall never be used. If approved by the Contracting Officer after a preconstruction demonstration, automatic laser controls may be used in lieu of or to supplement the taut wire guidelines. Side forms on slipform pavers shall be properly adjusted so that the finished edge of the paving lane meets all specified tolerances. Dowels in longitudinal construction joints shall be installed as specified below. The installation of these dowels by dowel inserters attached to the paver or by any other means of inserting the dowels into the plastic concrete shall not be permitted.

3.5.6.2 Guideline for Slipform Paving

Guidelines shall be accurately and securely installed well in advance of concrete placement. Supports shall be provided at necessary intervals to eliminate all sag in the guideline when properly tightened. The guideline shall be high strength wire set with sufficient tension to remove all sag between supports. Supports shall be securely staked to the underlying material or other provisions made to ensure that the supports will not be displaced when the guideline is tightened or when the guideline or supports are accidentally touched by workmen or equipment during construction. The appliances for attaching the guideline to the supports shall be capable of easy adjustment in both the horizontal and vertical directions. When it is necessary to leave gaps in the guideline to permit equipment to use or cross underlying material, provisions shall be made for quickly and accurately replacing the guideline without any delay to the forward progress of the paver. Supports on either side of the gap shall be secured in such a manner as to avoid disturbing the remainder of the guideline when the portion across the gap is positioned and tightened. The guideline across the gap and adjacent to the gap for a distance of 200 feet shall be checked for horizontal and vertical alignment after the guideline across the gap is tightened. Vertical and horizontal positioning of the guideline shall be such that the finished pavement shall conform to the alignment and

grade elevations shown on the drawings within the specified tolerances for grade and smoothness. The specified tolerances are intended to cover only the normal deviations in the finished pavement that may occur under good supervision and do not apply to setting of the guideline. The guideline shall be set true to line and grade.

3.5.6.3 Laser Controls

If the Contractor proposes to use any type of automatic laser controls, a detailed description of the system shall be submitted and a trial field demonstration shall be performed in the presence of the Contracting Officer at least one week prior to start of paving. Approval of the control system will be based on the results of the demonstration and on continuing satisfactory operation during paving.

3.5.7 Placing Reinforcing Steel

The type and amount of steel reinforcement shall be as shown on the drawings. For pavement thickness of 12 inches or more, the reinforcement steel shall be installed by the strike-off method wherein a layer of concrete is deposited on the underlying material, consolidated, and struck to the indicated elevation of the steel reinforcement. The reinforcement shall be laid upon the prestruck surface, and the remaining concrete shall then be placed and finished in the required manner. When placement of the second lift causes the steel to be displaced horizontally from its original position, provisions shall be made for increasing the thickness of the first lift and depressing the reinforcement into the unhardened concrete to the required elevation. The increase in thickness shall be only as necessary to permit correct horizontal alignment to be maintained. Any portions of the bottom layer of concrete that have been placed more than 30 minutes without being covered with the top layer shall be removed and replaced with newly mixed concrete without additional cost to the Government. For pavements less than 12 inches thick, the reinforcement shall be positioned on suitable chairs securely fastened to the subgrade prior to concrete placement. Concrete shall be vibrated after the steel has been placed. Regardless of placement procedure, the reinforcing steel shall be free from coatings which could impair bond between the steel and concrete, and laps in the reinforcement shall be as indicated. In lieu of the above, automatic reinforcement depressing attachments may be used to position the reinforcement, either bar mats or welded wire fabric, provided the entire operation is approved by the Contracting Officer. Regardless of the equipment or procedures used for installing reinforcement, the Contractor shall ensure that the entire depth of concrete is adequately consolidated.

3.5.8 Placing Dowels and Tie Bars

The method used in installing and holding dowels in position shall ensure that the error in alignment of any dowel from its required alignment after the pavement has been completed will not be greater than 1/8 in. per ft. Except as otherwise specified below, location of dowels shall be within a horizontal tolerance of plus or minus 5/8 inch. The Contractor shall furnish an approved template for checking the alignment and position of the dowels. The portion of each dowel intended to move within the concrete or

expansion cap shall be painted with one coat of the specified paint. When dry, the painted portion shall be wiped clean and coated with a thin, even film of lubricating oil before the concrete is placed. Pipe used as dowels shall be filled with a stiff sand-asphalt mixture or portland-cement mortar. Dowels in joints shall be omitted when the center of the dowel is located within a horizontal distance from an intersecting joint equal to or less than one-fourth of the slab thickness. Dowels shall be installed as specified in the following subparagraphs.

3.5.8.1 Contraction Joints

Dowels in longitudinal and transverse contraction joints within the paving lane shall be held securely in place, as indicated, by means of rigid metal frames or basket assemblies of an approved type. The assemblies shall consist of a framework of metal bars or wires arranged to provide rigid support for the dowels throughout the paving operation, with a minimum of four continuous bars or wires extending along the joint line. The dowels shall be welded to the assembly or held firmly by mechanical locking arrangements that will prevent them from rising, sliding out, or becoming distorted during paving operations. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. At the Contractor's option, in lieu of the above, dowels in contraction joints shall be installed near the front of the paver by insertion into the plastic concrete using approved equipment and procedures. Approval will be based on the results of a preconstruction demonstration which the Contractor shall conduct, showing that the dowels are installed within specified tolerances.

3.5.8.2 Construction Joints-Fixed Form Paving

Installation of dowels shall be by the bonded-in-place method. Installation by removing and replacing in preformed holes will not be permitted. Dowels shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms. The spacing of dowels in construction joints shall be as indicated, except that, where the planned spacing cannot be maintained because of form length or interference with form braces, closer spacing with additional dowels shall be used.

3.5.8.3 Dowels Installed in Hardened Concrete

Dowels installed in hardened concrete, such as in longitudinal construction joints for slipform paving, in joints between new and existing pavement, and similar locations, shall be installed by bonding the dowels into holes drilled into the hardened concrete. The installation of dowels in longitudinal construction joints by dowel inserters attached to a slipform paver or by any other means of inserting the dowels into the plastic concrete shall not be permitted. However, when paving two lanes together with a longitudinal contraction joint between, any dowels required may be installed in this joint with an approved inserter. Holes approximately 1/8 inch greater in diameter than the dowels shall be drilled into the hardened concrete with rotary core drills to receive the dowels. In lieu of rotary drills, the contractor may use percussion drills, provided that spalling at

the collar of the hole does not occur. Regardless of the type of drill used, the drill shall be held rigidly in exact alignment by means of a stable jig or framework, solidly supported; gang drills meeting this are acceptable. Any damage to the concrete face during drilling shall be repaired as directed; continuing damage shall require modification of the equipment and operation. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel shall not be permitted. The dowels shall be held in alignment at the collar of the hole, after insertion and before the grout hardens, by means of a suitable metal or plastic collar fitted around the dowel. The vertical alignment of the dowels shall be checked by placing a straightedge on the surface of the pavement over the top of the dowel and measuring the vertical distance between the straightedge and the beginning and ending point of the exposed part of the dowel. The horizontal alignment shall be checked with a framing square. Dowels required to be installed in any joints between new and existing concrete shall be grouted in holes drilled in the existing concrete, all as specified above.

3.5.8.4 Expansion Joints

Dowels in expansion joints shall be installed as shown using appropriate procedures specified above.

3.6 FINISHING

The finishing machine, or paver-finisher, shall meet all requirements specified in paragraph EQUIPMENT and herein. Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver and the machines shall be designed and operated to strike off, screed, and consolidate the concrete. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straightedge finishing, texturing, and then edging of joints. Finishing shall be by the machine method. The hand method shall be used only infrequently and only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. When approved, the hand finishing method may also be used for separate, isolated slabs during removal and replacement type repair operations. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Equipment to be used for supplemental hand finishing shall primarily be 10 to 12 feet cutting straightedges; only very sparing use of bull floats shall be allowed. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Every effort shall be made to prevent bringing excess paste to the surface and any operations which produce more than 3/32 inch of paste (mortar, water, laitance, etc.) over the top layer of coarse aggregate shall be halted immediately and the equipment, mixture, or procedures modified as necessary. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete

(not just the cutting edges of the screeds) will be at the required line and grade. Surface checks shall be made regularly and paving operations immediately halted and adjustments made whenever compensation is inadequate. Screed and float adjustments of the machines shall be checked at the start of each day's paving operations and more often if required. Machines that cause frequent delays due to mechanical failure shall be replaced. When machines ride the edge of a previously constructed slab, the edge shall be kept clean and provision shall be made to protect the surface of the slab. Clary screeds, "bridge deck" finishers, or other rotating pipe or tube type equipment will not be permitted. Finishing equipment and tools shall be maintained clean and in an approved condition.

At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way, except for fog (mist) sprays specified to prevent plastic shrinkage cracking.

3.6.1 Longitudinal Floating

When the equipment contains a mechanical, longitudinal, oscillating float, the float shall be operated to smooth and finish the pavement immediately behind the transverse screed or extrusion plate. The float shall be operated maintaining contact with the surface at all times. Care shall be taken to prevent working paste to the surface in excess of the amount specified above.

3.6.2 Other Types of Finishing Equipment

Concrete finishing equipment of types other than those specified above may be used on a trial basis, when specifically approved, except that rotating pipe or tubes or bridge deck finishers will not be permitted. Approval will be given after demonstration on a test section prior to start of construction, and provided the Contracting Officer determines that the pavement produced is better than that produced by the specified equipment. The use of equipment that fails to produce finished concrete of the required quality, using concrete proportions and slump as specified, shall be discontinued, and the concrete shall be finished with specified equipment and in the manner specified above. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved. Slipform paving equipment shall not be operated on fixed forms unless approved in writing prior to use.

3.6.3 Machine Finishing With Fixed Forms

The machine shall be designed to ride the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

3.6.4 Machine Finishing With Slipform Pavers

The slipform paver shall be operated so that only a very minimum of

additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled nonrotating pipe float may be used if the Contractor desires while the concrete is still plastic, to remove minor irregularities and score marks. The pipe float shall be 6 to 10 inches in diameter and sufficiently long to span the full paving width when oriented at an angle of approximately 60 degrees with the center line. Only one pass of the pipe float shall be allowed. If there is sufficient concrete slurry or fluid paste on the surface that it runs over the edge of the pavement, the paving operation shall be immediately stopped and the equipment, mixture, or operation modified to prevent formation of such slurry. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens. Slabs having areas of edge slump in excess of the specified tolerances shall be removed and replaced in accordance with paragraph, REPAIR, REMOVAL, REPLACEMENT OF SLABS; repair operations on such areas will not be permitted.

3.6.5 Surface Correction and Testing

After all other finishing is completed but while the concrete is still plastic, minor irregularities and score marks in the pavement surface shall be eliminated by means of cutting straightedges. Such straightedges shall be 12 feet in length and shall be operated from the sides of the pavement and from bridges. A straightedge operated from the side of the pavement shall be equipped with a handle 3 feet longer than one-half the width of the pavement. The surface shall then be tested for trueness with a straightedge held in successive positions parallel and at right angles to the center line of the pavement, and the whole area covered as necessary to detect variations. The straightedge shall be advanced along the pavement in successive stages of not more than one-half the length of the straightedge. Depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. Projections above the required elevation shall also be struck off and refinished. The straightedge testing and finishing shall continue until the entire surface of the concrete is free from observable departure from the straightedge and conforms to the surface requirements specified in paragraph ACCEPTABILITY OF WORK AND PAYMENT ADJUSTMENTS. Long-handled, flat bull floats shall be used very sparingly and only as necessary to correct minor, scattered surface defects. If frequent use of bull floats is necessary, the paving operation shall be stopped and the equipment, mixture or procedures adjusted to eliminate the surface defects. Finishing with hand floats and trowels shall be held to the absolute minimum necessary. Extreme care shall be taken to prevent overfinishing joints and edges. The surface finish of the pavement shall be produced essentially by the finishing machine and not by subsequent hand finishing operations. All hand finishing operations shall be subject to approval and shall be modified when directed. No water shall be added to the pavement surface during these operations.

3.6.6 Hand Finishing

Hand finishing operations shall be used only as specified above.

3.6.6.1 Equipment

In addition to approved mechanical internal vibrators for consolidating the concrete, a strike-off and tamping template and a longitudinal float shall be provided for hand finishing. The template shall be at least 1 foot longer than the width of pavement being finished, of an approved design, and sufficiently rigid to retain its shape, and shall be constructed of metal or other suitable material shod with metal. The longitudinal float shall be at least 10 feet long, of approved design, and rigid and substantially braced, and shall maintain a plane surface on the bottom. Grate tampers (jitterbugs) shall not be used.

3.6.6.2 Finishing and Floating

As soon as placed and vibrated, the concrete shall be struck off and screeded to the crown and cross section and to such elevation above grade that when consolidated and finished, the surface of the pavement will be at the required elevation. In addition to previously specified complete coverage with handheld immersion vibrators, the entire surface shall be tamped with the strike-off and tamping template, and the tamping operation continued until the required compaction and reduction of internal and surface voids are accomplished (grate tampers shall not be used). Immediately following the final tamping of the surface, the pavement shall be floated longitudinally from bridges resting on the side forms and spanning but not touching the concrete. If necessary, additional concrete shall be placed and screeded, and the float operated until a satisfactory surface has been produced. The floating operation shall be advanced not more than half the length of the float and then continued over the new and previously floated surfaces. Long-handled, flat bull floats shall be used very sparingly and only as necessary to correct minor, scattered surface defects. If frequent use of bull floats is necessary, the operation shall be stopped and adjusted to eliminate the surface defects. Finishing with hand floats and trowels shall be held to the absolute minimum necessary. Extreme care shall be taken to prevent overfinishing joints and edges. No water shall be added to the pavement during finishing operations.

3.6.7 Texturing

Before the surface sheen has disappeared and before the concrete hardens, the surface of the pavement shall be given a texture as described herein. After curing is complete, all textured surfaces shall be thoroughly power broomed to remove all debris.

3.6.7.1 Fabric Drag Surface Finish

Surface texture shall be applied by dragging the surface of the pavement, in the direction of the concrete placement, with an approved fabric drag. The drag shall be operated with the fabric moist, and the fabric shall be cleaned or changed as required to keep clean. The dragging shall be done so as to produce a uniform finished surface having a fine sandy texture

without disfiguring marks.

3.6.8 Outlets in Pavement

Recesses for the tie-down anchors, lighting fixtures, and other outlets in the pavement shall be constructed to conform to the details and dimensions shown. The concrete in these areas shall be carefully finished to provide a surface of the same texture as the surrounding area that will be within the requirements for plan grade and surface smoothness.

3.7 CURING

3.7.1 Protection of Concrete

Concrete shall be continuously protected against loss of moisture and rapid temperature changes for at least 7 days from the completion of finishing operations. Unhardened concrete shall be protected from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready for use before actual concrete placement begins. Sufficient sheet material to protect unhardened concrete from rain shall be at the paver at all times. Protection shall be provided as necessary to prevent cracking of the pavement due to temperature changes during the curing period. If any selected method of curing does not afford the proper curing and protection against concrete cracking, the damaged pavement shall be removed and replaced, and another method of curing shall be employed as directed. Curing shall be accomplished by one of the following methods .

3.7.2 Membrane Curing

A uniform coating of white-pigmented, membrane-forming, curing compound shall be applied to the entire exposed surface of the concrete as soon as the free water has disappeared from the surface after finishing. If evaporation is high and no moisture is present on the surface even though bleeding has not stopped, fog sprays shall be used to keep the surface moist until setting of the cement occurs and bleeding is complete. Curing compound shall then be immediately applied. Along the formed edge faces, it shall be applied immediately after the forms are removed. Concrete shall not be allowed to dry before the application of the membrane. If any drying has occurred, the surface of the concrete shall be moistened with a fine spray of water, and the curing compound applied as soon as the free water disappears. The curing compound shall be applied to the finished surfaces by means of an approved automatic spraying machine. The spraying machine shall be self-propelled and shall span the newly paved lane. The machine shall have one or more spraying nozzles that can be controlled and operated to completely and uniformly cover the pavement surface with the required amount of curing compound. The curing compound in the drum used for the spraying operation shall be thoroughly and continuously agitated mechanically throughout the full depth of the drum during the application. Air agitation may be used only to supplement mechanical agitation. Spraying pressure shall be sufficient to produce a fine spray as necessary to cover the surface thoroughly and completely with a uniform film. Spray equipment shall be kept clean and properly maintained and the spray nozzle or nozzles shall have adequate wind shields. The curing compound shall be

applied with an overlapping coverage that will give a two-coat application at a coverage of 400 square feet per gallon, plus or minus 5.0 percent for each coat. A one-coat application may be applied provided a uniform application and coverage of 200 square feet per gallon, plus or minus 5.0 percent is obtained. The application of curing compound by hand-operated, mechanical powered pressure sprayers will be permitted only on odd widths or shapes of slabs where indicated and on concrete surfaces exposed by the removal of forms. When the application is made by hand-operated sprayers, the second coat shall be applied in a direction approximately at right angles to the direction of the first coat. The compound shall form a uniform, continuous, cohesive film that will not check, crack, or peel and that will be free from pinholes and other discontinuities. If pinholes, abrasions, or other discontinuities exist, an additional coat shall be applied to the affected areas within 30 minutes. Concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above. Areas where the curing compound is damaged by subsequent construction operations within the curing period shall be immediately resprayed. The surfaces adjacent to joint sawcuts shall be cleaned and resprayed with curing compound immediately after cutting. Approved standby facilities for curing concrete pavement shall be provided at an accessible location at the job site for use in the event of mechanical failure of the spraying equipment or other conditions that might prevent correct application of the membrane-curing compound at the proper time. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected during the entire curing period from pedestrian and vehicular traffic, except as required for joint-sawing operations and surface tests, and from any other possible damage to the continuity of the membrane.

3.7.3 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period, or until curing compound is applied, commencing immediately after finishing. If forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Burlap and mats shall be clean and free from any contamination and shall be completely saturated before being placed on the concrete. The Contractor shall have an approved work system to ensure that moist curing is continuous 24 hours per day and that the entire surface is wet.

3.8 JOINTS

3.8.1 General Requirements for Joints

Joints shall conform to the details indicated and shall be perpendicular to the finished grade of the pavement. All joints shall be straight and continuous from edge to edge or end to end of the pavement with no abrupt offset and no gradual deviation greater than 1/2 inch. Before commencing construction, the Contractor shall submit for approval a control plan and equipment to be used for ensuring that all joints are straight from edge to

edge of the pavement within the above tolerances. Where any joint fails to meet these tolerances, the slabs adjacent to the joint shall be removed and replaced at no additional cost to the Government. No change from the jointing pattern shown on the drawings shall be made without written approval of the Contracting Officer. Sealing of joints shall be in accordance with Section 02760A.

3.8.2 Longitudinal Construction Joints

Longitudinal construction joints between paving lanes shall be located as indicated. Dowels shall be installed in the longitudinal construction joints, or the edges shall be thickened as indicated. Dowels shall be installed in conformance with paragraph, Placing Dowels and Tie Bars. After the end of the curing period, longitudinal construction joints shall be sawed to provide a groove at the top for sealant conforming to the details and dimensions indicated.

3.8.3 Transverse Construction Joints

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for 30 minutes or longer. When concrete placement cannot be continued, the transverse construction joint shall be installed at a planned transverse joint, if possible. Transverse construction joints shall be constructed by utilizing headers and the very minimum amount of hand placement and finishing techniques. Pavement shall be constructed with the paver as close to the header as possible, and the paver shall be run out completely past the header. Transverse construction joints installed at a planned transverse joint shall be constructed as shown or, if not shown otherwise, shall be dowelled. Those not at a planned transverse joint shall be constructed with tie bars and shall not be sawed or sealed.

3.8.4 Expansion Joints

Expansion joints shall be formed where indicated, and about any structures and features that project through or into the pavement, using joint filler of the type, thickness, and width indicated, and shall be installed to form a complete, uniform separation between the structure and the pavement. The filler shall be attached to the original concrete placement with adhesive or other fasteners and shall extend the full slab depth. Adjacent sections of filler shall be fitted tightly together, and the filler shall extend across the full width of the paving lane or other complete distance in order to prevent entrance of concrete into the expansion space. Edges of the concrete at the joint face shall be finished with an edger with a radius of 1/8 inch. The joint filler strips shall be installed 3/4 inch below the pavement surface with a slightly tapered, dressed-and-oiled wood strip or other approved material temporarily secured to the top of the filler to form a recess to be filled with joint sealant. The wood strip shall be removed soon after the concrete has set and the reservoir temporarily filled with an approved material to protect the reservoir until the joint sealer is installed. Expansion joints shall be constructed with dowels and thickened edges as shown on the drawings for load transfer.

3.8.5 Contraction Joints

Transverse and longitudinal contraction joints shall be of the weakened-plane or dummy type and shall be constructed as indicated. Longitudinal contraction joints shall be constructed by sawing a groove in the hardened concrete with a power-driven saw in conformance with requirements for sawed joints, unless otherwise approved in writing. Transverse contraction joints shall be constructed in conformance with requirements for sawed joints.

3.8.5.1 Sawed Joints

Sawed contraction joints shall be constructed by sawing an initial groove in the concrete with a 1/8 inch blade to the indicated depth. During sawing of joints, and again 24 hours later, the CQC team shall inspect all exposed lane edges for development of cracks below the saw cut, and shall immediately report results to the Contracting Officer. If the Contracting Officer determines that there are more uncracked joints than desired, the Contractor will be directed to saw succeeding joints 25 percent deeper than originally indicated at no additional cost to the Government. After expiration of the curing period, the upper portion of the groove shall be widened by sawing to the width and depth indicated for the joint sealer. The time of initial sawing shall vary depending on existing and anticipated weather conditions and shall be such as to prevent uncontrolled cracking of the pavement. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting the concrete without chipping, spalling, or tearing. The sawed faces of joints will be inspected for undercutting or washing of the concrete due to the early sawing, and sawing shall be delayed if undercutting is sufficiently deep to cause structural weakness or excessive roughness in the joint. The sawing operation shall be carried on as required during both day and night regardless of weather conditions. The joints shall be sawed at the required spacing consecutively in the sequence of the concrete placement. A chalk line or other suitable guide shall be used to mark the alinement of the joint. Before sawing a joint, the concrete shall be examined closely for cracks, and the joint shall not be sawed if a crack has occurred near the planned joint location. Sawing shall be discontinued when a crack develops ahead of the saw cut. Workmen and inspectors shall wear clean, rubber-soled footwear, and the number of persons walking on the pavement shall be limited to those actually performing the sawing operation. Immediately after the joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly flushed with water until all waste from sawing is removed from the joint. The surface shall be resprayed with curing compound as soon as free water disappears. Necessary precautions shall be taken to insure that the concrete is properly cured at sawed joints, but that no curing compound enters the joints. The top of the joint opening and the joint groove at exposed edges shall be tightly sealed with cord, backer rod, or other approved material before the concrete in the region of the joint is resprayed with curing compound. The method used for sealing the joint groove shall prevent loss of moisture from the joint during the entire specified curing period and shall prevent infiltration of foreign material until removed immediately before sawing joint sealant reservoir. The sawing equipment shall be adequate in the number of units and the power to complete the sawing at the required rate. An ample supply of saw blades

shall be available on the job before concrete placement is started and at all times during sawing. At least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operation.

3.8.6 Thickened Edge Joints

Thickened edge joints shall be constructed as indicated on the drawings. Underlying material in the transition area shall be graded as shown and shall meet the requirements for smoothness and compaction specified for all other areas of the underlying material.

3.8.7 Special Joints

"Special joints" (undercut joints) shall be constructed adjacent to existing pavement as indicated. The concrete under the edge of the existing pavement and the concrete below the normal level of the bottom of the new pavement shall be placed as a separate operation in front of the paving train. The concrete shall be worked under the edge of the existing pavement to completely fill the void and shall be thoroughly consolidated by the use of hand-held vibrators. Timing shall be such that this concrete is still workable when the paving train goes across it. In no case shall this concrete be placed as part of the operation of the paving equipment.

3.8.8 Sealing Joints

Joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit. Joints shall be sealed as specified in Section 02760A FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS.

3.9 REPAIR, REMOVAL, REPLACEMENT OF SLABS

3.9.1 General Criteria

New pavement slabs that are broken or contain cracks shall be removed and replaced or repaired, as specified hereinafter at no cost to the Government. Spalls along joints shall be repaired as specified. Where removal of partial slabs is permitted, as specified, removal and replacement shall be full depth, shall be full width of the paving lane, and the limit of removal shall be normal to the paving lane and not less than 10 feet from each original transverse joint (i.e., removal portion shall be at least 10 feet longitudinally, and portion to remain in place shall be at least longitudinally; thus, if original slab length is less than 20 feet, the entire slab shall be removed). The Contracting Officer will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall be at least 6 inch diameter, shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with epoxy resin, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Government. All epoxy resin used in this work shall conform to paragraph EPOXY RESIN, Type and Grade as specified.

3.9.2 Slabs with Cracks Thru Interior Areas

Interior area is defined as that area more than 24 inches from either adjacent original transverse joint. Slabs with any cracks that extend into the interior area, regardless of direction, shall be treated by one of the following procedures.

3.9.2.1 Cracks That Do Not Extend Full Depth of Slab

These cracks, and similar cracks within the areas 24 inches each side of transverse joints, shall be cleaned and then pressure injected with epoxy resin, Type IV, Grade 1, using procedures as approved. The procedure shall not widen the crack during epoxy resin injection. All epoxy resin injection shall take place in the presence of a representative of the Contracting Officer.

3.9.2.2 Cracks That Extend Full Depth of Slab

Where there is any full depth crack at any place within the interior area, the full slab shall be removed. However, if the cracked area all lies within 10 feet of one original transverse joint, only a partial slab need be removed provided all criteria specified above for distance from each original transverse joint is met.

3.9.3 Cracks close to and Parallel to Transverse Joints

All cracks essentially parallel to original transverse joints, extending full depth of the slab, and lying wholly within 24 inches either side of the joint shall be treated as specified hereinafter. Any crack extending more than 24 inches from the transverse joint shall be treated as specified above for Slabs With Cracks Through Interior Areas. Any cracks which do not extend full depth of the slab shall be treated as specified above in subparagraph, Cracks That Do Not Extend Full Depth Of Slab, and the original transverse joint constructed as originally designed.

3.9.3.1 Full Depth Cracks Present, Original Joint Not Opened

When the original transverse joint has not opened, the crack shall be routed and sealed, and the original transverse joint filled with epoxy resin. The crack shall be routed with an easily guided, wheel mounted, vertical shaft, powered rotary router designed so the routing spindle will caster as it moves along the crack, or with a small diameter saw designed for this use. The reservoir for joint sealant in the crack shall be formed by routing to a depth of 3/4 inch, plus or minus 1/16 inch, and to a width of 5/8 inch, plus or minus 1/8 inch. Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent such raveling or spalling. The joint sealant shall be a liquid sealant as specified for rigid pavement joints. Installation of joint seal shall be as specified for sealing joints or as directed. The uncracked transverse joint shall be filled with epoxy resin. If the joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures. If only the original narrow saw cut has been made, it shall be cleaned and pressure

injected with epoxy resin, Type IV, Grade 1, using approved procedures. If filler material (joint insert) has been used to form a weakened plane in the transverse joint, it shall be completely sawed out and the saw cut pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures. Where a parallel crack goes part way across the paving lane and then intersects and follows the original transverse joint which is cracked only for the remainder of the width, it shall be treated as follows: The area with the separate crack shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.

3.9.3.2 Full Depth Cracks, Original Joint Also Cracked

At a transverse joint, if there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, a section of the slab containing the crack shall be removed and replaced for the full lane width and at least 10 feet long. If this partial slab removal places the limit of removal less than 10 feet from the next transverse joint, the entire slab shall be removed. If the parallel crack crosses the transverse joint line, a similar area shall be removed and replaced in both slabs.

3.9.4 Removal and Replacement of Full Slabs

Where it is necessary to remove full slabs, unless there are keys or dowels present, all edges of the slab shall be cut full depth with a concrete saw.

All saw cuts shall be perpendicular to the slab surface. If keys, dowels, or tie bars are present along any edges, these edges shall be sawed full depth 6 inches from the edge if only keys are present, or just beyond the end of dowels or tie bars if they are present. These joints shall then be carefully sawed on the joint line to within 1 inch of the depth of the dowel or key. The main slab shall be further divided by sawing full depth, at appropriate locations, and each piece lifted out and removed. Suitable equipment shall be used to provide a truly vertical lift, and approved safe lifting devices used for attachment to the slabs. The narrow strips along keyed or doweled edges shall be carefully broken up and removed using light, hand-held jackhammers, 30 lb or less, or other approved similar equipment. Care shall be taken to prevent damage to the dowels, tie bars, or keys or to concrete to remain in place. The joint face below keys or dowels shall be suitably trimmed so that there is no abrupt offset in any direction greater than 1/2 inch and no gradual offset greater than 1 inch when tested in a horizontal direction with a straightedge. No mechanical impact breakers, other than the above hand-held equipment shall be used for any removal of slabs. If underbreak between 1-1/2 and 4 inches deep occurs at any point along any edge, the area shall be repaired as directed before replacing the removed slab. Procedures directed will be similar to those specified for surface spalls, modified as necessary. If underbreak over 4 inches deep occurs, the entire slab containing the underbreak shall be removed and replaced. Where there are no dowels, tie bars, or keys on an edge, or where they have been damaged, dowels of the size and spacing as specified for other joints in similar pavement shall be installed by epoxy grouting them into holes drilled into the existing concrete using procedures as specified in paragraph, Placing Dowels and Tie Bars. Original damaged dowels or tie bars shall be cut off flush with the joint

face. Protruding portions of dowels shall be painted and lightly oiled. All four edges of the new slab shall thus contain dowels or original keys or original tie bars. Placement of concrete shall be as specified for original construction. Prior to placement of new concrete, the underlying material shall be recompact and shaped as specified in the appropriate section of these specifications, and the surfaces of all four joint faces shall be cleaned of all loose material and contaminants and coated with a double application of membrane forming curing compound as bond breaker. Care shall be taken to prevent any curing compound from contacting dowels or tie bars. The resulting joints around the new slab shall be prepared and sealed as specified for original construction.

3.9.5 Removal and Replacement of Partial Slabs

Where the above criteria permits removal of partial slabs, removal and replacement operations shall be as specified for full slabs, except that the joint between the removed area and the partial slab to remain in place shall consist of a full depth saw cut across the full lane width and perpendicular to the centerline of the paving lane. Replacement operations shall be the same as specified above, except that, at the joint between the removed area and the partial slab to remain, deformed tie bars shall be epoxy resin grouted into holes drilled into the slab to remain in place. Size and spacing of the tie bars shall be as specified for dowels. Drilling of holes and installation of tie bars shall be as specified for dowels in paragraph, Placing Dowels and Tie Bars, except that no portion of the tie bars shall be painted or oiled. No curing compound shall be used on this joint face and, immediately before placing new concrete, the joint surface of the partial slab remaining in place shall be coated with epoxy resin, Type V, Grade 2.

3.9.6 Repairing Spalls Along Joints

Where directed, spalls along joints of new slabs, along edges of adjacent existing concrete, and along parallel cracks shall be repaired by first making a vertical saw cut at least 1 inch outside the spalled area and to a depth of at least 2 inches. Saw cuts shall be straight lines forming rectangular areas. The concrete between the saw cut and the joint, or crack, shall be chipped out to remove all unsound concrete and at least a depth of 1/2 inch of visually sound concrete. The cavity thus formed shall be thoroughly cleaned with high pressure water jets supplemented with compressed air to remove all loose material. Immediately before filling the cavity, a prime coat shall be applied to the dry cleaned surface of all sides and bottom of the cavity, except any joint face. The prime coat shall be applied in a thin coating and scrubbed into the surface with a stiff-bristle brush. Prime coat for portland cement repairs shall be a neat cement grout and for epoxy resin repairs shall be epoxy resin, Type III, Grade 1. The cavity shall be filled with low slump portland cement concrete or mortar or with epoxy resin concrete or mortar. Portland cement concrete shall be used for larger spalls, those more than 1/3 cu. ft. in size after removal operations; portland cement mortar shall be used for spalls between 0.03 cu. ft. and 1/3 cu. ft.; and epoxy resin mortar or Type III, Grade 3 epoxy resin for those spalls less than 0.03 cu. ft. in size after removal operations. Portland cement concretes and mortars shall be very low slump mixtures, 1/2 inch slump or less, proportioned, mixed,

placed, consolidated by tamping, and cured, all as directed. If the materials and procedures are approved in writing, latex modified concrete mixtures may be used for repairing spalls less than 1/3 cu.ft. in size. Epoxy resin mortars shall be made with Type III, Grade 1, epoxy resin, using proportions and mixing and placing procedures as recommended by the manufacturer and approved by the Contracting Officer. The epoxy resin materials shall be placed in the cavity in layers not over 2 inches thick. The time interval between placement of additional layers shall be such that the temperature of the epoxy resin material does not exceed 140 degrees F at any time during hardening. Mechanical vibrators and hand tampers shall be used to consolidate the concrete or mortar. Any repair material on the surrounding surfaces of the existing concrete shall be removed before it hardens. Where the spalled area abuts a joint, an insert or other bond-breaking medium shall be used to prevent bond at the joint face. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and then sealed with the sealer specified for the joints. If any spall penetrates half the depth of the slab or more, the entire slab, or 10 foot portion thereof, shall be removed and replaced as previously specified.

3.10 EXISTING CONCRETE PAVEMENT REMOVAL AND REPAIR

Existing concrete pavement shall be removed as indicated and as specified in Section 02220 DEMOLITION, modified, and expanded as specified herein. Repairs shall be made as indicated and as specified herein. All operations shall be carefully controlled to prevent damage to the concrete pavement and to the underlying material to remain in place. All saw cuts shall be made perpendicular to the slab surface, and forming rectangular areas.

3.10.1 Removal of Existing Pavement Slab

When existing concrete pavement is to be removed and adjacent concrete is to be left in place, the joint between the removal area and adjoining pavement to stay in place, including dowels, tie bars or keys, shall first be cut full depth with a standard diamond-type concrete saw. If keys or dowels are present at this joint, the saw cut shall be made full depth at 6 inches from the joint if only keys are present, or just beyond the end of dowels if dowels are present. The edge shall then be carefully sawed on the joint line to within 1 inch of the top of the dowel or key. Next, a full depth saw cut shall be made parallel to the joint at least 24 inches from the joint and at least 6 inches from the end of any dowels. This saw cut shall be made with a wheel saw as specified in paragraph SAWING EQUIPMENT. All pavement to be removed beyond this last saw cut shall be removed using equipment and procedures specified in Section 02220 DEMOLITION and as approved. All pavement between this last saw cut and the joint line shall be removed by carefully pulling pieces and blocks away from the joint face with suitable equipment and then picking them up for removal. In lieu of this method, this strip of concrete may be carefully broken up and removed using hand-held jackhammers, 30 lb or less, or other approved light-duty equipment which will not cause stress to propagate across the joint saw cut and cause distress in the pavement which is to remain in place. In lieu of the above specified removal method, the slab may be sawcut full depth to divide it into several pieces and each piece

lifted out and removed. Suitable equipment shall be used to provide a truly vertical lift, and safe lifting devices used for attachment to the slab. Where dowels or keys are present, care shall be taken to produce an even, vertical joint face below the dowels or keys. This joint face shall be trimmed so that there is no abrupt offset in any direction greater than 1/2 inch and no gradual offset greater than 1 inch when tested in a horizontal direction with a straightedge. If the Contractor is unable to produce such a joint face, or if underbreak or other distress occurs, the Contractor shall saw the dowels or keys flush with the joint. The Contractor shall then install new dowels, of the size and spacing used for other similar joints, by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph, Placing dowels and Tie-bars. All this shall be at no additional cost to the Government. Dowels of the size and spacing indicated shall be installed as shown on the drawings by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph, Placing Dowels and Tie Bars.

3.10.2 Edge Repair

The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Areas which are damaged during construction shall be repaired at no cost to the Government; repair of previously existing damage areas will be considered a subsidiary part of concrete pavement construction.

3.10.2.1 Spall Repair

Spalls along joints and along cracks shall be repaired where indicated and where directed. Repair materials and procedures shall be as previously specified in subparagraph, Repairing Spalls Along Joints.

3.10.2.2 Underbreak Repair

All underbreak shall be repaired. First, all delaminated and loose material shall be carefully removed. Next, the underlying material shall be recompact, without addition of any new material. Finally, the void shall be completely hand-filled with paving concrete mixture, thoroughly consolidated. Care shall be taken to produce an even joint face from top to bottom. Prior to placing concrete, the underlying material shall be thoroughly moistened. After placement, the exposed surface shall be heavily coated with curing compound. All this shall be done at least 24 hours before placing the new paving concrete against the joint.

3.10.2.3 Underlying Material

The underlying material adjacent to the edge of and under the existing pavement which is to remain in place shall be protected from damage or disturbance during removal operations and until placement of new concrete, and shall be shaped as shown on the drawings or as directed. Sufficient underlying material shall be kept in place outside the joint line to completely prevent disturbance of material under the pavement which is to remain in place. Any material under the portion of the concrete pavement to remain in place which is disturbed or loses its compaction shall be carefully removed and replaced with concrete as specified above under

Underbreak Repair. The underlying material outside the joint line shall be thoroughly compacted and shall be moist when new concrete is placed.

3.11 PAVEMENT PROTECTION

The Contractor shall protect the pavement against all damage prior to final acceptance of the work by the Government. Aggregates rubble, or other similar construction materials shall not be piled on airfield pavements. Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least 14 days old, or for a longer period if so directed. As a construction expedient in paving intermediate lanes between newly paved pilot lanes, operation of the hauling equipment will be permitted on the new pavement after the pavement has been cured for 7 days and the joints have been sealed or otherwise protected. Also, the subgrade planer, concrete paving and finishing machines, and similar equipment may be permitted to ride upon the edges of previously constructed slabs when the concrete has attained a minimum flexural strength of 400 psi and approved means are furnished to prevent damage to the slab edge. All new and existing pavement carrying construction traffic or equipment shall be continuously kept completely clean, and spillage of concrete or other materials shall be cleaned up immediately upon occurrence. Special care shall be used where Contractor's traffic uses or crosses active airfield pavement. In these areas, if necessary in order to accomplish this, full-time workmen with hand brooms shall be used at anytime there is traffic. Other existing pavements used by the Contractor shall be power broomed at least daily when traffic operates. For fill-in lanes, equipment shall be used that will not damage or spall the edges or joints of the previously constructed pavement.

3.12 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL

3.12.1 Testing and Inspection by Contractor

The Contractor shall perform the inspection and tests described below, and based upon the results of these inspections and tests, shall take the action required and submit reports as required. When, in the opinion of the Contracting Officer, the paving operation is out of control, concrete placement shall cease. The laboratory performing the tests shall be on-site and shall conform with ASTM C 1077. The individuals who sample and test concrete or the constituents of concrete as required in this specification shall have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technicians, Grade I. The individuals who perform the inspection of concrete shall have demonstrated a knowledge and ability equivalent to the ACI minimum guidelines for certification of Concrete Construction Inspector, Level II. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and at least once per year thereafter for conformance with ASTM C 1077. This testing shall be performed by the Contractor regardless of any other testing performed by the Government, either for pay adjustment purposes or for any other reason.

3.12.2 Testing and Inspection Requirements

3.12.2.1 Fine Aggregate

- a. Grading. At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits.
- b. Corrective Action for Fine Aggregate Grading. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall be immediately reported to the Contracting Officer, paving shall be stopped, and immediate steps taken to correct the grading.

3.12.2.2 Coarse Aggregate

- a. Grading. At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt approved limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling.
- b. Corrective Action for Grading. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer, and steps taken to correct the grading. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Contracting Officer, paving shall be stopped, and immediate steps shall be taken to correct the grading.

3.12.2.3 Quality of Aggregates

Thirty days prior to the start of concrete placement, the Contractor shall perform all tests specified for aggregate quality, including deleterious materials. In addition, after the start of paving, the Contractor shall perform similar tests for aggregate quality at least once every month, and when the source of aggregate or aggregate quality changes. Testing

interval may be increased to three months when the previous two tests indicate the aggregate meets all quality requirements. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

3.12.2.4 Scales, Batching and Recording

- a. Weighing Accuracy. The accuracy of the scales shall be checked by test weights prior to start of concrete operations and at least once every month for conformance with specified requirements. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors.
- b. Batching and Recording Accuracy. Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required mass, recorded mass, and the actual mass batched. The Contractor shall test and ensure that the devices for dispensing admixtures are operating properly and accurately.
- c. Corrective Action. When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

3.12.2.5 Batch-Plant Control

The measurement of all constituent materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate masses and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water masses per cubic yard, amount of water as free moisture in each size of aggregate, and the batch aggregate and water masses per cubic yard for each class of concrete batched during each day's plant operation.

3.12.2.6 Concrete Mixture

- a. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two other tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of paving. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Tests shall be made in accordance with ASTM C 231. Test results shall be plotted on control charts which are kept current and shall, at all times, be readily available to the Government and shall be submitted weekly. Copies of the current

control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single test result reaches either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the air content of the batch to plot on both the air content and the control chart for range, and for determining need for any remedial action. The result of each test, or average as noted in the previous sentence, shall be plotted on a separate control chart for each mixture on which an average line is set at the midpoint of the specified air content range from paragraph SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES. An upper warning limit and a lower warning limit line shall be set 1.0 percentage point above and below the average line, respectively. An upper action limit and a lower action limit line shall be set 1.5 percentage points above and below the average line, respectively. The range between each two consecutive tests shall be plotted on a secondary control chart for range where an upper warning limit is set at 2.0 percentage points and an upper action limit is set at 3.0 percentage points. Samples for air content shall be taken at the paving site. The Contractor shall deliver the concrete to the paving site at the stipulated air content. If the Contractor's materials or transportation methods cause air content loss between the mixer and the paving site, correlation samples shall be taken at the paving site as required by the Contracting Officer, and the air content at the mixer controlled as directed.

- b. Air Content Corrective Action. Whenever points on the control chart for percent air reach either warning limit, an adjustment shall immediately be made in the amount of air-entraining admixture batched. As soon as practical after each adjustment, another test shall be made to verify the result of the adjustment. Whenever a point on the secondary control chart for range reaches the warning limit, the admixture dispenser shall be recalibrated to insure that it is operating accurately and with good reproducibility. Whenever a point on either control chart (single test or result of two tests made concurrently, as specified above) reaches an action limit line, the air content shall be considered out of control and the paving operation shall immediately be halted until the air content is under control. Additional air content tests shall be made when paving is restarted.
- c. Slump Testing. Slump tests shall be made when test specimens are fabricated. In addition, at least four other slump tests shall be made on randomly selected batches in accordance with ASTM C 143/C 143M for each separate concrete mixture produced during each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single slump test reaches or goes beyond

the upper action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control chart for slump and the chart for range, and for determining need for any remedial action. An upper warning limit shall be set at 1/2 inch below the maximum allowable slump on separate control charts for slump used for each type of mixture as specified in paragraph, SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES, and an upper action limit line shall be set at the maximum allowable slump, as specified in the same paragraph for fixed form paving or as selected by the Contractor at the start of the project for slipform paving. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 1-1/2 inches. Samples for slump shall be taken at the paving site. The Contractor is responsible for delivering the concrete to the paving site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between the mixer and the paving site, correlation samples shall be taken at the paving site as required by the Contracting Officer, and the slump at the mixer controlled as directed.

- d. Slump Corrective Action. Whenever points on the control charts for slump reach the upper warning limit, an approved adjustment shall immediately be made in the batch masses of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum w/c specified, based on aggregates which are in a saturated surface dry condition. When a slump result (average of two tests made concurrently, as specified above) exceeds the upper action limit, no further concrete shall be delivered to the paving site until proper adjustments have been made. Immediately after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive individual slump tests, made during a period when there was no adjustment of batch masses, produce a point on the control chart for range at or above the upper action limit, the paving operation shall immediately be halted, and the Contractor shall take approved steps to bring the slump under control. Additional slump tests shall be made as directed.
- e. Temperature. The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064/C 1064M. The temperature shall be reported along with the compressive strength data.

3.12.2.7 Concrete Strength Testing for CQC

Contractor Quality Control operations for concrete strength shall consist of the following steps:

- a. Take samples for strength tests at the paving site. Fabricate and cure test cylinders in accordance with ASTM C 31/C 31M; test them in accordance with ASTM C 39/C 39M.

- b. Fabricate and cure 2 test cylinders per subplot from the same batch or truckload and at the same time acceptance cylinders are fabricated and test them for compressive strength at 7-day age.
- c. Average all 8 compressive tests per lot. Convert this average 7-day compressive strength per lot to equivalent 90-day flexural strength using the Correlation Ratio determined during mixture proportioning studies.
- d. Compare the equivalent 90-day flexural strength from the conversion to the Average Flexural Strength Required for Mixtures from paragraph of same title.
- e. If the equivalent average 90-day strength for the lot is below the Average Flexural Strength Required for Mixtures by 20 psi flexural strength or more, at any time, adjust the mixture to increase the strength, as approved.
- f. If the equivalent average 90-day strength is above the Average Flexural Strength Required for Mixtures by 20 psi flexural strength or more for 2 consecutive days, the Contractor will be permitted to adjust the mixture to decrease the strength, as approved.
- g. The Contractor's CQC testing agency shall maintain up-to-date control charts for strength, showing the 7-day CQC compressive strength, the 14-day compressive strength (from acceptance tests) and the 90-day equivalent flexural strength of each of these for each lot.

3.12.2.8 Inspection Before Placing

Underlying materials, construction joint faces, forms, reinforcing, dowels, and embedded items shall be inspected by the Contractor in sufficient time prior to each paving operation in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

3.12.2.9 Paving

- a. Paving Inspection. The placing foreman shall supervise all placing and paving operations, shall determine that the correct quality of concrete is placed in each location as shown and that finishing is performed as specified; shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, volume of concrete placed, and method of paving and any problems encountered.
- b. Placing and Paving Corrective Action. The paving foreman shall not permit batching and paving to begin until it has been verified that an adequate number of vibrators in working order and with competent operators are available. Paving shall not be continued

if piles of concrete exist or if the concrete is inadequately consolidated or if surface finish is not satisfactory. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

3.12.2.10 Vibrators

- a. **Vibrator Testing and Use.** The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when paving is in progress. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined while the vibrator is operating in concrete with the tachometer being held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head, and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing.
- b. **Vibrator Corrective Action.** Any vibrator not meeting the requirements of subparagraphs, Paver-Finisher and Consolidation, shall be immediately removed from service and repaired or replaced.

3.12.2.11 Curing Inspection

- a. **Moist Curing Inspections.** At least twice each shift, and not less than four times per day (never more than 7 hours apart) on both work and non-work days, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.
- b. **Moist Curing Corrective Action.** When any inspection finds an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for the area shall be extended by 1 day.
- c. **Membrane Curing Inspection.** No curing compound shall be applied until the Contractor has verified that the compound is properly mixed and ready for spraying. At the end of each day's operation, the quantity of compound used shall be determined by measurement of the container and the area of concrete surface covered; the Contractor shall then compute the rate of coverage in square feet per gallon and shall also note whether or not coverage is uniform. All this shall be reported daily.
- d. **Membrane Curing Corrective Action.** When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.
- e. **Sheet Curing Inspection.** At least once each shift and once per day on non-work days, an inspection shall be made of all areas

being cured using impervious sheets. The condition of the covering and the tightness of the laps and tapes shall be noted and recorded.

- f. Sheet Curing Corrective Action. When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by 1 day.

3.12.2.12 Cold-Weather Protection

At least once each shift and once per day on non-work days, an inspection shall be made of all areas subject to cold-weather protection. Any deficiencies shall be noted, corrected, and reported.

3.12.2.13 Mixer Uniformity

- a. Stationary Mixers. Prior to the start of concrete placing and once every 4 months when concrete is being placed, or once for every 50,000 cubic yards of concrete placed, whichever results in the longest time interval, uniformity of concrete mixing shall be determined in accordance with COE CRD-C 55. The original test shall be a Regular Test. After the mixing operation has been tested and approved, subsequent tests shall be Abbreviated Tests.
- b. Truck Mixers. Prior to the start of concrete placing and at least once every 4 months when concrete is being placed, uniformity of concrete mixing shall be determined in accordance with ASTM C 94/C 94M. The truck mixers shall be selected randomly for testing. When satisfactory performance is found in one truck mixer, the performance of mixers of substantially the same design and condition of the blades may be regarded as satisfactory.
- c. Mixer Uniformity Corrective Action. When a mixer fails to meet mixer uniformity requirements, either the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved. After adjustments have been made, another uniformity test shall be made.

3.12.2.14 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. 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 failures 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.

-- End of Section --

SECTION 16535

AIRFIELD LIGHTING

09/2002

AMENDMENT NO. 0001

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. FAA Advisory Circular (AC) references govern over military references for the airfield lighting in this project.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO-01 (1992) Standard Specifications for Highway
Bridges

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C57.12.25 (1990) Pad-Mounted Compartmental-Type
Self-Cooled Single-Phase Distribution
Transformers with Separable Insulated
High-Voltage Connectors, High-Voltage, 34
500 GrdY/19 920 Volts and Below;
Low-Voltage, 240/120, 167 kVA and Smaller

ANSI C80.1 (1990) Rigid Steel Conduit, Zinc Coated

ANSI C119.1 (1986; R 1997) Sealed Insulated
Underground Connector Systems Rated 600
Volts

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 48/A 48M (2000) Gray Iron Castings

ASTM B 8 (1999) Concentric-Lay-Stranded Copper
Conductors, Hard, Medium-Hard, or Soft

ASTM C 478 (2002a) Precast Reinforced Concrete
Manhole Sections

ASTM D 923 (1997) Sampling Electrical Insulating
Liquids

ASTM D 3304 (1977; R 1983) Analysis of Environmental
Materials for Polychlorinated Biphenyls

ASTM F 883 (1997) Padlocks

FM GLOBAL (FM)

FM P7825 (2002; Supplements I, II, and III)
Approval Guide

[AM#1]COMMERCIAL ITEM DESCRIPTIONS (CIDS)

CIDS A-A-55801 Rubber, Silicone; Packing Preformed

CIDS A-A-59213 Splice Connectors

CIDS A-A-59544 Cable And Wire, Electrical (Power, Fixed
Installation)

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 150/5345-10 (Rev E) Constant Current Regulators and
Regulator Monitors

FAA AC 150/5345-26 (Rev C) Specification for L-823 Plug and
Receptacle, Cable Connectors

FAA AC 150/5345-42 (Rev C; Change 1) Specification for
Airport Light Bases, Transformer Houses,
Junction Boxes, and Accessories

FAA AC 150/5345-43 (Rev E) Specification For Obstruction
Lighting Equipment

FAA AC 150/5345-46 (Rev B) Specification for Runway and
Taxiway Light Fixtures

FAA AC 150/5345-47 (Rev A) Isolation Transformers for Airport
Lighting Systems

FAA AC 150/5345-53 (Rev B; Change 1 Current Addendum)
Airport Lighting Equipment Certification
Program

FAA AC 150/5370-10 (Rev A; Changes 1 thru 13) Specifying
Construction of Airports

[AM#1]FAA AC 150/5345-3 (Rev E)Specification for L-821 Panels for
Control of Airport Lighting (9-1-98)

[AM#1]FAA AC 150/5345-56 Specification for L-890 Airport Lighting
Control and Monitoring System (ALCMS)

(9-30-04)

FEDERAL SPECIFICATIONS (FS)

<u>[AM#1]</u>	<u>[AM#1]</u>

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Std 48	(1998) Standard Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5 kV through 765 kV
IEEE Std 386	(1995; R 2001) Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V
IEEE Std 404	(2000) Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 V to 500 000 V
IEEE Std 592	(1990; R 1996) Standard for Exposed Semiconducting Shields on High-Voltage Cable Joints and Separable Insulated Connectors

MILITARY SPECIFICATIONS (MS)

<u>[AM#1]</u>	<u>[AM#1]</u>
<u>[AM#1]</u>	<u>[AM#1]</u>
<u>[AM#1]</u>	<u>[AM#1]</u>

MILITARY STANDARDS (MIL-STD)

<u>[AM#1]</u>	<u>[AM#1]</u>
<u>[AM#1]</u>	<u>[AM#1]</u>
<u>[AM#1]</u>	<u>[AM#1]</u>

<u>[AM#1]</u>	<u>[AM#1]</u>

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA FB 1	(2001) Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable
NEMA LA 1	(1992) Surge Arresters
NEMA PB 1	(2000) Panelboards
NEMA SG 6	(2000) Power Switching Equipment
NEMA TC 6 & 8	(1999) PVC Plastic Utilities Duct for Underground Installations

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2002) National Electrical Code
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UNDERWRITERS LABORATORIES (UL)

UL 6	(2000) Safety Rigid Metal Conduit
UL 198E	(1988; Rev Jul 1988) Safety Class R Fuses
UL 467	(1993) Safety Grounding and Bonding Equipment (Seventh Edition; Reprint with Revisions Through and Including 02/09/2001)
UL 486A	(1997) Safety Wire Connectors and Soldering Lugs for Use with Copper Conductors (Ninth Edition; Reprint with Revisions Through and Including May 23, 2001)
UL 486B	(1997; Rev Jun 1997) Wire Connectors for Use with Aluminum Conductors
UL 489	(2002) Safety Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 514A	(1996; R 2001) Safety Metallic Outlet

Boxes

UL 514B	(1997; R 2002) Safety Fittings for Cable and Conduit
UL 854	(1999; R 2002) Safety Service-Entrance Cables
UL 870	(1995; R 1999) Safety Wireways, Auxiliary Gutters, and Associated Fittings
UL 1242	(2001; R 2002) Safety Intermediate Metal Conduit

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Medium-Voltage Cable Installers; G, RE.

Certification of the Qualifications of Medium-Voltage Cable Installers: The Contractor shall submit a certification, to and for the approval of the Contracting Officer, that contains the names and the qualifications of persons recommended to perform the splicing and termination of medium-voltage cables approved for installation under this contract. The certification shall indicate that persons recommended to perform actual splicing and terminations have been adequately trained in the proper techniques and have had at least 3 recent years of experience in splicing and terminating the same or similar types of cables approved for installation. In addition, persons recommended by the Contractor may be required to perform a dummy or practice splice and termination, in the presence of the Contracting Officer, before being approved as a qualified installer of medium-voltage cables. If that additional requirement is imposed, the Contractor shall provide short sections of the approved types of cables along with the approved type of splice and termination kits, and detailed manufacturer's instruction for the proper splicing and termination of the approved cable types. The certification shall be prepared in conformance with paragraph CERTIFICATES OF COMPLIANCE in Section 01330 SUBMITTAL PROCEDURES, and shall be accompanied by satisfactory proof of the training and experience of persons recommended by the Contractor as cable installers.

SD-02 Shop Drawings

Materials and Equipment;

After receiving tentative approval of the equipment on the material lists and before installation of any of these items, the Contractor shall submit complete drawings and such other descriptive data as the Contracting Officer may require to demonstrate compliance with the contract documents. Detail drawings shall be submitted for the following items and such other items as the Contracting Officer may direct:

- a. Base assemblies and accessories.
- b. Cable: Power, airfield lighting, control and monitoring.
- c. Lamps.
- d. Light fixture assemblies.
- e. Regulators.
- f. Transformers: Isolating and power.
- g. Floodlight Supports
- h. Series Circuit Monitor System.

If departures from the contract drawings are deemed necessary by the Contractor, details of such departures, including changes in related portions of the project and the reasons therefor, shall be submitted with the shop drawings. Approved departures shall be made at no additional cost to the Government.

SD-03 Product Data

Materials and Equipment; G, RE

Within 10 days after notice to proceed, and before starting installation of any materials or equipment, the Contractor shall submit to the Contracting Officer for approval a complete list of materials and equipment to be incorporated in the work. This list shall include manufacturer's style or catalog numbers. Cuts or other descriptive data shall be furnished when required. No consideration will be given to partial lists submitted from time to time without prior approval of the Engineer of Record. Approval of materials will be based on manufacturer's published data, approval of materials and equipment will be tentative subject to submission of complete shop drawings indicating compliance with the contract documents.

SD-11 Closeout Submittals

Spare Parts;

As soon as practicable after approval of materials and equipment and, if possible, not later than 4 months prior to the date of beneficial use, the Contractor shall furnish spare parts data for

each different item of equipment listed. The data shall include a complete list of parts and supplies, with source of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment, or specified hereinafter to be furnished as part of the contract; and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 120 days at the particular installation. The foregoing shall not relieve the Contractor of any responsibilities under the guarantee specified.

1.3 MATERIALS TO BE RELOCATED OR REMOVED

The material and equipment in connection with airfield lighting system shall be removed and relocated where shown on the drawings. The Contractor shall furnish and install new materials and equipment conforming to the applicable requirements of these specifications necessary for a complete system. The material and equipment to be retained by the Government shall be stored on the Base or remain in place as directed by the Contracting Officer.

1.4 SERVICE INTERRUPTIONS

All alterations which will cause service interruption to the power, airfield lighting or to the communication circuits shall be performed during daylight hours and in visual meteorological conditions (ceiling of at least 1,000 feet and visibility of at least 3 miles as defined by the FAA). Special permission must be obtained from the Contracting Officer before any service to either the power, airfield lighting circuits or the communication circuits is interrupted. Any cable damaged due to the Contractor's operations shall be replaced, in kind, by the Contractor at no extra cost to the Government.

1.5 GENERAL REQUIREMENTS

The airfield lighting system shall be complete with all necessary accessories for proper operation. All equipment shall be thoroughly coordinated to secure the required results with the greatest assurance of protection to life and property consistent with these specifications. The contract drawings indicate the extent and general arrangement of the airfield lighting work. If any departures from the contract drawings are deemed necessary by the Contractor, details of such departures and the reasons therefor shall be submitted as soon as practicable to the Contracting Officer for approval. No such departures shall be made without the prior approval of the Contracting Officer. Furnish spare parts data upon completion and operation of the system in accordance with Part 1 paragraph SUBMITTALS.

1.5.1 Capacities

Capacities of all equipment and material shall be not less than those indicated.

1.5.2 Codes

The installation shall comply with the applicable requirements and recommendations of the NFPA 70, National Electrical Code, and the ANSI C2, National Electrical Safety Code.

1.5.3 Conformance with Agency Requirements

Where materials or equipment are specified to conform to the standards of Underwriters' Laboratories, Inc., or to be constructed or tested, or both, in accordance with the standards of the National Electrical Manufacturers Association or the American National Standards Institute, Inc., the Contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements. The label of, or listing by the Underwriters' Laboratories, Inc., will be acceptable as sufficient evidence that the items conform to Underwriters' Laboratories, Inc., requirements. A certification or published catalog specification data statement to the effect that the item is in accordance with the referenced NEMA standard by a company listed as a member company of NEMA for the section whose standards cover the item under consideration, will be acceptable as sufficient evidence that the item conforms to the requirements of the National Electrical Manufacturers Association. In lieu of such stamp, certification, label, or listing, the Contractor may submit a written certificate from any nationally recognized testing agency adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements listed hereinbefore, including methods of testing of the specified agencies. Conformance with the agency requirements does not relieve the item from complying with any other requirements of the specification.

1.5.4 Nameplates

Each major component of equipment shall have as a minimum the manufacturer's name, address, and catalog or style number on a nameplate securely attached to the item of equipment. Nameplates for individual items of electrical equipment shall be as specified in referenced publications and shall be provided on each item of equipment. Transformer nameplates shall be permanently marked with a statement to the effect that the transformer dielectric to be supplied is non-PCB classified with less than 50 parts per million (ppm) PCB content. If transformer nameplate is not so marked, the Contractor shall furnish manufacturer's certification for each transformer that the dielectric is non-PCB classified with less than 50 ppm PCB content. Certifications shall be related to serial numbers on transformer nameplates. Transformer dielectric exceeding the 50 ppm PCB content or transformers without certification will be considered as PCB insulated and will not be acceptable. In lieu of the manufacturer's certification, the Contractor may submit a test sample of the dielectric in accordance with ASTM D 923 and have tests performed in accordance with ASTM D 3304 at an EPA-approved testing facility to obtain this certification. Transformers with test results indicating PCB levels exceeding 50 ppm shall be replaced or decontaminated in accordance with approved EPA procedures to achieve the acceptable levels, and the certification specified shall be submitted and approved prior to acceptance of the transformer and approved dielectric. It is not permissible to dilute contaminated dielectric in an

attempt to lower the level of contamination. The PCB contaminated dielectric must be marked as PCB and transported to and incinerated by an approved EPA waste disposal facility and the Contractor shall furnish certification of proper disposal.

1.5.5 Prevention of Corrosion

All metallic materials shall be protected against corrosion. Exposed metallic parts of outdoor apparatus shall be given a rust-inhibiting treatment and standard finish by the manufacturer. All parts such as boxes, bodies, fittings, guards, and miscellaneous parts made of ferrous metals but not of corrosion-resistant steel, shall be zinc-coated in accordance with ASTM A 123 or ASTM A 153, except where other equivalent protective treatment is specifically approved in writing by the Contracting Officer. Steel conduits installed underground or under slabs on grade shall be coated with an approved asphaltic paint, plastic coating, or shall be wrapped with a single layer of a pressure-sensitive plastic tape, half-lapped. Where pressure-sensitive plastic tape is used, the conduit shall be coated with a primer recommended by the tape manufacturer before applying the tape.

1.5.6 Verification of Dimensions

The Contractor shall be specifically responsible for the coordination and proper relation of his work to the site and to work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, shall verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall conform to the respective publications and other requirements specified below. Other materials and equipment shall be as specified elsewhere herein and as shown on the drawings and shall be the products of the manufacturers regularly engaged in the manufacture of such products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening and shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Notwithstanding below specifications under this Materials and Equipment section, airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be approved under the Airport Lighting Equipment Certification Program described in Advisory Circular (AC) FAA AC 150/5345-53, Addendum No. 3, current edition. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer of Record.

2.1.1 Joint Sealer, Item P-605

FAA AC 150/5370-10. Materials used shall conform to applicable

requirements of Item P 605. Submit materials with satisfactory adhesive and waterproofing qualities for approval.

2.1.2 Bus Supports, Fittings, and Adapters

NEMA SG 6.

2.1.2.1 Bases and Accessories, Airport Light Fixtures

FAA AC 150/5345-42.

2.1.3 Cables

Cables shall be of annealed copper. Cables shall be single-conductor type, unless otherwise indicated.

2.1.3.1 Low-Voltage Cables

Low-voltage cables shall conform to UL 854 for Type USE service entrance cable and shall utilize [AM#1]_____ cross-linked, thermosetting-polyethylene [AM#1]_____ insulation. [AM#1]_____

2.1.3.2 Medium-Cables

Medium-voltage cables shall be cross-linked-thermosetting-polyethylene-insulated conforming to NEMA WC 7. Cables shall have a nonmetallic jacket. Jackets, shields, and coverings shall conform to NEMA WC 7.

[AM#1]5,000 Volt cable for airfield lighting service shall be FAA L-824, Type C, suitable for operation in wet or dry locations. Conductors shall be annealed (soft) copper, class B seven strand No. 8 AWG, copper. Single conductor cable shall be rated 5,000 volt, with 110 mil cross linked polyethylene insulation.

2.1.3.3 Grounding Cables

Grounding cables shall be bare, except where installed in conduit with associated phase conductors. Insulated cable shall be of the same material, green color-coded, and shall be insulated to match associated phase conductors, except that cable need be rated no more than 600 volt. Bare cables shall be ASTM B 8 soft-drawn unless otherwise indicated; aluminum is not acceptable.

2.1.3.4 Airfield Lighting Cable

FAA L-824. Reel numbers and date of manufacture shall be furnished.

2.1.3.5 Cable, Power

600V Non-Shielded-USE, [AM#1]600 Volt cable for airfield lighting service shall be sized as noted on the plans, FAA Type C, copper, seven strand, single conductor cable with 600 volt, 60 mil cross linked polyethylene insulation. 600-Volt cable shall be that manufactured by an FAA approved

manufacturer and subject to approval by the Engineer.

2.1.4 Cable Joints, Terminations, and Connectors

2.1.4.1 Power

[AM#1] In-line connections of underground primary cables shall be of the type called for in the plans or in the proposal and shall be one of the types listed below.

a. The Field-attached Plug-in Splice Figure 3 of AC 150/5345-26C, Specification for L-823 Plug and Receptacle, Cable Connectors, employing connector kits, is approved for field attachment to single conductor cable. The L-823 primary connector kits shall be Elastimold (Elastimold style 54-D4-D4 for L-824C No. 8 cable), or approved equivalent. Taping shall be as shown on the plans.

b. The Factory-molded Plug-in Splice Those meeting the Specification for L-823 Connectors, Factory-Molded to Individual Conductors, are approved.

2.1.4.2 Airfield Lighting Cable, Plug and Receptacle, Type L-823

FAA AC 150/5345-26.

2.1.4.3 Medium-Voltage Cable Joints

IEEE Std 404 and IEEE Std 592.

2.1.4.4 Medium-Voltage Cable Terminations

IEEE Std 48.

2.1.4.5 Medium-Voltage Separable Insulated Connectors

IEEE Std 386 and IEEE Std 592. Connectors shall be of the load-break type, shall be of suitable construction for the application and the type of cable connected, and shall include cable shield adaptors. External clamping points shall be provided.

2.1.4.6 Connectors for Low-Voltage Cables

[AM#1] UL 486A for copper conductors; and ANSI C119.1 for sealed insulated connectors.

2.1.5 Cast Iron

ASTM A 48/A 48M, Class 30B, minimum.

2.1.6 [AM#1] DELETED

[AM#1] _____

2.1.1.7 [AM#1] DELETED

[AM#1]

2.1.1.8 Concrete

Concrete, of not less than 3000 psi compressive strength in 28 days (except where otherwise indicated) shall meet all other requirements specified in Section 03300, CAST-IN-PLACE STRUCTURAL CONCRETE. Duct liner shall be of monolithic construction. Where connection is made to an existing duct line, the concrete encasement shall be well bonded or doweled to the existing encasement.

2.1.1.9 Conduit and Fittings, Steel

2.1.1.9.1 Conduit, Intermediate Metal

UL 1242.

2.1.1.9.2 Conduit, Rigid

ANSI C80.1 and UL 6.

2.1.1.9.3 Conduit Outlets and Fittings

NEMA FB 1, UL 514A, and UL 514B.

2.1.1.10 [AM#1]DELETED

[AM#1]

2.1.1.11 [AM#1]DELETED

[AM#1]

2.1.1.12 Duct and Conduit Caulking Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F., shall not slump at a temperature of 300 degrees F., and shall not harden materially when exposed to the air. Compounds shall readily calk or adhere to clean surfaces of asbestos-cement, fiber, or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials.

2.1.1.13 Duct and Fittings, Nonmetallic Type for Installation Underground

Wall thicknesses and fittings shall be suitable for the application. Ducts shall be single, round-bore type. Ducts shall be of the same material when used for applications requiring the same type of wall thickness.

2.1.13.1 Plastic

NEMA TC 6 & 8. Conduit fittings shall conform to the applicable NEMA standards, except that where NEMA standards for conduit fittings do not exist for the type of plastic installed, fittings shall be as recommended by the conduit manufacturer.

2.1.14 Filters

2.1.14.1 [AM#1]DELETED

[AM#1] _____

2.1.14.2 [AM#1]DELETED

[AM#1] _____

2.1.14.3 [AM#1]DELETED

[AM#1] _____

2.1.15 Fuse Cutouts, Primary

NEMA SG 2 with mounting brackets where required.

2.1.16 Grounding and Bonding

Equipment, UL 467. Wire, ASTM B 8, softdrawn copper. Copper cladding [AM#1]shall conform to the applicable requirements of ASTM B 371/B 371M.

2.1.17 Insulators, Apparatus

ANSI C29.8 or ASTM C29.9.

2.1.18 Lamps

Lamps, except for high mast fixture lamps, shall be quartz or LED as indicated in the drawings and conform to the current Addendum No. 3 of FAA AC 150/5435-53. High mast fixture lamps shall be high pressure sodium as indicated on the drawings.

2.1.19 Light Units

2.1.19.1 L-862 Elevated Runway Fixture
FAA AC 150/5345-46

2.1.19.2 Elevated Taxiway Fixture

FAA AC 150/5345-46.

2.1.19.3 L-580C, Semiflush Runway Edge Light Fixture

FAA AC 150/5345-46 [AM#1] _____ .

2.1.19.4 L-810, Obstruction Light, LED

FAA AC 150/5345-43

2.1.19.5 L-852 Semiflush, Omni-Directional, Taxiway Fixture

FAA AC 150/5345-46

2.1.19.6 Floodlights

Floodlights shall be metal halide luminaries by BEGA, or approved equivalent, as shown on the drawings. Contractor is responsible for complete design, including supports, if any substitute is proposed.

2.1.20 Nameplates

Nameplates shall be made of corrosion-resistant metal with not less than 1/4-inch tall raised or engraved characters. The name-plate shall be mounted on the front of the enclosure.

2.1.21 Padlocks

Padlocks shall conform to ASTM F 883, Type P02 (Combination operated), Grade 6, Option C (changeable combination), and resistant to opening by manipulation and surreptitious attack.

2.1.22 Panel, Airfield Lighting Control

[AM#1]FAA AC 150/5345-3 or [AM#1]FAA AC 150/5345-56, as applicable, modified as shown on the drawings.

2.1.23 Panelboards

NEMA PB 1. Panelboards exposed to the weather shall be weatherproof.

2.1.24 [AM#1]DELETED

[AM#1]

2.1.25 Poles

AASHTO LTS-3 for wind velocities. AASHTO Standard Specification for Structural Supports for Highway Signs; Luminaires, and Traffic Signals, 1994 edition. Poles for high mast lighting shall be as shown on the drawings.

2.1.26 Protective Apparatus

2.1.26.1 Circuit Breakers, Molded-Case

UL 489.

2.1.26.2 Fuses, Low Voltage, Cartridge

[AM#1] _____ Class G, J, K1, K5, K9, and L.

2.1.26.3 Fuses, Low-Voltage, Current-Limiting Types

[AM#1] _____ Class L or UL 198E, Class R.

2.1.26.4 Fuses, Medium-Voltage, Including Current-Limiting Types

NEMA SG 2.

2.1.27 Regulators

2.1.27.1 Type L-828

FAA AC 150/5345-10. The constant-current regulators shall be magnetic designs, L-828, dry, Class 1, 240 VAC, single phase, two wire. The regulators shall not have solid state controls in the series circuit and shall be designed to prohibit radio communications interference. The regulators shall limit transient current peaks without the use of solid state series circuit controls with soft-on feature. Each regulator shall include a true RMS ammeter, and ON/OFF/REMOTE switch and brightness controls. The regulators shall also meet any additional requirements shown on the plans.

In addition, the regulators shall be provided with single pole, double throw (SPDT) contacts rated 2 amperes at 120 volts to indicate the following functions for remote monitoring:

- a. REMOTE selected at control switch.
- b. Primary power ON.
- c. Regulator commanded ON.

2.1.27.2 Circuit Selector Switches

FAA AC 150/5345-5. Circuit selector switches shall include SPDT contacts rated 2 amperes at 120 volts (minimum) to indicate the following functions for remote monitoring:

- a. REMOTE selected at control switch
- b. High voltage contactor closed (one for each contact).

2.1.28 Series Circuit Monitor

FAA AC 150/5345-10.

2.1.29 Surge Arresters

NEMA LA 1 metal oxide varistors (MOV) for power and signal circuits with ratings recommended by system manufacturer.

2.1.30 Switches, Surface Mounted, Enclosed, Safety

[AM#1]UL1998-ED2

2.1.31 Tape

2.1.31.1 Friction Tape

[AM#1]ASTM-D 4514

2.1.31.2 Plastic Tape

[AM#1]FAA AC 150/5370-10 Item L-108, Installation of Underground Cable for Airports, Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic, for Low-Temperature Application

[AM#1]FAA AC 150/5370-10 Item L-108, Installation of Underground Cable for Airports, Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

2.1.31.3 Rubber Tape

[AM#1]ASTM D 4388 Rubber Tapes, Nonmetallic Semi-Conducting and Electrically Insulating

2.1.32 Transformer, Isolation, Type L-830

FAA AC 150/5345-47 and as indicated on the drawings.

2.1.33 Transformers

NEMA 3R.

2.1.33.1 Pad-Mounted Compartmental Type

ANSI C57.12.25.

2.1.34 Wireways

UL 870.

2.1.35 Controlled Low Strength Material (CLSM) Backfill

CLSM backfill for duct lines under pavement shall consist of a mixture of Portland cement, aggregates, water and admixtures proportioned to provide a nonsegregating, free-flowing, self-consolidating material that will result in a hardened, dense backfill that has relatively low permeability and that is excavatable.

Only approved materials, conforming to the requirements of this and other

referenced Specifications shall be used in the work. They may be subjected to inspections and tests at any time during the progress of their preparation or use. The source of supply of each of the materials shall be approved by the Government's Contracting Officer or Authorized Representative before delivery or use is started. When required by the Government's Contracting Officer or Authorized Representative or these Specifications, provide representative samples of materials and certified test results from a qualified, independent, commercial testing laboratory. Materials shall be stored and handled to ensure the preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and CLSM backfill must be clean before any material or CLSM backfill is placed therein.

2.1.35.1 Cement

Conform to ASTM C 150, Type I, low alkali.

2.1.35.2 Aggregate

Aggregate shall consist of fine aggregate with or without coarse aggregate with a maximum allowable particle size of 1-inch, and shall be free of clay balls, organics, and other deleterious materials. Fine and coarse aggregates shall conform to the requirements of ASTM C 33 except that alternative gradations will be allowed as specified hereinafter, and provided that less than 20 percent by weight based on an average of tests performed on samples taken at the proposed borrow source, passes the No. 200 sieve as determined in accordance with ASTM C 117. A minimum of 95 percent of the samples shall have less than 20 percent minus No. 200 sieve material and the remainder shall have less than 25 percent minus No. 200 material. Materials passing the No. 200 sieve shall be non-plastic as determined in accordance with ASTM D 4318.

Aggregate used in CLSM backfill shall come from a single source designated by the Contractor and approved by the Program Manager, and shall conform within the approved gradation limits identified in the Contractor's mix design. Mix design tests shall, to the satisfaction of the Program Manager, be representative of the range of aggregate gradations in the aggregate source and shall demonstrate the suitability of the mix design for the range of aggregate gradations in the aggregate source. Aggregates shall be sampled in accordance with ASTM D 75, and aggregate gradations shall be determined in accordance with ASTM C 117 and C 136. Crusher fines will be allowed if such material becomes available from concrete crushing operations on airport property and if the strength requirements can be met.

2.1.35.3 Water

Conform to the requirements of ASTM C 94.

2.1.35.4 Admixtures

a. Air entraining admixtures, if used, shall conform to the requirements of ASTM C 260.

- b. Fly ash, if used, shall conform to the requirements of ASTM C 618.

2.1.36 Caution Tape

Trench marking tape (caution tape) shall be 6 inches wide except where shown otherwise on the drawings, 4 mils thick, bright red in color, marked "Electric Line Buried Below," Terra Tape manufactured by Reef Industries, Houston, Texas, telephone 1-800-231-2417, or approved equivalent.

2.1.37 High Performance Grout

Where specified in the drawings, a high performance nonshrink grout shall be used for backfill around light bases and conduit. This high performance nonshrink grout shall be Penatron 3003 for airfield lighting applications by ASTC Polymers, Inc. of Costa Mesa, California, Telephone No. 800-475-7568, or Durapatch Hiway/Everbond system for airport lighting fixtures by L&M Construction Chemicals, Inc. of Omaha, Nebraska, Telephone No. 800-362-3331, or approved equivalent. Aggregate for these systems, where specified, shall be gravel, crushed gravel, or crushed stone, silica free and non-consolidated, meeting the requirements of ASTM C 33. Maximum coarse aggregate size shall be 3/8-inch.

PART 3 EXECUTION

3.1 WORKMANSHIP

All materials and equipment shall be installed in accordance with the recommendations of the manufacturer as approved by the Contracting Officer or Authorized Representative to conform with the contract documents. The installation shall be accomplished by workmen skilled in this type of work.

Certification of the qualifications of medium-voltage cable installers shall be submitted in accordance with paragraph SUBMITTALS.

3.2 DUCT LINES

Duct lines shall be concrete-encased, electrical Schedule 40 PVC, or as otherwise shown on the drawings.

3.2.1 Requirements

Numbers and sizes of ducts shall be as indicated. Duct lines shall be laid with a minimum slope of 3 inches per 100 feet, unless otherwise shown on the drawings. Depending on the contour of the finished grade, the high-point may be at a terminal, a manhole, a pullbox, a handhole, or between manholes, pullboxes or handholes. Manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 18 inches for ducts of less than 3-inch diameter, and 36 inches for ducts 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends as required, but the

maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells whenever duct lines terminate in manholes/pullboxes or handholes.

3.2.2 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and match factory tapers. After a duct line is completed, a standard flexible mandrel shall be used for cleaning followed by a brush with stiff bristles. Mandrels shall be at least 12 inches long and have diameters 1/4-inch less than the inside diameter of the duct being cleaned. Pneumatic rodding may be used to draw in lead wires. A coupling recommended by the duct manufacturer shall be used whenever an existing duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

3.2.3 Concrete Encasement

Each single duct (conduit) shall be completely encased in concrete with a minimum of 3 inches of concrete around each duct, except that only 2 inches of concrete are required between adjacent ducts. Duct line encasements shall be monolithic construction. Where a connection is made to a previously poured encasement, the new encasement shall be well bonded or doweled to the existing encasement. Tops of concrete encasements shall be not less than 18 inches below finished grade or top of subgrade when under pavement. Separators shall be made of plastic, placed not further apart than 5 feet on centers. Ducts shall be securely anchored to prevent movement during the placement of concrete and joints shall be staggered at least 6 inches vertically.

3.2.3.1 Trench and Backfill

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored. Trenches may be excavated manually or with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Road patrols or graders shall not be used to excavate the trench with their blades. The bottom surface of trenches shall be essentially smooth and free from coarse aggregate. Trenches shall be excavated to the minimum depths below finished grade shown on the drawings.

The Contractor shall excavate all trenches in earth to a width not less than 6 inches (150 mm). The trench shall be widened where more than two conduit are to be installed parallel in the same trench. Unless otherwise specified in the drawings, all conduit in the same location and running in the same general direction shall be installed in the same trench. When rock excavation is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required cable depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch sieve. All

excavation shall be unclassified.

Care shall be taken to not damage existing underground lines or cables. Cable damage resulting from excavating shall be repaired or replaced by the Contractor at the Contractor's expense.

Duct or conduit markers temporarily removed for trench excavations shall be replaced as required.

After ducts or conduits have been properly installed and the concrete has had time to set, the trench shall be backfilled with controlled low strength material under all paved areas.

For concrete encased duct banks not under paved areas, after the duct banks have been properly installed and the concrete has cured, the trench shall be backfilled in at least two layers with select excavated material not larger than 4 inches (100 mm) in diameter. In areas where the trenches are within the safety areas of runways or taxiways, the backfill shall be thoroughly tamped and compacted to a minimum 95 percent dry density as determined by ASTM D 1557 with a moisture content of +/-2 percent of optimum. In all other areas, the backfill shall be thoroughly tamped and compacted to a minimum 93 percent dry density as determined by ASTM D 698. Moisture content shall be from -1 percent to +4 percent of optimum. If necessary to obtain the desired compaction, the backfill material shall be moistened or aerated as required. One moisture/density test per lift shall be made for each 250 linear feet of concrete encased duct bank or one work period's construction, whichever is less.

Trenches shall not be excessively wet and shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface. Any excess excavated material shall be removed and disposed of in accordance with instructions issued by the Government's Contracting Officer or Authorized Representative.

3.2.3.2 Controlled Low Strength Material Backfill

Mix Design

a. Mix Performance Requirements: The CLSM backfill mix shall be proportioned to be a nonsegregating, free-flowing, self-consolidating, low-shrink slurry with an unconfined compressive strength at 28 days of not less than 50 psi and not more than 300 psi determined in accordance with ASTM D 4832. CLSM falling outside the allowable range shall be removed and replaced. The CLSM backfill mix shall have a slump sufficient to provide the flowability to flow into all voids without vibration. Fly ash may be added to improve workability.

b. Mix Design Requirements: The Contractor and its supplier shall determine the materials and proportions used to meet the requirements of these specifications. At least 28 days before starting placement of CLSM backfill, the Contractor and its supplier shall submit a mix

design for the CLSM backfill to the Government's Contracting Officer or Authorized Representative. The mix design shall include, but not be limited to, the following information:

1. Certification of compliance of the design mix relative to the mix performance requirements of this Specification.
2. Certification of compliance of the component materials used in the mix design relative to this specification and referenced specifications.
3. Representative gradations for aggregate from the designated aggregate source and proposed gradation limits for aggregates to be used in the CLSM backfill.
4. Plastic characteristics of the design mix including temperature, slump, air entrainment, wet unit weight, yield, and cement factor.
5. Performance characteristics of the hardened CLSM backfill to include compressive strength of all test specimens and the corresponding average compressive strength. Compressive strength tests shall be reported for ages of 7 days, and 28 days and shall be in accordance with ASTM D 4832.
6. Unit weight of all compressive strength specimens at the time of testing and the corresponding average unit weight.

The mix design tests shall be performed for at least three different aggregate gradations that are representative of the range in aggregate gradation to be expected in the designated aggregate source and within the proposed gradation limits for the mix design. If the Contractor and its supplier choose to use fine and coarse aggregate conforming to ASTM C 33 with a locally accepted mix design conforming to the local Department of Transportation specification, or equal, then the mix design tests need only be performed for one representative aggregate gradation, as approved by the Government's Contracting Officer or Authorized Representative.

c. Mix Design Accepted: No CLSM backfill shall be placed until the mix design has been reviewed and accepted by the Government's Contracting Officer or Authorized Representative. Acceptance of the mix design shall be understood to indicate conditional acceptance of the CLSM backfill. Final acceptance will be based on conformance with these specifications and satisfactory test results on field samples during placement as required by these Specifications or as required by the Government's Contracting Officer or Authorized Representative.

Batching, Mixing, And Delivery

Batching, mixing, and delivery shall conform to the requirements of either ASTM C 94 or C 685.

Temperature

CLSM backfill may be placed when weather conditions are favorable, and when the ambient temperature is above 40 degrees F, or above 34 degrees F and rising. CLSM backfill placement shall stop when the ambient temperature is below 36 degrees and falling. At the time of placement, CLSM backfill shall have a temperature of at least 50 degrees F. CLSM backfill shall be cured at a minimum temperature of 40 degrees F for at least 24 hours after placement.

Preparation For Placement

Trenches or areas to receive CLSM backfill shall be cleaned of all trash, debris, loose soil, and other material prior to placement of CLSM backfill.

CLSM backfill shall not be placed on either frozen subgrade materials or saturated subgrade materials. Properly support and anchor pipes, structures, and temporary bulkheads as necessary to prevent their movement during placement of CLSM backfill. Obtain Government's Contracting Officer or Authorized Representative's approval of the area to receive CLSM backfill prior to placement.

Placement

CLSM backfill shall be discharged from a mixer into the areas to be filled by any means acceptable to the Government's Contracting Officer or Authorized Representative. CLSM backfill shall be placed in lifts not exceeding 4 feet in height, at time intervals of not less than 1 hour between lifts. Contractor shall maintain duct alignments during CLSM backfilling operations. Further, backfilling of trenches with CLSM backfill shall be done in not less than two lifts with the first lift not exceeding 1 foot above the top of the duct line.

Vibration after placement may only be used as approved by the Government's Contracting Officer or Authorized Representative. CLSM backfill shall be protected from physical disturbance for at least 24 hours following placement. The Contractor shall provide steel plates to span backfilled trenches and prevent traffic contact with CLSM backfill for at least 24 hours following placement or until the CLSM backfill is hard enough, in the Government's Contracting Officer or Authorized Representative's opinion, to prevent rutting or damage by construction equipment or traffic.

Restoration

Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the trenching, storing of dirt, cable pulling, pad construction and other work shall be restored to its original condition. The restoration shall include any necessary topsoiling, fertilizing, liming, seeding, sprigging, or mulching. All such work shall be performed in accordance with Specification Section 02925. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance.

3.2.4 Installation of Couplings

Joints in each type of duct shall be made up in accordance with the manufacturer's recommendations for the particular type of duct and coupling selected and as approved. In the absence of specific recommendations, various types of duct joint couplings shall be made watertight as specified.

3.2.4.1 Plastic Duct

Duct joints shall be made by brushing a plastic solvent cement produced for this purpose on insides of plastic coupling fittings and on outsides of duct ends. Each duct and fitting shall then be slipped together with a quick one-quarter-turn twist to set the joint tightly.

3.2.5 Underground Metallic Conduit

The underground conduit shall consist of rigid steel conduit or intermediate metal conduit, Type I for the electrical-distribution system. The size of conduit shall be as indicated on the drawings. Conduit lines shall be installed so that the top of the conduit is not less than 2 feet below finished grade. Trenching and backfilling shall conform to the applicable requirements of the Section 02300 EARTHWORK of these specifications. During construction and after the conduit lines are completed, the ends of the conduit shall be plugged to prevent water washing mud into the runs. Particular care shall be taken to keep the conduits clean of concrete or any other substance during the course of construction. After the conduit lines have been completed, and mandrel not less than 12 inches long, having a cross section approximately 1/4-inch less than the inside cross section of the conduit shall be pulled through each conduit, after which a brush with stiff bristles shall be pulled through to make certain that no particles of earth, sand or gravel have been left in the line.

3.3 PULLBOXES, HANDHOLES, AND MANHOLES

3.3.1 General

Pullboxes, handholes, and manholes shall be constructed approximately where shown. The exact location of each item shall be determined after careful consideration has been given to the location of other utilities, grading, and paving. The location of each pullbox, handhole, or manhole shall be approved by the Contracting Officer or Authorized Representative before construction is started. Pullboxes, handholes, and manholes shall be monolithically constructed precast concrete structures having the required strength as established by ASTM C 478, and inside dimensions as required by the drawings. Frames and covers shall be made of gray cast iron unless otherwise shown on the drawings. A machine-finished seat shall be provided to insure a matching joint between the frame and cover. Frames and covers shall be delivered on the job unpainted and, after approval, shall be given two coats of asphalt paint. Within runway or taxiway/taxilane safety areas, manholes and pullboxes shall be aircraft rated for FAA Airport Design Group VI aircraft. In other paved areas, frames and covers for manhole, pullbox, and handhole entrances in vehicular traffic areas shall be rated for H20 wheel loads in accordance with AASHTO-01 and the top of

covers shall be flush with the finished surface of the paving. In unpaved areas, the top of covers shall be approximately 1/2-inch above the finished grade. Where existing grades that are higher than finished grades are encountered, a sufficient number of courses of brick shall be installed between the top of manhole and manhole frame to elevate temporarily the manhole cover to existing grade level. Manholes/pullboxes shall be provided with knockouts in each vertical wall; the space between ducts and between ducts and walls shall be caulked tight with lead wool or approved equivalent. A cast-metal grille-type sump frame and cover shall be installed over the sump. A cable-pulling iron shall be installed in the wall opposite each duct line entrance.

3.3.2 Hardware

3.3.2.1 Pullboxes and Manholes

Cables shall be securely supported from walls by hot-dip galvanized cable racks equipped with adjustable hooks and insulators. The number of cable racks indicated shall be installed in each manhole or pullbox and not less than two spare hooks shall be installed on each cable rack. Insulators shall be made of high-glazed porcelain. Insulators will not be required on spare hooks.

3.4 COUNTERPOISE

A #6 soft drawn, bare, copper counterpoise shall be furnished and installed with all new circuits. Where light units occur, the counterpoise shall be attached with an exterior mechanical ground connection to the transformer housing (can or light base) or to elevated structures as noted on the drawings. Where circuits are combined a common counterpoise shall be used.

The existing counterpoise, where available, shall be connected to the new counterpoise. The counterpoise system shall be grounded at point of origin, the midpoint of the circuit, at the end of the circuit, and at each 1000 feet or less of the lighting system as shown on the drawings. Grounding of the counterpoise system shall be accomplished by connection to driven ground rods. Ground rods shall conform to UL 647 and shall be 3/4-inch diameter and 10 feet long copperclad steel. Copper cladding shall conform to the applicable requirements of ASTM B 371/B 371M. The ground resistance shall not exceed 25 ohms. Exothermic welded connections shall be used throughout the counterpoise network.

3.5 INSTALLATION OF AIRFIELD LIGHTING CABLES

3.5.1 Cable Connections

All cables between lights shall be connected with proper molded plugs and receptacles conforming to FAA AC 150/5345-26. The Contractor shall furnish and install the proper molded plugs and receptacles. All connections made with molded plugs and receptacles shall have the mating surfaces coated with a thin film of Dow-Corning compound DC-4, or an approved equivalent, sufficient to coat the entire mating surface. Only FAA approved L-823 connector kits shall be used for attaching connectors on bulk cable and on field fabricated leads. The plug, receptacle, and connectors shall be installed as shown on the drawings. Factory installed caps shall remain in

place until final connection is made.

3.5.2 Airfield Lighting Cable Splices

Connections of the type shown in the drawings shall be made as follows:

Field-attached Plug-in Splices: These shall be assembled in accordance with manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. The "no go" gage attached to each cold shrink stretcher of the connector kit shall be left attached so that sizing may be verified during and after commissioning of the system.

Factory-Molded Plug-in Splices These shall be made by plugging directly into mating connectors.

The Cast Splice: This means of splicing is the only type approved for telephone control cable. The cast splice shall not be used for L-824C cable.

3.5.3 Tagging Conductors

All underground airfield lighting cable installed under this contract shall be properly identified Thomas & Betts Ty-Rap #TY546MT, or approved equivalent at each connector, at pullbox, manhole, or handhole, and at ends of ducts or conduits where no pullbox, manhole, or handhole exists.

3.6 INSTALLATION OF HIGH MAST LIGHTING

High mast lighting fixtures, inclusive of pole foundations, poles, steps, climbing devices, service baskets, fixtures, lamps, wiring, LED obstruction lights, air terminals, cabinets, utility power duct extension, junction cans, warranty, and all incidentals shall be contractor furnished and installed as shown on the drawings and shall provide a complete high mast lighting system approved by the Government's Contracting Officer.

3.7 INSTALLATION OF RUNWAY AND TAXIWAY LIGHTS

Airfield lighting units, including bases, shall be installed as detailed on the drawings. Lighting units shall be assembled as shown on the drawings and following the manufacturer's guidelines, and shall be placed into operational condition as approved by the Contracting Officer or Authorized Representative. Temporary blank covers shall remain on light bases until final installation of light units or permanent blank covers are installed.

3.7.1 3.7.1 General Light Fixture Base Installation Requirements

Caution shall be exercised during light base installation to prevent the collection of foreign matter in equipment and on operating components. All installation residue shall be collected as installation progresses. As directed by Government's Contracting Officer or Authorized Representative, a cover shield shall be used to protect components from foreign matter during installation.

Fixture base shall be installed in concrete or high strength nonshrink grout with connecting conduit as shown on the drawings. Light bases shall be set level. Leveling jig shall be required.

Flexible, sealtight steel conduit may be used where shown on the drawings. A maximum length of four (4) feet of flexible, sealtight steel conduit can be installed at the connection point to fixture base cans. Any flexible, sealtight steel conduit bend radius shall meet the cable manufacturer's minimum bend radius requirements or shall meet bend radius requirements for rigid conduit. The more stringent requirement shall govern, as determined by the Government's Contracting Officer or Authorized Representative.

Light bases shall have one, two or more 2 inch threaded metallic hubs for all required conduit entrances, or as otherwise indicated on the drawings. The cable entrance hubs shall be oriented in the proper direction to align with the connecting conduit.

Where high performance grout for backfill of conduit trenches or for light bases is specified on the drawings, it shall be a material specified in this specification Section 2.1.40. Coarse aggregate shall be omitted from backfill for light bases within Portland cement concrete pavements, and may be Contractor's option in asphaltic concrete pavements. Water shall NOT be mixed with the Durapatch Hiway product if it is selected. A manufacturer's representative knowledgeable in the application of the selected anchoring system shall be on site during the initial use of the system. After the required equipment is in place and the counterpoise wire grounding connections inspected, prepared trench, cored pavement surfaces, and exterior light base surface shall be wet down and all standing water shall be blown out of the trench and core hole as instructed by manufacturer's representative. Primer, where recommended, shall be sprayed on the exposed sides of the pavement. Installation shall proceed as instructed by manufacturer's representative. After the anchoring system has hardened and the jig has been removed, the light fixture shall be installed as indicated on the drawings.

Stub-in conduit connections into existing light bases shall be Meyers Hub installation, where required on the drawings and as noted on drawing details.

Breakage of fixture hold down bolts normally and regularly occurs in the field during fixture removal or fixture installation. When breakage occurs, the Contractor shall adhere to the following requirements:

1. The Contractor shall submit a broken bolt removal process for approval of the Engineer. Submittal shall include information about the planned broken bolt removal process and jig required to effectively drill and tap broken bolts, when necessary.
2. Whenever encountered, broken bolts shall be removed. Where drilling and tapping is required, a jig approved for use by the Engineer shall be used. All broken bolts shall be replaced with 3/8"-16 stainless steel bolts. In the event that light fixture bases are permanently damaged in the course of removing broken bolts, the Contractor shall be held responsible for the immediate

repair/replacement of the lighting base. Permanent damage includes drilling of holes which exceed the required 3/8" bolt diameter and/or any "off centered" impressions that penetrate the inner lip of the existing bolt holes.

3. Use of "helicoils" shall be strictly prohibited as a method of dealing with stripped bolt holes.

Light fixture bases to be used as junction boxes shall be installed at the approximate locations indicated in the drawings.

3.7.2 General Cable Installation Requirements

The primary cable shall enter the light base and transformer housing as shown on the drawings.

Primary cable slack shall be provided inside the light fixture base. In general, enough slack shall be left in the cable to permit installation aboveground of the connections between the primary cable and the isolation transformer primary leads. A similar length of primary cable slack shall be provided for any unconnected cable installed in a fixture base can.

When more than one (1) circuit is installed within the lighting base, each cable shall bear its appropriate circuit identification marker.

The transformer secondary leads shall be connected to the lamp leads with a disconnecting plug and receptacle.

3.7.3 General Duct and Conduit Installation Requirements

Trenching, installation of ducts and conduits, concrete backfilling, trench backfilling, installation of duct markers and the type of material used shall conform to the drawings and these specifications.

3.7.4 Light Fixture Installations In New Rigid Pavement

3.7.4.1 Light Base Installation Requirements

Install light fixture bases in accordance with the general requirements of 3.7.1 and as noted on the drawings.

Conduit and base trench in new rigid pavement shall be filled with a concrete slurry of well graded aggregate mix with a top size aggregate of 3/8 inches. This concrete shall have a minimum cement content of six (6) sacks per cubic yard and a slump of 5 to 6 inches. The aggregate and other material shall meet the requirements of Section 03300.

Light base setting and leveling jig shall not be removed for 24 hours after placing the anchor block around the bottom base section in new rigid pavement. Follow the drawings for installation procedures for the top base section in new rigid pavement which requires high performance nonshrink grout.

After installation of the light fixture, the azimuth of the light beam shall not vary more than +1/2 degree from the required direction. The elevation of the light fixture outside edge (downslope side) shall be flush with the surrounding surface elevation such that the elevation of the fixture is not more than +0 inches higher than or -1/16 inch lower than the

elevation of the pavement. If this tolerance is not met, the Contractor shall, at its expense, remove and replace the fixture to the satisfaction of the Government's Contracting Officer or Authorized Representative. In concrete light bases shall have one, two or more 2 inch threaded metallic hubs for all required conduit entrances, as indicated on the drawings.

3.7.4.2 Light Fixture Installation

Assemble the light fixture in accordance with the manufacturer's instructions. Connect the secondary leads of the transformer to the fixture leads with a disconnecting plug and receptacle conforming to AC 150/5345-26 without taping the joint. Install a lamp or lamps of the proper rating in the fixture. Level each fixture as recommended by the manufacturer.

3.7.4.3 Cable, Duct, and Conduit

Install the cable, duct, and conduit in accordance with Section 3.7.1.

3.8 JUNCTION BOXES

3.8.1 Additional Equipment

Additional equipment indicated on the drawings shall be included in the Contract.

3.8.2 Junction Cans

Prior to setting, the Contractor shall provide a 6-inches drainage layer material as a suitable base to receive the junction can. The drainage layer material shall be compacted and graded level and at proper elevation to receive the junction can in proper relation to the conduit grade or ground cover requirements, as indicated on the drawings. After primary structure has been properly installed and cast-in-place concrete has had time to set, the excavation shall be backfilled in 8 to 10-inch lifts with excavated material not larger than 4 inches in diameter. Backfill shall be thoroughly tamped and compacted to a minimum 95 percent dry density as determined by ASTM D 1557 at a compaction moisture content of +/- 2 percent optimum moisture. If necessary to obtain the desired compaction, the backfill material shall be moistened or aerated, as required and approved by the Government's Contracting Officer or Authorized Representative.

3.8.3 Wiring, Power Transformer, Panelboard, and Safety Switch

Wiring, power transformers, panelboards, and safety switches shall be as shown on the drawings .

3.9 LAMP WATTAGES

Lamp wattages shall be as shown on the Airfield Light Fixture Schedule and

the Pole Lighting Schedule of the drawing 3.10 MEDIUM-VOLTAGE CABLES

Medium-voltage cables shall be suitable for a rated circuit voltage of 5 kV. Other parts of the cable system such as joints and terminations shall have ratings not less than the rating of the cables on which they are installed. Separable insulated connectors shall have nominal voltage ratings coordinated to associated apparatus ratings rather than cable ratings when used to connect cable to apparatus. Cables shall be provided with 133 percent insulation level. Neutral conductors of grounded neutral systems shall be of the same insulation material as phase conductors, except that a 600-volt insulation rating is acceptable.

3.10.1 Cable Joints

Shields shall be applied as required to continue the shielding system through each entire cable joint. Shields may be integrally molded parts of preformed joints. Shields shall be grounded at each joint.

3.10.1.1 Types

Separable insulated connectors of suitable construction or standard splice kits shall be used. Splice kits may be of the heat-shrinkable type for voltages up to 15 kV, of the premolded splice and connector type, the conventional taped type, or the resin pressure-filled overcast taped type for voltages up to 35 kV; except that for voltages of 7.5 kV or less a resin pressure-filled type utilizing a plastic-tape mold is acceptable. Separable insulated connectors are acceptable for voltages up to 35 kV.

3.10.1.2 Requirements

Cable joints shall provide insulation and jacket equivalent to that of the associated cable. Lead sleeves shall be provided for lead-covered cables. Armored cable joints shall be enclosed in compound-filled, cast-iron or alloy, splice boxes equipped with stuffing boxes and armor clamps of a suitable type and size for the cable being installed.

3.10.2 Terminations

Terminations shall be IEEE Std 48, Class 1 or Class 2; of the molded elastomer, wet-process porcelain, prestretched elastomer, heat-shrinkable elastomer, or taped type. Acceptable elastomers are track-resistant, silicon-rubber or track-resistant, ethylene-propylene compounds such as ethylene propylene rubber or ethylene propylene diene monomer. Separable insulated connectors may be used for apparatus terminations, when such apparatus is provided with suitable bushings. Terminations shall be of the outdoor type, except that where installed inside outdoor equipment housings which are sealed against normal infiltration of moisture and outside air, indoor, Class 2 terminations are acceptable. Class 3 terminations are not acceptable. Terminations, where required, shall be provided with mounting brackets suitable for the intended installation and with grounding provisions for the cable shielding, metallic sheath, and armor.

3.10.2.1 Factory-Preformed Type

Molded elastomer, wet-process porcelain, prestretched, and heat-shrinkable terminations shall utilize factory preformed components to the maximum extent practicable rather than tape build-up. Terminations shall have basic impulse levels as required for the system voltage level.

3.11 TAPED TERMINATIONS

Taped terminations shall use standard termination kits providing suitable terminal connectors, field-fabricated stress cones, and rain hoods. Terminations shall be at least 12-1/2 inches long from the end of the tapered cable jacket to the start of the terminal connector, or not less than the kit manufacturer's recommendations, whichever is greater.

3.11.1 Fireproofing

Medium-voltage cables and conductors in manholes shall be fireproofed for their entire length within a manhole on an individual cable basis. Fireproofing shall extend at least 1-inch into any duct. Systems shall be listed in FM P7825 as a fire protective coating for grouped electrical conductors and shall be suitable for application on the type of medium-voltage cables provided. After being fully cured, materials shall be suitable for use where exposed to oil, water, gases, salt water, sewage, and fungus and shall not damage cable jackets or insulation. Asbestos materials are not acceptable.

3.11.2 Tape Method

Tapes shall be at least 2 inches wide.

3.11.2.1 Pre-Application

Plastic tape wrapping shall be applied before application of fireproofing tape, over exposed metallic items such as the cable ground wire, metallic outer covering, or armor to minimize the possibility of corrosion from the fireproofing materials and moisture. Plastic tape shall be pressure sensitive, 10-mil thick, conforming to [AM#1]CIDS A-A-55801. Before applying fireproofing tape, irregularities of cables, such as at cable joints, shall be evened out with insulation putty.

3.11.2.2 Fireproofing Tape Application

A flexible conformable polymeric elastomer fireproof tape shall be wrapped tightly around each cable spirally in one-half lapped wrapping or in two butt-jointed wrappings with the second wrapping covering the joints of the first.

3.11.3 Sprayable Method

The manufacturer shall certify that cable coatings are seismically qualified in accordance with IEEE Std 344. Coatings when applied on bundled cables shall have a derating factor of less than 5 percent, and a dielectric strength of 95 volts per mil minimum after curing.

3.11.4 Cable Coatings

Cable coatings shall be compounded of water-based thermoplastic resins, flame-retardant chemicals, and inorganic incombustible fibers and shall be suitable for the application methods used. After application, cable coatings shall be dry to the touch in 1 to 2 hours and fully cured in 48 hours, except where the manufacturer has stated that because of unusual humidity or temperature, longer periods may be necessary.

3.11.5 Application

Manholes shall be power ventilated until coatings are dry and dewatered until coatings are cured. Ventilation requirements shall be in accordance with the manufacturer's instruction, but not less than 10 air changes per hour shall be provided. Cable coatings shall be applied by spray, brush, or glove to a wet film thickness that reduces to the dry film thickness approved for fireproofing by FM. Application methods and necessary safety precautions shall be in accordance with the manufacturer's instructions.

3.12 LOW-VOLTAGE CABLES

Cable shall be rated 600 volts. Other parts of cable systems such as splices and terminations shall be rated at not less than 600 volts. Splices in wires No. 10 AWG and smaller shall be made with an insulated, solderless, pressure type connector, Type I, Class 1, Grade B, Style G, or Type II, Class 1 of [AM#1]CIDS A-A-59213 and conforming to the applicable requirements of UL 486A. Splices in wires No. 8 AWG and larger shall be made with noninsulated, solderless, pressure type connector, Type II, Class 2 of [AM#1]CIDS A-A-59213, conforming to the applicable requirements of UL 486A and UL 486B. They shall then be covered with an insulation and jacket material equivalent to the conductor insulation and jacket. All splices below grade or in wet locations shall be sealed type conforming to ANSI C119.1 or shall be waterproofed by a sealant filled, thick wall, heat shrinkable, thermosetting tubing or by pouring a thermo-setting resin into a mold that surrounds the joined conductors.

3.13 TRANSFORMERS (PAD-MOUNTED)

Padmounted tamperproof compartmental transformer stations shall be of the radial type of the ratings indicated and shall be of the outdoor type. Protective devices shall have ratings compatible with the associated transformer rating. Transformer stations shall be assembled and coordinated by one manufacturer and each transformer station shall be shipped as a complete unit so that field installation requirements are limited to mounting each unit on a concrete pad and connecting it to primary and secondary lines. Barriers are required between high- and low-voltage compartments. High-voltage compartment doors shall be interlocked with low-voltage compartment doors to prevent access to any high-voltage section unless its associated low-voltage section door has first been opened. Compartments shall be sized to meet the specific dimensional requirements of ANSI C57.12.25.

3.13.1 High-Voltage Compartments

High-voltage compartments shall be dead-front construction. Primary protection shall include load-break switching, draw-out dry-well mounted current-limiting fuses, and medium-voltage separable connectors.

3.13.2 Low-Voltage Compartments

Neutrals shall be provided with fully-insulated bushings. No ground straps shall be provided between neutrals and ground pads. Clamp type cable terminations, suitable for both copper and aluminum conductors entering from below, shall be provided as necessary.

3.13.3 Accessories

Instruction nameplates shall include the number of gallons of transformer oil. High-voltage warning signs shall be permanently attached. Stainless steel ground connection pads shall be provided in both the high and low voltage compartments.

3.14 GROUNDING

Grounding shall conform to applicable requirements of NFPA 70, ANSI C2, and to requirements herein. Neutral conductors, cable shields, metallic conduits, pothead bodies, junction boxes, surge arresters, and all non-current-carrying metallic parts of equipment, shall be grounded. Ground rods shall be copper-clad steel, not less than 3/4-inch by 10 feet long, and shall be driven into the earth at least 10 feet.

3.15 WORK IN VAULT

Work shall be performed in accordance with applicable provisions of NFPA 70.

The drawings indicate the extent of new work. New materials furnished and installed by the Contractor shall be as specified hereinafter or as specified in the paragraph MATERIALS AND EQUIPMENT.

3.15.1 Conductors

Conductors for miscellaneous wiring shall be copper of Type THW conforming to [AM#1]CIDS A-A-59544.

3.15.2 Conduit System

High voltage conductors shall be installed in rigid steel galvanized conduit or IMC Type I conduit. Low voltage feeders and control wires will be installed in rigid steel, IMC Type I, or EMT except where indicated to be installed in wireway. Conduits below or passing through concrete slabs-on-grade shall be rigid steel or IMC Type I. Conduits below slab-on-grade shall be corrosion protected. Conduits shall not be installed horizontally within slabs-on-grade.

3.15.3 Control Relays

Control relays shall be furnished, installed, and connected as shown on the

drawings. Relays shall conform to applicable requirements of NEMA ICS standards.

3.15.4 Ground Connections

Ground connections shall be made to all equipment as required by NFPA 70. Connections shall be made to the existing grounding system.

3.15.5 [AM#1]REGULATORS

[AM#1]Regulators shall be L-828 of the type, ratings, and details indicated on the drawings.

3.15.5.1 Test Reports

Prior to final acceptance of regulators by the Contracting Officer, the Contractor shall submit for approval test reports from the manufacturer or from a recognized independent testing laboratory.

3.15.6 Wireways

Wireways shall be furnished and installed where shown on the drawings. Installation shall be complete with necessary fittings, connectors, and accessories. Wireway shall be of the "lay-in" type with hinged cover for full channel access. All parts in cable space shall be free from burrs or sharp corners and shall present smooth surfaces to wiring. Interconnection of sections shall provide a rigid mechanical assembly. Resistance of a unit length of wireway without a joint shall be no greater than the same length of wireway without a joint. Finish shall be corrosion resistant gray baked enamel on a phosphatized surface. Wireways exposed to the weather shall be galvanized after fabrication and painted in accordance with the paragraph: PAINTING AND FINISHING and shall be "raintight" type with sealing provisions. Wireways shall have cross-sectional dimensions as indicated on the drawings.

3.16 TESTS

3.16.1 Electrical Distribution System Tests

3.16.1.1 Primary Conductors

Immediately after the primary conductors have been installed, AC or DC voltage tests at the option of the Contractor and insulation resistance tests shall be conducted in accordance with applicable IPCEA Standard and/or the cable manufacturer. Tests shall be performed by a qualified cable test engineer. Certified typewritten copies of test results along with remarks, in triplicate, shall be furnished to the Contracting Officer immediately following the test, and shall indicate acceptability of the tested cable.

3.16.1.2 Operating Test

After the installation has been completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct an operating

test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this section of the specifications. The test shall be performed in the presence of the Contracting Officer. The Contractor shall furnish the necessary instruments and personnel required for the test. Utilities for testing shall be provided as specified in the SPECIAL CONTRACT REQUIREMENTS.

3.16.2 Ground Resistance

Ground resistance measurements of each ground rod shall be taken and certified by the Contractor to the Contracting Officer. The Contractor shall submit in writing to the Contracting Officer upon completion of the project, the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system, as well as the resistance and soil conditions at the time the measurements were made. When the building water service is used as a ground or part of the grounding system, ground resistance measurements shall also be made of this connection. Ground resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds.

3.16.3 Test Reports

Factory test reports on equipment, including the impulse tests specified for transformers, shall be certified by the manufacturer or testing laboratory and furnished by the Contractor to the Contracting Officer.

3.16.4 Airfield Lighting Tests

At such times as the Contracting Officer may direct, the Contractor shall conduct the following tests for approval. The installation shall be demonstrated to conform with the requirements and intent of the specifications. The test shall be performed in the presence of the Contracting Officer or his authorized representative. The Contractor shall furnish all instruments and personnel required for the test. System operation tests shall not be performed until all other tests have been successfully completed.

3.16.4.1 Circuit Tests

Each underground circuit will be subjected to the following tests. Cables buried in earth (i.e. not in duct) will be tested before and after backfilling the cable trench:

a. Each series circuit will be tested for continuity by ohmmeter or equivalent method. The circuit shall then be checked with a MEGGER to ascertain it is free of grounds. Any faults indicated by these tests should be located and repaired before proceeding with high voltage tests.

b. Each series and multiple underground circuit shall be subjected to high voltage insulation resistance tests to determine complete freedom from grounds. Whenever possible, these tests will be performed when the ground is thoroughly wet. Each circuit, including

transformers, will be tested as follows:

(1) Each circuit shall be tested immediately after installation in accordance with "First Test For New Circuits". Any circuit which has been installed for 60 days or more, even if it has not been operated, will be tested in accordance with "Succeeding Tests and Old Circuits".

(2) When additions are made to old circuits, only the new sections will be tested in accordance with "First Tests On New Circuits". The complete circuit will be checked at the reduced voltages to insure reliable operation.

(3) Connect both conductors and apply the test voltage indicated below for a period of five minutes between conductors and ground.

	First Test on New Circuits	Succeeding Tests and Old Circuits
High Intensity Runway Edge Light Circuits	9000V DC	5000V DC
Taxiway Circuits	6000V DC	3000V DC
600 Volt Circuits	1800V DC	600V DC

c. The above tests must be performed with a suitable high voltage tester which has a steady, filtered DC output voltage. The high voltage tester must contain an accurate voltmeter and microammeter for reading the voltage applied to the circuit and the leakage current.

d. During the last minute of the above tests the insulation leakage current in microamperes for each complete circuit will be measured and will not exceed the value calculated for each circuit as follows:

(1) Allow two microamperes for each 30/45, 65, 100, 200, 300, and 500 watt series transformer.

(2) Allow three microamperes for each 1000 feet of cable.

(3) Add the above values to determine the total allowable microampere leakage for each complete circuit.

e. If the leakage current exceeds the value calculated as outlined above, the circuit shall be sectionalized and the above test repeated for each section. Defective components shall be located and repaired or replaced until each section and the entire circuit passed the test. Contractor will not be required to repair or replace existing circuits unless otherwise directed by the Contracting Officer.

f. On new circuits, a check should be made with the low voltage

insulation resistance tester (MEGGER) immediately after a circuit has satisfactorily passed the high voltage tests and has been accepted. These initial readings should be recorded for future reference and use by maintenance personnel. Also ambient temperature and weather conditions shall be recorded.

g. When using the MEGGER, the following rule may be used to establish a reasonable megohm value for the circuit. Calculate the microampere current leakage which a new, similar circuit in excellent condition would have from the leakage values previously listed. Divide the circuit test voltage specified above by the calculated leakage current (in MICRO-AMPERES) to obtain the theoretical resistance value in MEGOHMS.

3.16.4.2 Regulator Tests

a. With load disconnected, each regulator shall be energized once. Open-circuit protector shall de-energize the regulator within 2 or 3 seconds.

b. After circuit tests have been successfully completed, regulator shall be connected to the load and the following tests performed. Measurements shall be made with a voltmeter and ammeter with an accuracy of plus or minus 1% deviation from full scale deflection.

(1) Supply voltage shall be measured.

(2) For regulators which have input voltage taps the tap which most nearly corresponds to the supply voltage shall be selected.

(3) Input voltage and output current shall be measured simultaneously on all brightness steps. The output current shall be within plus or minus 2% of the required value after any correction due to supply voltage deviation for non-automatic compensating regulators. A deviation of plus or minus 5% will be allowed for steps 1 to 4 for automatic compensating regulators. Any internal adjustments required shall be in accordance with manufacturers instructions.

(4) After "System Operation Tests" have been completed the supply voltage measurement shall be repeated. If supply voltage varies from previously measured value tests required by paragraphs (2) and (3) above shall be repeated.

3.16.4.3 System Operation Tests

a. Operate each switch of the airport lighting control panel in the control tower so that each switch position is reached at least twice. During this process, all lights and vault equipment will be observed to determine that each switch properly controls the corresponding circuit.

b. Repeat the above test for the panel in the alternate control

station (vault) and then repeat it again, using the local control switches on the regulators.

c. Each lighting circuit shall be tested by operating it continuously at maximum brightness for at least 6 hours. Visual inspection will be made at the beginning and end of this test to determine that the correct number of lights are operating at full brightness. In addition, the lamp terminal voltage will be measured on at least one light in each multiple circuit, to determine that it is within plus or minus 5 percent of the rated lamp voltage marked on each lamp.

-- End of Section --