Environmental

Reference: DACW09-87-R-0010

SPECIFICATIONS

for

AGUA FRIA RIVER LEVEES
MARICOPA COUNTY, ARIZONA

Authority: Public Law 89-298, Flood Control Act of 1965

Appropriation: 96 x 8122, Construction, General
96 x 8862, Contributed Funds, Required
96 x 8862, Contributed Funds, Other
Corps of Engineers, Civil

Buckeye Road to Broadway Rd.

US Army Corps of Engineers
Los Angeles District

SOLICITATION, OFFER, AND AWARD *(Construction, Alteration, or Repair)*	1. SOLICITATION NO.	2. TYPE OF SOLICITATION	3. DATE ISSUED	PAGE OF PAGES
	DACW09-87-R-0010	☐ SEALED BID (IFB) ☒ NEGOTIATED *(RFP)*	18 MAR.87	1 of 3

IMPORTANT – The "offer" section on the reverse must be fully completed by offeror.

4. CONTRACT NO.	5. REQUISITION/PURCHASE REQUEST NO.	6. PROJECT NO.

7. ISSUED BY — CODE

U.S.ARMY ENGINEER DISTRICT,
LOS ANGELES
P.O. Box 2711
Los Angeles, California
90053-2325

8. ADDRESS OFFER TO

U.S.ARMY ENGINEER DISTRICT,
LOS ANGELES
P.O. Box 2711
300 North Los Angeles Street
Los Angeles, California
90053-2325

9. FOR INFORMATION CALL:	A. NAME	B. TELEPHONE NO. *(Include area code) (NO COLLECT CALLS)*
▶	SEE "INSTRUCTIONS TO OFFRS"	

SOLICITATION

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

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

AGUA FRIA RIVER LEVEES, MARICOPA COUNTY, ARIZONA

Work consists of clearing and grubbing, diversion and control of water; excavation;borrow material, fill and backfill; concrete and soil cement; asphalt concrete road modifications,pipe gates and flapgates; safety rails; landscaping and irrigation work; and appurtenant work.

Estimated Cost of Construction is between $1,000,000 and $5,000,000

11. The Contractor shall begin performance within _____ calendar days and complete it within 240 calendar days after receiving ☐ award, ☒ notice to proceed. This performance period is ☒ mandatory, ☐ negotiable. *(See* ~~SPECIAL CLAUSES~~ *.)*

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS? *(If "YES," indicate within how many calendar days after award in Item 12B.)*	12B. CALENDAR DAYS
☒ YES ☐ NO	10

13. ADDITIONAL SOLICITATION REQUIREMENTS:

A. Sealed offers in original and _____ copies to perform the work required are due at the place specified in Item 8 by N/A *(hour)* local time N/A *(date)*. If this is a sealed bid solicitation, offers must be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

B. An offer guarantee ☒ is, ☐ is not required.

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

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

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

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

AMOUNTS ▶ In Accordance with the attached Bidding Schedule

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

19 ACKNOWLEDGMENT OF AMENDMENTS

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

AMENDMENT NO										
DATE										

20A NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (Type or print)	20B. SIGNATURE	20C OFFER DATE

AWARD *(To be completed by Government)*

21. ITEMS ACCEPTED

22. AMOUNT	23 ACCOUNTING AND APPROPRIATION DATA
24 SUBMIT INVOICES TO ADDRESS SHOWN IN ▶ *(4 copies unless otherwise specified)* ITEM	25 OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO ☐ 10 U S C 2304(c) ( ) ☐ 41 U S C 253(c) ( )
26. ADMINISTERED BY CODE	27. PAYMENT WILL BE MADE BY

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

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

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

30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN (Type or print)	31A. NAME OF CONTRACTING OFFICER (Type or print)

30B SIGNATURE	30C DATE	31B. UNITED STATES OF AMERICA BY	31C. AWARD DATE

Continuation of Standard Form 1442

20D. (1) IF THE OFFEROR IS A JOINT VENTURER, COMPLETE THE FOLLOWING:

(Company Name)	(Signature)	(Title)
(Company Name)	(Signature)	(Title)
(Company Name)	(Signature)	(Title)

NOTE: If a Corporation is participating as a member of a Joint Venture, the Certificate as to Corporate Principal in item (3) below must also be completed and signed.

(2) IF THE OFFEROR IS A PARTNERSHIP, LIST FULL NAME OF ALL PARTNERS

(Name)	(Signature)
(Name)	(Signature)
(Name)	(Signature)

(3) IF THE OFFEROR IS A CORPORATION, THE FOLLOWING CERTIFICATE SHOULD BE COMPLETED:

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____ (name), certify that I am the _____

Secretary of the corporation named as offeror in the within offer; that _____ (name), who signed said offer on behalf of the corporation, was then _____ (title) of said corporation: that the signature thereto is genuine; and that said contract was duly signed, sealed and attested for and in behalf of said corporation by authority of its governing body.

_____
(Name of Corporation)

(Affix)
(CORPORATE SEAL)

_____
(Secretary)

BIDDING SCHEDULE

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
1.	DIVERSION AND CONTROL OF WATER	1	Job	L.S.	
2.	CLEAR SITE AND REMOVE OBSTRUCTIONS	1	Job	L.S.	
3.	EXCAVATION				
	A. First 100,000 cubic yards	100,000	Cu.Yd.		
	B. Over 100,000 cubic yards	105,000	Cu.Yd.		
4.	COMPACTED FILL, LEVEE				
	A. First 100,000 cubic yards	110,000	Cu.Yd.		
5.	COMPACTED FILL, ROADWAY	40,900	Cu.Yd.		
6.	BACKFILL, TOE	107,000	Cu.Yd.		
7.	MISCELLANEOUS FILL	20,100	Cu.Yd.		
8.	SOIL CEMENT	91,000	Cu.Yd.		
9.	CONCRETE, SIDE DRAIN AT STATION 11+60	1	Job	L.S.	
10.	TRIPLE BOX CULVERT UNDER LOWER BUCKEYE ROAD	1	Job	L.S.	
11.	ROAD MODIFICATION AT LOWER BUCKEYE ROAD AND 127TH AVENUE	1	Job	L.S.	
12.	36-INCH DIA. REINFORCED CONCRETE PIPE SLEEVES	1440 ~~1,200~~	Lin.Ft.		
13.	SIDEWALK MODIFICATION AT BUCKEYE ROAD	1	Job	L.S.	
14.	SAFETY RAIL	11,400	Lin.Ft.		
15.	PIPE GATE	9	Ea.		
16.	GRAVEL (4" ABC)	1,100	Cu.Yd.		
17.	LANDSCAPING	1	Job	L.S.	
18.	WASTEWATER PIPE EXTENSION	1	Job	L.S.	

TOTAL ESTIMATED AMOUNT $_____

NOTE: If a bid or 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 Bidding 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 Bidding Schedule.

Amounts and prices shall be indicated in either figures or words, not both.

Bids shall be submitted on all items of the Bidding Schedule.

* * * * *

INSTRUCTIONS TO OFFERORS

1. SOLICITATION DEFINITIONS (APR 1984) FAR 52.215-5.

"Offer" means "proposal" in negotiation.

"Solicitation" means a request for proposals (RFP) or a request for quotations (RFQ) in negotiations.

2. ACKNOWLEDGEMENT OF AMENDMENTS TO SOLICITATIONS (APR 1984) FAR 52.215-8. Offerors shall acknowledge receipt of any amendment to this solicitation (a) by signing and returning the amendment, (b) by identifying the amendment number and date in the space provided for this purpose on the form for submitting an offer, or (c) by letter or telegram. The Government must receive the acknowledgement by the time and at the place specified for receipt of offers.

3. SUBMISSION OF OFFERS (APR 1984) FAR 52.215-9.

3.1 Offers and modifications thereof shall be submitted in sealed envelopes or packages (1) addressed to the office specified in the solicitation and (2) showing the time specified for receipt, the solicitation number, and the name and address of the offeror.

3.2 Telegraphic offers will not be considered unless authorized by the solicitation; however, offers may be modified or withdrawn by written or telegraphic notice, if such notice is received by the time specified for receipt of offers.

3.3 Item samples, if required, must be submitted within the time specified for receipt of offers. Unless otherwise specified in the solicitation, these samples shall be (1) submitted at no expense to the Government and (2) returned at the sender's request and expensse, unless they are destroyed during preaward testing.

4. EXPLANATION TO PROSPECTIVE OFFERORS (APR 1984) FAR 52.215-14. Any prospective offeror desiring an explanation or interpretation of the solicitation, drawings, specifications, etc., must request it in writing soon enough to allow a reply to reach all prospective offerors before the submission of their offers. Oral explanations or instructions given before the award of a contract will not be binding. Any information given a prospective offeror concerning a solicitation will be furnished promptly to all other prospective offerors as an amendment to the solicitation, if the information is necessary in submitting offers or if the lack of it would be prejudicial to other prospective offerors.

5. LATE SUBMISSIONS, MODIFICATIONS, AND WITHDRAWALS OF PROPOSALS (APR 1984) FAR 52.215-10.

5.1 Any proposal received at the office designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before award is made and it:

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

5.1.2 Was sent by mail (or was a telegram if authorized), and it is determined by the Government that the late receipt was due solely to mishandling by the Government after receipt at the Government installation; or

5.1.3 Is the only proposal received.

5.2 Any modification of a proposal or quotation, except a modification resulting from the Contracting Officer's request for "best and final" offer, is subject to the same conditions as in subparagraphs 5.1.1 and 5.1.2 above.

5.3 A modification resulting from the Contracting Officer's request for "best and final" offer received after the time and date specified in the request will not be considered unless received before award and the late receipt is due solely to mishandling by the Government after receipt at the Government installation.

5.4 The only acceptable evidence to establish the date of mailing of a late proposal or modification, sent either by registered or certified mail is the U.S. or Canadian Postal Service postmark on the wrapper or on the original receipt from the U.S. or Canadian Postal Service. If neither postmark shows a legible date, the bid, modification, or withdrawal shall be processed as if mailed late. "Postmark" means a printed, stamped, or otherwise placed impression (exclusive of a postage meter machine impression) that is readily identifiable without further action as having been supplied and affixed by employees of the U.S. or Canadian Postal Service on the date of mailing. Therefore, offerors or quoters should request the postal clerks to place a hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

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

5.6 Notwithstanding paragraph 5.1 above, 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.

5.7 Proposals amy be withdrawn by written notice or telegram (including mailgram) received at any time before award. Proposals may be withdrawn in person by an offeror or its authorized representative if the representative's identity is made known and signs a receipt for the proposal before award.

6. PREPARATION OF OFFERS (APR 1984). FAR 52.215-13.

6.1 Offerors are expected to examine the drawings, specifications, Schedule, and all instructions. Failure to do so will be at the offeror's risk.

6.2 Each offeror shall furnish the information required by the solicitation. The offeror shall sign the offer and print or type its name on the Schedule and each continuation sheet on which it makes an entry. Erasures or other changes must be initialed by the person signing the offer. Offers 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.

6.3 For each item offered, offerors shall (1) show the unit price/cost, including, unless otherwise specified, packaging, packing, and preservation and (2) enter the extended cost/price for the quantity of each item offered in the "Amount" column of the Schedule. In case of discrepancy between a unit price/cost and an extended price/cost, the unit price/cost will be presumed to be correct, subject, however, to correction to the same extent and in the same manner as any other mistake.

6.4 Offers for supplies or services other than those specified will not be considered unless authorized by the solicitation.

6.5 Offerors must state a definite time for delivery of supplies or for performance of services, unless otherwise specified in the solicitation.

Time, if stated as number of days, will include Saturdays, Sundays, and holidays.

7. CONTRACT AWARD (APR 1984). FAR 52.215-16.

7.1 The Government will award a contract resulting from this solicitation to the responsible offeror whose offer conforming to the solicitation will be most advantageous to the Government, cost or price and other factors, specified elsewhere in this solicitation, considered.

7.2 The Government may (1) reject any or all offers, (2) accept other than the lowest offer, and (3) waive informalities or minor irregularities in offers received.

7.3 The Government may award a contract on the basis of initial offers received, without discussions. Therefore, each initial offer should contain the offeror's best terms from a cost or price and technical standpoint.

7.4 The Government may accept any item or group of items of an offer, unless the offeror qualifies the offer by specific limitations. Unless otherwise provided in the Schedule, offers may be submitted for quantities less than those specified. 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 offer.

7.5 A written award or acceptance of offer mailed or otherwise furnished to the successful offeror within the time for acceptance specified in the offer shall result in a binding contract without further action by either party. Before the offer's specified expiration time, the Government may accept an offer (or part of an offer, as provided in paragraph 7.4 above), whether or not there are negotiations after its receipt, unless a written notice of withdrawal is received before award. Negotiations conducted after receipt of an offer do not constitute a rejection or counteroffer by the Government.

7.6 Neither financial data submitted with an offer, nor representations concerning facilities or financing, will form a part of the resulting contract. However, if the resulting contract contains a clause providing for pricing reduction for defective cost or pricing data, the contract price will be subject to reduction if cost or pricing data furnished is incomplete, inaccurate, or not current.

8. UNNECESSARILY ELABORATE PROPOSALS OR QUOTATIONS (APR 1984). FAR 52.215-7.

8.1 Unnecessarily elaborate brochures or other presentations beyond those sufficient to present a complete and effective response to this solicitation are not desired and may be construed as an indication of the offeror's or quoter's lack of cost consciousness. Elaborate art work, expensive paper and bindings, and expensive visual and other presentation aids are neither necessary nor wanted.

9. FAILURE TO SUBMIT OFFER (APR 1984). FAR 52.215-15.

9.1 Recipients of this solicitation not responding with an offer should not return this solicitation, unless it specifies otherwise. Instead, they should advise the issuing office by letter or postcard whether they want to receive future solicitations for similar requirements. If a recipient does not submit an offer and does not notify the issuing office that future solicitations are desired, the recipient's name may be removed from the applicable mailing list.

10. RESTRICTION ON DISCLOSURE AND USE OF DATA (APR 1984). FAR 52.215-12.

10.1 Offerors or quoters who include in their proposals or quotations data that do not want disclosed to the public for any purpose or used by the Government except for evaluation purposes, shall:

10.1.1 Mark the title page with the following legend:

"This proposal or quotation 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 or quotation. If, however, a contract is awarded to this offeror or quoter 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

10.1.2 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 or quotatio."

11. DIRECTIONS FOR SUBMITTING OFFERS.

11.1 Envelopes containing offers, guarantee, etc., must be sealed, marked, and addressed as follows:

Offer Under Reference No:
(DACW09-87-R-0010)

To: U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
P.O. Box 2711
Los Angeles, California 90053-2325

11.2 Hand carried offers shall be deposited in Room 6202, 300 North Los Angeles Street, Los Angeles, California, prior to the time and date set for receipt of offers.

12. TYPE OF CONTRACT (APR 1984). FAR 52.216-1. The Government contemplates award of a Firm-Fixed Price contract.

13. BID (OFFER) GUARANTEE (APR 1984). FAR 52.228-1.

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

13.1.2 The offeror (bidder) shall furnish a bid (offer) guarantee in the form of a firm commitment, such as a bid (offer) bond, postal money order, certified check, irrevocable letter of credit, or, under Treasury Department regulations, certain bonds or notes of the United States. The Contracting Officer will return bid (offer) guarntees, other than bonds, (1) to unsuccessful bidders as soon as practicable after the date set for receipt of offers, and (2) to the successful offeror upon execution of contractual documents and bonds (including any necessary coinsurance or reinsurance agreements), as required by the offer as accepted.

13.1.3 If the successful offeror, upon acceptance of its offer by the Government within the period specified for acceptance, fails to execute all contractual documents or give a bond(s) as required by the solicitation within the time specified, the Contracting Officer may terminate the contract for default.

13.1.4 Unless otherwise specified in the offer, the offeror will (1) allow 60 days for acceptance of its offer and (2) give bond within 10 days after receipt of the forms by the offeror.

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

14. AVAILABILITY OF SPECIFICATIONS LISTED IN THE DOD INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) (APR 1984) FAR 52.210-2. Single copies of specifications cited in this solicitation may be obtained by submitting a written request to the supply point listed below. The request must contain the title of the specification, its number, date, applicable amendment(s), and the solicitation or contract number. In case of urgency, telephone or telegraphic requests are acceptable. Voluntary standards, which are not available to offerors and contractors from Government sources, may be obtained from the organization responsible for their preparation, maintenance, or publication.

Commanding Officer
U.S. Naval Publication and Forms Center
5801 Tabor Avenue
Philadelphia, PA 19120
Telex Number.....834295
Western Union Number....710-670-1685
Telephone Number.....(215) 697-3321

15. AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS, STANDARDS, PLANS, DRAWINGS, DATA ITEM DESCRIPTIONS, AND OTHER PERTINENT DOCUMENTS (JUN 1977). FAR SUP 52.210-7003. The specification, standards, plans, drawings, descriptions, and other

pertinent documents cited in this solicitation may be examined at the following locations:

300 North Los Angeles Street
Los Angeles, California 90053-2325

16. EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE. Whenever a contract or modification of contract price is negotiated, the Contractor's cost proposals for equipment ownership and operating expenses shall be determined in accordance with the requirements of paragraph, EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE of the SPECIAL CLAUSES. A copy of EP 1110-1-8 "Construction Equipment Ownership and Operating Expense Schedule" is available for review at Room 7216, 300 North Los Angeles Street, Los Angeles, California.

17. SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING. Offerors are cautioned that failure to comply in good faith with the CONTRACT CLAUSES entitled (1) "Utilization of Small Business Concerns and Small Disadvantaged Business Concerns" and (2) "Small Business and Small Disadvantaged Business Subcontracting Plan (Alternate I)", when applicable, will be a material breach of contract. In order to assist prime contractors in developing a source list of Small and Small Disadvantaged Business Concerns, you are encouraged to contact minority Contractor associations, the Minority Business Development Agency, and the appropriate General Business Service Centers in your Standard Metropolitan Statistical Area, addresses of which may be obtained from:

Write: U.S. Army Engineer District, Los Angeles
ATTN: SPLSD
300 North Los Angeles Street, P.O. Box 2711
Los Angeles, California 90053-2325

Telephone Alice Tafoya
Small and Disadvantaged Business Utilization Specialist
Area Code (213) 894-5679

18. ADDITIONAL INFORMATION pertaining to these plans and specifications may be obtained by writing or calling (collect calls not accepted) U.S. Army Engineer District, Los Angeles, Attn: Mr G. E. Davis, P. O. Box 2711, Los Angeles, California 90053-2325. Telephone (213) 894-5493.

18.1 All inquiries after the date specified for receipt of offers should be directed as specified hereinbefore, Attn: Mr. Bernard Meirowsky. Telephone (213) 894-5660.

19. SITE INSPECTION. Arrangements for visiting the site may be made by contacting: Mr. Neil Erwin, Telephone (602) 261-3023.

20. NOTICE OF TOTAL SMALL BUSINESS SET-ASIDE (APR 1984). FAR 52.219-6.

20.1 Definition. "Small business concern", as used in this clause, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the size standards in this solicitation.

20.2 General.

20.2.1 Offers are solicited only from small business concerns. Offers received from concerns that are not small business concerns shall be considered nonresponsive and will be rejected.

20.2.2 Any award resulting from this solicitation will be made to a small business concern.

20.3 Agreement. A manufacturer or regular dealer submitting an offer in its own name agrees to furnish, in performing the contract, only end items manufactured or produced by small business concerns inside the United States, its territories and possessions, the Commonwealth of Puerto Rico, the Trust Territory of the Pacific Islands, or the District of Columbia. However, this requirement does not apply in connection with construction or service contracts.

20.4 Small Business Size Standard. For the purpose of this solicitation, in order to qualify as a "small business concern" the average annual receipts of the concern and its affiliates for its preceding three (3) fiscal years did not exceed 17,000,000.

21. NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (APR 1984). FAR 52.222-23.

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

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

Goals for minority participation for each trade	Goals for female participation for each trade
25.0 to 30.0%	6.9%

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

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

female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

21.4 The Contractor shall provide written notification to the Director, Office of Federal Contract Compliance Programs, within 10 working days following award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the:

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

21.5 As used in this Notice, and any contract resulting from this solicitation, the "covered area" is Maricopa County, Arizona.

22. BONDS.

22.1 Bid (Offer) Bonds. Each Offeror shall submit with his bid a Bid (Offer) Bond (Standard Form 24) with good and sufficient surety or surities acceptable to the Government, or other security as provided in Paragragh: BID (OFFER) GUARANTEE hereinbefore, in the form of twenty percent (20%) of the amount of the offer or $3,000,000, whichever is lesser. The Bid (Offer) Bond penalty may be expressed in terms of a percentage of the amount of the offer or may be expressed in dollars and cents.

22.2 Performance and Payment Bonds. After the perscribed forms have been presented to the offeror to whom award is made for signature, two bonds, each with good and sufficient surety or sureties acceptable to the Government, shall be furnished; namely a Performance Bond (Standard Form 25) and a Payment Bond (Standard Form 25A). The penal sums of such bonds will be as follows:

22.2.1 Performance Bond. The penal sum shall equal one hundred percent (100%) of the contract price.

22.2.2 Payment Bond.

22.2.2.1 When the contract price is $1,000,000 or less, the penal sum will be fifty percent (50%) of the contract price.

22.2.2.2 When the contract price is in excess of $1,000,000 but not more than $5,000,000, the penal sum shall be forty percent (40%) of the contract price.

22.2.2.3 When the contract price is more than $5,000,000, the penal sum shall be $2,500,000.

22.3 Any bonds furnished will be furnished by the Contractor to the Government prior to commencement of Contract performance.

23. EQUAL OPPORTUNITY PREAWARD CLEARANCE OF SUBCONTRACTORS (APR 1984). FAR 52.222-28. Notwithstanding the clause of this contract entitled "Subcontractors," the Contractor shall not enter into a first-tier subcontract for an estimated or actual amount of $1 million or more without obtaining in writing from the Contracting Officer a clearance that the proposed subcontractor is in compliance with equal opportunity requirements and therefore is eligible for award.

* * * * *

REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFEROR

1. CERTIFICATES OF INDEPENDENT PRICE DETERMINATION (APR 1985) FAR 52.203-2.

(a) The Offeror certifies that-

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other Offeror or competitor relating to (i) those prices, (ii) the intention to submit an offer, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this offer have not been and will not be knowingly disclosed by the Offeror, directly or indirectly, to any other Offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the Offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory-

(1) Is the person in the Offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above _____

(insert full name of person(s) in the Offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the Offeror's organization);

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the Offeror deletes or modifies subparagraph (a)(2) above, the Offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

2. CONTINGENT FEE REPRESENTATION AND AGREEMENT (APR 1984) FAR 52.203-4.

(a) Representation. The Offeror represents that, except for full-time bona fide employees working solely for the Offeror, the Offeror-

(Note: The Offeror must check the appropriate boxes. For interpretation or the representation, including the term "bona fide employee," see Subpart 3.4 of the Federal Acquisition Regulation.)

(1) ☐ has, ☐ has not employed or retained any person or company to solicit or obtain this contract; and

(2) ☐ has ☐ has not paid or agreed to pay to any person or company employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

(b) Agreement. The Offeror agrees to provide information relating to the above Representation as requested by the Contracting Officer and, when subparagraph (a)(1) or (a)(2) is answered affirmatively, to promptly submit to the Contracting Officer-

(1) A completed Standard Form 119, Statement of Contingent or Other Fees, (SF 119); or

(2) A signed statement indicating that the SF 119 was previously submitted to the same contracting office, including the date and applicable solicitation or contract number, and representing that the prior SF 119 applies to this offer or quotation.

3. TYPE OF BUSINESS ORGANIZATION-SEALED BIDDING (APR 1985) FAR 52.214-2.

The bidder, by checking the applicable box, represents that it operates as
☐ a corporation incorporated under the laws of the State of _____,
☐ an individual, ☐ a partnership,
☐ a nonprofit organization, or ☐ a joint venture.

4. PARENT COMPANY AND IDENTIFYING DATA (APR 1984) FAR 52.214-8.

(a) A "parent" company, for the purpose of this provision, is one that owns or controls the activities and basic business policies of the bidder. To own the bidding company means that the parent company must own more that 50 percent of the voting rights in that company. A company may control a bidder as a parent even though not meeting the requirement for such ownership if the parent company is able to formulate, determine, or veto basic policy decisions of the Offeror through the use of dominant minority voting rights, use of proxy voting or otherwise.

(b) The bidder ☐ is, ☐ is not (check applicable box) owned or controlled by a parent company.

(c) If the bidder checked "is" in paragraph (b) above, it shall provide the following information:

Name and Main Office Address of Parent Company (including Zip Code)	Parent Company's Employer's Identification Number

(d) If the bidder checked "is not" in paragraph (b) above, it shall insert its own Employer's Identification Number on the following line _____.

5. SMALL BUSINESS CONCERN REPRESENTATION (APR 1984) FAR 52.219-1.

The Offeror represents and certifies as part of its offer that it ☐ is, ☐ is not a small business concern and that ☐ all, ☐ not all supplies to be furnished will be manufactured or produced by a small business concern in the United States, its possessions, or Puerto Rico. "Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the size standards in this solicitation.

6. SMALL DISADVANTAGED BUSINESS CONCERN REPRESENTATION (APR 1984) FAR 52.219-2.

(a) Representation. The Offeror represents that it ☐ is, ☐ is not a small disadvantaged business concern.

(b) Definitions.

"Asian-Indian American," as used in this provision, means a United States citizen whose origins are in India, Pakistan, or Bangladesh.

"Asian-Pacific American," as used in this provision, means a United States citizen whose origins are in Japan, China, the Phillipines, Vietnam, Korea, Samoa, Guam, The U.S. Trust Territory of the Pacific Islands, the Northern Mariana Islands, Laos, Cambodia, or Taiwan.

"Native Americans," as used in this provision, means American Indians, Eskimos, Aleuts, and native Hawaiians.

"Small business concern," as used in this provision, means a concern including it affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria and size standards in 13 CFR 121.

"Small disadvantaged business concern," as used in this provision, means a small business concern that (1) is at least 51 percent owned by one or more individuals who are both socially and economically disadvantaged, or publicly owned business having at least 51 percent of its stock owned by one or more socially and economically disadvantaged individuals and (2) has its management and daily business controlled by one or more such individuals.

(c) Qualified Groups. The Offeror shall presume that socially and economically disadvantaged individuals include Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Asian-Indian Americans, and other individuals found to be qualified by the SBA under 13 CFR 124.1.

7. WOMEN-OWNED SMALL BUSINESS REPRESENTATION (APR 1984) FAR 52.219-3.

(a) Representation. The Offeror represents that it ☐ is, ☐ is not a women-owned small business concern.

(b) Definitions.

"Small business concern," as used in this provision, means a concern including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria and size standards in 13 CFR 121.

"Women-owned," as used in this provision, means a small business that is at least 51 percent owned by a woman or women who are U.S. citizens and who also control and operate the business.

8. CERTIFICATION OF NONSEGRATED FACILITIES (APR 1984) FAR 52.222-21.

(a) "Segregated facilities," as used in this provision, means any waiting rooms work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origi because of habit, local custom, or otherwise.

(b) By the submission of this offer, the Offeror certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Offeror agrees that a breach of this certification is a violation of the Equal Opportunity clause in the contract.
(c) The Offeror further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) it will-

(1) Obtain identical certifications from proposed subcontractors before the award of subcontracts under which the subcontractor will be subject to the Equal Opportunity clause;

(2) Retain the certifications in the files; and

(3) Forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES.

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract under which the subcontractor will be subject to the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).
NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

9. PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (APR 1984) FAR 52.222-22.

The Offeror represents that-
(a) It ☐ has, ☐ has not participated in previous contract or subcontract subject either to the Equal Opportunity clause of this solicitation, the clause originally contained in Section 310 of Executive Order No. 10925, or the clause contained in Section 201 of Executive Order No. 11114;
(b) It ☐ has, ☐ has not, filed all required compliance reports; and
(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

10. CLEAN AIR AND WATER CERTIFICATION (APR 1984) FAR 52.223-1.

The Offeror certifies that-
(a) Any facility to be used in the performance of this proposed contract is ☐ , is not ☐ listed on the Environmental Protection Agency List of Violating Facilities;
(b) The Offeror will immediately notify the Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the Environmental Protection Agency, indicating that any facility that the Offeror proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and
(c) The Offeror will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

11. DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER REPORTING (DEC 1980) FAR SUP 52.204-7004.

In the block with its name and address, the Offeror should supply the Data Universal Numbering System (DUNS) Number applicable to that name and address. The DUNS Number should be preceded by "DUNS:". If the Offeror does not have a DUNS Number, it may obtain one from any DUN and Bradstreet branch office. No Offeror should delay the submission of its offer pending receipt of its DUNS Number.

12. PREFERENCE FOR LABOR SURPLUS AREA CONCERNS (APR 1984) FAR 52.220-1.

(a) This acquisition is not set aside for labor surplus area (LSA) concerns. However, the Offeror's status as such a concern may affect (1) entitlement to award in case of tie offers or (2) offer evaluation in accordance with the Buy American Act clause of this solicitation. In order to determine whether the Offeror is entitled to a preference under (1) or (2) above, the Offeror must identify, below, the LSA in which the costs to be incurred on account of manufacturing or production (by the Offeror or the first-tier subcontractors) amount to more than 50 percent of the contract price.

_____

_____

(b) Failure to identify the locations as specified above will preclude consideration of the Offeror as an LSA concern. If the Offeror is awarded a contract as an LSA concern and would not have otherwise qualified for award, the Offeror shall perform the contract or cause the contract to be performed in accordance with the obligations of an LSA concern.

CLAUSES INCORPORATED BY REFERENCE (APR 1984) FAR 52.252-2.

This contract incorporates the following clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting officer will make their full text available.

I. FEDERAL ACQUISITION REGULATIONS (48 CFR CHAPTER 1) CLAUSES.

II. ENGINEER FEDERAL ACQUISITION REGULATION SUPPLEMENT (EFARS) CLAUSES.

III. DEPARTMENT OF DEFENSE FAR SUPPLEMENT (DFARS) (48 CFR CHAPTER 2) CLAUSES.

(End of clause)

These clauses may be obtained from Contracting Division, 300 North Los Angeles Street, Room 6021, Los Angeles, California, 90053-2325.

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Issued by: Department of the Army, Corps of Engineers
Edition of 15 NOV 85

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16.	52.222-3	CONVICT LABOR
17.		DAVIS-BACON ACT
18.	52.222-4	CONTRACT WORK HOURS AND SAFETY STANDARDS ACT--OVERTIME COMPENSATION
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U.S. Department of Labor

GENERAL WAGE DECISION NO. AZ87-2

Supersedes General Wage Decision No. AZ86-2

State: ARIZONA

County(ies): Statewide

Construction Type: Heavy & Highway

Construction Description: Heavy & Highway Construction Projects

Modification Record:

No.	Publication Date	Page No.(s)
1	Jan. 23, 1987	1 thru 4
2	Mar. 6, 1987	1 and 5
3	Mar. 13, 1987	1,2

AZ87-2

	Basic Hourly Rates	Fringe Benefits
BRICKLAYERS; Stonemasons:		
Northern Area:		
Zone A	18.43	3.04
Zone B	19.90	3.04
Zone C	20.83	3.04
Zone D	21.75	3.04
Zone E	22.48	3.04
Zone F	23.96	3.04
Southern Area:		
Zone A:		
Bricklayers; Stonemasons	13.13	2.62
Manhole Builders	13.43	2.62
Zone B:		
Bricklayers; Stonemasons	13.50	2.62
Manhole Builders	13.80	2.62
Zone C:		
Bricklayers; Stonemasons	13.88	2.62
Manhole Builders	14.18	2.62
Zone D:		
Bricklayers; Stonemasons	14.63	2.62
Manhole Builders	14.93	2.62
*CARPENTERS:		
Northern Area:		
Carpenters: Saw Filer	18.625	2.55
Piledrivermen	18.98	2.55
Millwrights	19.29	2.59
Central & Southern Areas:		
Carpenters: Saw Filer	16.125	2.55
Piledrivermen	16.48	2.55
Millwrights	16.29	2.59
CEMENT MASONS:		
Zone 1:		
Northern Area:		
Cement Masons	17.50	3.05
Concrete Troweling Machine; Sawing and Scoring Machine; Curb and Gutter Machine	17.72	3.05
Central & Southern Areas:		
Cement Masons	15.00	3.05
Concrete Troweling Machine; Sawing and Scoring Machine; Curb and Gutter Machine	15.52	3.05
Zone 2:		
Cement Masons	15.43	2.62
Concrete Troweling Machine; Sawing and Scoring Machine; Curb and Gutter Machine; Clary and similar type of power Screed Operator	15.65	2.62
ELECTRICIANS:		
Area 1:		
Electricians	16.81	1.30+ 3.75%
Cable Splicers	18.16	1.30+ 3.75%
Area 2:		
Electricians' Technicians; Cable Splicers:		

Zone A	17.10	1.89+ 3.5%
Zone B	20.22	1.89+ 3.5%
Area 3:	18.24	.80+ 12%
Area 4:		
Electricians on projects having an electrical contract value of less than $20 million	16.00	2.14+ 3%
Electricians on projects having an electrical contract value of $20 million or more	17.95	2.14+ 3%
Area 5:		
Electricians	17.00	1.00+ 11.5%
Cable Splicers	17.25	1.00+ 11.5%
IRONWORKERS:		
Northern Area	19.25	5.60
Southern Area	16.25	5.60
*LABORERS:		
Area 1:		
Group 1	12.69	2.77
Group 2	15.15	2.77
Group 3	15.71	2.77
Group 4	15.97	2.77
Group 5	17.48	2.77
Barricade Setter:		
Placement, removal, transport, and maintenance of the traffic control devices	5.90	1.27
Area 2:		
Group 1	10.19	2.77
Group 2	12.65	2.77
Group 3	13.21	2.77
Group 4	13.47	2.77
Group 5	14.98	2.77
Barricade Setter:		
Placement, removal, transport, and maintenance of the traffic control devices	5.90	1.27
(Tunnel and Shaft Work):		
Area 1:		
Group 1	15.015	2.77
Group 2	15.25	2.77
Group 3	15.43	2.77
Group 4	15.94	2.77
Group 5	16.235	2.77
Area: 2		
Group 1	12.515	2.77
Group 2	12.75	2.77
Group 3	12.93	2.77
Group 4	13.44	2.77
Group 5	13.735	2.77
LINE CONSTRUCTION:		
Zone 1:		
Groundmen	13.41	4.75+ 3.5%
Equipment Operator; Powdermen & Mechanics	15.83	4.75+ 3.5%
Linemen, Crane Operator, Sagger, and Pilot	18.15	4.75+ 3.5%
Cable splicers	18.66	4.75+ 3.5%
Zone 1-A:		

Groundmen	14.41	4.75+ 3.5%
Equipment Operator; Powdermen & Mechanics	16.74	4.75+ 3.5%
Linemen, Crane Operator, Sagger, and Pilot	18.15	4.75+ 3-1/2%
Cable splicers	19.73	4.75+ 3-1/2%
Zone 2:		
Groundmen	15.40	4.75+ 3-1/2%
Equipment Operator; Powdermen & Mechanics	17.74	4.75+ 3-1/2%
Linemen, Crane Operator, Sagger, and Pilot	20.12	4.75+ 3-1/2%
Cable splicers	20.67	4.74+ 3-1/2%
PAINTERS:		
Area 1:		
Zone A:		
Brush	11.60	1.90
Brush, Steel & Bridge	12.10	1.90
Spray	12.05	1.90
Spray, Steel & Bridge	12.60	1.90
Zone B: ($0.75 per hour above Zone A BHR)		
Zone C: ($1.75 per hour above Zone A BHR)		
Zone D: ($2.00 per hour above Zone A BHR)		
Area 2:		
Zone A:		
Brush and Roller; Sandblaster (Nozzleman); Sheetrock Taper; Floor Coverer; Sandblaster (pot tender)	13.54	1.30
Spray; Paperhanger	13.79	1.30
Creosote Applier	13.87	1.30
Swing Stage:		
Brush; Sandblaster	13.94	1.30
Spray	14.19	1.30
Steeplejack	14.40	1.30
Steel and Bridge, Brush; Nozzleman and Pot Tender; Steel (steam cleaner); Electric and Air Tool Operator; Steel Sandblaster	14.67	1.30
Steel Sandblaster	14.67	1.30
Zone B: ($1.00 per hour above Zone A (BHR)		
Zone C: ($2.50 per hour above Zone A BHR)		
Area 3:		
Zone A:		
Brush	12.47	1.77
Spray; Sandblaster	13.07	1.77
Paperhanger	12.60	1.77
Swing Stage, under 40 feet:		
Brush	12.77	1.77
Spray	13.37	1.77
Swing Stage, over 40 feet:		
Brush	13.47	1.77
Spray	14.07	1.77
Structural Steel & Tanks:		
Brush	13.47	1.77

Spray & Sandblasters	14.07	1.77
Creosote Base and Bituminous material	12.87	1.77
Zone B: ($0.75 per hour above Zone A BHR)		
Zone C: ($1.50 per hour above Zone A BHR)		
Zone D: ($2.75 per hour above Zone A BHR)		
*PLUMBERS AND PIPEFITTERS:		
Zone 1	16.50	3.33
Zone 2	18.50	3.33
Zone 3:		
Commercial	16.84	3.38
Industrial	18.34	3.38
POWER EQUIPMENT OPERATORS:		
Area 1:		
Group 1	13.33	3.08
Group 2	15.76	3.08
Group 3	16.32	3.08
Group 4	16.97	3.08
Group 5	17.77	3.08
Group 6	18.56	3.08
Group 7	19.01	3.08
Group 8	19.51	3.08
Group 9	20.41	3.08
Area 2:		
Group 1	10.83	3.08
Group 2	13.26	3.08
Group 3	13.82	3.08
Group 4	14.47	3.08
Group 5	15.27	3.08
Group 6	16.06	3.08
Group 7	16.51	3.08
Group 8	17.01	3.08
GRoup 9	17.91	3.08
TRUCK DRIVERS:		
Area 1:		
Group 1	15.33	2.67
Group 2	15.53	2.67
Group 3	15.86	2.67
Group 4	16.38	2.67
Group 5	16.61	2.67
Group 5A	16.90	2.67
Group 6	17.10	2.67
Group 7	17.70	2.67
Group 8	18.48	2.67
Group 8A	18.62	2.67
Group 8B	18.88	2.67
Area 2:		
Group 1	12.83	2.67
Group 2	13.03	2.67
Group 3	13.36	2.67
Group 4	13.88	2.67
Group 5	14.11	2.67
Group 5A	14.40	2.67
Group 6	14.60	2.67

Group 7	15.20	2.67
Group 8	15.98	2.67
Group 8A	17.12	2.67
Group 8B	16.48	2.67

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

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

AREA DESCRIPTIONS

BRICKLAYERS; STONEMASONS:
Northern Area: Apache, Coconino and Gila Counties; Graham County (west and north of the San Francisco River to the Gila River); Greenlee County (west and north of the San Francisco River to the Gila River); Maricopa, Mohave, and Navajo Counties; Pinal County (north of a boundary line drawn west along the Gila River to the western City limits of Florence, a straight line from the extreme southwestern City limits of Florence to the extreme southern City limits of Coolidge, then a straight line to the extreme southern City limits of Casa Grande, with the line extending to the Maricopa/Pinal County Line); Yavapai, Yuma and La Paz Counties:

Zone A: 0-40 road miles from the City Hall in Phoenix
Zone B: 40-50 road miles from the City Hall in Phoenix
Zone C: 50-75 road miles from the City Hall in Phoenix
Zone D: 75-100 road miles from the City Hall in Phoenix
Zone F: 200 road miles and over from the City Hall in Phoenix

Southern Area: Cochise County; Graham County (east and south of the San Francisco River to the Gila River); Greenlee County (east and south of the San Francisco River to the Gila River); Pima County; Pinal County (south of a boundary line drawn west along the Gila River to the western City limits of Florence, a straight line from the extreme southwestern City limits of Florence to the extreme southern City limits of Coolidge, then a straight line to the extreme southern City limits of Casa Grande, with the line extending to the Maricopa/Pinal County Line); Santa Cruz Counties:

Zone A: 0-15 road miles from Tucson City limits
Zone B: 15-30 road miles from Tucson City limits
Zone C: 30-40 road miles from Tucson City limits
Zone D: Over 40 road miles from Tucson City limits

CARPENTERS:
Northern Area: Area north of a straight line drawn between a point 35 miles due north of the City Hall in Flagstaff and a point 35 miles due north of the City Hall in Kingman, extending to the Arizona/Nevada State Line on the west; and connecting to a point 35 miles due north of the City Hall in Holbrook, thence due east to the intersection of the Arizona/New Mexico State Line
Central and Southern Areas: All areas not included in the Northern Area

CEMENT MASONS:
Zone 1: Apache, Coconino, and Gila Counties; Graham County (north of Sentinel-Casa Grande-Safford Line); Greenlee County (north of Sentinel-Casa Grande-Safford Line); Maricopa County (north of Sentinel-Casa Grande-Safford Line); Mohave, and Navajo Counties; Pinal County (north of Sentinel-Casa Grande-Safford Line); Yavapai, Yuma and La Paz Counties:

NORTHERN AREA: Area North of a straight line drawn between a point 35 miles due north of the City Hall in Flagstaff and a point 35 miles due north of the City Hall in Kingman, extending to the Arizona/Nevada State Line on the west and connecting to a point 35 miles due north of the City Hall in Holbrook, thence due east to the intersection of the Arizona/New Mexico State Line.

CENTRAL and SOUTHERN AREAS: All Areas not included in the NORTHERN AREA

Zone 2: Southern parts of Cochise, Graham, Greenlee, Maricopa, and Pinal Counties; Pima and Santa Cruz Counties

ELECTRICIANS:
Area 1: Apache County (north of Highway #66)
Area 2: Coconino County; Navajo County (north and west of a boundary line beginning at a point where Clear Creek crosses the Coconino/Navajo County Line and then extending in a northeasterly direction along Clear Creek and northeasterly to Cottonwood Wash, along Cottonwood Wash extending northeasterly to where it intersects the Navajo Indian Reservation, then easterly along the Navajo Indian Reservation boundary line to a point where it intersects the Navajo/Apache County Line):

Zone A: 5 miles north-south, east and west of the Post Offices of Williams, Sedona, and Winslow

Zone B: Remainder of Area 2 not covered by Zone A

Area 3: Apache County (south of Highway #66); Gila County; Navajo County (south and east of a boundary beginning at a point where Clear Creek crosses the Coconino/Navajo County Line, then extending in a northeasterly direction along Clear Creek and northeasterly to Cottonwood Wash, along Cottonwood Wash extending northeasterly to where it intersects the Navajo Indian Reservation, then easterly along the Navajo Indian Reservation boundary line to a point where it intersects the Navajo/Apache County Line); Pinal County (north of the line, "First Standard Parallel South" and east of the line "Second Guide Meridian East")
Area 4: Maricopa and Mohave Counties; Pinal County (north and west of the boundary line beginning at a point where the Papago Indian Reservation Road #15 crosses the Pima/Pinal County Line, then extending in a northeasterly direction on the Papago Indian Reservation Road #15 to the intersection with the Florence Canal, north and east on the Florence Canal to the intersection with the line, "Second Guide Meridian East", then north to the Pinal/Maricopa County Line); Yavapai County
Area 5: Cochise, Graham, Greenlee, and Pima Counties; Pinal County (south and east of the boundary line beginning at a point where the Papago Indian Reservation Road #15 crosses the Pima/Pinal County Line, then extending in a northeasterly direction on the Florence Canal, north and east on the Florence Canal to the intersection

with the line, "Second Guide Meridian East", then north to the line, "First Standard Parallel South", and along that line to the Graham/Pinal County Line); Santa Cruz, Yuma, and La Paz Counties

IRONWORKERS:
Northern Area: Area from a line 10 miles north and parallel to Highway #66, north to the Arizona-Utah border and from the Arizona-California border east to the Arizona New Mexico border
Southern Area: All Areas not included in the Northern Area

LINE CONSTRUCTION:
Zone 1: Phoenix and Tucson 30 miles radius from the center of Town; Area within 10 mile radius from the City Hall in Yuma
Zone 1-A: Flagstaff, Globe, and Kingman; and 10 mile radius from the center of Town
Zone 2: Other areas not covered by Zone 1 and Zone 1-A

PAINTERS:
Area 1: Apache, Coconino, Navajo, and Yavapai Counties (north of Woodruff/Camp Wood Line); Mohave County (north of a line following the Geodetic Hualapai Boundary Line to the Colorado River, a distance of 23 miles east of Pierce Ferry and then intersecting the Arizona/Nevada State Line):
- Zone A: 0-20 road miles from Courthouse in Flagstaff
- Zone B: 20-35 road miles from Courthouse in Flagstaff
- Zone C: 35-80 road miles from Courthouse in Flagstaff
- Zone D: 80 road miles and over from Courthouse in Flagstaff

Area 2: Apache, Coconino, Navajo, and Yavapai Counties (south of the Woodruff/Camp Wood Line); Gila, Graham, Greenlee, Maricopa, and Pinal Counties (north of 33rd Parallel); Mohave County (south of a line following the Geodetic Hualapai Boundary Line to the Colorado River, a distance of 23 miles east of Pierce Ferry and then intersecting the Arizona/Nevada State Line):
- Zone A: 0-40 paved road miles from Courthouse in Phoenix; also, Luke and Williams Air Force Bases
- Zone B: 41-60 paved road miles from Courthouse in Phoenix
- Zone C: 61 paved road miles and over from Courthouse in Phoenix

Area 3: Cochise County; Graham, Greenlee, Maricopa and Pinal Counties (south of 33rd Parallel); Pima, Santa Cruz, Yuma, and La Paz Counties:
- Zone A: 0-30 paved road miles from Stone and Congress in Tucson or from the County Courthouse in Yuma
- Zone B: 31-40 paved road miles from Stone and Congress in Tucson or from the County Courthouse in Yuma
- Zone C: 41-50 paved road miles from Stone and Congress in Tucson or from the County Courthouse in Yuma
- Zone D: 51 paved road miles and over from Stone and Congress in Tucson or from the County Courthouse in Yuma

PLUMBERS & PIPEFITTERS

ZONE 1

Base points shall be: Phoenix--the intersection of Central Avenue and Jefferson Street; Flagstaff, Yuma, Kingman, Prescott, Havasu City and Winslow -- the main Post Office building in each city. The "Free Zone" (Zone No. 1) from Phoenix shall be 40 miles from the stated base point. The Free Zone from Flagstaff, Yuma, Kingman, Prescott, Havasu City and Winslow shall be 20 road miles from the stated base point. In addition, all areas within the city limits of Phoenix, Chandler, Scottsdale, Tempe, Glendale, Mesa and Gilbert, as well as that area bordered or encompassed by Apache Trail on the north, Higley Road on the east, Elliott Road on the south and Arizona Avenue on the west, and Sun City West will be included as Free Zones. Any work contracted for outside of these Free Zones will be determined from the Phoenix base point.

ZONE 2
Pay Zone shall refer to all jobs outside of the Free Zones listed above.

ZONE 3
Seven Southern Counties of Arizona: Pima, Gila, Pinal, Graham, Greenlee, Santa Cruz, and Cochise

LABORERS; POWER EQUIPMENT OPERATORS; and TRUCK DRIVERS:
Area 1: Area north of a straight line drawn between a point 35 miles due north of the City Hall in Flagstaff and a point 35 miles due north of the City Hall in Kingman, extending to the Arizona/Nevada State Line on the west; and connecting to a point 35 miles due north of the City Hall in Holbrook, thence due east to the intersection of Arizona/New Mexico State Line
Area 2: All Areas not included in Area 1

GROUP DESCRIPTIONS

LABORERS

Group 1: Laborer, General or Construction; Tool Dispatcher or Checker; Manually Controlled Signal Operator; Fence Builder; Guard Rail Builder - highway; Chat Box Man; Dumpman and/or Spotter; Rip Rap Stone Man; Rock Slinger; Head Rock Slinger ($.25); Form Stripper; Packing Rod Steel and Form Stripper; Packing Rod Steel and Pans; Cesspool Diggers and Installers; Astro Turf Layer; Clean Up - Bull Gang Trackman; Railroad Chipper (clearing and grubbing); Kettleman - Tarman; Spikers; Wrenchers - Creosote Tieman; Floor Sanders - Concrete; Sandblaster (Pot Tender); Powderman Tender; Fire Grader; All Tenders not herein Separately classified; Window Cleaner Flaggers

Group 2: Chuck Tender (except tunnel); Concrete Laborer (belt, pipe and/or Hoseman); Cement Mason Tender; Cutting Torch Operator; Power-type Concrete Buggy; Bander

Group 3: Guinea Chaser; Operator and Tender of Pneumatic and Electric Tools; Concrete Vibrating Machines, Chain Saw Machines (on clearing and grubbing); Hydraulic Jacks and similar mechanical tools not separately herein classified; Pipe Caulker and/or Backup

Man - Pipeline; Rigger and Signal Man - Pipeline; Pipe Wrapper; Cribber; Shorer (except tunnel); Pneumatic Gopher; Pre-cast, Manhole Erector

Group 4: Asphalt Raker and Ironer; Air and Water Washout Nozzleman (low and high pressure); Scaler (using Bos n's Chair or Safety Belt); Tamper (mechanical - all types); Sandblaster (Nozzleman); Concrete Saw (hand-guided); Concrete Cutting Torch; Gunite (Gunman, Mixerman, Rodman); Bio-filer; Pressman; Installer; Operator; Hand-guided Trencher and similarly operated equipment; Driller (Jackhammer and/or Pavement Breaker); Grade Setter (pipeline); Pipe Layer (included but not limited to non-metallic transite and plastic pipe, sewer pipe, drain pipe, underground tile pipe and conduit)

Group 5: Drill Doctor and/or Air Tool Repairman; Scaler (Driller); Form Setter and/or Builder; Welder and/or Pipe Layer installing process piping; Driller - Core Diamond, Wagon, Air Track, Joy, Mustang, PR-143, 220 Gardner, Denver, Hydrasonic; Powder Man; Water Blaster Operator

(TUNNEL and SHAFT WORK)

Group 1: Bull Gang, Muckers, Trackman; Dumpmen; Concrete Crew (includes Rodders and Spreaders); Grout Crew; Swamper (Brakeman and Switchmen on tunnel work)

Group 2: Nipper; Chucktender, Cabletender; Vibratorman, Jackhammer, Pneumatic Tools (except Driller)

Group 3: Grout Gunman

Group 4: Timberman, Retimberman - wood or steel blaster, Driller, Powderman; Cherry Pickerman; Powderman - Primer House; Steel Form Raiser and Setter; Kemper and other Pneumatic Concrete Placer Operator; Miner - Finisher; Miners - Tunnel (hand or machine)

Group 5: Diamond Drill

Group 5A: Shaft and Raise Miner Welder

POWER EQUIPMENT OPERATORS

Group 1: Air Compressor Operator; Pump Operator; Conveyor Operator; Generator Operator (all); Power Grizzly Operator; Fireman (all); Welding Machine Operator; Tripper Operator; Concrete Mixer Operator, skip type; Highline Cableway Signalman

Group 2: Oiler; Forklift and Ross Carrier Operator; Skiploader, 1 1/2 cu. yd. and less; Pavement Breaker; Roller Operator (except as otherwise classified); Wheel-type Tractor Operator (Ford-Ferguson type); Slurry Seal Machine Operator (driver Moto-paver); Power Sweeper

Group 3: Self-propelled Chip Spreading Machine Conveyor Operator; Dinky Operator, under 20 ton; Elevator Hoist Operator, Husky and similar

Group 4: Motor Crane Driver; Beltcrete Operator; Curing Machine Operator, Boring Bridge and Texture; Cross Tineing and Pipe Float; Straw Blower; Hydrographic Seeder; Hydrographic Mulcher; Jumbo Finishing Machine; Joint Inserter

Group 5: A-frame Boom Truck or Winch Truck Operator; Grade Checker (excluding Civil Engineer); Multiple Power Concrete Saw Operator; Screed Operator; Stationary Pipe Wrapping and Cleaning Machine Operator; Tugger Operator

Group 6: Aggregate Plant Operator (including crushing, screening, and sand plants, etc.); Asphalt Laydown Machine Operator; Asphalt Plant Mixer Operator; Boring Machine Operator; Concrete Mechanical Tamping, Spreading or Finishing Machine Operator (including Clary, Johnson or similar types); Concrete Pump Operator; Concrete Batch Plant Operator, all types and sizes; Conductor, Brakeman, or Handler; Drilling Machine Operator, all types and sizes except as otherwise classified; Field Equipment Serviceman; Kolman Belt Loader Operator or similar type, with belt width 48" or over; Locomotive Engineer (including Dinky 20 tons weight and over); Moto-paver and similar type equipment Operator; Operating Engineer Rigger; Pneumatic-tired Scraper Operator, up to and including 12 cu. yds. (Turnapull, Euclid, Cat, D.W. Hancock, and similar equipment); Power Jumbo Form Setter Operator; Pressure Grout Machine Operator (as used in heavy engineering construction); Road Oil Mixing Machine Operator; Roller Operator, on all type asphalt pavement; Self-propelled Compactor, with blade; Skip Loader Operator, all types with a rated capacity over 1-1/2 but less than 4 cu. yds.; Slip Form Operator (power driven lifting device for concrete forms); Soil Cement Road Mixing Machine Operator, single pass type; Stationary Central Generating Plant Operator, rated 300 K.W. or more; Surface Heater and Planer Operator; Traveling Pipewrapping Machine Operator

Group 7: Pneumatic-tired Scraper Operator, all sizes and types over 12.cu. yds. MRC (Turnapull, Euclid, Cat, D.W. Hancock and similar equipment); Tractor Operator (Pusher, Bulldozer, Scraper); Trenching Machine Operator

Group 8: Asphalt or Concrete Planing, Rotomill, and Milling Machine Operator; Auto Grade Machine Operator (CMI and similar equipment); Boring Machine Operator (including Mole, Badger and similar type); Concrete Mixer Operator, paving type and Mobile Mixers; Concrete Pump Operator, with boom attached (truck mounted); Crane Operator, Crawler and Pneumatic type under 100 ton capacity MRC; Crawler-type Tractor Operator, with boom attachment or Slope Bar; Derrick Operator; Forklift Operator for hoisting personnel; Gradall Operator; H.D. Mechanic and/or Welder; Helicopter Hoist Operator; Highline Cableway Operator (less than 20 tons rated capacity); Mass Excavator Operator (150 Bucyrus Erie and similar types); Mechanical Hoist Operator (two or more drums); Motor Grader Operator, any type power blade; Motor Grader Operator, with Elevating Grader attachment; Mucking Machine Operator; Overhead Crane Operator; Piledriver Engineer (portable, stationary or skid rig); Pneumatic-tired Scraper Operator, all sizes and types (Turnapull, Euclid, Cat, D.W. Hancock and similar equipment over 45 cu. yds. MRC); Power driven Ditch Lining or Ditch Trimming Machine Operator; Skip Loader Operator, all

types rated capacity 4 cu. yds. but less than 8 cu. yds.; Slip Form Paving Machine Operator (including Gunnert, Zimmerman and similar types); Specialized Power Digger Operator, attached to wheel-type tractor; Tower Crane (or similar type) Operator; Tugger Operator (two or more); Universal Equipment Operator, Shovel, Backhoe, Dragline, Clamshell, etc., up to 8 cu. yds.

Group 9: Crane Operator, Pneumatic or Crawler, 100 ton hoisting capacity and over MRC rating; Helicopter Pilot, FAA qualified, when used in construction work other than executive travel and single casual rental; Highline Cableway Operator, over 20 ton rated capacity and using Traveling Head and Tail Tower; Remote-control Earth Moving Equipment Operator; Skip Loader Operator, all types with rated capacity of 8 cu. yds. or more; Universal Equipment Operator, Shovel, Backhoe, Dragline, Clamshell, etc., 8 cu. yds. and over

TRUCK DRIVERS

Group 1: Teamsters; Pick-ups; Station Wagon; Man Haul Driver

Group 2: Dump or Flatrack (2 or 3 axle); Water Truck (under 2500 gallons); Buggymobile (1 cu. yd. or less); Bus Driver; Self-propelled Street Sweeper; Shop Greaser

Group 3: Dump or Flatrack (4 axle); Dumptor or Dumpster (less than 7 cu. yds.); Water Truck (2500 gallons but less than 4000 gallons); Tireman

Group 4: Dumptor or Dumpster (7 cu. yds. but less than 16 cu. yds); Dump or Flatrack (5 axle); Water Truck (4000 gallons and over); Slurry type equipment Driver or Leverman; Vacuum Pump Truck Drivers; Flaherty Spreader or similar type equipment or Leverman; Transit Mix (8 cu. yds. or less mixer capacity); Ambulance Driver

Group 5: Dump or Flatrack (6 axle); Transit Mix (over 8 cu. yds. but less than 10.5 cu. yds.); Rock Truck (i. e. Dart, Euclid and other similar type end dumps, single unit) less than 16 cu. yds.

Group 5A: Oil Tanker or Spreader and/or Bootman, Retortman or Leverman

Group 6: Transit Mix (over 10.5 cu. yds. but less than 14 cu. yds. mixer capacity); Ross Carrier, Fork Lift or Lift Truck; Hydro Lift, Swedish Crane, Iowa 300 and similar types; Concrete Pump (when integral part of Transit Mix Truck); Dump or Flatrack (7 axle); Transport Driver (unless axle rating results in hugher classification)

Group 7: Dump or Flatrack (8 axle)

Group 8: Off-highway equipment Driver including but not limited to: 2 or 4 wheel power unit, i.e Cat, DW Series, Euclid, International and similar type equipment transporting material when top loaded or by external means including pulling Water Tanks, Fuel Tanks or other applications under Teamster Classifications; Rock truck (Dart, Euclid, or other similar end dump types) 16 cu. yds. and over; Ejectalls; Dumptor or Dumpster (16 cu. yds. and over); Dump or Flatrack

(9 axle)

Group 8A: Heavy-duty Mechanic/Welder; Body and Fender Man

Group 8B: Field Equipment Servicemen or Fuel Truck Driver

Reference: DACW09-87-R-0010

SPECIFICATIONS

for

AGUA FRIA RIVER LEVEES
MARICOPA COUNTY, ARIZONA

Authority: Public Law 89-298, Flood Control Act of 1965

Appropriation: 96 x 8122, Construction, General
96 x 8862, Contributed Funds, Required
96 x 8862, Contributed Funds, Other

Corps of Engineers, Civil

US Army Corps of Engineers
Los Angeles District

SPECIAL CLAUSES

Index

1. COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (1984 APR) FAR 52.212-3. The Contractor shall be required to (a) commence work under this contract within 5 calendar days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than 180 calendar days after the date of receipt of notice to proceed, except for seeding and planting. Seeding and planting shall be completed as soon as practicable and within the time limits stated in the Technical Provisions or as directed by the Contracting Officer. The time stated for completion shall include final cleanup of the premises.

2. LIQUIDATED DAMAGES-CONSTRUCTION (APR 1984) FAR 52.212-5.

2.1 If the Contractor fails to complete the work within the time specified in the contract, or any extensions, the Contractor shall pay to the Government as liquidated damages, the sum of $750.00 for each day of delay.

2.2 If the Government terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Government in completing the work.

2.3 If the Government does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

3. CONTRACT DRAWINGS AND SPECIFICATIONS. (JAN 1985) (DFARS 52.236-7002).

3.1 Ten sets of large scale contract drawings and specifications will be furnished the Contractor without charge, except applicable publications incorporated into the Technical Provisions by reference. Additional sets will be furnished on request at the cost of reproduction. The work shall conform to the contract drawings which form a part of these specifications and are available in the office of the U.S. Army Engineer District, Los Angeles, 300 North Los Angeles Street, Los Angeles, California. The list of drawings set out in the following drawing is hereby incorporated by reference into the contract:

District File No.	Index To Contract Drawings
252/203	

3.2 Omissions from the drawings or specifications or the misdescription of details of work which are manifestly necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work but they shall be performed as if fully and correctly set forth and described in the drawings and specifications.

3.3 The Contractor shall check all drawings furnished him immediately upon their receipt and shall promptly notify the Contracting Officer of any discrepancies. Figures marked on drawings shall in general be followed in preference to scale measurements. Large scale drawings shall in general govern small scale drawings. The Contractor shall compare all drawings and verify the figures before laying out the work and will be responsible for any errors which might have been avoided thereby.

4. SUBMITTALS. (ER 415-1-10)

4.1 General. Reference is made to the CONTRACT CLAUSE: SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION. The Contractor shall submit for approval all shop drawings, certificates of compliance, equipment data, and/or material samples called for by these specifications.

4.2 Submittal Register. Within 15 days after receipt of notice to proceed, the Contractor shall complete and submit to the Contracting Officer, in duplicate, Submittal Register, ENG FORM 4288, listing all submittals required under the contract (including the Contract Clauses, the Special Clauses, and the Technical Provisions and dates of submittals. In addition to those items listed on ENG FORM 4288, the Contractor shall furnish submittals for any proposed deviations from the plans or specifications. The scheduled need dates shall be recorded on the Register for each item for control purposes. In preparing the Register, adequate time (a minimum of 30 days) shall be allowed for review and approval and possible resubmittal. Scheduling shall be coordinated with the approved progress schedule. The Contractor's Quality Control Representative shall review the Register at least every 30 days and take appropriate action to maintain an effective system. Copies of updated or corrected Registers shall be submitted to the Contracting Officer at least every 60 days in the quantity specified. Payment will not be made for any material or equipment which does not comply with contract requirements.

4.2.1 The attached submittal register is a minimum listing of the submittals that the Contractor shall submit to the Contracting Officer. The Contractor shall complete those columns in the submittal register (ENG Form 4288) entitled "NAS Activity Code," "Submital Identification Number," and "Contractor Schedule Dates." The Contractor shall coordinate the submittal register with the specific detailed requirements of the Technical Provisions of the contract. In the case of conflict between the submittal register and the Technical Provisions of this contract, the requirements of the Special Clauses shall govern.

4.2.2 The listing of submittals in the Submittal Register shall not relieve the Contractor from providing additional submittals required by the Contracting Officer under the Provisions of the Contract Clauses.

4.3 Transmittals. The Contractor shall complete ENG FORM 4025, "Transmittal of Shop Drawings, Equipment Data, Material Samples, or Manufacturer's Certificates of Compliance" with each set of shop drawings, certificates, equipment data or

samples submitted. Blank ENG FORM 4025 will be furnished by the Contracting Officer on request. Six (6) copies of each submittal will be required.

4.4 Shop Drawings. The Contractor shall submit to the Contracting Officer for approval 10 copies of all shop drawings called for by these specifications. One set will be returned to the Contractor.

4.5 Certificates of Compliance (1969 MAY OCE). Any certificates required for demonstrating proof of compliance of materials with specification requirements shall be executed in 6 copies. Each certificate shall be signed by an official authorized to certify in behalf of the manufacturing company and shall contain the name and address of the Contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the Contractor from furnishing satisfactory material, if, after tests are performed on selected samples, the material is found not to meet the specific requirements.

4.6 Resubmittals. If a submittal is returned for correction or is not satisfactory and is disapproved by the Contracting Officer, the Contractor shall resubmit the corrected material, in the same quantity, as specified for the original submittal, for approval within 14 days after receipt of the disapproved material.

5. PHYSICAL DATA (APR 1984) FAR 52.236-4. Data and Information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

5.1 The indications of physical conditions on the drawings and in the specifications are the result of site investigations by topographic surveys and as-built drawings.

5.2 Weather Conditions. The Contractor shall satisfy himself as to the hazards likely to arise from weather conditions. Complete weather records and reports may be obtained from any U.S. National Weather Service.

5.3 Transportation Facilities. The Contractor shall make his own investigation of the condition of available public and private roads, railroads, and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress at the site work. It shall be the Contractor's responsibility to construct and maintain at his own expense, any haul roads required for construction operations.

5.4 Additional Information, including but not necessarily limited to, results of laboratory tests of material encountered in test holes or other explorations and field logs, is available for inspection and study in the office of District Engineer, Geotechnical Branch, 300 N. Los Angeles Street, Los Angeles, California.

6. LAYOUT OF WORK (APR 1984) FAR 52.236-17.

6.1 The Government has established bench marks and horizontal control points at the site of the work. These are described and indicated on contract drawings.

6.2 From these control points, the Contractor shall lay out the work by establishing all lines and grades at the site necessary to control the work and shall be responsible for all measurements that may be required for the execution of the work to the location and limit marks prescribed in the specifications or on the contract drawings.

6.2.1 The above are minimum requirements and the Contractor shall place and establish such additional stakes and markers as may be necessary for control and guidance of his construction operations. All survey data shall be recorded in accordance with standard and approved methods. All field notes, sketches, recordings and computations made by the Contractor in establishing above horizontal and vertical control points shall be available at all times during the progress of the work for ready examination by the Contracting Officer or his duly authorized representative.

6.3 The Contractor shall furnish, at his own expense, all such stakes, spikes, steel pins, templates, platforms, equipment, tools and material, and all labor as may be required in laying out any part of the work from the control points established by the Government. It shall be the responsibility of the Contractor to maintain and preserve all stakes and other markers established by him until authorized to remove them. If any of the control points established at the site by the Government are destroyed by or through the negligence of the Contractor prior to their authorized removal, they may be replaced by the Contracting Officer, and the expense of replacement will be deducted from any amount due or which may become due to the Contractor. The Contracting Officer may require that work be suspended at any time when horizontal and vertical control points established at the site by the Contractor are not reasonably adequate to permit checking the work. Such suspension will be withdrawn upon proper replacement of the control points.

7. QUANTITY SURVEYS (APR 1984) FAR ALT I 52.236-16 (EFARS 52.2/9102(d)).

7.1 Quantity surveys shall be conducted, and the data derived from these surveys shall be used in computing the quantities of work performed and the actual construction completed and in place.

7.2 The Contractor shall conduct the original and final surveys and surveys for any periods for which progress payments are requested. All these surveys shall be conducted under the direction of a representative of the Contracting Officer, unless the Contracting Officer waives this requirement in a specific instance. The Government shall make such computations as are necessary to determine the quantities of work performed or finally in place. The Contractor shall make the computations based on the surveys for any periods for which progress payments are requested.

7.3 Promptly upon completing a survey, the Contractor shall furnish the originals of all field notes and all other records relating to the survey or to the layout of the work to the Contracting Officer, who shall use them as necessary to determine the amount of progress payments. The Contractor shall retain copies of all such material furnished to the Contracting Officer.

8. VARIATION IN ESTIMATED QUANTITIES-SUBDIVIDED ITEMS (1985 JAN HQ USACE) (EFARS 52.2/9109(g)). This clause is applicable only to Item No. 3.

8.1 Variation from the estimated quantity in the actual work performed under any second or subsequent sub-item or elimination of all work under such a second or subsequent sub-item will not be the basis for an adjustment in contract unit price.

8.2 Where the actual quantity of work performed for Item No. 3 is less than 90 percent of the quantity of the first sub-item listed under such item, the Contractor will be paid at the contract unit price for that sub-item for the actual quantity of work performed and, in addition, an equitable adjustment in contract price shall be made upon demand of the Contractor. The equitable adjustment in price for the under-run shall be made on the basis that the Contractor has assumed the risk and is entitled to no adjustment for the first 10 percent under-run.

8.3 If the quantity of work performed under Item No. 3 exceed 105 percent or is less than 96 percent of the total estimated quantity of the sub-items under that item, and/or if the quantity of work performed under the second sub-item or any subsequent sub-item under Item No. 3 exceed 105 percent or is less than 96 percent of the estimated quantity of any such sub-item, and if such variation causes an increase or a decrease in the time required for performance of this contract the contract completion time will be adjusted as follows.

8.3.1 If the quantity variation is such that it will cause an increase in the time necessary for completion, the Contracting Officer shall, upon receipt of a written request for an extension within 10 days from the beginning of such delay or within such further period of time which the Contracting Officer grants prior to the date of final settlement of the contract, ascertain the facts and make such adjustment for extending the completion date as in his judgment the findings justify.

8.3.2 If the quantity variation is such that it will cause a decrease in the time necessary for completion, the Contracting Officer shall ascertain the facts and promptly notify the Contractor in writing of his findings and the extent of adjustment.

8.4 If the parties fail to agree upon the adjustment to be made the dispute shall be determined as provided in the CONTRACT CLAUSE: DISPUTES.

9. EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE. (1985 JAN HQ USACE) (EFARS 52.2/9108(f)).

9.1 Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a Contractor or subcontractor at any tier shall be based on actual cost data when the Government can determine both ownership and operating costs for each piece of equipment or equipment groups of similar serial and series from the Contractor's accounting records. When both ownership and operating costs cannot be determined from the Contractor's accounting records, equipment costs shall be based upon the applicable provisions of EP 1110-1-8, "Construction Equipment Ownership and Operating Expense Schedule," Region VII. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the Contracting Officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in

using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For restrospective pricing, the schedule in effect at the time the work was performed shall apply. For retrospective pricing, the schedule in effect at the time the work was performed shall apply.

9.2 Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36 substantiated by certified copies of paid invoices. Rates for equipment rented from an organization under common control, lease-purchase or sale-leaseback arrangements will be determined using the schedule except that rental costs leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees are allowable. Costs for major repairs and overhaul are unallowable.

9.3 When actual equipment costs are proposed and the total amount of the pricing action is over $25,000, cost or pricing data shall be submitted on Standard Form 1411, "Contract Pricing Proposal Cover Sheet." By submitting cost or pricing data, the Contractor grants to the Contracting Officer or an authorizing representative the right to examine those books, records, documents and other supporting data that will permit evaluation of the proposed equipment costs. After price agreement the Contractor shall certify that the equipment costs or pricing data submitted are accurate, complete and current.

10. PERFORMANCE OF WORK BY THE CONTRACTOR (1984 APR) FAR 52.236-1.

10.1 The Contractor shall perform on the site, and with its own organization, work equivalent to at least thirty-five (35) percent of the total amount of work to be performed under the contract. This percentage may be reduced by a supplemental agreement of this contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

11. PERFORMANCE EVALUATION OF CONTRACTOR (1985 JAN HQ USACE) (EFARS 52.2/9006(f)).

11.1 As a minimum, the Contractor's performance will be evaluated upon final acceptance of the work. However, interim evaluation may be prepared at any time during contract performance when determined to be in the best interest of the Government.

11.2 The format for the evaluation will be SF 1421, and the Contractor will be rated either outstanding, satisfactory, or unsatisfactory in the areas of Contractor Quality Control, Timely Performance, Effectiveness of Management, Compliance with Labor Standards, and Compliance with Safety Standards. The Contractor will be advised of any unsatisfactory rating either in an individual element or in the overall rating, prior to completing the evaluation, and all Contractor comments will be made a part of the official record. Performance Evaluation Reports will be available to all DOD Contracting offices for their future use in determining Contractor responsibility, in compliance with DFARS 36.201(C)(1).

12. HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA (APR 1984 FAR 52.223-3).

12.1 The Contractor agrees to submit a Material Safety Data Sheet (Department of Labor Form OSHA-20), as prescribed in Federal Standard No. 313A, for all hazardous material 5 days before delivery of the material, whether or not listed in Appendix A of the Standard. This obligation applies to all materials delivered under this contract which will involve exposure to hazardous materials or items containing these materials.

12.2 "Hazardous material," as used in this clause is as defined in Federal Standard No. 313A, in effect on the date of this contract.

12.3 Neither the requirements of this clause nor any act or failure to act by the Government shall relieve the Contractor of any responsibility or liability for the safety of Government, Contractor, or subcontractor personnel or property.

12.4 The Contractor shall comply with applicable Federal, state, and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with hazardous material.

12.5 The Government's rights in data furnished under this contract with respect to hazardous material are as follows:

12.5.1 To use, duplicate, and disclose any data to which this clause is applicable. The purposes of this right are to (i) apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous materials; (ii) obtain medical treatment for those affected by the material; and (iii) have others use, duplicate, and disclose the data for the Government for these purposes.

12.5.2 To use, duplicate, and disclose data furnished under this clause, in accordance with subparagraph 12.5.1 above, in precedence over any other clause of this contract providing for rights in data.

12.5.3 That the Government is not precluded from using similar or identical data acquired from other sources.

12.5.4 That the data shall not be duplicated, disclosed, or released outside the Government, in whole or in part for any acquisition of manufacturing purpose, if the following legend is marked on each piece of data to which this clause applies-

"This is furnished under United States Government Contract No. _____ and shall not be used, duplicated, or disclosed for any acquisition or manufacturing purpose without the permission of _____. This legend shall be marked on any reproduction of this data."

12.5.5 That the Contractor shall not place the legend or any other restrictive legend or any data which (i) the Contractor or any subcontractor previously delivered to the Government without limitations or (ii) should be delivered without limitations under the conditions specified in the Federal Acquisition Regulation in the clause at 52.227-18, Rights in Data.

12.6 The Contractor shall insert this clause, including this paragraph, with appropriate changes in the designation of the parties, in subcontracts at any tier (including purchase designations or purchase orders) under this contract involving hazardous material.

13. AS-BUILT DRAWINGS. (ER 415-345-38)

13.1 General. The Contractor shall furnish 3 full size sets of as-built blueline prints for use in preparation of as-built drawings by the Government. The as-built prints shall be a record of the construction as installed and completed by the Contractor. They shall include all the information shown on the contract set of drawings and a record of all deviations, modifications, or changes from those drawings, however minor, which were incorporated in the work, all additional work not appearing on the contract drawings, and all changes which are made after final inspection of the contract work. In event the Contractor accomplishes additional work which changes the as-built conditions of the facility after submission of the as-built drawings, the Contractor shall furnish revised and/or additional drawings as required to depict as-built conditions. The requirements for these additional drawings will be the same as for the as-built drawings included in the original submission. The prints shall show the following information, but not be limited thereto:

13.1.1 The location and description of any utility lines or other installations of any kind or description known to exist within the construction area. The location includes dimensions to permanent features.

13.1.2 The location and dimensions of any changes within the building or structure.

13.1.3 Correct grade or alignment of roads, structures or utilities if any changes were made from contract plans.

13.1.4 Correct elevations if changes were made in site grading.

13.1.5 Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

13.1.6 The topography and grades of all drainage installed or affected as a part of the project construction.

13.1.7 All changes or modifications which result from the final inspection.

13.1.8 Options. Where contract drawings or specifications allow options, only the option selected for construction shall be shown on the as-built drawings.

13.1.9 Submittal to Contracting Officer for review and approval. Not later than 2 weeks after acceptance of the project by the Government, the Contractor shall deliver to the Contracting Officer 3 full size sets of blueline prints marked up to depict as-built conditions. If upon review, the drawings are found to contain errors and/or omissions, they shall be returned to the Contractor for corrections. The Contractor shall complete the corrections and return the drawings to the Contracting Officer within ten (10) calendar days.

3.1.10 Preliminary As-Built Prints. The Contractor shall maintain one set of prints to show the as-built conditions. These as-built marked prints shall be kept current and available on the jobsite at all times. All changes from the

contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and neatly recorded as they occur by means of details and notes. The as-built marked prints will be jointly inspected for accuracy and completeness by the Contracting Officer's representative and a responsible representative of the construction Contractor prior to submission of each monthly pay estimate. Information to be included on the preliminary prints shall conform to the requirements of final as-built prints.

14. ENVIRONMENTAL LITIGATION (1974 NOV OCE) (EFARS 52.2/9109(j)).

14.1 If the performance of all or part of the work is suspended, delayed, or interrupted due to an order of a court of competent jurisdiction as a result of environmental litigation, as defined below, the Contracting Officer, at the request of the Contractor, shall determine whether the order is due in any part to the acts or omissions of the Contractor or a subcontractor at any tier not required by the terms of this contract. If it is determined that the order is not due in any part to acts or omissions of the Contractor or a subcontractor at any tier other than as required by the terms of this contract, such suspension, delay, or interruption shall be considered as if ordered by the Contracting Officer in the administration of this contract under the terms of the CONTRACT CLAUSE: SUSPENSION OF WORK. The period of such suspension, delay or interruption shall be considered unreasonable, and an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) as provided in that clause, subject to all the provisions thereof.

14.2 The term "environmental litigation", as used herein, means a lawsuit alleging that the work will have an adverse effect on the environment or that the Government has not duly considered, either substantively or procedurally, the effect of the work on the environment.

15. TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER. (DAEN-ECC-Q LTR 3 APR 84)

15.1 This provision specifies the procedure for the determination of time extensions for unusually severe weather in accordance with the CONTRACT CLAUSE: DEFAULT. The listing below defines the monthly anticipated adverse weather for the contract period and is based upon NOAA or similar data for the geographical location of the project.

MONTHLY ANTICIPATED ADVERSE WEATHER CALENDAR DAYS

Element	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Precp. .10"	2	2	1	0	0	0	0	2	2	1	1	2	15
Temp 32°F	7	4	1	0	0	0	0	0	0	0	2	6	20
Total days	9	6	2	0	0	0	2	2	2	1	3	8	35

15.2 Determination.

15.2.1 The above schedule of anticipated adverse weather will constitute the base line for monthly (or portion thereof) weather time evaluations. Upon acknowledgment of the notice to proceed and continuing throughout the contract on a monthly basis, actual adverse weather days will be recorded on a calendar day basis (including weekends and holidays) and compared to the monthly anticipated

adverse weather in subparagraph 15.1 above. For purposes of subparagraph 15.2, the term actual adverse weather days shall include days impacted by actual adverse weather days.

15.2.2 The number of actual adverse weather days shall be calculated chronologically from the first to the last day in each month. Once the number of actual adverse weather days anticipated in subparagraph 15.1 above have been incurred, the Contracting Officer will examine any subsequently occurring adverse weather days to determine whether a Contractor is entitled to a time extension. These subsequently occurring adverse weather days must prevent work for 50 percent or more of the Contractor's work day and delay work critical to the timely completion of the project. The Contracting Office will convert any delays to meeting the above requirements to calendar days and issue a modification in accordance with the CONTRACT CLAUSE: DEFAULT.

15.3 The Contractor's schedule must reflect the above anticipated adverse weather delays on all weather dependent activities.

16. DAMAGE TO WORK (1966 MAR OCE). The responsibility for damage to any part of the permanent work shall be as set forth in the CONTRACT CLAUSE: PERMITS AND RESPONSIBILITIES. However, if, in the judgment of the Contracting Officer, any part of the permanent work performed by the Contractor is damaged by flood or earthquake, which damage is not due to the failure of the Contractor to take reasonable precautions or to exercise sound engineering and construction practices in the conduct of the work, the Contractor will make the repairs as ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. If, in the opinion of the Contracting Officer, there are no contract unit or lump sum prices applicable to any part of such work an equitable adjustment pursuant to CONTRACT CLAUSE: CHANGES, will be made as full compensation for the repairs of that part of the permanent work for which there are no applicable contract unit or lump sum prices. Except as herein provided, damage to all work (including temporary construction), utilities, materials, equipment and plant shall be repaired to the satisfaction of the Contracting Officer at the Contractor's expense, regardless of the cause of such damage.

17. CONTINUING CONTRACTS (1977 OCT OCE).

17.1 This is a continuing contract, as authorized by Section 10 of the River and Harbor Act of September 22, 1922 (33 U.S. Code 621). The payment of some portion of the contract price is dependent upon reservations of funds from future appropriations. The responsibilities of the Government are limited by this clause notwithstanding any contrary provision of the CONTRACT CLAUSE: PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS or any other clause of this contract.

17.2 The sum of $1,500,000 has been reserved for this contract and is available for payments to the Contractor during the current fiscal year. It is expected that Congress will make appropriations for future fiscal years from which additional funds will be reserved for this contract.

17.3 Failure to make payments in excess of the amount currently reserved, or that may be reserved from time to time, shall not entitle the Contractor to a price adjustment under the terms of this contract except as specifically provided in paragraphs 17.6, 17.7, 17.8, and 17.9 below. No such failure shall constitute a

breach of this contract, except that this provision shall not bar a breach-of-contract action if an amount finally determined to be due as a termination allowance remains unpaid for one year due solely to a failure to reserve sufficient additional funds therefor.

17.4 The Government may at any time reserve additional funds for payments under the contract if there are funds available for such purpose. The Contracting Officer will promptly notify the Contractor in writing of any additional funds reserved for the contract.

17.5 If earnings will be such that funds reserved for the contract will be exhausted before the end of the fiscal year, the Contractor shall give written notice to the Contracting Officer of the estimated date of exhaustion and the amount of additional funds which will be needed to meet payments due or to become due under the contract during that fiscal year. This notice shall be given not less than 45 nor more than 60 days prior to the estimated date of exhaustion.

17.6 No payments will be made after exhaustion of funds except to the extent that additional funds are reserved for the contract. The Contractor shall be entitled to simple interest on any payment that the Contracting Office detemines was actually earned under the terms of the contract and would have made except for exhaustion of funds. Interest shall be computed from the time such payment would otherwise have been made until actually or constructively made, and shall be at the rate established by the Secretary of the Treasury pursuant to Public Law 92-41, 85 STAT 97, for the Renegotiation Board, as in effect on the first day of the delay in such payment.

17.7 Any suspension, delay, or interruption of work arising from exhaustion or anticipated exhaustion of funds shall not constitute a breach of this contract and shall not entitle the Contractor to any price adjustment under the CONTRACT CLAUSE: SUSPENSION OF WORK or in any other manner under this contract.

17.8 An equitable adjustment in performance time shall be made for any increase in the time required for performance of any part of the work arising from exhaustion of funds or the reasonable anticipation of exhaustion of funds.

17.9 If, upon the expiration of sixty (60) days after the beginning of the fiscal year following an exhaustion of funds, the Government has failed to reserve sufficient additional funds to cover payments otherwise due, the Contractor, by written notice delivered to the Contracting Officer at any time before such additional funds are reserved, may elect to treat his right to proceed with the work as having been terminated. Such a termination shall be considered a termination for the convenience of the Government.

17.10 If at any time it becomes apparent that the funds reserved for any fiscal year are in excess of the funds required to meet all payments due or to become due the Contractor because of work performed and to be performed under the contract during the fiscal year, the Government reserves the right, after notice to the Contractor, to reduce said reservation by the amount of such expenses.

* * * * *

TABLE OF CONTENTS

TECHNICAL PROVISIONS

* * * * *

SECTION 1A

GENERAL REQUIREMENTS

Index

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

1.1 Federal Specifications (Fed. Spec.).

FF-B-575C	Bolts, Hexagon and Square
FF-N-105B & Am-3	Nails, Brads, Staples and Spikes: Wire, Cut and Wrought
FF-N-836D & Am-1	Nut: Square, Hexagon, Cap, Slotted, Castle, Knurled, Welding and Single Ball Seat
MM-L-751H	Lumber; Softwood
TT-E-529F	Enamel, Alkyd, Semi-Gloss
TT-P-25E & Am-2	Primer Coating, Exterior (Undercoat for Wood, Ready-Mixed, White and Tints)

1.2 U.S. Department of Commerce National Bureau of Standards, Product Standard (Prod. Std).

PS 1-74	Construction and Industrial Plywood

2. PROJECT FACILITIES. The Contractor shall construct and/or erect the following project facilities.

2.1 Construction Signs. The signs shall be erected as soon as possible and within 15 days after commencement of work under this contract.

2.1.1 Six project signs at location designated by the Contracting Officer.

2.1.2 Warning Signs facing approaching traffic on all haul roads crossing under overhead power transmission lines.

2.1.3 Hard hat signs at locations directed.

2.2 Project Engineer's Office including a fenced parking area.

2.3 Bulletin Board at the Contractor's office.

2.4 Sanitary Facilities.

3. CONSTRUCTION SIGNS.

3.1 Materials.

3.1.1 Lumber shall conform to Fed. Spec. MM-L-751, and shall be seasoned Douglas Fir, S4S, Grade D or better except that posts, braces and spacers shall be construction Grade (WCLB).

3.1.2 Plywood shall conform to Prod. Std. PS 1, grade A-C, Group 1, exterior type.

3.1.3 Bolts, Nuts and Nails. Bolts shall conform to Fed. Spec. FF-B-575, nuts shall conform to Fed. Spec. FF-N-836, and nails shall conform to Fed. Spec. FF-N-105.

3.1.4 Paints and Oils. Paints shall conform to Fed. Spec. TT-P-25 for primer and TT-E-529 for finish paint and lettering.

3.2 Construction.

3.2.1 Project and hard hat signs shall be constructed as detailed on Figures 1, 1a, 2 and 3. Decals and safety signs will be furnished by the Contracting Officer.

3.2.2 Warning Signs shall be constructed of plywood not less than 1/2 inch thick and shall be securely bolted to the supports with the bottom of the sign face 3 feet above the ground. The sign face shall be 2 x 4 feet, all letters shall be 4 inches in height, and the wording shall be: "WARNING: OVERHEAD TRANSMISSION LINES."

3.3 Painting. All exposed surfaces and edges of plywood shall be given one coat of linseed oil and be wiped prior to applying primer. All exposed surfaces of signs and supports shall be given one coat of primer and 2 finish coats of white paint. Except as otherwise indicated, lettering on all signs shall be black and sized as indicated.

4. PROJECT ENGINEER'S OFFICE.

4.1 General. The Contractor shall provide a suitable office trailer or building for the Project Engineer. The exact site will require the Contracting Officer's approval. The trailer or building shall be adequately heated, well lighted, suitably ventilated, and cooled with an exterior mounted air-conditioner, complete, with all piping and electrical connections. An adequate supply of cooled drinking water shall be furnished and maintained. Open parking space for 6 vehicles and water and sanitary facilities shall be located convenient to the office. The combined parking and building area shall be enclosed with a woven wire fence approximately 6 feet high with a 10-foot wide lockable gate accessible

from a road or street. The fenced area shall be of sufficient size to permit ease in the parking of vehicles. Materials for the facilities need not be new provided they are adequate for the intended use.

4.2 Office Trailer shall be approximately 10 feet wide by 40 feet in length.

5. BULLETIN BOARD. A weatherproof bulletin board, approximately 36 inches wide and 30 inches high, with hinged glass door shall be provided adjacent to or mounted on the Contractor's project office. If adjacent to the office, the bulletin board shall be securely mounted on no less than 2 posts. Bulletin board and posts shall be painted or have other approved factory finish. The bulletin board shall be easily accessible at all times and shall contain wage rates, equal opportunity notice, and such other items required to be posted.

6. MAINTENANCE AND DISPOSAL OF PROJECT FACILITIES. The Contractor shall maintain the project facilities in good condition throughout the life of the contract. Upon completion of work under this contract, the facilities covered under this section will remain the property of the Contractor and shall be removed from the site at his expense.

7. SCRAP MATERIAL. Materials indicated to be removed and not indicated to be salvaged, stored or reinstalled are designated as scrap and shall become the property of the Contractor and be removed from the site of work. The Contractor by signing this contract hereby acknowledges that he made due allowance for value, if any, of such scrap in the contract price.

8. ARCHEOLOGICAL FINDINGS DURING CONSTRUCTION. Should the Contractor or any of his employees in the performance of this contract find or uncover any archeological remains, he shall notify the Project Engineer immediately. Such notifications will be a brief statement in writing giving the location and nature of the findings. Should the discovery site require archeological studies resulting in delays and/or additional work, the Contractor will be compensated by an equitable adjustment under the CONTRACT CLAUSES.

9. PUBLIC UTILITIES, NOTICES, AND RESTRICTIONS.

9.1 General. The approximate location of all railroads, pipe lines, power and communication lines, and other utilities known to exist within the limits of the work are indicated on the drawings. The sizes, locations, and names of owners of such utilities are given from available information, but their accuracy is not guaranteed. Except as otherwise indicated on the drawings, all existing utilities will be left in place and the Contractor shall conduct his operations in such a manner that the utilities will be protected from damage at all times, or arrangements shall be made by the Contractor for their relocation at the Contractor's own expense. The Contractor shall be responsible for any damage to utilities known to exist and shall reimburse the owners for such damage caused by his operations.

9.2 Relocation or Removal. Utilities to be relocated or removed not as part of this contract are designated "To be Relocated by Others" or "To be Removed by Others," respectively. Utilities shown on the plans and not so designated will be left in place and be subject to the CONTRACT CLAUSE: PROTECTION OF EXISTING VEGETATION, STRUCTURES, UTILITIES, AND IMPROVEMENTS. The Contractor may make arrangements with the owner for the temporary relocation and restoration of

utilities not designated to be relocated, or for additional work in excess of the work needed to relocate utilities designated for relocation at no additional cost to the Government.

9.3 Utilities Not Shown. If the Contractor encounters, within the construction limits of the entire project, utilities not shown on the plans and not visible as of the date of this contract and if such utilities will interfere with construction operations, he shall immediately notify the Contracting Officer in writing to enable a determination by the Contracting Officer as to the necessity for removal or relocation. If such utilities are left in place, removed or relocated, as directed by the Contracting Officer, the Contractor shall be entitled to an equitable adjustment for any additional work or delay.

9.4 Coordination. The Contractor shall consult and cooperate with the owner of utilities that are to be relocated or removed by others to establish a mutual performance schedule and to enable coordination of such work with the construction work. These consultations shall be held as soon as possible after award of the contract or sufficiently in advance of anticipated interference with construction operations to provide required time for the removal or relocation of affected utilities.

9.4.1 During construction other Contractors are expected to be working in the area. The Contractor shall be responsible for coordinating work as required to avoid interference with each other's work in progress.

9.5 Notices. The Contractor shall notify the Contracting Officer, in writing, not less than 14 days in advance of the date on which he will complete trenching, excavation, fill or rough grading, as applicable, at each location where such completed work is required for temporary or permanent relocations by others. The Contractor shall allow a period of 14 calendar days at each relocation, after which time the Contractor may resume his operations.

9.6 Connection to Existing Utilities (For Irrigation System).

9.6.1 Connection to Existing Utilities. The Contractor shall make all necessary arrangements with Mr. Larry Ramirez, Public Works Director of the City of Avondale at (602) 932-1909 for their connection to the existing waterlines and installation of meters and shall pay all connection fees and water costs until final acceptance of all work.

9.6.2 Connection to Existing Electrical Pull Box. The Contractor shall make all necessary arrangements with Mr. John E. Mozingo, Traffic Signal Supervisor, Maricopa County Highway Department, (602) 233-8660, for electrical connection to existing MCFCD pull box.

9.7 Road Closures. The Contractor will be permitted to close Lower Buckeye Road and 127th Avenue to vehicular traffic for a period of 90 days without constructing a detour. After 90 days, the Contractor will be required to construct a detour at his own expense.

9.8 Hours of Work. As noted under SECTION: ENVIRONMENTAL PROTECTION construction will not be permitted between hours of 6 p.m. and 7 a.m. without advance approval from the Contracting Officer.

9.9 Connection to Wastewater Pipe. The Contractor shall make all necessary arrangements with Mr. Larry Ramirez, Public Works Director by calling (602) 932-1909 for the temporary closure of the pipe.

9.10 Cashion/Phoenix Distance Sign. The Contractor shall remove, store and reinstall the sign as required. The three posts shall be installed to a depth of 2-1/2 to 3 feet. Arizona Department of Transportation should be notified for a final inspection after the sign is reinstalled. Inspection should be coordinated with Mr. George Chin at (602) 255-7521.

9.11 Survey Monuments. The Contractor shall make all necessary arrangements with Mr. Don Nelson at (602) 233-4685 to coordinate the removal and installation of all survey section monuments. County will furnish survey monuments.

9.12 Pavement Markings. The Contractor shall notify Mr. John Orrahood, Maricopa County Highway Department at (602) 233-8600 upon construction completion of the Lower Buckeye Road Modification for marking of the pavement.

9.13 Fiber Optic Conduit and 12" Petroleium Pipeline. The Contractor shall field locate the fiber optic and 12-inch petroleum pipeline prior to any excavation.

9.14 Restrictions.

9.14.1 Representatives of Other Agencies. Personnel representing owners and agencies may be present for various portions of the work. However, the Contractor will be responsible only to the Contracting Officer.

10. PUBLIC SAFETY. Attention is invited to the CONTRACT CLAUSE: PERMITS AND RESPONSIBILITIES. The Contractor shall provide temporary fencing, barricades, and/or guards, as required, to provide protection in the interest of public safety. Whenever the Contractor's operations create a condition hazardous to the public, he shall furnish at his own expense and without cost to the Government, such flagmen and guards as are necessary to give adequate warning to the public of any dangerous conditions to be encountered and he shall furnish, erect, or maintain such fences, barricades, lights, signs and other devices as are necessary to prevent accidents and avoid damage or injury to the public. Flagmen and guards, while on duty and assigned to give warning and safety devices shall conform to applicable city, county, and state requirements. Should the Contractor appear to be neglectful or negligent in furnishing adequate warning and protection measures, the Contracting Officer may direct attention to the existence of a hazard and the necessary warning and protective measures shall be furnished and installed by the Contractor without additional cost to the Government. Should the Contracting Officer point out the inadequacy of warning and protective measures, such action of the Contracting Officer shall not relieve the Contractor from any responsiblilty for public safety or abrogate his obligation to furnish and pay for those devices. The installation of any general illumination shall not relieve the Contractor of his responsibility for furnishing and maintaining any protective facility.

11. OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA) STANDARDS. The OCCUPATIONAL SAFETY and HEALTH ACT (OSHA) STANDARDS for CONSTRUCTION (Title 29, Code of Federal Regulations Part 1926 as revised from time to time) and the Corps of Engineers General Safety and Health Requirements Manual, EM 385-1-1, are both applicable to this contract. The most stringent requirement of the two standards will be applicable.

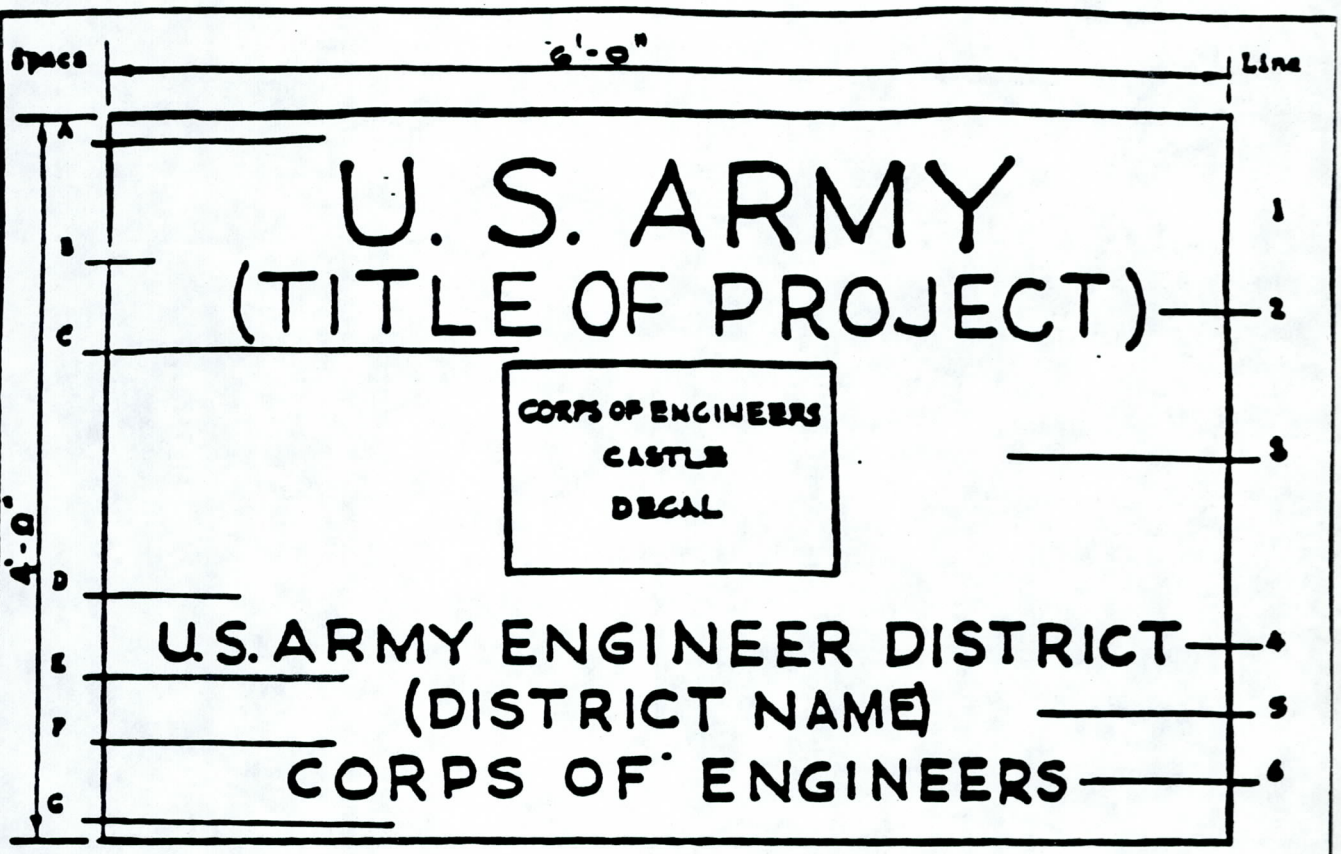
12. WATER CONTAMINATION. In order to prevent contamination of water along waterways, all refuse, oil, greases, and other petroleum products; all toxic materials; all cement or concrete; or water containing such materials shall be disposed of in a manner to prevent their entry into water along waterways.

13. DUST CONTROL. The Contractor shall provide an acceptable plan for preventing the generation of dust due to his operation in construction zones, along haul routes, in equipment parking areas, and in waste areas located in the Project Area. This plan may consist of water sprinkling or an equivalent service.

14. PERMITS.

14.1 General. Reference is made to the CONTRACT CLAUSE: PERMITS AND RESPONSIBILITIES, which obligates the Contractor to obtain all required licenses and permits.

* * * * *



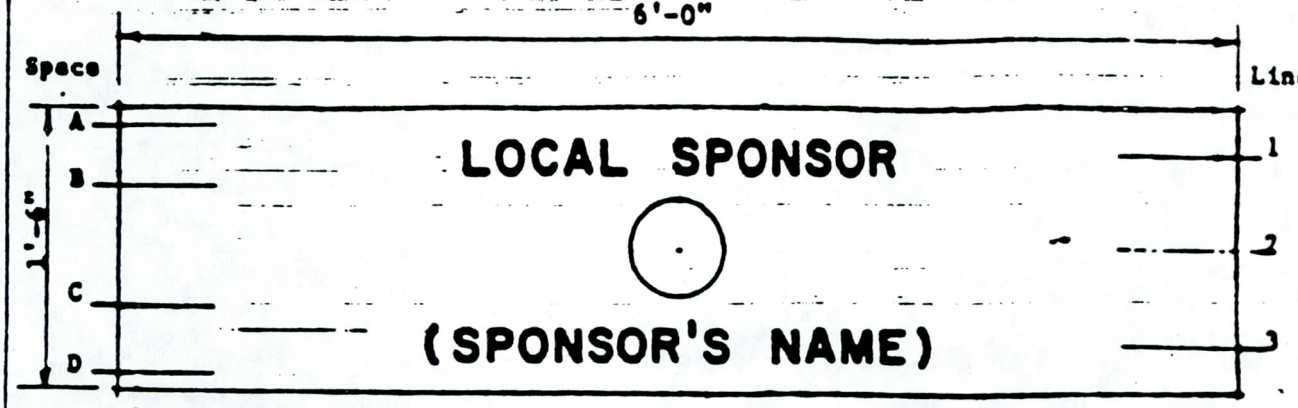
S C H E D U L E

Space	Height	Line	Description	Letter Height	Stroke
A	3"	1	U. S. ARMY	5 1/2"	7/8"
B	2"	2	PROJECT NOMENCLATURE	4"	5/8"
C	2"	3	CORPS OF ENGINEERS CASTLE (DECAL)	11"	--
D	3"	4	U. S. ARMY ENGINEER DISTRICT	2 3/4"	3/8"
E	2"	5	DISTRICT NAME	2 1/4"	1/4"
F	2"	6	CORPS OF ENGINEERS	2 1/2"	3/8"
G	3"				

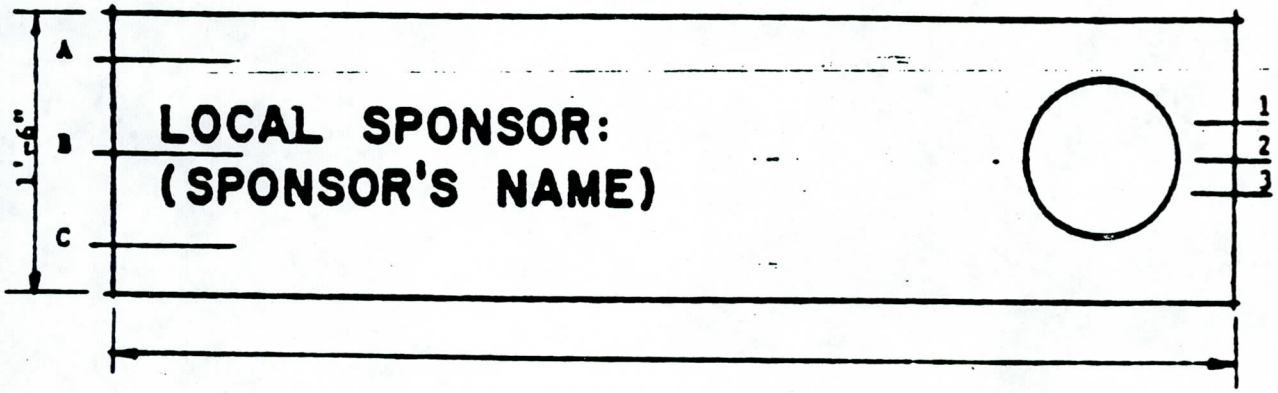
Lettering Color -- Black

PROJECT SIGN
(Army-Civil Works)

Figure 1
14 August 1972



Space	Height	Line	Description	Letter Height	Stroke
A	2"				
B	2" Min.	1	LOCAL SPONSOR	2"	3/8"
		2	SPONSOR'S EMBLEM (DECAL)		
C	2" Min.				
D	2"	3	SPONSOR'S NAME	2"	3/8"



Space	Height	Line	Description	Letter Height	Stroke
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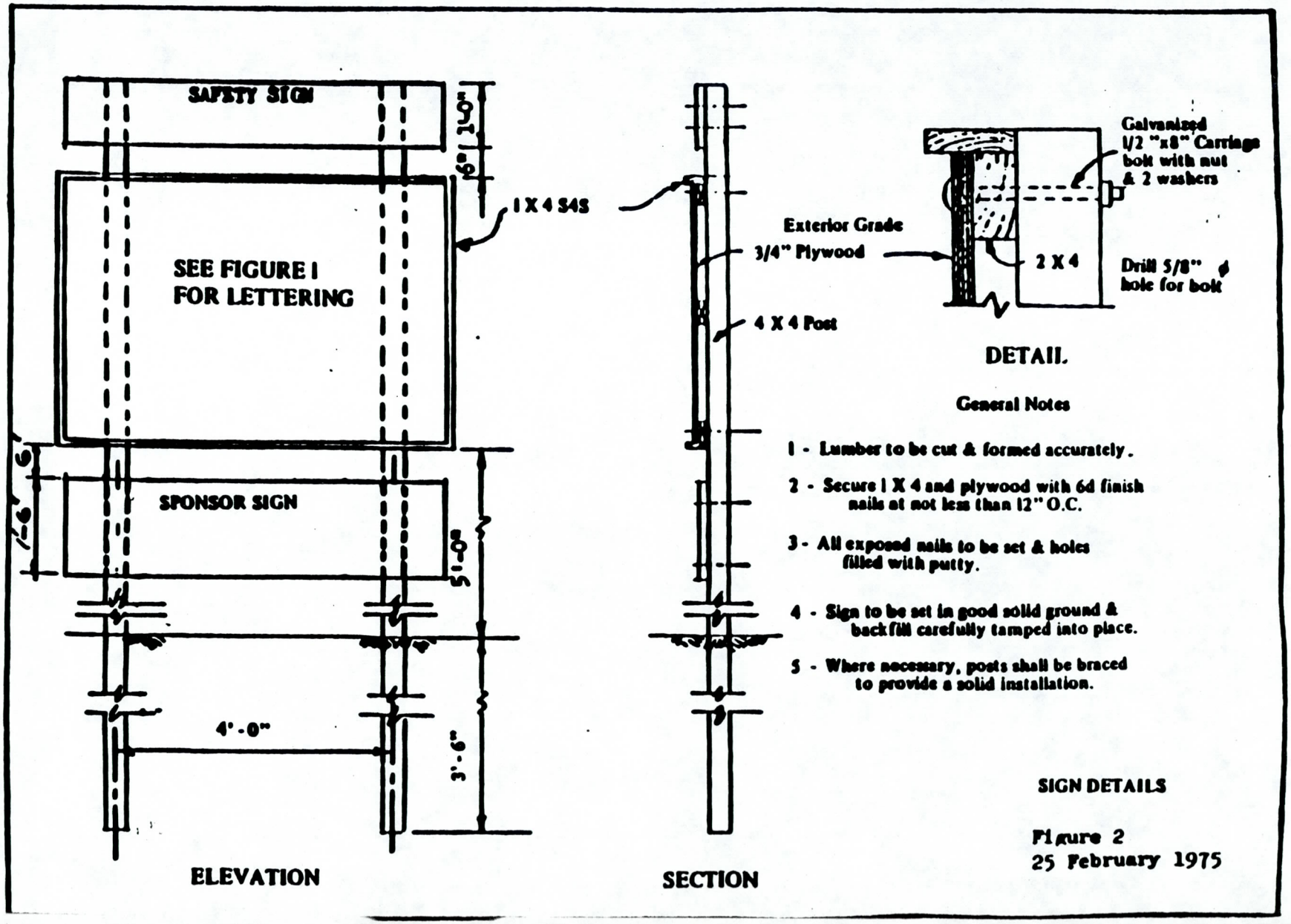
B	2"	1	LOCAL SPONSOR	2"	3/8"
		2	SPONSOR'S EMBLEM (DECAL)		
C	6"				
		3	SPONSOR'S NAME	2"	3/8"

Lettering Color -- Black

Figure 1A
21 February 1975


SAFETY SIGN
6" 2'-0"
1 X 4 S4S
SEE FIGURE 1
FOR LETTERING
SPONSOR SIGN
1'-6"
5'-0"
4'-0"
3'-6"
ELEVATION
SECTION
Galvanized
1/2 "x8" Carriage
bolt with nut
& 2 washers
Exterior Grade
3/4" Plywood
2 X 4
Drill 5/8"
hole for bolt
4 X 4 Post
DETAIL
General Notes
1 - Lumber to be cut & formed accurately.
2 - Secure 1 X 4 and plywood with 6d finish nails at not less than 12" O.C.
3 - All exposed nails to be set & holes filled with putty.
4 - Sign to be set in good solid ground & backfill carefully tamped into place.
5 - Where necessary, posts shall be braced to provide a solid installation.
SIGN DETAILS
Figure 2
25 February 1975

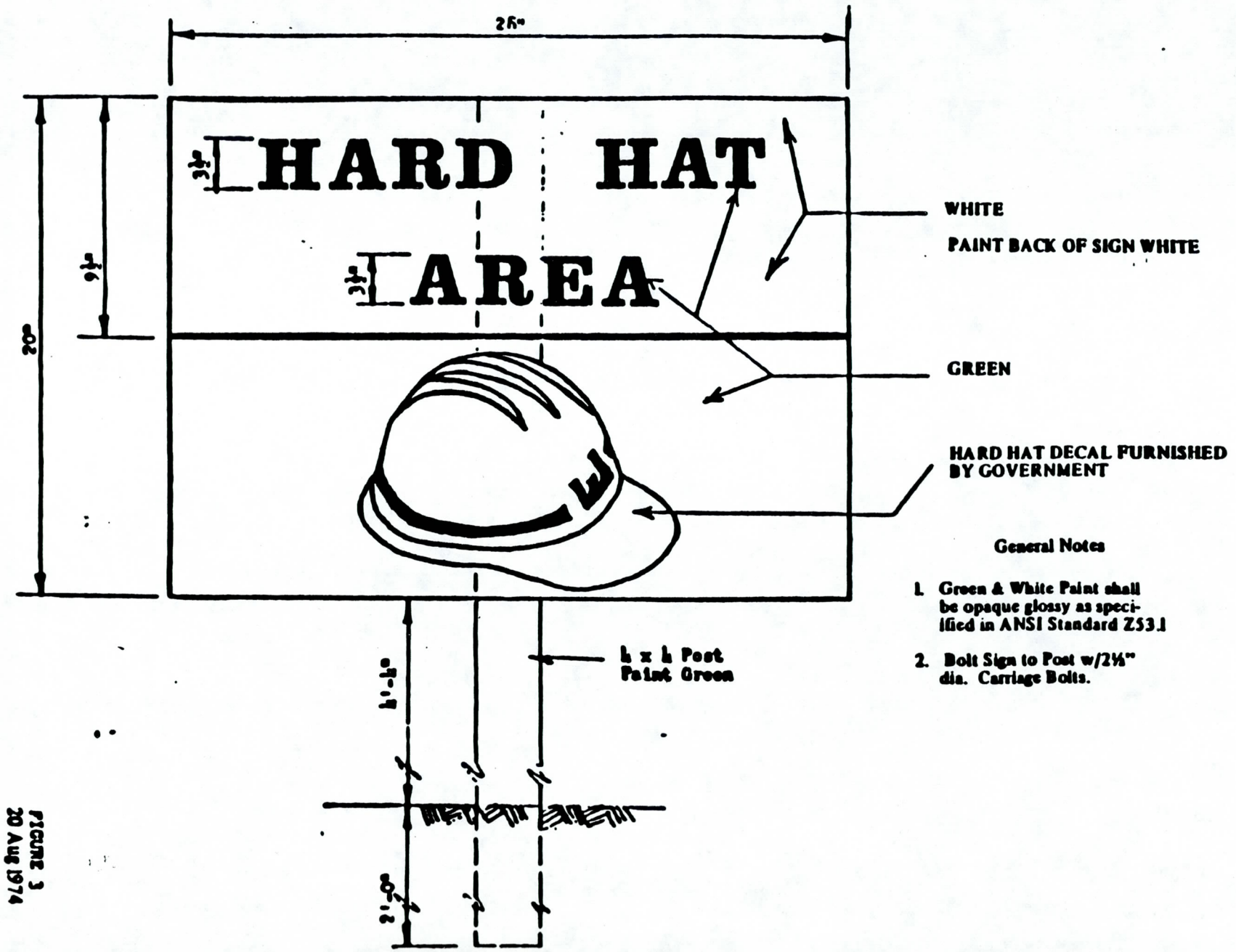


FIGURE 1
20 Aug 1974

General Notes

1. Green & White Paint shall be opaque glossy as specified in ANSI Standard Z53.1
2. Bolt Sign to Post w/2½" dia. Carriage Bolts.

SECTION 1B

MEASUREMENT AND PAYMENT

Index

1. DIVERSION AND CONTROL OF WATER. Payment will be made at the applicable contract price, which payment shall constitute full compensation for the diversion and control of water, complete.

2. CLEARING SITE AND REMOVING OBSTRUCTIONS. Payment will be made at the applicable contract price, which payment shall constitute full compensation for clearing the site and removing obstructions, including clearing and grubbing, complete. Also included in this item is the relocation of the highway sign, Cashion/Phoenix distance, on the south side of Buckeye Road east of the Agua Fria River.

3. EXCAVATION.

3.1 Measurement. A survey of the site shall be made prior to commencement of work, and all measurements will be based on this survey without regard to any changes in the site that may be made between the excavation lines and grades indicated on the drawings or staked in the field and ground surfaces as indicated by the above mentioned surveys. The actual slopes as excavated may be greater or less than those indicated or staked depending on the materials excavated and methods used in performing the work, but such alterations shall not change the measurement for payment from the original lines as specified herein. The quantity of directed excavation necessary for the removal of unsuitable foundation material as specified shall be included in the measurement of the excavation where the unsuitable soils are encountered. Quantities will be computed in cubic yards by the average end area method and the planimeter will be considered a precise instrument for measurement of plotted cross sections. All excavation outside of excavation lines shown on the drawings or staked in the field will be considered as being for the convenience of the Contractor. Measurement for payment will not include voids larger than 5 cubic feet in structures to be removed.

3.2 Payment for Excavation will be made at the applicable contract price, which payment shall constitute full compensation for excavation (including toe excavation), and stockpiling but shall not include excavation from borrow area(s).

4. COMPACTED FILL, LEVEE AND COMPACTED FILL, ROADWAY.

4.1 Measurement of compacted fills will be made between the excavation and structure lines and the fill limit lines, or between the ground lines and fill lines, as indicated. Quantities will be computed in cubic yards by the average end area method and the planimeter will be considered a precise instrument for measuring plotted cross sections.

4.2 Payment for Compacted Fill, Levee and Compacted Fill, Roadway will be made at the applicable contract price, which payment shall constitute full compensation for excavating (including from borrow areas) hauling, stockpiling, subgrade preparation placing and compacting the fill, complete.

5. BACKFILL, TOE.

5.1 Measurement for payment of the Backfill, Toe will be made between the toe excavation line and soil cement structure line and the fill line that matches the adjacent natural ground as indicated. Quantities will be computed in cubic yards by the average end area method and the planimeter will be considered a precise instrument for measuring plotted cross sections.

5.2 Payment for Backfill, Toe will be made at the applicable contract price, which payment shall constitute full compensation for excavating from borrow areas, hauling, stock piling, placing and compacting the backfill, complete.

6. MISCELLANEOUS FILL.

6.1 Measurement for payment of miscellaneous fill will be measured to the nearest cubic yard. Quantities will be computed by the average end area method and the planimeter will be considered a precise instrument for measuring plotted cross sections.

6.2 Payment for miscellaneous fill will be made to the applicable contract price, which payment shall constitute full compensation for excavating from borrow areas, hauling, stockpiling, and placing the miscellaneous fill, complete.

7. SOIL CEMENT.

7.1 Measurement of the soil cement to be paid for will be in cubic yards acceptably placed between the excavation and pay lines as indicated.

7.2 Payment for Soil Cement will be at the applicable contract price, which payment shall constitute full compensation for the soil cement including materials, batching, subgrade preparation, placing, curing, and trimming, complete in place.

8. CONCRETE, SIDE DRAIN AT STA. 11+60. Payment will be made at the applicable contract price, which payment shall constitute full compensation for labor, materials (aggregate, cement, reinforcing, flapgates), earthwork, placing and curing concrete, furnishing and installing flapgates, and excavating of approach and daylight channels as indicated.

9. TRIPLE BOX CULVERT UNDER LOWER BUCKEYE ROAD. Payment will be made at the applicable contract price, which payment shall constitute full compensation for labor, materials (aggregate, cement, reinforcing), earthwork pertinent to the structure, and placing and curing concrete. Also included are the four wingwalls.

10. ROAD MODIFICATION AT LOWER BUCKEYE ROAD AND 127TH AVENUE. Payment will be made at the applicable contract price, which payment shall constitute full compensation for labor, materials, and construction of road modifications, complete, exclusive of the Roadway Fill and the Triple Box Culvert which are included under separate items. Included in this item are the select fill, aggregate base course, asphalt concrete pavement, guardrails, barricades, sawcutting and joining to existing pavement, removal of existing concrete irrigation ditch, headwalls and reinforced concrete pipe, removal of drainage culvert and headwalls beneath Lower Buckeye Road, construction of an irrigation ditch, siphon and culvert, complete under Lower Buckeye Road, and construction of a 24-inch storm drain culvert under Lower Buckeye Road and 127th Avenue, complete.

11. 36-INCH DIAMETER REINFORCED CONCRETE PIPE SLEEVES. Payment will be made at the applicable contract price, which payment shall constitute full compensation for labor, materials, and installation of two 36-inch diameter reinforced concrete pipes through each of the two levees, complete, including earthwork and capping of each end of each of the pipes with bricks.

12. SIDEWALK MODIFICATION AT BUCKEYE ROAD. Payment will be made at the applicable contract price, which payment shall constitute full compensation for labor, materials, and construction of the sidewalk modification including the removal of the existing sidewalk, placement of new curb and sidewalk, the select fill, aggregate base course, asphalt concrete paving, and relocation of Phoenix/Cashion road sign.

13. SAFETY RAIL.

13.1 Measurement of safety rail will be the actual number of linear feet of safety rail, measured end to end, acceptably installed.

13.2 Payment for safety rail will be made at the applicable contract price, which payment shall constitute full compensation for furnishing and installing the safety rail, complete in place.

14. PIPE GATE.

14.1 Measurement of the pipe gate will be the actual number of pipe gates acceptably installed.

14.2 Payment for the pipe gate will be made at the applicable contract price, which payment shall constitute full compensation for furnishing and installing the pipe gate, complete in place.

15. GRAVEL.

15.1 Measurement for payment of gravel (4" ABC) for the levee will be in cubic yards acceptably placed on the top of the levee as indicated.

15.2 Payment for gravel (4" ABC) for the levee will be made at the applicable contract price, which payment shall constitute full compensation for furnishing and placing of the gravel, complete in place.

16. LANDSCAPING. Payment will be made at the applicable contract price, which payment shall constitute full compensation for all trees, shrubs, ground covers, and irrigation system including materials, installation, and maintaining, complete.

17. WASTEWATER PIPE EXTENSION. Payment will be made at the applicable contract price, which payment shall constitute full compensation for the extension of the wastewater pipe near Station 35+50 through the levee including all materials for the pipe materials and outlet structure and labor, complete. Also included is the excavation of the pilot channel to required borrow Area D.

* * * * *

SUBMITTAL REGISTER (ER 415-1-10)

TITLE AND LOCATION: Agua Fria River Levees

CONTRACTOR:

CONTRACT NUMBER:

NAS ACTIVITY CODE I J	SUBMITTAL IDENTIFICATION (ITEM NUMBER)	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF SUBMITTAL	TYPE OF SUBMITTAL: SHOP DRAWING	SAMPLE	GUARANTEE	MFR'S DATA	CERTIFICATE	TEST REPORT	OTHER, AS NOTED	ACTION ELEMENT: *TECH REVIEW BY	CONTRACTOR SCHEDULED DATES: SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CORPS ACTION DATES: SUBMITTED TO CORPS	ACTION CODE	REMARKS
		1C, 2.1	Contractor Quality Control Plan							X							
		1D, 3	Environmental Protection Plan							X							
		1D, 7	Restoration Landscape Damage Plan							X							
		2A, 1.1	Dewatering Plan							X							
		2D, 3	Moisture Density and Field Density							X							
		2E, 3	Manufacturer's Recommendations				X										
		2E, 4	Pipe Specifications						X								
		2E, 7.6	Gasket Joint Installation Instr.							X							
		2E, 7.6	Gasket Test Results						X								
		2F, 3.1	Aggregate Base Course Test Results						X								
		2F, 3.3	Base Course Material Test Results						X								
		2F, 3.4	Material Preliminary Reports						X								
		2F, 15	Waybills and Delivery Tickets							X							
		2H, 3.3	Bituminous Material, Prime Coat						X								
		2H, 10	Waybills and Delivery Tickets							X							
		2I, 16	Waybills and Delivery Tickets							X							
		2I, 6.1	Job Mix Formula							X							
		2I, 6.1	Aggregate and Asphalt Samples		X												

*AE-Architect Engineer ED-Engineering Division CD-Construction Division AREA-Area Engineer RE-Resident Engineer

SUBMITTAL REGISTER *(ER 415-1-10)*

TITLE AND LOCATION Agua Fria River Levees

CONTRACTOR

CONTRACT NUMBER

NAS ACTIVITY CODE I J	SUBMITTAL IDENTIFICATION (ITEM NUMBER)	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF SUBMITTAL	TYPE OF SUBMITTAL							ACTION ELEMENT	CONTRACTOR SCHEDULED DATES			CORPS ACTION DATES		REMARKS
				SHOP DRAWING	SAMPLE	GUARANTEE	MFR'S DATA	CERTIFICATE	TEST REPORT	OTHER, AS NOTED	*TECH REVIEW BY	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	SUBMITTED TO CORPS	ACTION CODE	
		2J, 3.1	Topsoil Sample		X												
		2J, 3.2	Certificates of Conformance or														
		-------	Compliance for Plants					X									
		2J, 3.3	Plant Maintenance Instructions							X							
		2J, 7.2.1	Variance in Planting Conditions							X							
		2J, 10.1	Notice Requesting Inspection							X							
		2K, 11	Variation in Arrangement of Sprinklers	X													
		2K, 12	Guarantee			X											
		3A, 2.1	Request for Approval of Materials							X							
		3A, 2.3	Plan for Batching, Conveyance,														
			Placement, Compaction, Finishing														
			and Curing Soil Cement Mixture							X							
		3A, 4.4.2	Soil Sample		X												
		3A, 15.2.5	Density Test Results						X								
		3A, 15.4	Test Results						X								
		3B, 13	Waybills and Delivery Tickets							X							
		5A, 2.1	Material and Product Samples		X												
		5A, 4	Anchorage Slotted Inserts				X										

*AE Architect Engineer ED-Engineering Division CD-Construction Division AREA-Area Engineer RE-Resident Engineer

SUBMITTAL REGISTER (ER 415-1-10)

TITLE AND LOCATION: Agua Fria River Levees

CONTRACTOR:

CONTRACT NUMBER:

NAS ACTIVITY CODE	SUBMITTAL IDENTIFICATION (ITEM NUMBER)	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF SUBMITTAL	TYPE OF SUBMITTAL							ACTION ELEMENT	CONTRACTOR SCHEDULED DATES			CORPS ACTION DATES		REMARKS
				SHOP DRAWING	SAMPLE	GUARANTEE	MFR'S DATA	CERTIFICATE	TEST REPORT	OTHER AS NOTED	*TECH REVIEW BY	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	SUBMITTED TO CORPS	ACTION CODE	
		5A, 7.2	Miscellaneous Metal Work	X													
		16A, 5	List of Materials and Equipment							X							
		16A, 6	Shop Drawings	X													
		16A, 12.4	Factory Test Reports						X								
		16A, 13	Guarantee			X											
		SC, 4.2	Submittal Register							X							
		3C,15.1.9	As-Built Drawings							X							
		2C,10	Excavation Plan							X							
		2N,2.1	Certificates of Conformance					X									
		2N,2.2	Manufacturer's Literature				X										
		2N,2.3	Maintenance Instructions							X							
		2C,10	Method of Transportation							X							
		2G,4.7	Gravel Color Samples		X												

*AE Architect Engineer ED-Engineering Division CD-Construction Division AREA-Area Engineer RE-Resident Engineer

SECTION 1C

CONTRACTOR'S QUALITY CONTROL

Index

1. GENERAL. The Contractor shall establish and maintain an effective quality control system in compliance with CONTRACT CLAUSE: INSPECTION OF CONSTRUCTION. The quality control system consist of plans, procedures, and organization necessary to provide materials, equipment, workmanship, fabrication, construction and operations which comply with contract requirements. The system shall cover construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence.

2. QUALITY CONTROL PLAN.

2.1 General. The Government will consider an interim plan for the first 15 days of operation. However, the Contractor shall furnish for approval by the Government, not later than 30 days after receipt of Notice to Proceed the Contractor Quality Control (CQC) Plan with which he proposes to implement the requirements of CONTRACT CLAUSE: INSPECTION OF CONSTRUCTION. The plan shall identify personnel, procedures, instructions, records, and forms to be used. If the Contractor fails to submit an acceptable QC plan with the time herein prescribed, the Contracting Officer (CO) may refuse to allow construction to start if an acceptable interim plan is not furnished or withhold funds from progress payments in accordance with the CONTRACT CLAUSE: PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS until such time as the Contractor submits an acceptable final plan.

2.2 Coordination Meeting. Before start of construction, the Contractor shall meet with the CO and discuss the Contractor's quality control system. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's inspection and control with the Government's inspection. Minutes of the meeting shall be prepared and signed by both the Contractor and the CO. The minutes shall become a part of the contract file. There may also be occasions when subsequent conferences will be called to reconfirm mutual understandings.

2.3 The Quality Control Plan. This plan shall include as a minimum, the following:

2.3.1 A description of the quality control organization including chart showing lines of authority and acknowledgement that the CQC staff shall conduct the phase inspections for all aspects of the work specified and shall report to the project manager or someone higher in the Contractor's organization.

2.3.2 The name, qualifications, duties, responsibilities and authorities of each person assigned a QC functions.

2.3.3 A copy of the letter to the QC manager signed by an authorized official of the firm, which describes the responsibilities and delegates the authorities of the QC manager shall be furnished.

2.3.4 Procedures for scheduling and managing submittals, including those of subcontractors, offsite fabricators, suppliers and purchasing agents.

2.3.5 Control testing procedures for each specific test. (Laboratory facilities will be approved by the Contracting Officer).

2.3.6 Reporting procedures including proposed reporting formats.

2.4 Acceptance of Plan. Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC plan and operations as necessary to obtain the quality specified.

2.5 Notification of Changes. After acceptance of the QC plan, the Contractor shall notify the CO in writing of any proposed change. Proposed changes are subject to acceptance by CO.

3. QUALITY CONTROL ORGANIZATION.

3.1 System Manager. The Contractor shall identify an individual, within his organization at the site of the work, who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. This CQC System Manager shall be approved by the CO.

3.2 Personnel. A staff shall be maintained under the direction of the system manager to perform all QC activities. The actual strength of the staff during any specific work period may vary to cover work phase needs, shifts, and rates of placement. The personnel of this staff shall be fully qualified by experience and technical training to perform their assigned responsibilities and shall be directly hired by and work for the Prime Contractor.

4. SUBMITTALS. Submittals shall be as specified in the SPECIAL CLAUSE: SUBMITTALS, The CQC Organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

5. CONTROL. Contractor Quality Control is the means by which the Contractor assures himself that his construction complies with the requirements of the contract plans and specifications. The controls shall be adequate to cover all construction operations, including both onsite and offsite fabrication, and will be keyed to the proposed construction sequence. The controls shall include at least three phases of inspection for all definitive features of work as follows:

5.1 Preparatory Inspection. This shall be performed prior to beginning any work on any definable feature of work. It shall include a review of contract requirements; a check to assure that all materials and/or equipment have been tested, submitted and approved; a check to assure that provisions have been made

to provide required control testing; examination of the work area to ascertain that all preliminary work has been completed; and a physical examination of materials, equipment and sample work to assure that they conform to approved shop drawings or submittal data and that all materials and/or equipment are on hand. The Contracting Officer Representative (COR) shall be notified at least 24 hours in advance of the preparatory inspection and such inspection shall be made a matter of record in the Contractor's Quality Control documentation as required below. Subsequent to the preparatory inspection and prior to commencement of work, the Contractor shall instruct each applicable worker as to the acceptable level of workmanship required in his CQC plan in order to meet contract specifications.

5.2 Initial Inspection. This shall be performed as soon as a representative portion of the particular feature of work has been accomplished and shall include examination of the quality of workmanship and a review of control testing for compliance with contract requirements, use of defective or damaged materials, omissions, and dimensional requirements. The Contracting Officer's Representative shall be notified at least 24 hours in advance of the initial inspection and such inspection shall be made a matter of record in the CQC documentation as required below.

5.3 Follow-up Inspections. These shall be performed daily to assure continuing compliance with contract requirements, including control testing, until completion of the particular feature of work. Such inspections shall be made a matter of record in the CQC documentation as required below. Final follow up inspections shall be conducted and test deficiencies corrected prior to the addition of new features of work.

6. TESTS.

6.1 Testing Procedure. The Contractor shall perform tests specified or required to verify that control measures are adequate to provide a product which conforms to contract requirements. The Contractor shall procure the services of an industry recognized testing laboratory or he may establish an approved testing laboratory at the project site. A list of tests which the Contractor understands he is to perform shall be furnished as a part of the CQC plan to the Contracting Officer. The list shall give the test name, specification paragraph containing the test requirements, and the personnel and laboratory responsible for each type of test. The Contractor shall perform the following activities and record and provide the following data.

6.1.1 Verify that testing procedures comply with contract requirements.

6.1.2 Verify that facilities and testing equipment are available and comply with testing standards.

6.1.3 Check test instrument calibration data against certified standards.

6.1.4 Verify that recording forms, including all of the test documentation requirements, have been prepared.

6.2 Testing.

6.2.1 Capability Check. The COR will have the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check laboratory technician's testing procedures and techniques.

6.2.2 Capability Re-Check. If the selected laboratory fails the capability check, the Contractor will be assessed a charge of $675.00 to reimburse the Government for each succeeding re-check of the laboratory or the checking of a subsequently-selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

6.2.3 Project Laboratory. The COR will have the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

6.2.4 Transportation of Samples for Testing. Costs incidental to the transportation of samples or materials will be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to the Corps of Engineers Division Laboratory, f.o.b., at the following address:

For delivery by mail:
Director
South Pacific Division Laboratory
U.S. Army Corps of Engineers
P.O. Box 37
Sausalito, CA 94966

For other deliveries:
Director
South Pacific Division Laboratory
U.S. Army Corps of Engineers
Bridgeway, Foot of Spring St.
(bldg. directly east of 2000 Bridgeway)
Sausalito, CA 94965

7. COMPLETION INSPECTION. At the completion of all work or any increment thereof established by a completion time stated in the paragraph: COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK of the SPECIAL CLAUSES, or stated elsewhere in the specifications, the CQC System Manager shall conduct a completion inspection of the work and develop a punch list of items which do not conform to the approved plans and specifications. Such a list shall be included in the CQC documentation, as required by paragraph: DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or his staff shall make a second completion inspection to ascertain that all deficiencies have been corrected and so notify the Contracting Officer's Representative. The completion inspection and any defeciency corrections required by this paragraph will be accomplished within the time stated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

8. DOCUMENTATION.

8.1 The Contractor shall maintain correct records of quality control operations, activities, and tests performed including the work of suppliers and subcontractors. In addition, these records shall include factual evidence that the required activities or tests have been performed, including but not limited to the following:

8.1.1 Type and number of control activities and tests involved.

8.1.2 Results of control activities or tests.

8.1.3 Nature of defects, causes for rejection, etc.

8.1.4 Proposed remedial action.

8.1.5 Corrective actions taken.

8.2 These records shall cover both conforming and defective or deficient features and shall include a statement that supplies and materials incorporated in the work comply with the contract. Legible copies of these records shall be furnished to the CO daily. Each report will include the following statement:

> I certify the above information is complete and correct, to the best of my knowledge. All materials, equipment utilized and work performed were in strict compliance with the specifications and contract drawings unless otherwise noted.

9. NOTIFICATION OF NONCOMPLIANCE. The Contracting Officer will notify the Contractor of any noncompliance with the foregoing requirements. The Contractor shall, after receipt of such notice immediately take corrective action. Such notice, when delivered to the Contractor or his representative at the site of the work, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of claim for extension of time or for excess costs or damage by the Contractor.

* * * * *

SECTION 1D

ENVIRONMENTAL PROTECTION

Index

1. SCOPE. This section covers prevention of environmental pollution and damage as the result of construction operations under this contract and for those measures set forth in other Technical Provisions of these specifications. For the purpose of this specification, environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of air, water, and land, and includes management of visual aesthetics, noise, solid waste, radiant energy and radioactive materials, as well as other pollutants.

2. QUALITY CONTROL. The Contractor shall establish and maintain quality control for environmental protection of all items set forth herein. The Contractor shall record on daily reports any problems in complying with laws, regulations and ordinances and corrective action taken.

3. SUBMITTALS. The Contractor shall submit an environmental protection plan in accordance with provisions as herein specified.

3.1 Environmental Protection Plan shall include but not be limited to the following:

(1) A list of Federal, State and local laws, regulations, and permits concerning environmental protection, pollution control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations and permits.

(2) Methods for protection of features to be preserved within authorized work areas. The Contractor shall prepare a listing of methods to protect resources needing protection, i.e., trees, shrubs, vines, grasses and ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, archeological and cultural resources.

(3) Procedures to be implemented to provide the required environmental protection and to comply with the applicable laws and regulations. The Contractor shall set out the procedures to be followed to correct pollution of the environment due to accident, natural causes or failure to follow the procedures set out in accordance with the environmental protection plan.

(4) Permit or license and the location of the solid waste disposal area.

(5) Drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials.

(6) Environmental monitoring plans for the jobsite, including land, water, air, and noise monitoring.

(7) Methods of protecting surface and groundwater during construction activities.

(8) Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or non-use. Plan should include measures for marking the limits of use areas.

3.2 Implementation. After receipt of Notice to Proceed, the Contractor shall submit in writing the above Environmental Protection Plan within 14 days. If the Contractor fails to submit an acceptable Environmental Protection Plan within the time herein prescribed, the Contracting Officer may refuse to allow construction to start or may withhold funds from progress payments in accordance with the CONTRACT CLAUSE entitled PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS until such time as the Contractor submits an acceptable final plan. Approval of the Contractor's plan will not relieve the Contractor of his responsibility for adequate and continuing control of pollutants and other environmental protection measures.

4. SUBCONTRACTORS. Assurance of compliance with this section by subcontractors will be the responsibility of the Contractor.

5. NOTIFICATION. The Contracting Officer will notify the Contractor in writing of any observed noncompliance with the aforementioned Federal, State or local laws or regulations, permits and other elements of the Contractor's environmental protection plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective action and take such action as may be approved. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or costs or damages allowed to the Contractor for any such suspension.

6. PROTECTION OF ENVIRONMENTAL RESOURCES. The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine his activities to areas defined by the drawings and specifications. Environmental protection shall be as stated in the following subparagraphs.

6.1 Protection of Land Resources. Prior to the beginning of any construction, the Contractor shall identify all land resources to be preserved within the Contractor's work area. The Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, cacti, shrubs, vines, grasses, top soil, and land forms without special permission from the Contracting Officer. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage

unless specifically authorized. Where such special emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs.

6.1.1 Work Area Limits. Prior to any construction the Contractor shall mark the areas within the construction work limits that are not required to accomplish all work to be performed under this contract. Isolated areas within the general work area which are to be saved and protected shall also be fenced or flagged. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, the markers shall be visible. The Contractor shall convey to his personnel the purpose of marking and/or protection of all necessary objects.

6.1.2 Protection of Landscape. Trees, cacti, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by fencing, flagging, or any other approved techniques.

6.1.3 Reduction of Exposure of Unprotected Erodible Soils. Earthwork brought to final grade shall be finished as indicated and specified. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils.

6.1.4 Temporary Protection of Disturbed Areas. Such methods as necessary shall be utilized to effectively prevent erosion and control sedimentation, including but not limited to the following:

(1) Redardation and control of Runoff. Runoff from the construction site shall be controlled by construction of diversion ditches, benches, and berms to retard and divert runoff to protected drainage courses, and any measures required by area-wide plans approved under paragraph 208 of the Clean Water Act.

6.1.5 Erosion and Sedimentation Control Devices. The Contractor shall construct or install all temporary and permanent erosion and sedimentation control features as necessary. Temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing and mulching shall be maintained until permament drainage and erosion control facilities are completed and operative.

6.1.6 Location of Field Offices, Storage and Other Contractor Facilities. The Contractors' field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated by the Contracting Officer. Due to the sensitive nature of riparian habitat in the basin, strict adherence to the designated areas is necessary. Temporary movement or relocation of Contractor facilities shall be made only on approval by the Contracting Officer.

6.1.7 Spoil Areas shall be managed and controlled to limit spoil to areas designated and prevent erosion of soil or spoil from entering nearby water courses or lakes.

6.1.8 Temporary Excavations and Embankments for plant and/or work areas shall be controlled to protect adjacent areas from dispoilment.

6.1.9 Disposal of Solid Wastes. Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. All handling and disposal shall be conducted to prevent contamination and shall conform to the requirements of applicable local, State and Federal laws and regulations.

6.1.10 Disposal of Chemical Waste. Chemical waste shall be stored in corrosion resistant containers, removed from the work area and disposed of in accordance with Federal, State and local regulations. Crankcase oil and other waste chemicals shall be captured and not drained onto the ground.

6.1.11 Disposal of Discarded Materials. Discarded materials other than those which can be included in the solid waste category will be handled as directed by the Contracting Officer.

6.2 Preservation and Recovery of Historical, Archeological and Cultural Resources. Existing historical, archeological and cultural resources within the Contractor's work area will be so designated by the Contracting Officer and precautions taken to preserve all such resources as they existed at the time they were pointed out to the Contractor. The Contractor shall install all protection for these resources so designated on the drawings and shall be responsible for their preservation during this contract. If during construction activities the Contractor observes unusual items that might have historical or archeological value all work in the immediate area shall be stopped and such observations shall be reported as soon as practicable to the Contracting Officer. Recording and preservation of historical and archeological finds during construction shall conform to the requirements of SPECIAL CLAUSES.

6.3 Protection of Water Resources. The Contractor shall keep construction activities under surveillance, management and control to avoid pollution of surface and groundwaters. Special management techniques as set out below shall be implemented to control water pollution by the listed construction activities which are included in this contract.

6.3.1 Washing and Curing Water. Waste waters directly derived from construction activities shall not be allowed to enter water areas. These waste waters shall be collected and placed in retention ponds where suspended material can be settled out or the water evaporates so that pollutants are separated from the water.

6.3.2 Cofferdam and Diversion Operations. The Contractor shall plan his operation and perform all work necessary to minimize adverse impact or violation of the water quality standard of Federal, state, or local governments. Construction operations for dewatering, removal of cofferdams shall be controlled at all times to limit the impact of water turbidity on the habitat for wildlife and impacts on water quality for downstream use.

6.3.3 Monitoring of Water Areas Affected by Construction Activities shall be the responsibility of the Contractor. All water areas affected by construction activities shall be monitored by the Contractor.

6.4 Protection of Fish and Wildlife Resources. The Contractor shall keep construction activities under surveillance, management and control to minimize interference with, disturbance to and damage of fish and wildlife. Species that require specific attention along with the measures for their protection will be listed by the Contractor prior to beginning of construction operations.

6.5 Protection of Air Resources. The Contractor shall keep construction activities under surveillance, management and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or performed by the Contractor in accomplishing the specified construction shall be in strict accordance with the State of Arizona and all Federal emission and performance laws and standards. Ambient Air Quality Standards set by the Environmental Protection Agency shall be maintained for those construction operations and activities specified in this section. Special management techniques as set out below shall be implemented to control air pollution by the construction activities which are included in the contract.

6.5.1 Particulates. Dust particles, aerosols, and gaseous by-products from all construction activities, processing and preparation of materials, such as from asphaltic batch plants, shall be controlled at all times, including weekends, holidays and hours when work is not in progress. A permit will be required by Maricopa County that will require particulate suppression control.

6.5.1.1 Particulates Control. The Contractor shall maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause the air pollution standards mentioned in paragraph hereinabove to be exceeded or which would cause a hazard or a nuisance. Sprinkling, treatment with an approved non-toxic dust palliative, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated at such intervals as to keep the disturbed area damp at all times. The Contractor must have sufficient equipment available to accomplish this task. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

6.5.2 Hydrocarbons and Carbon Monoxide. Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

6.5.3 Odors. Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

6.5.4 Monitoring of Air Quality shall be the responsibility of the Contractor. All areas affected by the construction activities shall be monitored by the Contractor.

6.6 Protection of Sound Intrusions. The Contractor shall keep construction activities under surveillance, and control to minimize damage to the environment by noise. Construction will not be allowed between the hours of 6:00 PM and 7:00 AM without the prior approval of the Contracting Officer.

7. RESTORATION OF LANDSCAPE DAMAGE. The Contractor shall restore all landscape features damaged or destroyed during construction operations outside the limits of the approved work areas. Such restoration shall be in accordance with the plan submitted for approval by the Contracting Officer. This work will be accomplished at the Contractor's expense.

8. MAINTENANCE OF POLLUTION CONTROL FACILITIES. The Contractor shall maintain all constructed facilities and portable pollution control devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

9. TRAINING OF CONTRACTOR PERSONNEL IN POLLUTION CONTROL. The Contractor shall train his personnel in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual familiarization with cultural resource identification, and installation and care of facilities (vegetative covers, and instruments required for monitoring purposes) to ensure adequate and continuous environmental pollution control.

10. POST CONSTRUCTION CLEAN UP. The Contractor shall clean up areas used for construction.

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SECTION 2A

DIVERSION AND CONTROL OF WATER

1. REQUIREMENT.

1.1 General. All permanent construction shall be carried on in areas free from water. Water in varying quantities may be flowing in the Agua Fria River during the entire period of construction as a result of either rainfall or releases from agricultural irrigation ditches. Runoff from the watersheds is rapid, and, during periods of rain, intermittent freshets may be expected. The responsibility of the Contractor for protection of work against water flows is specified in paragraph: DAMAGE TO WORK of the SPECIAL CLAUSES. At all locations where construction work is at a lower elevation than the elevation of the stream or ground water at the time of doing the work, suitable cofferdams or dikes, if necessary, shall be constructed, the construction area shall be dewatered prior to commencement of work, and all subgrades, whether for earth fill, stone, or concrete, shall be kept drained and free of water throughout the working period. Within 10 days after receipt of Notice to Proceed, the Contractor shall submit plans showing the method that he proposes to use to dewater each working area and control the water from rain, sheet flow, stream flow, and any other surface water. The plans shall show the scheme of operations and a complete layout of drainage pipes, pumps, diversion channels, cofferdams, etc. The plans shall also take into consideration the following specific requirements.

1.2 Flood Flows. The Contractor shall provide for diversion of channel flows as hereinafter specified. The channel flows will include water originating from upstream of the work; adjacent drainages; and in addition any and all ground water originating within the work. Flood flows are defined as any flow in excess of 5000 cfs.

1.3 Waste Water Treatment Plant. The 30" and 12" diameter pipes orginating from the wastewater treatment plant and discharging into the Agua Fria River near West Levee Station 35+50 shall be kept operational during the construction of the levee.

1.4 Drainage Ditches. The location and depth of any drainage ditch to be constructed under this contract shall be subject to the approval of the Contracting Officer. Special precautions shall be taken to avoid impairing the permanent subgrade, and any excavation below the existing streambed or invert subgrade shall be refilled with compacted fill in accordance with SECTION: FILLS AND SUBGRADE PREPARATION by and at the expense of the Contractor.

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SECTION 2B

CLEARING SITE AND REMOVING OBSTRUCTIONS

1. PROTECTION.

1.1 Environmental Protection. All work and Contractor operations shall comply with the requirements of SECTIONS: ENVIRONMENTAL PROTECTION and EXCAVATION.

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

3. REQUIREMENTS.

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

3.2 Existing Structures and Obstructions. The Contractor shall clear and grub the site, including all fill, borrow, and excavation areas, and remove and dispose of all existing structures and obstructions for project construction, except as otherwise noted on the drawings. Obstructions which are designated or specified to be removed but which are not designated or specified to be removed by others shall be removed by the Contractor. Except as otherwise specified, obstructions designated to be removed by others will be removed in sufficient time to preclude interference with the Contractor's operations. Utility relocations are not considered to be obstructions.

3.2.1 Clearing. Trees smaller than 1-1/2 inches in diameter and other vegetation, except as specified, shall be cut off at least 6 inches below the indicated channel subgrade or ground level whichever is lower. Other vegetation shall be cut off flush or slightly below the original ground surface. Clearing operations shall be conducted so as to prevent damage to trees, structures, and installations under construction, or to remain in place, and to provide for the safety of employees and others. All rubbish, waste dumps, and debris areas shall be cleared.

3.2.2 Grubbing shall consist of removing all trees, stumps, roots, logs, and other objectionable vegetable matter in the required fills, foundation areas, and all excavation areas. In grubbing out stumps and roots, all roots or other timber more than 1-1/2 inches in diameter shall be removed to at least 3 feet below the depth of the required excavation or existing ground level, whichever is lower. Trees and stumps shall be pulled, not cut off.

3.3 Utilities. Prior to removing an obstruction, all applicable utility relocations shall have been coordinated in accordance with SECTION: GENERAL REQUIREMENTS paragraph: Public Utilites, Notices, and Restrictions. Pipes designated by owners as "abandoned" shall be removed within the limits of the project as necessary for clearing. All pipe shall be plugged at the cut ends.

4. DISPOSAL OF CLEARED, GRUBBED, AND REMOVED MATERIAL. All material removed, except material specified and/or indicated to be salvaged, is designated as scrap, shall become the property of the Contractor, and shall be removed from the site. Materials removed during clearing operations may be temporarily used for diversion and control of water. Disposal shall be in accordance with the requirements of SECTION: ENVIRONMENTAL PROTECTION.

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SECTION 2C

EXCAVATION

Index

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

1.1 American Society for Testing and Materials (ASTM) Standards.

D 2487-83	Classification of Soils for Engineering Purposes

2. GENERAL. Excavation shall consist of the removal of every type of material encountered (except materials covered by the provisions of the SECTION: CLEARING SITE AND REMOVING OBSTRUCTIONS) in the designated areas or from areas directed. The material to be removed may include, but is not limited to earth, hardpan, silt, clay, gravel, cemented sand and gravel, cobbles and boulders, adobe, detached pieces of stone and concrete, rock fills, existing fills of miscellaneous debris and rubbish, and other unsuitable materials. Slope lines indicated on the drawings for temporary cuts do not necessarily represent the actual slope to which the excavation must be made to safely perform the work. The stability of the temporary cut slopes and the safety of personnel shall be the responsibility of the Contractor. Stability of temporary cut slopes may require flatter slopes, in some instances, than that indicated on the drawings. Excavation for permanent cuts shall be made to the slope lines indicated. Excavation shall be performed in a manner which will not impair the subgrade. Except as otherwise specified, the finish surface of subgrades shall be smooth and shall not vary more than one inch from indicated grade.

3. BLASTING. Blasting will not be permitted.

4. PRESERVATION OF PROPERTY. All excavation operations shall be conducted in such a manner that street pavements, sidewalks, curbs, utilities, or other facilities and improvements which are to remain in place permanently will not be subjected to settlement or horizontal movement.

5. EXCAVATION IN VICINITY OF STRUCTURES. Excavation within the vicinity of existing structures, utilities, and drainage pipes to remain in place shall be performed in a manner to prevent damage to the structure. Earth banks and facilities to remain in place shall be supported as necessary during excavation. In general, unless otherwise shown or specified, the actual side slopes will be at the Contractor's option.

6. EXCAVATION FOR ROADS will include the excavation of the existing pavement and subgrade.

7. REMOVAL OF UNSATISFACTORY SOILS. The removal of soils which are unsatifactory for foundations of the channel, structures, levees, roads, and drains, may be required in certain areas. Unsatisfactory materials shall consist of any material classified by ASTM 2487 as CH, OH, MH, and OL. Unsatisfactory materials include, but are not limited to those materials containing roots and other organic matter, trash, debris, and stones larger than 4 inches. Unsatisfactory materials also include man-made fills, refuse, or backfills from previous construction. Satisfactory materials consist of those materials not designated as unsatisfactory. The Contractor will be required to excavate any such areas to the depth directed and backfill the areas with compacted fill conforming to the requirements of the SECTION: FILLS AND SUBGRADE PREPARATION.

8. DISPOSAL OF EXCAVATED MATERIALS.

8.1 General. Excavated materials suitable for required fills shall be placed in temporary stockpiles or used directly in the work. All excess materials suitable for fills under the various specifications of this contract shall be placed in miscellaneous fill areas or spread in the borrow areas after borrow excavation is completed. Excavated material not suitable for fills and unsatifactory materials shall become the property of the Contractor and shall be removed from the site. No excavated materials or waste of any kind shall be disposed of at any place beyond the limits of the work under this contract without the approval of the Contracting Officer. Prior to placing material, the disposal areas and stockpile area(s) shall be cleared of trash and vegetation. Clearing shall conform to the applicable requirements of the SECTION: CLEARING SITE AND REMOVING OBSTRUCTIONS. The stockpiles and disposal fills shall be placed in a manner to preclude ponding of water.

8.2 All required fills shall be completed prior to disposal of any materials in disposal area(s) selected by the Contractor unless approved in writing by the Contracting Officer.

8.3 Additional requirements for disposal of excess excavated material can be found in the SPECIAL CLAUSES; SECTIONS: GENERAL REQUIREMENTS; ENVIRONMENTAL PROTECTION; and CLEARING SITE AND REMOVING OBSTRUCTIONS.

9. OVERCUT. Except as otherwise specified or as may be ordered in writing by the Contracting Officer, any overcut or excavation made outside the lines indicated on the drawings or directed shall be backfilled with compacted fill, or concrete, and all excavating, backfilling, compacting of backfill, and concreting occasioned thereby shall be by the Contractor at no additional cost to the Government. Any overcut under bridge footings shall be backfilled with concrete.

10. EXCAVATION FOR BORROW MATERIAL. Borrow for levee fill and soil cement aggregate shall be taken from the areas indicated on the drawings. Borrow areas A, B, and C shall be utilized to the greatest extent possible before any excavation is accomplished in area E. Borrow area D is a required borrow area and the material shall be removed generally to the limits and configuration shown on the drawings. All excavated materials removed from the designated borrow areas and the required borrow area that meet requirements of this specification must be used for the construction of this project only. An excavation plan, indicating the methods and equipment to be used in excavating borrow areas shall be submitted to the Contracting Officer for approval prior to commencement of excavation in borrow areas. The methods proposed for transporting material from the borrow

areas to the batch plant shall be submitted to the Contracting Officer for approval prior to use. If haul roads are required, the Contractor shall construct and maintain such roads until project completion. Borrow excavation shall not exceed 5 feet of cut below the average existing grade. Excavation shall not be accomplished within 50 feet of electrical transmission tower footings. Upon completion of excavation in the borrow areas, all slopes shall not be steeper than 1 vertical to 5 horizontal and the areas shall be left in a neat condition, graded to drain toward the river channel, and in accordance with the requirements specified in SECTION: ENVIRONMENTAL PROTECTION.

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SECTION 2D

FILLS AND SUBGRADE PREPARATION

Index

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

1.1 American Society for Testing and Materials (ASTM) Standards.

D 1556-82	Density of Soil In-Place by the Sand-Cone Method
D 1557-70	Moisture-Density Relations of Soils Using a 10-Lb. Rammer and an 18-In. Drop
D 2922-81	Density of Soil and Soil-Aggregate In-Place By Nuclear Methods (Shallow Depth)
D 3877-80	One-Dimensional Expansion, Shrinkage and Uplift Pressure of Soil-Lime Mixture

2. COMPACTION EQUIPMENT.

2.1 General. All equipment, tools, and machines shall be maintained in satisfactory working condition at all times.

2.2 Tamping Rollers.

2.2.1 Towed. Tamping rollers shall consist of two or more non-vibratory roller drums mounted side by side in a suitable frame and towed by either a crawler-type or rubber tired tractor having sufficient power to pull the roller satisfactorily when the drums are fully ballasted. Each drum shall be free to pivot about an axis parallel to the direction of travel. Rollers operated in tandem sets shall be controlled in a manner such that the prints produced by the tamping feet of the tandem units are staggered. Each drum of a roller shall have an outside diameter of not less than 5 feet and shall be not less than 5 feet in length. The space between two adjacent drums, when on a level surface, shall be not less than 12 inches nor more than 15 inches. Each drum ballasted with fluid shall be equipped with at least one pressure-relief valve and with at least one safety head. The safety head shall be equal to union-type safety heads equipped with rupture discs

suitable for rupturing pressures between 50 and 75 psi as manufactured by Fike Metal Products Corporation, Blue Springs, Missouri. The pressure-relief valve is a manually operated valve and shall be opened periodically. Personnel responsible for opening pressure-relief valves shall be periodically instructed to acertain that valve openings are free from plugging to assure that any pressure developed in roller drums is released at each inspection. At least one tamping foot shall be provided for each 100 square inches of drum surface. The length of each tamping foot from the outside surface of the drum shall be not more than 10 inches and shall be maintained at not less than 7 inches. The bearing surface of each tamping foot shall be flat with a surface area not less than 5 square inches nor more than 10 square inches. During the operation of rolling, the spaces between the tamping feet shall be maintained clear of materials which would impair the effectiveness of the tamping rollers. The weight of a roller when fully loaded shall be not less than 4,000 pounds per foot of length of drum. The weight of a roller empty shall be not more than 2,500 pounds per foot of drum length. The bearing surface, tamping foot size, the drum loading, and operation of the rollers shall be as required to obtain the desired compaction. If more than one roller is used on any one layer of fill, all rollers so used shall be of the same type and essentially of the same dimensions. Rollers shall be drawn by crawler-type or rubber-tired towing tractors at a speed not to exceed 5.0 miles per hour. The use of rubber-tired towing equipment shall be discontinued if the tires leave ruts that prevent uniform compaction by the tamping roller, and the substitution of crawler type towing equipment may be directed by the Contracting Officer.

2.2.2 Self-propelled. The use of self-propelled non-vibratory rollers conforming to the following specifications will be permitted, and their design and operation shall be subject to the approval of the Contracting Officer who shall have the right at any time during the prosecution of the work, to direct such modifications to the tamping feet or variations in roller drum weight where applicable, as may be found necessary to secure optimum compaction of the earthfill materials. If use of self-propelled rollers causes shearing of the fill or laminations in the fill, or results in inadequate compaction, the Contracting Officer may direct that the rollers be removed from the fill and that appropriate towed tamping rollers be used. Two- or three-drum side-by-side units that are either in drive position or drawn by separate power equipment shall have a clearance between adjacent drums not less than 12 inches nor more than 15 inches. Two-drum or four-drum equipment separated by cab and differential and arranged in tandem must have its static weight equally distributed to all compaction drums and must have the tandem drums positions such that the prints of the tamping feet produced by the tandem drums are staggered. The surface on which the tamping feet are mounted shall have a minimum outside diameter of 4 feet and at least one tamping foot for each 100 square inches of drum surface. The distance between the centers of any two adjacent tamping feet shall be not less than 9 inches. The length of each tamping foot from the outside mounting surface of the drum shall be not more than 11 inches and shall be maintained at not less than 9 inches. The bearing surface of each tamping foot shall be flat and have a surface area not less than 7 square inches nor more than 14 square inches. Cupped recesses within the bearing surface of each tamping foot will be permitted, but shall not exceed 0.5 inches in depth. During rolling operations, the spaces between the tamping feet shall be maintained clear of materials which would impair the effectiveness of the tamping roller. The weight of all roller drums during compaction of fill materials shall be maintained uniform and with the weight per foot of drum length not less than 4,300 pounds. For self-propelled rollers with drums capable of being ballasted with fluid, each drum shall be equipped with at least one pressure-relief valve

and with at least one safety head. The safety head shall be equal to union type safety heads equipped with rupture discs suitable for rupturing pressures between 50 and 75 psi as manufactured by the Fike Metal Products Corporation, Blue Springs, Missouri. The pressure relief valve is a manually operated valve and shall be opened periodically. Personnel responsible for opening pressure-relief valves shall be periodically instructed to ascertain that valve openings are free from plugging to assure that any pressure developed in roller drums is released at each inspection. For self-propelled rollers in which steering is accomplished through the use of rubber-tired wheels, the tire pressure shall not exceed 40 psi. The use of the compactor shall be discontinued if the tires leave ruts that prevent uniform compaction by the tamping roller and the substitution of appropriate towed tamping rollers may be directed by the Contracting Officer. When self-propelled roller is provided with a dozer blade, coverages made with the blade in operation shall not be counted as compaction coverages. Self-propelled rollers shall be operated at a speed not to exceed 5.0 mph.

2.2.3 Vibratory Rollers. Vibratory rollers shall be equipped with smooth steel compaction drum and shall be operated at a frequency of vibration during compaction operations between 1100 and 1500 vpm. Vibratory rollers may be either towed or self-propelled and shall have an unsprung drum weight that is a minimum of 60 percent of the rollers' static weight. Towed rollers shall have at least 90 percent of their weight transmitted to the ground through the compaction drum when the roller is standing in a level position hitched to the towing vehicle. Rollers shall have a minimum static weight of 20,000 pounds, a minimum dynamic force of 40,000 pounds when operating at 1400 vpm, and an applied force not less than 9,000 pounds per foot of compaction drum length. The level of amplitude and vibration frequency during compaction will be maintained uniform throughout the zone within which it is operating. Rollers shall be operated at speeds not to exceed 1.5 miles per hour. The equipment manufacturer shall furnish sufficient data, drawings, and computation for verification of the above specifications, and the character and efficiency of this equipment shall be subject to the approval of the Contracting Officer.

2.2.4 Rubber-Tired Rollers shall have a minimum of 4 wheels equipped with pneumatic tires. The tires shall be of such size and ply as to be capable of being operated at tire pressures between 80 and 100 pounds per square inch at a 25,000-pound wheel load. The roller wheels shall be located abreast and be so designed that each wheel will carry approximately equal load in traversing uneven ground. The spacing of the wheels will be such that the distance between the nearest edges of adjacent tires will not be greater than 50 percent of the rated tire width of a single tire at the operating pressure for a 25,000-pound wheel load. The roller shall be provided with a body suitable for such ballast loading that the load per wheel may be varied as directed by the Contracting Officer from 18,000 to 25,000 pounds. The roller shall be towed at speeds not to exceed 5 miles per hour. The character and efficiency of this equipment shall be subject to the approval of the Contracting Officer. If the rubber-tired rollers cause shearing of the fill or laminations in the fill, the Contracting Officer may direct that the rollers be removed from the fill and that tractor-drawn tamping rollers be used.

2.2.5 Mechanical Tampers. Compaction of material, in areas where it is impracticable to use a roller, shall be performed by the use of approved mechanical tampers.

3. GENERAL REQUIREMENTS FOR COMPACTED FILLS AND COMPACTED BACKFILLS.

3.1 Control. Moisture-density relations shall be established by the Contractor. Field density tests shall be performed by the Contractor in sufficient number and in such locations to insure that the specified density is being obtained. Moisture-density relations and field densities shall be reported on approved forms. One copy of density data less dry weight determinations shall be provided on the day each test is taken. The completed test reports shall be provided to the Contracting Officer on the work day following the test.

3.1.1 Laboratory Control. One moisture-density relation shall be made for each classification, blend or change in classification of soil material encountered. Approval of moisture-density relations shall be obtained prior to the compacting of any material in the work. The moisture-density relations shall be determined in a laboratory in accordance with ASTM D 1557, modified as specified hereafter.

3.1.1.1 A separate batch of materials will be used for each compaction test specimen. No materials will be re-used.

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

3.1.2 Field Control. Field in-place density shall be determined in accordance with ASTM Specifications D 1556, except that in each test, the weight of the disturbed sample representing the full depth of layer shall be not less than 10 pounds for fine grain material and 12 pounds for coarse grain material using a scale for weighing of sufficient capacity and sensitive to .01 pounds. The density tests shall be well distributed and shall average not less than one test for each 2000 cubic yards of compacted fill or backfill material, and not less than one test per 10,000 square feet of subgrade area. At least one test shall be made for each 2 feet of elevation of compacted material processed as a unit and at least one test shall be made in each area compacted. Determination of in-place densities using the nuclear method (ASTM D 2922) may be used to supplement the sand-cone density tests, but will not be permitted as the primary control. In using a nuclear density device the results obtained using factory supplied curves must be compared with density and water contents determined by the sand-cone method. If field density tests determined by the nuclear method vary by more than 3 pounds per cubic foot from comparison sand-cone tests, and are consistently high or low, then adjustment of the calibration curve is necessary.

3.1.3 Moisture-Density Curves for Cohesionless and Cohesive Material. Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils typically show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

3.2 Settling of Fills or Backfills with Water will not be permitted, except as specified hereinafter for backfills and culverts.

3.3 Fill material shall be obtained from the required excavations; shall be free from sod, roots, brush, debris, trash or other objectionable material, and shall contain no stone whose greatest dimension is more than 3/4 of the layer thickness after compaction.

3.4 Placement. Fill material shall not be placed against concrete which has not been in place at least 14 days or until the concrete has attained a strength of 2,500 p.s.i. when tested in accordance with the SECTION: CONCRETE. Heavy equipment shall not be operated over pipes and buried structures until at least 2 feet of fill material has been placed and compacted over them in conformance with the requirements of SECTION: CULVERTS. Compacted fill and backfill shall be placed with suitable equipment in horizontal layers which after compaction, shall not exceed 12 inches in depth for rubber-tired or vibratory rollers, 6 inches in depth for tamping rollers, and 4 inches in depth when mechanical tampers are used. The Contractor may vary the layer thickness within these limits for most efficient operations. Material containing stones shall be placed in a manner to prevent the stones from striking the concrete structures and to prevent the formation of voids.

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

3.6 Compaction. No layer of fill shall be compacted before the appropriate uniform moisture content has been obtained. (If the compacted surface of any layer of material is determined by the Contracting Officer to be too smooth to bond properly with the succeeding layers, it shall be scarified by an approved method.) Scarified areas shall be compacted as specified for the fill placed thereon. Rollers will not be permitted to operate within one foot of channel or structure walls or over buried structures until the compacted fill over the top of the structures has reached a depth of 2 feet. Compaction equipment shall be so operated that structures are not damaged nor overstressed during compaction operations. Mechanical tampers shall be used for compaction of fill material adjacent to structures where rolling equipment is impracticable for use in compaction.

4. COMPACTED FILL, CULVERTS. Bedding and backfill for culverts shall conform to the requirements of SECTION: CULVERTS.

5. COMPACTED FILL, LEVEE.

5.1 Preparation for Placing. Before placing material for compacted fill, the foundation surface shall be cleared of all existing obstructions, vegetation, and debris. Unsuitable material not meeting the requirements for fill material shall be removed where directed, and the existing surfaces scarified to a depth of 6

inches before placing the fill. Sloped ground surfaces steeper than one vertical to 4 horizontal, on which fill or compacted backfill is to be placed, shall be stepped in such a manner that the compaction equipment will bear on the full depth of the fill layer.

5.2 Compaction. Each layer of levee fill shall be compacted to not less than 90 percent of maximum density as determined by ASTM D 1557.

5.3 Trimming. The river side and top of levees shall be trimmed to the lines indicated on the drawing with a tolerance of plus or minus one inch as measured perpendicular to the slope. Any material loosened by trimming shall be recompacted. The land side of levees shall be trimmed to a uniform alinement at top of levee and to a reasonably uniform slope at, or outside the lines on the drawings. The ramps shall be trimmed to a uniform alinement and reasonably uniform slopes.

6. COMPACTED FILL, ROAD.

6.1 Location. Compacted road fill shall consist of fill placed for road construction, excluding levee fill and all other fill and backfill within the road right-of-way.

6.2 Compaction. Each layer of road fill shall be compacted to not less than 90 percent of maximum density as determined by ASTM D 1557, except the upper 6 inches of fill shall be compacted to not less than 95 percent of maximum density.

6.3 Trimming. All shoulders and side slopes shall be neatly and accurately trimmed to the cross section indicated.

7. BACKFILLS.

7.1 Backfill and Fill About Structures.

7.1.1 Location. Backfill shall consist of all fill against and/or around structures, except backfill for culvert trenches.

7.1.2 Material. Backfill and fill material shall be obtained from the required excavation and borrow source(s) as approved by the Contracting Officer. In general, the best material available will be designated as backfill and fill about structures. Backfill may consist of sand, gravelly sand, silty sands, and clayey sands. Organic material, silt, clay, broken concrete or pavement, boulders and other objectionable material shall not be used.

7.1.3 Placing. Fill material shall not be placed against concrete which has not been in place at least 14 days or until the concrete has attained a strength of 2,500 p.s.i. when tested in accordance with SECTION: CONCRETE. Fill shall be placed in layers no greater than 4 inches after compaction.

7.1.4 Compaction shall be not less than 90 percent of maximum density as determined by ASTM D 1557 except that backfill in levee fill sections shall not be less than 95 percent of maximum density as determined by ASTM D 1557.

7.2 Backfill, Culvert Trenches. Backfill for culverts shall conform to SECTION: CULVERTS.

7.3 Backfill, Toe shall consist of material placed over the toe of the soil cement protection. In general, the fill shall consist of material suitable for compacted fill placed in horizontal layers not more than 9 inches in thickness after compaction, smoothed and dressed to the lines and grades indicated, and compacted to not less than 90 percent maximum density as determined by ASTM D 1557. No depressions shall be left in toe backfill areas.

8. MISCELLANEOUS FILL shall consist of material placed in the areas indicated and shall be placed in layers which shall not exceed 24 inches in depth before consolidation. Miscellaneous fill shall be free of broken concrete, rock, and bituminous paving. No depressions in which water might pond shall be left in miscellaneous fill areas. The finished areas shall be sloped to drain. Compaction other than that obtained by the controlled movement of the construction equipment will not be required.

9. SUBGRADE PREPARATION FOR ROADS. The subgrade shall be alternately watered and scarified until the material is uniformly moistened throughout for a depth of not less than 6 inches. All stones larger than 4 inches in diameter, and hard ribs of earth shall be removed. All unsatisfactory materials, as defined in paragraph: REMOVAL OF UNSATISFACTORY SOILS of SECTION: EXCAVATION, shall also be removed. The amount of water to be applied shall be that which is required to provide optimum results in compaction under rolling. Following the above operations, the roadbed shall be shaped to a true cross section sufficiently higher than the specified grade to allow for subsequent compaction and then be thoroughly compacted to not less than 95 percent of maximum density as determined by ASTM D 1557. After the subgrade has been prepared and completed, the surface shall be firm, hard, and unyielding, with a true, even, and uniform surface conforming to the grade and cross section indicated on the drawings. All points of the finished subgrade shall be not more than 1/4 inch below or above true subgrade. Testing requirements and frequencies shall be as described in paragraph: GENERAL REQUIREMENTS FOR COMPACTED FILLS AND COMPACTED BACKFILLS.

10. SUBGRADE PREPARATION FOR SOIL-CEMENT.

10.1 The areas which shall receive soil-cement shall be cleaned of debris, trash, organics, and unsuitable materials, and excavated to the lines and grades as shown on the drawings without damage to the subgrade. The subgrade for the soil-cement fill shall be compacted to at least 95 percent maximum density as determined by ASTM D 1557 to a depth of at least 12 inches and shall be capable of withstanding, without displacement, the compaction specified for the soil-cement mixture. Unsatisfactory subgrade material shall be removed and replaced with acceptable material in accordance with paragraph: REMOVAL OF UNSATISFACTORY SOILS of SECTION: EXCAVATION. Testing requirements and frequencies shall be as described in paragraph: GENERAL REQUIREMENTS FOR COMPACTED FILLS AND COMPACTED BACKFILLS.

11. GRAVEL.

11.1 Location. Gravel for the levee shall consist of the gravel course over the compacted fill for the levee as specified in SECTION: MISCELLANEOUS AGGREGATES.

11.2 Compaction. Gravel for the levee shall be compacted to not less than 90 percent of maximum density as determined by ASTM D 1557.

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SECTION 2E

CULVERTS

Index

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

1.1 Federal Specification (Fed. Spec.).

HH-P-117	Packing; Jute, Twisted
SS-S-210A	Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints

1.2 Federal Standards (Fed. Std.).

No. 601	Rubber: Sampling and Testing

1.3 American Association of State Highway and Transportation Officials (AASHTO), Standards.

M 65-80	Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
M 170-84	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
M 198-75 (1982)	Joint for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets

1.4 American Society for Testing and Materials (ASTM) Standards.

C 76-84a	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C 231-82	Air Content of Freshly Mixed Concrete by the Pressure Method
C 270-73	Mortar for Unit Masonry
C 425-75	Compression Joints for Vitrified Clay Pipe and Fittings

C 443-79	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
C 700-78a (R1983)	Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
C558-82	Moisture Density Relations of Soil Cement Mixtures
D 1556-82	Density of Soil in Place by the Sand-Cone Method
D 1557-78	Moisture-Density Relations of Soils, and Soils-Aggregate Mixtures Using 10-lb. (4.5-Kg) Rammer and 18-in. (457-mm) Drop
D 1751-73 (1978)	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
D 1752-67 (1978)	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

2. DELIVERY, STORAGE, AND HANDLING OF MATERIALS.

2.1 Delivery and Storage. Materials delivered to site shall be inspected for damage, unloaded, and stored with the minimum of handling. Do not store materials directly on the ground. Inside of pipes and fittings shall be kept free of dirt and debris.

2.2 Handling. Materials shall be handled in such a manner as to insure delivery to the trench in sound undamaged condition. Pipe shall be carried to the trench not dragged. Gasket materials and plastic materials that are not to be installed immediately shall not be stored in the direct sunlight.

3. MANUFACTURER'S RECOMMENDATIONS. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Contracting Officer prior to installation. Installation of the item will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

4. TESTS FOR PIPE. Certified copies of test reports demonstrating conformance to applicable pipe specifications shall be delivered to the Contracting Officer before pipe is installed. Strength tests for concrete and clay pipe as required in applicable specifications shall be the three-edge bearing tests.

5. PIPE FOR CULVERTS shall be as indicated and shall conform to requirements for the following pertinent types.

5.1 Reinforced Concrete Pipe. ASTM C 76 or AASHTO M 170, type as shown on the drawings.

5.2 Mortar. Type M, conforming to ASTM C 270 except the maximum placement time shall be 30 minutes after the ingredients are mixed with water.

5.3 Vitrified Clay Pipe. ASTM C 700 or AASHTO M 65, extra strength type.

6. MATERIALS FOR DRAINAGE STRUCTURES.

6.1 Concrete. Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements of the SECTION: CONCRETE, 4,000 psi compressive strength at 28 days. The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 1-1/2 inches. Air content shall be determined in accordance with ASTM C 231. The concrete covering over steel reinforcing shall be not less than 1-1/2 inches thick for walls and flooring. Concrete covering deposited directly against the ground shall have a thickness of at least three inches between steel and ground. Expansion-joint filler material shall conform to ASTM D 1751 and D 1752, or shall be resin impregnated fiberboard conforming to the physical requirements of ASTM D 1752.

6.2 Mortar. Mortar for pipe joints and connections to other drainage structures shall conform to ASTM C 270, Type M, except the maximum placement time shall be 30 minutes after the ingredients are mixed with water.

6.2.1 The inside of the joint shall be wiped clean and finished smooth. In pipe too small for a man to work inside, wiping may be done by dragging a suitable swab or long-handled brush through the pipe as work progresses. The mortar bead on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

7. CONCRETE AND VITRIFIED CLAY PIPE JOINTS. Unless otherwise specified, one of the following methods of jointing for bell-and-spigot and tongue-and-groove pipe shall be used:

7.1 Cement-Mortar Bell-And-Spigot Joint. The first pipe shall be bedded to the established gradeline, with the bell end placed upstream. The interior surface of the bell shall be carefully cleaned with a wet brush and the lower portion of the bell filled with mortar to such depth as to bring inner surfaces of abutting pipes flush and even. The spigot end of each subsequent pipe shall be cleaned with a wet brush and uniformly matched into the bell so that sections are closely fitted. After each section is laid, remainder of the joint shall be filled with mortar, and a bead shall be formed around the outside of the joint with sufficient additional mortar. Cement mortar, finish, and protection of joints shall be as specified in paragraph: MATERIALS FOR DRAINAGE STRUCTURES: Mortar. If the mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside of the joint shall be wrapped or bandaged with cheesecloth to hold the mortar in place.

7.2 Cement-Mortar Oakum Joint for Bell-And-Spigot Pipe. A closely twisted gasket shall be made of joint packing, conforming to Fed. Spec. HH-P-117, of diameter required to support the spigot end of the pipe at the proper grade and to make the joint concentric. Joint packing shall be in one piece of sufficient length to

pass around the pipe and lap at the top. This gasket shall be thoroughly saturated with neat cement grout. The bell of the pipe shall be thoroughly cleaned with a wet brush, and the gasket shall be laid in the bell for the lower third of the circumference and covered with mortar. The spigot of pipe shall be thoroughly cleaned with a wet brush, inserted in the bell, and carefully driven home. A small amount of mortar shall be inserted in the annular space for the upper two-thirds of the circumference. The gasket then shall be lapped at the top of the pipe and driven home in the annular space with a calking tool. The remainder of annular space then shall be filled completely with mortar and beveled at an angle of approximately 45 degrees with the outside of the bell. If the mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside of the joint thus made shall be wrapped with cheesecloth. Placing of this type of joint shall be kept at least five joints behind laying operations.

7.3 Cement-Mortar Diaper Joint for Bell-And-Spigot Pipe. The pipe shall be centered so that annular space is uniform. The annular space shall be calked with joint packing conforming to Fed. Spec. HH-P-117. Before calking, the inside of bell and outside of spigot shall be clean.

7.3.1 Diaper bands shall consist of heavy cloth fabric to hold the grout in place at the joints and shall be cut into such lengths that they will extend one-eighth of the circumference of pipe above the spring line on one side of the pipe and up to the spring line on the other side of the pipe. Longitudinal edges of fabric bands shall be rolled and stitched around two pieces of wire. Width of fabric bands shall be such that after the fabric has been securely stitched at both edges with wires, the wires will be uniformly spaced not less than 8 inches apart. Wires shall be cut into lengths to pass around the pipe with sufficient extra length for the ends to be twisted at the top of pipe to hold the band securely in place; bands shall be accurately centered around the lower portion of joint.

7.3.2 Grout shall be poured between band and pipe from only the high side of band, until grout rises to the top of the band at the spring line of the pipe, or as nearly as possible, on the opposite side of pipe, to insure a thorough sealing of joint around the portion of pipe covered by the band. Silt, slush, water, or polluted mortar grout forced up on the lower side shall be carefully forced out by the pouring and removed.

7.3.3 The remaining unfilled upper portion of the joint shall then be filled with mortar and a bead formed around the outside of this upper portion of the joint with sufficient amount of additional mortar. The diaper shall be left in place. Placing of this type joint shall be kept at least five joints behind actual laying of pipe. No backfilling around joints shall be done until joints have been fully inspected and approved.

7.4 Cement-Mortar Tongue-And-Groove Joint. The first pipe shall be bedded carefully to the established gradeline with the groove upstream. A shallow excavation shall be made underneath the pipe at the joint and filled with mortar to provide a bed for the pipe. The grooved end of the first pipe shall be carefully cleaned with a wet brush, and a layer of soft mortar applied to the lower half of the groove. The tongue of the second pipe shall be cleaned carefully with a wet brush; while in horizontal position, a layer of soft mortar shall be applied to the upper half of the tongue. The tongue end of the second pipe then shall be inserted in the grooved end of the first pipe until mortar is squeezed out on interior and exterior surfaces. Sufficient mortar shall be used to fill the joint completely and to form a bead on the outside.

7.5 Cement-Mortar Diaper Joint for Tongue-And-Groove Pipe. The joint shall be of the type described in paragraph: Cement-Mortar Tongue-And-Groove Joint above, except that the shallow excavation directly beneath the joint shall not be filled with mortar until after a gauze or cheesecloth band dipped in cement mortar has been wrapped around the outside of the joint. The cement-mortar bead at the joint shall be at least 1/2-inch thick, and the width of the diaper band shall be at least eight inches. The diaper shall be left in place. Placing of this type joint shall be kept at least five joints behind the actual laying of the pipe. No backfilling around the joints shall be done until joints have been fully inspected and approved.

7.6 Rubber Gasket Joint. Design of joints and physical requirements for rubber-type gaskets shall conform to ASTM C 443 or AASHTO M 198. Gaskets shall have not more than one factory-fabricated splice, except that two factory-fabricated splices of the rubber gasket type are permitted if nominal diameter of pipe being gasketed exceeds 54 inches. Material conforming to Fed. Spec. SS-S-210 is acceptable as an alternate to ASTM C 443 provided the necessary installation instructions are furnished. Gaskets or jointing materials shall not swell more than 100 percent by volume when immersed in accordance with Method 6211 of Fed. Std. 601, in immersion medium No. 3 for 70 hours at 212 degrees F. Certified copies of test results shall be delivered to the Contracting Officer before gaskets or jointing materials are installed. Alternate types of watertight joint may be furnished if specifically approved. Gaskets and joining materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pulled together. If, while making the joint, the gasket or jointing material becomes loose and can be seen through the exterior joint recess when joint is pulled up to within one inch of closure, the pipe shall be removed and the joint remade.

7.7 Plastic conforming to ASTM C 425 may be used with clay pipe. Plastic shall be molded in the annular space or on the spigot of the pipe, or both, in a plant especially equipped for the purpose.

8. EXCAVATION AND TRENCHING FOR PIPE CULVERTS. Excavation of trenches shall be in accordance with the applicable portions of SECTION: EXCAVATION and the following requirements.

8.1 Trenching. Sheeting and bracing where required shall be placed within the trench width as specified in SECTION: EXCAVATION. Care shall be taken not to over excavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures shall be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.

8.2 Removal of Rock. Rock encountered during excavation in either ledge or boulder formation shall be replaced with satisfactory materials containing no stone larger than recommended by the pipe manufacturer to provide a compacted

earth cushion having a thickness between unremoved rock and the pipe of at least 8 inches or 1/2-inch for each foot of fill over the top of the pipe, whichever is greater, but not more than three-fourths the nominal diameter of the pipe. Where bell-and-spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe. Satisfactory materials are defined in accordance with paragraph: REMOVAL OF UNSATISFACTORY SOILS of SECTION: EXCAVATION.

8.3 Removal of Unstable Material. Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is encountered in bottom of trench, such material shall be removed to depth required and replaced to the proper grade with satisfactory material, compacted as provided in paragraph: BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor in his performance of shoring and sheeting, water removal, or other specified requirements, resulting material shall be excavated and replaced.

9. BEDDING FOR CULVERTS.

9.1 General. Bedding for culverts shall consist of sand fill placed around the pipe in accordance with paragraph: BACKFILLING. Compacted fill above the bedding shall be placed in accordance with paragraph: BACKFILLING.

9.1.1 Material for the bedding of the culvert shall be clean sand, free of trash, organic materials, debris, and with 100 percent passing the No. 4 sieve and not more than 10 percent passing the No. 100 sieve.

9.1.2 Material for the compacted fill above the bedding shall not contain any stone larger than 3/4 inch and may consist of sand, gravelly sand, silty sands, and clayey sands. Organic material, silt, clay, broken concrete or pavement, boulders and other objectionable material shall not be used.

9.2 Placing. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. The pipe shall be bedded carefully on a foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular pipe, for the entire length of pipe. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making the particular type joint.

10. PLACING PIPE. Each pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alinement indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. All pipe in place shall be inspected before backfilling, and those damaged during placement shall be removed and replaced at no additional cost to the Government.

10.1 Concrete and Vitrified Clay Pipe. Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

11. BACKFILLING.

11.1 **Backfilling Pipe Trenches.** After the bedding has been prepared and the pipe installed, clean sand as defined in paragraph: BEDDING FOR CULVERTS, shall be placed along both sides of pipe in a single lift to the springing line (maximum horizontal dimension of a pipe). The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. Water shall be applied to the sand fill by jetting in a manner, quantity, and at a rate sufficient to thoroughly saturate the entire lift. Vibrating compaction equipment shall be used to obtain not less than 85 percent of maximum density as determined by ASTM D 1557. Care shall be taken to insure thorough compaction of the satisfactory material under the haunches of the pipe. Above the springing line, the trench shall be filled with satisfactory material containing no stone larger than that recommended by the pipe manufacturer. The satisfactory material, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 4 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. Each layer shall be thoroughly compacted with mechanical tampers or vibrators to not less than 85 percent of maximum density. This method of filling and compacting shall continue until the fill has reached an elevation of at least 24 inches above the top of the pipe. The remainder of the trench shall be backfilled and compacted by the spreading and rolling or compacted by mechanical tampers or vibrators in layers not exceeding 6 inches compacted to 90 percent of maximum density (ASTM D 1557). Where it is necessary in the opinion of the Contracting Officer, any sheeting and/or portions of bracing used shall be left in place, and the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

11.2 Backfilling Pipe Trenches in Fill Sections. For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified above. The fill material above the springing line shall be uniformly spread in layers longitudinally on both sides of pipe, not exceeding 4 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or vibrating to obtain not less than 85 percent of maximum density (ASTM D 1557). Prior to commencing normal filling operations, the crown width of the fill at a height of 24 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 24 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 6 inches.

11.3 **Backfilling Pipe Trenches in Soil-Cement Sections.** For pipe placed in soil-cement fill sections, after the pipe bedding has been prepared and the pipe installed, soil-cement material shall be placed along both sides of the pipe and made to ramp over the pipe in compacted lifts not to exceed 4-inches until the pipe is covered with a minimum of 24-inches of soil-cement. The gradient of the ramp shall be limited to a maximum of 10 percent. The soil-cement fill shall be brought up evenly on both sides and for the full length of the pipe along the soil-cement facing. Vibratory compacting equipment shall be used to obtain not less than 98 percent of maximum density as determined by ASTM D 558. Care shall be taken to insure thorough compaction of the soil-cement fill under the haunches of and around the pipe to prevent damage to the pipe. Soil cement shall conform to the specifications set forth in SECTION: SOIL-CEMENT.

11.4 Movement of Construction Machinery. Movement of construction machinery over a culvert at any stage of the construction shall be at the Constractor's risk. Any pipe damaged thereby shall be repaired or replaced at the expense of the Contractor.

11.5 Compaction.

11.5.1 Laboratory Control. The moisture-density relations shall be determined in a laboratory in accordance with ASTM D 1557 and ASTM D 558.

11.5.2 Field Control. Field density tests shall be well distributed and shall average not less than one test per 2 feet depth or less of backfill for each 200 lineal feet of trench. At least one test shall be made in each trench. Field in-place density shall be detemined in accordance with ASTM D 1556, except that in each test, the weight of the disturbed sample representing the full depth of layer shall be not less than 10 pounds for fine grain material and 12 pounds for coarse grain material using a scale for weighing of sufficient capacity and sensitive to .01 pounds.

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SECTION 2F

AGGREGATE BASE (ARIZONA)

Index

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

1.1 American Society for Testing and Materials (ASTM) Publications.

C 117-84	Materials Finer than No. 200 (75-m) Sieve in Mineral Aggregates by Washing
C 131-81	Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
C 136-84a	Sieve or Screen Analysis of Fine and Coarse Aggregates
D 75-82	Sampling Aggregates
D 422-63 (R 1972)	Particle-Size Analysis of Soils
D 1556-82	Density of Soil in Place by the Sand-Cone Method
D 1557-78	Moisture Unit Weight Relations of Soils and Soil Aggregate Mixtures Using 10-lb. (4.5 Kg) Rammer and 18-in. (457 mm) Drop
D 4318-83	Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
E 11-81	Sieves for Testing Purposes

2. MATERIALS. Aggregates shall consist of crushed stone, crushed gravel, angular sand, soil, or other sound, durable, approved materials processed and blended or naturally combined. Aggregates shall be durable and sound, free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material. It shall be the responsibility of the Contractor to obtain materials

that will meet the requirements specified herein and that can be constructed to meet the grade and smoothness requirements specified herein after all compaction requirements have been completed. The material retained on a No. 4 sieve shall be known as coarse aggregate, and the material passing the No. 4 sieve shall be known as binder material.

2.1 Coarse Aggregate conforming to the requirements specified above shall have a percentage of wear not to exceed 50 percent after 500 revolutions when tested in accordance with ASTM C 131. Coarse aggregate shall consist of angular fragments reasonably uniform in density and quality. The amount of flat and elongated particles shall not exceed 30 percent. A flat particle is one having a ratio of width to thickness greater than 3, and an elongated particle is one having a ratio of length to width greater than 3.

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

2.2 Binder Material shall consist of screenings, angular sand, soil, or other finely divided mineral matter processed or naturally combined with the coarse aggregate. Liquid-limit and plasticity-index requirements stated herein shall apply to any component that is blended to meet the required gradation and shall also apply to the completed course. The portion of any component or of the completed course passing the No. 40 sieve shall be either nonplastic or shall have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2.3 Gradation requirements specified herein shall apply to the completed base course and select materials, and it shall be the responsibility of the Contractor to obtain materials that will meet the gradation requirements after mixing, placing, compacting, and other operations. The values are based on aggregates of uniform specific gravity, and the percentages passing the various sieves are subject to appropriate correction by the Contracting Officer when aggregates of varying specific gravities are used.

2.3.1 The Base Course aggregates shall have a maximum size of one inch and shall be continuously graded within the limits specified below:

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve
1-1/8 Inch	100
No. 4	38-65
No. 8	25-60
No. 50	10-40
No. 200	3-12

2.3.2 The select material aggregates shall have a maximum size of 3 inches and shall be continuously graded within the limits specified below:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieve
3 inch	100
No. 4	30-75
No. 8	20-60
No. 30	10-40
No. 200	0-12

2.3.3 Gravel material aggregate quality and gradation requirements shall be as indicated for aggregate base course, except the maximum size shall be 3/4-inch.

3. SAMPLING AND TESTING. Sampling and testing shall be by and at the expense of the Contractor.

3.1 Samples shall be of the size required and shall be taken by the Contractor. Copies of test results shall be submitted for approval 7 days prior to starting the work, and thereafter at regular intervals during production, as specified hereinafter. These samples shall be obtained at the source, from test pits, borings, trucks, stockpiles, or from other designated locations. Samples for material gradation, liquid-limit determination, and plasticity-index tests shall be taken in conformance with ASTM D 75. After the material has been placed and compacted, samples for density tests shall be taken as specified in ASTM D 1556, and additional samples for gradation, liquid-limit, and plasticity-index tests shall be taken by an appropriate method. Where deemed necessary, the sampling will be supervised by the Contracting Officer. The Contractor shall arrange his work so that sampling and testing may be performed without interruption.

3.2 Tests.

3.2.1 Aggregate Gradation. Aggregate gradation shall be determined in accordance with ASTM C 117, C 136, and D 422. Sieves shall conform to ASTM E 11.

3.2.2 Liquid Limit shall be determined in accordance with ASTM D 4318.

3.2.3 Plasticity Index shall be determined in accordance with ASTM D 4318.

3.2.4 Wear Test shall be made in conformance with ASTM C 131.

3.2.5 Field in-place density shall be determined in accordance with ASTM D 1556. Moisture-density relations shall be established in the laboratory in accordance with ASTM D 1557, Method D.

3.3 Testing Frequency. Results of tests to determine particle shape, presence of objectionable coatings and foreign matter, percentage of wear, fracture count, gradation, liquid-limit, plasticity-index, specific gravity, and other specification requirements for determination of the acceptability of the source shall be submitted for approval at least 7 days prior to starting of manufacture of the base course material. Production testing for material gradation, liquid limit, and plasticity index shall be performed at regular intervals with at least one test being made for each 500 cubic yards or fraction thereof, of material

produced and results shall be submitted on a daily basis. Deviations from specification requirements shall be corrected immediately upon discovery. After the material has been placed and compacted, one field density test for each 1,000 square yards or fraction thereof of finished base course and one additional gradation, liquid-limit, and plasticity index test for each 1,000 square yards of base course or fraction thereof shall be performed. Maximum-density moisture relations shall be established for each 1,000 square yards of base course material. The location of the after-placement tests shall be as directed. One copy of density data (less dry weight determinations) shall be provided on the day each test is taken. The completed test report shall be provided with the Contractor Quality Control Report on the following work day. Results of all tests made shall be submitted for approval on a daily basis and subsequent paving operations shall not commence until final approval has been obtained. Failure of any test shall be reported verbally, by the most expeditious means and followed promptly by written report. Contractor field operations shall immediately reflect corrective measures. For every failing test, retesting will be required after corrective measures have been taken.

3.4 Approval of Material. The source of the material shall be selected 7 days in advance of the time materials will be required in the work. Tentative approval of the preliminary reports submitted by the Contractor and the source will be based on an inspection by the Contracting Officer. Tentative approval of the materials will be based on test samples as specified herein. Final approval of both the source and the materials will be based on specific tests performed on samples taken from the completed and compacted base course and selected material.

4. EQUIPMENT. All plant, equipment, and tools used in the performance of the work covered by this section will be subject to approval by the Contracting Officer before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein and within the specified time limits.

5. OPERATION OF PITS OR QUARRIES. All work involved in clearing, stripping, and excavating in opening or operation of pits or quarries shall be performed by the Contractor. Pits or quarries shall be opened to expose vertical faces of deposit to depths suitable for working. Materials excavated from pits shall be obtained in successive vertical cuts extending through all exposed strata. All pockets or strata of unsuitable materials overlying or occurring within the deposit shall be wasted as directed. The methods of operating pits or quarries and the processing and blending of the material may be changed or modified by the Contracting Officer when necessary to obtain material conforming to the specified requirements. Quarries shall be conditioned in agreement with the local laws or authorities.

6. WEATHER LIMITATIONS. Aggregate base shall be constructed only when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F., the Contractor shall protect all areas of the completed aggregate base course, by approved methods, against any detrimental effects of freezing. Areas of completed aggregate base course damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.

7. PREPARATION OF UNDERLYING SURFACE. Prior to constructing the aggregate base course, the previously constructed subgrade constructed with select materials shall be cleaned of all foreign substances. Surface of the subgrade shall be

inspected by the Contractor for adequate compaction and surface tolerances. The subgrade shall conform to SECTION: FILLS AND SUBGRADE PREPARATION. Ruts or soft, yielding spots that may appear in the subgrade areas having inadequate compaction, and deviations of the surface from the requirements set forth therein shall be corrected to line and grade and to all specification requirements. The finished subgrade shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the base course is placed.

8. GRADE CONTROL. During construction the lines and grades including crown and cross slope indicated for the aggregate base course shall be maintained by means of line and grade stakes placed by the Contractor at the worksite in accordance with SPECIAL CLAUSES of these specifications.

9. MIXING AND PLACING MATERIALS. The material shall be mixed by the stationary-plant, traveling-plant or road-mix method and placed in such a manner as to obtain uniformity of the aggregate base course material and at a uniform optimum moisture content for compaction. The Contractor shall make such adjustments in mixing or placing procedures or in equipment as may be directed to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to insure a satisfactory aggregate base course meeting all the requirements of this specification.

10. COMPACTION. The select material and aggregate base course (including shoulders) shall be compacted with approved compaction equipment. Water content shall be maintained at optimum or at the percentage specified during compaction. In places not accessible to the rollers, the mixture shall be compacted with mechanical tampers. Compaction shall continue until each layer through the full depth is compacted to at least 100 percent of maximum density. The Contractor shall make such adjustments in rolling or finishing procedures as may be required to obtain true grades, to minimize segregation and degradation, to reduce or accelerate loss or gain of water, and to insure a satisfactory aggregate base course. Unsatisfactory materials shall be reworked to produce a satisfactory material.

11. EDGES OF BASE COURSE. Where the base course is not placed between curbs or similar construction, approved material shall be placed along the edges of the aggregate base course in such quantities as will compact to the thickness of the course being considered, or when the course is being constructed in two layers, to the thickness of each layer of the course. Allow in each operation at least a 1-foot width of the shoulder to be rolled and compacted simultaneously with the rolling and compacting of each layer of the base course.

12. SMOOTHNESS TEST. The surface of each layer shall not show any deviations in excess of 3/8 inch when tested with either a 10-foot straightedge applied both parallel with and at right angles to the center line of the paved area. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting, as directed.

13. THICKNESS CONTROL. The completed thicknesses of the select material and base course shall be within 1/2 inch, plus or minus, of the thickness indicated. Thickness test shall be made and recorded by the Contractor. The thickness of the base course shall be measured at intervals in such manner that there will be a thickness measurement for at least 1,000 square yards of base course. The

thickness measurement shall be made by test holes at least 3 inches in diameter through the base course. Where the measured thickness of the base course is more than 1/2 inch deficient in thickness, the Contractor, at no additional expense to the Government, shall correct such areas by scarifying, adding mixture of proper gradation, reblading, and recompacting, as directed. Where the measured thickness of the base is more than 1/2 inch thicker than that indicated, it shall be considered as conforming with the specified thickness requirements plus 1/2 inch. The average job thickness shall be the average of the job measurements determined as specified above, but shall be within 1/4 inch of the thickness indicated.

14. MAINTENANCE. The Contractor shall maintain the aggregate base course in a satisfactory condition until the completed work is accepted.

15. WAYBILLS AND DELIVERY TICKETS. Copies of waybills or delivery tickets shall be attached to the Daily Contractor Quality Control Report for the day of delivery. Before the final statement is allowed, the Contractor shall file with the Contracting Officer waybills and/or certified delivery tickets for all aggregates actually used in the construction covered by the contract.

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SECTION 2G

MISCELLANEOUS AGGREGATES

1. APPLICABLE PUBLICATIONS. The American Society for Testing and Materials (ASTM) Standards listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

D 43-18-83	Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

2. DECOMPOSED GRANITE. Decomposed granite shall be placed on the area as shown on the drawings in accordance with the following requirements.

2.1 Decomposed granite (D.G.) shall be any granitoid igneous rock which has been weathered in place and which has as principal constituents granular fragments of quartz and feldspar. It may also contain fragments of granite rock not yet broken down into the component minerals. The material shall remain stable when saturated with water.

2.2 Material shall be free from all foreign objects, lumps, irregularities and shall be consistent in color.

2.3 D.G. Color shall be similar to earthen tones conforming to "Munsell" soild color chart, as follows: "AMBER" (trade name) color designated - hue 7.5 yr, value/chroma 6/4.

2.4 The material shall be spread to the thickness as shown on the plans (minimum thickness shall be 2-1/2 inches). The finished decomposed granite (D.G.) surface shall be raked smooth.

2.5 The decomposed granite shall be obtained from a commercial quarry site as approved by the Contracting Officer.

2.6 Subgrade shall be thoroughly compacted prior to application.

2.7 Gravel color shall be similar to earthen tones conforming to "Munsell" soil color chart (1975 Edition - published) by Kollmorgen Corp., 2441 North Calvet St., Baltimore, Maryland 21218), as follows: areas designated "amber" or D.G. - hue 7.5 yr, value/chroma 6/4. Contractor shall submit color samples (minimum of 3) of D.G. to the Contracting Officer or his representative for approval prior to installation.

2.8 Decomposed granite shall have a maximum size of not more than 1/2 inch, have not more than 30 percent of the material passing the No. 200 sieve, and shall have a plasticity index of less than 10, determined as described in ASTM D 4318, for the materials passing the No. 40 sieve.

3. HERBICIDES. Areas to be covered with decomposed granite shall be treated with Dacthal or equal applied at maximum manufacturer's approved rates for pre-emergent herbicides. Material shall be applied to ground in a slurry mix through a 50 mesh or larger screen prior to and following installation of decomposed granite and sand.

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temperature is 50 degrees F. or above and the temperature has not been below 35 degrees F. for 12 hours immediately prior to application.

6. EQUIPMENT.

6.1 General. All equipment, tools, and machines, used in the performance of the work required by this section shall be subject to the approval and shall be maintained in satisfactory working conditions.

6.2 Bituminous Distributor shall have pneumatic tires of such width and number that the load produced on the base surface shall not exceed 650 pounds per inch of tire width. The distributor shall be designed and equipped to distribute the bituminous material uniformly at even heat on variable widths of surface at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard with a pressure range of 25 to 75 pounds per square inch and with an allowable variation not to exceed 5 percent from any specified rate. Distributor equipment shall include a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gages, volume-measuring devices, adequate heaters for heating the materials to the proper application temperature, a thermometer to show the temperature of the tank contents, and a hose attachment suitable for applying bituminous material to spots avoidably missed by the distributor. The distributor shall be equipped to circulate and agitate the bituminous material during the heating process.

6.3 Heating Equipment for Storage Tanks. Equipment for heating bituminous material shall consist of steam coils and equipment for producing steam, so designed that steam cannot get into the material. An armored thermometer with a range from 40 to 200 degrees F. shall be fixed to the tank so that the temperature of the bituminous material may be read at all times.

6.4 Brooms and Blowers shall be of the power type and shall be suitable for cleaning prepared surfaces.

7. PREPARATION OF SURFACE. Immediately before applying the weed killer and prime coat, all loose material, dirt, clay or other objectionable substance shall be removed from the surface by means of a power broom or blower supplemented with hand brooms. After the cleaning operation and prior to the application of the material, an inspection of the area to be treated shall be made by the Contractor to determine the fitness of the area to receive the material. The Contracting Officer shall be notified 24 hours in advance of application of the material. To assure a uniform spread of the material, the areas prepared for treatment, if excessively dry, shall be lightly sprinkled with water immediately before the application as directed.

8. WEED KILLER. A chemical weed killer shall be applied to subgrade surfaces on levees and access ramps prior to application of the prime coat. The weed killer may be either a fire retardant non-corrosive, water soluble mixture of sodium chlorates and sodium borates, or dry, free flowing borax. The sodium chlorate-sodium borate mixture shall be applied in a water solution at a rate that will yield a minimum of one pound of sodium chlorate per 100 square feet of treated surface. The equipment used for application of the solution shall mechanically agitate and circulate the solution at all times when application is in process. Borax shall be applied dry on a previously dampened subgrade at a

SECTION 2H

PRIME COAT AND WEED KILLER

Index

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

1.1 American Society for Testing and Materials (ASTM) Publications.

D 140-70 (R 1981)	Sampling Bituminous Materials
D 1250-80	Petroleum Measurement Tables
D 2027-76 (R 1981)	Liquid Ashalt (Medium-Curing Type)

2. BITUMINOUS MATERIAL. The bituminous material for the prime coat shall be liquid asphalt, conforming to ASTM D 2027, designation MC-70.

3. SAMPLING AND TESTING.

3.1 Sampling. Samples of bituminous material, unless otherwise specified, shall be in accordance with ASTM D 140.

3.2 Testing shall be the responsibility of the Contractor. Testing shall be performed by an acceptable commercial testing laboratory or by the Contractor on approval of the Contracting Officer. Materials shall be tested to establish compliance with the specified requirements.

3.3 Certified Laboratory Test Reports. Before delivery of bituminous materials, certified copies, in triplicate, of the tests specified herein and in referenced publications shall be submitted to and approved by the Contracting Officer. The testing shall have performed by an independent laboratory approved by the Contracting Officer.

4. QUANTITY TO BE APPLIED. Bituminous material for the prime coat shall be applied in quantities of not less than 0.10 gallon nor more than 0.35 gallon per square yard of the surface to be primed. Application of prime coat shall be divided, if necessary, into 2 applications to avoid flowing off the surface. The exact quantities which may be varied to meet field conditions shall be determined by the Contractor and approved.

5. WEATHER LIMITATIONS. The prime coat shall be applied only when the prepared surface is dry or when the moisture content permits uniform distribution and desired penetrations. Prime coat shall be applied only when the ambient

rate to yield the equivalent of 3 pounds of boron trioxide (B_2O_3) per 100 square feet of treated surface. After application of the borax, the area shall be uniformly sprinkled with water. The quantity of water applied in the solutions or after application of dry borax shall be at least 4 gallons per 100 square feet of treated surfaces.

9. APPLICATION OF BITUMINOUS MATERIAL. Immediately following the preparation of the surface, the bituminous materials shall be applied by means of a bituminous distributor. The bituminous material shall be applied at a pressure within the range of 25 to 75 pounds per square inch and in the amounts as directed. The bituminous material shall be so applied that uniform distribution is obtained at all points of the surface to be treated. Unless the distributor is equipped to obtain satisfactory results at the junction of the previous and subsequent application, building paper shall be spread on the surface of applied material for a sufficient distance back from the ends of each application so that flow from the sprays may be started and stopped on the paper, and all sprayers operate at full force on the surface to be treated. Immediately after the application, building paper shall be removed and destroyed. Spots unavoidably missed by the distributor shall be properly treated with bituminous material. Following the application of bituminous material, the surface shall be allowed to dry without being disturbed for a period of not less than 48 hours, or longer as necessary to attain penetration into the foundation course and evaporation of the volatiles from prime material. The Contractor shall furnish and spread enough approved sand to blot up effectively and cure any excess bituminous material. The Contractor shall maintain the primed surface until the succeeding layer of pavement is placed by protecting the surface against damage and by repairing and reprimimg deficient areas at no additional cost to the Government. No smoking, fires, or flames other than heaters that are a part of the equipment shall be permitted in the vicinity of heating, distributing, or transferring operations of bituminous material.

9.1 Application Temperature shall be as directed and shall provide an application viscosity between 40 and 120 centistokes, kinematic, or 20 and 60 seconds, Saybolt-Furol. Application temperatures shall be within the following range, except that appropriate changes should be made when the ranges of viscosity are raised or lowered.

MC-70	120-190 degrees F.

The temperature-viscosity relationship shall be furnished to the Contracting Officer.

10. WAYBILLS AND DELIVERY TICKETS. Copies of waybills or delivery tickets shall be submitted during the progress of the work. Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified waybills and/or certified delivery tickets for all bituminous material actually used in the construction of pavement covered by this section of the specification.

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SECTION 2I

ASPHALT CONCRETE

CENTRAL-PLANT HOT MIX

Index

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

1.1 American Association of State Highway and Transportation Officials (AASHTO) Standard.

M 226-80	Viscosity Graded Asphalt Cement

1.2 American Society for Testing and Materials (ASTM) Publications.

C 117-84	Materials Finer Than No. 200 (75 um) Sieve in Mineral Aggregates by Washing
C 127-84	Specific Gravity and Absorption of Coarse Aggregate
C 128-84	Specific Gravity and Absorption of Fine Aggregate
C 136-84	Sieve or Screen Analysis of Fine and Coarse Aggregates
D 242-70 (R 1980)	Mineral Filler for Bituminous Paving Mixtures
D 977-84	Emulsified Asphalt
D 1559-82	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

1.3 Military Standard.

MIL-STD-620A & Notice 1	Test Methods for Bituminous Paving Materials

2. DESCRIPTION. Asphalt concrete indicated as "A.C." or "P.M.S." shall consist of fine and coarse aggregates and mineral filler uniformly mixed with hot bituminous material, and placed and compacted on a prepared base course subgrade.

3. AGGREGATES shall consist of crushed stone, crushed or uncrushed gravel, screenings, sand, and mineral filler. Aggregates shall have a satisfactory service record in bituminous pavement construction. The source selected shall be approved by the Contracting Officer. Material passing the No. 200 sieve shall be known as mineral filler. Mineral filler shall conform to ASTM D 242. The combined aggregates and mineral filler shall meet the requirements of subsequent paragraphs entitled AGGREGATE GRADATION and COMPOSITION OF MIXTURE.

4. BITUMINOUS MATERIAL to be mixed with the mineral aggregates shall be asphalt cement conforming to AASHTO M226, viscosity grade AR-40 or AR-80 Table 3.

5. AGGREGATE GRADATION. The aggregate gradation as determined by ASTM C 117 and C 136 shall conform to one of the following.

Sieve Openings	Percentage by Weight Passing
1 inch	100
3/4 inch	97-100
1/2 inch	85-100
3/8 inch	70-90
No. 4	50-75
No. 8	35-65
No. 30	20-40
No. 200	2-8

6. COMPOSITION OF MIXTURE.

6.1 Job-Mix Formula shall be submitted by the Contractor, and no bituminous mixture shall be manufactured until it has been approved. The formula will indicate the percentage of each sieve fraction of aggregate, percentage of asphalt, and temperature of the mixture as discharged from the mixer. The percentage of asphalt in the job-mix formula will be between 5.5 percent and 6.5 percent. Samples of the aggregates and asphalt shall be submitted for approval with the job-mix formula.

6.2 Test Properties of Bituminous Mixtures. The apparent specific gravity, as determined by ASTM C 127 and C 128, shall be used in computing the voids total mix and voids filled with bitumen, and the mixture shall meet the following requirements as determined by ASTM D 1559:

Test Property	50-Blow Compaction
Stability, minimum, pounds	500
Flow, maximum, 1/100-inch	20
Voids total mix, percent	3-5
Voids filled with bitumen, percent	75-85

6.3 Stripping of Aggregates. If the index of retained stability of the job-mix formula is less than 75 when tested in accordance with Method 104 of MIL-STD-620, the aggregates shall be rejected or treated by one of the following procedures:

(1) Addition of heat-stable additives to bitumen.

(2) Addition of hydrated lime, or other cementitious material containing free lime, as a portion of the mineral filler.

7. MIXING PLANT shall be a weigh-batch or continuous-mixing type approved by the Contracting Officer and operated so as to produce a mixture within the job-mix formula.

8. OTHER EQUIPMENT.

8.1 Bituminous-Material Spreaders shall be self-propelled, capable of producing a finished surface conforming to the smoothness requirements specified hereinafter. The use of a spreader that leaves indentations or other objectionable irregularities in the freshly-laid mix will not be permitted.

8.2 Blowers and Brooms shall be of the power type suitable for cleaning the surface to be paved.

8.3 Saw shall be of the power type, capable of rapidly cutting pavement and trimming joints and edges of pavement.

8.4 Small Tools available on the work shall consist of the following: rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heater for heating small tools, wood sandals and stilt sandals of standard type, and other small tools as may be required.

8.5 Steel-Wheel Rollers shall be self-propelled, 3-wheel (tricycle) and/or tandem type, weighing not less than 20,000 pounds each. The rollers shall have adjustable wheel scrapers, water tanks, and sprinkling apparatus to keep the wheels sufficiently wet to prevent the bituminous mixture from sticking to the wheels. Rollers shall be capable of reversing without backlash and shall be free from worn parts. Roller wheels shall not have flat or pitted areas or projections that will leave marks in the pavement.

8.6 Pneumatic-Tired Rollers shall be self-propelled and shall consist of 2 axles on which are mounted multiple pneumatic-tired wheels in such a manner that the rear group of wheels will not follow in the tracks of the forward group but spaced to give essentially uniform coverage with each pass. Axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading. Tires shall be smooth and capable of being inflated to at least 90 p.s.i. Construction of roller shall be such that each wheel can be loaded to a minimum of 4,500 pounds.

9. TREATMENT OF UNDERLYING SURFACE. Prior to laying a bituminous course, the underlying surface shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, and hand brooms, as directed. The surface to be paved shall receive a prime coat conforming to the requirements of SECTION: PRIME COAT AND WEED KILLER.

10. TRANSPORTATION OF BITUMINOUS MIXTURE. The bituminous mixture shall be transported from the mixing plant to the site in trucks having tight, clean, smooth bodies with a minimum coating of concentrated solution of hydrated lime and water to prevent adhesion of the mixture. Each load of mixture shall be covered

with canvas or other suitable material to protect the mixture from the weather and to prevent loss of heat. Mixtures having temperatures greater than 350 degrees, mixtures having temperatures less than 235 degrees, or mixtures which form or show indications of moisture will be rejected. Hauling over freshly laid material will not be permitted.

11. PLACING. Contact surfaces of previously constructed pavement, curbs, manholes and other structures shall be sprayed with a thin coat of asphalt conforming to the requirements of subsequent paragraph: TACK COAT. The mechanical spreader shall be adjusted and its speed regulated so that the surface of the course being placed will be smooth and continuous without tears and pulling. The course will be of such depth that after compaction, the cross section, grade, and contour will be as indicated. In areas where the use of machine spreading is impractical, the mixture shall be spread by hand. Unless otherwise directed, placing shall begin on the high side of areas with a one-way slope or along the centerline of areas with a crowned section and shall be in the direction of the main traffic flow. Placing of the mixture shall be as continuous as possible, and the speed of placing shall be adjusted, as directed, to permit proper rolling.

12. COMPACTION OF MIXTURE shall be accomplished by steel-wheel and pneumatic-tired rollers. Rolling shall begin as soon after placing as the mixture will support the roller without undue displacement. Rolling of the course shall be continued until all roller marks are eliminated and at least 95 percent of the density of a laboratory specimen of the same mixture has been obtained. The speed of the rollers at all times shall be slow enough to avoid displacement of the hot mixture. The wheels of the roller shall be moistened to prevent adhesion of the mixture. In areas not accessible to the roller, the mixture shall be compacted with hot hand tampers.

13. JOINTS. The joints between old and new pavements or between lanes of new work shall be constructed so as to insure uniform bond, texture, density, and smoothness as in other sections of the course. Edges of existing pavement shall be cut to straight, vertical surfaces. All contact surfaces of existing pavement shall be painted with a thin, uniform coat of asphalt.

14. PROTECTION OF PAVEMENT. After final rolling, no vehicular traffic shall be permitted on the pavement for at least 6 hours after rolling.

15. TACK COAT.

15.1 BITUMINOUS MATERIAL. Bituminous material for use in the tack coat shall be an asphalt emulsion conforming to the requirements of ASTM D 997, Type SS-1h. The Contractor shall furnish a certified statement from the emulsion manufacturer giving an analysis of the base asphalt used in the manufacture of the emulsion and attesting to conformity to the applicable requirements above.

15.2 QUANTITIES TO BE APPLIED. Bituminous Materials for the tack coat shall be applied in quantities of not less than 0.05 gallons nor more than 0.15 gallon per square yard. The exact quantities within the range specified above shall be determined by the Contractor and shall be approved by the Contracting Officer's Representative.

15.3 PREPARATION OF SURFACE. Immediately prior to applying the tack coat all loose material, dirt, clay, or other objectionable material shall be removed from the surface to be treated.

16. WAYBILLS AND DELIVERY TICKETS. Copies of waybills or delivery tickets shall be attached to the Daily Contractor Quality Control Report for the day of delivery. Before the final statement is allowed, the Contractor shall file with the Contracting Officer, waybills and/or certified delivery tickets for all asphalt concrete actually used in the construction covered by this contract.

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SECTION 2J

TREES AND SHRUBS

Index

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

1.1 Federal Specification (Fed. Spec.).

O-F-241D Fertilizers, Mixed Commercial

1.2 American National Standards Institute (ANSI) Publication.

Z60.1-1980 American Standard for Nursery Stock

1.3 American Joint Committee on Horticultural Nomenclature (AJCHN) Publication.

Standarized Plant Names
(Second Edition, 1942)

2. SOURCE INSPECTIONS.

2.1 Plant Materials. Plant materials will be inspected by the Contracting Officer at the growing site and tagged or otherwise approved for delivery. Such inspection does not preclude right of rejection at the project site.

2.2 Topsoil. The source of topsoil will be inspected by the Contracting Officer to determine the acceptability of the topsoil and the depth to which it is to be stripped.

3. SUBMITTALS.

3.1 Samples. The following samples shall be submitted for approval before work is started.

a. Topsoil--representative samples shall be taken from several locations on the area under consideration.

3.2 Certificates of Conformance or Compliance. Before delivery, notarized certificates attesting that the following materials meet the requirements specified, shall be submitted in triplicate for approval.

a. Plant Materials.

3.3 Maintenance Instruction. Prior to the end of the contract maintenance period, 3 copies of written instructions for year round maintenance and care of installed plants shall be furnished to the Contracting Officer.

4. DELIVERY, STORAGE, AND HANDLING.

4.1 Delivery.

4.1.1 The Contractor shall notify the Contracting Officer of the delivery schedule in advance so the plant material may be inspected upon arrival at the jobsite by the Contracting Officer. Unacceptable plant material shall be removed from the jobsite immediately.

4.1.2 Plants shall be protected during delivery to prevent damage to the root balls or desiccation of leaves. Trees shall be protected during transportation by tying in the branches and covering all exposed branches.

4.1.3 Fertilizer shall be delivered to the site in the original, unopened containers bearing the manufacturer's guaranteed chemical analysis, name, trade name or trademark, and in conformance to state and Federal law. In lieu of containers, fertilizer may be furnished in bulk and a certificate indicating the above information shall accompany each delivery.

4.1.4 All pesticide material, including soil fumigants, shall be delivered to the site in the original unopened containers. Containers that do not have a legible label that identifies the Environmental Protection Agency registration number and the manufacturer's registered uses will be rejected.

4.2 Storage.

4.2.1 Plant Storage. Plants not installed on the day of arrival at the site shall be stored and protected. Outside storage locations shall be continually shaded and protected from the wind. Plants stored on the project shall be protected from any drying at all times. Plants in containers, shall be kept in a moist condition until planted by routine watering.

4.2.2 Storage of Other Materials. Pesticide material shall be kept in dry storage and shall not contaminate adjacent material, and shall be handled and stored following manufacturer's directions. Storage of materials shall be in areas designated or as approved by the Contracting Officer.

4.3 Handling. Care shall be taken to avoid damaging plants being moved from the nursery or storage area to the planting site. Plants shall be protected from freezing or drying out by covering with burlap, tarpaulin or mulching material during transporation to planting site. Plants shall not be handled by the trunk or stems. Damaged plants will be rejected and shall be removed from the site.

5. ENVIRONMENTAL PROTECTION. All work and Contractor operations shall comply with the requirements of SECTION: ENVIRONMENTAL PROTECTION.

6. MATERIALS.

6.1 Plants.

6.1.1 Plants shall conform to the varieties specified in the plant list and be true to botanical names as listed in AJCHN Standarized Plant Names. Plants shall be in accordance with ANSI Z60.1 except as otherwise stated in the specifications or shown on the plans. Where the drawings or specifications are in conflict with ANSI Z60.1, the drawings and specifications shall prevail.

6.1.2 Planting stock shall be well-branched and well-formed, sound, vigorous, healthy, and free from disease, sun-scald, windburn, abrasion, and harmful insects or insect eggs and shall have healthy, normal and unbroken root systems. Deciduous trees and shrubs shall be symmetrically developed, of uniform habit of growth, and free from objectionable disfigurements. Plants shall have been grown under climatic conditions similar to those in the locality of the project.

6.1.3 The minimum acceptable sizes of all plants, measured before pruning and with branches in normal position, shall conform to the measurements indicated. Plants larger in size than specified may be used with the approval of the Contracting Officer with no change in the contract price. If larger plants are used, the ball of earth or spread of roots shall be increased in accordance with ANSI Z60.1.

6.1.4 The Contractor shall facilitate inspection and identifications by labeling trees and bundles or containers of the same shrub, with a durable waterproof label and weather-resistant ink. Labels shall state the correct plant name and size as specified in the list of required plants. Labels shall be securely attached to plants, bundles, and containers of plants and shall be legible for 60 days after delivery to the planting site.

6.1.5 Plant material shall be nursery grown unless otherwise indicated and shall conform to the requirements and recommendations of ANSI Z60.1. Plants shall be dug and prepared for shipment in a manner that will not cause damage to branches, shape, and future development after planting.

6.1.5.1 Container grown plants shall have sufficient root growth to hold the earth intact when removed from containers but shall not be root bound.

6.1.6 Substitutions shall be made only when a plant (or its alternates as specified) is not obtainable and the Contracting Officer authorizes a change order providing for use of the nearest equivalent obtainable size or variety of plant having the same essential charateristics with an equitable adjustment of the contract price.

6.2 Topsoil.

6.2.1 Topsoil shall be the existing surface soil stripped and stockpiled on the site.

6.2.2 If additional topsoil is required, it shall be furnished by the Contractor and shall be natural, friable soil representative of productive soils in the vicinity. It shall be obtained from well-drained areas and shall be free of

admixture of subsoil and foreign matter or objects larger than one inch in any dimension, toxic, substances, and any material or substance that may be harmful to plant growth. The pH range shall be 7.0 to 8.0.

6.3 Staking Material. Stakes for support if required shall be lodge pole pine, free from knots, rot, cross grain, or other defects that would impair the strength. Standard stakes shall be a minimum of 2-1/2 inches in diameter, and pointed at one end, and of length indicated on the drawings.

6.4 Water. Water shall not contain elements toxic to plant life.

6.5 Granular fertilizer shall conform to Fed. Spec. O-F-241, Type I, Level B, and shall bear the manufacturer's guaranteed statement of analysis. Granular fertilizer shall contain a minimum percentage by weight of: 14 nitrogen, 14 available phosphoric acid, and 14 potash.

7. INSTALLATION.

7.1 Planting Seasons and Conditions. Planting shall be done when the ground is not frozen, water logged or in an otherwise unsuitable condition for planting. Planting shall be done from 1 February to 1 May for spring planting and from 1 October to 15 November for fall planting.

7.2 Setting Plants. Container-grown plants shall be handled and moved only by the container. Plants shall be set plumb and held in position until sufficient soil has been firmly placed around roots or ball. Plants shall be set in relation to surrounding grade so that they are even with the depth at which they were grown in the nursery container.

7.2.1 Planting shall be done with the approval of the Contracting Officer only when the ground is in suitable condition for planting. If special conditions exist that may warrant a variance in the above planting conditions, a written request shall be submitted to the Contracting Officer stating the special conditions and proposed variance.

7.2.2 Layout. Plant material locations and bed outlines shall be staked on the project site by the Contractor and approved by the Contracting Officer before any plant pits or beds are dug. The Contracting Officer may adjust plant material locations to meet field conditions.

7.3 Excavation for Planting.

7.3.1 Prior to excavating for plant pits the area shall conform to the lines and grades shown on the plans and the locations of any underground utilities shall be verified by the Contractor and the Contracting Officer. Damage to utility lines shall be repaired at the Contractor's expense. Existing trees, shrubbery, and beds that are to be preserved shall be barricaded in a manner that will effectively protect them during planting operations.

7.3.2 Rocks and other underground obstructions shall be removed to a depth necessary to permit proper planting according to plans and specifications. If underground utilities, construction, or solid rock ledges are encountered, other locations may be selected by the Contracting Officer.

7.3.3 Plant pits may be dug by any method approved by the Contracting Officer provided that the pits have vertical sides and flat bottoms. When pits are dug with an auger and the sides of the pits become glazed, the glazed surface shall be scarified. The size of plant pits shall be as shown on the plans.

7.4 Container grown stock shall be removed from containers in such a way so as to prevent damage to plant or root system. Planting shall be completed as specified above.

7.4.1 Container stock shall be backfilled with topsoil to approximately half the depth of the ball and then tampered and watered. The remainder of backfill of topsoil shall be tamped and watered. Earth saucers or water basins shall then be formed around isolated plants. Water holding basins shall be ample enough in size and height to hold at least 2-1/2 gallons for shrubs or 5 gallons for trees.

7.5 Watering. Depressed water basins shall be used around all plants. All watering shall be done in a manner which will provide deep penetration, but which will not cause erosion or damage to the finished surface. Sufficient water shall be applied to penetrate the planting bed to a depth of 24 inches. Frequent watering may be necessary during periods of hot weather.

7.6 Inspection. The trunks of the trees shall be inspected for physical damage or insect infestation and required treatment or rejection shall be determined.

7.7 Fertilization. long term slow release (14-14-14)

7.7.1 After establishment of finished grade around plants, all pit areas shall be topdressed with fertilizer at the rate of one pound per 100 square feet of area. Fertilizer adhering to plants shall be flushed off.

8. PRUNING.

8.1 New plant material shall be pruned in the following manner. Dead and broken branches shall be removed. Trees and shrubs shall be pruned to reduce total amount of anticipated foliage by one fourth. Typical growth habit of individual plants shall be retained with as much height and spread as is practicable. Cuts shall be made with sharp instruments, and shall be flush with trunk or adjacent branch to insure elimination of stubs. "Headback" cuts at right angles to line of growth shall not be permitted. Trees shall not be poled or the leader removed. Trimmings shall be removed from the site. Cuts 1/2 inch in diameter and larger shall be painted with the specified tree wound dressing.

8.2 Restoration and Clean-Up. Excess and waste material shall be removed daily. When planting in an area has been completed, they shall be cleared of all debris; spoil piles, and containers.

8.3 Maintenance During Installation. Maintenance operations shall begin immediately after each plant is planted and shall continue as required until final acceptance. Plants shall be kept in a healthy, growing condition by watering, pruning, spraying, weeding, and any other necessary operations of maintenance. Plant saucers and beds shall be kept free of weeds, grass, and other undesired vegetation. Plants shall be inspected at least once per week by the Contractor during the installation period and needed maintenance performed promptly.

9. PLANT ESTABLISHMENT PERIOD. Final acceptance of all work and materials under this section shall be at the end of a period of establishment to be determined as follows.

9.1 Beginning of the Plant Establishment Period. The period of establishment shall begin on the date that an inspection by the Contracting Officer shows that all plants are in place and have been installed in accordance with the specifications and plans. Replacement of plants that were not supplied by the Contractor but were relocated under this contract and that die for any reason other than improper handling during transplanting and/or lack of proper care will not be required. Loss through Contractor negligence, however, shall require replacement in kind and size per specification and shall be at the Contractor's expense.

9.2 During the Plant Establishment Period.

9.2.1 During the plant establishment period, the Contractor shall water all plants as necessary to maintain an adequate supply of moisture within the root zone. Water shall not be applied so quickly that it cannot be absorbed by the plants.

9.2.2 Plants shall be pruned as required.

9.2.3 Stakes and eroded plant saucers shall be replaced as required.

9.2.4 Other work, such as spraying with approved insecticides and fungicides to control pests, shall be done (each day if necessary) to ensure plant survival in a healthy growing condition.

9.2.5 Dead plants shall be removed immediately at the Contractor's expense and replacement plant immediately installed. The Contractor will not be responsible for theft or damage to plants by vehicles or vandalism following completion and approval of the installation portion of the planting contract.

9.3 Termination of the Plant Establishment Period.

9.3.1 A preliminary inspection by the Contractor and the Contracting Officer will be held 180 days from the date of the beginning of the plant establishment period to determine plant acceptability and the number of replacements. Alternate or substituted varieties of plants shall be used only if approved by the Contracting Officer.

9.3.2 A final inspection of all plants will be held after the replacement planting has been completed. No additional plant establishment period will be required for replacement plants. The establishment period will end on the date of this inspection and said inspection will be considered final acceptance provided the Contractor has complied with the following requirements.

a. Dead, missing, and defective plant material shall have been replaced as directed by the Contracting Officer otherwise, final acceptance will be delayed until such replacements have been satisfactorily accomplished.

b. Plant saucers shall be free of weeds.

c. Stakes and guys shall be in good condition.

d. Remedial measures directed by the Contracting Officer to ensure plant survival shall have been carried out.

e. Plant material shall have been fertilized as required prior to acceptance.

10. FINAL ACCEPTANCE.

10.1 General. At conclusion of the establishment period, an inspection will be made by the Contracting Officer, upon written notice requesting inspection submitted by the Contractor at least 10 days prior to the anticipated date. The purpose of the inspection will be for the acceptance of the contract work, including maintenance but exclusive of replacement. After inspection, the Contractor will be notified in writing of acceptance of the plants subject to guarantee. If there are any deficiencies in the maintenance, the Contractor will be notified and the work subject to re-inspection before acceptance.

10.2 Replacement. At the end of the guarantee period the Contracting Officer will make another inspection to determine the condition of plants. Plants not in healthy growing condition, as determined by the Contracting Officer will be noted and as soon as seasonal conditions permit shall be removed from the site and replaced with plants of the same species and sizes as originally specified. Such replacements shall be made in the same manner as specified for the original plantings, and at no cost to the Government. The guarantee on plants will be limited to one replacement.

* * * * *

SECTION 2K

IRRIGATION SYSTEM

Index

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

1.1 Federal Specification (Fed. Spec.).

WW-U-531E	Unions, Pipe, Steel or Malleable Iron, Threaded Connection, 150 lbs and 250 lbs
WW-V-51F	Valve, Angle, Check, and Globe, Bronze, (125, 150 and 200 Pound, Threaded End, Flanged Ends, Solder Ends, and Brazed Ends, for Land Use)
WW-V-54D & Int. Am-3	Valve, Gate, Bronze (125, 150 and 200 Pound, Threaded Ends, Flange Ends, Solder End and Brazed Ends, for Land Use)

1.2 American Society for Testing and Materials (ASTM) Standards.

D 1785-82	Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
D 2241-82	Poly (Vinyl Chloride) (PVC) Plastic Pipe (DDR-PR)
D 2464-76	Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
D 2466-78	Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
D 2564-80	Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings

1.3 American Water Works Association (AWWA) Standards.

C 601-81	Disinfecting Water Mains

2. GENERAL. This section covers irrigation piping including connection to source of water supply, complete. Excavation, trenching, and backfill are specified in SECTION: EXCAVATION.

2.1 Above ground piping shall be galvanized steel.

2.2 Below Ground Piping. Pipe smaller than 2-inch shall be plastic. Pipe for sleeving shall be plastic. The minimum cover for laterals and branches shall be 12 inches and 8 inches for polyethylene, unless otherwise indicated on drawings. The minimum cover for pressure lines shall be 2.5 feet except under roadways, parking and paved areas where the minimum cover shall be 3 feet.

2.3 Electrical Work shall conform to the applicable requirements of SECTION: ELECTRICAL WORK (FOR IRRIGATION LANDSCAPING).

3. EXCAVATION.

3.1 General. All excavation of every description and of whatever substances encountered shall be performed to the depths indicated or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and wasted as indicated or as directed. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other exavations, and any water accumulating therein shall be removed by pumping or by other approved methods. Sheeting and shoring shall be done as may be necessary for the protection of the work and for the safety of personnel. Earth excavation shall comprise all materials not classified as rock excavation. Rock excavation shall comprise the following: boulders measuring 1/3 cubic yard or more in volume; rock material in ledges, bedded deposits, unstratified masses, and conglomerate deposits so firmly cemented as to possess the characteristics of solid rock that cannot be removed without systematic drilling and blasting; and concrete or masonry structures except sidewalks and paving.

3.2 Trench Excavation. Trenches shall be of the necessary width for proper laying of pipe. The banks of pipe trenches shall be as nearly vertical as practicable. Care shall be taken not to overexcavate. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along entire length, except for the portions of the pipe sections where it is necessary to excavate for bell holes and for the proper sealing of pipe joints, and as hereinafter specified. Bell holes and depressions for joint shall be dug after the trench bottom has been graded, and, in order that the pipe rest on the prepared bottom for as nearly its full length as practicable, bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joint. Stones shall be removed as necessary to avoid point bearing. Where rock excavation, as defined hereinbefore, is required in trenches for pipe, the rock shall be excavated to a minimum overdepth of 6 inches below the trench depths indicated or specified. Except as hereinafter specified for wet or otherwise unstable material, overdepth excavation shall be backfilled as and with materials specified for backfilling the lower portion of trenches. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe is encountered in the bottom of the trench, and overdepth is not indicated on the

drawings, such material shall be overexcavated to a depth to allow for construction of a stable pipe bedding. The trench shall be backfilled to the proper grade with approved materials.

4. BACKFILLING. The trenches shall not be backfilled until all required pressure tests are performed and until the irrigation systems as installed conform to the requirements specified. Except as otherwise specified for special conditions, trenches shall be backfilled to the ground surface with selected material that is suitable for the specified compaction and as hereinafter specified. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted as specified, or the condition shall be otherwise corrected as approved. The meaning of "density of the adjacent soil" when the adjacent formation is rock shall be interpreted as maximum density in accordance with MIL-STD-621, Method 100, CE 55. The surface shall be restored to its original condition as near as practicable and as hereinafter specified.

5. MATERIALS shall conform to the respective specifications and other requirements specified below.

5.1 Pipe.

5.1.1 Galvanized Steel Pipe shall conform to ASTM A 120, standard weight.

5.1.2 Plastic Pipe shall conform to ASTM D 1785, schedule 40 for pipe with solvent welded joints and schedule 80 for pipe with threaded joints, or to ASTM D 2241, Type 1, grade 1, 315 psi for pressure lines and 200 psi for other lines for pipe with solvent welded joints. Pipe and fittings shall bear the seal of approval (nsf mark) of the National Sanitation Foundation's standard for plastic pipe and fittings for potable water service.

5.1.3 Polyethylene pipe shall be 100 percent polyethylene as follows:

1/2" I.D. .574" wall thickness .050"
Melting point- .065 grams per 10 minutes
Plastic Recovery- 30%
Tensile strength at break- 1665 pounds per square inch
Elongation- 65%
Brittleness at 76°C- zero failures from 10 samples
Stress crack in 100% Igepol solution- zero failures from 10 samples

5.1.4 Polyethylene pipe (dripline) shall have a maximum length of 500 feet if the line returns to the PVC lateral, or a maximum length of 300 feet if the line dead ends. Maximum flow (gpm) shall not exceed the manufacturer's recommendations for pipe size indicated.

5.2 Joints.

5.2.1 Plastic Pipe Joints shall be solvent welded or threaded. Solvent for welded joints shall conform to ASTM D 2564. Use of pipe dope or solvents on threaded joints will not be permitted. Polyethylene shall have compression joints.

5.3 Fittings and Specials.

5.3.1 For Galvanized Steel Pipe. Steel fittings shall be galvanized. Threaded fittings shall conform to ANSI B 16.3.

5.3.2 For Plastic Pipe. Fittings shall conform to ASTM D 2464 or D 2466.

5.4 Gate Valves shall be designed for a working pressure of not less than 150 psi. Valve connections shall be as required for the piping in which they are installed. Valves shall have a clear waterway equal to the full nominal diameter of the valve, and shall be opened by turning counterclockwise. The operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of the opening. Valves smaller than 3 inches shall be all bronze and shall conform to Fed. Spec. WW-V-54, type I.

5.5 Valve Boxes shall be concrete, except that concrete boxes may be installed only in locations not subjected to vehicular traffic. Concrete boxes shall be the standard product of manufacturer of precast concrete equipment. The words "Irrigate", for gate valves; and "RCV" for remote control valves shall be cast in covers of boxes for the irrigation system. The boxes shall be such length as will be adapted, without full extension to the depth of cover required over the pipe at valve location.

5.6 Backflow Prevention Units.

5.6.1 General. Backflow prevention units of the types indicated shall be installed below ground at the locations shown on the drawings. Where union connections are not provided as part of the unit, the Contractor shall provide and install a union or sleeve type coupling between the control valve and the inlet side of the unit. Pipe and fittings for backflow prevention units shall be galvanized steel.

5.6.2 Reduced Pressure Backflow Prevention Unit. The reduced pressure backflow prevention unit shall be a factory assembled unit consisting of two independently acting spring-loaded check valves with a differential pressure relief valve controlled-reduced-pressure zone in between and shall be complete with test cocks and drain. The first check valve shall reduce the supply pressure a predetermined amount so that during normal flow and the cessation of normal flow the pressure between the checks is less than the supply pressure. The pressure differential relief valve shall automatically discharge to atmosphere to maintain the pressure in the reduced pressure zone below the supply pressure. All parts shall be removeable or replaceable without removal of the unit from the line. The unit shall be suitable for a working pressure of 125 pounds per square inch and shall be the product of a manufacturer regularly engaged in the production of backflow prevention units of the reduced pressure type.

5.7 Emitters. Emitters shall be independent pressure compensating plastic in-line emitters, capable of providing a consistent discharge rate of 1 gallon per hour (gph) at 3 to 60 pounds per square inch (psi). The emitter shall be constructed of heat resistant plastic and have an operating range of 3 to 60 pounds per square inch. Emitters shall be spaced 12 inches on center.

5.8 Remote Control Valves and Valve Accessories.

5.8.1 The remote control valves shall be an electrically actuated single-chamber hydraulic valve, where the diaphragm is an integral part of the flow path.

The valve shall have ___ inch threaded (FIPT) inlet and outlet.

The valve shall have no moving parts except the diaphragm and the spring. The valve shall have a removable chamber cover for easy inline maintenance.

Materials: body - Cast bronze ASTM 145-5A.
diaphragm - Natural and synthetic rubber to withstand all chemicals in common landscape and agricultural use.
spring - Stainless steel SE 32.

The valve pressure rating shall be no less than 150 PSI.

The solenoid actuator shall be 24 volt A.C. 50/60 Hz, 3-way type with manual override and 150 PSI pressure rating. Solenoid capsule shall be Standard, General Purpose NEMA 4, IP 65. Orifice size shall be no less than 0.063". Inrush and holding current shall be no more than 650 mA and 275 mA respectively. The solenoid actuator shall be a universal type, capable of functioning as normally open (N.O.) or normally closed (N.O.).

5.8.2 Quick Coupling Valves shall be two piece, spring-loaded, compression type, normally closed, opening against line pressure, and actuated by downward thrust against the valve. Body shall be of cast red bronze. Machined parts shall be fabricated from red brass. Valve washers and sealers for key stems shall be of a semi-rigid, non-metallic, material and shall be easily replaceable. Inlets shall be tapped for National Standard pipe thread of the pipe riser size or sizes shown on the drawings. Valves shall be suitable for a maximum operating pressure of 150 psi and shall be the standard product of a reputable manufacturer of quick coupling valves for lawn sprinkling systems. The Contractor shall furnish coupler keys for operating the valves with hose swivels. Rubber sleeves shall be the standard product of the manufacturer of quick coupling valves adn when required they shall replace hinged cover as regularly furnished. Each sleeve shall have a cover.

5.8.3 Control Valve Keys shall consist of a D-handle or T-handle, stem, and 2-pronged fork. Overall length shall be approximately 30 inches. They shall be fabricated from steel rod having a diameter of not less than 3/8 inch and shall be galvanized after fabrication. Prongs of the fork shall be spaced to fit between spokes of the cross on the valve stem. Two keys shall be provided.

5.9 Unions shall conform to the requirements of Fed. Spec. WW-U-531, Type B.

5.10 Automatic Controllers. Controllers shall be the product of a manufacturer regularly engaged in the production of turf sprinkler systems and shall be specifically designed for use on a drip system. Controllers shall be suitable for operation on the available electrical supply and shall be capable of complete automatic and manual operation. Control circuit voltage shall be less than 30 volts. Each controller shall have a master switch to disconnect controller from supply lines.

5.10.1 Housing. Where more than one controller is installed in an irrigation system a single key shall open all cabinets. Two keys for each system shall be furnished.

5.10.2 Programming. The controller shall have 8 independently programmable stations. The controller programming schedule shall be based on a variable 8-day cycle. Each station shall have the capability of being programmed to

automatically start on any quarter hour up to 4 times per day. Station timing shall be variable from 1 to 99 minutes in 1 minute increments or for 0.1 to 9.9 hours in 0.1 hour increments. Controller station operation shall be sequential to avoid overlapping operation. The controller shall have a water budgeting mode to allow simultaneous increasing or decreasing of watering time for all stations from 25 percent to 200 percent in 25 percent increments. During operation the controller shall provide a monitoring readout indicating station in operation and time remaining. The controller shall have a 12-hour AM/PM or 24-hour clock.

5.10.3 Charts. A chart, encased in plastic, showing clearly the areas serviced by each remote control valve shall be provided at each controller.

5.10.4 Electrical Work shall conform to the requirements of SECTION: ELECTRICAL WORK (FOR IRRIGATION LANDSCAPING). Electrical wiring from controller to control valves shall be solid, single conductor, copper wire, type UF, size recommended by the controller manufacturer except that minimum wire size shall be No. 14. Common wire shall be different color from all others and be minimum wire size of No. 12. Regardless of the number of location of valves connected to a single controller station, separate control wires shall be run from the controller station to each valve. Wiring from controllers to panel shall be installed in rigid conduit.

5.11 Gravel shall be crushed or natural materials washed and uniformly graded between 3/8 and one-inch size.

5.12 Pipe Bedding and Backfill Materials. Sand bedding material not less than 2 inches thick shall be placed under pipe where trench excavation is in rock. Where sand bedding is not required, the bottom of trenches shall be accurately graded to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its entire length. Backfill material shall be suitable for the required compaction and free from stones larger than one-inch in any dimension.

5.13 The pressure regulator shall be multiple spring-loaded piston type, and shall maintain constand downstream pressure regardless of upstream fluctuations.

Output pressure shall be determined by the type of springs that are being utilized. The different springs, for different output pressures, shall be color coded and field interchangeable.

The pressure regulator shall be installed above ground or in an underground valve box, shall have a built-in indicator to show proper functioning, and removable caps for easy inline maintenance.

Materials housing - Brass.
Caps - Chemical resistant plastic.
Pistons - Chemical resistant plastic.
Guides - Chemical resistant plastic.
Seals - Teflon.
Springs - Stainless steel.

The pressure regulator's pressure rating shall be no less than 150 PSI.

The pressure regulator shall have a device enabling the user to neutralize the regulation (for flusing purposes) without disassembling the unit.

5.14 Plastic Desk Filter shall be designed to permit cleaning wihtout removal from the water supply line. The filter head is made of plastic or metal, while the parts subjected to high pressures are made of reinforced plastic. The filtering element is made of grooved plastic rings which are aligned to form a cylindrical body. Recommended working pressure upto 10 atm.

5.15 Enclosure bos shall be a NEMA 4, 12 gauge steel, all welded enclosure 36"(W) x 18"(D) x 48"(H) in height, having a full-gasketed hinged door, 3-point dead bolt latch mechanism, padlockable handle, and integral mounting racks compatible with specified controller, power supply and ancillary equipment. The preferred box is manufactured by Cross Brothers, Inc. and is known as a La Max Enclosure, specifically the "Arizona Box" which has additional louvers.

5.16 The fertilizer injector shall be venturi-type injector with no moving parts, to be used inline or in parallel to a pressure differential source.

The injector shall come with a e/4" MIPT inlet and outlet, and shall have a built-in union joint for portability and easy maintenance.

The injector shall be equipped with an inline strainer to protect the converging nozzle and a built-in vacuum indicator.

The suction port of the injector shall consist of a suction flow control valve, a non return valve and a suction hose with a strainer at the fertilizer intake.

Materials	body	-	Fiberglass reinforced plastic.
	nozzle	-	Chemical resistant plastic.
	nozzle strainer	-	Chemical resistant plastic.
	nozzle seal	-	Viton
	flow control valve	-	Polypropylene body with Viton seals.
	non-return vavlve	-	Chemical resistant plastic with Viton seals and stainless steel spring.
	fert. intake strainer	-	Stainless steel.

6. INSTALLATION.

6.1 General. Unless otherwise specified, installation of emitters, backflow prevention units, control valves, meters and boxes shall conform to the standard details shown on drawing.

6.2 Handling. Pipe and accessories shall be handled so as to insure delivery to the trench in sound, undamaged condition. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material at no additional cost to the Government.

6.3 Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contracting Officer, cutting shall be done with an approved type mechanical cutter. Wheel cutters shall be used when practicable.

6.3.1 Plastic Pipe shall be cut square and all burrs, particles and curls shall be removed.

6.4 Placing and Laying. Pipe and accessories shall be carefully lowered in to the trench. Under no circumstances shall any of the materials be dropped or dumped into the trench. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate joints. Pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until jointing is completed. When work is not in progress, open ends of pipe, fitting, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes of fittings.

6.4.1 Plastic Pipe shall be installed in accordance with the procedures recommended in ASTM D 2774 and as herein specified.

6.4.2 Tracer wire or tracer tape shall follow the main line pipe lines and terminate in the yard box with the gate valve that controls these main irrigation lines. Provide enough length of wire or tape to make a loop and attach a plastic label with the designation "Tracer Wire."

6.5 Jointing.

6.5.1 Galvanized Steel Pipe. Threaded joints shall be made tight with a stiff mixture of graphite and oil, inert filler and oil, or with an approved graphite compound, applied with a brush to the male threads only. Compounds shall not contain lead.

6.5.2 Insulation Joints shall be installed in accordance with recommendations of the manufacturer.

6.5.3 Connections between different types of pipe and accessories shall be made with transition fittings approved by the Contracting Officer.

6.6 Pipe Sleeves shall be installed with a minimum of off-set at the joints to permit easy installation and removal of the irrigation lines. All plastic lines shall be installed in sleeves under paved areas. Sleeves shall extend at least 12 inches beyond the edges of the pavement. Sizes of sleeves shall be as follows:

Pipe Size (inches)	Minimum Sleeve Size (inches)
1/2	2
3/4	2-1/2
1,1-1/4 and 1-1/2	3
2 and 2-1/2	4
3 and 4	6

6.7 Setting of Valves, and Boxes. Valves and valve boxes shall be installed where shown or directed, and shall be set plumb. Valve boxes shall be centered on the valves. Valves shall be located outside the area of roads and streets. Earthfill shall be carefully tamped around each valve or meter box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face if less than 4 feet. Valves shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and the valve shall be inspected in open and closed positions to insure that all parts are in working condition.

6.8 Reaction Backing.

6.8.1 Thrust blocks shall be concrete mixed not leaner than one cement: 2-1/2 sand: 5 gravel. Blocks shall be placed between solid ground and the fitting to be anchored. The area of bearing shall be as indicated or as approved.

6.9 Remote Control Valves.

6.9.1 Install remote control valves in locations as shown on the drawings. Install a union on downstream side of all valves not provided with a union type connection. Fit with concrete valve box and cover. Top of valve box shall be 1/2-inch above finish grade.

6.10 Remote Control Wiring. Connections of wiring, other than in the controller housing, shall be made with epoxy encapsulated connectors. Where more than one wire is placed in trench, the wiring shall be taped together at maximum intervals of 10 feet.

6.11 Automatic Sprinkler Controller. Controller shall be mounted on concrete with expansion shield type anchors or embedded anchor bolts. Connect electrical panel as shown on the drawings. Connection to control wiring shall be made within the pedestal or head of the controller. Electrical wiring shall be in a rigid conduit from controllers to panel provided under SECTION: ELECTRICAL WORK (FOR IRRIGATION LANDSCAPING). The work under this section shall include all wiring to the panels or elsewhere as required, in order to complete the installation of the control system.

7. TESTS.

7.1 After completion of the piping system and prior to backfilling and the installation of the sprinkler heads, the entire system shall be tested for leaks and thoroughly flushed under pressure to remove any dirt, scale or other material. Lines shall be tested at 100 psi for one hour duration. Cracked or defective pipe, fittings, or accessories disclosed in the pressure tests shall be replaced by the Contractor with sound material at no additonal cost to the Government, and the test shall be repeated until results are satisfactory to the Contracting Officer.

7.1.1 No line shall be covered until inspection and approval has been given by the Contracting Officer.

7.1.2 Testing of plastic pipe shall not be done until all joints have had at least 24 hours to set and cure. During cold weather, 48 hours elasped time shall be allowed for setting prior to testing. No water under pressure shall come in contact with any joint during the specified curing period. In hot weather, water shall not be permitted to stand in pipes until after backfilling is completed. Water used in testing shall be drained from pipes after completion of testing.

7.2 Coverage Test. When the irrigation system is completed the entire system shall be adjusted and operated to demonstrate the water coverage is complete and adequate and that the system conforms to the requirements of the plans and specifications. All deficiencies and inadequacies resulting from defective or inadequate materials and/or workmanship shall be corrected at no additional cost

to the Government. In the event any modifications to the system or deviation from the approved plans and specifications are directed, an adjustment in contract price will be made.

8. DISINFECTION. The completed line from the backflow prevention unit to the connection to the existing waterline shall be disinfected as prescribed by AWWA C 601.

9. TOOLS. Three sets of special wrenchs for removal and/or installation of sprinkler heads shall be provided at locations designated by the Contracting Officer.

10. CLEANUP. Upon completion of the installation of the irrigation system and appurtenances, all debris and surplus materials resulting from the work shall be removed.

11. VARIATION IN ARRANGEMENT OF SPRINKLERS from those shown on drawings will be permitted. The Contractor shall submit a shop drawing for approval in accordance with the SPECIAL CLAUSES. If any conflicts occur necessitating departures from the contract drawings, details of departures, hydraulic calculation and reasons shall be submitted as soon as practicable for written approval of the Contracting Officer. Hydraulic calculations shall include application rate per hour, maximum triangular spacing of heads for design flow rate and pressure, overlap including wind loss allowance and friction loss through pipe fittings, valves and accessories.

12. GUARANTEE. The following equipment to be furnished under this specification shall be guaranteed for a period of one year from the date of acceptance thereof, either for beneficial use or final acceptance, whichever is earlier, against defective materials, design, and workmanship:

Backflow prevention units
Quick coupling valves and keys
Water meters
Control valves
Automatic controller
Emitters
Filters

* * * * *

SECTION 2N

HYDROSEEDING

Index

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

1.1 Federal Specification (Fed. Spec.).

O-F-241D	Fertilizers, Mixed, Commercial

1.2 U.S. Department of Agriculture (USDA) Agricultural Marketing Service, Seed Branch, Grain Division.

53 Stat. 1275	Federal Seed Act (Approved August 9, 1939, Reprinted Sept 1975; Amendment May 1976 Sept 1977)

2. SUBMITTALS.

2.1 Certificates of Conformance or Compliance. Before delivery, notarized certificates attesting that the following materials meet the requirements specified, shall be submitted in triplicate for approval.

a. Seed

b. Fertilizer

2.2 Manufacturer's Literature. Manufacturer's literature on the following materials shall be submitted.

a. Hydro-Mulch

b. Erosion Control Materials

2.3 Maintenance Instructions. Prior to end of the contract maintenance period, 3 copies of written instructions for year-round maintenance and care of installed hydroseeded area shall be furnished to the Contracting Officer.

3. DELIVERY, STORAGE, AND HANDLING.

3.1 Delivery.

3.1.1 The Contractor shall notify the Contracting Officer of the delivery schedule in advance so material may be inspected upon arrival at the jobsite. Unacceptable material shall be removed from the jobsite immediately.

3.1.2 During delivery seed shall be protected from drying out and contamination.

3.1.3 Fertilizer shall be delivered to the site in the original, unopened containers bearing the manufacturer's guaranteed chemical analysis, name, trade name, trade mark, and conformance to state and Federal laws. In lieu of containers, fertilizer may be furnished in bulk and a certificate indicating the above information shall company each delivery.

3.2 Storage.

3.2.1 Seed and fertilizer shall be kept in dry storage away from contaminants.

3.2.2 Storage of materials shall be in areas designated or as approved.

4. ENVIRONMENT PROTECTION. All work and Contractor operations shall comply with the requirements of SECTION: ENVIRONMENTAL PROTECTION.

5. MATERIALS.

5.1 Seed. Seed shall be state-certified seed of the latest season's crop and shall be delivered in original sealed packages bearing the producer's guaranteed analysis for percentages of mixtures, pure live seed, germination weedseed content, and inert material. Seed shall be labeled in conformance with U.S. Department of Agriculture rules and regulations under the Federal Seed Act and applicable state seed laws. Seed that has become wet, moldy, or otherwise damaged will not be acceptable. Onsite seed mixing shall be done only in the presence of the Contracting Officer. Seed mixture shall be proportioned by the pounds of pure live seed per acre as follows:

	Botanical Name	Common Name	Pure Live Seed
A.	Atriplex polycarpa	Desert Saltbush	2.0 Lbs/Acre
B.	Cenchrus ciliaris	Buffelgrass	2.5 Lbs/Acre
C.	Schismus barbatus	Mediterranean Grass	2.5 Lbs/Acre
D.	Encelia farinosa	Brittle Bush	2.0 Lbs/Acre
E.	Encelia frutescens	Green Brittlebush	1.5 Lbs/Acre
F.	Ambrosia dumosa	White Bursage	2.0 Lbs/Acre
G.	Ambrosia deltoides	Triangleleaf Bursage	2.0 Lbs/Acre
H.	Plantago insularis	Wooly Indian Wheat	2.5 Lbs/Acre
I.	Hapolopappus linearifolius H. acradenii (substitution)	Golden Weed	1.5 Lbs/Acre
		Total PLS	18.5 Lbs/Acre

Maximum weed seed shall not exceed one percent by weight.

5.2 Fertilizer shall be commercial grade, free flowing, uniform in composition and shall conform to applicable state and Federal regulations. Granular fertilizer shall conform to Fed. Spec. O-F-241. Type I, Level B, and shall bear the manufacturer's guaranteed statement of analysis. Granular inorganic fertilizer shall contain a minimum percentage by weight equaling 16 nitrogen (of which 50 percent shall be organic), 8 available phosphoric acid and 4 potash. Granular slow release fertilizer shall contain a minimum percentage by weight equaling 16 nitrogen, 6 available phosphoric acid, and 8 potash.

5.3 Mulch.

5.3.1 Wood cellulose fiber for use with hydraulic application of seed and fertilizer shall consist of specially prepared wood cellulose fiber, processed to contain no growth or germination-inhibiting factors and dyed an appropriate color to facilitate visual metering of the application of materials. On an air-dry weight basis, the wood cellulose fiber shall contain a maximum of 12 percent moisture, plus or minus 3 percent at the time of manufacture. The pH range shall be from 3.5 to 5.0. The wood cellulose fiber shall be manufacturer so that:

a. After addition and agitation in slurry tanks with fertilizers, seeds,. water, and other approved additivies, the fibers in the material will become uniformly suspended to form a homogeneous slurry.

b. When hydraulically sprayed on the ground, the material will form a blotterlike cover impregnated uniformly with seed.

c. The cover will allow the absorption of moisture and allow rainfall or applied water to percolate to the underlaying soil.

5.4 Water. Water shall contain no elements toxic to plant life. Water necessary for the maintenance of hydroseeded area shall be obtained by the Contractor and shall be adequate for the intended purpose.

5.5 Erosion Control Material shall be totally organic substance supplied in dry, powdered form, at least 70 percent of which is 92 percent pure muciloid, derived from Plantago ovata-insularis husk. Erosion control material shall be water-soluble, non-toxic, hydrophyllic and shall not inhibit germination.

5.6 Soil Conditioners.

5.6.1 Rotted manure shall be unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials and containing no chemicals or ingredients harmful to plants.

5.6.2 Topsoil shall be the existing surface soil amended by the addition of manure as a soil conditioner at the rate of 150 lbs per acre.

5.7 Erosion Control Netting.

5.7.1 The erosion control netting shall be designed for use over straw mulch. Erosion Control netting shall be an extruded oriented polypropylene net with a mesh opening of approximately 5/8" x 3/4", the strand count approximately 1.5 x 1.3 strands per inch, and weight approximately 3 lbs per 1000 square feet. The color shall be green.

6. INSTALLATION.

6.1 Tillage. After the areas required to be seeded have been brought to the grades as specified, they shall be thoroughly tilled to a depth of at least 4 inches by scarifying, disking, harrowing, or other approved methods. Soil conditioners shall be incorporated into the soil to a depth of at least 4 inches

and shall be incorporated as part of the tillage operation hereinbefore specified. Immediately before seeding, the soil shall be restored to an even condition. All debris remaining on the surface after tillage shall be removed.

6.2 Planting Seasons and Conditions. Seeding shall be done between 28 February and 30 April for Spring planting and/or between 30 October and 30 November for Fall planting.

6.2.1 Planting shall not be done when the ground is frozen, snow covered, or in an unsatisfactory condition for planting. If special conditions exist that may warrant a variance in the above planting dates or conditions, a written request shall be submitted to the Contracting Officer stating the special conditions and proposed variance.

6.3 Seeding. The seed and fertilizer shall be mixed in the required amount of water to produce a homogeneous slurry and then uniformly applied under pressure at the following rates (dry weight) per acre:

2000 lbs. wood cellulose fiber mulch
350 lbs. 16-8-4 inorganic fertilizer
18.5 lbs. of seed mix
150 lbs. slow release fertilizer 16-6-8

6.4 Protection of Seeded Areas. Immediately after seeding the area shall be mulch with 2000 Lbs/Acre of straw mulch through the use of a mulch blower. The straw mulch shall be affixed with a water-soluble erosion control material, crimping will not be allowed. The straw mulch shall be held in place using an open mesh erosion contol netting. The netting shall be pinned or stapeled in place per manufacturers' recommendations. The mulch and netting shall be maintained until final acceptance. The seeded area shall be protected against traffic or other use by erecting barricades, as required, and placing approved signs at appropriate intervals until final acceptance.

6.5 Restoration and Clean-Up. Excess and waste material shall be removed daily. When hydroseeding in an area has been completed, the area shall be cleaned of all debris and excess material. Paving shall be cleaned when work in adjacent areas is completed.

* * * * *

SECTION 3A

SOIL-CEMENT

Index

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

1.1 American Society for Testing and Material (ASTM) Standards.

C 39-83b	Compressive Strength of Cylindrical Concrete Specimens
C 136-84	Sieve or Screen Analysis of Fine and Coarse Aggregates
C 150-84	Specification for Portland Cement
C 171-69 (R 1980)	Sheet Materials for Curing Concrete
C 309-81	Liquid Membrane-Forming Compounds for Curing Concrete
C 618-84	Fly-Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
D 75-82	Sampling Aggregates
D 558-82	Moisture Density Relations of Soil Cement Mixtures
D 1556-86	Density of Soil In Place by the Sand-Cone Method
D 1633-84	Compressive Strength of Molded Soil-Cement Cylinders
D 2216-80	Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures

2. QUALITY ASSURANCE.

2.1 Preconstruction Testing. The Government will sample and test the cement and pozzolan. The Contractor shall notify the Contracting Officer as soon as practicable, but not less than 45 days in advance of the time when soil-cement placement is expected to begin, of the manufacturer from which each of those materials intended to be used by the Contractor will be obtained together with the sampling location, brand name, type and quantity. The Contractor may submit to the Contracting Officer a request for approval of materials for soil-cement based on certificates of compliance of materials produced at the proposed sources with the requirements of these specifications. Certificates of compliance shall include appropriate manufacturer's test data and results which demonstrate compliance with these specifications. The Contractor shall proceed with required sampling until he receives, in writing from the Contracting Officer, approval for use of the proposed materials. Facilities and labor necessary for sampling will be provided by the Contractor and testing will be performed by and at the expense of the Government except as otherwise specified. No material shall be used until notice has been given by the Contracting Officer that test results are satisfactory and all movement of materials after sampling shall be as directed.

2.1.1 Cement. If cement is to be obtained from more than one source, the initial notification shall state the estimated amount to be obtained from each source and proposed schedule of shipments. Cement will be sampled at the mill or shipping point and/or at the soil-cement mixing plant. If tests prove that a cement which has been delivered is unsatisfactory, it shall be promptly removed from the site of the work. Cement which has not been used within 6 months after compliance testing will be retested at the expense of the Contractor when directed by the Contracting Officer and shall be rejected if test results are not satisfactory. The cost of testing cement in excess of the project requirements will also be at the expense of the Contractor. The charges for testing cement at the expense of the Contractor will be deducted from payments due to the Contractor at a rate of 7 cents per hundred weight of cement represented by the tests.

2.1.1.1 Prequalified Cement Sources. Cement shall be delivered and used directly from a mill of a producer designated as a qualified source. Samples of cement for compliance testing will be taken at the project site or soil-cement mixing plant by a representative of the Contracting Officer for testing at the expense of the Government. A list of prequalified cement sources is available from Commander and Director, U.S. Army Engineer Waterways Experiment Station, P.O. Box 631, Vicksburg, Mississippi 39180.

2.1.1.2 Other Cement Sources. Sampling, testing and shipping inspection from the point of sampling, when the point is other than at the site of work, will be made by or under the supervision of the Government and at the Contractor's expense. No cement shall be used until notice has been given, in writing, by the Contracting Officer that test results are satisfactory. In the event of failure of compliance tests, the cement may be resampled and tested at the request of the Contractor, and at the Contractor's expense. When the point of sampling is other than at the site of work, the fill gate or gates of the sampled bin will be sealed and kept sealed until shipment from the bin has been completed. Sealing of the fill gate

or gates and of conveyances used in shipment will be done by or under the supervision of the Government. Conveyances will not be accepted at the site of work unless received with all seals intact. If tested cement is rehandled at transfer points, the extra cost of inspection will be at the Contractor's expense.

2.1.2 Pozzolan. The use of pozzolan as a soil-cement admixture may be used as a partial replacement of cement. Pozzolan will be sampled at the source and stored in sealed bins pending completion of tests. Pozzolan will also be sampled at the site when determined necessary. Sampling and compliance testing will be by and at the expense of the Government. Release for shipment and approval for use will be based on compliance with 7-day strength requirements in accordance with ASTM C 618 and other physical and chemical and uniformity requirements for which tests can be completed by the time the 7-day strength test is completed. Release for shipment and approval for use on the above basis will be contingent on continuing compliance with the other requirements of the specifications. If the contents of a bin fails, the contents may be resampled and tested at the Contractor's expense. In this event the pozzolan may be sampled as it is loaded into cars, trucks or barges provided they are kept at the source until released for shipment. Unsealing and resealing of bins and sealing of shipping conveyances will be done by or under the supervision of the Government. Shipping conveyances will not be accepted at the site of work unless received with all seals intact. If pozzolan is damaged in shipment, handling, or storage, it shall be promptly removed from the site of work. Pozzolan which has not been used within 6 months after compliance testing for this project will be retested at the expense of the Contractor when directed by the Contracting Officer and shall be rejected if the test results are not satisfactory. If tested pozzolan is rehandled at transfer points, the extra cost of inspection will be at the Contractor's expense. The cost of testing pozzolan in excess of project requirements will be at the Contractor's expense at a rate of 2 dollars ($2.00) per ton and will be deducted from payments due to the Contractor.

2.1.2.1 Prequalified Pozzolan Sources. Pozzolan shall be delivered and used directly from a mill of a producer designated as a qualified source. Samples of pozzolan for compliance testing will be taken at the project site or soil-cement mixing plant by a representative of the Contracting Officer for testing at the expense of the Government. A list of prequalified pozzolan sources is available from Commander and Director, U.S. Army Engineer Waterways Experiment Station, P.O. Box 631, Vicksburg, Mississippi 39180.

2.1.2.2 Other Pozzolan Sources. Sampling, testing and shipping inspection from the point of sampling, when the point is other than at the site of work, will be made by, or under the supervision of the Government and at the Contractor's expense. No pozzolan shall be used until written notice has been given by the Contracting Officer that test results are satisfactory. In the event of failure, the pozzolan may be resampled and tested at the request of the Contractor, and at the Contractor's expense. When the point of sampling is other than at the site of work, the fill gate or gates of the sampled bin will be sealed and kept sealed until shipment from the bin has been completed. Sealing of the fill gate or gates and of conveyances used in shipment will be done by or under the supervision of the Government. Conveyances will not be accepted at the site of work unless received with all seals intact. If tested pozzolan is rehandled at transfer points, the extra cost of inspection will be at the Contractor's expense.

2.2 Construction Testing by Government. The Government will sample and test cement, pozzolan, soil and soil-cement to determine compliance with the specifications. The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples. Samples of soil will be obtained from stockpiles and at the point of batching in accordance with ASTM D 75. Compression test specimens of soil cement will be made and laboratory-cured in accordance with ASTM D 1633, Method A, and will be tested in accordance with ASTM C 39.

2.3 Submittals. The Contractor shall submit, in writing to the Contracting Officer, for approval a plan for the batching, conveyance, placement, compaction, finishing and curing of the soil-cement mixture. The Contractor's plan shall also include the following items: the approximate length of soil-cement to be placed prior to the start of compaction operations; the number and type of watering equipment to be used; the method used to keep soil-cement surfaces continually moist until subsequent layers of soil-cement are placed; the method used to cure permanently exposed soil-cement surfaces; proposed sources of soil to be used in soil-cement if other than designated sources; and mix designs for the soil-cement.

3. EVALUATION AND ACCEPTANCE. The strength of the soil-cement will be considered satisfactory so long as the average of all sets of three consecutive test results equal or exceed the required specified strength as described in paragraph: CEMENT CONTENT and no individual test result falls below the specified strength by more than 50 pounds per square inch. Additional analysis or testing may be required at the Contractor's expense when the strength of the soil-cement in the structure is considered potentially deficient. Soil-cement work judged inadequate shall be replaced at the Contractor's expense as directed by the Contracting Officer.

4. MATERIALS.

4.1 Cement shall conform to the requirements of ASTM C 150, Type II. Cement shall be stored in a manner to prevent the absorption of moisture.

4.2 Pozzolan shall conform to the requirements of ASTM C 618, Class F. Pozzolan shall be stored in a manner to prevent absorption of moisture or damage by other means.

4.3 Water shall be clean, fresh, and free from injurious amounts of oil, acid, salt, alkali, organic matter, and other substances deleterious to the hardening of soil-cement and shall be subject to the approval of the Contracting Officer.

4.4 Aggregate.

4.4.1 Soil aggregate for use in soil-cement construction, when tested in accordance with ASTM C 136, shall conform to the following gradation and be free of any deleterious material:

Standard Sieve Size	Percent passing
1-1/2 in.	100
No. 4	60-90
No. 200	5-20

4.4.2 Borrow areas are shown on the drawings as "Borrow Areas A, B, C, D, and E". Borrow Areas A and B are the recommended sources of soil aggregate to be used in soil-cement construction, although the Contractor may obtain soil aggregate from any of the five areas shown. Borrow areas A, B, C, and D shall be utilized to the greatest possible extent before any excavation is accomplished in area E. The Contractor shall make all arrangements, and secure all permits for the procurement, furnishing and transporting the soil aggregate including the final grading of the borrow area. If the Contractor elects to obtain soil aggregate from a source(s) other than that shown on the drawings, the Contractor shall obtain the approval of the Contracting Officer. It is the responsibility of the Contractor to blend and/or process available materials (or import additional suitable materials from other required excavations or from other sources approved by the Contracting Officer) so that soil used in construction of soil-cement conforms to the above requirements. (Supplemental exploration data presenting the laboratory test results of soils in the project area are available for informational purposes as stated in paragraph: PHYSICAL DATA of the SPECIAL CLAUSES).

4.5 Curing Materials.

4.5.1 Waterproof sheeting shall be white waterproof paper or white opaque polyethylene film conforming to ASTM C 171.

4.5.2 Curing Compounds shall conform to ASTM C 309, Type 2.

5. PROPORTIONING AND MIXING.

5.1 General. The Contractor shall be responsible for determining the required proportions of cement, aggregate, water, and pozzolan (if any) to be used in the soil-cement mix. These proportions will vary depending on the aggregate used and shall be determined in accordance with paragraph: CEMENT CONTENT, WATER CONTENT, and STOCKPILING of MATERIAL. The soil, cement, and water shall be accurately measured and conveyed into the mixer in the proportionate amounts necessary to meet the specified requirements. All ingredients shall be mixed for at least 30 seconds per cubic yard of mixture, or longer as may be necessary to insure a thorough and uniform mix of the soil, cement, and water, and until the resulting mixture is homogeneous and uniform in appearance.

5.2 Cement Content.

5.2.1 Cement content is defined as the percentage of cement, by weight, of total dry aggregate. The base cement content of the soil-cement mixture shall be such that a compressive strength of 750 psi at the end of seven (7) days is attained when tested in accordance with ASTM D 1633. The base cement content shall be derived from an average of at least two molded samples tested in compression. The minimum acceptable compressive strength shall be that strength developed by adding an additional 2 percent cement to the base cement content. The following example is given for illustrative purposes only: If the base cement content required to achieve a compressive strength of 750 psi at seven days is 8.0 percent, then the total cement content required to achieve the specified strength shall be equal to (8.0% + 2.0%) 10.0 percent. Therefore, the governing compressive strength for this example shall be that strength attained by the 10.0 percent cement content mix. The final mix design shall be subject to the approval of the Contracting Officer prior to the placement of soil-cement.

5.3 Water Content. Water shall be added and mixing shall be continued until a uniform mixture of soil, cement and water is obtained. When mixing is completed, the percentage of moisture in the mixture, on a basis of oven-dry weight as determined in accordance with ASTM D 2216, shall be such that at the time of compaction, it will be between optimum moisture and 2 percentage points wet of the optimum moisture content. Optimum moisture-maximum density relationships shall be determined in accordance with ASTM D 558.

6. PLANT AND EQUIPMENT.

6.1 Mixing Plant. Mixing of the soil, cement, and water to be used in the soil-cement mixture shall be accomplished in a stationary mixing plant. The mixer shall be an approved twin-pugmill type or a continuous-mixing type designed for either weight or volume proportioning. The plant shall be designed and operated so as to produce a uniform mixture within the limits required by these specifications. The plant shall be equipped with a hydraulically or mechanically operated holding bin having a minimum capacity of 20 tons. Facilities for efficiently storing, handling, and proportioning unmixed materials shall be provided at the plant.

6.1.1 Satisfactory means shall be provided to obtain the proper amount of cement, soil, and water. Measuring devices for soil and water shall be sensitive to a 2 percent variation above or below the actual weight required. Measuring devices for cement shall be sensitive to within plus or minus 0.5 percent of the actual weight in pounds. Proportioning may be on a volume basis, provided that the sensitivity specified for the weight basis is maintained.

6.1.2 The plant shall be equipped with a positive, adjustable governor for controlling the mixing time of each batch. The mixing time shall be considered as the interval between the time the cement contacts the soil and water and time the mixture leaves the mixing unit.

6.1.3 Batching plants designed for weight proportioning shall include means for accurately weighing soil and cement in a weight box or hopper suspended on scales, ample in size to hold a full batch without hand raking or running over. The weight box or hopper shall be supported on fulcrums and knife edge so constructed that they will not be easily thrown out of alinement or adjustment. Scales may be either of the beam type with over-and-under indicator or springless-dial type and shall be of a standard make and design, sensitive to 1/2 of 1 percent of the maximum load that may be required. If the beam-type scale is used, there shall be included a separate beam for soil and for cement, each beam being connected so as to actuate the over-and-under indicator, and a tare beam for balancing the hopper.

6.1.4 Plants designed for continuous mixing shall include a means for accurately proportioning soil and cement and shall be equipped to insure positive interlocking control of the flow of soil and cement from bins.

6.2 Transportation Equipment. Equipment for transporting the soil-cement mixture shall have clean, smooth beds and protective covers for use in unfavorable weather (as described in paragraph: WEATHER LIMITATIONS).

6.3 Spreader. The equipment for spreading the soil-cement mixture shall be suitable for the purpose and shall be capable of discharging the mixture in layers to produce reasonably smooth uniform surfaces. The equipment shall be

controllable so as to produce layers, which when compacted, will each be approximately of the specified thickness and will meet all of the requirements of these specifications.

6.4 Compaction Equipment. Compaction shall be accomplished by tamping rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well-suited to the material being compacted. The equipment shall provide uniform compaction across the width of the equipment for each pass. The use of trucks, tractors, or other hauling equipment shall not be allowed for compaction of soil-cement mixtures.

6.5 Watering Equipment. Watering equipment consisting of pumps, water tanks, sprinklers, or other approved equipment shall be furnished by the Contractor. Adequate equipment, subject to the approval of the Contracting Officer, shall be available at all times to provide water as required for curing and protection of permanently exposed slopes and for moistening compacted surfaces that are to receive an overlying layer of soil-cement. Water trucks or sprinklers for adding water to in-place layers of soil-cement shall be equipped with fog-type sprayers.

7. STOCKPILING OF MATERIAL. Soil aggregate shall be stockpiled on firm ground, drained and leveled, free of debris, trash, organics, and other objectionable or deleterious material. Stockpiles shall be constructed in layers not exceeding 2 feet in thickness. Ramps formed for the construction of stockpiles shall be of the same material as that being stockpiled, and will be considered a part of the stockpile. Material taken from the stockpile for soil-cement production shall be scooped from the stockpile in such a manner that material from several layers of the stockpile are combined in each scoop and the gradation of the material obtained is representative of that used in the mix design. The Contractor shall notify the Contracting Officer at least eight (8) days prior to the start of soil-cement production to allow the Government time to sample and test the stockpiled material. Soil aggregate for use in soil-cement shall not be used from any stockpile without the prior approval of the mix design submitted (for the particular stockpile) by the Contractor to the Contracting Officer. A minimum of one mix design shall be conducted for each 10,000 cubic yards of stockpiled material or one per stockpile, whichever is less. Samples from stockpiles for mix designs shall be obtained by taking a minimum of six (6) face cuts at different locations on the stockpile and blending the sampled material.

8. DRAINAGE. Adequate drainage shall be provided during the entire construction period to prevent water from collecting or standing on the area to be stabilized or on the mixed, or partially-mixed material.

9. SUBGRADE PREPARATION. The subgrade shall be cleaned of debris, trash, and organics. The subgrade shall be adequately compacted and shall be capable of withstanding, without displacement, the compaction specified for the soil-cement mixture. Debris and removed in-place material designated as unsuitable shall become the property of the Contractor and be disposed of. The subgrade for the soil-cement fill shall be compacted in accordance with SECTION: FILLS AND SUBGRADE PREPARATION.

10. TRANSPORTING SOIL-CEMENT MIXTURE. The soil-cement mixture shall be transported from the mixing plant to the site of the work in clean equipment provided with protective covers for use in unfavorable weather (as described in paragraph: WEATHER LIMITATIONS). The total elasped time between the addition of

water to the soil-cement mixture and the start of compaction shall not exceed thirty (30) minutes. Any load excessively wetted by rain or excessively dried (dry of optimum moisture content) for any reason will be subject to rejection. Equipment shall not be operated on a finished compacted layer of soil-cement except where specifically permitted, and any damage resulting to the soil-cement from such operation shall be repaired at the expense of and by the Contractor.

11. PLACEMENT OF SOIL-CEMENT.

11.1 Spreading. The soil-cement mixture shall be placed and distributed in such a manner as to produce a reasonably smooth, uniform surface in layers of such uncompacted thickness that when compacted each layer shall not exceed 8 inches nor be less than 4 inches in thickness. In general, soil-cement shall be placed in horizontal layers. The Contractor will be permitted to place the material in sloping layers to accommodate hauling and compacting equipment if such sloping layers are not steeper than 8:1.

11.2 Compaction. Compaction shall commence as soon as practical after spreading. Compaction shall be completed within one hour from the time the soil-cement mixture is discharged from the mixer. Each layer shall be compacted to a density of at least 98 percent maximum density in accordance with ASTM D 558. The blade of the self-propelled roller or the tractor towing the roller shall not be used for spreading.

11.3 The specified moisture content shall be maintained uniformly throughout the layer of material being compacted. If necessary, water shall be added and incorporated during the compaction operation to maintain the uncompacted mixture at its optimum moisture content. If in the opinion of the Contracting Officer, the surface of a layer of soil-cement has been rutted or compacted unduly by hauling equipment to reduce the effectiveness of compaction by the specified rollers, the Contractor will be required to scarify such surfaces as directed prior to compacting with the specified rollers. At the start of compaction, the mixture shall be in a uniform, loose condition throughout its full depth. No section shall be left undisturbed for longer than thirty minutes during compaction operations. Compaction of each layer shall be done in such a manner as to produce a dense surface, free from compaction planes.

11.4 Where compaction of the soil-cement adjacent to concrete structures or elsewhere by means of the above specified roller is impracticable or undesirable as determined by the Contracting Officer, the soil-cement shall be compacted by mechanical tampers or by other approved methods to obtain the compaction equivalent to the soil-cement compacted with the above rollers.

11.5 Construction Joints.

11.5.1 Compacted surfaces of soil-cement that are to receive an overlying layer of soil-cement shall be kept moist continuously until placement of the overlying or adjacent layer of soil-cement; provided that the Contractor will not be required to keep such surfaces moistened for a period longer than 7 days. Whenever the Contractor's operation is interrupted for more than two (2) hours, the top surface of the completed soil-cement layer, if smooth, shall be scarified to a depth of at least one (1) inch with a spike tooth instrument prior to placement of the next layer. The scarified surface shall then be swept using a

power broom or other method approved by the Contracting Officer to completely free the surface of all loose material prior to the placement of the soil-cement for the next layer.

11.5.2 The Contractor shall clean off bonding surfaces thoroughly by power brooming prior to placing the next layer of soil-cement. Equipment operating on soil-cement layers shall be routed so as not to disrupt or damage the layers, and no equipment shall be operated over the finished edges of the soil-cement on the slope unless proper protection is provided. Transverse joints at stoppages of work shall be trimmed to form straight, vertical joints. When lanes of soil-cement are placed in adjacent layers, the longitudinal joints, if placement is discontinued, shall be trimmed within 3 hours of compaction to form straight, vertical joints prior to the placement of the adjacent lane. Soil-cement materials removed in brooming, smoothing, or trimming the layers after the time limits specified for transporting and compacting the layers shall be wasted.

11.6 Protection.

11.6.1 Protection from Construction Traffic. The Contractor shall take all necessary precautions to avoid damage to completed soil-cement by the movement of equipment, and shall avoid the deposition of soil or foreign materials between layers of soil-cement. Earthen ramps crossing completed soil-cement shall have a minimum compacted thickness of two feet. Where ramps are constructed over soil-cement that is not to grade, all foreign materials and the uppermost 1-inch of the previously placed soil-cement mixture shall be removed prior to continuation of the soil-cement construction.

11.6.2 Protection from Rain or Waterflow. If, prior to completion of compaction, the soil-cement mixture is wetted by rain so that the average moisture content exceeds the tolerance given in subparagraph: WATER CONTENT, at the time of final compaction, the entire layer affected, as determined by the Contracting Officer, shall be removed and shall be replaced in accordance with these specifications at the expense of the Contractor.

11.7 Finishing. After compaction, the soil-cement shall be cut to the required lines, grades, and cross-sections and rolled to a reasonably smooth surface. Trimming and shaping of the soil-cement shall be conducted at the completion of each day's production utilizing a smooth blade.

12. WEATHER LIMITATIONS. No soil-cement shall be prepared except when the air temperature is at least 40 degrees F. in the shade and rising. No cement shall be applied to soils that are frozen or contain frost. When the air temperature does not exceed 90 degrees F, the moisture content shall not be below optimum nor be more than 2 percent above optimum at the time of compaction. When the air temperature exceeds 90 degrees F, or there is a breeze or wind which promotes the rapid drying of the soil-cement mixture, protective covers on transporting equipment shall be used and the moisture content of the mix shall be increased as needed at the direction of the Contracting Officer, but shall be less than that quantity that will cause the soil-cement to become unstable during compaction and finishing operations. Protective covers on transportation equipment will also be required to protect the soil-cement mixture from extra moisture caused by rain.

13. CURING AND PROTECTION.

13.1 General. Temporarily exposed surfaces of soil-cement that will be in contact with suceeding layers of soil-cement shall be kept continously moist by moist curing or impervious-sheet curing methods described hereinafter until placement of the subsequent layer, provided that the Contractor will not be required to keep such surfaces continuously moist for a period longer than seven (7) days. Curing of permanently exposed surfaces shall begin immediately after compaction, or immediately after trimming if the surface is to be trimmed. Curing shall continue for at least seven (7) days. The soil-cement shall be cured and protected from premature drying, extremes in temperature, rapid temperature change, freezing, mechanical damage and exposure to rain or flowing water. The Contractor shall have all equipment needed for adequate curing and protection of the soil-cement on hand and ready to install before actual soil-cement placement begins. The curing medium and method, or the combination of mediums and methods used, shall be approved by the Contracting Officer. Soil-cement shall be protected from the damaging effects of rain for 12 hours and flowing water for 14 days.

13.2 Moist Curing. Soil-cement may be moist cured by maintaining all surfaces continuously (not periodically) wet for the duration of the entire curing period with the exceptions listed below. Water for curing shall comply with the requirements of paragraph: WATER. If water is used which stains or discolors soil-cement surfaces which are to be permanently exposed, the surfaces shall be cleaned to the satisfaction of the Contracting Officer. Horizontal surfaces shall be cured by covering with a minimum uniform thickness of 2 inches of continuously saturated sand, or by covering with saturated non-staining burlap or cotton mats. Horizontal construction joints may be allowed to dry for twelve hours immediately prior to the placing of the following lift.

13.3 Curing Compound. A curing compound conforming to ASTM C 309 may be used on permanently exposed surfaces which will not be in contact with suceeding layers of soil-cement. The curing compound shall be applied to surfaces as soon as final compaction has been completed. The curing compound shall be applied in a 2-coat continuous operation by approved motorized power-spraying equipment and pressure tank type equipment with provisions for continuous agitation. The compound shall be applied at a uniform coverage of not more than 400 square feet per gallon for each coat. Soil-cement surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage herein specified. All soil cement surfaces on which the curing compound has been applied shall be adequately protected for the duration of the entire curing period from pedestrian and vehicular traffic and from any other cause which will disrupt the continuity of the curing membrane.

13.4 Impervious-sheet Curing. The sheets shall comply with the requirements of ASTM C 171, except that the polyethylene film, if used, shall be white opaque. All surfaces shall be thoroughly wetted and be completely covered with waterproof paper or polyethylene film. Covering shall be laid with light-colored side up. Covering shall be taped to form a continuous cover with completely closed joints. The sheet shall be weighted to prevent displacement so that it remains in contact with soil-cement during the specified length of curing. Coverings shall be folded down over exposed edges of slabs and secured by approved means. Sheets shall be immediately repaired or replaced if tears or holes appear during the curing period.

14. GRADE CONTROL. The finished and completed soil-cement slope protection shall conform to the lines, grades, cross section, and dimensions indicated. All points of the finished soil-cement surfaces shall be within 1 inch of the construction lines shown on the contract drawings. The lines and grades indicated shall be maintained by means of line and grade stakes placed by the Contractor at the site of the work in accordance with the SPECIAL CLAUSES.

15. CONTRACTOR QUALITY CONTROL.

15.1 General. The Contractor shall perform the inspection and tests described in paragraph: INSPECTION DETAILS AND FREQUENCY OF TESTING, and based upon the results of these inspections and tests, he shall take the action required in paragraph: ACTION REQUIRED, and submit reports as required in paragraphs: ACTION REQUIRED and REPORTS. The laboratory performing the tests shall conform to ASTM E 329. The individuals who sample and test soil-cement or the constituents of soil-cement shall have demonstrated a knowledge and ability to perform the necessary test procedures.

15.2 Inspection Details and Frequency of Testing.

15.2.1 Aggregate. At least once during each shift in which soil-cement is being delivered, there shall be one sieve analysis performed in accordance with ASTM C 136 for aggregates. 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 aggregate to the mixer within the specification limits. Each time the Contractor performs a moisture-density relation, an additional gradation analysis in conformance with ASTM C 136 shall be performed, corresponding to the material used in the moisture-density relation.

15.2.2 Scales. The accuracy of scales used shall be checked by test weights at least once a month for conformance with the applicable requirement of paragraph: PLANT AND EQUIPMENT. Such tests shall also be made whenever there are variations in properties of the soil-cement which could result from batching errors.

15.2.3 Preparation for Placing. Foundation or construction joints shall be inspected in sufficient time prior to each soil-cement placement by the Contractor in order to certify to the Contracting Officer that it is ready to receive soil-cement. The results of each inspection shall be reported in writing. Density tests for subgrade shall be taken for every 5000 square feet.

15.2.4 Placing. The placing foreman shall supervise all placing operations and shall be responsible for measuring and recording ambient temperature, weather conditions, time of placement, yardage placed, and method of placement.

15.2.5 Density Tests. One density test conforming to ASTM D 1556 shall be taken for every 200 cubic yards of soil-cement placed. The locations of tests shall be randomly distributed throughout the soil-cement which has been placed. The Contracting Officer shall be immediately notified of all density test results. A complete written report of test results shall be supplied to the Contracting Officer within 48 hours of sampling.

15.2.6 Compressive strengths. At least one compressive strength test (two cylinders each) shall be conducted for each 1500 cubic yards of soil cement placed. Samples shall be taken from the wet batched mix. Tests shall determine the seven (7) day compressive strength in accordance with ASTM D 1633.

15.2.7 Curing.

15.2.7.1 Moist curing. At least once each shift, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.

15.2.7.2 Curing Compound. No curing compound shall be applied until it has been verified that the compound is properly mixed and ready for spraying. At the end of each operation, the quantity of compound used and the area of soil-cement covered shall be reported and the rate of coverage in square feet per gallon shall be computed. The report shall state whether coverage is uniform.

15.2.7.3 Impervious Sheet Curing. At least once each shift, 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.

15.2.8 Protection. At least once each shift, an inspection shall be made of all areas subject to protection from adverse weather or flows. Deficiencies shall be noted.

15.3 Action Required.

15.3.1 Aggregates. When the amount passing any sieve is outside the specified limits, the aggregate shall immediately be resampled and retested. If there is another failure on any sieve, the fact shall immediately be reported to the Contracting Officer, and immediate steps shall be taken to rectify the situation.

15.3.2 Scales. Whenever the weighing accuracy or batching accuracy is found not to comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made.

15.3.3 Placing. The placing foreman shall not permit placing to begin until he has verified that adequate equipment manned with competent operators are available for compacting the soil-cement mixture. Placing shall be temporarily discontinued if any lift is inadequately compacted until such time as that lift has been reworked, retested, and meets the density requirements.

15.3.4 Density. Whenever the results of a density test indicate that the soil-cement has not been adequately compacted, the Contracting Officer shall be immediately notified. The extent of unsuitably compacted material will be determined and, if the time periods specified in paragraph: PLACEMENT OF SOIL-CEMENT have not expired, the Contractor may be allowed to apply additional rolling. If the time period has expired, the material will be removed, disposed of, and replaced with soil-cement meeting these specifications at no additional cost to the Government.

15.3.5 Curing.

15.3.5.1 Moist Curing. When a daily inspection report lists an area of inadequate curing, the required curing period for that area shall be extended by one day.

15.3.5.2 Curing Compound. When the coverage rate of curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.

15.3.5.3 Impervious Sheet Curing. When a daily inspection report lists any tears, holes, or laps of 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 one day.

15.4 Reports. All results of tests conducted at the project site shall be reported as required. Each report shall include the updating of control charts covering the entire period from the start of construction through the current week. During periods requiring protection from weather, reports of pertinent temperatures or flows 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.

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SECTION 3B

CONCRETE

Index

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

1.1 American Concrete Institute (ACI) Standards.

318-83	Building Code Requirements for Reinforced Concrete
SP-66	ACI Detailing Manual - 1980

1.2 American Society for Testing and Materials (ASTM) Standard.

C 94-84	Ready-Mixed Concrete

2. GENERAL. The work shall be in conformance with ACI 318, part entitled "Construction Requirements", except as specified herein. Concrete shall conform to ASTM C 94.

3. STORAGE. Materials shall be stored so as not to deteriorate or become contaminated.

4. MATERIALS.

4.1 Anchorage Items. Anchorage items for anchoring work of other trades to concrete shall be of standard manufacture and of types to engage with anchors provided and installed under other sections.

4.2 Concrete Materials. Concrete materials shall conform to ASTM C 94, cement type optional. Only one brand of any one type of cement shall be used for exposed concrete surfaces of any individual structure.

4.3 Curing Materials. Curing materials shall be impervious sheet or membrane-forming curing compound. Impervious sheet shall be white opaque polyethylene 4 mil thick, waterproof kraft paper, or polyethylene-coated burlap. Membrane-forming curing compound shall be of commercial formulation, sprayable, nontoxic, and will form a film highly resistant to moisture loss from concrete while curing and will dry within 4 hours. Compound shall be clear with fugitive dye, resin-base or chlorinated-rubber-base-type.

4.4 Dowels. Dowels shall be plain carbon steel bars, minimum yield point of 40,000 psi for use in slabs on grade.

4.5 Expansion Joint Filler Strips, Premolded. Expansion joint strips shall be nonextruding, resilient bituminous or nonbituminous type commercially used in concrete paving or construction, 3/8-inch thick.

4.6 Form Coating. Form coating shall be nonstaining form oil or form release agent that will not deleteriously affect concrete surfaces nor impair subsequent applications.

4.7 Form Materials. Form materials shall be plywood or hardboard especially made for concrete form use or other materials that will produce the specified finishes without adversely affecting the concrete surfaces.

4.8 Form Ties. Form ties shall be metal, factory-fabricated removable or snap-off, that will leave holes not less than 1/4 inch nor more than one inch in diameter and not more than one inch deep. That portion of the tie remaining permanently in the concrete shall not project beyond the surface of the concrete and shall be recessed at least one inch from any concrete surface that will be exposed, painted, dampproofed, or will receive direct applications of plaster.

4.9 Joint Sealant. Joint sealant shall be hot- or cold-applied, made specifically for sealing joints in concrete against moisture infiltration.

4.10 Reinforcement. Reinforcement bars shall be deformed, Grade 40 or Grade 60 billet or axle steel, or Grade 50 or Grade 60 rail steel. Mesh shall be welded steel wire fabric with wires at right angles to each other.

5. CONCRETE QUALITY. Proportioning of concrete mixes to meet the requirements specified below shall be the Contractor's responsibility.

5.1 Compressive Strength. Compressive strength in 28 days shall be 4,000 psi for all concrete. The maximum water-cement ratio shall not exceed 0.45 by weight. The compressive strengths shall be reached in 7 days when high-early-strength cement is used.

5.2 Entrained-Air Content. Entrained-air content of exterior concrete shall be maintained at 5 to 7 percent by volume of concrete.

5.3 Slump. Slump shall be 3 to 4 inches for walls and 2 to 3 inches for other work.

6. FORMWORK. Formwork shall provide for concrete conforming accurately to the indicated shapes, lines, dimensions, and with surfaces free of offset, waviness, or bulges. Where surfaces are to be exposed or painted, panels shall be manufacturer's stock size material, using smaller panels cut to required dimensions only where required by openings and joints. Panel joints in exposed or painted work shall occur at control joints, including alinement with masonry control joints and construction joints. Exposed corners shall be chamfered, beveled, or rounded by moldings placed in the forms. Surfaces shall be thoroughly cleaned and coated before each use. Forms shall be removed at a time and in a manner that will not injure the concrete.

7. REINFORCEMENT. Reinforcement detailing and placement shall conform to ACI SP-66 and ACI 318. Reinforcement shall be interrupted 2 inches clear on each side of joints in slabs on grade and perimeter joints. Wire-mesh reinforcement shall be continuous between joints in slabs on grade. Laps shall be at least one full mesh plus 2 inches; staggered to avoid continuous lap in either direction; and securely wired or clipped with the standard clips. Mesh shall be supported on precast concrete units in a manner that will support the mesh at the minimum height indicated. Dowels and tie bars in slabs on grade shall be installed at right angles to joints; accurately alined parallel to the finished surface; and rigidly held in place and supported during concrete placement. One end of dowels shall be oiled or greased.

8. INSTALLATION OF ANCHORAGE ITEMS. Anchorage items shall be of number, size, and location to insure sufficient anchorage for purpose intended.

9. PLACING. Concrete footings and slabs and walls shall be placed upon clean undisturbed surfaces free from frost, ice, and water. Dry or pervious surfaces receiving concrete shall be covered with impervious sheet materials. Concrete may be placed directly on impervious surfaces that are thoroughly moistened but not muddy. Concrete shall be placed in layers not over 12 inches deep. Concrete to receive other construction shall be screeded to the proper level.

10. CONSOLIDATION OF CONCRETE. Consolidation of concrete shall be with internal concrete vibrators supplemented by handspading, rodding, and tamping. Vibrating equipment shall be adequate to thoroughly consolidate the concrete.

11. FINISHES OF CONCRETE. Fins and loose material shall be removed. Unsound concrete, voids over 1/2 inch in diameter, and tie-rod and bolt holes shall be cut back to solid concrete, reamed, brush-coated with cement grout, and filled solid with a stiff Portland-cement-sand mortar mix. Patchwork shall finish flush with adjoining concrete surfaces and where exposed, shall match adjoining surfaces in texture and color. Patchwork shall be cured for 72 hours. White Portland cement shall be used as needed to attain color match.

11.1 Smooth Finish. Surfaces to be painted or exposed to view shall be thoroughly wetted and then brush-coated with Portland-cement-sand grout of thick consistency and of mixture so that final color will approximately match the concrete. White Portland cement shall be used as needed to attain color match. Grout shall be cork- or wood-floated to fill voids, excess scraped off with a trowel, and visible grout film removed by rubbing with burlap. Grout shall be kept damp until set.

11.2 Forms shall be fabricated with facing materials that produce the following specified construction tolerance requirements:

11.2.1 This class of finish shall apply to all surfaces unless otherwise noted. The sheathing shall be composed of tongue-and-groove or shiplap lumber, plywood conforming to NBS Produce Standards PS-1 Grade B-B Concrete Form, Tempered concrete from hardboard, or steel. Steel lining on wood sheathing will not be permitted.

11.3 Surface Requirements. Allowable irregularities are designated "abrupt" or "gradual" for purposes of providing for surface variations. Offsets resulting from displaced, misplaced, or mismatched forms, or sheating, or by loose knots in sheathing, or other similar form defects, shall be considered "Abrupt"

irregularities. Irregularities resulting from warping, unplaneness or similar uniform variations from planeness, or true curvature, shall be considered "Gradual" irregularities. "Gradual" irregularities will be checked for compliance with the prescribed limits with a 5-ft. template, consisting of a straightedge for plane surfaces and a shaped template for curved or warped surfaces. In measuring irregularities, the straightedge or template may be placed anywhere on the surface in any direction, with the testing edge held parallel to the intended surface.

Irregularities	
Abrupt, inches	1/4
Gradual, inches	1/2

12. CURING shall start as soon as free water has disappeared from concrete surfaces after placing and finishing. Curing materials shall be applied and maintained so as to protect the concrete from moisture loss for 7 days. Curing shall be accomplished by impervious sheet or membrane-forming curing compound. Concrete surfaces shall be thoroughly wetted before covering with impervious-sheet materials. Membrane-forming curing compound shall be applied with mechanical spraying equipment at a coverage of not more than 300 square feet per gallon. Surfaces damaged during curing shall be resprayed.

13. SIDEWALKS AND CURB AND GUTTERS

13.1 Concrete. Concrete for use in curb and gutters shall have a compressive strength of 3000 psi at 28 days.

13.2 Forms.

13.2.1 Sidewalks. Construct forms to conform to line and grade. Do not remove side forms until at least 12 hours after finishing.

13.2.2 Curb and Gutters. Construct forms to conform to the dimensions of the curb. Hold forms rigidly in place by the use of stakes placed at intervals not to exceed 4 feet. Remove the forms on the front of the curb not less than 2 hours not more than 6 hours after the concrete has been placed. Remove the remainder of the forms not less than 12 hours after the concrete placement.

13.2.3 Curb Forming Machines. Curb-forming machines for constructing curb and gutter may be used provided satisfactory results are obtained.

13.3 Finishing. Concrete for the sidewalks shall have a broom finish. Concrete for curb and gutter shall be finished as specified above.

13.3.1 Edges for sidewalks including those at formed joints, shall be finished with an edger having a radius of 1/8 inch. Edges for curb and gutter shall be rounded with a 1/2 inch edging tool.

13.4 Joints.

13.4.1 Sidewalks.

13.4.1.1 Construction joints in sidewalks shall be placed so that the surface is divided into rectangular areas not more than 5 feet on center.

13.4.1.2 Expansion joints shall be installed at sidewalk returns.

13.4.2 Curb and Gutters.

13.4.2.1 Contraction joints will be placed so the monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet.

13.4.2.2 Expansion joints will be placed in curb and gutter at intervals not exceeding 15 feet.

14. WAYBILLS AND DELIVERY TICKETS. Copies of waybills or delivery tickets shall be attached to the Daily Contractor Quality Control Report for the day of delivery. Before the final statement is allowed, the Contractor shall file with the Contracting Officer waybills and/or certified delivery tickets for all concrete actually used in the construction covered by this contract.

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SECTION 5A

FLAPGATES AND MISCELLANEOUS METALS

Index

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

1.1 Federal Specification (Fed. Specs.).

FF-B-575C	Bolts, Hexagon and Square
FF-N-836D & Am-1	Nut: Square, Hexagon, Cap, Slotted, Castle, Knurled, Welding and Single Ball Seat
QQ-B-750 & Am-2	Bronze, Phosphor; Bar, Plate, Rod, Sheet, Strip, Flat Wire, and Structural and Special Shaped Sections
QQ-S-763d & Notice 1	Steel Bars, Shapes, and Forgings, Corrosion-Resisting
WW-P-401E	Pipe Fittings: Bushings, Locknuts, and Plugs; Brass or Bronze, Iron or Steel, and Aluminum; (Screwed); 125-150-Pound

1.2 American Society for Testing and Materials (ASTM) Standards.

A 36-81a	Structural Steel
A 53-83	Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless
A 126-73 (R 1979)	Gray Iron Castings for Valves, Flanges, and Pipe Fittings

A 320-83 Alloy-Steel Bolting Materials for Low-Temperature Service

1.3 Military Specification (Mil. Spec.).

Mil-C-18480A Am-3 Coating Compound, Bituminous, Solvent, Coal Tar Base

2. MATERIALS.

2.1 General. Materials indicated on the drawing or required in the work and not covered elsewhere by detailed requirements shall conform to the requirements of this section. In all cases not specifically covered in these specifications, the Contractor shall furnish approved highest grade commercial materials or products.

2.2 Structural Steel shall conform to ASTM A 36.

2.3 Corrosion-Resisting Steel Bolts and Anchor Bolts shall conform to Fed. Spec. QQ-S-763, Class 304, Condition A, or the applicable requirements of ASTM A 320, Grade BB.

2.4 Bronze shall conform to Federal Specification QQ-B-750, hard temper of either composition.

2.5 Bolts shall conform to Fed. Spec. FF-S-575.

2.6 Nuts shall conform to Fed. Spec. FF-N-836.

2.7 Cast Iron for Drainage Gates shall conform to ASTM A 126, Class B.

2.8 Cast Iron Pipe and Fittings shall conform to the applicable requirements of Fed. Spec. WW-P-401.

2.9 Coal Tar Base Paint shall conform to Mil. Spec. MIL-C-18480. A special primer shall be used only if as recommended by the manufacturer of the coating.

2.10 Grease shall be water-resistant and shall be similar or equal to one of the following:

2.10.1 "All Purpose Superlube" as manufactured by Conoco.

2.10.2 "Multi-Fax Heavy Duty No. 2" as manufactured by Texaco.

2.10.3 "Lubriplate No. 630 AAA" or Alvania No. 1" as manufactured by Shell Oil Company.

3. FINISHES. In general, new flapgate tolerances for machine-finished surfaces designated by nondecimal dimensions shall be within 1/64 inch. Sufficient machining stock shall be allowed on placing pads to insure true surfaces of solid material. Finished contact or bearing surfaces shall be true and exact to secure full contact. All drilled holes for bolts shall be accurately located and drilled

from templates. Bolt holes shall be reamed normal to the member and shall be truly cylindrical throughout. Unless otherwise specified, holes for bolts shall not be more than 0.2 inch larger than the diameter of the bolt.

4. ANCHORAGE. Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete. Slotted inserts shall be of types required to engage with the anchors and shall be approved.

5. FLAPGATES. Side drain flapgates shall be of the sizes indicated and constructed for a minimum 20-foot seating head. Frames and covers shall be cast iron or cast steel. Seating surfaces shall be bronze or ductile iron. Links may be cast iron, steel, or high strength malleable iron. Bushings shall be bronze. Fasteners shall be galvanized steel, bronze, or corrosion-resistant steel. Gates shall have fully adjustable linkage. Each gate shall be rigidly secured in place with seating faces inclined from the vertical by approximately 3 degrees. Installation of gates shall be as recommended by the gate manufacturers. Fasteners of the size recommended by the gate manufacturer shall be utilized in assembly of gate and to secure the gates to the frame. The gates shall be so constructed as to prevent locking in any partially open position.

6. PAINTING NEW FLAPGATES.

6.1 Cleaning. All oil and grease shall be removed. When required, welds shall be neutralized by the use of ammonia or other suitable agent. All surfaces to be painted shall be cleaned in the shop to remove all rust, scale, dirt, and other foreign matter. "Tight" mill scale, that cannot be lifted by applying a sharp knife to any edge, will be permitted. The cleaning shall be accomplished by scraping, wire brushing, and wiping or other approved methods. The cleaning and painting operations shall be carried on in such a manner that the time between cleaning and the application of the paint will not exceed 24 hours.

6.2 Painting.

6.2.1 Flapgates shall be given 3 coats of cold applied coal tar base paint. The paint shall be applied heavily by brush, at a coverage rate of approximately 100 square feet per gallon to give a total film thickness of 3 coats of 1/32 of an inch. Each additional coat shall be brushed perpendicularly to strokes of preceding coat. Drying time between coats shall be as recommended by manufacturer of coatings.

7. SAFETY RAILS AND PIPE GATES.

7.1 Safety Rails and Pipe Gates. Safety railings shall be made of galvanized standard weight steel pipe of nominal 1-1/2 inch size conforming to ASTM A 53. Pipe Gates shall be made of galvanized steel pipe of sizes and weights as shown on the drawings.

7.1.1 Jointing shall be by one of the following:

a. Flush-type rail fittings, welded and ground smooth with railing splice locks secured with 3/8-inch hexagonal-recessed-head setscrews.

b. Mitered and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners groove welding joints and grinding smooth. Railing splices shall be butted and reinforced by tight-fitting interior sleeve not less than 6 inches long.

7.1.2 Installation shall be by grouting embedded pipe post in concrete or soil cement.

7.2 Workmanship. Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean, true lines, and surfaces. Welding shall be continuous along the entire area of contact, except where tack welding is permitted. Exposed connection of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alinement. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawing, cuts, and details.

7.3 Shop Painting. Unless otherwise specified, surfaces of ferrous metal, except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating. Items to be finish painted shall not be given a bituminous protective coating. Surface shall be cleaned with solvents to remove grease and oil and with power wire-brushing or sandblasting to remove loose rust, loose mill scale, and other foreign substances. Surfaces of items embedded in concrete shall not be painted.

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SECTION 16A

ELECTRICAL WORK (FOR IRRIGATION LANDSCAPING)

Index

1. CONTROLLER TO CONTROL VALVE WORK. Electrical work from controller to control valves are specified in SECTION: IRRIGATION SYSTEM.

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

2.1 Federal Specifications (Fed. Spec.).

J-C-30A & Am-1	Cable and Wire, Electrical (Power, Fixed Installation)
W-C-375B/GEN	Circuit Breakers, Molded Case; Branch Circuit and Service
W-C-586C	Conduit Outlet Boxes, Bodies and Entrance Caps, Electrical: Cast Metal
W-F-406b & Int. Am-1 (GSA-FSS)	Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible
W-F-408C & Am-1	Fittings for Conduit, Metal Rigid, (Thick-Wall and Thin-Wall (EMT) Type)
W-P-115a & Am-3	Panel, Power Distribution
W-S-610C & Am-1	Splice Conductor
FF-P-101E & Am-2	Padlocks
HH-I-510D	Insulation Tape, Electrical, Friction
HH-I-553C & Am-1	Insulation Tape, Electrical (Rubber, Natural and Synthetic)
HH-I-595C	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

SS-A-281b & Am-1	Aggregate; (For) Portland-Cement-Concrete

2.2 American Society for Testing and Materials (ASTM) Standards.

A 48-76	Grey Iron Castings
A 123-78	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
A 153-80	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
C 150-81	Portland Cement

2.3 National Electrical Manufacturers Association (NEMA) Standards.

No. SG 3-1975 Incl Rev 1	Low-Voltage Power Circuit Breakers
TC 2-1978 Incl Rev 1 thru 4	Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)

2.4 National Fire Protection Association (NFPA) Publication.

No. 70-198* Vol. 6)	National Electrical Code

2.5 Institute of Electrical and Electronics Engineers (IEEE) Standards.

National Electrical Safety Code (ANSI C2) (1981 Edition)

No. 142-1972	Recommended Practice for Grounding of Industrial and Commercial Power Systems

2.6 Underwriters' Laboratories, Inc. (UL) Standards.

UL 6	Rigid Metal Conduit (Oct 23, 1981; 9th Ed.)
UL 467	Grounding and Bonding Equipment (Nov 7, 1972, 5th Ed.; Rev. thru 26 Mar 1982)
UL 651	Schedule 40 and 80 Rigid PVC Conduit (May 8, 1981; 4th Ed.)
UL 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit (May 11, 1981; 1st Ed.)

UL 854	Service-Entrance Cables (June 15, 1979 6th Edition; Appendix Jul 2, 1979 Rev. thru Nov 23, 1981)
UL 869	Service Equipment (Aug 19, 1977; Rev. thru Nov 10, 1980)
UL 1242	Outline of Proposed Investigation for Intermediate Metal Conduit Type I and Type II (Jan 14, 1977)

3. GENERAL. The contract drawings indicate the extent and general arrangement of the underground electrical distribution systems.

3.1 Capacities for all equipment and materials shall be not less than those indicated.

3.2 Codes. The installation shall comply with the applicable requirements and recommendations of the National Electrical Code and the National Electrical Safety Code.

3.3 Conformance With Agency Requirements. Where materials or equipment are specified to conform to the standards of the 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 Underwriter's 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 specifications.

3.4 Nameplates. Each major component of equipment shall have as a minimum the manufacturer's name, address, and catalog number, model, style, or type on a plate securely and conspicuously attached to the item of equipment. Nameplates for electrical apparatus shall conform to the referenced standards.

3.5 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. Aluminum shall not be used in contact with the earth, and where connected to dissimilar metal shall be protected by approved fittings and treatment. 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

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-sensative plastic tape is used, the conduit shall be coated with a primer recommended by the tape manufacturer before applying the tape.

3.6 Spare-Parts Data. As soon as practicable after approval of materials and equipment and, if possible, not later than one month 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 current unit prices and 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 hereinafter.

3.7 Standard Products. Materials and equipment shall be essentially the standard products of a manufacturer regularly engaged in the manufacturer of the product, shall meet the requirements of the specification, and essentially duplicate materials and equipment that have been in satisfactory use at least 2 years.

3.8 Verification of Dimensions. The Contractor shall be specifically responsible for the coordination and proper relation of this work to the site and to the 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.

4. MATERIALS AND EQUIPMENT shall conform to the respective specifications and other requirements specified herein.

4.1 Cable shall have copper conductors unless otherwise indicated.

4.1.1 Conductors, Insulated. Fed. Spec. J-C-30, types as indicated.

4.2 Conduit, Steel. UL 6.

4.3 Plastic Conduit shall be single bore, and shall be polyvinyl-chloride (UL 651), conduit for underground use without concrete encasement or polyvinyl-chloride tubing (UL 651A, Type A PVC) for underground use with concrete encasement conforming to NEMA TC 2 and applicable UL. 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. Conduit and fittings shall be free, within commercial tolerances, of objectionable lines, striations, bubbles, welds, and other manufacturing defects that would impair the service of the conduit. The bore of the conduit shall be straight and circular in cross section with smooth interior surfaces free from obstructions and rough and flaky areas. The conduit and fittings shall be free from all substances that injuriously affect any wire or cable covering such as is used on rubber-covered wire, polychloroprene-sheathed

cable, weatherproof wire, and lead- or lead-alloy-covered cable. The conduit and fittings shall be corrosion-resistant and not adversely affected by chewing insects, gnawing rodents, acids, alkalies, salts, bacteria, and other organic matter that would normally be encountered in the ground. The conduit length for each size shall be the length that is standard with the manufacturer with a permissible tolerance of 1/4 inch per 10-foot length. Bends, elbows, and other fittings shall be capable of freely passing a ball that is 1/4 inch less in diameter than the nominal bore of the conduit. Fittings shall be of a type especially made for use with plastic conduits for electrical service. Conduit and fittings shall be capable of being joined, by means of a solvent welding cement, so as to provide a watertight and rootproof joint. Electrical plastic tubing, EPT-PVC, for use with concrete encasement, and electrical plastic conduit, EPC-40-PE or EPC-40-PVC for use without concrete encasement shall have dimensions for the corresponding size in accordance with Table 2-1 of NEMA TC-2. Sections cut from the conduit shall be calipered for wall thickness.

4.4 Connectors. Fed. Spec. W-S-610.

4.5 Fittings, cable and conduit. Fed. Spec. W-F-406 or W-F-408. Insulating material in bushing shall be of the thermosetting type and shall not support combustion.

4.6 Mortar shall be composed of the following materials.

4.6.1 Aggregate. Fed. Spec. SS-A-281.

4.6.2 Portland Cement. ASTM Standard C 150.

4.6.3 Water shall be clean, fresh, and free from injurious amounts of mineral and organic substances.

4.6.4 Mixture shall be in the proportions of one part portland cement to one part sand with sufficient water added to produce a pliable and workable mortar.

4.7 Outlets, metal, for conduit. Fed. Spec. W-C-586.

4.8 Padlocks. Fed. Spec. FF-P-101.

4.9 Paint. As specified.

4.10 Panelboards. Fed. Spec. W-P-115, type and class as indicated. Panelboards installed exposed to the weather shall be raintight except as otherwise indicated.

4.11 Service Entrance Equipment shall be U.L. listed, and approved for use by the Arizona Public Service. Equipment outdoors shall be in NEMA 3R enclosure.

4.12 Tape.

4.12.1 Friction Tape. Fed. Spec. HH-I-510.

4.12.2 Plastic Tape. Fed. Spec. HH-I-595.

4.12.3 Rubber Tape. Fed. Spec. HH-I-553.

4.13 Circuit Breakers.

4.13.1 Low-voltage power circuit breakers. NEMA SG 3.

4.13.2 Molded-case circuit breakers. Fed. Spec. W-C-375.

4.14 Grounding and Bonding. UL 467.

4.15 Concrete shall conform to the applicable requirements of ASTM C 94.

5. LIST OF MATERIALS AND EQUIPMENT. Before starting installation of any materials or equipment the Contractor shall submit to the Contracting Officer for approval a complete list, in accordance with the SPECIAL CLAUSES, 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 by the Contracting Officer. No consideration will be given to partial lists submitted from time to time. 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.

6. SHOP DRAWINGS. After receiving tentative approval of the equipment on the material lists and before installation of any of these items, the Contractor shall submit complete shop drawings and such other descriptive data as the Contracting Officer may require to demonstrate compliance with the contract documents. Shop drawings shall be submitted for the following items and such other items as the Contracting Officer may direct.

a. Meter Pedestal.

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 therefore, shall be submitted with the shop drawings. Approved departures shall be made at no additional cost to the Government.

7. WORKMANSHIP.

7.1 General. All materials and equipment shall be installed in accordance with the recommendations of the manufacturer as approved by the Contracting Officer to conform with the contract documents. The installation shall be accomplished by workmen skilled in this type of work.

8. DUCT SYSTEM.

8.1 General. The duct system shall consist of single round-bore conduit. The number and size of the duct shall be as indicated. Duct lines shall be laid to a minimum grade of 4 inches per 200 feet. Grade may be from one pullbox to the next or both ways from high point between pullboxes, depending on the contour of the finished grade. Duct lines shall be installed so that the top of concrete in encased duct lines is not less than 18 inches below, or duct in non-encased duct lines is not less than 24 inches below finished grade or finished paving at any point. Changes in direction of runs exceeding the total of 10 degrees, either vertical or horizontal, shall be accomplished by long sweep bends having a minimum radius of curvature of 25 feet, except that manufactured bends may be used at the

ends of the run. The long sweep bends may be made up of one or more curved or straight sections and/or combinations thereof. Manufactured bends shall have a minimum radius of 18 inches for use with ducts of less than 3 inches in diameter and a minimum radius of 36 inches for ducts of 3 inches in diameter and larger. Conduits shall terminate in end bells where duct lines enter pullboxes. Conduit shall be thoroughly cleaned before using or laying. During construction and after the duct line is completed, the end of the conduits shall be plugged to prevent water washing mud into the conduits or pullboxes. Particular care shall be taken to keep the conduit clean of concrete, dirt, and any other substance during the course of construction. Where it is necessary to cut a tapered end on a piece of conduit at the site, the cut shall be made with a tool or lathe designed to cut a taper to match the taper to the particular conduit being used. After the duct line has been completed, a standard flexible mandrel not less than 12 inches long, having a diameter approximately 1/4 inches less than the inside diameter of the conduit, shall be pulled through each conduit, after which a brush with stiff bristles shall be pulled through each conduit to make certain that no particles of earth, sand, or gravel, have been left in the line. Pneumatic rodding may be used to draw in the lead wire. Where connection is made to an existing duct that is of different material and shape than the duct line being installed, a suitable coupling of a type recommended by the duct manufacturer shall be used. Conduits shall be stored to avoid warping or deterioration. Conduit joints in concrete encasement may be placed side by side horizontally but shall be staggered at least 6 inches vertically.

8.2 Materials.

8.2.1 Ducts for Secondary Electrical, Feeders and Branch Circuit Conductors shall be rigid steel or plastic conduits without concrete encasement, except conduits shall be concrete encased under all roads, and paved or traffic areas.

8.3 Installation of Ducts.

8.3.1 Conduits. Conduits shall be buried directly in the earth, except as specified hereinbefore. The width of the trench shall be approximately the width of the conduit plus 6 inches, with depth of cover over the top of the conduit not less than 24 inches. The bottom of the trench shall be graded toward pullboxes, and shall be smooth and free of stones, soft spots, and sharp objects. Where bottom of trench comprise materials other than sand or stone-free earth, a 3-inch layer of sand, or stone-free earth shall be laid on the bottom of the trench and compacted to the approximate density of the surrounding firm soil before installing the conduits. The first layer of backfill cover shall be sand or stone-free earth, compacted as specified. Conduits may be held in alinement with a few shovelfuls of dirt. The selected earth at the sides of the conduit shall be thoroughly tamped in 4- to 6-inch layers.

8.4 Installation of Couplings.

8.4.1 General. Joints in all types of conduit shall be made up in accordance with the manufacturer's recommendations for the particular conduit and coupling selected and as approved by the Contracting Officer. In the absence of specific recommendations, the various types of conduit joint couplings shall be made watertight by the following method.

8.4.1.1 Plastic Conduit Joints shall be made up by brushing a plastic solvent cement on the inside of the plastic coupling fitting and on the outside of the conduit ends. The conduit and fitting shall then be slipped together, until seated, with a slight twist to set the joint tightly, and the conduit then rotated one-half turn to distribute the cement evenly. Excess cement built up on the inside surface of the conduit shall then be removed.

8.5 Concrete shall be 2,500 psi at 28 days. Duct lines shall be of monolithic construction. Where a connection is made to an existing duct line, the concrete encasement shall be well bonded or doweled to the existing encasement.

9. SECONDARY JUNCTION BOXES shall be installed where indicated, for the purpose of splicing or connecting secondary cables. Boxes and covers shall be made of cast iron with zinc-coated or aluminized finish, and of the sizes indicated. A suitable gasket shall be installed between the box and cover, for watertightness. A sufficient number of cover screws shall be installed to hold the cover firmly in place along its entire contact surface. Unless otherwise indicated, the approximate inside dimensions of these boxes shall be 12 inches square and 6 inches deep.

10. METER PEDESTALS.

10.1 General. Meter pedestals shall be NEMA 3R raintight and suitable for service equipment. Meter pedestals shall be of the concrete-base-mounted type, consisting of a meter section and panelboard section, assembled as a single integral unit in a substantial weatherproof and tamperproof metal enclosure. The metal enclosure shall have locking provisions and shall be provided with a 2-in padlock. Exterior shall have rust inhibiting primer and two coats of dark green enamel. Interior finish shall be white enamel. Arrangement shall be as shown. Meter installation shall meet APS requirement. Panelboard shall be circuit breaker equipped, Type I. Circuit breaker interrupting capacities shall conform to Fed. Spec. W-C-375 unless otherwise indicated. Single-pole breakers shall be full module size; two poles shall not be installed in a single module. Plug-in type circuit breakers are not acceptable. Directories shall be typed to indicate load served by each circuit and mounted in holder behind protective covering.

10.2 Installation. Meter pedestals shall be mounted on a concrete base, reinforced as indicated. The top of the concrete base shall be approximately 3 inches above the finished grade. The base shall be of adequate size to project beyond the equipment and sloped to drain. Concrete shall be 3000 psi minimum at 28 days. The metal enclosure shall be secured to the concrete base by a minimum of 4-1/2 inch galvanized anchor bolts.

11. GROUNDING.

11.1 General. Grounding shall conform to applicable requirements in the National Electrical Code, the National Electrical Safety Code, and to requirements herein. Neutral conductors, cable shields, metallic cable sheaths, metallic conduits, pothead bodies, junction boxes, and all non-current-carrying metallic parts of equipment, shall be grounded. Ground rods except those installed in pullboxes shall be made of copper, or copper-clad steel, not less than 3/4 inch by 10 feet long, and shall be driven into the earth at least 10 feet unless otherwise indicated.

11.2 Meter Pedestal. Each meter pedestal shall have one ground rod. A bare copper cable not smaller than No. 8 AWG shall be connected to the ground rod. Connection to the ground rod shall be by means of approved fusion-weld process.

12. TESTS.

12.1 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 tests shall be performed in the presence of the Contracting Officer. The Contractor shall furnish the necessary instruments and personnel required for the test.

12.2 Ground Resistance Measurements. Ground resistance shall be measured in accordance with and shall meet the requirements of the National Electric Code.

12.3 The maximum resistance measured in accordance with IEEE No. 142 of a driven ground shall not exceed 25 ohms under normally dry conditions. If this resistance cannot be obtained with a single rod, 2 additional rods not less than 6 feet on centers, or if sectional type rods are used, 4 additional sections may be coupled and driven with the first rod. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately.

12.4 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.

13. GUARANTEE. The following equipment furnished under this section of the specifications shall be guaranteed for a period of one year from the date of acceptance thereof, either for beneficial use or final acceptance, whichever is earlier, against defective materials, design, and workmanship.

Meter Pedestals

Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guarantee period, new replacement parts shall be furnished and installed promptly by the Contractor at no additional cost to the Government.

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