VOL. 1 of 2

SOLICITATION/SPECIFICATIONS

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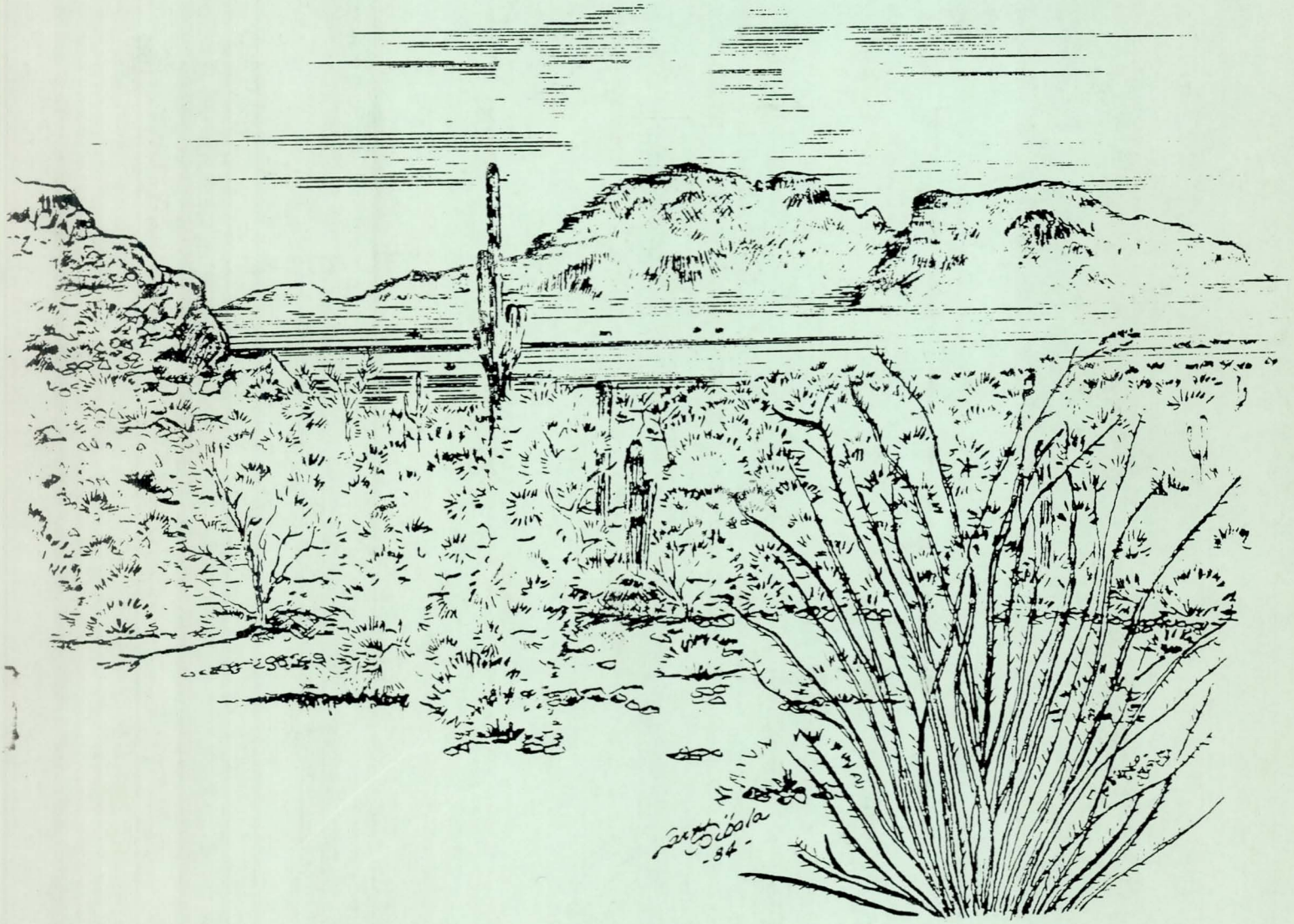
CENTENNIAL REACH OF WESTSIDE CANAL

HARQUAHALA VALLEY IRRIGATION DISTRICT, ARIZONA
CENTRAL ARIZONA PROJECT



04-4-00-1-00/00

UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

A333.501

Prepared by Franzoy • Corey Engineering Company

VOL. 1 of 2

SOLICITATION/SPECIFICATIONS

NO.

DRAFT

CENTENNIAL REACH OF WESTSIDE CANAL

HARQUAHALA VALLEY IRRIGATION DISTRICT, ARIZONA
CENTRAL ARIZONA PROJECT

04-4-00-1-00/00

UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

Prepared by Franzoy • Corey Engineering Company

This solicitation/specifications distributed by

Bureau of Reclamation

Lower Colorado Region

P.O. Box 427

Nevada Highway and Park Street

Boulder City, Nevada

PHONE INQUIRIES

regarding this solicitation/specifications should

be made to the office listed below:

See also paragraph 1 of the Instructions to Bidders

(Standard Form 22)

Contracting Officer,
Boulder City, Nevada 702-293-8459

Franzoy, Corey & Associates 602-838-8626
1030 E. Guadalupe
Tempe, Arizona 85283

#10

CENTENNIAL REACH OF
WESTSIDE CANAL
HARQUAHALA VALLEY IRRIGATION DISTRICT, ARIZONA
CENTRAL ARIZONA PROJECT

FOREWARD

The Centennial Reach of Westside Canal is located approximately 65 miles west of Phoenix, Arizona, in Maricopa County. This project is a feature of the Central Arizona Project and is a portion of the system which will convey water from the Granite Reef Aqueduct to the Harquahala Valley Irrigation District.

Work under these specifications includes earthwork and construction of about 5 miles of concrete lined canal; earthwork and construction of about 5 miles of detention dike and floodway; earthwork and construction of the Centennial Wash siphon, canal wasteway, deer escape ramps, lateral turnout structure, and miscellaneous drainage culverts. Other related construction includes fencing, gravel surfacing, and floodway crossings.

NOTE: Wherever a reference to "Standard Form 19-A" appears in this solicitation/specification, it shall be construed to mean "Labor Standards Provisions".

FOR DATE AND PLACE OF BID OPENING, SEE "INVITATION FOR BIDS", STANDARD FORM 20, IMMEDIATELY FOLLOWING THE "CONTENTS".

FOR INFORMATION REGARDING BUREAU OF RECLAMATION'S HANDBOOK ENTITLED "CONSTRUCTION SAFETY STANDARDS," WHICH IS APPLICABLE TO WORK UNDER THIS CONTRACT, SEE NOTICE IN PART I.

PRICE: $_____

TABLE OF CONTENTS

FOREWORD

PART I--BID SOLICITATION DOCUMENTS

INVITATION FOR BIDS (STANDARD FORM 20)
INSTRUCTION TO BIDDERS (STANDARD FORM 22)
SUPPLEMENT TO INSTRUCTIONS TO BIDDERS
NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)
STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)
NOTICE OF SAFETY AND HEALTH REQUIREMENTS AND OF SAFETY HANDBOOK AVAILABILITY

PART II--BID SUBMITTAL DOCUMENTS

BID FORM (STANDARD FORM 21)
REPRESENTATIONS AND CERTIFICATIONS (STANDARD FORM 19-B)
SUPPLEMENT TO REPRESENTATIONS AND CERTIFICATIONS
BIDDING SCHEDULE
- SCHEDULE (2 SHEETS)
- REPRESENTATIONS BY BIDDER PURSUANT TO "BUY AMERICAN ACT"

BID BOND (STANDARD FORM 24)

PART III--CONTRACT DOCUMENTS

CONSTRUCTION CONTRACT (STANDARD FORM 23)
GENERAL PROVISIONS (STANDARD FORM 23-A)

1. Definitions (Revised by Supplement to General Provisions)
2. Specifications and Drawings
3. Changes
4. Differing Site Conditions (See Supplement to General Provisions for Administration of the Differing Site Conditions Clause)
5. Termination for Default-Damages for Delay-Time Extensions (Addition in Supplement to General Provisions)
6. Disputes (Superceded by Supplement to General Provisions)
7. Payments to Contractor (Revised by Supplement to General Provisions)
8. Assignment of Claims
9. Material and Workmanship
10. Inspection and Acceptance (Addition in Supplement to General Provisions)
11. Superintendence by Contractor (Addition in Supplement to General Provisions)
12. Permits and Responsibilities (Addition in Supplement to General Provisions)

13. Conditions Affecting the Work
14. Other Contracts
15. Shop Drawings (Addition in Supplement to General Provisions)
16. Use and Possession Prior to Completion
17. Suspension of Work
18. Termination for Convenience of the Government
19. Payment of Interest on Contractor' Claims (Deleted by Supplement to General Provisions)
20. Pricing of Adjustments
21. Patent Indemnity (Addition in Supplement to General Provisions)
22. Additional Bond Security
23. Examination of Records by Comptroller General
24. Buy American
25. Equal Opportunity (Superseded by Supplement to General Provisions)
26. Covenant Against Contingent Fees
27. Officials Not to Benefit
28. Convict Labor (Revised by Supplement to General Provisions)
29. Utilization of Small Business Concerns (Superseded by Supplement to General Provisions)
30. Utilization of Minority Business Enterprises (Superseded by Supplement to General Provisions)
31. Federal, State, and Local Taxes
32. Disabled Veterans and Veterans of the Vietnam Era (Added by Supplement to General Provisions)
33. Employment of the Handicapped (Added by Supplement to General Provisions)
34. Clean Air and Water (Added by Supplement to General Provisions)
35. Utilization of Women-Owned Business Concerns (Added by Supplement to General Provisions)
36. Through 40. Reserved. (Reserved by Supplement to General Provisions)

SUPPLEMENT TO GENERAL PROVISIONS (CONSTRUCTION CONTRACT)

PART A--REVISIONS AND ADDITIONS TO STANDARD FORM 23-A (REV. 4-75) CLAUSES

PART B--ADDITIONAL CLAUSES

41. Authorities and Limitations (1981 Sep)
42. Technical Data Approval Procedures (1981 Sep)
43. Compliance With Government Orders (1981 Sep)
44. Use of Construction Facilities (1981 Sep)
45. Warranty of Construction (1981 Sep)
46. Variations in Estimated Quantities (1981 Sep)
47. Adjustment Procedures (1981 Sep)
48. Equipment Ownership and Operation Expense (1981 Sep)
49. Interest (1978 Feb)
50. Environmental Litigation (1981 Sep)
51. Bonds (1981 Sep)

52. Contract Prices-Bidding Schedule (1981 Sep)
53. Preferences for United States-Flag Air Carriers (1976 Nov)
54. Use of United States-Flag Commercial Vessels (1976 Nov)
55. Rates of Wages (1981 Sep)
56. Labor Standards Data (1981 Sep)
57. Rights-of-Way (1981 Sep)
58. Asbestos Free Warranty (1982 Jan.)

SPECIAL PROVISIONS

1. Commencement, Prosecution, and Completion of Work
2. Liquidated Damages
3. Construction Program
4. Performance of Work by Contractor
5. Women-Owned Business Concerns Subcontracting Program
6. Small Business and Small Disadvantaged Business Subcontracting Plan (Advertised)
7. Funds Available for Earnings
8. Progress Payments
9. Posting Securities in Lieu of Retained Percentages
10. Method of Payment
11. Mobilization and Preparatory Work
12. Backcharges to Contractor
13. Price Reduction for Defective Cost or Pricing Data-Price Adjustments
14. Audit
15. Subcontractor Cost or Pricing Data-Price Adjustments
16. Value Engineering Construction
17. Preconstruction Conference
18. Performance of Work for the Convenience of the Contractor.
19. Insurance

LABOR STANDARDS PROVISIONS (40 U.S.C. 276a-7)

1. Davis-Bacon Act
2. Contract Work Hours and Safety Standards Act-Overtime Compensation
3. Apprentices and Trainees
4. Payrolls and Basic Records
5. Compliance With Copeland Act Requirement
6. Withholding
7. Subcontracts
8. Contract Termination-Debarment
9. Disputes Concerning Labor Standards
10. Compliance with Davis Bacon and Related Act Requirement
11. Certification of Eligibility

DEPARTMENT OF LABOR WAGE DETERMINATIONS

SPECIFICATIONS

Page

DIVISION 1--GENERAL REQUIREMENTS

SECTION 1.1 GENERAL 1-1

1.1.1 The Requirement 1-1
1.1.2 Description of the Work 1-1
1.1.3 Staking Out Work 1-1

SECTION 1.2 MATERIALS 1-2

1.2.1 Materials to be Furnished by the Contractor 1-2
1.2.2 Reference Specifications and Standards 1-3
1.2.3 Deleted 1-6
1.2.4 Deleted 1-6
1.2.5 Deleted 1-6

SECTION 1.3 LOCAL CONDITIONS 1-6

1.3.1 Access to the Work and Haul Routes .. 1-6
1.3.2 Use of Land for Construction Purposes 1-7
1.3.3 Use and Maintenance of Roads 1-7
1.3.4 Existing Fences 1-8
1.3.5 Transmission, Telegraph, and Telephone Lines 1-8
1.3.6 Deleted 1-9
1.3.7 Deleted 1-9
1.3.8 Maintaining Public Traffic 1-9
1.3.9 Deleted 1-10
1.3.10 Construction at Existing Watercourses and Utilities 1-10
1.3.11 Geologic Investigations 1-11
1.3.11a Construction and Foundation Materials Test Data 1-15
1.3.12 Electric Power for Construction Purposes 1-15
1.3.13 Water for Construction Purposes 1-16

SECTION 1.4 SAFETY 1-16

1.4.1 Safety of the Public 1-16
1.4.2 Safety and Health 1-16
1.4.3 Deleted 1-18
1.4.4 Deleted 1-18
1.4.5 Submission of Material Safety Standard Data Sheets for Hazardous Materials 1-18

		Page
SECTION 1.5	ENVIRONMENTAL QUALITY PROTECTION	1-19
1.5.1	Landscape Preservation	1-19
1.5.2	Preservation of Trees and Shrubbery	1-20
1.5.3	Protected Plants	1-22
1.5.4	Prevention of Water Pollution	1-22
1.5.5	Abatement of Air Pollution	1-23
1.5.6	Dust Abatement	1-24
1.5.7	Deleted	1-25
1.5.8	Light Abatement	1-25
1.5.9	Preservation of Historical and Archaeological Data	1-25
1.5.10	Pesticides	1-26
1.5.11	Cleanup and Disposal of Waste Materials	1-26
	DIVISION 2--SITEWORK	
SECTION 2.1	CLEARING AND GRUBBING	2-1
2.1.1	Clearing	2-1
2.1.2	Grubbing	2-1
2.1.3	Measurement and Payment	2-1
SECTION 2.2	USE OF WATER	2-2
2.2.1	Water for Dust Abatement	2-2
2.2.2	Prewetting	2-2
SECTION 2.3	SITE DRAINAGE	2-3
2.3.1	Cross Drainage	2-3
SECTION 2.4	FENCING	2-4
2.4.1	Removing and Re-Installing Barbed Wire Fence	2-4
2.4.2	Barbed Wire Fence	2-4
SECTION 2.5	SOIL EROSION CONTROL	2-7
2.5.1	Seeding	2-7
	DIVISION 3--EARTHWORK	
SECTION 3.1	EARTHWORK, GENERAL	3-1
3.1.1	Earthwork, General	3-1
3.1.2	Earthwork Diagrams and Data	3-1
3.1.3	Compacting Earth Materials	3-1

		Page
SECTION 3.2	EXCAVATION	3-5
3.2.1	Classification of Excavation	3-5
3.2.2	Excavation Adjacent to Contract Boundaries	3-5
3.2.3	Excavation for Canal	3-6
3.2.4	Excavation for Structures	3-8
3.2.5	Excavation for Pipe Trenches	3-9
3.2.6	Deleted	3-10
3.2.7	Overhaul	3-11
3.2.8	Disposal of Excavated Materials	3-11
SECTION 3.3	BACKFILL	3-11
3.3.1	Backfill About Structures	3-11
3.3.2	Compacting Backfill About Structures	3-12
3.3.3	Backfill in Pipe Trenches	3-13
3.3.4	Compacting Backfill in Pipe Trenches	3-14
3.3.5	Refill at Top of Concrete Canal Lining	3-15
SECTION 3.4	EMBANKMENT	3-16
3.4.1	Deleted	3-16
3.4.2	Preparation of Surfaces Under Embankments	3-16
3.4.3	Constructing Canal and Detention Dike Embankments	3-17
3.4.4	Compacting Embankments	3-18
	DIVISION 4--PIPE	
SECTION 4.1	PIPE, GENERAL	4-1
4.1.1	Pipe, General	4-1
4.1.2	Pipe Options	4-2
4.1.3	Payment for Pipe	4-2
4.1.4	Maintenance Warranty of Pipe	4-3
4.1.5	Field Testing Pipe Siphons	4-4
SECTION 4.2	REINFORCED CONCRETE PRESSURE PIPE	4-4
4.2.1	Reinforced Concrete Pressure Pipe	4-4
4.2.2	Fittings for Reinforced Concrete Pressure Pipe	4-6
4.2.3	Laying Reinforced Concrete Pressure Pipe	4-9

		Page
SECTION 4.3	EMBEDDED CYLINDER PRESTRESSED CONCRETE PIPE	4-13
4.3.1	Embedded Cylinder Prestressed Concrete Pipe	4-13
4.3.2	Fittings for Embedded Cylinder Prestressed Concrete Pipe	4-14
4.3.3	Laying Embedded Cylinder Prestressed Concrete Pipe	4-15
SECTION 4.4	NONCYLINDER PRESTRESSED CONCRETE PIPE	4-18
4.4.1	Noncylinder Prestressed Concrete Pipe	4-18
4.4.2	Fittings for Noncylinder Prestressed Concrete Pipe	4-33
4.4.3	Laying Noncylinder Prestressed Concrete Pipe	4-35
SECTION 4.5	REINFORCED CONCRETE CULVERT PIPE	4-37
4.5.1	Reinforced Concrete Culvert Pipe	4-37
4.5.2	Fittings for Reinforced Concrete Culvert Pipe	4-38
4.5.3	Laying Reinforced Concrete Culvert Pipe	4-38
SECTION 4.6	CORRUGATED METAL PIPE	4-40
4.6.1	Corrugated Metal Pipe & Pipe-Arch Culverts	4-40
	DIVISION 5--CONCRETE	
SECTION 5.1	CONCRETE STRUCTURES	5-1
5.1.1	Structures to be Constructed	5-1
SECTION 5.2	CONCRETE CANAL LINING	5-3
5.2.1	Trimming Earth Foundations for Concrete Lining	5-3
5.2.2	Concrete in Canal Lining	5-3
5.2.3	Contracting Joints for Unreinforced Concrete Canal Lining	5-4
5.2.4	Safety Ladders for Concrete-Lined Canals	5-6
5.2.5	Payment	5-8

		Page
SECTION 5.3	GENERAL CONCRETE REQUIREMENTS	5-8
5.3.1	Composition	5-8
5.3.1A	Concrete Quality Control Measures and Concrete Quality Assurance Test Program	5-9
5.3.2	Cementitious Materials	5-11
5.3.3	Admixtures	5-17
5.3.4	Water	5-19
5.3.5	Sand	5-20
5.3.6	Coarse Aggregate	5-21
5.3.7	Deleted	5-25
5.3.8	Batching	5-25
5.3.9	Mixing	5-28
5.3.10	Temperature of Concrete	5-30
5.3.11	Forms	5-31
5.3.12	Tolerances for Concrete Construction	5-34
5.3.13	Reinforcing Bars and Fabric	5-41
5.3.14	Deleted	5-43
5.3.15	Preparation for Placing	5-43
5.3.15A	Sponge Rubber Filler for Concrete Joints	5-44
5.3.16	Placing	5-45
5.3.17	Finishes and Finishing	5-48
5.3.18	Protection	5-50
5.3.19	Curing	5-51
5.3.20	Repair of Concrete	5-54
5.3.21	Payment for Concrete in Structures ..	5-54
5.3.22	Payment for Concrete in Canal Lining	5-55
SECTION 5.4	DELETED	5-5%
SECTION 5.5	GROUTING MORTAR FOR EQUIPMENT AND METALWORK	5-55
5.5.1	Grouting Mortar for Equipment and Metalwork	5-55
	DIVISION 6--METALWORK	
SECTION 6.1	METALWORK	6-1
6.1.1	Fabricated and Miscellaneous Metalwork	6-1

Page

DIVISION 7--SPECIAL CONSTRUCTION

SECTION 7.1	SPECIAL STRUCTURE REQUIREMENTS	7-1
7.1.1	Miscellaneous Drainage Culverts	7-1
7.1.2	Temporary Bulkhead	7-1
SECTION 7.2	EROSION CONTROL AND MISCELLANEOUS CONSTRUCTION	7-1
7.2.1	Bank Protection	7-1
7.2.2.	Grouted Rock Riprap	7-2
7.2.3.	Gravel Surfacing	7-4
7.2.4	Floodway Crossings	7-5

DIVISION 8--MECHANICAL

SECTION 8.1	MECHANICAL, GENERAL	8-1
8.1.1	Drawings, Data, and Test Reports, to be Furnished by the Contractor	8-1
8.1.2	Manufacture	8-2
8.1.3	Surface Roughness and Finish	8-3
8.1.4	Steel Slide Gates	8-3

DIVISION 9--PAINTING, LINING, AND COATING

SECTION 9.1	PAINTING, GENERAL	9-1
9.1.1	General	9-1
9.1.2	Painting Tabulation	9-25
9.1.3	Color Schedule for Painting	9-28
SECTION 9.2	CEMENT MORTAR LINING AND CEMENT MORTAR COATING	9-29
9.2.1	Cement Mortar Lining and Cement Mortar Coating	9-29

DIVISION 10--DRAWINGS

SECTION 10.1	DRAWINGS	10-1
10.1.1	Drawings, General	10-1
10.1.2	List of Drawings	10-2

PART I- BID SOLICITATION DOCUMENTS

STANDARD FORM 20
JANUARY 1961 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

REFERENCE
Solicitation/Specifications

INVITATION FOR BIDS
(CONSTRUCTION CONTRACT)

DATE

NAME AND LOCATION OF PROJECT

DEPARTMENT OR AGENCY
U.S. Department of the Interior
Bureau of Reclamation

BY (*Issuing office*) Bureau of Reclamation
Lower Colorado Region
P O Box 427
Nevada Highway and Park Street
Boulder City, Nevada

Address Bids To (if other than issuing office)
Bureau of Reclamation
Construction Engineer
Suite 2200, 201 North Central Avenue
Phoenix AZ 85073

Sealed bids in original only for the work described herein will be received until

at the place specified in the "Address Bids To" block above, or if handcarried, in the bid depository located in Suite 2200, 201 North Central Avenue, Phoenix, Arizona, until 10 a.m. (local time at place of bid opening),

and at that time publicly opened.

Information regarding bidding material, bid guarantee, and bonds

Bonds: Bid guarantee and bonding requirements are set forth in paragraph No. 4 of Instructions to Bidders (Standard Form 22), the reverse of the Bid Form (Standard Form 21), and the clause of the General Provisions entitled "Bonds."

Estimated Price Range of the Work:

Description of work See paragraph 1.1.2 of the specifications.

U.S. GOVERNMENT PRINTING OFFICE : 1974—O-535-325

INSTRUCTIONS TO BIDDERS

(CONSTRUCTION CONTRACT)

1. **Explanations to Bidders.**—Any explanation desired by a bidder regarding the meaning or interpretation of the invitation for bids, drawings, specifications, etc., must be requested in writing and with sufficient time allowed for a reply to reach bidders before the submission of their bids. Any interpretation made will be in the form of an amendment of the invitation for bids, drawings, specifications, etc., and will be furnished to all prospective bidders. Its receipt by the bidder must be acknowledged in the space provided on the Bid Form (Standard Form 21) or by letter or telegram received before the time set for opening of bids. Oral explanations or instructions given before the award of the contract will not be binding.

2. **Conditions Affecting the Work.**—Bidders should visit the site and take such other steps as may be reasonably necessary to ascertain the nature and location of the work, and the general and local conditions which can affect the work or the cost thereof. Failure to do so will not relieve bidders from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Government will assume no responsibility for any understanding or representations concerning conditions made by any of its officers or agents prior to the execution of the contract, unless included in the invitation for bids, the specifications, or related documents.

3. **Bidder's Qualifications.**—Before a bid is considered for award, the bidder may be requested by the Government to submit a statement regarding his previous experience in performing comparable work, his business and technical organization, financial resources, and plant available to be used in performing the work.

4. **Bid Guarantee.**—Where a bid guarantee is required by the invitation for bids, failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

A bid guarantee shall be in the form of a firm commitment, such as a bid bond, postal money order, certified check, cashier's check, irrevocable letter of credit or, in accordance with Treasury Department regulations, certain bonds or notes of the United States. Bid guarantees, other than bid bonds, will be returned (*a*) to unsuccessful bidders as soon as practicable after the opening of bids, and (*b*) to the successful bidder upon execution of such further contractual documents and bonds (including any necessary coinsurance or reinsurance agreements) as may be required by the bid as accepted.

If the successful bidder, upon acceptance of his bid by the Government within the period specified therein for acceptance (sixty days if no period is specified) fails to execute such further contractual documents, if any, and give such bond(s) (including any necessary coinsurance or reinsurance agreements) as may be required by the terms of the bid as accepted within the time specified (ten days if no period is specified) after receipt of the forms by him, his contract may be terminated for default. In such event he shall be liable for any cost of procuring the work which exceeds the amount of his bid, and the bid guarantee shall be available toward offsetting such difference.

5. **Preparation of Bids.**—(*a*) Bids shall be submitted on the forms furnished, or copies thereof, and must be manually signed. If erasures or other changes appear on the forms, each erasure or change must be initialed by the person signing the bid. Unless specifically authorized in the invitation for bids, telegraphic bids will not be considered.

(*b*) The bid form may provide for submission of a price or prices for one or more items, which may be lump sum bids, alternate prices, scheduled items resulting in a bid on a unit of construction or a combination thereof, etc. Where the bid form explicitly requires that the bidder bid on all items, failure to do so will disqualify the bid. When submission of a price on all items is not required, bidders should insert the words "no bid" in the space provided for any item on which no price is submitted.

(*c*) Unless called for, alternate bids will not be considered.

(*d*) Modification of bids already submitted will be considered if received at the office designated in the invitation for bids by the time set for opening of bids. Telegraphic modifications will be considered, but should not reveal the amount of the original or revised bid.

6. **Submission of Bids.**—Bids must be sealed, marked, and addressed as directed in the invitation for bids. Failure to do so may result in a premature opening of, or a failure to open, such bid.

7. **Withdrawal of Bids.**—Bids may be withdrawn by written or telegraphic request received from bidders prior to the time set for opening of bids. (See par. 8 regarding late withdrawals.)

STANDARD FORM 22 (Rev. 2-78)
Prescribed by GSA, FPR (41 CFR) 1-16.401

8. Late Bids, Modifications of Bids, or Withdrawal of Bids.—(*a*) Any bid received at the office designated in the soliciation after the exact time specified for receipt will not be considered unless it is received before award is made and either:

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

(2) It was sent by mail (or 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.

(*b*) Any modification or withdrawal of a bid is subject to the same conditions as in (a), above. A bid may also be withdrawn in person by a bidder or his authorized representative, provided his identify is made known and he signs a receipt for the bid, but only if the withdrawal is made prior to the exact time set for receipt of bids.

(*c*) The only acceptable evidence to establish:

(1) The date of mailing of a late bid, modification, or withdrawal sent either by registered or certified mail is the U.S. Postal Service postmark on both the envelope or wrapper and on the original receipt from the U.S. Postal Service. If neither postmark shows a legible date, the bid, modification, or withdrawal shall be deemed to have been mailed late. (The term "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 on the date of mailing by employees of the U.S. Postal Service. Therefore, offerors should request the postal clerk to place a hand cancellation bull's-eye "postmark" on both the receipt and the envelope or wrapper.)

(2) The time of receipt at the Government installation is the time-date stamp of such installation on the bid wrapper or other documentary evidence of receipt maintained by the installation.

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

NOTE: The term "telegram" includes mailgrams.

9. Public Opening of Bids.—Bids will be publicly opened at the time set for opening in the invitation for bids. Their content will be made public for the information of bidders and others interested, who may be present either in person or by representative.

10. Award of Contract.—(*a*) Award of contract will be made to that responsible bidder whose bid, conforming to the invitation for bids is most advantageous to the Government, price and other factors considered.

(*b*) The Government may, when in its interest, reject any or all bids or waive any informality in bids received.

(*c*) The Government may accept any item or combination of items of a bid, unless precluded by the invitation for bids or the bidder includes in his bid a restrictive limitation.

11. Contract and Bonds.—The bidder whose bid is accepted will, within the time established in the bid, enter into a written contract with the Government and, if required, furnish performance and payment bonds on Government standard forms in the amounts indicated in the invitation for bids or the specifications.

☆ U.S. GOVERNMENT PRINTING OFFICE : 1981 O - 341-526 (6232)

SUPPLEMENT TO INSTRUCTIONS TO BIDDERS
[STANDARD FORM 22 (Rev. 2-78)]
(Construction Contract)

The following paragraphs are added to Standard Form 22:

12. AMENDMENT TO SOLICITATION (1981 SEP)

The right is reserved, as the interest of the Government may require, to amend any or all portions of or cancel this solicitation, at no obligation on the part of the Government. Should postponement of the bid opening be necessary, the new date will be established by the amendment.

13. RECEIPT AND ACKNOWLEDGMENT OF AMENDMENTS (1981 SEP)

Bidders are required to acknowledge receipt of all amendments to this solicitation on the Bid Form (Standard Form 21) in the space provided, or by separate letter or telegram received prior to opening of bids. Failure to acknowledge all amendments may cause the bid to be considered nonresponsive to the solicitation, which would require rejection of the bid. For the purpose of determining the acceptability as to timeliness of an apparently late acknowledgment of amendments by a bidder, the principles set forth in paragraph 8 shall govern.

14. BID SUBMITTAL DOCUMENTS (1981 SEP)

One complete set of all the documents described in the solicitation table of contents under the heading "PART II—BID SUBMITTAL DOCUMENTS" must be submitted with the bid, together with any special submittals otherwise prescribed. To facilitate preparation, one additional set of the documents contained in Part II is included with the solicitation.

15. CAUTION TO BIDDERS—BID ERRORS (1981 SEP)

Bidders are cautioned to exercise extreme care in preparation of their bids. Errors in bids are costly and could result in substantial loss to the bidder as well as delayed award of contracts. Actions that can be taken to avoid errors include:

(a) Make sure that the bid takes into consideration all amendments to the solicitation. If uncertain whether all amendments have been received, call the solicitation issuing office in time to obtain any missing amendments.

(b) Verify all quantities and prices, especially quotations from subcontractors. Make sure no line items have been overlooked in recapitulating. Have the bid reviewed by someone other than those preparing the bid.

(c) Retain all original notes, subcontractor quotations, estimates, and summary and worksheets from which the bid was prepared. If a mistake is made, these papers will be needed to determine the nature and amount of the error and to support an allegation of a mistake in bid.

16. ALLEGATIONS OF MISTAKES IN BIDS (1981 SEP)

(The following provision shall apply to all allegations of mistakes in bids made by bidders pursuant to 41 CFR Sec. 1-2.406.)

Allegations of mistakes in bids often result in delays to the Government in processing and making timely award of contract, thus delaying the ultimate completion of work under the contract. For the purpose of these bidding conditions, sixty (60) calendar days (or such lesser time as the solicitation may establish for acceptance of offers) after the date of opening of bids shall be considered as the Government's normal processing time for making award of a contract. Therefore, if a bidder alleges a mistake or mistakes in its bid, and requests an administrative determination regarding such a mistake or mistakes, the bidder agrees, by submission of its bid, that the time period allowed for completion of the work under the contract, or any part thereof for which a separate completion period is stated, shall be reduced by one (1) calendar day for each calendar day that award is made in excess of the normal processing time for making award of a contract, as established above; however, in no case will such

reduction for delayed award exceed ten (10) percent of the completion period stated for the work, or any part thereof for which a separate completion period is stated.

17. ARITHMETIC DISCREPANCIES (1981 SEP)

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

(1) Obviously misplaced decimal points will be corrected;

(2) Where there is a discrepancy between unit price and extended price, the unit price will govern;

(3) Apparent errors in extension of unit prices will be corrected; and

(4) Apparent errors in addition of lump-sum and extended prices will be corrected.

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

(c) It shall be the responsibility of each bidder to promptly check its own figures and advise the Contracting Officer of any instance where its bid as thus corrected does not represent its intentions. Such allegations will be processed in accordance with the procedures contained in paragraph 16 above.

(d) Arithmetic discrepancies resolved in accordance with subparagraph (a) above will not be subject to the provisions of paragraph 16 above.

18. FALSE STATEMENTS IN BIDS (1981 SEP)

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

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION
TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY

(EXECUTIVE ORDER 11246)

1. The offeror's or bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the contractor's aggregate work force in each trade on all Construction Work in the covered area, are as follows:

Goals and timetables for female utilization

Timetables	Goals (percent)
From April 1, 1978 until March 31, 1979	3.1
From April 1, 1979 until March 31, 1980	5.0
From April 1, 1980 until further notice	6.9

Goals and timetables for minority utilization

Timeable	Trade	Goal (percent)
Until further notice	All	19.6

These goals are applicable to all the contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The contractor's compliance with the Executive Order and the regulations in 41 CFR part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and 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, and 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, the Executive Order, and the regulations in 41 CFR part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of 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 name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this notice, and in the contract resulting from this solicitation, the "covered area" for female utilization is nationwide and for minority utilization is Pinal County, Arizona.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY

CONSTRUCTION CONTRACT SPECIFICATIONS

(EXECUTIVE ORDER 11246)

1. As used in these specifications:

a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the director delegates authority;

c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.

d. "Minority" includes:

(i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

(ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);

(iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

(iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The contractor shall implement the specific affirmative action standards provided in subparagraphs 7.a. through p. of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered Construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the contractor during the training period, and the contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and community organizations when the contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the contractor may have taken.

d. Provide immediate written notification to the director when the union or unions with which the contractor has a collective bargaining agreement has not referred to the contractor a minority person or woman sent by the contractor, or when the contractor has other information that the union referral process has impeded the contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under 7.b. above.

f. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with on-site supervisory personnel such as superintendents, general foremen, etc., prior to the initiation of construction work at any jobsite. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students, and to minority and female recruitment and training organizations serving the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's work force.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that senority practices, job classifications, work assignments, and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the contractor's EEO policies and affirmative action obiigations.

8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7.a. through p.). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7.a. through p. of these specifications: Provided, That the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female work-force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and nonminority. Consequently, the contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally, the contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the director shall proceed in accordance with 41 CFR 60-4.8.

14. The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

NOTICE OF SAFETY AND HEALTH REQUIREMENTS AND OF SAFETY HANDBOOK AVAILABILITY

Bidders are advised that the Department of Labor Safety and Health Regulations for Construction promulgated under section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327 et seq.), and the Bureau of Reclamation's handbook entitled "Construction Safety Standards" will be applicable to the work under any resulting contract. See clause entitled "Safety and Health" in "Special Provisions Applicable to Work at the Installation Site." Copies of this Bureau handbook can be obtained at no charge for the first copy, and a nonrefundable charge of $12.00 (plus $3.00 for foreign mailing) for each additional copy, from: Bureau of Reclamation, Attn D-922, P O Box 25007, Denver CO 80225. Payment should be made by check or money order payable to the Bureau of Reclamation. Bidders should indicate the number of the solicitation/specifications in their request.

PART II- BID SUBMITTAL DOCUMENTS

BID FORM
(Construction Contract)

1. REFERENCE (Project/Solicitation Number) *(Include on correspondence)*

2. *Read the instructions to Bidders (Standard Form 22).*
Submit original and _____ signed copies of this form.

3. DATE OF INVITATION

4. NAME AND LOCATION OF PROJECT

5. BIDDER'S NAME AND ADDRESS *(Include ZIP Code) (Type or print)* †

6. TELEPHONE NO. *(Include Area Code)* †

7. DATE †

8. MAIL BID TO:

In compliance with the above-dated invitation for bids, the undersigned hereby proposes to perform all work [redacted] required thereunder.

in strict accordance with the General Provisions (Standard Form 23-A), Labor Standards Provisions Applicable to Contracts in Excess of $2,000 (Standard Form 19-A), specifications, schedules, drawings, and conditions, [redacted] for the amount(s) set forth in the accompanying Bidding Schedule(s).

†To be filled in by bidder.

Each contractor receiving an award over $10,000 shall identify its principal place of performance and furnish its DUNS number if one has been assigned.

The undersigned agrees that, upon written acceptance of this bid, mailed or otherwise furnished within _____ † calendar days* after the date of opening of bids (unless a different period is inserted by the bidder), bidder will, within 15 calendar days after receipt of the prescribed forms (unless a longer period is allowed), execute Standard Form 23, Construction Contract, and give performance and payment bonds, as required**, on Government standard forms with good and sufficient surety. The undersigned further agrees that, when reinsurance agreements are contemplated, all necessary reinsurance agreements will be on Government forms and will be executed and submitted with the bonds. However, when an additional period of _____ days (not to exceed 45 calendar days) is authorized by the procuring activity, reinsurance agreements may be submitted within such period after the execution of the bond.

The undersigned agrees, if awarded the contract, to commence the work within _____ calendar days after the date of receipt of notice to proceed, and to complete the work within _____ calendar days after the date of receipt of notice to proceed.

*Bids acceptance period. Bids offering less than _____ days for acceptance by the Government from the date set for opening will be considered nonresponsive and will be rejected.

**Performance and payment bonds shall be furnished when (1) the contract award resulting from this bid exceeds $25,000, or (2) bonds are specifically required by the Invitation for Bids (Standard Form 20).

† RECEIPT OF AMENDMENTS. *The undersigned acknowledges receipt of the following amendments of the invitation for bids, drawings, and/or specifications, etc. (Give number and date of each.)*

AMENDMENT NO.						
DATE						
AMENDMENT NO.						
DATE						

The representations and certifications on the accompanying STANDARD FORM 19-B are made a part of this bid.

ENCLOSED IS BID GUARANTEE, CONSISTING OF †	IN THE AMOUNT OF $ †
NAME OF BIDDER *(Type or print)* †	FULL NAME OF ALL PARTNERS *(Type or print)* †
BUSINESS ADDRESS *(Type or print) (Include ZIP Code)* †	
BY *(Signature in ink. Type or print name under signature)* †	
TITLE *(Type or print)* †	

DIRECTIONS FOR SUBMITTING BIDS: *Envelopes containing bids, guarantee, etc., must be sealed, marked, and addressed as follows:*

The envelope submitting your bid must be addressed to the office designated in Block 8 on the face of this Bid Form, and contain the information shown at the right (with blanks completed) on the lower left hand corner thereof:

IFB NO.: _____
DATE FOR OPENING: _____
TIME FOR OPENING: _____

CAUTION—*Bids should not be qualified by exceptions to the bidding conditions.*

STANDARD FORM 21 BACK (REV. 9-81)

†To be filled in by bidder.

GPO 836-383

REPRESENTATIONS AND CERTIFICATIONS

(Construction and Architect-Engineer Contract)

(For use with Standard Forms 19, 21 and 252)

REFERENCE *(Enter same No.(s) as on SF 19, 21 and 252)*

NAME AND ADDRESS OF BIDDER (*No., Street, City, State, and ZIP Code*)

DATE OF BID

In negotiated procurements, "bid" and "bidder" shall be construed to mean "offer" and "offeror."

The bidder makes the following representations and certifications as a part of the bid identified above. *(Check appropriate boxes.)*

1. SMALL BUSINESS

He ☐ is, ☐ is not, a small business concern. (A small business concern for the purpose of Government procurement is a concern, including its affiliates, which is independently owned and operated, is not dominant in the field of operations in which it is bidding on Government contracts, and can further qualify under the criteria concerning number of employees, average annual receipts, or other criteria as prescribed by the Small Business Administration. For additional information see governing regulations of the Small Business Administration (13 CFR Part 121)).

2. MINORITY BUSINESS ENTERPRISE

He ☐ is, ☐ is not a minority business enterprise. A minority business enterprise is defined as a "business, at least 50 percent of which is owned by minority group members or, in case of publicly owned businesses, at least 51 percent of the stock of which is owned by minority group members." For the purpose of this definition, minority group members are Negroes, Spanish-speaking American persons, American-Orientals, American-Indians, American-Eskimos, and American-Aleuts."

3. CONTINGENT FEE

(a) He ☐ has, ☐ has not, employed or retained any company or person (other than a full-time bona fide employee working solely for the bidder) to solicit or secure this contract, and *(b)* he ☐ has, ☐ has not, paid or agreed to pay any company or person (other than a full-time bona fide employee working solely for the bidder) any fee, commission, percentage or brokerage fee, contingent upon or resulting from the award of this contract; and agrees to furnish information relating to *(a)* and *(b)* above as requested by the Contracting Officer. *(For interpretation of the representation, including the term "bona fide employee," see Code of Federal Regulations, Title 41, Subpart 1-1.5.)*

4. TYPE OF ORGANIZATION

He operates as an ☐ individual, ☐ partnership, ☐ joint venture, ☐ corporation, incorporated in State of .....

5. INDEPENDENT PRICE DETERMINATION

(a) By submission of this bid, each bidder certifies, and in the case of a joint bid each party thereto certifies as to his own organization, that in connection with this procurement:

(1) The prices in this bid have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;

(2) Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, in the case of a bid, or prior to award, in the case of a proposal, directly or indirectly to any other bidder or to any competitor; and

(3) No attempt has been made or will be made by the bidder to induce any other person or firm to submit or not to submit a bid for the purpose of restricting competition.

(b) Each person signing this bid certifies that:

(1) He is the person in the bidder's organization responsible within that organization for the decision as to the prices being bid herein and that he has not participated, and will not participate, in any action contrary to (*a*)(1) through (*a*)(3) above; or

(2) (i) He is not the person in the bidder's organization responsible within that organization for the decision as to the prices being bid herein but that he has been authorized in writing to act as agent for the persons responsible for such decision in certifying that such persons have not participated, and will not participate, in any action contrary to (*a*)(1) through (*a*) (3) above, and as their agent does hereby so certify; and (ii) he has not participated, and will not participate, in any action contrary to (*a*)(1) through (*a*)(3) above.

(c) This certification is not applicable to a foreign bidder submitting a bid for a contract which requires performance or delivery outside the United States, its possessions, and Puerto Rico.

(d) A bid will not be considered for award where (*a*)(1), (*a*)(3), or (*b*) above, has been deleted or modified. Where (*a*)(2) above, has been deleted or modified, the bid will not be considered for award unless the bidder furnishes with the bid a signed statement which sets forth in detail the circumstances of the disclosure and the head of the agency, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

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

STANDARD FORM 19-B, JUNE 1976 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401 AND 1-16.701

THE FOLLOWING NEED BE CHECKED ONLY IF BID EXCEEDS $10,000 IN AMOUNT.

6. EQUAL OPPORTUNITY

He ☐ has, ☐ has not, participated in a previous contract or subcontract subject to the Equal Opportunity Clause herein, the clause originally contained in Section 301 of Executive Order No. 10925, or the clause contained in Section 201 of Executive Order No. 11114; he ☐ has, ☐ has not, filed all required compliance reports; and representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained prior to subcontract awards.

(The above representations need not be submitted in connection with contracts or subcontracts which are exempt from the equal opportunity clause.)

7. PARENT COMPANY AND EMPLOYER IDENTIFICATION NUMBER

Each bidder shall furnish the following information by filling in the appropriate blocks:

(a) Is the bidder owned or controlled by a parent company as described below? ☐ Yes ☐ No. *(For the purpose of this bid, a parent company is defined as one which either owns or controls the activities and basic business policies of the bidder. To own another company means the parent company must own at least a majority (more than 50 percent) of the voting rights in that company. To control another company, such ownership is not required; if another company is able to formulate, determine, or veto basic business policy decisions of the bidder, such other company is considered the parent company of the bidder. This control may be exercised through the use of dominant minority voting rights, use of proxy voting, contractual arrangements, or otherwise.)*

(b) If the answer to *(a)* above is "Yes," bidder shall insert in the space below the name and main office address of the parent company.

NAME OF PARENT COMPANY	MAIN OFFICE ADDRESS *(No., Street, City, State, and ZIP Code)*

(c) Bidder shall insert in the applicable space below, if he has no parent company, his own Employer's Identification Number (E.I. No.) *(Federal Social Security Number used on Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941)*, or, if he has a parent company, the E.I. No. of his parent company.

EMPLOYER IDENTIFICATION NUMBER OF ➤	PARENT COMPANY	BIDDER

8. CERTIFICATION OF NONSEGREGATED FACILITIES

(Applicable to (1) contracts, (2) subcontracts, and (3) agreements with applicants who are themselves performing federally assisted construction contracts, exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause.)

By the submission of this bid, the bidder, offeror, applicant, or subcontractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. He certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The bidder, offeror, applicant, or subcontractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" 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 which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or otherwise. He further agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certificatons from proposed subcontractors prior to the award of subcontractors exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause; that he will retain such certifications in his files; and that he will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES

A Certification of Nonsegregated Facilities must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of 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. CLEAN AIR AND WATER

(Applicable if the bid or offer exceeds $100,000, or the contracting officer has determined that orders under an indefinite quantity contract in any year will exceed $100,000, or a facility to be used has been the subject of a conviction under the Clean Air Act (42 U.S.C. 1857c-8(c)(1)) or the Federal Water Pollution Control Act (33 U.S.C. 1319(c)) and is listed by EPA, or is not otherwise exempt.)

The bidder or offeror certifies as follows:

(a) Any facility to be utilized in the performance of this proposed contract has ☐, has not ☐, been listed on the Environmental Protection Agency List of Violating Facilities.

(b) He will promptly notify the contracting officer, prior to award, of the receipt of any communication from the Director, Office of Federal Activities, Environmental Protection Agency, indicating that any facility which he proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities.

(c) He will include substantially this certification, including this paragraph (c), in every nonexempt subcontract.

☆ U.S. GOVERNMENT PRINTING OFFICE : 1975—O-580-456 #18-1

SUPPLEMENT TO REPRESENTATIONS AND CERTIFICATIONS
(Standard Form 19-B, June 1976 Edition)
(Construction Contract)

a. The following is added as item 10 of Standard Form 19-B:

10. REPRESENTATION, AFFIRMATIVE ACTION PROGRAM

The bidder represents that he (check appropriate box):

(a) ☐ has developed and has on file

☐ has not developed and does not have on file

at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor (41 CFR 60-1 and 60-2), or

(b) ☐ has not previously had contracts subject to the written affirmative action program requirement of the rules and regulations of the Secretary of Labor.

b. The following is added as item 11 of Standard Form 19-B:

11. WOMEN-OWNED BUSINESS

The offeror represents that the firm submitting this offer ☐ is, ☐ is not, a women-owned business. A women-owned business is a business that is at least 51 percent owned by a woman or women who also control and operate the business. Control in this context means exercising the power to make policy decisions. Operate in this context means being actively involved in the day-to-day management.

For the purposes of this definition, businesses which are publicly owned, joint stock associations, and business trusts are exempted. Exempted businesses may voluntarily represent that they are or are not women-owned if this information is available. (Approved by the Office of Management and Budget under OMB control number 3090—0075).

c. The following is added as item 12 of Standard Form 19-B:

12. COUNTRY OF MANUFACTURER

The product which the offeror proposes to furnish ☐ is, ☐ is not manufactured, mined, or grown in the United States. If the product is not manufactured, mined, or grown in the United States, the country of manufacturer is _____.

(Approved by the Office of Management and Budget under OMB control number 3090—0061.)

BIDDING SCHEDULE FOR
SOLICITATION/SPECIFICATIONS
NO. _____

CENTENNIAL REACH OF WESTSIDE CANAL
HARQUAHALA VALLEY IRRIGATION DISTRICT, ARIZONA

CENTRAL ARIZONA PROJECT

Bids will be considered for award on the following schedule, but no bid will be considered for award for only a part of the schedule.

All bids are subject to the provisions contained in the enclosed "Instructions to Bidders" and "Supplement to Instructions to Bidders".

The quantities stated in the schedule are estimated quantities for comparison of bids, and except as provided in the clause entitled, "Variations in Estimated Quantities", no claim shall be made against the Government for excess or deficiency therein.

See the clause entitled "Mobilization and Preparatory Work" which applies to schedule item 1.

SCHEDULE

Item	Work or material	Quantity and Unit	Unit price	Amount
1.	Mobilization and Preparatory Work	For the lump sum of	(Not to Exceed $_____)	_____
2.	Clearing and Grubbing	For the lump sum of		_____
3.	Prewetting	For the lump sum of		_____
4.	Excavation for Canal and Floodway	1,019,254 Yds.^{3}	_____	_____
5.	Compacting Embankments	530,322 Yds.^{3}	_____	_____
6.	Construct Centennial Wash Siphon - Sta. 357+17.50 to Sta. 379+47.50	For the lump sum of		_____
7.	Construct Canal Wasteway - Sta. 355+25	For the lump sum of		_____
8.	Construct Deer Escape Ramps			
	a. Sta. 233+00	For the lump sum of		_____
	b. Sta. 355+00	For the lump sum of		_____
9.	Construct Turnout Structure - Sta. 191+08.91 Lt.	For the lump sum of		_____

BIDDING SCHEDULE FOR
SOLICITATION/SPECIFICATIONS
NO. _____

Item	Work or material	Quantity and Unit	Unit price	Amount
10.	Construct Concrete Canal Lining	23,927 Lin. ft.	_____	_____
11.	Furnish and Install Barb Wire Fence	55,000 Lin. ft.	_____	_____
12.	Furnish and Place Gravel Surfacing	3,593 Yds.^{3}	_____	_____
13.	Grouted Rock Riprap	414 Yds.^{2}	_____	_____
14.	Construct Floodway Crossings -			
	a. Sta. 0+00	For the lump sum of		_____
	b. Sta. 57+20	For the lump sum of		_____
	c. Sta. 110+00	For the lump sum of		_____
	d. Sta. 155+30	For the lump sum of		_____
	e. Sta. 194+00	For the lump sum of		_____
		Total for Schedule	$	_____

7-1532 (6-68)
Bureau of Reclamation
(Construction)

NOTE: Unless bidder intends to furnish NONDOMESTIC construction materials it is unnecessary to complete this form, but it should be returned with the bid.

REPRESENTATIONS BY BIDDER PURSUANT TO "BUY AMERICAN ACT"

Bidder represents that all construction materials to be used, other than those specifically exempt from the requirements of the Buy American Act as listed on the back of this form, will be domestic materials conforming to the clause entitled "Buy American," of the General Provisions (Standard Form 23-A) except as noted below:

Name of each item of nondomestic material	Quantity (weight, feet, no., etc.)	Cost delivered to the job site
	Total	$

The contractor will be limited in the use of nondomestic materials to those listed above and those specifically exempt from the requirements of the Buy American Act as listed on the back of this form.

List below the lowest cost of domestic material comparable to each item of nondomestic material shown above, based upon bidder's canvass of domestic suppliers (as required by Paragraph (b)(2) on the back of this form).

Name of each item of domestic material comparable to offered nondomestic material	Quantity (weight, feet, no., etc.)	Cost delivered to the job site
	Total	$

If nondomestic construction materials are listed above, an alternate bid may be submitted offering comparable domestic materials as described in Paragraph (b)(3) on the reverse hereof. However, unless the bidder specifically states alternate bid prices for specific items of the schedule, based upon use of comparable domestic materials, the bid will be evaluated only on the basis of the foreign materials listed above.

(over)

INFORMATION REGARDING BUY AMERICAN ACT

(a) The Buy American Act (41 U.S.C. 10a-10d) generally requires that only domestic construction material be used in the performance of this contract. (See the clause entitled "Buy American" in Standard Form 23-A, General Provisions, Construction contract.) This requirement does not apply to the following construction material or components:

Acetylene black
Asbestos, amosite
Bismuth
Books, pamphlets, newspapers, magazines, periodicals, printed briefs, and films which are not printed in the United States and for which domestic editions are not available
Cadmium, ores and flue dust
Calcium cyanamide
Chrome ore or chromite
Cobalt, in cathodes, rondelles, or other primary forms
Cocoa beans
Cork, wood or bark and waste
Diamonds, industrial, stones
Fair linen, altar
Fibers of the following types: Abace, agave, coir, jute, and palmyra
Goat and kid skins
Graphite, natural
Mica
Nickel, primary, in ingots, pigs, shot, cathodes, or similar forms; nickel oxide and nickel salts
Petroleum, crude oil; unfinished oils and finished products
Platinum and platinum group metals refined, as sponge, powder, ingots, or cast bars
Quartz crystals
Radium salts
Rubber, crude and latex
Sperm oil
Talc, block steatite
Tin in bars, blocks and pigs
Wax, carnauba
Woods of the following species: Angelique, balsa, ekki, greenheart, lignum vitae, mahogany, and teak

(b)(1) Furthermore, bids or proposals offering use of additional nondomestic construction material may be acceptable for award if the Government determines that use of comparable domestic construction material is impracticable or would unreasonably increase the cost or that domestic construction material (in sufficient and reasonably available commercial quantities and of a satisfactory quality) is unavailable. Reliable evidence shall be furnished justifying such use of additional nondomestic construction material.

(2) Where it is alleged that use of domestic construction material would unreasonably increase the cost:

(i) Data shall be included by the bidder, based on a reasonable canvass of suppliers, demonstrating that the cost of each such domestic construction material would exceed by more than 6 percent the cost of comparable nondomestic construction material. (All costs of delivery to the construction site shall be included, as well as any applicable duty.)

(ii) For evaluation purposes, 6 percent of the cost of all additional nondomestic construction material, which qualifies under Paragraph (i) above, will be added to the bid or proposal.

(3) When offering additional nondomestic construction material, bids or proposals may also offer, at stated prices, any available comparable domestic construction material, so as to avoid the possibility that failure of a nondomestic construction material to be acceptable under (1) above, will cause rejection of the entire bid.

☆ U.S. Government Printing Office-1982-576-007-1087

DO O/P (3-72)

STANDARD FORM 24
JUNE 1964 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.801

BID BOND

(See Instructions on reverse)

24-103

DATE BOND EXECUTED *(Must not be later than bid opening date)*

PRINCIPAL *(Legal name and business address)*

TYPE OF ORGANIZATION *("X" one)*

☐ INDIVIDUAL ☐ PARTNERSHIP
☐ JOINT VENTURE ☐ CORPORATION

STATE OF INCORPORATION

SURETY(IES) *(Name and business address)*

PENAL SUM OF BOND					BID IDENTIFICATION	
PERCENT OF BID PRICE	AMOUNT NOT TO EXCEED				BID DATE	INVITATION NO.
	MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENTS		
20%					FOR *(Construction, Supplies or Services)*	

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal and Surety(ies) hereto, are firmly bound to the United States of America (hereinafter called the Government) in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally: *Provided*, That, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the bid identified above.

NOW, THEREFORE, if the Principal, upon acceptance by the Government of his bid identified above, within the period specified therein for acceptance (sixty (60) days if no period is specified), shall execute such further contractual documents, if any, and give such bond(s) as may be required by the terms of the bid as accepted within the time specified (ten (10) days if no period is specified) after receipt of the forms by him, or in the event of failure so to execute such further contractual documents and give such bonds, if the Principal shall pay the Government for any cost of procuring the work which exceeds the amount of his bid, then the above obligation shall be void and of no effect.

Each Surety executing this instrument hereby agrees that its obligation shall not be impaired by any extension(s) of the time for acceptance of the bid that the Principal may grant to the Government, notice of which extension(s) to the Surety(ies) being hereby waived; provided that such waiver of notice shall apply only with respect to extensions aggregating not more than sixty (60) calendar days in addition to the period originally allowed for acceptance of the bid.

IN WITNESS WHEREOF, the Principal and Surety(ies) have executed this bid bond and have affixed their seals on the date set forth above.

PRINCIPAL			
Signature(s)	1. *(Seal)*	2. *(Seal)*	*Corporate Seal*
Name(s) & Title(s) *(Typed)*	1.	2.	

INDIVIDUAL SURETIES		
Signature(s)	1. *(Seal)*	2. *(Seal)*
Name(s) *(Typed)*	1.	2.

CORPORATE SURETY(IES)					
SURETY A	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		

CORPORATE SURETY(IES) (Continued)					
SURETY B	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		
SURETY C	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		
SURETY D	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		
SURETY E	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		
SURETY F	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		
SURETY G	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		

INSTRUCTIONS

1. This form is authorized for use whenever a bid guaranty is required in connection with construction work or the furnishing of supplies or services. There shall be no deviation from this form without approval by the Administrator of General Services.

2. The full legal name and business address of the Principal shall be inserted in the space designated "Principal" on the face of this form. The bond shall be signed by an authorized person. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of his authority must be furnished.

3. The penal sum of the bond may be expressed as a percentage of the bid price if desired. In such cases, a maximum dollar limitation may be stipulated (e.g., 20% of the bid price but the amount not to exceed _____ dollars).

4. (a) Corporations executing the bond as sureties must be among those appearing on the Treasury Department's list of approved sureties and must be acting within the limitations set forth therein. Where more than a single corporate surety is involved, their names and addresses (city and State) shall be inserted in the spaces (Surety A, Surety B, etc) headed "CORPORATE SURETY(IES)", and in the space designated "SURETY(IES)" on the face of this form only the letter identification of the Sureties shall be inserted.

(b) Where individual sureties execute the bond, they shall be two or more responsible persons. A completed Affidavit of Individual Surety (Standard Form 28), for each individual surety, shall accompany the bond. Such sureties may be required to furnish additional substantiating information concerning their assets and financial capability as the Government may require.

5. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Seal"; and, if executed in Maine or New Hampshire, shall also affix an adhesive seal.

6. The name of each person signing this bid bond should be typed in the space provided.

★U.S. Government Printing Office: 1978—261-647/4642

PART III -CONTRACT DOCUMENTS

STANDARD FORM 23
JANUARY 1961 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

CONSTRUCTION CONTRACT

(See instructions on reverse)

CONTRACT NO.

DATE OF CONTRACT

NAME AND ADDRESS OF CONTRACTOR

CHECK APPROPRIATE BOX

- [ ] Individual
- [ ] Partnership
- [ ] Joint Venture
- [ ] Corporation, incorporated in the State of _____.

DEPARTMENT OR AGENCY

CONTRACT FOR *(Work to be performed)*

PLACE

CONTRACT PRICE *(Express in words and figures)*

ADMINISTRATIVE DATA *(Optional)*

The United States of America (hereinafter called the Government), represented by the Contracting Officer executing this contract, and the individual, partnership, joint venture, or corporation named above (hereinafter called the Contractor), mutually agree to perform this contract in strict accordance with the General Provisions (Standard Form 23-A), Labor Standards Provisions Applicable to Contracts in Excess of $2,000 (Standard Form 19-A), and the following designated specifications, schedules, drawings, and conditions:

WORK SHALL BE STARTED

WORK SHALL BE COMPLETED

Alterations. The following alterations were made in this contract before it was signed by the parties hereto:

In witness whereof, the parties hereto have executed this contract as of the date entered on the first page hereof.

THE UNITED STATES OF AMERICA	CONTRACTOR
By _____	_____ (*Name of Contractor*)
_____ (*Official title*)	By _____ (*Signature*)
	_____ (*Title*)

INSTRUCTIONS

1. The full name and business address of the Contractor must be inserted in the space provided on the face of the form. The Contractor shall sign in the space provided above with his usual signature and typewrite or print his name under the signature.

2. An officer of a corporation, a member of a partnership, or an agent signing for the Contractor shall place his signature and title after the word "By" under the name of the Contractor. A contract executed by an attorney or agent on behalf of the Contractor shall be accompanied by two authenticated copies of his power of attorney or other evidence of his authority to act on behalf of the Contractor.

☆U.S. GOVERNMENT PRINTING OFFICE: 1981—341-526:7077

GENERAL PROVISIONS

(Construction Contract)

1. DEFINITIONS

(a) The term "head of the agency" or "Secretary" as used herein means the Secretary, the Under Secretary, any Assistant Secretary, or any other head or assistant head of the executive or military department or other Federal agency; and the term "his duly authorized representative" means any person or persons or board (other than the Contracting Officer) authorized to act for the head of the agency or the Secretary.

(b) The term "Contracting Officer" as used herein means the person executing this contract on behalf of the Government and includes a duly appointed successor or authorized representative.

2. SPECIFICATIONS AND DRAWINGS

The Contractor shall keep on the work a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy either in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at his own risk and expense. The Contracting Officer shall furnish from time to time such detail drawings and other information as he may consider necessary, unless otherwise provided.

3. CHANGES

(a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make any change in the work within the general scope of the contract, including but not limited to changes:

(1) In the specifications (including drawings and designs);

(2) In the method or manner of performance of the work;

(3) In the Government-furnished facilities, equipment, materials, services, or site; or

(4) Directing acceleration in the performance of the work.

(b) Any other written order or an oral order (which terms as used in this paragraph (b) shall include direction, instruction, interpretation, or determination) from the Contracting Officer, which causes any such change, shall be treated as a change order under this clause, provided that the Contractor gives the Contracting Officer written notice stating the date, circumstances, and source of the order and that the Contractor regards the order as a change order.

(c) Except as herein provided, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment hereunder.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any order, an equitable adjustment shall be made and the contract modified in writing accordingly: *Provided, however,* That except for claims based on defective specifications, no claim for any change under (b) above shall be allowed for any costs incurred more than 20 days before the Contractor gives written notice as therein required: *And provided further,* That in the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with such defective specifications.

(e) If the Contractor intends to assert a claim for an equitable adjustment under this clause, he must, within 30 days after receipt of a written change order under (a) above or the furnishing of a written notice under (b) above, submit to the Contracting Officer a written statement setting forth the general nature and monetary extent of such claim, unless this period is extended by the Government. The statement of claim hereunder may be included in the notice under (b) above.

(f) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract.

4. DIFFERING SITE CONDITIONS

(a) The Contractor shall promptly, and before such conditions are disturbed, notify the Contracting Officer in writing of: (1) Subsurface or latent physical conditions at the site differing materially from those indicated in this contract, or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in this contract. The Contracting Officer shall promptly investigate the conditions, and if he finds that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made and the contract modified in writing accordingly.

(b) No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required in (a) above; provided, however, the time prescribed therefor may be extended by the Government.

(c) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract.

5. TERMINATION FOR DEFAULT—DAMAGES FOR DELAY—TIME EXTENSIONS

(a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with such diligence as will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within such time, the Government may, by written notice to the Contractor, terminate his right to proceed with the work or such part of the work as to which there has been delay. In such event the Government may take over the work and prosecute the same to completion, by contract or otherwise, and may take possession of and utilize in completing the work such materials, appliances, and plant as may be on the site of the work and necessary therefor. Whether or not the Contractor's right to proceed with the work is terminated, he and his sureties shall be liable for any damage to the Government resulting from his refusal or failure to complete the work within the specified time.

(b) If fixed and agreed liquidated damages are provided in the contract and if the Government so terminates the Contractor's right to proceed, the resulting damage will consist of such 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.

(c) If fixed and agreed liquidated damages are provided in the contract and if the Government does not so terminate the Contractor's right to proceed, the resulting damage will consist of such liquidated damages until the work is completed or accepted.

(d) The Contractor's right to proceed shall not be so terminated nor the Contractor charged with resulting damage if:

(1) The delay in the completion of the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, acts of the public enemy, acts of the Government in either its sovereign or contractual capacity, acts of another contractor in the performance of a contract with the Government, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, or delays of subcontractors or suppliers arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and such subcontractors or suppliers; and

(2) The Contractor, within 10 days from the beginning of any such delay (unless the Contracting Officer grants a further period of time before the date of final payment

under the contract), notifies the Contracting Officer in writing of the causes of delay.

The Contracting Officer shall ascertain the facts and the extent of the delay and extend the time for completing the work when, in his judgment, the findings of fact justify such an extension, and his findings of fact shall be final and conclusive on the parties, subject only to appeal as provided in Clause 6 of these General Provisions.

(e) If, after notice of termination of the Contractor's right to proceed under the provisions of this clause, it is determined for any reason that the Contractor was not in default under the provisions of this clause, or that the delay was excusable under the provisions of this clause, the rights and obligations of the parties shall, if the contract contains a clause providing for termination for convenience of the Government, be the same as if the notice of termination had been issued pursuant to such clause. If, in the foregoing circumstances, this contract does not contain a clause providing for termination for convenience of the Government, the contract shall be equitably adjusted to compensate for such termination and the contract modified accordingly; failure to agree to any such adjustment shall be a dispute concerning a question of fact within the meaning of the clause of this contract entitled "Disputes."

(f) The rights and remedies of the Government provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

(g) As used in Paragraph (d) (1) of this clause, the term "subcontractors or suppliers" means subcontractors or suppliers at any tier.

6. DISPUTES

(a) Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Contracting Officer shall be final and conclusive unless, within 30 days from the date of receipt of such copy, the Contractor mails or otherwise furnishes to the Contracting Officer a written appeal addressed to the head of the agency involved. The decision of the head of the agency or his duly authorized representative for the determination of such appeals shall be final and conclusive. This provision shall not be pleaded in any suit involving a question of fact arising under this contract as limiting judicial review of any such decision to cases where fraud by such official or his representative or board is alleged: *Provided, however*, That any such decision shall be final and conclusive unless the same is fraudulent or capricious or arbitrary or so grossly erroneous as necessarily to imply bad faith or is not supported by substantial evidence. In connection with any appeal proceeding under this clause, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of his appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision.

(b) This Disputes clause does not preclude consideration of questions of law in connection with decisions provided for in paragraph (a) above. Nothing in this contract, however, shall be construed as making final the decision of any administrative official, representative, or board on a question of law.

7. PAYMENTS TO CONTRACTOR

(a) The Government will pay the contract price as hereinafter provided.

(b) The Government will make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates approved by the Contracting Officer. If requested by the Contracting Officer, the Contractor shall furnish a breakdown of the total contract price showing the amount included therein for each principal category of the work, in such detail as requested, to provide a basis for determining progress payments. In the preparation of estimates the Contracting Officer, at his discretion, may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site may also be taken into consideration (1) if such consideration is specifically authorized by the contract and (2) if the Contractor furnishes satisfactory evidence that he has acquired title to such material and that it will be utilized on the work covered by this contract.

(c) In making such progress payments, there shall be retained 10 percent of the estimated amount until final completion and acceptance of the contract work. However, if the Contracting Officer, at any time after 50 percent of the work has been completed, finds that satisfactory progress is being made, he may authorize payment in full of each progress payment for work performed beyond the 50 percent stage of completion. Also, whenever the work is substantially complete, the Contracting Officer, if he considers the amount retained to be in excess of the amount adequate for the protection of the Government, at his discretion, may release to the Contractor all or a portion of such excess amount. Furthermore, on completion and acceptance of each separate building, public work, or other division of the contract, on which the price is stated separately in the contract, payment may be made therefor without retention of a percentage.

(d) All material and work covered by progress payments made shall thereupon become the sole property of the Government, but this provision shall not be construed as relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work, or as waiving the right of the Government to require the fulfillment of all of the terms of the contract.

(e) Upon completion and acceptance of all work, the amount due the Contractor under this contract shall be paid upon the presentation of a properly executed voucher and after the Contractor shall have furnished the Government with a release of all claims against the Government arising by virtue of this contract, other than claims in stated amounts as may be specifically excepted by the Contractor from the operation of the release. If the Contractor's claim to amounts payable under the contract has been assigned under the Assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15), a release may also be required of the assignee.

8. ASSIGNMENT OF CLAIMS

(a) Pursuant to the provisions of the Assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15), if this contract provides for payments aggregating $1,000 or more, claims for moneys due or to become due the Contractor from the Government under this contract may be assigned to a bank, trust company, or other financing institution, including any Federal lending agency, and may thereafter be further assigned and reassigned to any such institution. Any such assignment or reassignment shall cover all amounts payable under this contract and not already paid, and shall not be made to more than one party, except that any such assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in such financing. Unless otherwise provided in this contract, payments to an assignee of any moneys due or to become due under this contract shall not, to the extent provided in said Act, as amended, be subject to reduction or setoff. (The preceding sentence applies only if this contract is made in time of war or national emergency as defined in said Act; and is with the Department of Defense, the General Services Administration, the Energy Research and Development Administration, the National Aeronautics and Space Administration, the Federal Aviation Administration, or any other department or agency of the United States designated by the President pursuant to Clause 4 of the proviso of section 1 of the Assignment of Claims Act of 1940, as amended by the Act of May 15, 1951, 65 Stat. 41.)

(b) In no event shall copies of this contract or of any plans, specifications, or other similar documents relating to work under this contract, if marked "Top Secret," "Secret," or "Confidential," be furnished to any assignee of any claim arising under this contract or to any other person not entitled to receive the same. However, a copy of any part or all of this contract so marked may be furnished, or any information contained therein may be disclosed, to such assignee upon the prior written authorization of the Contracting Officer.

9. MATERIAL AND WORKMANSHIP

(a) Unless otherwise specifically provided in this contract, all equipment, material, and articles incorporated in the work covered by this contract are to be new and of the most suitable grade for the purpose intended. Unless otherwise specifically provided in this contract, reference to any equipment, material, article, or patented process, by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition, and the Contractor may, at his option, use any equipment, material, article, or process, which, in the judgment of the Contracting Officer, is equal to that named. The Contractor shall furnish to the Contracting Officer for his approval the name of the manufacturer, the model number,

and other identifying data and information respecting the performance, capacity, nature, and rating of the machinery and mechanical and other equipment which the Contractor contemplates incorporating in the work. When required by this contract or when called for by the Contracting Officer, the Contractor shall furnish the Contracting Officer for approval full information concerning the material or articles which he contemplates incorporating in the work. When so directed, samples shall be submitted for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles installed or used without required approval shall be at the risk of subsequent rejection.

(b) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may, in writing, require the Contractor to remove from the work any employee the Contracting Officer deems incompetent, careless or otherwise objectionable.

10. INSPECTION AND ACCEPTANCE

(a) All work (which term includes but is not restricted to materials, workmanship, and manufacture and fabrication of components) shall be subject to inspection and test by the Government at all reasonable times and at all places prior to acceptance. Any such inspection and test is for the sole benefit of the Government and shall not relieve the Contractor of the responsibility of providing quality control measures to assure that the work strictly complies with the contract requirements. No inspection or test by the Government shall be construed as constituting or implying acceptance. Inspection or test shall not relieve the Contractor of responsibility for damage to or loss of the material prior to acceptance, nor in any way affect the continuing rights of the Government after acceptance of the completed work under the terms of paragraph (f) of this clause, except as hereinabove provided.

(b) The Contractor shall, without charge, replace any material or correct any workmanship found by the Government not to conform to the contract requirements, unless in the public interest the Government consents to accept such material or workmanship with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(c) If the Contractor does not promptly replace rejected material or correct rejected workmanship, the Government (1) may, by contract or otherwise, replace such material or correct such workmanship and charge the cost thereof to the Contractor, or (2) may terminate the Contractor's right to proceed in accordance with the clause of this contract entitled "Termination for Default—Damages for Delay—Time Extensions."

(d) The Contractor shall furnish promptly, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspection and test as may be required by the Contracting Officer. All inspection and test by the Government shall be performed in such manner as not unnecessarily to delay the work. Special, full size, and performance tests shall be performed as described in this contract. The Government reserves the right to charge to the Contractor any additional cost of inspection or test when material or workmanship is not ready at the time specified by the Contractor for inspection or test or when reinspection or retest is necessitated by prior rejection.

(e) Should it be considered necessary or advisable by the Government at any time before acceptance of the entire work to make an examination of work already completed, by removing or tearing out same, the Contractor shall, on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming in any material respect, due to the fault of the Contractor or his subcontractors, he shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work if found to meet the requirements of the contract, an equitable adjustment shall be made in the contract price to compensate the Contractor for the additional services involved in such examination and reconstruction and, if completion of the work has been delayed thereby, he shall, in addition, be granted a suitable extension of time.

(f) Unless otherwise provided in this contract, acceptance by the Government shall be made as promptly as practicable after completion and inspection of all work required by this contract, or that portion of the work that the Contracting Officer determines can be accepted separately. Acceptance shall be final and conclusive except as regards latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Government's rights under any warranty or guarantee.

11. SUPERINTENDENCE BY CONTRACTOR

The Contractor, at all times during performance and until the work is completed and accepted, shall give his personal superintendence to the work or have on the work a competent superintendent, satisfactory to the Contracting Officer and with authority to act for the Contractor.

12. PERMITS AND RESPONSIBILITIES

The Contractor shall, without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any applicable Federal, State, and municipal laws, codes, and regulations, in connection with the prosecution of the work. He shall be similarly responsible for all damages to persons or property that occur as a result of his fault or negligence. He shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. He shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire construction work, except for any completed unit of construction thereof which theretofore may have been accepted.

13. CONDITIONS AFFECTING THE WORK

The Contractor shall be responsible for having taken steps reasonably necessary to ascertain the nature and location of the work, and the general and local conditions which can affect the work or the cost thereof. Any failure by the Contractor to do so will not relieve him from responsibility for successfully performing the work without additional expense to the Government. The Government assumes no responsibility for any understanding or representations concerning conditions made by any of its officers or agents prior to the execution of this contract, unless such understanding or representations by the Government are expressly stated in the contract.

14. OTHER CONTRACTS

The Government may undertake or award other contracts for additional work, and the Contractor shall fully cooperate with such other contractors and Government employees and carefully fit his own work to such additional work as may be directed by the Contracting Officer. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other contractor or by Government employees.

15. SHOP DRAWINGS

(a) The term "shop drawings" includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract.

(b) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with contract requirements and shall indicate his approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate his approval or disapproval of the shop drawings and if not approved as submitted shall indicate his reasons therefor. Any work done prior to such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (c) below.

(c) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation(s), he shall issue an appropriate contract modification, except that, if the variation is minor and does not involve a change in price or in time of performance, a modification need not be issued.

16. USE AND POSSESSION PRIOR TO COMPLETION

The Government shall have the right to take possession of or use any completed or partially completed part of the work. Prior to such possession or use, the Contracting Officer shall furnish the Contractor an itemized list of work remaining to be performed or corrected on such portions of the project as are to be possessed or used by the Government, provided that failure to list any item of work shall not relieve the Contractor of responsibility for compliance with the terms of the

contract. Such possession or use shall not be deemed an acceptance of any work under the contract. While the Government has such possession or use, the Contractor, notwithstanding the provisions of the clause of this contract entitled "Permits and Responsibilities," shall be relieved of the responsibility for the loss or damage to the work resulting from the Government's possession or use. If such prior possession or use by the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment in the contract price or the time of completion will be made and the contract shall be modified in writing accordingly.

17. SUSPENSION OF WORK

(a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as he may determine to be appropriate for the convenience of the Government.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Contracting Officer in the administration of this contract, or by his failure to act within the time specified in this contract (or if no time is specified, within a reasonable time), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent (1) that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or (2) for which an equitable adjustment is provided for or excluded under any other provision of this contract.

(c) No claim under this clause shall be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of such suspension, delay, or interruption, but not later than the date of final payment under the contract.

18. TERMINATION FOR CONVENIENCE OF THE GOVERNMENT

If not physically incorporated elsewhere, the clause in Section 1–8.703 of the Federal Procurement Regulations, or paragraph 7–602.29(a) of the Armed Services Procurement Regulation, as applicable, in effect on the date of this contract is hereby incorporated by reference as fully as if set forth at length herein.

19. PAYMENT OF INTEREST ON CONTRACTORS' CLAIMS

(a) If an appeal is filed by the Contractor from a final decision of the Contracting Officer under the Disputes clause of this contract, denying a claim arising under the contract, simple interest on the amount of the claim finally determined owed by the Government shall be payable to the Contractor. Such interest shall be at the rate determined by the Secretary of the Treasury pursuant to Public Law 92–41, 85 Stat. 97, from the date the Contractor furnishes to the Contracting Officer his written appeal under the Disputes clause of this contract, to the date of (1) a final judgment by a court of competent jurisdiction, or (2) mailing to the Contractor of a supplemental agreement for execution either confirming completed negotiations between the parties or carrying out a decision of a board of contract appeals.

(b) Notwithstanding (a) above, (1) interest shall be applied only from the date payment was due, if such date is later than the filing of appeal; and (2) interest shall not be paid for any period of time that the Contracting Officer determines the Contractor has unduly delayed in pursuing his remedies before a board of contract appeals or a court of competent jurisdiction.

20. PRICING OF ADJUSTMENTS

When costs are a factor in any determination of a contract price adjustment pursuant to the Changes clause or any other provision of this contract, such costs shall be in accordance with the contract cost principles and procedures in Part 1–15 of the Federal Procurement Regulations, (41 CFR 1–15) or Section XV of the Armed Services Procurement Regulation, as applicable, which are in effect on the date of this contract.

21. PATENT INDEMNITY

Except as otherwise provided, the Contractor agrees to indemnify the Government and its officers, agents, and employees against liability, including costs and expenses, for infringement upon any Letters Patent of the United States (except Letters Patent issued upon an application which is now or may hereafter be, for reasons of national security, ordered by the Government to be kept secret or otherwise withheld from issue) arising out of the performance of this contract or out of the use or disposal by or for the account of the Government of supplies furnished or construction work performed hereunder.

22. ADDITIONAL BOND SECURITY

If any surety upon any bond furnished in connection with this contract becomes unacceptable to the Government, or if any such surety fails to furnish reports as to his financial condition from time to time as requested by the Government, or if the contract price is increased to such an extent that the penal sum of any bond becomes inadequate in the opinion of the Contracting Officer, the Contractor shall promptly furnish such additional security as may be required from time to time to protect the interests of the Government and of persons supplying labor or materials in the prosecution of the work contemplated by this contract.

23. EXAMINATION OF RECORDS BY COMPTROLLER GENERAL

(a) This clause is applicable if the amount of this contract exceeds $10,000 and was entered into by means of negotiation, including small business restricted advertising, but is not applicable if this contract was entered into by means of formal advertising.

(b) The contractor agrees that the Comptroller General of the United States or any of his duly authorized representatives shall, until the expiration of 3 years after final payment under this contract or such lesser time specified in either Appendix M of the Armed Services Procurement Regulation or the Federal Procurement Regulations Part 1–20, as appropriate, have access to and the right to examine any directly pertinent books, documents, papers, and records of the contractor involving transactions related to this contract.

(c) The Contractor further agrees to include in all his subcontracts hereunder a provision to the effect that the subcontractor agrees that the Comptroller General of the United States or any of his duly authorized representatives shall, until the expiration of 3 years after final payment under the subcontract or such lesser time specified in either Appendix M of the Armed Services Procurement Regulation or the Federal Procurement Regulations Part 1–20, as appropriate, have access to and the right to examine any directly pertinent books, documents, papers, and records of such subcontractor, involving transactions related to the subcontract. The term "subcontract" as used in this clause excludes (1) purchase orders not exceeding $10,000 and (2) subcontracts or purchase orders for public utility services at rates established for uniform applicability to the general public.

(d) The periods of access and examination described in (b) and (c), above, for records which relate to (1) appeals under the "Disputes" clause of this contract, (2) litigation or the settlement of claims arising out of the performance of this contract, or (3) costs and expenses of this contract as to which exception has been taken by the Comptroller General or any of his duly authorized representatives, shall continue until such appeals, litigation, claims, or exceptions have been disposed of.

24. BUY AMERICAN

(a) *Agreement.* In accordance with the Buy American Act (41 U.S.C. 10a–10d), and Executive Order 10582, December 17, 1954 (3 CFR, 1954–58 Comp., p. 230), as amended by Executive Order 11051, September 27, 1962 (3 CFR, 1959–63 Comp., p. 635), the Contractor agrees that only domestic construction material will be used (by the Contractor, subcontractors, materialmen, and suppliers) in the performance of this contract, except for nondomestic material listed in the contract.

(b) *Domestic construction material.* "Construction material" means any article, material, or supply brought to the construction site for incorporation in the building or work. An unmanufactured construction material is a "domestic construction material" if it has been mined or produced in the United States. A manufactured construction material is a "domestic construction material" if it has been manufactured in the United States and if the cost of its components which have been mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. "Component" means any article, material, or supply directly incorporated in a construction material.

(c) *Domestic component.* A component shall be considered to have been "mined, produced, or manufactured in the

United States" (regardless of its source in fact) if the article, material, or supply in which it is incorporated was manufactured in the United States and the component is of a class or kind determined by the Government to be not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality.

25. EQUAL OPPORTUNITY

(The following clause is applicable unless this contract is exempt under the rules, regulations, and relevant orders of the Secretary of Labor (41 CFR, ch. 60).)

During the performance of this contract, the Contractor agrees as follows:

(a) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this Equal Opportunity clause.

(b) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(c) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency Contracting Officer, advising the labor union or workers' representative of the contractor's commitments under this Equal Opportunity clause, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(d) The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(e) The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(f) In the event of the Contractor's noncompliance with the Equal Opportunity clause of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended, in whole or in part, and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(g) The Contractor will include the provisions of paragraphs (a) through (g) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action will respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: *Provided, however*, that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

26. COVENANT AGAINST CONTINGENT FEES

The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this contract without liability or in its discretion to deduct from the contract price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

27. OFFICIALS NOT TO BENEFIT

No member of or delegate to Congress or resident Commissioner shall be admitted to any share or part of this contract, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

28. CONVICT LABOR

In connection with the performance of work under this contract, the Contractor agrees not to employ any person undergoing sentence of imprisonment at hard labor except as provided by Public Law 89–176, September 10, 1965 (18 U.S.C. 4082(c)(2)) and Executive Order 11755, December 29, 1973.

29. UTILIZATION OF SMALL BUSINESS CONCERNS

(a) It is the policy of the Government as declared by the Congress that a fair proportion of the purchases and contracts for supplies and services for the Government be placed with small business concerns.

(b) The Contractor agrees to accomplish the maximum amount of subcontracting to small business concerns that the Contractor finds to be consistent with the efficient performance of this contract.

30. UTILIZATION OF MINORITY BUSINESS ENTERPRISES

(a) It is the policy of the Government that minority business enterprises shall have the maximum practicable opportunity to participate in the performance of Government contracts.

(b) The Contractor agrees to use his best efforts to carry out this policy in the award of his subcontracts to the fullest extent consistent with the efficient performance of this contract. As used in this contract, the term "minority business enterprise" means a business, at least 50 percent of which is owned by minority group members or, in case of publicly-owned businesses, at least 51 percent of the stock of which is owned by minority group members. For the purposes of this definition, minority group members are Negroes, Spanish-speaking American persons, American-Orientals, American-Indians, American-Eskimos, and American-Aleuts. Contractors may rely on written representations by subcontractors regarding their status as minority business enterprises in lieu of an independent investigation.

31. FEDERAL, STATE, AND LOCAL TAXES

(a) Except as may be otherwise provided in this contract, the contract price includes all applicable Federal, State and local taxes and duties.

(b) Nevertheless, with respect to any Federal excise tax or duty on the transactions or property covered by this contract, if a statute, court decision, written ruling, or regulation takes effect after the contract date, and—

(1) Results in the Contractor being required to pay or bear the burden of any such Federal excise tax or duty or increase in the rate thereof which would not otherwise have been payable on such transactions or property, the contract price shall be increased by the amount of such tax or duty or rate increase: *Provided*, That the Contractor if requested by the Contracting Officer, warrants in writing that no amount for such newly imposed Federal excise tax or duty or rate increase was included in the contract price as a contingency reserve or otherwise; or

(2) Results in the Contractor not being required to pay or bear the burden of, or in his obtaining a refund or drawback of, any such Federal excise tax or duty which would otherwise have been payable on such transactions or property or which was the basis of an increase in the contract price, the contract price shall be decreased by the amount of the relief, refund, or drawback, or that amount shall be paid to the Government, as directed by the Contracting Officer. The contract price shall be similarly decreased if the Contractor, through his fault or negligence or his failure to follow instructions of the Contract-

ing Officer, is required to pay or bear the burden of, or does not obtain a refund or drawback of, any such Federal excise tax or duty.

(c) No adjustment pursuant to paragraph b above will be made under this contract unless the aggregate amount thereof is or may reasonably be expected to be over $100.00.

(d) As used in paragraph b above, the term "contract date" means the date set for the bid opening, or if this is a negotiated contract, the date of this contract. As to additional supplies or services procured by modification to this contract, the term "contract date" means the date of such modification.

(e) Unless there does not exist any reasonable basis to sustain an exemption, the Government, upon request of the Contractor, without further liability, agrees, except as otherwise provided in this contract, to furnish evidence appropriate to establish exemption from any tax which the Contractor warrants in writing was excluded from the contract price. In addition, the Contracting Officer may furnish evidence to establish exemption from any tax that may, pursuant to this Clause, give rise to either an increase or decrease in the contract price. Except as otherwise provided in this contract, evidence appropriate to establish exemption from duties will be furnished only at the discretion of the Contracting Officer.

(f) The Contractor shall promptly notify the Contracting Officer of matters which will result in either an increase or decrease in the contract price, and shall take action with respect thereto as directed by the Contracting Officer.

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SUPPLEMENT TO GENERAL PROVISIONS (CONSTRUCTION CONTRACT)

PART A—REVISIONS AND ADDITIONS TO STANDARD FORM 23—A (REV. 4-75) CLAUSES

a. Clause No. 1.—Parargraph 1(b) of clause No. 1 of the General Provisions is deleted in its entirety and the following is substituted therefor:

"(b) The term 'Contracting Officer' means the person executing this contract on behalf of the Government, and any other officer or civilian employee who is a properly designated Contracting Officer; and the term includes, except as otherwise provided in this contract, the authorized representative of a Contracting Officer acting within the limits of his authority."

b. Clause No. 4A.—The following is added as clause No. 4A of the General Provisions:

"4A. ADMINISTRATION OF THE DIFFERING SITE CONDITIONS CLAUSE

"(a) Nature of the clause. The Differing Site Conditions clause provides for an equitable adjustment to the Contractor or the Government which reflects the increases or decreases in a Contractor's cost of and time for performance that result from a differing site condition (as that term is defined in the clause) encountered by the Contractor. However, an equitable adjustment is only available to the Contractor if he gives the Contracting Officer a prompt notice in writing before disturbing the conditions (or secures an extension of the time for giving such notice) and asserts the claim before final payment under the contract.

"(b) Notice of differing site conditions. When a Contractor believes that a differing site condition has been encountered, the clause requires that a prompt written notice be given to the Contracting Officer so that the condition of the site can be investigated, the facts can be ascertained, and a determination can be made regarding the presence or absence of a differing site condition. The prompt notice requirement enables the Government to examine the condition of the site and, if necessary, (1) to modify the contract so that it will reflect the increased or decreased cost of and time for performance or (2) to develop records concerning any increase or decrease in the cost of and time for performance. Cost and time information is essential for an independent Government judgment regarding an equitable adjustment of the contract. A failure to give a timely notice could seriously prejudice the Government's ability to determine the extent to which the Contractor or the Government is entitled to an equitable adjustment. Since the existence of a differing site condition is not always recognizable immediately, the clause provides that the Contracting Officer may extend the time for the submission of the required notice. The purpose of the authority to extend the time for the notice is to ensure that Contractors are not deprived of the remedy provided by the clause because of an inadvertent failure to give the required notice. However, this authority to extend the time for the notice does not entitle a Contractor to a time extension beyond the time when he knew, or reasonably should have known, of the existence of the differing site condition. If the Contractor gives the required notice at the time he knew, or reasonably should have known, of the existence of the differing site condition, he is entitled to an equitable adjustment which reflects the increased costs and time required for performance that result from the differing site condition. If the Contractor fails to submit the required notice to the Contracting Officer by the time he knew, or reasonably should have known, of the existence of a differing site condition, he is not entitled to an equitable adjustment which reflects the increased costs and time required for performance prior to the time when he gave the notice or the time when the Government had actual notice of the existence of a differing site condition.

"(c) Processing of claims.

"(1) Since the time required by the Contractor to ascertain the amount of his claim varies with the circumstances, no specific time for the submission of a claim is specified in the clause or in this section. The clause simply states that no claim will be allowed if asserted after final payment. However, Contractors should not unnecessarily postpone the submission of claims for equitable adjustment.

"(2) To prevent Contractors from unnecessarily postponing the submission of claims, Contracting Officers shall take the following actions.

"(i) When a Contractor gives a prompt written notice of a differing site condition but has not submitted a claim for an equitable adjustment, although there has been a reasonable opportunity to ascertain the amount of the adjustment involved, the Contracting Officer shall send a written request to the Contractor (by registered or certified mail) that he submit within a specified period of time either a written claim or a request for an extension of the time for submission of the claim together with the reasons why the additional time is needed.

"(ii) In the event that the Contractor fails to submit a claim within the time specified in the request, or an approved time extension, the Contracting Officer shall make a unilateral determination of the amount of the equitable adjustable which the Contractor is entitled to and shall notify the Contractor of the determination. Such unilateral determinations may not be appealed under the Disputes clause of the contract."

c. Clause No. 5.—At the end of paragraph 5(d)(2) of clause No. 5 of the General Provisions, the period after the word "delay" is deleted, a colon is substituted therefor, and the following is added:

"Provided, That the Contractor shall be excused for delays of suppliers only if the Contracting Officer shall determine

that the materials or supplies to be furnished are not procurable in the open market."

d. Clause No. 6.—Clause No. 6 of the General Provisions is deleted in its entirety and the following is substituted therefor:

"6. DISPUTES CLAUSE

"(a) This contract is subject to the Contract Disputes Act of 1978 (Pub. L. 95-563).

"(b) Except as provided in the Act, all disputes arising under or relating to this contract shall be resolved in accordance with this clause.

"(c) (i) As used herein, 'claim' means a written demand or assertion by one of the parties seeking, as a legal right, the payment of money, adjustment or interpretation of contract terms, or other relief, arising under or relating to this contract.

"(ii) A voucher, invoice, or request for payment that is not in dispute when submitted is not a claim for the purposes of the Act. However, where such submission is subsequently not acted upon in a reasonable time, or disputed either as the liability or amount, it may be converted to a claim pursuant to the Act.

"(iii) A claim by the Contractor shall be made in writing and submitted to the Contracting Officer for decision. A claim by the Government against the Contractor shall be subject to a decision by the Contracting Officer.

"(d) For Contractor claims of more than $50,000, the Contractor shall submit with the claim a certification that the claim is made in good faith; the supporting data are accurate and complete to the best of the Contractor's knowledge and belief; and the amount requested accurately reflects the contract adjustment for which the Contractor believes the Government is liable. The certification shall be executed by the Contractor if an individual. When the Contractor is not an individual, the certification shall be executed by a senior company official in charge at the Contractor's plant or location involved, or by an officer or general partner of the Contractor having overall responsibility for the conduct of the Contractor's affairs.

"(e) For Contractor claims of $50,000 or less, the Contracting Officer must render a decision within 60 days. For Contractor claims in excess of $50,000, the Contracting Officer must decide the claim within 60 days or notify the Contractor of the date when the decision will be made.

"(f) The Contracting Officer's decision shall be final unless the Contractor appeals or files a suit as provided in the Act.

"(g) The authority of the Contracting Officer under the Act does not extend to claims or disputes which by statute or regulation other agencies are expressly authorized to decide.

"(h) Interest on the amount found due on a Contractor claim shall be paid from the date the claim is received by the Contracting Officer until the date of payment.

"(i) Except as the parties may otherwise agree, pending final resolution of a claim by the Contractor arising under the contract, the Contractor shall proceed dilligently with the performance of the contract in accordance with the Contracting Officer's decision."

e. Clause No. 7.—Paragraph 7(c) of clause No. 7 of the General Provisions is deleted and the following paragraph 7(c) is substituted therefor:

"(c) In making such progress payments, there shall be retained 10 percent of the estimated amount until final completion and acceptance of the contract work. However, if the Contracting Officer finds that satisfactory progress was achieved during any period for which a progress payment is to be made, he may authorize such payment to be made in full without retention of a percentage. Also, whenever the work is substantially complete, the Contracting Officer shall retain an amount he considers adequate for protection of the Government and, at his discretion, may release to the Contractor all or a portion of any excess amount. Furthermore, on completion and acceptance of each separate building, public work, or other division of the contract, on which the price is stated separately in the contract, payment may be made therefor without retention of a percentage."

Paragraph 7(e) of clause No. 7 of the General Provisions is redesignated as paragraph 7(f) and the following is added as paragraph 7(e):

"(e) If Miller Act (40 U.S.C. 270a-270e) performance or payment bonds are required under this contract, the Government shall pay to the Contractor the total premiums paid by the Contractor to obtain the bonds. This payment shall be paid at one time to the Contractor together with the first progress payment otherwise due after the Contractor has (1) furnished the bonds (including coinsurance and reinsurance agreements, when applicable), (2) furnished evidence of full payment to the surety company, and (3) submitted a request for such payment. The payment by the Government of the bond premiums to the Contractor shall not be made as increments of the individual progress payments and shall not be in addition to the contract price."

f. Clause No. 10.—At the end of clause No. 10 of the General Provisions, the following is added:

"(g) The Contractor shall keep on the work a copy of any of its quality control procedures related to the work and the records of any reviews and corrective actions it has made thereunder.

"(h) In addition to any tests specifically prescribed in the Specifications, the Government reserves the right to inspect and test materials, equipment, and workmanship during the life of the contract in accordance with the clause of this contract entitled 'Inspection and Acceptance.' The Contractor shall cooperate with the Contracting Officer in arrangements for such inspections and tests so that they may be

made without endangering personnel or unnecessarily delaying the work."

g. Clause No. 11.—At the end of clause No. 11 of the General Provisions, the following is added:

"Where a superintendent (rather than personal superintendence) is used, the superintendent shall be an employee of the Contractor and on the Contractor's payroll. The superintendent shall give personal supervision to the work, including coordinating, directing, and expediting of all subcontracted work, until completion and acceptance of all work under the contract. All directions given to such superintendent shall be considered as given to the Contractor and shall be binding on the Contractor. Unless otherwise provided in writing by the Contracting Officer, the superintendent shall be authorized by the Contractor to agree to contract modifications of at least $10,000 in individual amount."

h. Clause No. 12.—At the end of clause No. 12 of the General Provisions, the following is added:

"The Contractor shall indemnify and hold the Government harmless for any and all losses, damages, or liability including attorney's fees, on account of personal injury, death, or property damage, or claims for personal injury, death, or property damage of any nature whatsoever and by whomsoever made, arising out of the activities of the Contractor, its employees, subcontractors, or agents under the contract, regardless of whether such claim, loss, damage, actions, cause of actions, expense, and/or liability may be attributable in whole or in part to the fault, failure, or negligence of the Contractor, its employees, subcontractors, or agents under the contract.

"The rights and remedies of the Government provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

"Upon completion of the contract, or final acceptance of any completed unit thereof, the work shall be delivered complete and undamaged."

i. At the end of clause No. 15 of the General Provisions, the following is added:

"(d) The Government may duplicate, use, and disclose, in any manner and for any purpose, shop drawings delivered under this contract."

j. Clause No. 19.—Clause No. 19 of the General Provisions is deleted in its entirety.

k. Clause No. 21.—At the end of Clause No. 21 of the General Provisions, the following is added:

"Any patented invention, the use of which by these Specifications is required or permitted in the alternative to be used and which the United States has the right to use royalty free, shall be available to the Contractor without the payment of the royalty."

l. Clause No. 25.—Clause No. 25 of the General Provisions is deleted in its entirety and the following is substituted therefor:

"25. EQUAL OPPORTUNITY

"(The following clause is applicable unless this contract is exempt under the rules, regulations, and relevant orders of the Secretary of Labor (41 CFR, ch. 60).)

"During the performance of this contract, the Contractor agrees as follows:

"(a) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.

"(b) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without discrimination because of race, color, religion, sex, or national origin.

"(c) The Contractor will send to each labor union or representative of workers, with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Contracting Officer, advising the said labor union of workers' representative of the Contractor's commitments under section 202 of Excecutive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

"(d) The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.

"(e) The Contractor will furnish all information and reports required by said amended Executive Order and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the Contracting Officer and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

"(f) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the such rules, regulations, or orders, this contract may be canceled, terminated, or suspended, in whole or in part, and the Contractor may be declared ineligible for further Government contracts in

accordance with procedures authorized in said amended Executive Order, and such other sanctions may be imposed and remedies invoked as provided in said Executive Order, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

"(g) The Contractor will include the provisions of paragraphs (a) through (g) in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of said amended Executive Order, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

"Note: Equal Employment Opportunity provisions are directed by Executive Order No. 11246 of September 24, 1965 (3 CFR page 167, 1965 Supplement), as amended by Executive Order No. 11375 of October 13, 1967 (3 CFR page 320, 1967 Compilation), and Executive Order No. 12086 of October 5, 1978."

m. Clause No. 28.—In the third line of Clause No. 28 of the General Provisions, the words "at hard labor" are deleted.

n. Clauses No. 29 and 30.—Clauses No. 29 and 30 of the General Provisions are deleted in their entirety and the following clause No. 29 is substituted therefor:

"29. UTILIZATION OF SMALL BUSINESS CONCERNS AND SMALL BUSINESS CONCERNS OWNED AND CONTROLLED BY SOCIALLY AND ECONOMICALLY DISADVANTAGED INDIVIDUALS

"The following clause is applicable if the contract is over $10,000 except (1) contracts for services which are personal in nature and (2) contracts which will be performed entirely (including all subcontracts) outside any State, territory, or possession of the United States, the District of Columbia, or the Commonwealth of Puerto Rico. Subcontracting plans are not required of small business concerns.

"(a) It is the policy of the United States that small business concerns and small business concerns owned and controlled by socially and economically disadvantaged individuals shall have the maximum practicable opportunity to participate in the performance of contracts let by any Federal agency.

"(b) The Contractor hereby agrees to carry out this policy in the awarding of subcontracts to the fullest extent consistent with the efficient performance of this contract. The Contractor further agrees to cooperate in any studies or surveys that may be conducted by the Small Business Administration or the Contracting Agency which may be necessary to determine the extent of the Contractor's compliance with this clause.

"(c) (1) As used in this contract, the term 'small business concern' shall mean a small business as defined pursuant to section 3 of the Small Business Act and in relevant regulations promulgated pursuant thereto.

"(2) The term 'small business concern owned and controlled by socially and economically disadvantaged individuals' shall mean a small business concern—

"(i) which is at least 51 per centum owned by one or more socially and economically disadvantaged individuals; or in the case of any publicly owned business, at least 51 per centum of the stock of which is owned by one or more socially and economically disadvantaged individuals; and

"(ii) whose management and daily business operations are controlled by one or more of such individuals.

"The contractor shall presume that socially and economically disadvantaged individuals include Black Americans, Hispanic Americans, Native Americans, Asian Pacific Americans, and other minorities, or any other individual found to be disadvantaged by the Small Business Administration pursuant to section 8(a) of the Small Business Act.

"(d) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as a small business concern or a small business concern owned and controlled by socially and economically disadvantaged individuals."

o. Clause No. 32.—The following is added as clause No. 32 of the General Provisions:

"32. DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA

"(This clause is applicable pursuant to 41 CFR 60-250.)

"(a) The Contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam Era in regard to any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified disabled veterans and veterans of the Vietnam Era without discrimination based upon their disability or veterans status in all employment practices such as the following: employment upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

"(b) The Contractor agrees that all suitable employment openings of the Contractor which exist at the time of the execution of this contract and those which occur during the performance of this contract, including those not generated by this contract and including those occurring at an establishment of the Contractor other than the one wherein the contract is being performed but excluding those of independently operated corporate affiliates, shall be listed at an appropriate local office of the State employment service system wherein the opening occurs. The Contractor further agrees to provide such reports to such local office regarding employment openings and hires as may be required.

"State and local government agencies holding Federal contracts of $10,000 or more shall also list all their suitable openings with the appropriate office of the State employment service, but are not required to provide those reports set forth in paragraphs (d) and (e).

"(c) Listing of employment openings with the employment service system pursuant to this clause shall be made at least concurrently with the use of any other recruitment source of effort and shall involve the normal obligations which attach to the placing of a bona fide job order, including the acceptance of referrals of veterans and nonveterans. The listing of employment openings does not require the hiring of any particular job applicant or from any particular group of job applicants, and nothing herein is intended to relieve the Contractor from any requirements in Executive Orders or regulations regarding nondiscrimination in employment.

"(d) The reports required by paragraph (b) of this clause shall include, but not be limited to, periodic reports which shall be filed at least quarterly with the appropriate local office or, where the Contractor has more than one hiring location in a State, with the central office of that State employment service. Such reports shall indicate for each hiring location (1) the number of individuals hired during the reporting period, (2) the number of nondisabled veterans of the Vietnam Era hired, (3) the number of disabled veterans of the Vietnam Era hired, and (4) the total number of disabled veterans hired.

The reports should include covered veterans hired for on-the-job training under 38 U.S.C. 1787. The Contractor shall submit a report within 30 days after the end of each reporting period wherein any performance is made on this contract identifying data for each hiring location. The Contractor shall maintain at each hiring location copies of the reports submitted until the expiration of 1 year after final payment under the contract, during which time these reports and related documentation shall be made available, upon request, for examination by any authorized representatives of the Contracting Officer or of the Secretary of Labor. Documentation would include personnel records respecting job openings, recruitment, and placement.

"(e) Whenever the Contractor becomes contractually bound to the listing provisions of this clause, he shall advise the employment service system in each State where he has establishments of the name and location of each hiring location in the State. As long as the Contractor is contractually bound to these provisions and has so advised the State system, there is no need to advise the State system of subsequent contracts. The Contractor may advise the State system when he is no longer bound by this contract clause.

"(f) This clause does not apply to the listing of employment openings which occur and are filled outside of the 50 States, the District of Columbia, Puerto Rico, Guam, and the Virgin Islands.

"(g) The provisions of paragraphs (b), (c), (d), and (e) of this clause do not apply to openings which the Contractor proposes to fill from within his own organization or to fill pursuant to a customary and traditional employer-union hiring arrangement. This exclusion does not apply to a particular opening once an employer decides to consider applicants outside of his own organization or employer-union arrangement for that opening.

"(h) As used in this clause:

"(1) 'All suitable employment openings' includes, but is not limited to, openings which occur in the following job categories: Production and nonproduction; plant and office; laborers and mechanics; supervisory and nonsupervisory; technical; and executive, administrative, and professional openings as are compensated on a salary basis of less than $25,000 per year. This term includes full-time employment, temporary employment of more than 3 days duration, and part-time employment. It does not include openings which the Contractor proposes to fill from within his own organization or to fill pursuant to a customary and traditional employer-union hiring arrangement nor openings in an educational institution which are restricted to students of that institution. Under the most compelling circumstances, an employment opening may not be suitable for listing, including such situations where the needs of the Government cannot reasonably be otherwise supplied, where listing would be contrary to national security, or where the requirement of listing would otherwise not be for the best interest of the Government.

"(2) 'Appropriate office of the State employment service system' means the local office of the Federal-State national system of public employment offices with assigned responsibility for serving the area where the employment opening is to be filled, including the District of Columbia, Guam, Puerto Rico, and the Virgin Islands.

"(3) 'Openings which the Contractor proposes to fill from within his own organization' means employment openings for which no consideration will be given to persons outside the Contractor's organization (including any affiliates, subsidiaries, and the parent companies), and includes any openings which the Contractor proposes to fill from regularly established 'recall' lists.

"(4) 'Openings which the Contractor proposes to fill pursuant to a customary and traditional employer-union hiring arrangement' means employment openings which the Contractor proposes to fill from union halls, which is part of the customary and traditional hiring relationship which exists between the Contractor and representatives of his employees.

"(i) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

"(j) In the event of the Contractor's noncompliance with the requirements of this clause, actions for noncompliance may be taken in accordance with the rules, regulations, and relevant orders of the Secretary of Labor issued Pursuant to the Act.

"(k) The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, provided by or through the Contracting Officer. Such notice shall state the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam Era for employment, and the rights of applicants and employees.

"(l) The Contractor will notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of the Vietnam Era Veterans Readjustment Assistance Act, and is committed to take affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam Era.

"(m) The Contractor will include the provisions of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary issued pursuant to the Act, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Director of the Office of Federal Contract Compliance Programs may direct to enforce such provisions, including action for noncompliance."

p. Clause No. 33.—The following is added as clause No. 33 of the General Provisions:

"33. EMPLOYMENT OF THE HANDICAPPED

"(a) The Contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap in regard to any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices such as the following: employment, upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training including apprenticeship.

"(b) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Rehabilitation Act of 1973, as amended.

"(c) In the event of the Contractor's noncompliance with the requirements of this clause, actions for noncompliance may be taken in accordance with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

"(d) The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, Office of Federal Contract Compliance Programs, Department of Labor, provided by or through the Contracting Officer. Such notices shall state the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified handicapped employees and applicants for employment, and the rights of applicants and employees.

"(e) The Contractor will notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of section 503 of the Act and is committed to take affirmative action to employ and advance in employment physically and mentally handicapped individuals.

"(f) The Contractor will include the provisions of this clause in every subcontract or purchase order of $2,500 or more unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 503 of the Act, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Director, Office of Federal Contract Compliance Programs, may direct to enforce such provisions, including action for noncompliance."

q. Clause No. 34.—The following is added as clause No. 34 of the General Provisions:

"34. CLEAN AIR AND WATER

"(Applicable only if the contract exceeds $100,000 or the Contracting Officer has determined that the orders under an indefinite quantity contract in any one year will exceed $100,000, or a facility to be used has been the subject of a conviction under the Clean Air Act (42 U.S.C. 1857c-8(c)(1)) or the Federal Water Pollution Control Act (33 U.S.C. 1319(c)) and is listed by EPA, or the contract is not otherwise exempt.)

"(a) The Contractor agrees as follows:

"(1) To comply with all the requirements of section 114 of the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Public Law 91-604) and section 308 of the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq., as amended by Public Law 92-500), respectively, relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the award of this contract.

"(2) That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date when this contract was awarded unless and until the EPA eliminates the name of such facility or facilities from such listing.

"(3) To use his best efforts to comply with clean air standards and clean water standards at the facility in which the contract is being performed.

"(4) To insert the substance of the provisions of this clause in any nonexempt subcontract, including this paragraph (a)(4).

"(b) The terms used in this clause have the following meanings:

"(1) The term 'Air Act' means the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Public Law 91-604).

"(2) The term 'Water Act' means Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Public Law 92-500).

"(3) The term 'clean air standards' means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order No. 11738, an applicable implementation plan as described in section 110(d) of the Clean Air Act (42 U.S.C. 1857c-5(d)), an approved implementation procedure or plan under section 111(c) or section 111(d), respectively, of the Air Act (42 U.S.C. 1857c-6(c) or (d)), or an approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 1857c-7(d)).

"(4) The term 'clean water standards' means any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a state under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by a local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

"(5) The term 'compliance' means compliance with clean air or water standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency, or an air or water pollution control agency in accordance with the requirements of the Air Act or Water Act and regulations issued pursuant thereto.

"(6) The term 'facility' means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned, leased, or supervised by a Contractor or subcontractor, to be utilized in the performance of a contract or subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are colocated in one geographical area."

r. Clause No. 35.—The following is added as clause No. 35 of the General Provisions:

"35. UTILIZATION OF WOMEN-OWNED BUSINESS CONCERNS

"The following clause is applicable if the contract is over $10,000 except (i) contracts which, including all subcontracts thereunder, are to be performed entirely outside the United States, its possessions, Puerto Rico and the Trust Territory of the Pacific Islands, and (ii) contracts for services which are personal in nature.

"(a) It is the policy of the United States Government that women-owned businesses shall have the maximum practicable opportunity to participate in the performance of contracts awarded by any Federal agency.

"(b) The Contractor agrees to use his best efforts to carry out this policy in the award of subcontracts to the fullest extent consistent with the efficient performance of this contract. As used in this contract, a 'woman-owned business' concern means a business that is at least 51 percent owned by a woman or women who also control and operate it. 'Control' in this context means exercising the power to make policy decisions. 'Operate' in this context means being actively involved in the day-to-day management. 'Women' means all women business owners."

s. Clause Nos. 36 through 40.—Reserved for future additional SF 23-A clauses required by regulations.

A. The following insertions and revisions are made in Part A of the Supplement to General Provisions:

1. Clause No. 1 - The following is added to the end of Clause No. 1, "Definitions", Part A, Supplement to General Provisions:

"(c) The term "District" means the Harquahala Valley Irrigation District, Arizona, together with its officers, director, agents and employees.

"(d) The term "Engineer" means Franzoy Corey Engineering Company, an Arizona corporation which is an engineering firm with offices in Tempe, Arizona. The Engineer has been retained to be a representative of the District for construction surveillance and contract coordination. The duty of the Engineer is to monitor Contractor compliance with the specifications and to report violations thereof to the Contracting Officer, and to monitor the Contractor's compliance with construction safety standards and all requirements under Section 1.4, Safety, of these specifications and to report violation thereof to the Contracting Officer.

"(e) The term "Construction Engineer" where used in these specifications shall mean "Engineer" as defined above unless otherwise directed.

2. Clause No. 6 - In addition to the required submittal of a claim in paragraph 6(c)(iii) "Disputes" clause, as supplemented in Section d of Part A of the Supplement to General Provisions the following is inserted:

"The Contractor shall at the time of the submittal to the Contracting Officer also provide copies of the claims together with any exhibits, attachments or other supporting material to the District and the Engineer for their information."

3. Clause No. 12 - Clause No. 12 of the Supplement to General Provision, Part A, "h" is to read as follows:

"The Contractor shall indemnify and hold the Government, the District, and the Engineer, harmless for any and all losses, damages, or liability including attorney's fees, on account of personal injury, death, or property damage or claims for personal injury, death, or property damage of any nature whatsoever and by whomsoever made, arising out of the activities of

the Contractor, its employees, subcontractors, or agents under the contract, to the extent that claim, loss, damage, actions, cause of actions, expense, and/or liability may be attributable in whole or in part to the fault, failure, or negligence of the Contractor, its employees, subcontractors, or agents under the contract. Nothing contained in this paragraph, however, shall be deemed to apply to actions for which the District or Engineer is responsible, or to relieve the District or Engineer of its responsibility for such actions.

"The rights and remedies of the Government provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

"Upon completion of the contract, or final acceptance of any completed unit thereof, the work shall be delivered complete and undamaged."

PART B—ADDITIONAL CLAUSES (The following additional clauses are hereby added to the General Provisions.)

41. AUTHORITIES AND LIMITATIONS (1981 SEP)

(a) Authority to modify this contract on behalf of the Government is expressly limited to authorized persons who are properly designated as Contracting Officers in accordance with 41 CFR 14-1.400 through 14-1.404.

(b) Authority of the authorized representative of the Contracting Officer is as may be prescribed in this contract and as set forth in the written designation(s) thereof, signed by the Contracting Officer and copy provided to the Contractor in accordance with 41 CFR 14-1.450.

(c) Except as otherwise provided in this contract, the Contractor assumes all risks and consequences of performing this contract in accordance with any written or oral order (including but not limited to direction, instruction, interpretation, or determination) of a person not authorized to issue such an order.

42. TECHNICAL DATA APPROVAL PROCEDURES (1981 SEP)

(a) If individuals other than the Contracting Officer are authorized to approve technical data (e.g., shop drawings, color chips for paint, water control plans, steel building data, or other data of a technical nature), such authorizations will be set forth in the contract or otherwise provided in writing to the Contractor by the Contracting Officer.

(b) No approval of technical data shall form the basis for an increase in price or in time of performance, and the Contractor hereby waives all such claims regarding approved technical data, except to the extent that the approval (i) was signed by the Contracting Officer (as contrasted with a designated representative thereof) and (ii) expressly accepted or provided for future negotiation of such increases.

43. COMPLIANCE WITH GOVERNMENT ORDERS (1981 SEP)

(a) Except as provided in (b) below, the Contractor shall, without unnecessary delay, comply with any written or oral order (which terms as used in this clause include any direction, instruction, interpretation, or determination, including those related to drawings, samples, and literature) of the Contracting Officer or his or her authorized representative.

(b) If the Contractor considers that the order was issued without proper authority, it shall immediately, in writing, request written confirmation from the Contracting Officer, and any performance pending receipt of such confirmation, if any, shall be subject to the provisions of paragraph (c) of the clause of this contract entitled "Authorities and Limitations."

(c) If the Contractor intends to assert a claim for an equitable adjustment for an order that it regards as a change order pursuant to paragraph (b) of the clause of this contract entitled "Changes," the written notice prescribed therein must be submitted immediately, and in no event more than 20 days of the date of receipt of such order.

44. USE OF CONSTRUCTION FACILITIES (1981 SEP)

Work at, or in the vicinity of, the worksite may be performed by the Government or by other Contractors engaged in work for the Government during the contract period. The Contractor shall, without charge, permit the Government and such other Contractors to use the roads, bridges, lighting installation, and any other facilities constructed or acquired by the Contractor for use in the performance of the work under these Specifications as are available without entailing any material increase in cost to the Contractor for maintenance or operation of such facilities.

45. WARRANTY OF CONSTRUCTION (1981 SEP)

(a) In addition to any other warranties set out elsewhere in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect of equipment, material or design furnished, or workmanship performed by the Contractor or any of his subcontractors or suppliers at any tier. Such warranty shall continue for a period of one year from the date of final acceptance of the work, but with respect to any part of the work which the Government takes possession of prior to final acceptance, such warranty shall continue for a period of one year from the date the Government takes possession. Under this warranty, the Contractor shall remedy at its own expense any such failure to conform or any such defect. In addition, the Contractor shall remedy at its own expense any damage to Government owned or controlled real or personal property, when that damage is the result of the Contractor's failure to conform to contract requirements or any such defect of equipment, material, workmanship, or design. The Contractor shall also restore any work damaged in fulfilling the terms of this clause. The Contractor's warranty with respect to work repaired or replaced hereunder will run for one year from the date of such repair or replacement.

(b) The Government shall notify the Contractor in writing within a reasonable time after the discovery of any failure, defect, or damage.

(c) Should the Contractor fail to remedy any failure, defect, or damage described in (a) above within a reasonable time after receipt of notice thereof, the Government shall have the right to replace, repair, or otherwise remedy such failure, defect, or damage at the Contractor's expense.

(d) In addition to the other rights and remedies provided by this clause, all subcontractors', manufacturers', and suppliers' warranties expressed or implied, respecting any work and materials shall, at the direction of the Government, be enforced by the Contractor for the benefit of the Government. In such case if the Contractor's warranty under (a) above has expired, any suit directed by the Government to enforce a subcontractor's, manufacturer's, or supplier's warranty shall be at the expense of the Government. The Contractor shall obtain any warranties which the subcontractors, manufacturers, or suppliers would give in normal commercial practice.

(e) If directed by the Contracting Officer, the Contractor shall require any such warranties to be executed in writing to the Government.

(f) Notwithstanding any other provision of this clause, unless such a defect is caused by the negligence of the Contractor or its subcontractors or suppliers at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage which results from any such defect in Government-furnished material or design.

(g) The warranty specified herein shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistake, or fraud.

(h) Defects in design or manufacture of equipment specified by the Government on a "brand name and model" basis shall not be included in this warranty. The Contractor shall require any subcontractors, manufacturers, or suppliers thereof to execute their warranties in writing through the Contractor to the Government.

46. VARIATIONS IN ESTIMATED QUANTITIES (1981 SEP)

(Applicable only to items in the Bidding Schedule which are not subdivided and have an estimated dollar amount which exceeds $10,000.)

Where the quantity of a pay item in this contract is an estimated quantity and where the actual quantity of such pay item varies more than thirty percent (30%) above or below the estimated quantity stated in this contract, an equitable adjustment in the contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above one hundred and thirty percent (130%) or below seventy percent (70%) of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Contracting Officer shall, upon receipt of a written request for an extension of time within ten (10) days from the beginning of such delay, or within such further period of time which may be granted by the Contracting Officer 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.

47. ADJUSTMENT PROCEDURES (1981 SEP)

(a) The provisions of the clause of this contract entitled "Changes" of the General Provisions are supplemented as set forth in this clause.

(b) Upon written request from the Government, the Contractor shall submit a written proposal, in accordance with the requirements and limitations set forth in this clause, for an adjustment for contemplated changes covered by the request.

(c) The proposal shall be submitted within the time limit indicated in the request, or any extension of time of such time limit as may subsequently be granted.

(d) The proposal shall be submitted in appropriate pricing format (e.g., lump sum, unit pricing, or a combination thereof), together with a price breakdown, itemized as required by the Contracting Officer. Unless otherwise directed, the breakdown shall be in sufficient detail to permit an analysis of all material, labor, equipment, subcontract, and overhead costs, as well as profit, and shall cover all work involved in the modification, whether such work is to be deleted, added, or changed. Any amount claimed for subcontracts shall be supported by a similar price breakdown, together with the Contractor's evaluation of its price reasonableness.

(e) Allowance for indirect cost (overhead) will be made where appropriate (see 41 CFR Sec. 1-3.807-11). There shall be no duplication or direct cost elements in any allowance for indirect cost. The maximum percentage limitations on indirect cost set forth in paragraph (g) below shall be considered to include, but are not limited to, jobsite staff and office expense, incidental job burdens, small tools, and general office overhead allocation.

(f) Allowance for profit on added work will be made where appropriate, and will be established in accordance with the applicable provisions of Bureau of Reclamation Procurement Regulations 14S-3.808-7 (copy available from the Contracting Officer or his or her authorized representative).

(g) Where adjustments are allowed for performance wholly or substantially by subcontractors or suppliers, such adjustments may include an allowance for the prime Contractor's indirect cost and profit. However, the total of such allowances for the prime Contractor's indirect cost and profit shall not exceed 10 percent of the adjustment allowed for the subcontractor or supplier, or the allowance for the prime Contractor's profit, whichever is the greater. Where more than one tier of subcontractors or suppliers are involved in the performance, the total allowance for indirect cost and profit allowed for each tier shall not exceed 10 percent of the adjustment allowed for the subcontractor or supplier who wholly or substantially performs the work, or the allowance for such tier's profit, whichever is the greater.

(h) Allowability of costs shall be determined in accordance with the clause of this contract entitled "Pricing of Adjustments," except that costs of equipment ownership and operation shall be determined in accordance with the clause of this contract entitled "Equipment Ownership and Operation Expense".

(i) The Contractor shall include with its proposal, sufficient information and dates to demonstrate whether and to what extent the change will affect the time of performance under the contract, and shall request any appropriate time adjustment.

(j) Insofar as possible, adjustments will be agreed to and the contract modified accordingly in advance of performance of the work. However, when the necessity to proceed with a change does not allow time to reach such agreement, the parties may agree that the Contractor will proceed, or the Contracting Officer may order the Contractor to proceed, on the basis that the adjustment will be established at the earliest possible date.

(k) If an adjustment cannot be agreed to in a timely manner after issuance of an agreement or order to proceed, the Contracting Officer may establish the adjustment unilaterally by issuing a final decision in accordance with the clause of this contract entitled "Disputes."

(l) Unless and until the parties agree on a full and complete adjustment and the contract is modified accordingly, the Contractor and its subcontractors shall maintain sufficient records and data to establish the cost of the work in accordance with the requirements of 41 CFR part 1-15. For each change which exceeds $100,000, the Contractor shall maintain a separate account by job order or other suitable accounting procedure of all incurred segregable direct costs (less allocable credits) of work both changed and unchanged allocable to the change. The accounts shall be controlled by the general books of account.

(m) For the purpose of determining the amount allowable for contract adjustments pursuant to 41 CFR Sec. 1-3.809, the Contracting Officer, through his or her authorized agents, shall have access to all payrolls, records of personnel, invoices of materials, records of plant and equipment, and any and all other data relevant to the performance of the contract or necessary to determine its costs. Where it is determined to be necessary for computation of the proper amount of an adjustment, the Contractor shall furnish any pertinent part of its original bid computations and supporting documents thereto.

(n) Whenever the Contractor proposes an adjustment under the contract, such proposal shall include all types of adjustments in the total amounts to which the clause entitles the Contractor, including but not limited to adjustments arising out of delays or disruptions or both, caused by such change. Except as the parties may otherwise expressly agree, the Contractor shall be deemed to have waived (i) any adjustments to which it otherwise might be entitled under the clause where such proposal fails to request such adjustments, and (ii) any increase in the amount of adjustments additional to those requested in its proposal. The Contractor agrees that, if required by the Contracting Officer, it will execute a release, in form and substance satisfactory to the Contracting Officer, as part of the supplemental agreement setting forth the aforesaid adjustment, and that such release shall discharge the Government, its officers, agents, and employees, from any further claims, including but not limited to further claims arising out of delays or disruptions or both, caused by the aforesaid change.

(o) The Contractor agrees that requests for proposals issued by the Government under the clauses of this contract entitled "Differing Site Conditions" and "Suspension of Work" and Contractor responses thereto shall be subject to all of the requirements and limitations set forth in this "Adjustment Procedures" clause. The Contractor further agrees that all other claims for adjustment under the contract, except for termination settlements, shall be submitted in accordance with, and subject to all of the requirements and limitations set forth in, this "Adjustment Procedures" clause.

48. EQUIPMENT OWNERSHIP AND OPERATION EXPENSE (1981 SEP)

(a) General.—Adjustments allowed under clause No. 3 or 4 of the General Provisions of this contract may include allowances for ownership of equipment owned by the Contractor or any subcontractor and available at the site of the work. The Contractor should anticipate that allowances for equipment ownership will be based on the Contractor's actual cost records complying with 41 CFR part 1-15. For contract modifications under $100,000, equipment ownership expense will be computed as provided in this clause, unless an otherwise acceptable method is proposed by the Contractor and agreed to by the Contracting Officer.

It is to be understood that allowances for equipment ownership and operating expense as herein provided are for equipment in good operating condition only. The Contractor shall furnish a complete description of each item of equipment which is involved in any request for adjustment, listing the date of manufacture, date of acquisition, make, model, size, capacity, mounting, type of power, and any and all accessory equipment which is attached thereto for use under the particular work to be performed. The Contractor shall furnish acceptable evidence of his acquisition cost of new or used equipment. Acquisition cost is defined as the Contractor's original purchase price, including sales tax. The acquisition cost of the unit of equipment shall include all accessories and expendable components required for a specific equipment utilization. As an example, the acquisition cost would include: (1) the ripper attachments purchased with a crawler tractor, and (2) the original tires on a wheeled vehicle. If used equipment is reconditioned and recapitalized, its acquisition cost shall be adjusted to the recapitalized value shown in the Contractor's accounting records. If acceptable evidence to determine acquisition cost is not supplied, the Contracting Officer may determine the same by any means he may deem appropriate, such as use of national publications which list current average equipment values.

(b) Equipment ownership allowances.—Allowances for equipment ownership will be determined as follows:

(1) Depreciation.—Allowances for depreciation will be made in accordance with the tables in the "Contractors' Equipment Manual" in effect on the date of the contract, as published by the Associated General Contractors of America, without regard to the provisions and examples included in the text of the manual. The expense per working hour for depreciation will be determined by multiplying the acquisition cost of new or used equipment by the percentage given in the column "Depreciation" and dividing by the number listed in the column "Average Use Hours Per Year." In accordance with the last sentence in the first paragraph of subparagraph (a) above, consideration will be given to shorter periods of depreciation writeoff then provided in the AGC Manual if the Contractor supplies sufficient data to establish his entitlement thereto, pursuant to 41 CFR Sec. 1-15.205-9.

(2) Taxes, insurance, and incidentals.—The expense per working hour for taxes, insurance, and incidentals will be determined by multiplying the acquisition cost by 3 percent and dividing by the average number of hours use per year determined as in (1) above. The amount allowed hereunder shall not be duplicated in any general allowance for overhead.

(3) Interest on investment and replacement cost escalation.—No allowance is made under this clause for interest on investment (see 41 CFR Sec. 1-15.205-17) or for replacement cost escalation.

The sum allowances for depreciation, taxes, insurance, and incidentals computed in accordance with the above criteria shall constitute the hourly cost of ownership of equipment. Rates allowed for equipment ownership expense for the use of items of equipment not listed in the AGC tables will be established by agreement or by the Contracting Officer conformably with items which are listed in the AGC tables.

(c) Idle time.—Ownership expense allowance for idle time of equipment allowed under clauses No. 3 and 4 will be made on the basis of 50 percent of the hourly rate. A maximum of 40 hours per week will be allowed. No allowance will be made for Saturdays, Sundays, or holidays, when work is not actually performed. This 50 percent factor shall be applied to ownership rates allowed for working time. Periods of time less than 2 hours on which equipment is down for normal and regular servicing and for minor field repair or field maintenance shall be considered as operating rather than idle time and such periods will not be deducted from use or operating time. No allowance will be made as idle time for equipment which is not in good operating condition. This clause shall not apply to adjustments under clause No. 17.

(d) Small tools.—Small tools shall mean all items having a replacement value of less than $400. For modifications in excess of $100,000, small tool allowances shall be based on information furnished by the Contractor. For contract modifications amounting to $100,000 or less, at the option of the Contracting Officer, an allowance for small tools not to exceed 5 percent of direct labor may be made where appropriate.

(e) Equipment ownership expense under clause No. 17.—Allowances for equipment ownership under clause No. 17 shall be made on the basis of depreciation only, based on acceptable evidence thereof furnished by the Contractor.

(f) Equipment operating expense.—Allowances for the cost of operating equipment such as operating crew labor, servicing labor and equipment, labor and parts for all repairs, fuel, oil, grease, and supplies will be made in addition to the amounts allowed for equipment ownership expense. Equipment operating expense allowances shall be based on the Contractor's cost records or other sources complying with 41 CFR parts 1-3.8 and 1-15 as approved by the Contracting Officer. For forward-priced adjustments, operating expense figures developed for use by the Contractor in estimating or bidding generally from historical accounting records or actual cost experience under this contract will be accepted if evidence thereof, satisfactory to the Contracting Officer, is furnished.

49. INTEREST (1978 FEB)

Notwithstanding any other provision of this contract, unless paid within 30 days, all amounts that become payable by the Contractor to the Government under this contract (not of any applicable tax credit under the Internal Revenue Code) shall bear interest at the rate determined by the Secretary of the Treasury pursuant to Public Law 92-41, 85 Stat. 97. Amounts shall be due upon the earliest of (a) the date fixed pursuant to this contract; (b) the date of the first written demand for payment, consistent with this contract, including demand consequent upon default termination; (c) the date of transmittal by the Government to the Contractor of a proposed supplemental agreement to confirm completed negotiations fixing the amount; or (d) if this contract provides for revision of prices, the date of written notice to the Contractor stating the amount of refund payable in connection with a pricing proposal or in connection with a negotiated pricing agreement not confirmed by contract supplement.

50. ENVIRONMENTAL LITIGATION (1981 SEP)

(a) If the performance of all or any 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 "Suspension of Work" clause of this contract. 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.

(b) 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.

51. BONDS (1981 SEP)

(a) Bid guarantee.—For bids which exceed $25,000, the bidder shall furnish guarantee with each bid in an amount not less than 20 percent of the amount of the bid: Provided, however, That guarantee in excess of $3,000,000 will not be required. (See Standard Form 22, Instructions to Bidders.)

(b) Performance and payment bonds.—For contracts which exceed $25,000, the Contractor shall furnish to the Government bonds as follows:

(1) Performance bond.—Performance bond with a surety or sureties approved by the Contracting Officer, and with a penal amount equal to 100 percent of the contract price at the time of award.

(2) Payment bond.—Payment bond with a surety or sureties approved by the Contracting Officer, for the protection of all persons supplying labor and material in the prosecution of the work provided for in the contract, for the use of each such person. Whenever the contract price at the time of award is not more than $1,000,000, the payment bond shall be in the sum of one-half of the contract price at the time of award. Whenever the total amount of the contract price at the time of award is more than $1,000,000 and not more than $5,000,000, the payment bond shall be in the sum of 40 percent of the contract price at the time of award. Whenever the contract price at the time of award is more than $5,000,000, the payment bond shall be in the sum of $2,500,000.

(3) Costs.—All costs of furnishing performance and payment bonds shall be included in the lump-sum price bid in the schedule for mobilization and preparatory work.

(c) Requirements for execution of surety bonds.— Each surety company bond (bid, performance, payment), which purports to have been executed by an agent or attorney-in-fact for the corporate surety, is required to have submitted with it a power of attorney to the signatory agent or attorney-in-fact, and executed by the corporate surety upon a date reasonably proximate to the date of the bond, or the power of attorney shall be accompanied by a certification of the surety to the effect that the power of attorney was in full force and effect upon a date reasonably proximate to the date of the bond.

(d) Failure to satisfactorily execute performance and payment bonds.—If the Contractor fails to satisfactorily execute the required performance and payment bonds within the time established in the solicitation, the Contracting Officer may by written notice to the Contractor, terminate for default the contract at no cost to the Government and the Government may have the required work performed by contract or otherwise, in which event the Contractor shall be liable for any excess cost to the Government and any bid bond or other guarantee provided by the Contractor shall be available toward offsetting such excess cost.

52. CONTRACT PRICES—BIDDING SCHEDULE (1981 SEP)

Payment for the various items (including any subdivided items) listed in the Bidding Schedule shall constitute full compensation to the Contractor for providing all plant, equipment, machinery, materials, supplies, tools, transportation, labor, and all other property, services, and expenditures for performing all operations required to complete the work in conformity with the drawings and Specifications, unless otherwise specifically provided in this contract.

53. PREFERENCE FOR UNITED STATES-FLAG AIR CARRIERS (1976 NOV)

(a) Public Law 93-623 requires that all Federal agencies and Government Contractors and subcontractors will use United States-flag air carriers for international air transportation of personnel (and their personal effects) or property to the extent service by such carriers is available. It further provides that the Comptroller General of the United States shall disallow any expenditure from appropriated funds for international air transportation on other than a United States-flag air carrier in the absence of satisfactory proof of the necessity therefor.

(b) The Contractor agree to utilize United States-flag air carriers for international air transportation of personnel (and their personal effects) or property to the extent service by such carriers is available.

(c) In the event that the Contractor selects a carrier other than a United States-flag air carrier for international air transportation, he will include a certification on vouchers involving such transportation which is essentially as folows:

CERTIFICATON OF UNAVAILABILITY
OF UNITED STATES-FLAG AIR
CARRIERS

I hereby certify that transportation service for personnel (and their personal effects) or property by certificated air carrier was unavailable for the following reasons: *(state reasons).

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*See Federal Procurement Regulations (41 CFR 1-1.323-3.

(d) The terms used in this paragraph have the following meanings:

(1) "International air transportation" means transportation of persons (and their personal effects) or property by air between a place in the United States and a place outside thereof or between two places both of which are outside the United States.

(2) "United States-flag air carrier" means one of a class of air carriers holding a certificate of public convenience and necessity issued by the Civil Aeronautics Board, approved by the President, authorizing operations between the United States and/or its territories and one or more foreign countries.

(3) The term "United States" includes the 50 States, Commonwealth of Puerto Rico, possessions of the United States, and the District of Columbia.

(e) The Contractor shall include the substance of this clause, including this subparagraph (e) in each subcontract or purchase hereunder which may involve international air transportation.

54. USE OF UNITED STATES-FLAG COMMERCIAL VESSELS (1976 NOV)

(a) The Cargo Preference Act of 1954 (Public Law 664, August 26, 1954, 63 Stat. 832, 46 U.S.C. 1241(b)), requires that Federal departments or agencies shall transport at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) of equipment, materials, or commodities which may be transported on ocean vessels on privately owned United States-flag commercial vessels. Such transportation shall be accomplished whenever:

(1) Any equipment, materials, or commodities, within or outside the United States, which may be transported by ocean vessel, are:

(a) Procured, contracted for, or otherwise obtained for the agency's account; or

(b) Furnished to or for the account of any foreign nation without provision for reimbursement.

(2) Funds or credits are advanced or the convertibility of foreign currencies is guaranteed in connection with furnishing such equipment, materials, or commodities which may be transported by ocean vessel.

NOTE: This requirement does not apply to small purchases as defined in 41 CFR 1-3.6 or to cargoes carried in the vessels of the Panama Canal Co.

(b) The Contractor agrees as follows:

(1) To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved whenever shipping any equipment, material, or commodities under the conditions set forth in subparagraph (a) above pursuant to this contract to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.

NOTE: Guidance regarding fair and reasonable rates for United States-flag vessels may be obtained from the Division of National Cargo, Office of Market Development, Maritime Administration, Washington DC 20230: area code 202, phone 377-3449.

(2) To furnish, within 15 working days following the date of loading for shipments originating within the United States or within 25 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated "on-board" commercial ocean bill of lading in English for each shipment of cargo covered by the provisions in subparagraph (a) above to both the Contracting Officer (through the prime Contractor in the case of subcontractor bills of lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington DC 20230.

(3) To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract except for small purchases as defined in 41 CFR 1-3.6.

55. RATES OF WAGES (1981 SEP)

Pursuant to the provisions of the Davis-Bacon Act, 40 U.S.C. 276(a), as amended, the Secretary of Labor has determined that rates of wages and fringe benefits listed in this contract as Wage Determinations are those prevailing for the classifications specified in the locality of the work covered by this contract and said rates of wages and fringe benefits shall be the minimum rates per hour to be paid for the work covered by this contract.

Fringe benefit payments include contributions, except those required by Federal, State, or local law, which the Contractor makes irrevocably to a trustee or a third party pursuant to any fund, plan, or program to provide for medical or hospital care, compensation for injuries or illness resulting from occupation activity, unemployment benefits, life insurance, disability and sickness insurance, accident insurance (all designated as health and welfare), pensions, vacation and holiday pay, apprenticeship, or other similar programs, and other bona fide fringe benefits.

While the wage rates and fringe benefits shown are the minimum rates required to be paid during the life of the contract, it is the responsibility of bidders to inform themselves as to local labor conditions such as the length of workday or workweek, overtime compensation, fringe benefit contributions, labor supply, and prospective changes or adjustments of wage rates or fringe benefits. Except as provided in the clause of the contract entitled "Adjustment for Changes in Cost of Labor," if any, no increase in the contract price will be allowed or authorized on account of the payment of wage rates or fringe benefits in excess of those listed herein.

56. LABOR STANDARDS DATA (1981 SEP)

(a) Within seven days after the award of the contract, the Contractor shall deliver to the Contracting Officer:

(1) A list of all subcontracts, together with a description of the work to be performed under each, and

(2) A completed DD Form 1566 (Statement and Acknowledgment) for each such subcontract (including the subcontractor's signed and dated acknowledgment thereon that the clauses set forth in Standard Form 19-A of this contract have been included therein as required by the clause thereof entitled "Subcontracts").

(b) Within seven days after the award of any subcontract not initially included in the list required by subparagraph (a)(1) above, the Contractor shall deliver to the Contracting Officer an updated list and description of the work together with the corresponding completed DD Form 1566 required by subparagraph (a)(2) above.

57. RIGHTS-OF-WAY (1981 SEP)

Unless specified otherwise, the Government will provide the right-of-way or the site for permenant works or installations, the site for borrow pits, channels, spill banks, and ditches, and right-of-way for access thereto over routes established by the Contracting Officer. The Contractor will be permitted to use such land for construction purposes, but any additional right-of-way or land desired by the Contractor for construction purposes shall be provided by the Contractor without expense to the Government.

SGP-13 ☆ U. S. GOVERNMENT PRINTING OFFICE 1982 - 577-706/140 Reg. 8

A. The following additions and changes are made in the Additional Clauses:

1. Clause No. 42.—At the end of clause No. 42, page SGP-8, the following is added:

(c) Government delay in approving timely, complete, and accurate requests for approval of technical data, which requests were properly submitted by the Contractor and required under the contract, shall be subject to the provisions of paragraphs (b) and (c) of the clause of this contract entitled "Suspension of Work"; however, such delay shall not be deemed to be a "suspension order" as the term is used in that clause.

(d) Any work done prior to approval shall be at the Contractor's risk. Approval by the Government shall not relieve the Contractor from responsibility for any errors or omissions in such technical data, nor from responsibility for complying with the requirements of this contract, except with respect to variations in technical data described and approved in accordance with the procedures prescribed in paragraph (c) of the clause of this contract entitled "Shop Drawings."

2. Clause No. 43.—In subparagraph (c), page SGP-8, second line from the top of the right column, delete "20 days of" and substitute "30 days after" therefor.

3. Clause No. 46.—Clause No. 46, page SGP-9 is deleted in its entirety and the following is substituted therefor:

46. VARIATIONS IN ESTIMATED QUANTITIES (1983 Jan)

(Applicable only to items in the bidding schedule which are not subdivided and have an estimated dollar amount which exceeds $10,000.)

Where the quantity of a pay item in this contract is an estimated quantity and where the actual quantity of such pay item varies more than 15 percent above or below the estimated quantity stated in this contract, an equitable adjustment in the contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above 115 percent or below 85 percent of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Contracting Officer shall, upon receipt of a written request for an extension of time within 10 days from the beginning of such delay, or within such further period of time which may be granted by the Contracting Officer 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.

4. Clause No. 47.—In subparagraph (f), page SGP-9, fourth line, the reference "14S-3.808-7" is deleted and the reference "14S-3.808-71" is substituted therefor.

5. Clause No. 56.—Clause No. 56, page SGP-13, is deleted in its entirety and the following is substituted therefor:

56. LABOR STANDARDS DATA (1983 Jun)

(a) Within 14 days after the award of the contract, the Contractor shall deliver to the Contracting Officer:

(1) a list of all subcontracts, together with a description of the work to be performed under each, and

(2) a completed DD Form 1566 entitled "Statement and Acknowledgment" (copies available from the U.S. Army A.C. Publication Center, 2800 Eastern Boulevard, Baltimore MD 21520) for each such subcontract, including the subcontractor's signed and dated acknowledgment thereon that the clauses set forth in the Labor Standards Provisions of this contract have been included in the subcontract as required by the clause entitled "Subcontracts" in the Labor Standards Provisions.

(b) Within 14 days after the award of any subcontract not initially included in the list required by subparagraph (a)(1) above, the Contractor shall deliver to the Contracting Officer an updated list and description of the work together with the corresponding completed DD Form 1566 required by subparagraph (a)(2) above.

6. Clause No. 57.—Page SGP-13, second line, delete the word "permenent" and substitute therefor the word "permanent"; and in the third line, delete the words "spill banks" and substitute therefor the words "spoil banks".

B. The following clause is added to the Additional Clauses:

58. ASBESTOS FREE WARRANTY (1982 Jan)

(a) The Contractor warrants that, subject to the below-listed exceptions, all items or work required by the contract shall be free of asbestos in any form whatsoever:

(i) asbestos-cement pipe and couplings;

(ii) brake linings, pads, and blocks;

(iii) transmission components;

(iv) motor armatures for vehicle and industrial equipment; and

(v) items or work which the contract expressly requires to be of or contain asbestos.

(b) Requests for additional exceptions may be submitted to the Contracting Officer where asbestos free products are not available in necessary commercial quantities. Such requests shall be fully documented and timely submitted, and disapproval thereof by the Contracting Officer shall be final and not subject to the provisions of the clause of this contract entitled "Disputes."

SPECIAL PROVISIONS

1. COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK

a. Completion period - The Contractor shall begin work within 30 calendar days after date of receipt of notice to proceed, and shall complete all of the work within _____ calendar days from the date of receipt of such notice: Provided, That at the sole election of the Contracting Officer, either: (1) the period allowed for the completion of the work, shall be reduced by 1 calendar day for each calendar day in excess of 10 calendar days, or any extension thereof, elapsing between the Contractor's receipt of and return of properly executed contract if any, and performance and payment bonds as required in the Bid Form (Standard Form 21), or (2) the Contractor's right to proceed with the work shall be terminated for default in accordance with the clauses of this contract entitled, "Terminations for Default-Damages for Delay-Time Extensions" and "Bonds", if the Contractor fails to satisfactorily execute and deliver the required performance and payment bonds within the time established in the solicitation.

The drawings and data required to be submitted for approval under the specifications include those described in paragraphs 2.2.2, 4.1.2, 4.2.2, 4.3.2, 4.4.1, 4.4.2, 5.2.3, 5.3.1A, 5.3.3, 5.3.13, 5.3.19, 8.1.1, and 9.4.1. Except as otherwise provided in the specifications for specific submittals, the Contracting Officer will require 40 calendar days for review of drawings or data submitted by the Contractor for approval, and this review time will apply to each separate submittal or resubmittal whether the drawings or data are approved, not approved, or returned for revision. If the Contracting Officer uses time in excess of the above-stated number of days for review of any submittal or resubmittal, additional time not to exceed the excess time will be added to the time allowed the Contractor for completion of the work affected by such excess time, to the extent it is demonstrated that the excess time caused delay: Provided, That if the review of two or more separate submittals or resubmittals is late and results in concurrent days of excess time, such days will be counted only once in computing an extension fo the completion date.

The excess time added to the time allowed the Contractor for completion of the work affected by such excess time shall be the Contractor's sole remedy for any excess time used by the Contracting Officer for review of drawings and data submittals. The number of calendar days required for review of drawings or data submitted or resubmittal for approval will include the date the drawings or data are received by

the Contracting Officer and will extend through the date of return mailing to the Contractor.

b. Prosecution of the work - The capacity of the Contractor's construction plant, sequence of operations, method of operation, and the forces employed shall, at all times during the continuance of the contract, be subject to the approval of the Contracting Officer and shall be such as to insure the completion of the work within the specified period of time.

c. Priorities - If performance under the specifications is delayed by operations of any United States national priorities or material allocation system, the time for performance of the affected work will be extended to compensate for such delays.

2. LIQUIDATED DAMAGES

In case of failure on the part of the Contractor to complete the work within the time fixed in the contract or any extensions thereof, the Contractor shall pay to the Government as fixed and agreed liquidated damages, pursuant to the clause of this contract entitled "Termination for Default-Damages for Delay-Time Extensions," the sum of $1,000.00 for each calendar day of delay in completion of the work.

3. CONSTRUCTION PROGRAM

a. General - Within 45 calendar days after date of receipt of notice to proceed, the Contractor shall submit to the Construction Engineer for information a complete and practicable construction program. The construction program shall show in detail his proposed program of operations and shall provide for orderly performance of the work.

The construction program shall be in such form and detail as to show the following:

(1) Sequence of operations.

(2) The dates for commencing and completing the work on the several controlling features of the project, including erection of construction plant and each item or group of like items involving placement of concrete, if applicable.

(3) The dates of issuance of orders for procurement of Contractor-furnished materials and equipment and their delivery and installation dates.

(4) The dates on which Contractor-prepared drawings will be submitted for approval, including all shop drawings as required in the specifications.

The construction program shall be in suitable form and show the percentage of work for each line item scheduled for completion each month, and shall include the Contractor's estimate of earnings by months.

b. Submittal requirements - An original or translucent reproducible and three blackline prints of each construction program and each revised program shall be submitted. Originals or reproducibles shall be of such quality as to permit clear, sharp, legible prints to be made by direct-contact methods.

The Contractor shall revise the construction program as necessary to keep it current and shall enter on the program the actual progress at the end of each progress payment period or at such other intervals as directed by the Construction Engineer, and shall submit two such marked prints of the program to the Construction Engineer.

Timely submittal of the construction program and timely revisions thereto are important. The Construction Engineer must have the information contained in the construction program for such purposes as scheduling the preparation of additional drawings required for construction, and scheduling services of inspectors and survey crews.

If the Contractor elects to program the work by the CPM (Critical Path Method), or by a similar type of network analysis system, he shall submit such program and revised programs as required in lieu of the program specified above. Such CPM program shall include all information required above. The Contractor shall submit translucent reproducibles of the network diagram and of printout or computation sheets for such construction program. Reproducibles shall be of such quality as to permit clear, sharp, legible prints to be made by direct-contact methods. If requested, the Contractor shall also furnish a printout of the computer data.

The construction program shall be submitted to the Engineer, Franzoy Corey Engineering Company, 1030 East Guadalupe Road, Tempe, Arizona 85283.

c. Cost - The cost of all work required by this clause shall be included in the prices in the bidding schedule for other items of work.

4. PERFORMANCE OF WORK BY CONTRACTOR

The Contractor shall perform on the site, and with his own organization and forces on his payroll, work equivalent to at least 30 percent of the total amount of construction work at the site. The cost of Contractor-furnished material and equipment incorporated in the work shall not be included in computing the total amount of construction work at the site.

5. WOMEN-OWNED BUSINESS CONCERNS SUBCONTRACTING PROGRAM

a. The Contractor agrees to establish and conduct a program which will enable women-owned business concerns to be considered fairly as subcontractors and suppliers under this contract. In this connection, the Contractor shall:

(1) Designate a liaison officer who will administer the Contractor's "Women-Owned Business Concerns Program."

(2) Provide adequate and timely consideration of the potentialities of known women-owned business concerns in all "make-or-buy" decisions.

(3) Develop a list of qualified bidders that are women-owned businesses and assure that known women-owned business concerns have an equitable opportunity to compete for subcontracts, particularly by making information on forthcoming opportunities available, by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation of women-owned business concerns.

(4) Maintain records showing (i) procedures which have been adopted to comply with the policies set forth in this paragraph, including the establishment of a source list of women-owned business concerns; (ii) awards to women-owned businesses on the source list by minority and nonminority women-owned business concerns; and (iii) specific efforts to identify and award contracts to women-owned business concerns.

(5) Include the "utilization of Women-Owned Business Concerns" clause in subcontracts which offer substantial subcontracting opportunities.

(6) Cooperate in any studies and surveys of the Contractor's women-owned business concerns procedures

and practices that the Contracting Officer may from time-to-time conduct.

(7) Submit periodic reports of subcontracting to women-owned business concerns with respect to the records referred to in subparagraph (4) above, in such form and manner and at such time (not more often than quarterly) as the Contracting Officer may prescribe.

b. The Contractor further agrees to insert, in any subcontract hereunder which may exceed $500,000 for supply, or $1,000,000 in the case of contracts for the construction of any public facility and which offers substantial subcontracting possibilities, provisions which shall conform substantially to the language of this paragraph, including this subparagraph (b), and to notify the Contracting Officer of the names of such subcontractors.

c. The Contractor further agrees to require written certification by its subcontractors that they are bona fide women-owned and controlled business concerns in accordance with the definition of a women-owned business concern as set forth in the Utilization of Women-Owned Business Concerns (Over $10,000) Clause at the time of submission of bids or proposals.

6. SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING PLAN (Advertised)

a. This provision does not apply to small business concerns.

b. The term "subcontract" means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for the performance of the original contract or subcontract.

c. The offeror or bidder acknowledges that it is aware of the subcontracting plan requirement in this provision and, if selected for award, will submit within the time specified by the Contracting Officer a subcontracting plan that will afford the maximum practicable opportunity to participate in the performance of the contract to small and small disadvantaged business concerns and will include:

(1) Percentage goals (expressed in terms of percentage of total planned subcontracting dollars) for the utilization as subcontractors of small business concerns and small business concerns owned and controlled by socially and economically disadvantaged individuals (for the purposes of the subcontracting plan, the Contractor shall include all purchases which contribute to the performance of the contract including

a proportionate share of products, services, etc., whose costs are normally allocated as indirect or overhead costs).

As part of its establishment of percentage goals, the apparent successful bidder shall also include in its subcontracting plan:

(a) A statement of: (aa) total dollars planned to be subcontracted; (bb) total dollars planned to be subcontracted to small business; and (cc) total dollars planned to be subcontracted to small disadvantaged business.

(b) A description of the principal product and service areas to be subcontracted and an identification of those areas where it is planned to use (aa) small business subcontractors and (bb) small disadvantaged business subcontractors.

(2) The name of an individual within the employ of the bidder who will administer the bidder's subcontracting program and a description of the duties of such individual;

(3) A description of the efforts the bidder will take to assure that small business concerns and small business concerns owned and controlled by socially and economically disadvantaged individuals will have an equitable opportunity to compete for subcontracts;

(4) Assurances that the bidder will include the clause entitled "Utilization of Small Business Concerns and Small Business Concerns Owned and Controlled by Socially and Economically Disadvantaged Individuals" in all subcontracts which offer further subcontracting opportunities, and to require all subcontractors (except small business concerns) which receive subcontracts in excess of $500,000 or in the case of a contract for the construction of any public facility, $1,000,000 to adopt and comply with a plan similar to the plan agreed to by the bidder.

(5) Assurances that the Bidder will submit such periodic reports and cooperate in any studies or surveys as may be required by the contracting agency of the SBA (Small Business Administration) in order to determine the extent of compliance by the bidder with the subcontracting plan; and

(6) A recitation of the types of records the successful bidder will maintain the demonstrate procedures which have been adopted to comply with the requirements and goals set forth in the plan including

the establishment of source lists of small business concerns and small business concerns owned and controlled by socially and economically disadvantaged individuals; and efforts to identify and award subcontracts to such small business concerns. The records shall include at least the following (these records may be maintained on a plantwide or companywide basis unless otherwise indicated):

(a) Small and disadvantaged business source lists, guides, and other data identifying small and small disadvantaged business vendors.

(b) Organizations contacted for small and disadvantaged business sources.

(c) On a contract-by-contract basis, records on all subcontract solicitations over $100,000, indicating on each solicitation (aa) whether small business was solicitied, and if not, why not; (bb) whether small disadvantaged business was solicited, and if not, why not; and (cc) reasons for the failure of solicited small business or small disadvantaged business to receive the subcontract award. This requirement does not apply to a plan submitted pursuant to subparagraph (f) hereof.

(d) Records to support other outreach efforts:

Contacts with minority and small business trade associations
Contacts with business development organizations, and
Attendance at small and minority business procurement conferences and trade fairs

(e) Records to support internal activities to guide and encourage buyers:

Workshops, seminars, training programs, and
Monitoring activities to evaluate compliance.

(f) On a contract-by-contract basis, records to support award data submitted to the Government to include name and address of subcontractor. This requirement does not apply to a plan submitted pursuant to subparagraph (f) hereof.

d. The bidder understands that:

(1) It agrees to carry out the Government's policy to provide the maximum practicable opportunity for small business concerns and small business concerns owned and

controlled by socially and economically disadvantaged individuals to participate in the performance of theract, consistent with its efficient performance.

(2) If it does not submit a subcontracting plan within the time limits prescribed by the contracting agency, it will be ineligible to be awarded the contract.

(3) Prior compliance of the bidder with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(4) It is the bidder's responsibility to develop a subcontracting plan with respect to both small business concerns and small business concerns owned and controlled by socially and economically disadvantaged individuals and that each such aspect of the plan will be judged independently of the other.

e. The failure of any Contractor or subcontractor to comply in good faith with (1) the clause entitled "Utilization of Small Business Concerns and Small Business Concerns Owned and Controlled by Socially and Economically Disadvantaged Individuals", or (2) the terms of any subcontracting plan required by this Small Business and Small Disadvantaged Business Subcontracting Plan (Advertised) provision will be a material breach of the contract or subcontract.

f. Commercial products - If a commercial product (defined below) is offered, the required subcontracting plan may relate to the company's or division's production generally (both for commercial and noncommercial products) rather than solely to the item being procured under the Government contract. In such cases, the Contractor shall be required to submit one companywide annual plan to be reviewed for approval by the first agency with which it enters into a prime contract (which required a subcontracting plan) during the fiscal year, or by another agency satisfactory to the Contracting Officer. The approved plan will remain in effect for the company's entire fiscal year for all of the company's or division's commercial products.

The term "commercial products" means products in regular production sold in substantial quantities to the general public and/or industry at established market or catalog prices. A product which, in the opinion of the Contracting Officer, differs only insificantly from the Contractor's commercial product may be regarded for the purpose of this clause as a commercial product.

g. Reference is made to Standard Form SF-294, "Subcontracting Report for Individual Contracts," and Standard Form SF-295, "Summary Subcontract Report," for the Contractor's use in reporting. Optional Form 61 has been canceled.

Subcontracting reports under contracts subject to a Small Business and Small Disadvantaged Business Subcontracting Plan shall be submitted on Standard Form 294, "Subcontracting Report for Individual Contracts" and Standard Form 295, "Summary Subcontract Report." Standard Form 294 shall be submitted semiannually to the Contracting Officer. Standard Form 295 shall be submitted quarterly to the Office of Small and Disadvantaged Business Utilization, Room 2527, Department of the Interior, Washington, DC 20240.

7. FUNDS AVAILABLE FOR EARNINGS

Pursuant to section 12 of the Reclamation Project Act of 1939 (43 U.S.C., sec. 388), funds for earnings under this contract will be made available as provided in this clause.

a. Funds have been reserved to finance the estimated face value of the contract during the current fiscal year. The Contractor will be notified of the amount so reserved.

b. As to any work which may be done in excess of the amount for which funds have been reserved under the provisions of this clause, the liability of the United States is contingent upon the necessary appropriations being made therefor by the Congress and an appropriate reservation of funds thereunder. Further, the Contractor hereby releases the Government from any and all liability due to the failure of the Congress to appropriate sufficient funds, or for delays in payments due to lack of funds, including any adjustments under clauses No. 3, "Changes"; 17, "Suspension of Work"; or 18, "Termination for Convenience of the Government", of the General Provisions, or an adjustment under any other provision of the contract. The Contractor also releases the Government from any and all liability for damages for breach of contract as a result of the failure of the Congress to appropriate sufficient funds.

The above information as to program estimates for future fiscal years is provided solely for informational purposes. The Contractor is cautioned that any schedule of operations which contemplates a different rate of funding is his own responsibility. It is expressly understood that the Government does not represent that any or all of the funds covering these estimates will be appropriated by the Congress or will be reserved for earnings under this contract. The Contractor hereby releases the Government from any and all liability due to the failure of the

Congress to appropriate funds sufficient to cover payment in accordance with the above estimates, including any adjustments under clauses No. 3, "Changes"; 17, "Suspension of Work"; or 18, "Termination for Convenience of the Government," of the General Provisions, or an adjustment under any other provision of the contract. The Contractor also releases the Government from any and all liability for damages for breach of contract as a result of the failure of the Congress to appropriate sufficient funds. Annual reservations of funds will be made in writing as provided elsewhere in this clause after the Congress acts on the Appropriation Act.

c. If at any time the Contracting Officer finds that the balance of this reservation is in excess of the estimated amount required to meet all payments due and to become due the Contractor because of work performed or to be performed prior to the beginning of the next fiscal year, the right is reserved to reduce said reservation by the amount of such excess. The Contractor will be notified in writing of any such reduction.

d. If the rate of progress of the work is such that the Contracting Officer finds that the balance of the reservation is less than the estimated amount required to meet all payments due and to become due because of work performed prior to the beginning of the next fiscal year, the Government may reserve additional funds for payments under this contract if there are funds available for such purpose. The Contractor will be notified in writing of such additional reservation.

e. Should it become apparent to the Contractor that existing fund reservations will be exhausted within the next 30 days, the Contractor shall at that time give written notice thereof to the Contracting Officer. If additional funds can be made available, the Contracting Officer may issue an additional fund reservation as provided for in subparagraph (d) hereof. It is expressly understood, however, that the Government has no obligation to provide funds in addition to those reserved in writing. The Contractor is also cautioned that the prosecution of the work at a rate that will exhaust the funds reserved before the end of the fiscal year will be at his own risk. If additional funds cannot be made available, the Contracting Officer will given written notice thereof to the Contractor. If at any time funds are being made available by appropriations for interim periods prior to the enactment of an Appropriation Act, the Contractor will be so advised in writing in which case the other notice requirements of this subparagraph will not apply.

If the Contractor so elects, he may continue work under the conditions and restrictions of the solicitation after funds

have been exhausted, so long as there are funds for inspection and supervision, concerning which he will be notified in writing. No payment will be made for any work done after funds have been exhausted unless and until sufficient additional funds have been provided by the Congress. When funds again become available, the Contractor will be notified in writing as to the amount thereof reserved for payments under this contract. The amount so reserved shall be subject to decrease or increase in a manner similar to that provided in subparagraphs (c) and (d) hereof. However, if the Contractor so elects, the work may be suspended when the available funds have been exhausted. Should work be thus suspended, additional time for completion will be allowed equal to the period during which the work is necessarily so suspended. Such a suspension of work shall not be considered to be a suspension, delay, or interruption under the terms of clause No. 17, "Suspension of Work," of the General Provisions.

f. The procedure above described in this clause shall be repeated as often as necessary on account of exhaustion of available funds and the necessity of awaiting the appropriation of additional funds by Congress.

g. Should Congress fail to provide the expected additional funds during its regular session, the contract may, at the option of the Contractor, by written notice, be terminated and considered to be completed without prejudice to it or liability to the Government at any time subsequent to 30 days after payments are discontinued, or subsequent to 30 days after passage of the act which would ordinarily carry an appropriation for continuing the work, or after adjournment of the Congress which failed to make the necessary appropriations. Such a termination shall not be considered to be a termination for convenience of the Government under the terms of clause No. 18, "Termination for Convenience of the Government," of the General Provisions.

8. PROGRESS PAYMENTS

a. General - Payments will be made in accordance with clause No. 7 of the General Provisions and will be made as close to 30 calendar days as administratively possible, after receipt by the Government of signed vouchers from the Contractor on estimates approved by the Contracting Officer.

b. Payment for materials - Estimates for progress payments, as provided in clause No. 7 of the General Provisions, will include items of materials delivered on the site which will become a part of the finished construction work and for which the Contractor presents satisfactory evidence that it has acquired title to such materials. Invoices receipted by the supplier showing that payment in

full has been made, or certificates from both the Contractor and the supplier warranting that full title to the materials is vested in the Contractor and that the materials are free of liens and encumbrances, will be accepted as satisfactory evidence that the Contractor has acquired title to the materials. No consideration, however, will be given to individual purchases of less than $1,000 for any one item. At the discretion of the Contracting Officer, progress payments may also include materials delivered to the Contractor in whole or in part at locations other than the site, including its supplier's plant or plants subject to the above provisions.

c. Payment for separate contract divisions - Clause No. 7(c) of the General Provisions provides for payment without retention of a percentage on completion and acceptance of each separate building, public work, or other division of the contract on which the price is separately stated in the contract. Any separate building, public work, or other division of the contract which is intended to come under this provision of clause No. 7(c) will be specifically so identified elsewhere in the contract.

d. Lump-sum payment - Payment at the lump-sum price(s) for items so identified in the schedule will be in full for the completed work and will cover materials, supplies, transportation, labor, tools, machinery, and all expenditures incident to satisfactory compliance with the contract, unless otherwise specifically provided.

9. POSTING SECURITIES IN LIEU OF RETAINED PERCENTAGES

a. At his option the Contractor may, subject to procedures prescribed by the Contracting Officer, deposit approved interest-bearing negotiable securities, with interest accruing to the Contractor, in lieu of retained percentages contemplated in clause No. 7 of the General Provisions (Standard Form 23-A).

b. Securities approved for the purpose of this provision are notes or bonds of the United States of America or any State of the United States. Notes or bonds of any State of the United States shall not include revenue bonds or notes of any political subdivision of a State. All securities shall be negotiable and carry no restrictions on marketability. Except as limited in this paragraph and subsequent supplemental agreement between the Contractor and the Contracting Officer, the choice of securities shall be that of the Contractor.

c. If the Contractor elects to exercise his option, he shall notify the Contracting Officer, who will then provide him with a form of agreement to which he must subscribe and which will set forth the requirements deemed necessary to

protect the interest of the Government to the same extent as would be the case if the option to post securities in lieu of retained percentages were not exercised. A copy of the notification letter shall be sent by the Contractor to the Construction Engineer, Bureau of Reclamation, Arizona Projects Office, Suite 2200 Valley Center, 201 North Central Avenue, Phoenix, AZ 85073. The required forms of agreement are available for inspection by bidders at the office of the Contracting Officer.

d. The securities shall be deposited in escrow with an escrow agent approved by the Contracting Officer. The escrow agent shall be insured by the Federal Deposit Insurance Corporation.

10. METHOD OF PAYMENT

a. Payments under this contract will be made either by check or by wire transfer through the Treasury Financial Communications System at the option of the Government.

b. The Contractor shall forward the following information in writing to Regional Finance Officer, P. O. Box 427, Boulder City, Nevada, 89005, (702) 293-8431, not later than 7 days after receipt of notice of award.

(1) Full name (where practicable), title, phone number, and complete mailing address of responsible official(s), (i) to whom check payments are to be sent, and (ii) who may be contacted concerning the bank account information requested below.

(2) The following bank account information required to accomplish wire transfers:

(a) Name, address, and telegraphic abbreviation of the receiving financial institution.

(b) Receiving financial institution's 9-digit American Bankers Association (ABA) identifying number for routing transfer of funds. (Provide this number only if the receiving financial institution has access to the Federal Reserve Communications System.)

(c) If the receiving financial institution does not have access to the Federal Reserve Communications System, provide the name of the correspondent financial institution through which the receiving financial institution receives electronic funds transfer messages. If a correspondent financial institution is specified, also provide:

(i) Address and telegraphic abbreviation of the correspondent financial institution.

(ii) The correspondent financial institution's 9-digit ABA identifying number for routing transfer of funds.

c. Any changes to the information furnished under paragraph (b) of this clause shall be furnished to Regional Finance Officer, P.O. Box 427, Boulder City, Nevada, 89005, (702) 294-8431, in writing at least 30 days before the effective date of the change. It is the Contractor's responsibility to furnish these changes promptly to avoid payments to erroneous addresses or bank accounts.

d. The document furnishing the information required in paragraphs (b) and (c) must be dated and contain the signature, title, and telephone number of the Contractor official authorized to provide it as well as the Contractor's name and contract number.

11. MOBILIZATION AND PREPARATORY WORK

a. General - For the purpose of providing for expenses incident to the initiation of construction and discouraging unbalanced bidding, an item has been included in the bidding schedule to provide for payment for mobilization and preparatory work. The amount bid for this item shall not exceed $_____. The item for payment for mobilization and preparatory work is intended to compensate the Contractor for operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of offices, buildings, plants, and other facilities at the project site; for payment of premiums for bonds and insurance for the project including premiums for performance and payment bonds; for any necessary costs of acquisition of equipment including purchase and mobilization expense; and for any other work and operations which must be performed or costs that must be incurred incident to the initiation of meaningful work at the site and for which payment is not otherwise provided for under the contract.

All facilities, plant, and equipment which are established at or brought to the worksite shall be deemed to be subject to the provisions of this clause unless the Contracting Officer specifically provides otherwise in writing for a particular item or items. The Contractor shall be solely responsible for the adequacy, efficiency, use, protection, maintenance, repair, and preservation of all facilities, plant, and equipment. The facilities, plant, and equipment covered by this clause shall not be dismantled or removed from the worksite prior to completion of the work under the

contract without the written permission of the Contracting Officer.

All facilities, plant, and equipment on the worksite shall also be subject to the Government's right to take possession of and utilize the same for the purposes of completion of the work as provided by clause No. 5 of the General Provisions should the Contractor's right to proceed be terminated thereunder. In addition, any encumbrance lien, or other security interest on any such facilities, plant, or equipment shall be subordinated to the Government's rights under said clause No. 5 to utilize all facilities, plant, and equipment to complete the work under the contract, and the Contractor agrees to provide evidence of this, acceptable to the Contracting Officer.

b. Payment - Payment for mobilization and preparatory work will be made at the lump-sum price bid therefor in the schedule. Progress payments for mobilization and preparatory work will be made as follows:

(1) The total amount of premiums paid by the Contractor to obtain performance and payment bonds will be paid at one time together with the first progress payment otherwise due, as provided in clause No. 7(c) of the General Provisions.

(2) When 5 percent of the total original contract amount is earned from other schedule items, 50 percent of the amount bid for mobilization and preparatory work will be paid exclusive of any amount already paid the Contractor for performance and payment bond premiums.

(3) When 10 percent of the total original contract amount is earned from other schedule items, the balance of the amount bid for mobilization and preparatory work will be paid.

Progress payments for mobilization and preparatory work shall be subject to retainage as provided by clause No. 7(c) of the General Provisions. In addition, for the purposes of said clause No. 7(c), the item for mobilization and preparatory work will not be considered to be a separate division of the work, completion of which would permit the payment of the complete item price without retention.

12. BACKCHARGES TO CONTRACTOR

Where this contract provides for charges to the Contractor for costs incurred by the Government for services, materials, or use of equipment, such charges will include the costs of labor and materials, a reasonable allowance for use of plant and equipment, and other expenditures which can

be directly assigned to the services or materials furnished, plus 15 percent of such total costs for Government overhead.

In the event of termination of the contract for default under clause No. 5 of the General Provisions, the increased costs incurred by the Government thereunder shall include those administrative costs which are necessary for and directly assignable to completing the work following such termination and which would not have been required had termination not been necessary. In addition, the Government shall be entitled to 15 percent of the total of such administrative costs for Government overhead.

13. PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA-PRICE ADJUSTMENTS

a. This clause shall become operative only with respect to any modification of this contract which involves aggregate increases and/or decreases in costs plus applicable profits in excess of $100,000 unless the modification is priced on the basis of adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation. The right to price reduction under this paragraph is limited to defects in data relating to such modification.

b. If any price, including profit or fee, negotiated in connection with any price adjustment under this contract was increased by any significant sums because:

(1) The Contractor furnished cost or pricing data which was not accurate, complete, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data;

(2) A subcontractor, pursuant to the clause of this contract entitled "Subcontractor Cost or Pricing Data-Price Adjustments" or any subcontract clause therein required, furnished cost or pricing data which was not accurate, complete, and current as certified in the subcontractor's Certificate of Current Cost or Pricing Data;

(3) A subcontractor or prospective subcontractor furnished cost or pricing data which was required to be accurate, complete, and current and to be submitted to support a subcontract cost estimate furnished by the Contractor but which was not accurate, complete, and current as of the date certified in the Contractor's Certificate of Current Cost or Pricing Data; or

(4) The Contractor or a subcontractor or prospective subcontractor furnished any data, not within (1), (2), or (3) above, which was not accurate, as submitted;

the price shall be reduced accordingly and the contract shall be modified in writing as may be necessary to reflect such reduction. However, any reduction in the contract price due to defective subcontract data of a prospective subcontractor, when the subcontract was not subsequently awarded to such subcontractor, will be limited to the amount (plus applicable overhead and profit markup) by which the actual subcontract, or actual cost to the Contractor if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor: Provided, the actual subcontract price was not affected by defective cost or pricing data.

(Note: Since the contract is subject to reduction under this clause by reason of defective cost or pricing data submitted in connection with certain subcontracts, it is expected that the Contractor may wish to include a clause in each such subcontract requiring the subcontractor to appropriately indemnify the Contractor. It is also expected that any subcontractor subject to such indemnification will generally require substantially similar indemnification for defective cost or pricing data required to be submitted by his lower tier subcontractors.)

c. Failure to agree on a reduction shall be a dispute concerning a question of fact within the meaning of the "Disputes" clause of this contract.

14. AUDIT

a. General - The Contracting Officer or his representatives shall have the audit and inspection rights described in the applicable paragraphs (b), (c), and (d) below.

b. Examination of costs - If this is a cost-reimbursement-type, incentive, time-and-materials, labor-hour, or price-redeterminable contract, or any combination thereof, the Contractor shall maintain, and the Contracting Officer or his representatives shall have the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to reflect properly all direct and indirect costs of whatever nature claimed to have been incurred and anticipated to be incurred for the performance of this contract. Such right of examination shall include inspection at all reasonable times of the Contractor's plants, or such parts thereof, as may be engaged in the performance of this contract.

c. Cost or pricing data - If the Contractor submitted cost or pricing data in connection with the pricing of this contract or any change or modification thereto, unless such pricing was based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation, the Contracting Officer or his representatives who are employees of the United States Government shall have the right to examine all books, records, documents and other data of the Contractor related to the negotiation, pricing, or performance of such contract, change, or modification, for the purpose of evaluating the accuracy, completeness, and currency of the cost of pricing data submitted. Additionally, in the case of pricing any change or modification exceeding $100,000 to formally advertised contracts, the Comptroller General of the United States or his representatives who are employees of the United States Government shall have such rights. The right of examination shall extend to all documents necessary to permit adequate evaluation of the cost or pricing data submitted, along with the computations and projections used therein.

d. Availability - The materials described in (b) and (c) above shall be made available at the office of the Contractor, at all reasonable times, for inspection, audit, or reproduction, until the expiration of 3 years from the date of final payment under this contract or such lesser time specified in part 1-20 of the Federal Procurement Regulations (41 CFR part 1-20) and for such longer period, if any, as is required by applicable statute, or by other clauses of this contract, or by (1) and (2) below:

(1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for a period of 3 years from the date of any resulting final settlement.

(2) Records which relate to appeals under the "Disputes" clause of this contract, or litigation or the settlement of claims arising out of the performance of this contract, shall be made available until such appeals, litigation, or claims have been disposed of.

e. The Contractor shall insert a clause containing all the provisions of this clause, including this paragraph (e), in all subcontracts hereunder except altered as necessary for proper identification of the contracting parties and the Contracting Officer under the Government prime contract.

15. SUBCONTRACTOR COST OR PRICING DATA-PRICE ADJUSTMENTS

a. Paragraphs (b) and (c) of this clause shall become operative only with respect to any modification made

pursuant to one or more provisions of this contract which involves aggregate increases and/or decreases in costs plus applicable profits expected to exceed $100,000. The requirements of this clause shall be limited to such modifications.

b. The Contractor shall require subcontractors hereunder to submit cost or pricing data under the following circumstances:

(1) Prior to the award of any subcontract, the amount of which is expected to exceed $100,000 when entered into;

(2) Prior to the pricing of any subcontract modification which involves aggregate increases and/or decreases in costs plus applicable profits expected to exceed $100,000; except where the price is based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation.

c. The Contractor shall require subcontractors to certify that to the best of their knowledge and belief, the cost or pricing data submitted under (b) above is accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract change or modification.

d. The Contractor shall insert the substance of this clause including this paragraph (d) in each subcontract which exceeds $100,000.

16. VALUE ENGINEERING-CONSTRUCTION (1982 Dec.)

a. General - The Contractor is encouraged to develop, prepare, and submit VECP (value engineering change proposals) voluntarily. The Contractor shall share in any instant contract savings realized from accepted VECPs in accordance with paragraph (f) below.

b. Definitions - "Collateral costs" means agency cost of operation, maintenance, logistic support, or Government-furnished property.

"Contractor's development and implementation costs" means those costs the Contractor incurs on a VECP.

(1) Before Government acceptance, to develop, test, prepare, and submit it; and

(2) After acceptance, specifically to make the changes it required.

"Government costs" means those agency costs that result directly from developing and implementing the VECP, such as any net increases in the cost of testing, operations, maintenance, and logistic support. The term does not include the normal administrative costs of processing the VECP.

"Instant contract savings" means the estimated reduction in Contractor cost of performance resulting from acceptance of the VECP, minus allowable Contractors' development and implementation costs, including subcontractors' development and implementation costs (see paragraph (g) below).

"VECP (value engineering change proposal)" means a proposal that:

(1) Requires a change to this, the instant contract, to implement; and

(2) Results in reducing the contract price or estimated cost without impairing essential functions or characteristics: Provided, That it does not involve a change:

(a) In deliverable quantities only; or

(b) To the contract type only.

c. VECP preparation - As a minimum, the Contractor shall include in each VECP the information described in subparagraphs (1) through (7) below. If the proposed change is affected by contractually required configuration management or similar procedures, the instructions in those procedures relating to format, identification, and priority assignment shall govern VECP preparation. The VECP shall include the following:

(1) A description of the difference between the existing contract requirement and that proposed, the comparative advantages and disadvantages of each, a justification when an item's function or characteristics are being altered, and the effect of the change on the end item's performance.

(2) A list and analysis of the contract requirements that must be changed if the VECP is accepted, including any suggested specification revisions.

(3) A separate, detailed cost estimate for (i) the affected portions of the existing contract requirement and (ii) the VECP. The cost reduction associated with the VECP shall take into account the Contractor's allowable development and implementation costs,

including any amount attributable to contracts under paragraph (g) below.

(4) A description and estimate of costs the Government may incur in implementing the VECP, such as test and evaluation and operating and support costs.

(5) A prediction of any effects the proposed change would have on collateral costs to the agency.

(6) A statement of the time by which a contract modification accepting the VECP must be issued in order to achieve the maximum cost reduction, noting any effect on the contract completion time or delivery schedule.

(7) Identification of any previous submissions of the VECP, including the dates submitted, the agencies and contract numbers involved, and previous Government actions, if known.

d. Submission - The Contractor shall submit VECPs to the Construction Engineering, Arizona Projects Office, Suite 2200 Valley Center, 201 North Central Avenue, Phoenix, Arizona, 85073, with a copy to the Contracting Officer.

e. Government action -

(1) The Contracting Officer shall notify the Contractor of the status of the VECP within 45 calendar days after the contractor office receives it. If additional time is required, the Contracting Officer shall notify the Contractor within the 45-day period and provide the reason for the delay and the expected date of the decision. The government will process VECPs expeditiously; however, it shall not be liable for any delay in acting upon a VECP.

(2) If the VECP is not accepted, the Contracting Officer shall notify the Contractor in writing explaining the reasons for rejection. The Contractor may withdraw any VECP, in whole or in part, at any time before it is accepted by the Government. The Contracting Officer may require that the Contractor provide written notification before undertaking significant expenditures for VECP effort.

(3) Any VECP may be accepted, in whole or in part, by the Contracting Officer's award of a modification to this contract citing this clause. The Contracting Officer may accept the VECP, even though an agreement on price reduction has not been reached, by issuing the Contractor a notice to proceed with the change. Until a notice to proceed is issued or a contract

modification applies a VECP to this contract, the Contractor shall perform in accordance with the existing contract. The Contracting Officer's decision to accept or reject all or part of any VECP shall be final and not subject to the Disputes clause or otherwise subject to litigation under the Contract Disputes Act of 1978 (41 U.S.C. 601-613).

f. Sharing -

(1) Rates - The Contractor's share of savings is determined by subtracting Government costs from instant contract savings and multiplying the result by (i) 55 percent for fixed-price contracts or (ii) 25 percent for cost-reimbursement contracts.

(2) Payment - Payment of any share due the Contractor for use of a VECP on this contract shall be authorized by a modification to this contract to:

(a) Accept the VECP.

(b) Reduce the contract price or estimated cost by the amount of instant contract savings; and

(c) Provide the Contractor's share of savings by adding the amount calculated under subparagraph (1) above to the contract price or fee.

g. Subcontracts - The Contractor shall include an appropriate value engineering clause in any subcontract of $50,000 or more and may include one in subcontracts of lesser value. In computing any adjustment in this contract's price under paragraph (f) above, the Contractor's allowable development and implementation costs clearly resulting from a VECP accepted by the Government under this contract, but shall exclude any value engineering incentive payments to a subcontractor. The Contractor may choose any arrangement for subcontractor value engineering incentive payments: Provided, That these payments shall not reduce the Government's share of the savings resulting from the VECP.

h. Data - The Contractor may restrict the Government's right to use any part of a VECP or the supporting data by marking the following legend on the affected parts:

"These data, furnished under the Value Engineering-Construction clause of contract . . . shall not be disclosed outside the Government or duplicated, used, or disclosed, in whole or in part, for any purpose other than to evaluate a value engineering change proposal submitted under the clause. This restriction does not limit the Government's right to use information contained in these data if it has

been obtained or is otherwise available from the Contractor or from another source without limitations."

If a VECP is accepted, the Contractor hereby grants the Government unlimited rights in the VECP and supporting data, except that, the Government shall have the rights specified in the contract modification implementing the VECP and shall appropriately mark the data.

17. PRECONSTRUCTION CONFERENCE (1983 DEC)

The Contracting Officer will hold a preconstruction conference after award of any resultant contract. The Contractor and any subcontractors which the Contractor or the Contracting Officer may designate shall attend. The Contractor shall perform all work and meet all requirements provided in the contract, and shall not be entitled to any adjustment in the amount due under the contract nor any extension in the contract time as a result of the requirements of this clause.

18. PERFORMANCE OF WORK FOR THE CONVENIENCE OF THE CONTRACTOR (1983 DEC.)

a. Performance of any portion of the estimated quantity of a Schedule pay item, or any other work, beyond that required to comply with contract drawings and/or specifications shall be deemed to be for the convenience of the Contractor, and shall be at the Contractor's sole expense, unless such performance was either directed in writing by the Contracting Officer or clearly authorized for payment by another provision of this contract.

b. There shall be no increase in the contract price or the time allowed for performance of this contract, for work performed for the convenience of the Contractor.

19. INSURANCES

The Contractor shall procure and maintain during the term of this contract and any extension thereof, the following insurance by a company and in a form satisfactory to the Contracting Officer, the District and the Engineer, and pay all costs in connection therewith:

a. Workers' Compensation Insurance

The Contractor will provide certificates of insurance in accordance with Section 4, paragraph 4.1.5 of the Construction Safety Standards.

b. General Liability Insurance (Including Automobile)

The Contractor shall maintain during the life of this contract such general liability insurance as will provide coverage for claims for damages for personal injury, including accidental death, as well as for claims for property damage, which may arise directly or indirectly from performance of the work under this contract. Coverage for property damage shall be on a "broad form" basis. Amount of insurance to be provided shall be not less than $1,000,000 for any one person or $3,000,000 for each occurrence for bodily injury, with coverage for property damage not less than $500,000, plus umbrella excess liability and automobile liability insurance in an amount not less than $3,000,000 per occurrence in excess of the above-stated primary limits.

In the event any work under this contract is performed by a subcontractor, the Contractor shall be responsible for any liability directly or indirectly arising out of the work performed under this contract by a subcontractor, which liability is not covered by the subcontractor's insurance.

The Government, the District and the Engineer, their officers, agents and employees shall be named as additional insureds on the Contractor's and any subcontractor's general liability and automobile liability insurance policies for any claims arising out of work performed under this contract.

c. Builders Risk All Risk Insurance

The Contractor shall secure and maintain during the life of this contract, Builders Risk All Risk Insurance coverage for 100 percent of the contract amount. Such insurance shall exclude coverage for damages which have been proximately caused by "acts of Gods", in excess of 5 percent of the contract amount. Such insurance shall provide for losses to be paid the Contractor as their interests may appear.

d. Each policy or certificate evidencing the insurance shall contain an endorsement which provides that the insurance company will notify the Contracting Officer 30 days prior to the effective date of any cancellation or termination of the policy or certificate which adversely affects the interests of the Government in such insurance. The notice shall be sent by registered mail and shall identify this contract, the name and the address of the contracting office, the policy and the insured.

e. Prior to the commencement of work hereunder, the Contractor shall furnish the Contracting Officer with acceptable evidence showing that the insurance coverage described in this clause has been obtained.

f. In any and all claims against the Government, the District, the Engineer, or any of their agents or employees, the indemnification obligation under this contract shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor or any subcontractor under any of the foregoing insurance coverages or under Workers' Compensation Acts, Disability Benefit Acts, or other Employee Benefit Acts.

LABOR STANDARDS PROVISIONS
Applicable to Contracts in Excess of $2,000

1. Davis-Bacon Act (40 U.S.C. 276a-276a-7)

(a) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (d) of this clause; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in the clause entitled "Apprentices and Trainees." Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (b) of this clause) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(b)(1) The Contracting Officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington DC 20210. The Administrator of the Wage and Hour Division, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(3) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator for determination. The Administrator of the Wage and Hour Division, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (b)(2) or (b)(3) of this clause, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(c) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(d) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program: Provided, That the Secretary of Labor has found, upon the written request of the Contractor, that applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(e) Paragraphs (a) through (d) of the clause shall apply to the contract to the extent that it is (1) a prime contract with the Government subject to the Davis-Bacon Act, or (2) a subcontract also subject to the Davis-Bacon Act under such prime contract.

2. Contract Work Hours and Safety Standards Act—Overtime Compensation (40 U.S.C. 327-333)

This contract is subject to the Contract Work Hours and Safety Standards Act and to the applicable rules, regulations, and interpretations of the Secretary of Labor.

(a) Overtime requirements.—No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of 8 hours in any calendar day or in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 8 hours in any calendar day or in excess of 40 hours in such workweek, whichever is greater.

(b) Violation; liability for unpaid wages; liquidated damages.—In the event of any violation of the provisions set forth in paragraph (a) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the provisions set forth in paragraph (a) of this clause, in the sum of $10 for each calendar day for which such individual was required or permitted to work in excess of 8 hours or in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in paragraph (a) of this clause.

(c) Withholding for unpaid wages and liquidated damages.—The Contracting Officer shall upon his/her own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same Prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same Prime Contractor such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in paragraph (a) of this clause.

(d) Subcontracts.—The Contractor or subcontractor shall insert in any subcontracts the provisions set forth in paragraphs (a) through (d) of this clause and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the provision set forth in paragraphs (a) through (d) of this clause.

3. Apprentices and Trainees

(a) Apprentices.—Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the jobsite in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the jobsite in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(b) Trainees.—Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor Employment and Training Administration. The ratio of trainees to journeymen on the jobsite shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the jobsite in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination of the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(c) Equal employment opportunity.—The utilization of apprentices, trainees, and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order No. 11246, as amended, and 29 CFR Part 30.

4. Payrolls and Basic Records

(a) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of 3 years thereafter for all laborers and mechanics working at the site of

the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under paragraph (d) of the clause entitled "Davis-Bacon Act" that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprenticeships and trainees, and the ratios and wage rates prescribed in the applicable programs.

(b)(1) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer if the agency is a party to the contract but if the agency is not such a party, the Contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be for transmission to the Contracting Officer. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraph (a) of this clause. The information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents, Government Printing Office. The Contractor is responsible for the submission of copies of payrolls by all subcontractors.

(2) Each payroll submitted shall be accomplished by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be maintained under paragraph (a) of this clause entitled "Payrolls and Basic Records" and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned other than permissible deductions as set forth in Regulations, 29 CFR Part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (b)(2) of this clause.

(4) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(c) The Contractor or subcontractor shall make the records required under paragraph (a) of this clause available for inspection, copying, or transcription by the Contracting Officer or the Department of Labor or their authorized representatives. The Contractor and subcontractors shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

5. Compliance with Copeland Act Requirement

The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

6. Withholding

The Contracting Officer shall upon his/her own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same Prime Contractor, or any other Federally assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same Prime Contractor, so much of the accured payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Prime Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

7. Subcontracts

The Contractor or subcontractor shall insert in any subcontracts the clauses entitled "Davis-Bacon Act," "Contract Work Hours and Safety Srandards Act—Overtime Compensation," "Apprentices and Trainees," "Payrolls and Basic Records," "Compliance with Copeland Act Requirements," "Withholding," "Subcontracts," "Contract Termination-Debarment," "Disputes Concerning Labor Standards," "Compliance With Davis-Bacon and Related Act Requirements," and "Certification of Eligibility," and such other clauses as the Contracting Officer may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with all the contract clauses cited above.

8. Contract Termination; Debarment

A breach of the contract clauses entitled "Davis-Bacon Act," "Contract Work Hours and Safety Standards Act—Overtime Compensation," "Apprentices and Trainees," "Payrolls and Basic Records," "Compliance with Copeland Act Requirements," "Subcontracts," "Compliance with Davis-Bacon and Related Act Requirements," and "Certification of Eligibility," may be grounds for termination of the contract, and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.

9. Disputes Concerning Labor Standards

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Compliance with Davis-Bacon and Related Act Requirements

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

11. Certification of Eligibility

(a) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(c) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

DEPARTMENT OF LABOR WAGE DETERMINATIONS

The classifications, wage rates, and fringe benefits will be furnished by amendment before bids are opened.

SPECIFICATIONS

DIVISION 1--GENERAL REQUIREMENTS

SECTION 1.1 GENERAL

1.1.1 THE REQUIREMENT

It is required that there be constructed and completed, in accordance with the Construction Contract (Standard Form 23), including the General Provisions (standard Form 23A), Special Provisions, Labor Standards Provisions, these specifications, and the drawings listed in paragraph 10.1.2 (List of Drawings) hereof: Solicitation/Specifications No. _____, Centennial Reach of Westside Canal, Harquahala Valley Irrigation District, Arizona.

The work is situated approximately 65 miles west of Phoenix, Arizona, in Maricopa County.

1.1.2 DESCRIPTION OF THE WORK

The principal components of the work to be performed under these specifications include the following:

a. Earthwork and construction of about 5 miles of concrete lined canal. The bottom width is 6 feet, the height of lining is 5.75 feet.

b. Earthwork and construction of about 5 miles of detention dike and floodway.

c. Earthwork and construction of the Centennial Wash siphon, canal wasteway, deer escape ramps, lateral turnout structure, and miscellaneous drainage culverts.

d. Furnishing and installing barbed wire fence.

e. Furnishing and placing gravel surfacing.

f. Grouted rock riprap.

g. Constructing floodway crossings.

1.1.3 STAKING OUT WORK

a. Lines and grades - The District will establish reference points required for proper monitoring of the work.

The reference points shall consist of rebar set at all P.I.'s and selected P.O.T.'s. The District will also

provide a series of rebar referenced stakes to be used to re-establish P.I.'s and P.O.T.'s.

The Contractor shall, without additional cost to the District, give such assistance and provide such drill holes, forms, ladders, spikes, nails and light as may be required by the Contracting Officer in monitoring lines and grades. The Contractor shall adjust his construction operations at such points and for such reasonable time as may be necessary to assist with the work of transferring lines and marking points for line and grade.

The District will provide only the minimum of survey crew services for monitoring and final check of the Contractor's performance.

The Contractor shall develop and make all detail surveys needed for construction, as required by these specifications and Clause No. 10 of the General Provisions.

The cost incurred by the Contractor shall be included in the prices bid in the schedule for other items of work.

b. Replacement of survey stakes - Where construction operations require removal of the District's stakes or other survey marks, the Contractor shall reference such points in an approved manner. Survey stakes or marks established by the Engineer shall be preserved by the Contractor unless he is authorized to remove them, and in case of their destruction or removal by the Contractor's forces, they will be replaced by the Engineer at Contractor's expense. The cost to the District of replacing survey stakes or marks will be deducted from payments due the Contractor.

SECTION 1.2 MATERIALS

1.2.1 MATERIALS TO BE FURNISHED BY THE CONTRACTOR

a. General - The Contractor shall furnish all materials required for completion of the work.

When a separate item which includes the furnishing of any materials is provided in the schedule, the cost of furnishing, hauling, storing, and handling shall be included in the price bid for that item. When a separate item is not provided in the schedule for furnishing any material required to be furnished by the Contractor, the cost of furnishing, hauling, storing, and handling shall be included in the price bid for the work for which the material is required.

Materials furnished by the Contractor shall be of the type and quality described in these specifications. The Contractor shall make diligent effort to procure the

specified materials from any and all sources, but when materials required by the specifications become unavailable, substitute materials may be used: Provided, That no substitute materials shall be used without prior written approval of the Contracting Officer, said written approval to state the amount of the adjustment, if any, to be made in favor of the Government. The Contracting Officer's determination as to whether substitution shall be permitted and as to what substitute materials may be used shall be final and conclusive. If the substitute materials approved are of less value to the Government or involve less cost to the Contractor than the materials specified, an adjustment shall be made in favor of the Government, and where the amount involved or the importance of the substitution warrants, an order for changes will be issued, otherwise the adjustment will be handled by deduction from payments to the Contractor on the basis of prices stated in the written approval. No payments in excess of prices bid in the schedule will be made because of substitution of one material for another or because of the use of one alternate material in place of another.

b. Inspection of materials - Materials and equipment furnished by the Contractor which will become a part of the completed construction work shall be subject to inspection at any one or more of the following locations, as determined by the Contracting Officer: at the place of production or manufacture, at the shipping point, or at the site of the work. To allow sufficient time to provide for inspection, the Contractor shall submit to the Contracting Officer, at the time of issuance, copies in triplicate of purchase orders, including drawings and other pertinent information, covering materials and equipment on which inspection will be made as advised by the Contracting Officer, or shall submit other evidence in the event such purchase orders are issued verbally or by letter.

The inspection of materials and equipment at any of the locations specified above or the waiving of the inspection thereof shall not be construed as being conclusive as to whether the materials and equipment conform to the contract requirements, nor shall the Contractor be relieved thereby of the responsibility for furnishing materials and equipment meeting the requirements of these specifications. Acceptance of all materials and equipment will be made only at the site of the work.

1.2.2 REFERENCE SPECIFICATIONS AND STANDARDS

a. General - The materials to be furnished by the Contractor which are specified by reference to Federal Specifications, Federal Standards, or other standard specifications or codes shall be in compliance with the latest editions or revisions thereof in effect on the date

bids are received, including any amendments or supplements. In the event of conflicting requirements between a referenced specification, standard, or code, and these specifications, these specifications shall govern.

Unless otherwise specified, all materials that will become a part of the completed work shall be new and shall conform to the Federal or other specifications and standards referred to herein. Where reference specifications numbers are designated throughout these specifications, they refer to Federal Specifications unless otherwise noted. In the event that the materials are not covered by Federal or other specifications, the materials furnished shall be of standard commercial quality. Where types, grades, or other options offered in the reference specifications are not specified in these specifications, the material furnished will be acceptable if it is in accordance with any one of the types, grades, or options offered.

The references to materials, wherein manufacturer's products or brands are specified, are made as standards of comparison only as to type, design, character, or quality of the article required, and do not restrict bidders to the manufacturer's products or to the specific brands named. It shall be the responsibility of the Contractor to prove equality of materials and products to those referenced and to provide all descriptive information, test results, and other evidence as may be necessary to prove the equality of materials or products which he offers as being equal to those referenced.

Copies of the Federal Specifications may be examined at the office of the Bureau of Reclamation, Engineering and Research Center, building 67, Denver Federal Center, Denver, Colorado or the Regional Office, Bureau of Reclamation, Lower Colorado Region, P. O. Box 427, Nevada Highway and Park Street, Boulder City, Nevada.

Single copies of Federal Specifications required for bidding purposes may be obtained without charge at Business Service Centers of Regional Offices of the General Services Administration. Specifications, standards, and codes published by associations or other standardized agencies should be obtained by the Contractor, at his expense, directly from those agencies.

b. Addresses for obtaining reference specifications and standards - Addresses for obtaining some of the referenced specifications, standards, and codes are listed below. Information on other specifications, standards, and codes referred to in these specifications may be obtained from the Bureau of Reclamation, Attn. D-1312, P. O. Box 25007, Denver, Colorado 80225.

Federal Specifications and Standards - General Services Administration, Specifications Unit (WFSIS), 7th and D Streets SW., Washington, D.C. 20407

Bureau of Reclamation Specifications - Bureau of Reclamation, Attention D-1312, P. O. Box 25007, Denver, Colorado 80225

Department of Defense and Military Specifications and Standards - Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120

Maritime Administration Specifications - Division of Naval Architecture, Room 4057, Maritime Administration, Department of Commerce Building, 14th and East Street NW., Washington, DC 20230

AASHTO - American Association of State Highway and Transportation Officials, 444 North Capitol Street NW., Suite 225, Washington, DC 20001

ACI - American Concrete Institute, P. O. Box 19150, Redford Station, Detroit, Michigan 48219

AISC - American Institute of Steel Construction, Inc., 400 North Michigan Avenue, Chicago, ILlinois 60611

AISI - American Iron and Steel Institute, 1000 16th Street NW, Washington, D.C. 20036

*ANSI - American National Standards Institute, 1430 Broadway, New York, New York 10018

ASME - American Society of Mechanical Engineers, 345 East 47th Street, New York, New York 10017

ASTM - American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103

AWS - American Welding Society, Inc., 2501 NW Seventh Street, Miami Florida 33125

AWWA - American Water Works Association, Inc., 6666 West Quincy Avenue, Denver, Colorado 80235

GA - Gypsum Association, 1603 Orrington Avenue, Evanston, Illinois 60201

IEEE - Institute of Electrical and Electronic Engineers, 345 East 47th Street, New York, New York 10017

ICEA - Insulated Cable Engineers Association, Inc., P. O. Box P, South Yarmouth, Massachusetts 02664

JIC - Joint Industrial Council, 7901 Westpark Drive, McLean, Virginia 22101

MBMA - Metal Building Manufacturers Association, 1230 Keith Building, Cleveland, Ohio 44115

NACE - National Association of Corrosion Engineers, P.O. Box 218340, Houston, Texas 77218

NEC - National Electrical Code, National Fire Protection Association, Battery March Park, Quincy, Massachusettes 02269

NEMA - National Electrical Manufacturers Association, 2101 L Street NW, Suite 300, Washington, D.C. 20037

SAE - Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, Pennsylvania 15096
SSPC - Steel Structures Painting Council, 4400 Fifth Avenue, Pittsburgh, Pennsylvania 15213
UL - Underwriters' Laboratories, 333 Pfingsten Road, Northbrook, Illinois 60062
WCLIB - West Coast Lumber Inspection Bureau, P. O. Box 23145, Portland, Oregon 97223
**WPRS - Water and Power Resources Service, order from: Bureau of Reclamation, Attn. D-922, P. O. Box 25007, Denver, Colorado 80225

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* Information on standards which are identified in the specifications by dual acronyms, for example, ANSI/ASTM, indicating approval by the American National Standards Institute and sponsorship by the American Society for Testing Materials or other sponsoring organization, may also be obtained from the appropriate sponsoring organization.

** For various manuals and standard specifications printed, reprinted, or published while the Bureau of Reclamation was offocially named Water and Power Resrouces Service. All references to Water and Power Resources Service or any form derivative thereof herein shall be considered synonymous with the Bureau of Reclamation.

1.2.3 DELETED

1.2.4 DELETED

1.2.5 DELETED

SECTION 1.3 LOCAL CONDITIONS

1.3.1 ACCESS TO THE WORK AND HAUL ROUTES

a. General - Rights-of-way for access to the work from existing roads will be provided by the District. All work on the rights-of-way necessary for access to the site shall be performed by the Contractor at his expense.

The Contractor shall make his own investigation of the condition of available public or private roads and of clearances, restrictions, bridge-load limits, bond requirements, and other limitations that affect or may affect transportation and ingress and egress at the jobsites. The unavailability of transportation facilities or limitations thereon shall not become a basis for claims for damages or extension of time for completion of work. It shall be the Contractor's responsibility to construct and maintain, at his own expense and at his own risk, any haul roads, access roads, bridges, or drainage structures required for construction operations.

b. Existing roads - The use of existing roads shall be at the Contractor's own expense and risk. It shall be the Contractor's responsibility to anticipate and meet all conditions properly imposed upon the use of existing roads by those having jurisdiction thereover, including (without limitation of the generality of the foregoing) seasonal or other limitations or restrictions, the payment of excess size and weight fees, and the posting of bonds conditioned upon repair of road damage caused by contract-generated traffic. It shall be the Contractor's responsibility to satisfy all lawful demands for repair of damage to existing roads caused by contract-generated traffic.

c. Haul routes - The hauling of sand, gravel, earth materials, or other intrajob hauling, over public highways, roads, or bridges shall be in compliance with the applicable local regulations and shall be such as to minimize interference with or congestion of local traffic. Where haul routes cross public highways or roads, the Contractor shall provide barricades, flagmen, and other necessary precautions for safety of the public as provided in Paragraph 1.4.1, Safety of Public.

d. Payment - The cost of all work described in this paragraph shall be included in the prices bid in the schedule for other items of work.

1.3.2 USE OF LAND FOR CONSTRUCTION PURPOSES

The Contractor will be permitted to use Government/District land, controlled by the U. S. Bureau of Reclamation, for field offices, construction plant, storage yards, shops, and other facilities required for construction operations: Provided, That such use shall not interfere with any part of the work or of the work of other contractors or of the Government in the vicinity, or with reservations made by the Government for use of the land. Personnel housing will not be permitted on Government land, except housing for guards or watchmen as approved by the Contracting Officer.

If private land is used by the Contractor for construction facilities or other purposes, the Contractor shall make all necessary arrangements with the owner and shall pay all rentals or other costs connected therewith.

The location, construction, maintenance, operation, and removal of the Contractor's construction facilities on Government/District land shall be subject to the approval of the Contracting Officer.

1.3.3 USE AND MAINTENANCE OF ROADS

a. General - After their completion any operation and maintenance road ramps required to be constructed under

these specifications will be available for the use of the Contractor in his construction operations for the remaining work under the contract. The Contractor shall maintain the roadbed, structures, and surfacing of these roads and ramps until completion and acceptance of all the work under this contract. Maintenance is considered to include repair of any of the roads and ramps as required to keep them in good, safe, serviceable condition.

At his option, the Contractor may defer, until the latest practicable date within the specified completion period, placement of the surfacing on any of the roads or ramps subject to heavy and deteriorating use by his construction operations or equipment.

1.3.4 EXISTING FENCES

Fences on the right-of-way shall be removed by the Contractor where necessary for the performance of the work, and where required, shall be rebuilt in as good condition as found. Where designated, fences shall be maintained until the work is completed or their removal is authorized. Where the Contractor removes existing fences to facilitate the work, temporary fence protection for lands adjacent to the right-of-way shall be provided at all times during the continuation of the contract. Such temporary fence protection shall be adequate to prevent livestock from straying from or onto adjacent lands and shall be constructed complete with gates and/or cattle guards. Temporary fencing constructed on the right-of-way shall be removed by the Contractor as part of the cleanup operations prior to final acceptance of the completed work.

If the Contractor does not provide the necessary fences, gates, and cattle guards to adequately protect property adjacent to the right-of-way within a reasonable time after need for such protection arises, the Government will cause the work to be performed and backcharge the Contractor for such work.

The cost of all work described in this paragraph shall be included in the prices bid in the schedule for other items of work.

1.3.5 TRANSMISSION, TELEGRAPH, AND TELEPHONE LINES

The Contractor shall make all necessary or required provisions and shall perform all work required by his operations under the contract and incident to any interference with transmission, telegraph, or telephone lines, existing on the date bids are received, with their operation or with the maintenance of service thereon, all in a manner satisfactory to the owners or operators thereof and to the Government. Where an existing overhead transmission

line crosses an open waterway, roadway, or other feature of the work to be constructed under this contract, the Contractor will provide clearances at the crossing site between the transmission line and the original ground surface or between whichever is higher. Such clearances will be in accordance with the Sixth Edition of the National Electric Safety Code of the National Bureau of Standards, Department of Commerce. Any transmission line poles or accessories lying within the section of a waterway, roadway, pipe trench, or other feature of work will be moved by the Contractor. The Contractor shall provide at his expense any additional overhead clearances required for his construction operations.

The cost of providing and maintaining all necessary or required watchmen, signals, guards, and temporary structures; of making any necessary repairs, replacements, or similar operations; or furnishing indemnity or other bonds, if required; and all or any other costs required by this paragraph shall be paid by the Contractor and shall be included in the prices bid in the schedule for other items of work.

1.3.6 DELETED

1.3.7 DELETED

1.3.8 MAINTAINING PUBLIC TRAFFIC

The Contractor shall make all necessary provisions for the maintenance of public traffic and shall conduct his operations for the construction of the roadways so as to offer the least possible obstruction and inconvenience to public traffic. Convenient access to driveways, houses, and buildings along the line of the work shall be maintained, and temporary approaches to crossings or intersecting roads shall be provided and kept in good condition. Public traffic shall be permitted to cross over and pass through construction operations at all times with as little inconvenience and delay as possible and the Contractor shall, when ordered, provide and station competent flagmen whose sole duties consist of directing and controlling the movement of public traffic either through or around the work.

Where public traffic will be required to cross over or pass through the work, construction operations shall be conducted so as to provide a reasonably smooth, even, dustless, and unobstructed passageway for one lane of traffic at all times. The Contractor shall construct temporary connections of sufficient width for two lanes of traffic between the existing roadway and new construction, where necessary. At any and all points along the work where the nature of the construction operations in progress and the equipment and

machinery in use are of such character as to endanger passing traffic, the Contractor shall provide such guards as may be necessary to insure against accidents and avoid damage or injury to passing traffic.

The cost of all work involved in providing for maintenance of public traffic, as set forth in this paragraph, shall be included in the prices bid in the schedule for other items of work.

1.3.9 DELETED

1.3.10 CONSTRUCTION AT EXISTING WATERCOURSES AND UTILITIES

Where the work to be performed under these specifications crosses or otherwise interferes with water, sewer, gas, or oil pipelines; buried cable or other public or private utilities; or with artificial or natural watercourse, the Contractor shall provide for such utilities and watercourses, and shall perform such construction during the progress of the work so that no damage will result to either public or private interests. The term "watercourses" includes canals, ditches, terraces, furrows, or other features of surface irrigation systems. The Government does not represent that the locations of watercourses and utilities shown on the drawings are complete or exact. It shall be the responsibility of the Contractor to determine the actual locations of, and make provision for, all water courses and utilities.

The Contractor shall be liable for all damage that may result from failure to provide for such watercourses and utilities during the progress of the work and the Contractor shall indemnify and hold harmless the Government from claims of whatsoever nature or kind arising out of or connected with damage to utilities and watercourses encountered during construction; damages resulting from disruption of service; and injury to persons or damage to property resulting from the negligent, accidental, or intentional breaching or watercourses or utilities.

Irrigation systems disturbed by the work shall be restored in the location and in as good condition as found, except as otherwise approved.

If the Contractor does not maintain the existing watercourses and utilities in such condition that no damage will result to either public or private interests, the Government will cause the necessary repairs to be made and backcharge the Contractor for such work.

Except as other provided below, the cost of all work described in this paragraph shall be included in the prices bid in the schedule for other items of work.

1.3.11 GEOLOGIC INVESTIGATIONS

a. General - The drawings, logs of subsurface explorations, and test data in these specifications include information and records of subsurface investigations for the work and are the final geologic data on which design of the work is based. These data supersede any previous versions which may be available for examination by bidders.

Groundwater levels were not encountered in the explorations, as shown on the logs, for the indicated dates. The absence of a groundwater level or moisture content on any log of explorations within the areas does not, however, imply that groundwater or variable moisture content will not be encountered in the vicinity of such explorations.

Bidders are encouraged to obtain their own samples and perform tests on the soil and rock materials to evaluate properties which the bidder believes to be significant in arriving at a proper bid.

The District does not represent that the available cores, samples, logs, and other available subsurface information show the conditions that will be encountered in performing the work, and the District represents only that such subsurface information shows conditions encountered at the particular point from which such information was obtained. It is expressly understood that the making of deductions, interpretations, and conclusions from all the accessible factual information, including the nature of the materials to be excavated, the difficulties of making and maintaining the required excavations, and the difficulties of doing other work affected by the geology, water level elevations, and other subsurface conditions at the site of the work, are the Contractor's sole responsibility.

b. Geological description -

(1) Structural Geology - The Harquahala Plains is a basin of moderate size within the Basin and Range lowlands geological province. The major structural trend in the area is northwest-southeast which is visible in a series of parallel ranges of Precambrian rocks separated by alluvial basins. The principle basin-forming faults in the Harquahala Plains basin are steep and generally parallel on the northwest-southeast axis. The buried basement rock surface is probably stair-stepped due to periodic movement on these parallel faults from Tertiary to Quaternary time. Smaller, less numerous northeast-southwest faults have

modified what is now a narrow, deep trough. Continued movement on both sets of faults has resulted in displacement in the older sediments, but their presence in the upper, younger sediments has not been seen.

Volcanics associated with the middle aged and younger tectonic events covered most of the Precambrian

basement rock on the northeast side of the basin forming the Big Horn Mountains. Volcanics form the Eagle Tail Mountains on the southwest side of the basin. Basalt and tuffs from several periods extend into the basin and are interbedded with basin fill. The basin fill consist primarily of materials derived from the nearby mountain ranges. The lower basin fill is predominantly gravels with occasional interfingering zones of basalt, tuffs or conglomerates. The upper basin fill consist of silts, sands and clays of lacustrine origin in the center of the basin with gravels along the margins. Numerous well logs show the basin fill to vary in depth from 700 to over 1200 feet.

(2) Water - A detailed study of the Harquahala Plains by Metzger in 1957 gives detailed descriptions of the geology and quantitative data concerning ground water location and volume in this basin at the beginning of the ground water development period. Denis reviewed the ground water production to 1971 and in 1980, Graff published maps showing ground water level declines resulting from the pumping to that date. As a result of this long study period and accumulation of subsurface and pumping data the character and water supply potential of the basin fill are well known.

Both Denis and Graff show annual increases in pumpage and area farmed from 1951 to a maximum in the years 1962-1965. The decline of the ground water surface had reached 300 or more feet below the land surface by 1966. Reduction in both the number of wells and of pumpage since 1966 appears to have had a stabilizing effect on the ground water level declines in some areas, but annual ground water declines are still being reported in others.

(3) Geological investigations - Generalized descriptions of the geology of Arizona, including the areas traversed by the Westside canal are included in "A Resume of the Geology of Arizona" by E. D. Wilson, 1962 and the "Geologic Map of Maricopa County" both published by the Arizona Bureau of Mines. A compilation of the county maps was published as "Geologic Map of Arizona" at a scale of 1:500,000 by the U. S. Geological Survey in 1969. The geology of the Harquahala Plains is also covered by two reports:

"Geology and Ground-Water Resources of the Harquahala Plains Area, Maricopa and Yuma Counties, Arizona," by D. G. Metzger, Water Resources Report No. 3, 1957; and "Groundwater Conditions in the Harquahala Plains, Maricopa and Yuma Counties, Arizona," by E. E. Denis, April 1971, Water Resources Report No. 45, published by the Arizona State Land Department.

Geological and soils investigations were conducted during August and September 1983. Auger holes and test pits were used to explore subsurface conditions of the materials along and adjacent to the canal alignments. The field investigations consisted of the following:

(a) Test pits were excavated at 40 locations along the Westside canal. Test borings were drilled in the Centennial Wash area. Test pits ranged from 10 to 15 feet in depth. Test borings were drilled to depths of 30 feet using a truck mounted CME drilling rig with continuous hollow stem flight augers.

(b) Standard penetration test samples (ASTM:1586), or larger diameter ring samples, were driven in all test borings at various depths. These samples allows examination of the in-place condition of the sub-soils, and the sampling data (blows/foot) provides an indication of the relative density of the subsoils.

Various representative samples obtained during the field investigation were subjected to the following analyses:

Test	Purpose
Moisture Content	Field moisture condition
Dry Density	In-place density condition
Sieve Analysis and Plasticity	Laboratory classification
Specific Gravity	Specific gravity
Maximum Density-Optimum Moisture	Earthwork compaction properties
Compression	Compressability potential
Chemical Analysis	Total soluble salts, soluble sulfates, soluble chlorides, electrical resistivity

Wherever applicable, the tests were performed in compliance with the current edition of the Bureau of Reclamation's "Earth Manual."

Locations of subsurface explorations along the canal alignments are shown on the plans and profile of the canals. Stations given on the logs of these subsurface explorations were from a preliminary traverse line and do not reflect stations on the existing alignment.

Further information regarding test pits and borings with test results is available at the Engineers (Franzoy Corey Engineering Company) office in Tempe, Arizona.

(4) Site Geology - The Harquahala Valley Irrigation District Distribution System begins at the C.A.P., Reach 5B, turnout, Sta. 707+90, in the Harquahala Plains and extends south to the southern boundary of the Harquahala Valley Irrigation District. The alignment begins and traverses alluvial fan deposits (Qaf) for approximately 2 miles then, crosses and continues through basin fill deposits (Qbf) throughout the remainder of its length. The alluvial deposits vary from uncemented to strongly caliche cemented. The terms "weakly", "moderately", and "strongly cemented" are field determinations referring to soils that can be crushed with the fingers, broken by hand, or require a hammer blow to break, respectively.

From subsurface investigations, the basin fill deposits consist of mostly gravelly sand (SM-SP) with 25 to 35 percent gravel graded to 2" size, moderately hard, subangular; 10 to 20 percent silty fines, non to low plasticity; low moisture content.

The surface and subsoils at the locations of tests are predominantly coarse grain mixtures. That is, more than 50 percent of the subsoil sizes are generally sand and gravel mixtures larger than the number 200 sieve size. The predominant features of the stratifications are generalized as follows:

1. The gravel size materials encountered were of a subangular shape and predominantly graded to 1 to 2 inch sizes. However, larger gravel and cobble size materials were present on the ground surface in some areas and, although not encountered in the test borings, it is probable that some cobble and occasional boulder size materials will be encountered during mass excavating for the canal section, and in siphon excavations.

2. The sands are also subangular, and range from moderately to poorly graded.

3. Silty fines were encountered in all strata, and clayey fines in some strata in the vicinity of I-10 highway.

1.3.11a CONSTRUCTION AND FOUNDATION MATERIALS TEST DATA

a. General - Field and laboratory test data secured during the subsurface investigations for earth materials, were obtained prior to preparation of specifications and are included in the specifications. Available detailed data and descriptions of samples obtained from drill holes and test pits are included in the geologic logs contained in Volume 2 of the specifications. This data was collected to develop an applicable design for the structures rather than to delineate the representative conditions likely to be encountered for the design selected. The District does not represent that the samples show the complete range of conditions which will be encountered in construction of the feature work, but represents only that the data show the conditions encountered at the particular points from which each core or sample was obtained.

The test data are made available for information purposes only and it shall be expressly understood that the District will not be responsible for any interpretations, deductions, or conclusions drawn therefrom by the Contractor.

The District disclaims responsibility for any opinions, conclusions, interpretations, or deductions that may be expressed or implied in any of the information contained in this test data report, it being expressly understood that the making of deductions, interpretations, and conclusions from all of the accessible factual information is the bidder's sole responsibility.

1.3.12 ELECTRIC POWER FOR CONSTRUCTION PURPOSES

The Contractor shall make all necessary arrangements and shall provide all electric power required for his construction purposes. This shall include providing all necessary transmission lines, distribution circuits, transformers, and other electrical equipment required for distributing the power to the place or places of use by the Contractor.

At the termination of the contract under these specifications, the Contractor shall dismantle and remove all distribution lines serving his installations, or those of his subcontractors, that are not part of the permanent power installation.

No direct payment will be made to the Contractor for providing electric power for construction purposes and the cost thereof shall be included in the prices bid in the schedule for other items of work.

1.3.13 WATER FOR CONSTRUCTION PURPOSES

The Contractor shall make all necessary arrangements for and provide all water he requires for his construction purposes. The Contractor shall provide all facilities for obtaining water and all means for conveying water to the points of use.

Water may be available from privately owned wells within the District.

Water required for use in concrete shall meet the requirements set forth in Paragraph 5.3.4.

The cost of all work described in this paragraph shall be included in the prices bid in the schedule for other items of work.

SECTION 1.4 SAFETY

1.4.1 SAFETY OF THE PUBLIC

Roads subject to interference by the work shall be kept open or suitable detours shall be provided and maintained by the Contractor. The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient flasher lights, flagmen, danger signals and signs, and shall take all necessary precautions for the protection of the work and the safety of the public. Roads closed to traffic shall be protected by effective barricades on which shall be placed acceptable warning and detour signs. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise.

The cost of all work required by this paragraph shall be included in the prices bid in the schedule for other items of work.

1.4.2 SAFETY AND HEALTH

a. The Contractor shall not require any laborer or mechanic employed in the performance of the contract to work under conditions which are unsanitary, hazardous, or dangerous to his health or safety, as determined under construction safety and health standards promulgated by the Secretary of Labor under section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327 et seq.), as amended, and "Construction Safety Standards," published by the Bureau (Bureau of Reclamation).

b. The Contractor shall fully comply with the Bureau's "Construction Safety Standards" and amendments or revisions thereto in effect on the date bids are received. This handbook will be provided at no charge for use in connection

with the specifications. Construction Safety and Health Standard promulgated by the Secretary of Labor may be obtained from any regional or area office of the Occupational Safety and Health Administration of the U.S. Department of Labor.

c. The Contractor shall submit in writing a proposed safety program in the form and time intervals prescribed in section 2 of the "Construction Safety Standards."

d. The Contractor is responsible for being cognizant of and insuring compliance with the requirements set forth in subparagraphs a. and b. above. Such responsibility shall apply to both his operations and those of his subcontractors. When violations of the safety and health requirements contained in these specifications or standards referenced in subparagraph a. are called to his attention by the Contracting Officer or his authorized representatives, the Contractor shall immediately correct the condition to which attention has been directed. Such notice, either oral or written, when served on the Contractor or his representative(s) shall be deemed sufficient.

e. In the event the Contractor fails or refuses to promptly comply with the compliance directive issued under Subparagraph d. above, the Contracting Officer or his authorized representative may issue an order to stop all or any part of the work. When satisfactory corrective action is taken, an order to resume work will be issued. The Contractor shall not be entitled to any extension of time, nor to any claim for damage or to additional compensation by reason of either the directive or the stop order. Failure of the Contracting Officer or his representative to order discontinuance of any or all of the Contractor's operations shall not relieve the Contractor of his responsibility for the safety of personnel and property.

f. The Contractor shall maintain an accurate record of, and shall report to the Contracting Officer's authorized representative in the manner prescribed by the Contracting Officer, all cases of death, occupational diseases, or traumatic injury to employees or the public involved, and property damage in excess of $2,500 incident to performance of work under this contract.

g. The rights and remedies of the Government provided in this paragraph are in addition to any other rights and remedies provided by law or under this contract.

h. In the event there is a conflict between the requirements contained in the Bureau's "Construction Safety Standards," specifications paragraphs, Contractor's approved safety program, referenced safety and health codes and standards, or the U.S. Department of Labor construction

safety and health standards, promulgated under section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327 et seq.), as amended, the more stringent requirement will prevail.

i. The cost of complying with this paragraph shall be included in the prices bid in the schedule for other items of work.

1.4.3 DELETED

1.4.4 DELETED

1.4.5 SUBMISSION OF MATERIAL SAFETY DATA SHEETS FOR HAZARDOUS MATERIAL

Federal Standard No. 313B for the preparation and submission of material safety data sheets is hereby incorporated and made a part of these specifications.

The Contractor shall submit a completed MSDS (Material Safety Data Sheet), Department of Labor Form OSHA-20, or GSA approved Alternate Form A for each hazardous material as required by Federal Standard No. 313B, to the Bureau of Reclamation, attention D-160, P.O. Box 25007, Denver, Colorado, 80225, and to Construction Engineer, Arizona Projects Office, Suite 2200 Valley Center, 201 North Central Avenue, Phoenix, Arizona, 85073. The information in this MSDS will be followed to assure safe use, handling, storage, and an environmentally acceptable disposal of the commodity used on the Bureau jobsite or by Bureau activities. For purpose of preparing and submitting the MSDS, a hazardous material is any commodity that contains a component with one or more of the following characteristics:

(a) Has a flashpoint below 200°F (93.3°C) closed cup, or is subject to spontaneous heating or is subject to polymerization with release of large amounts of energy when handled, stored, and shipped without adequate control.

(b) Has a threshold limit value equal to or below 1000 parts per million for gases and vapors, below 500 milligrams per cubic meter for fumes, and equal to or less than 30 million parts per cubic foot or 10 milligrams per cubic meter for dusts (less than or equal to 2.0 fibers per cubic centimeter greater than 5 micrometers in length for fibrous materials).

(c) A single oral dose which will cause 50 percent fatalities to test animals when administered in doses of less than 500 milligrams per kilogram of test animal weight.

(d) Is a flammable solid as defined in 49 CFR 173.150, or is an oxidizer, or is a strong oxidizing or reducing agent.

(e) Causes first degree burns to skin in short time exposure, or is systematically toxic by skin contact.

(f) In the course of normal operations, may produce dusts, gases, fumes, vapors, mists, or smokes with one or more of the above characteristics.

(g) Produces sensitizing or irritating effects.

(h) Is radioactive.

(i) The item has special characteristics which in the opinion of the manufacturer could cause harm to personnel if used or stored improperly.

(j) The item is hazardous in accordance with 29 CFR, Part 1910.

(k) The item is hazardous in accordance with 49 CFR, Parts 171-179.

(l) The item is regulated by the Environmental Protection Agency under 40 CFR.

The Contractor shall submit a MSDS for each item listed or which contains an item listed in Table 1, "Federal Supply Classes in Which All Items Must Be Identified and Certified", of Federal Standard 313B, Appendix A.

The Contractor shall also identify and certify those items which are listed in Table 11, "Federal Supply Classes In Which Only Hazardous Items Need To Be Identified", of Federal Standard 313B, Appendix A, and have hazardous characteristics.

The cost of complying with this paragraph shall be included in the prices bid in the schedule for other items of work.

SECTION 1.5 ENVIRONMENTAL QUALITY PROTECTION

1.5.1 LANDSCAPE PRESERVATION

a. General - The Contractor shall exercise care to preserve the natural landscape and shall conduct his construction operations so as to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for permanent works, approved construction roads, or excavation operations, all trees, native shrubbery, and vegetation shall be preserved and

shall be protected from damage by the Contractor's construction operations and equipment. The edges of clearings and cuts through trees, shrubbery, and vegetation shall be irregularly shaped to soften the undesirable visual impact of straight lines. Movement of crews and equipment within the right-of-way and over routes provided for access to the work shall be performed in a manner to prevent damage to grazing land, crops, or property.

On completion of the work, all work areas shall be prepared for seeding in accordance with Section 2.5 - Erosion Control. All unnecessary destruction, scarring, damage, or defacing of the landscape resulting from the Contractor's operations shall be repaired, replanted, reseeded, or otherwise corrected as directed by the Contracting Officer and at the Contractor's expense.

b. Construction roads - The location, alignment, and grade of construction roads shall be subject to approval of the Contracting Officer. When no longer required by the Contractor, construction roads shall be restored to the original contour and made impassable to vehicular traffic. The surfaces of such construction roads shall be seeded in accordance with Section 2.5 - Erosion Control.

c. Construction facilities - The Contractor's shop, office, and yard area shall be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. On abandonment all storage and construction buildings, including concrete footings and slabs, and all construction materials and debris shall be removed from the site. The area shall be regraded, as required, so that all surfaces drain naturally and blend with the natural terrain. The areas shall then be seeded in accordance with Section 2.5 - Erosion Control.

d. Blasting precautions - In addition to the requirements of section 24 of Bureau of Reclamation's publication "Construction Safety Standards," the Contractor shall adopt precautions when using explosives which will prevent scattering of rocks, stumps, or other debris outside the work area, and prevent damage to surrounding trees, shrubbery, and vegetation.

e. Costs - The cost of all work required by this paragraph (except seeding) shall be included in the prices bid in the schedule for other items of work.

1.5.2 PRESERVATION OF TREES AND SHRUBBERY

a. Preservation - All trees and shrubbery which are not specifically required to be cleared or removed for construction purposes shall be preserved and shall be protected from any damage that may be caused by the

Contractor's construction operations and equipment. Special care shall be exercised where trees or shrubs are exposed to injuries by construction equipment, blasting, excavating, dumping, chemical damage, or other operations; and the Contractor shall adequately protect such trees by use of protective barriers or other methods approved by the Contracting Officer. The removal of trees or shrubs will be permitted only after prior approval by the Contracting Officer.

The layout of the Contractor's construction facilities, such as shops, warehouses, storage areas, and parking areas; location of access and haul routes; and operations in borrow and spoil areas shall be planned and conducted in such manner that all trees and shrubbery not approved for removal by the Contracting Officer shall be preserved and adequately protected from either direct or indirect damage by the Contractor's operations.

Except in emergency cases or when otherwise approved by the Contracting Officer, trees shall not be used for anchorages. Where such use is approved, the trunk shall be wrapped with a sufficient thickness of approved protective material before any rope, cable, or wire is placed.

b. Repair or treatment of damage - The Contractor shall be responsible for injuries to trees and shrubs caused by his operations. The term "injury" shall include, without limitation, bruising, scarring, tearing, and breaking of roots, trunk, or branches. All injured trees and shrubs shall be repaired or treated without delay, at the Contractor's expense. If damage occurs, the Contracting Officer will determine the method of repair or treatment to be used for injured trees and shrubs as recommended by an experienced horticulturist or a licensed tree surgeon provided by and at the expense of the Contractor. All repairs or treatment of injured trees shall be performed under the direction of an experience horticulturist or a licensed tree surgeon provided by and at the expense of the Contractor.

Where tree climbing is necessary, the use of climbing spurs will not be permitted. If climbing is necessary, safety ropes shall be required.

c. Replacement - Trees or shrubs that, in the opinion of the Contracting Officer, are beyond saving shall be removed and replaced early in the next planting season. The replacements shall be the same species, or other approved species, of the maximum size that is practicable to plant and sustain growth in the particular environment. Replacement trees and shrubs shall be guyed, watered, and maintained for a period of 1 year. Any replacement tree or shrub that dies shall be removed and replaced, as directed

by the Contracting Officer, with such replacements being maintained for a period of 1 year from the date of replacement.

d. Costs - The costs of all work required by this paragraph shall be included in the prices bid in the schedule for other items of work.

1.5.3 PROTECTED PLANTS

Certain native plants in the State of Arizona are considered as protected plants in accordance with the provisions of the latest revision of the Arizona Native Plant Law. The Contractor shall ascertain which construction areas contain protected plants and, at least 60 days before beginning construction operations in such an area, shall notify the Contracting Officer. The Contractor will arrange for removal of the protected plants and the Contractor shall cooperate with those performing such removal.

The cost of complying with this paragraph shall be included in the prices bid in the schedule for other items of work.

1.5.4 PREVENTION OF WATER POLLUTION

a. General - The Contractor's construction activities shall be performed by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, and other pollutants and wastes into streams, flowing or dry watercourses, lakes, and underground water sources. Such pollutants and wastes include, but are not restricted to, refuse, garbage, cement, concrete, sanitary waste, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution.

Unwatering work for structure foundations or earthwork operations adjacent to, or encroaching on, streams or watercourses shall be conducted in a manner to prevent muddy water and eroded materials from entering the streams or watercourses by construction of intercepting ditches, bypass channels, barriers, settling ponds, or by other approved means. Excavated materials or other construction materials shall not be stockpiled or deposited near or on streambanks, lake shorelines, or other watercourse perimeters where they can be washed away by high water or storm runoff or can in any way encroach upon the actual watercourse itself.

Waste waters from aggregate processing, concrete batching, or other construction operations shall not enter streams, watercourses, or other surface waters without the use of such turbidity control methods as settling ponds, gravel-filter entrapment dikes, approved flocculating processes that are not harmful to fish, recirculation

systems for washing of aggregates, or other approved methods. Any such waste waters discharged into surface waters shall contain the least concentration of settleable material possible. For the purpose of these specifications, settleable material is defined as that material which will settle from the water by gravity during a 1-hour quiescent detention period.

b. Compliance with laws and regulations - The Contractor shall comply with applicable Federal and State laws, orders, regulation, and water-quality standards concerning the control and abatement of water pollution.

Prior to discharging waste water or other pollutants, or dredged or fill materials into navigable waters, the Contractor shall have the required permits and abide by nationwide standards for water pollution material.

Where the location of a construction site is such that oil from an accidental spill could reasonably be expected to enter into or upon the navigable waters of the United States or adjoining shorelines, and the aggregate storage of oil at the site is over 1,320 gallons or a single container has a capacity in excess of 660 gallons, the Contractor shall prepare a SPCC Plan (Spill Prevention Control and Counter Measure Plan) reviewed and certified by a registered professional engineer in accordance with 40 (CFR, part 112), as required by Public Law 92-500 as amended by Public Law 95-217 and Public Law 95-576.

The Contractor shall submit to the Contracting Officer a certified statement that states the SPCC plan was reviewed and certified by a registered professional engineer.

The Contractor shall also comply with the sanitation and potable water requirements of section 7 of the Bureau of Reclamation's publication "Construction Safety Standards".

c. Cost - The costs of complying with this paragraph shall be included in the prices bid in the schedule for the various items of work.

1.5.5 ABATEMENT OF AIR POLLUTION

The Contractor shall comply with applicable Federal, State, and local laws and regulations concerning the prevention and control of air pollution.

In conduct of construction activities and operation of equipment, the Contractor shall utilize such practicable methods and devices as are reasonably available to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminants.

The emission of dust into the atmosphere will not be permitted during the manufacture, handling, and storage of concrete aggregate, and the Contractor shall use such methods and equipment as are necessary for the collection and disposal, or prevention, of dust during these operations. The Contractor's methods of storing and handling cement and pozzolans shall also include means of eliminating atmospheric discharges of dust.

Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, shall not be operated until corrective repairs or adjustments are made.

Burning of materials resulting from clearing of trees and brush, combustible construction materials, and rubbish will be permitted only when atmospheric conditions for burning are considered favorable and when authorized by appropriate State or local air pollution or fire authorities. In lieu of burning, such combustible materials may be removed from the site, chipped or shredded, or buried as provided in Paragraphs 1.5.11 and 2.1.1. Where open burning is permitted, the burn piles shall be properly constructed to minimize smoke, and in no case shall unapproved materials, such as tires, plastics, rubber products, asphalt products, or other materials that create heavy black smoke or nuisance odors, be burned.

Storage and handling of flammable and combustible materials, provisions for fire prevention, and control of dust resulting from drilling operations shall be in accordance with the applicable provisions of the Bureau of Reclamation publication "Construction Safety Standards".

Dust nuisance resulting from construction activities shall be prevented in accordance with Paragraph 1.5.6.

The costs of complying with this paragraph shall be included in the prices bid in the schedule for the various items of work.

1.5.6 DUST ABATEMENT

During the performance of the work required by these specifications or any operations appurtenant thereto, whether on right-of-way provided by the District, or elsewhere, the Contractor shall furnish all the labor, equipment, materials, and means required, and shall carry out proper and efficient measures wherever and as often as necessary to reduce the dust nuisance, and to prevent dust which has originated from his operations from damaging crops, orchards, cultivated fields, and dwellings, or causing a nuisance to persons. The Contractor will be held liable for any damage resulting from dust originating from

his operations under these specifications on District right-of-way or elsewhere.

The cost of methods of reducing formation of dust, including the application of water, shall be included in the prices bid in the schedule for other items of work.

1.5.7 DELETED

1.5.8 LIGHT ABATEMENT

The Contractor shall exercise special care to direct all stationary floodlights to shine downward at an angle less than horizontal. These floodlights shall also be shielded so as not to become a problem to surrounding areas. No lighting shall include a residence in its direct beam.

The Contractor shall be responsible for correcting lighting problems when they occur, as approved by the Contracting Officer.

All costs of complying with the provisions of this paragraph shall be included in the prices bid in the schedule for other items of work.

1.5.9 PRESERVATION OF HISTORICAL AND ARCHAEOLOGICAL DATA

a. Federal legislation provides for the protection, preservation, and collection of scientific, prehistorical, historical, and archaeological data (including relics and specimens) which might otherwise be lost due to alteration of the terrain as a result of any Federal construction project.

b. The Contractor agrees that should he or any of his employees in the performance of this contract discover evidence of possible scientific, prehistorical, historical, or archaeological data he will immediately cease work in the discovery areas and notify the Contracting Officer immediately giving the location and nature of the findings. Written confirmation shall be forwarded to the Contracting Officer within 2 days. The Contractor shall exercise care so as not to damage artifacts or fossils uncovered during excavation operations and shall provide such cooperation and assistance as may be necessary to preserve the findings for removal or other disposition by the Government.

c. Where appropriate by reason of a discovery, the Contracting Officer may order delays in the time of performance, or changes in the work, or both. If such delays, or changes, or both, are ordered, the time of performance and contract price shall be adjusted in accordance with the applicable clauses in the General Provisions of this contract.

d. The Contractor agrees to insert this paragraph in all subcontracts which involve the performance of work on the terrain of the site.

e. Except as otherwise provided above, the cost of complying with this paragraph shall be included in the prices bid in the schedule for other items of work.

1.5.10 PESTICIDES

Pesticides include herbicides, insecticides, fungicides, rodenticides, piscicides, surface disinfectants, animal repellents, and insect repellents. Should the Contractor find it necessary to use pesticides in work areas of this contract, he shall submit his plan for such use to the Contracting Officer for written approval. Such plan shall be subject to submittal to and review by the Regional Pest Control Specialist before the plan is approved.

Pesticides shall only be those registered with the Environmental Protection Agency in compliance with the Federal Environmental Pesticide Control Act of 1972 or by appropriate state agencies.

The Contractor shall read and comply with all labeling requirements when using pesticides.

Requirements contained in the Bureau's publication "Construction Safety Standards" are applicable to pesticide storage, mixing, and application. In the event there is a conflict between the requirements contained in the Bureau's "Construction Safety Standards" and other Federal or State codes or standards, the more stringent requirement will prevail.

The cost of complying with this paragraph shall be included in the prices bid in the schedule for other items of work.

1.5.11 CLEANUP AND DISPOSAL OF WASTE MATERIALS

a. Cleanup - The Contractor shall at all times keep the construction area, including storage areas used by him, free from accumulations of waste materials or rubbish.

Prior to completion of the work, the Contractor shall remove from the vicinity of the work all plant facilities, buildings, rubbish, unused materials, concrete forms, and other like material, belonging to him or used under his direction during construction. All work areas shall be graded and left in a neat manner conforming to the natural appearance of the landscape as provided in Paragraph 1.5.1.

In the event of the Contractor's failure to perform the above work, the work may be performed by the Government, at

the expense of the Contractor, and his surety or sureties shall be liable therefor.

b. Disposal of waste materials -

(1) General - Waste materials including, but not restricted to, refuse, garbage, sanitary wastes, industrial wastes, and oil and other petroleum products, shall be disposed of by the Contractor. Except as otherwise provided in Paragraph 2.1.1, disposal of combustible materials shall be by burying; by burning, where burning of such materials is permitted in accordance with State and local laws; or by removal from the construction area. Except as otherwise provided in Paragraph 2.1.1, disposal of noncombustible materials shall be by burying or by removal from the construction area. Waste materials removed from the construction area shall be dumped at an approved dump.

(2) Disposal of material by burying - Burial shall be in pits at locations shown on the drawings or as otherwise approved by the Contracting Officer. The pits shall be covered by at least 2 feet of earth material prior to abandonment.

(3) Disposal of material by burning - The Contractor shall secure the necessary burning permits from the state and local authorities. All burning shall be in accordance with State and local laws.

All materials to be burned shall be piled in designated burning areas in such a manner as will cause the least fire hazards. Burning shall be thorough and complete and all charred pieces remaining after burning, except for scattered small pieces, shall be removed from the construction area and disposed of as otherwise provided in this paragraph.

The Contractor shall, at all times, take special precautions to prevent fire from spreading beyond the piles being burned and shall be liable for any damage caused by his burning operations. The Contractor shall have available, at all times, suitable equipment and supplies for use in preventing and suppressing fires and shall be subject to all laws and regulations locally applicable for presuppression, suppression, and prevention of fires.

(4) Disposal of material by removal - Material disposed of by removal from the construction area shall be removed from such lands prior to the completion of the work under these specifications. All materials removed shall become the property of the Contractor.

Materials to be disposed of by dumping shall be hauled to an approved dump. It shall be the responsibility of the Contractor to make any necessary arrangements with private parties and with county officials pertinent to locations and regulations of such dumping. Any fees or charges required to be paid for dumping of materials shall be paid by the Contractor.

c. Payment - The costs of complying with this paragraph shall be included in the prices bid in the schedule for the various items of work.

DIVISION 2 - SITEWORK

SECTION 2.1 CLEARING AND GRUBBING

2.1.1 CLEARING

a. General - That portion of the right-of-way where required for access to and for constructing the work under these specifications shall be cleared of all vegetation, such as trees, brush, grass, and weeds and all other objectionable matter including roots: Provided, That trees so designated on the drawings shall not be cut and shall be protected from injury as provided in paragraph 1.5.2. Materials from clearing operations shall be disposed of as provided in subparagraph b. below.

Clearing adjacent to cut-and-fill sections shall be to a minimum distance of 3 feet outside of the slope lines.

b. Disposal of cleared materials - Material from clearing operations shall be disposed of by burning, wasted within the right-of-way, reducing to chips and spreading as described below, or removal from the worksite. Disposal of material by burning and by removal from the worksite shall be performed in accordance with the provisions of paragraph 1.5.11 for disposing of waste material by burning and by removal, respectively.

Materials to be disposed of by chipping and spreading shall be reduced to chips of 1/2-inch-maximum thickness. The chips shall be distributed uniformly on the ground surface between the slope lines and right-of-way lines as approved. The chips shall be mixed with the underlying earth so that they will not support combustion.

2.1.2 GRUBBING

The ground surface under all embankments of normal dimensions, as shown on the drawings, and the surface of all excavation that is to be used for embankments shall be cleared of all stumps, roots, and vegetable matter of every kind. The stumps shall be pulled or otherwise removed and the roots shall be grubbed. The stumps and roots and any other combustible material removed shall be disposed of in the manner described in paragraph 2.1.1 for the disposal of cleared materials.

2.1.3 MEASUREMENT AND PAYMENT

Clearing and grubbing will not be measured for payment. Payment for clearing and grubbing will be made at the lump sum price bid therefor in the schedule and shall be included in the monthly estimate for progress payments as a

percentage of the operations which have been completed at that time.

This price shall include the cost of all work required by paragraphs 2.1.1 and 2.1.2, including disposal of the cleared and grubbed materials.

SECTION 2.2 USE OF WATER

2.2.1 WATER FOR DUST ABATEMENT

a. General - The Contractor shall procure and apply water for dust abatement and shall provide all means of conveying the water to the point of use.

b. Application - The amounts of water applied for dust abatement shall be adequate to provide and maintain a dust-free operation at all times during the period of this contract.

c. Costs - The costs of procuring, conveying and applying water for dust abatement shall be included in the prices bid in the schedule for other items of work.

2.2.2 PREWETTING

a. General - The Contractor shall furnish all labor, materials, and equipment and shall procure, convey and apply water for prewetting at the locations and extent detailed below and in accordance with the applicable provisions of paragraph 3.1.3 and 3.4.2.

(1) Canal alignment, including integral structures, from Sta. 117+82.39 to Sta. 383+73.74. Determination of minimum width of prewetted area shall be the toe or intersection point of the compacted embankment slope and natural ground and/or the top of the cut point whichever is greater. Water shall be applied in sufficient quantities to achieve a minimum depth of penetration of 5 feet below the elevation of the natural ground for embankment, and a minimum of 5 feet below, or back from, any cut surface. Within the canal prism, the minimum depth of penetration shall be 5 feet below the final canal invert elevation.

During the time interval between trimming the canal prism and placing canal lining the surfaces of the canal prism shall be wetted by sprinkling with a fine spray to keep the canal prism moist but not enough to cause erosion of the prism.

(2) Embankment foundation for detention dikes to be constructed along the canal alignment. Minimum width of prewetted area shall be the distance from

toe-of-slope to toe-of-slope of the embankments. Water shall be applied in sufficient quantities to achieve a minimum depth of 3 feet below the elevation of the natural ground upon which the embankment will be constructed.

(3) All borrow areas and any and all areas which the Contractor is required to excavate shall be prewet to the top width of the actual excavation. Water shall be applied in sufficient quantities to achieve the proper moisture content of the entire volume of material to be excavated.

Prewetting of areas underlying spoil or waste embankments will not be required, unless such embankments lie within the limits specified above.

Prewetting shall be accomplished in one continuous application by sprinkler irrigation before any clearing, grubbing, excavation, or construction of embankments is begun. The Contractor shall submit his program for prewetting to the Construction Engineer prior to beginning prewetting operations. The method of applying water and the amount of water applied shall be subject to approval by the Contracting Officer.

Temporary easements or rights-of-way other than the construction ROW provided must be obtained by the Contractor.

b. Payment - Payment for prewetting will be made at the lump-sum price bid therefor in the schedule and shall include costs of furnishing all labor, equipment, materials, water, rights-of-way, moving to the sites, assembling into working condition, operation and maintenance, disassembling and removing from the site, and all other work required by this paragraph.

Fifty percent of the lump-sum price bid in the schedule for prewetting will be included in the monthly estimate for progress payments for the month during which the prewetting operations have commenced. The remaining 50 percent of the lump-sum price will be included in the monthly estimates for progress payments as a percentage of the prewetting operations which have been completed during the month for which such estimate is prepared.

SECTION 2.3 SITE DRAINAGE

2.3.1 CROSS DRAINAGE

a. General - The Contractor shall handle all flows from natural drainage channels intercepted by the work under

these specifications. He shall provide and maintain any temporary construction required to bypass or otherwise cause the flows to be harmless to the work and adjacent property. When the temporary construction is no longer needed and prior to acceptance of the work, the Contractor shall remove the temporary construction and restore the site to its original conditions as approved by the Contracting Officer.

b. Payment - The cost of all work and materials required by this paragraph shall be included in the prices bid in the schedule for other items of work.

SECTION 2.4 FENCING

2.4.1 REMOVING AND RE-INSTALLING BARBED WIRE FENCE

a. General - The Contractor shall remove and re-install barbed wire fence as necessary.

b. Cost - The cost of removing and re-installing barbed wire fence shall be included in the prices bid in the schedule for related items of work.

2.4.2 BARBED WIRE FENCE

a. General - Barbed wire fences on metal posts with chain link gates, shall be erected in the locations and to the lines shown on the drawings and in accordance with the details shown on the drawings. The Contractor shall furnish all materials for the fence and gates including posts, wire, and all necessary hardware and accessories for complete installation.

b. Materials - All fence materials shall be zinc-coated (galvanized) after fabrication and except as otherwise provided herein, all zinc coating shall be in accordance with ASTM designation: A 123. At the Contractor's option, in lieu of zinc coating, the posts and braces may be furnished with the manufacturer's standard rust-resistance paint finish.

(1) Posts - All line, gate, brace, end, and corner posts and braces shall conform to Federal Specifications RR-F-221G/Gen and RR-F-221/3, except that the lengths of style 14 angle section posts shall be as shown on the drawings and that braces shall be of the same length as the post to which attached. Line posts may be either style 12, T-section or style 13, U-section posts weighing not less than 1.33 pounds per linear foot of post: Provided, that all line posts installed under these specifications shall have the same shape. Gate, brace, end and corner posts and braces shall be style 14 angle sections.

(2) Barbed wire - Barbed wire shall be galvanized and shall be No. 12-1/2 gage with two point, No. 14-gage round barbs spaced not more than 5 inches apart, conforming to Federal Specification RR-F-221G/Gen and RR-F-221/1A, Type I.

(3) Stays and fasteners - Stays and fasteners shall conform to Federal Specifications RR-F-221G/Gen and RR-F-221/3A.

(4) Gates and gate accessories - Except as otherwise provided in this paragraph or shown on the drawings, gates and gate accessories shall be in accordance with Federal Specification RR-F-191/2C, Type I or II.

Gates shall be swing-type gates with hot-dip, zinc-coated, steel pipe frames. Steel pipe shall conform to ANSI/ASTM A 120, schedule 40, standard weight. The zinc coating shall have weight of not less than 1.8 ounces per square foot of surface. The gate fabric shall be standard chain link mesh, No. 11 gauge with a minimum weight of zinc coating of 1.2 ounces per square foot of uncoated wire surface area.

Each gate shall be equipped with heavy hinges that will allow a full gate opening between gate posts. The hinges shall be designed to not twist or turn under gate action and shall allow the gate to swing a full 180° to lie along and parallel to the fenceline. The gate latch shall be a latch suitable for padlocking.

Gate hinges, latches, and other accessories shall be of zinc-coated steel, ductile iron, or malleable iron, except that wire ties and clip bolts and nuts may be of aluminum alloy. The minimum weight of the zinc coating shall be 1.2 ounces per square foot of coated surface area.

c. Erection - All brush and other obstacles which would interfere with the proper erection of the fences shall be removed in advance of starting fencing operations. Materials so removed shall be disposed of as provided in paragraph 1.5.11. Existing fences shall be connected to the new fences in accordance with the details shown on the drawings.

Corner posts, brace posts, gate posts, and end posts including the required braces for each post shall be set in concrete as shown. All posts shall be set plumb to the depths shown on the drawings and in accurate alignment. Line postholes shall be backfilled in layers not to exceed 8 inches and each layer shall be tamped.

The cement content of concrete for setting posts and braces shall not be less than 5-1/2 bags per cubic yard of concrete.

Approved steel post drivers shall be used for driving line posts and care shall be taken in driving and hauling the posts to avoid damage to the protective coating. It is desired that posts be set in alignment and spaced as shown on the drawings, but where large boulders or other similar obstructions interfere, the Contractor will be permitted to move the location of posts a maximum of two feet in any direction within the right-of-way but preferably along the line of the fence in order to avoid the obstruction.

At changes in alignment, the deflection points shall be considered as corners and corner posts and bracing shall be installed where shown on the drawings. At other deflection points, on curves and at intermediate locations along tangents at not more than 650-foot intervals, bracing shall be installed. Where such bracing does not occur in the form of gate posts, corner posts, and end posts, brace posts shall be installed.

On tangents, the wires shall be placed on the sides of the posts away from the waterway and on curves, the wire shall be placed on the sides of the posts away from the center of the curve.

At grade changes where stresses tending to pull posts from the ground are created, the fencing shall be anchored at the critical point by a double strand of No. 8-gage wire connecting to each horizontal line of fence wiring and to a deadman, weighing not less than 100 pounds, and buried in the ground not less than 2 feet.

All wire shall be drawn tight and fastened securely to each post with two wraps of tie wire, or by means of standard approved clips specifically designed for the purpose. Wire stays shall be placed in all panels as shown on the drawings.

Gates shall be located and erected in accordance with the drawings and shall be adjusted to operate in a proper manner.

d. Measurement and payment - Measurement for payment for furnishing and erecting barbed wire fence will be made of the actual length along the top wire of each line of erected fence, including length of tubular metal frame gates. Payment for furnishing and erecting barbed wire fence will be made at the unit price per linear foot bid therefor in the schedule, which unit price shall include the cost of furnishing all materials, including cement; digging and backfilling postholes; required earthwork; placing concrete for posts and braces; making the fence connections; gates; and all other work required for the complete erection of the fence.

SECTION 2.5 SOIL EROSION CONTROL

2.5.1 SEEDING

a. General - The contractor shall furnish and place seed as shown on the drawings at the following locations:

(1) All excavated area, excluding the top widths of operation and maintenance roads and the inside slope of the canal prism.

(2) All embankment area, excluding the top widths of operation and maintenance roads and the inside slope of the canal prism.

(3) All waste areas.

(4) Any natural ground area which is disturbed by the contractor's equipment or plant operations.

Seeding shall be done between October 15 and February 15.

Fertilizer, soil amendments, and mulching will not be required.

b. Seeding mixture - The seeding misture shall be of the species and percentage of mix shown in table 2A:

TABLE 2A

Genus/Species	Common name	Percent mix	Pounds per acre (Pure live seed)
Plantago insularis	desert indianwheat	20%	0.6
Atriplex polycarpa	desert saltbush	20%	0.75
Franseria dumosa	white bursage	20%	3.6
Schismus barbatus	schismus	20%	0.1
Sphaeralcea ambigua	desert globemallow	20%	0.75
TOTAL			5.8

c. Seeding preparation and treatment - Areas to be treated shall be dressed to a reasonably smooth, firm surface.

On sites where equipment can operate (generally slopes flatter than 1-1/2:1), the seedbed shall be adequately loosened (4 to 6 inches deep) and smoothed to a depth to allow drill seeding. Disking or cultipacking or both may be necessary as determined by the contracting officer.

On sites where equipment cannot operate, the seedbed shall be prepared by hand by scarifying to provide a roughened surface so that broadcast seed will stay in place.

If seeding is to be done immediately following construction, seedbed preparation may not be required except on compacted, polished, or freshly cut areas.

Rocks larger than 6 inches in diameter, trash, weeds, and other debris that will interfere with seeding or maintenance shall be removed or disposed of as directed.

Seedbed preparation shall be suspended when soil moisture conditions are not suitable for the preparation of a satisfactory seedbed as determined by the contracting officer.

Seed shall be applied at the rate of 5.8 pounds of PLS (pure live seed) per acre.

Seed placement shall be one-fourth to one-half inch deep on slopes flatter than 3:1 and shall be done with rangeland-type drill equipped with depth bands and packer wheels.

Seed on slopes of 3:1 or steeper may be broadcast or drilled.

Broadcast seeded areas shall be raked or dragged with a chain to cover the seed.

d. Cost - The cost for seeding disturbed areas and embankments, as outlined in this paragraph, shall be included in the prices bid in the schedule for other items of work.

DIVISION 3 - EARTHWORK

SECTION 3.1 EARTHWORK, GENERAL

3.1.1 EARTHWORK, GENERAL

Direct payment for earthwork performed under these specifications will only be made for the earthwork required for construction of open canal, floodways, and detention dikes. No direct payment will be made for earthwork required for construction of the concrete and pipe structures listed in the bidding schedule.

3.1.2 EARTHWORK DIAGRAMS AND DATA

To the extent that they exist, preliminary mass diagrams and earthwork data prepared for the preliminary studies of earthwork for construction of the canal will be available for inspection by bidders in the office of the District's Engineer, Franzoy Corey Engineering Company, located at 1030 E. Guadalupe Road, Tempe, Arizona 85283.

Such preliminary earthwork information is made available solely for the convenience of bidders. The District does not represent that this information is accurate or complete. Bidders are cautioned that this information is subject to revision and that the District disclaims responsibility for any interpretations, deductions, or conclusions which may be made therefrom. It is not intended that this preliminary earthwork information will limit or prescribe the excavation and hauling procedures of the Contractor, and the District reserves the right to utilize and distribute earthwork materials during the progress of the work as best serves the interest of the District.

3.1.3 COMPACTING EARTH MATERIALS

a. General - Where compacting of earth materials is required, the materials shall be deposited in horizontal layers and compacted as specified in this paragraph. The excavation, placing, moistening, and compacting operations shall be such that the material will be uniformly compacted and will be homogeneous, free from lenses, pockets, streaks, voids, laminations, or other imperfections.

b. Compacting clayey and silty materials - Where compaction of earth materials containing appreciable amounts of clay or silt is required, the materials shall be deposited in horizontal layers. The thickness of each horizontal layer after compaction shall be not more than 6 inches or two-thirds the length of the roller tamping feet whichever is the lesser. Where compaction is performed by hand or power tampers, the compacted layers shall not exceed 6 inches in thickness. The excavating and placing operations shall be such that the materials when compacted

will be blended sufficiently to secure the highest practicable density and lowest permeability and highest shear strength. If the surface of any compacted layer of earthfill is too dry or smooth to bond properly with the layer of material to be placed thereon, it shall be moistened and/or scarified in an approved manner to provide a satisfactory bonding surface before the next succeeding layer is placed.

Prior to and during compaction operations, the materials shall have a moisture content of not greater than 2 percent wet or less than 2 percent dry of optimum moisture, and the moisture content shall be uniform throughout each layer.

The optimum moisture content is defined as that moisture content which will result in the laboratory maximum dry density of the soil when subjected to either of the Bureau of Reclamation test procedures discussed in subparagraph b.(1) below.

Insofar as practicable, moistening of the material shall be performed at the site of excavation; but if necessary such moistening shall be supplemented by sprinkling at the site of compaction. If the moisture content is less than optimum for compaction by more than 2 percentage points or is greater than optimum for compaction by more than 2 percentage points, the compaction operations shall not proceed, until the material has been wetted or allowed to dry out, as may be required, to obtain a moisture content within the tolerances permitted above, and no adjustment in price will be made on account of any operations of the Contractor in wetting or drying the materials or on account of any delays occasioned thereby.

When the material has been conditioned as hereinbefore specified, it shall be compacted by rollers or by hand or power tampers. Where hand or power tampers are used to compact soils in confined areas such as under pipe, they shall be equipped with suitably shaped heads to obtain the required density.

The earth manual designations in this paragraph refer to the procedures described in the Second Edition of the Bureau of Reclamation "Earth Manual".

The dry density of the portion of the soil passing the No. 4 sieve in the compacted material shall not be less than 95 percent of the laboratory maximum dry density as determined by the Bureau of Reclamation laboratory compaction test.

(1) Bureau of Reclamation laboratory compaction test - The compaction tests will be made by the Government or its representative. The maximum dry density of the soil obtained by either of the following Bureau of

Reclamation procedures is called the laboratory maximum dry density.

Test	Earth Manual Designation
Proctor Compaction Test	E-11[a/]
Rapid Compaction Control	E-25

[a/] ASTM D-698 will be accepted as an alternate.

The optimum moisture content is the moisture content that corresponds to the laboratory maximum dry density.

c. Compacting Cohesionless materials -

(1) Compacting cohesionless, free-draining materials - Where compaction of cohesionless free-draining materials, such as sands and gravels, is required, the materials shall be deposited in horizontal layers and compacted to the relative density specified below. The excavating and placing operations shall be such that the materials, when compacted, will be blended sufficiently to secure the highest practicable density and highest shear strength. Water shall be added to the materials as may be required to obtain the specified density by the method of compaction being used.

The thickness of the horizontal layers after compaction shall not be more than 6 inches if compaction is performed by hand or power tampers or rollers; not more than 12 inches if compaction is performed by treads of crawler-type tractors, surface vibrators, or similar equipment; and not more than the penetrating depth of the vibrator.

The relative density of the compacted materials shall be not less than 70 percent as determined by the Bureau of Reclamation Relative Density of Cohesionless Soils test (designation E-12) of the "Earth Manual".

(a) Relative density test - The relative density tests will be made by the Government or its representative. The relative density of a cohesionless, free-draining soil is defined as its state of compactness with respect to the loosest and most compact states at which it can be placed by laboratory procedures described in designation

E-12 of the "Earth Manual". The relative density is determined by the following formula, wherein the maximum density is the highest density of the soil, minimum density is the lowest density of the soil, and in-place density is the density of the minus 3-inch fraction or portion of the soil in place. Tests for moisture content are made on the materials and the densities are expressed in terms of ovendry weights.

Rel. Den. (%)=

$$\frac{\text{max. den. x (in-place den. - min. den.)}}{\text{in-place den. x (max. den. - min. den.)}} \text{x } 100$$

(2) Compacting cohesionless materials containing some clay and silt - Cohesionless materials containing clay and silt may not be free-draining. When compaction of cohesionless materials containing clay and silt is required, the materials shall be compacted to a dry density in accordance with either subparagraph (a) or (b) below, using whichever test that results in the higher dry density of the compacted material in the placement.

(a) Dry density using the Bureau of Reclamation laboratory compaction test as prescribed in subparagraph b.(1) above - Prior to and during compaction operations, the materials shall have a moisture content of not greater than 2 percent wet or less than 4 percent dry of optimum moisture, and the moisture content shall be uniform throughout each layer: Provided, That for materials being compacted that have a moisture content of not greater than 2 per cent wet or less than 2 percent dry of optimum moisture, the dry density of the soil fraction in the compacted material shall not be less than 95 percent of the laboratory maximum soil dry density as determined by the Bureau of Reclamation laboratory compaction test and that for materials being compacted that have a moisture content between 2 and 4 percent dry of optimum moisture, the dry density of the soil fraction in the compacted material shall not be less than 98 percent of the laboratory maximum soil dry density as determined by the Bureau of Reclamation Proctor Compaction Test.

(b) Dry density using the relative density test as prescribed in subparagraph c.(1)(a) above - The relative density of the compacted material shall be not less than 70 percent as determined by the Bureau of Reclamation Relative Density of

Cohesionless Soils test (designation E-12 of the "Earth Manual").

Except as otherwise provided for moisture content in subparagraph c.(2)(a) above, the materials shall be moistened, placed, and compacted in accordance with subparagraph b. above when density is determined by the Bureau of Reclamation laboratory compaction test. When density is determined by the relative density test, the materials shall be moistened, placed, and compacted in accordance with subparagraph c.(1) above.

d. Rollers - Rollers used for compacting earth materials shall have staggered and uniformally spaced tamping feet and be of sufficient weight for proper compaction. The tamping heads and cleaner bars shall be properly maintained, and the spaces between the tamping feet shall be kept clear of materials which impair the effectiveness of the tamping rollers.

e. Payment - Payment for compacting earth materials as herein described shall be included in the prices bid in the schedule as described elsewhere in Division 3 - Earthwork.

SECTION 3.2 EXCAVATION

3.2.1 CLASSIFICATION OF EXCAVATION

Materials excavated will not be classified for payment. Except as otherwise provided in these specifications, Paragraph 3.1.1, 3.2.4, material excavated will be measured in excavation, to the lines shown on the drawings or as provided in these specifications, and all materials so required to be excavated will be paid for at the applicable prices bid in the schedule for excavation. No additional allowance above the price bid in the schedule will be made on account of any of the material being wet. Bidders and the contractor must assume all responsibility for deductions and conclusions as to the nature of the materials to be excavated and the difficulties of making and maintaining the required excavations. The District does not represent that the excavation can be performed or maintained at the pay lines described in these specifications or shown on the drawings.

3.2.2 EXCAVATION ADJACENT TO CONTRACT BOUNDARIES

Definite stations for the boundaries of the schedule are shown on the drawings, and these definite stations are the contract limits of the work covered by these specifications. Although it is not anticipated, it may be necessary to

perform a certain amount of excavation beyond the contract limits in order to provide space in which to work. Payment for any necessary excavation outside the contract limits will be made at the unit price per cubic yard bid in the schedule for "Excavation for Canal and Floodway".

3.2.3 EXCAVATION FOR CANAL

a. General - The canal shall be excavated to the lines, grades and dimensions shown on the drawings. Stones and indurated materials larger than 5 inches shall be removed from materials to be used for compacted embankments as specified in paragraph 3.4.4. Suitable materials excavated for the canal and not required for constructing canal embankments shall be used to construct detention dike embankments and/or wasted in accordance with Paragraph 3.2.7.

Care shall be taken to prevent overbreakage or loosening of material on bottoms and side slopes upon or against which lining is to be placed. Where the original ground surface is below the grade of the canal, the bottom of the canal shall be filled to the underside of the lining as prescribed for constructing and compacting the canal embankments.

Except as provided below, the canal shall be excavated to a subgrade and section as shown on the drawings to provide for the prescribed thickness of lining, and the foundation for the lining shall be prepared in accordance with paragraph 5.2.1.

Where unsuitable material is encountered in the foundation for the canal, the Construction Engineer or his authorized representative will direct additional excavation to remove the unsuitable material. This additional excavation shall be refilled to the underside of the lining as prescribed for constructing and compacting canal embankments. "Unsuitable Material" shall not be construed to be material in which moisture content is outside parameters established by these specifications for acceptable foundation.

b. Moisture - All areas to be excavated for canals and floodways, shall be prewet in accordance with Paragraph 2.2.2.

As far as practicable and as determined by the Contracting Officer, all material to be excavated in the project shall have additional moisture applied, if needed, by sprinkler irrigation to condition the materials in place in accordance with the following requirements before any excavation work is begun.

The moisture content of the earthfill materials prior to and during compaction shall be in accordance with paragraph 3.1.3, except that the materials to be placed in embankments

not to be compacted shall have a moisture content of not greater than 2 percent wet nor less than 5 percent dry of optimum. Whenever possible, all water added to condition materials shall be added in one application. When moisture is added to the areas to be excavated, care shall be taken to moisten the material uniformly to produce the required moisture content of the material for the purpose of which it is to be used. The Contractor is cautioned to control carefully the application of water and to check on the depth and amount of water penetration during application so as to avoid over-irrigation.

If at any location to be excavated before or during excavation operations there is excessive moisture, steps shall be taken to reduce the moisture by selective excavation to secure the drier materials; by excavating and placing in temporary stockpiles material containing excessive moisture; by excavating drainage ditches; by allowing adequate additional time for drying; or by any other approved means. To minimize operations with overly wet material, the Contractor will be permitted to utilize portions of the areas to be excavated which contain dry material to the greatest extent practicable consistent with obtaining suitable material.

The Contractor shall be entitled to no additional allowance above the unit prices bid in the schedule on account of the requirement for excavating drainage ditches; for allowing additional time for drying; for stockpiling and rehandling excavated materials which have been deposited temporarily in stockpiles; delays or increased costs due to stockpiling; poor trafficability on the excavated areas, the haul roads, or the embankment; reduced efficiency of the equipment the Contractor elects to use; or on account of any other operations or difficulties caused by overly wet materials. No additional allowance above the unit prices bid in the schedule will be made because of variation in the portion between wet and dry materials which are required to be excavated in order to obtain adequate suitable material.

c. Measurement and payment - Except as specified herein, measurement, for payment, of "Excavation for Canal and Floodway" will be made to the neat lines shown on the drawings.

Measurement for payment for removal of unsuitable material below subgrade elevations, will be made to the depths and dimensions directed by the Construction Engineer or his authorized representative. Payment for removal and refill of unsuitable material will be made at the per cubic yard price bid in the schedule for "Excavation for Canal and Floodway". Payment for compaction of refill material will be made at the per cubic yard price bid in the schedule for "Compacting Embankments".

Measurement, for payment, of excavation for canal and floodway will not include materials excavated in accordance with paragraph 3.2.4. (Excavation for Structures).

Payment for "Excavation for Canal and Floodway" will be made at the unit price per cubic yard bid therefor in the schedule. This price shall include the costs of scarifying, of procuring and applying water to condition earth materials if required at the point of placement, of placing the material in embankment, of refilling the additional excavation between the bottom of the excavation required and the depth directed, or of otherwise disposing of the excavated materials, of pumping or unwatering, and of all work necessary to maintain the excavations in good order during construction.

Payment for prewetting canals and adjacent areas including borrow areas will be made in accordance with paragraph 2.2.2.

3.2.4 EXCAVATION FOR STRUCTURES

a. General - Excavation for the foundation of structures shall be to the elevations shown on the drawings. Insofar as practicable, the material removed in excavation for structures shall be used for backfill and embankments; otherwise, it shall be wasted.

b. Foundations for Structures - The Contractor shall prepare the foundations at structure sites by methods which will provide firm foundations for the structures. The bottom and side slopes of excavation, upon or against which the structure is to be placed, shall be finished to the prescribed dimensions, and the surfaces so prepared shall be moistened and tamped with suitable tools to form firm foundations upon or against which to place the structure.

Densities of the compacted foundation materials and the testing thereof shall be in accordance with paragraph 3.1.3.

Where unsuitable material is encountered in the foundation for a structure, the Construction Engineer or his authorized representative will direct additional excavation to remove the unsuitable material. This additional excavation shall be refilled with compacted backfill to provide a firm foundation for the structure.

c. Over-excavation - If at any point in excavation, due to fault of the Contractor, the foundation material is excavated beyond the lines required to receive the structure, the overexcavation shall be filled with suitable materials and compacted in accordance with paragraph 3.1.3. If at any point in excavation the natural foundation material is disturbed or loosened during the excavation

process or otherwise, it shall be compacted in place or, where directed, it shall be removed and replaced with suitable material and compacted in accordance with paragraph 3.1.3. Fill and compacting of fill for such excess excavation or over-excavation shall be at the expense of the Contractor.

d. Measurement and payment - No direct payment will be made for excavation for structures. Limits of excavation for structures are as detailed on the drawings. The costs of excavation for structures as described in Paragraph 3.2.4 shall be included in the respective lump sum prices bid under items 6 through 9 in the schedule for the respective structures of which excavation for structures is an integral part.

Measurement for payment for removal of unsuitable material below foundation elevations will be made to the depths and dimensions directed by the Construction Engineer or his authorized representative. Payment for removal and refill of unsuitable material will be made at the per cubic yard price bid in the schedule for "Excavation for Canal and Floodway". Payment for compaction of refill material will be made at the per cubic yard price bid in the schedule for "Compacting Embankments".

3.2.5 EXCAVATION FOR PIPE TRENCHES

a. General - Excavation for pipe trenches includes excavation for pipe portions of siphons, delivery installations, wasteway pipelines, and pipeline accessories, all of which are intregal with various structures. Pipeline accessories are defined as connecting, controlling or measuring devices along the pipelines, including pipe erected vertically.

Excavation for pipe trenches for pipe for pipe portions of siphons, delivery installations, wasteway pipelines, and pipeline accessories shall be to the lines, grades, and dimensions shown on the drawings, and as provided in this paragraph.

Typical trench sections are shown on the drawings. The bottom of the trench shall be finished accurately to the lines and grades shown on the drawings.

The minimum trench widths permitted are shown on the drawings.

b. Safety - Shoring and sloping shall be in accordance with Section 22.3 of the Bureau of Reclamation publication, "Construction Safety Standards", 1979, and the provisions of paragraph 1.4.2. Payment for excavation shall be as set forth in Subparagraph e. below regardless of whether the trench is shored or sloped.

c. Foundation for pipe - When the foundation material below the bottom of the pipe is unsuitable, as determined by the Construction Engineer, the contractor shall overexcavate the bottom of the trench as directed and replace the overexcavation with compacted backfill.

If at any point in trench excavation, due to fault of the Contractor, the foundation material is excavated beyond the lines required to receive the pipelines, delivery installations, or pipeline accessories, the overexcavation shall be filled with suitable materials and compacted in accordance with Section 3.1.3 (Compacting Earth Materials).

If at any point in trench excavation, the natural foundation material is disturbed or loosened during the excavation process or otherwise, it shall be compacted in place or, where directed, it shall be removed and replaced with suitable material and compacted in accordance with Section 3.1.3 (Compacting Earth Materials). Fill and compacting of fill for such excess excavation or overexcavation shall be at the expense of the Contractor.

d. Excess excavation - Material excavated from the pipe trench which cannot be used in the pipe trench backfill shall be disposed of in common embankments at locations as approved by the Construction Engineer.

e. Payment - No direct payment will be made for excavation for pipe trenches. The costs of excavation for pipe trenches as described in Paragraph 3.2.5 shall be included in the lump sum prices bid under items 6 through 9 in the schedule for the respective structures of which pipelines, delivery installations, or pipeline accessories are an intregal part.

Measurement for payment for removal of unsuitable material below the bottom of the pipe, will be made to the depths and dimensions directed by the Construction Engineer or his authorized representative. Payment for removal and refill of unsuitable material will be made at the per cubic yard price bid in the schedule for "Excavation for Canal and Floodway." Payment for compaction of refill material will be made at the per cubic yard price bid in the schedule for "Compacting Embankments".

3.2.6 DELETED

3.2.7 OVERHAUL

a. General - The Contractor will be required to haul excavated material as needed to construct embankments. There is no limit set as to the free-haul distance for required excavation.

b. Payment - No overhaul will be paid under this contract. All costs for excavating, hauling, and depositing earth materials, including material wasted in accordance with Paragraph 3.2.8 shall be included in the costs of "Excavation for Canal and Floodway."

3.2.8 DISPOSAL OF EXCAVATED MATERIALS

a. General - All suitable materials removed in excavation, or as much thereof as may be needed, shall be used in the construction of canal embankments and roadway embankments, backfill about structures, or construction of dikes. All excess material excavated, or any unsuitable material, shall be deposited in low areas uphill of the canal to eliminate trapped drainage, as directed by the Construction Engineer, or otherwise wasted in the designated waste area as shown on the drawings, and as described below.

The area designated as the waste area for excess or unsuitable material, is located right of Sta. 341± to Sta. 357±.

The limits of the waste area, and the slopes to be constructed, shall be a shown on Drawing V-1. The waste area shall be cleared and grubbed as described in paragraphs 2.1.1 and 2.1.2.

Material placed in the waste area shall be placed as described in subparagraph 3.4.3(c).

b. Payment - With the exception of clearing and grubbing, the cost of all work described in this paragraph shall be included in the unit price per cubic yard bid in the schedule for "Excavation for Canal and Floodway."

Payment for clearing and grubbing the waste area shall be included in the lump sum price bid in the schedule for "Clearing and Grubbing".

SECTION 3.3 BACKFILL

3.3.1 BACKFILL ABOUT STRUCTURES

a. General - Backfill about structures, including pipe portions of structures, includes all backfill required to be placed under these specifications.

Backfill required for erecting fencing shall be placed in accordance with the provisions of this paragraph and the cost shall be included in items of work as specified in subparagraph 3.3.2d.

b. Materials - The type of material used for backfill, the amount thereof, and the manner of depositing the material shall be subject to the following: Backfill material shall

be obtained from material moved in required excavations for structures, but when sufficient suitable material is not available from this source, additional material shall be obtained from adjacent canal or floodway excavation.

Except as otherwise provided below, backfill material to be compacted shall contain no stones larger than 3 inches in diameter. Backfill material not to be compacted shall contain no stones larger than 5 inches in diameter.

Backfill within 2 inches of buried electrical grounding cables shall be sand or equally fine earth material.

c. Placing backfill - Backfill shall be placed to the lines and grades shown on the drawings or as prescribed in this paragraph.

All backfill shall be placed carefully and spread in uniform layers so that all spaces about rocks and clods will be filled. Backfill shall be placed to about the same elevation on all sides of the pipe portions of structures to prevent unequal loading and displacement of the pipe. The difference in elevation of the backfill on all sides of the pipe portions of the structures shall not exceed 6 inches at any time. The Contractor shall be responsible for providing adequate earth cover over pipe to prevent damage from construction equipment loads. Trenches for electrical grounding cables shall be backfilled to the finished lines of adjacent earthwork.

Backfill required to be compacted shall be compacted in accordance with paragraph 3.3.2.

d. Structures on fill - Where the original ground surface is below the base of a structure or below the bottom of pipe, all fill required for the structure foundation and all fill up to and above the bottom of the pipe shall be placed as backfill about structures.

e. Payment - The cost of providing backfill about structures will be paid in accordance with subparagraph 3.3.2d.

3.3.2 COMPACTING BACKFILL ABOUT STRUCTURES

a. General - Unless otherwise shown on the drawings, backfill about structures shall be compacted as prescribed in this paragraph.

The 1:1 slopes specified below shall extend from the top of the concrete walls to their intersection with the surfaces of the excavation or embankment as the case may be.

b. Location of compacted backfill -

(1) Backfill about all structures or portions of structures shall be compacted to slopes of 1:1 from the top of the structure: Provided, That where the structure is located in compacted embankment, the backfill shall be compacted to the elevation prescribed for the adjacent compacted embankment.

(2) All material placed in trenches for buried electrical installation shall be compacted.

(3) All material placed about fencepost footings shall be compacted.

c. Material and compacting - The material used for backfill to be compacted shall be selected material containing no stones larger than 3 inches in diameter, and obtained from required excavation or adjacent canal excavation. To prevent unequal loading and displacement of the structure, the backfill shall be placed and compacted in layers having essentially the same top elevation on all sides of the structure.

All materials in backfill to be compacted shall be placed, moistened, and compacted as provided in paragraph 3.1.3.

d. Payment - No direct payment will be made for the work of backfill and/or compacting backfill as described in paragraphs 3.3.1 and 3.3.2, and all costs associated with performance of this work shall be included in the lump sum prices bid for Items 6 through 9 in the schedule for the respective structures of which backfill and/or compacting backfill are an integral part.

3.3.3 BACKFILL IN PIPE TRENCHES

a. General - Backfill in pipe trenches includes backfill about pipelines, delivery installations, and pipeline accessories excavated in accordance with Paragraph 3.2.5 (Excavation for Pipe Trenches).

Backfill in pipe trenches shall be placed to the lines shown on the drawings and as specified in this paragraph. Backfill required to be compacted shall be placed as specified in Paragraph 3.1.3 (Compacting Earth Materials). The type of material used for backfill, the amount thereof, and the manner of depositing the material shall be subject to the provisions of this paragraph.

Insofar as practicable, backfill material shall be obtained from material moved in excavating for pipe trenches, but when sufficient suitable material is not available from

this source, additional material shall be obtained from adjacent excavation for structures or canals.

Backfill shall not be dropped directly on the pipe. Rocks and clods larger than 3 inches in maximum dimension shall not be placed within 6 inches of the pipe.

All backfill shall be carefully placed and spread in uniform layers so that all space about rocks and clods will be filled. Backfill shall be placed to about the same elevation on both sides of the pipe to prevent unequal loading and displacement of pipe. The difference in elevation of the backfill on both sides of pipe shall not exceed 6 inches at any time. Backfill above compacted backfill may be placed as soon as compacting of backfill is completed: Provided, that the placing of this backfill shall be delayed, at the direction of the Construction Engineer or his authorized representative, for the procurement of samples of compacted backfill for testing: Provided further, that if the tests indicate insufficient density of the compacted backfill about pipe, the Contractor may be required to remove the backfill until the proper density is obtained, and replace the backfill above the compacted backfill, all at the Contractor's expense. Backfill shall be placed to a minimum depth of 30 inches above the top of the pipe before power-operated hauling or rolling equipment is used over the pipe.

The maximum equipment loading allowed over the pipe shall be HS-20 loading in accordance with the "Standard Specification for Highway Bridges", AASHTO Twelfth Edition, 1977. Construction equipment that exerts a larger load on the top of the pipe shall not be allowed to travel over the pipe at any time.

b. Payment - The cost of providing backfill in pipe trenches will be paid in accordance with Paragraph 3.3.4d.

3.3.4 COMPACTING BACKFILL IN PIPE TRENCHES

a. General - Backfill in pipe trenches shall be compacted as shown on the drawings, and as specified in this paragraph.

b. Location of compacted backfill.--

(1) Backfill for bedding and backfill on outside of horizontal curves shall be compacted as shown on the drawings.

(2) Backfill placed where pipelines cross under existing roadways, driveways, shall be compacted to the top of the roadway and driveway and to the natural ground surface for proposed roads.

(3) Backfill placed where lateral pipelines cross under irrigation canals or drainage ditches shall be compacted to the finished section of the open canal or ditch and to the natural ground surface for proposed canals and drains.

(4) Where additional excavation for pipe trenches is shown on the drawings or to remove rock or unsuitable material, the backfill within the pay lines for this additional excavation shall be compacted. The backfill material below the pipe shall be shaved to form a cradle for the pipe where the backfill about the pipe will be compacted by tamping, rolling, or any surface vibration.

(5) Where pipes of different diameters are laid in the same trench, backfill shall be compacted to the height required for the larger diameter pipe for the entire width and length of the trench.

c. Compacting backfill - Backfill in pipe trenches shall be compacted by mechanical methods as described in Paragraph 3.1.3 (Compacting Earth Materials) in layers not to exceed 6 inches having the same top elevation on both sides of the pipe to prevent the unequal loading and displacement of the pipe.

Backfill shall be thoroughly worked under the pipe haunches and compacted by mechanical means as specified in Section 3.1.3 (Compacting Earth Materials), and shall be a minimum of 95 percent of laboratory standard or 70 percent relative density as applicable. All compacted backfill in pipe trenches shall be free from voids or loose material.

d. Payment - No direct payment will be made for the work of backfill and/or compacting backfill as described in Paragraph 3.3.3 and 3.3.4, and all costs associated with performance of this work shall be included in the lump sum prices bid for Items 6 through 9 in the schedule for the respective structures of which backfill and/or compacting backfill in pipe trenches are an integral part.

3.3.5 REFILL AT TOP OF CONCRETE CANAL LINING

The Contractor will be permitted to overexcavate at the top of the concrete canal lining as shown on the drawings if needed to accommodate lining equipment. Refill shall be placed on the berms at the top of the lining as shown on the drawings as soon after placing the lining as is feasible. The material used for the refill may be obtained from required excavation. The type of material used and the manner of depositing shall be subject to approval by the Contracting Officer. Refill shall be placed, moistened, and compacted in accordance with paragraph 3.1.3. The refill

shall be finished uniformly and neatly to the lines shown on the drawings.

The cost of all work described herein shall be included in the prices bid in the schedule for other items of work.

SECTION 3.4 - EMBANKMENT

3.4.1 DELETED

3.4.2 PREPARATION OF SURFACES UNDER EMBANKMENTS

The areas under the canal and dike embankments shall be prewet in accordance with Paragraph 2.2.2.

The Contractor is cautioned to control carefully the application of water and to check on the depth and amount of water penetration during application so as to avoid over-irrigation, accumulation of water in depressions, or excessive runoff.

If the moisture content of the existing material is beyond the parameters provided in Paragraph 3.1.3 at any location on embankment foundations before or during embankment construction, steps shall be taken to reduce the moisture by excavating drainage ditches, and allowing adequate drying time.

The Contractor shall be entitled to no additional allowance above the unit prices bid in the schedule on account of the requirement for excavating drainage ditches, for allowing additional time for drying, delays or increased costs due to poor trafficability on the embankment foundations or on the haul roads, reduced efficiency of the equipment the Contractor elects to use, or on account of any other operations or difficulties caused by overly wet embankment foundations or haul roads.

Where the ground surface under any embankment is not suitable as determined by the Contracting Officer for a foundation for the embankment, the Contractor shall strip the area under the embankment of such unsuitable material to such depth as may be directed. The material so removed shall be disposed of in accordance with Paragraph 3.2.8, Disposal of Excavated Materials. Measurement, for payment, of stripping unsuitable material under embankments will be made only to the lines and to such depths as may be directed, and payment therefor will be made at the unit prices per cubic yard bid in the schedule for "Excavation for Canal or Floodway."

As soon as feasible after the foundations have been wet to the required moisture content and before any embankment materials are placed, the entire surface of the foundations

for all dike and canal embankments shall be scarified or plowed throughly to a depth of 6 inches.

The cost of scarifying the foundation surfaces under the intercepting dike and canal embankments and under other embankments shall be included in the unit price per cubic yard bid in the schedule for "Compacting Embankments."

Water applied for prewetting areas under the detention dike and canal embankments and under other embankments shall be paid for as specified in paragraph 2.2.2.

3.4.3 CONSTRUCTING CANAL AND DETENTION DIKE EMBANKMENTS

a. General - Canal and detention dike embankments shall be constructed to top widths and side slopes as shown on the drawings. The top of all canal and detention dike embankments shall be graded to be suitable for a roadway in accordance with subparagraph b. below and the top of other embankments shall be graded or scarified as directed. All materials shall be deposited in embankments so that cobbles, gravel, and boulders will be well-distributed through the other materials and not nested in any position within or under the embankment except that stones and indurated materials larger than 5 inches shall be removed from materials to be used for compacted embankments as specified in paragraph 3.4.4.

In areas where required excavation does not furnish suitable or adequate material for constructing embankments, material shall be obtained from required excavation only in areas where material in excess of that required to construct the adjacent embankments is available.

Where the original ground surface is below the grade of the canal, and where construction of a fill below the bottom of the canal is prescribed, such fill shall be placed as compacted embankment. Where the original ground surface is below the base of a structure, the fill required to form a suitable foundation for the structure shall be placed as compacted embankments.

b. Roads and ramps.- Except as provided elsewhere in conjunction with construction of canal and detention dike embankments, the Contractor shall construct operation and maintenance roads and earth ramps adjacent to the canal and detention dikes, and structures where shown on the drawings. Suitable material from required excavation shall be placed as embankments for the roads and ramps. Where the width of a road is not shown on the drawings, it shall have a width of not less than 12 feet. The work required for construction of operation and maintenance roads and for earth ramps shall include grading to uniform grades and surface.

c. Embankments not to be compacted - Material for these embankments shall have a moisture content of not greater than 2 percent wet or less than 5 percent dry of optimum before equipment is routed over the embankments. Embankments shall be built in approximately horizontal layers carried across the entire width of the embankments to the required slopes. Embankments shall not be widened with loose material dumped from the top. Embankments may be built by excavating and hauling equipment, or by excavating machinery depositing the materials directly from the excavation. Embankments built by excavating and hauling equipment shall be made in horizontal layers not to exceed 1 foot in depth and shall be kept as close to level as practicable. The travel over the embankments during construction shall be routed so as to distribute the compacting effect of the equipment to the best practicable advantage.

Embankments built by excavating machinery depositing the material directly from the excavation shall be made in horizontal layers having a thickness not to exceed 1 foot in depth. Finer portions of the material excavated shall be placed in that part of the embankment nearest linings, and the coarser material shall be placed in the outer part of the embankment.

d. Embankments to be compacted - The requirements for compacted embankments will be as specified in Paragraph 3.4.4. All materials in compacted embankments shall be placed, moistened, and compacted as provided in paragraph 3.1.3.

e. Payment - Except as otherwise provided for compacting of embankments, the costs of all work described in this paragraph shall be included in the unit price bid in the schedule for "Excavation for Canal and Floodway."

3.4.4 COMPACTING EMBANKMENTS

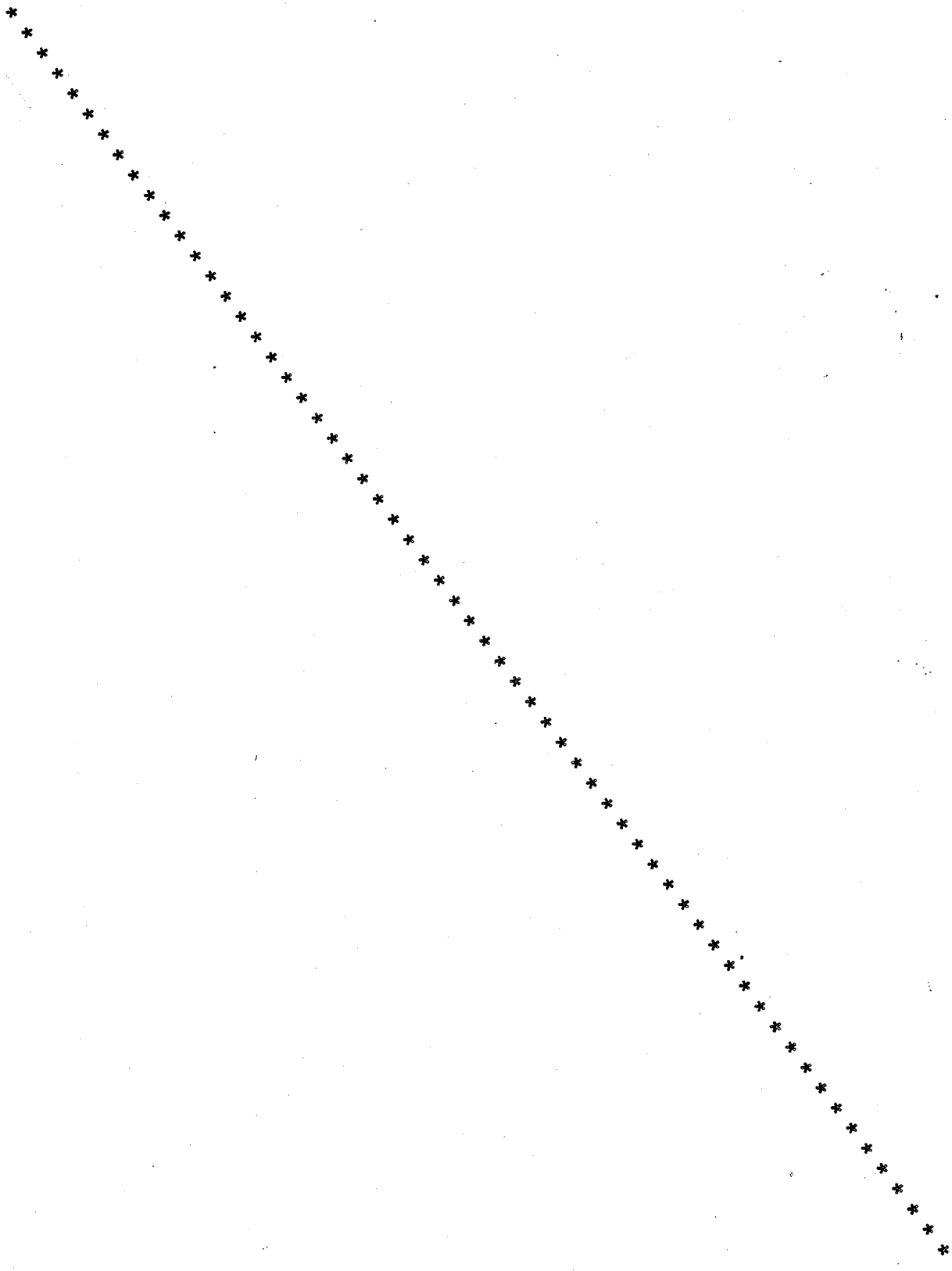
a. General - The materials used for the compacted embankments shall be suitable materials and shall be obtained from required excavation. Before the material for the first layer of the embankment is placed, the foundation of the embankment shall be prepared as provided in Paragraph 3.4.2 and shall be moistened and compacted in the manner hereinafter specified for each layer of compacted embankment to be placed theron. The embankments shall be compacted to the elevation and to the top widths and side slopes shown on the drawings. All materials in embankments to be compacted shall be placed, moistened, and compacted as provided in Section 3.1.3.

The Contractor's operations in the excavation of materials for the compacted embankment shall be such as will result in

an acceptable gradation of materials to provide for the best possible impermeability and stability when compacted. The maximum dimensions of stones and indurated materials placed in the compacted embankment shall not exceed 5 inches. Stones or indurated materials larger than 5 inches shall be removed by raking or other methods.

Where the original ground surface is below the bottom of the canal and where compacted fill below the bottom of the canal is prescribed, such fill shall be placed as compacted embankment. Where the original ground surface is below the base of a structure, or where sloping concrete walls or slabs extend above the original ground surface and it is practicable to construct the walls or slabs directly on earth foundation without the use of intervening forms, compacted embankments shall be constructed to lines and grades as directed to form suitable foundations for the structure or for the sloping walls or slabs.

b. Measurement and payment.--Measurement, for payment, of compacting embankments will be made of the embankments in place, as measured from existing ground elevations and, not including the quantity, or any part thereof, for a 6-inch layer of the foundation for the embankment scarified or plowed as provided in Paragraph 3.4.2, and will include such portions of the embankments and foundation as have been identified as pay lines on the drawings, as compacted embankment. Payment for compacting embankments will be made at the unit price per cubic yard bid therefor in the schedule, which unit price will be in addition to the unit price bid in the schedule for excavating the material placed in compacted embankments and shall include the cost of placing materials in layers, removing materials larger than 5 inches, furnishing water, moistening, and compacting as provided in this paragraph.



DIVISION 4
PIPE

SECTION 4.1 PIPE, GENERAL

4.1.1 PIPE, GENERAL

The Contractor shall furnish and lay pipe for the siphons and structures as shown on the drawings and as specified in these specifications.

For the pipe used in the siphon and wasteway structure, the pipe class is designated on the drawings by symbols. The symbols include the pipe diameter, earth cover, and the hydrostatic head as follows: The first number in the symbol designates the internal diameter of the pipe in inches; the letters A, B, C, and D designate external loadings of earth over the top of the pipe of 5, 10, 15, and 20 feet, respectively; and the last number designates the hydrostatic head in feet measured to the centerline of the pipe. A symbol of 78B 50 designates pipe of 78-inch diameter for 10 feet of earth cover and 50 feet of hydrostatic head. Unless specific reference is made to outside diameter of pipe, the pipe diameters shown on the drawings and used in these specifications are inside diameters. The pipe designations shown on the drawings and in these specifications establish the minimum requirements for all the pipe types allowed under these specifications.

The Contractor shall furnish a maintenance warranty of pipe as specified in paragraph 4.1.4.

During manufacturing, transporting, storing, and laying pipe and pipefittings, the pipe and pipefittings shall not be dropped or subjected to any unnecessary jar, impact, or other treatment that could crack the shell or otherwise damage the pipe. Pipe shall not be loaded and hauled to the worksite until after the specified curing period.

Pipe shall not be stored in the yard or on the jobsite under conditions that would cause injurious drying out of the concrete. Whenever necessary in order to prevent cracking of the concrete or other objectionable effect of drying, pipe shall be adequately protected by means of shelter and/or application of water. Any length of pipe that in the opinion of the Contracting Officer is damaged beyond repair by the Contractor in hauling, handling, unloading, storing, exposure to cold weather or otherwise shall be removed from the worksite and replaced by and at the expense of the Contractor with another length of pipe of equal or greater strength.

The Contractor shall not lay any pipe by using a method of stabbing or swinging one joint into the collar or bell of another joint. Bumping or pushing of pipe units with pneumatic tire equipment will not be permitted.

The Contractor shall not reuse rubber gaskets when pipe joints are pulled and refitted.

The Contractor shall take the necessary precautions to avoid floating or otherwise displacing the pipe. If a portion of the pipeline is floated or otherwise displaced, those pipe sections that floated or were displaced shall be removed, any damage to the material beneath the pipe sections shall be repaired, and the pipe sections shall be relaid all at the expense of the Contractor. If any pipe sections are damaged due to the floatation or displacement, the damaged pipe sections either shall be repaired to the satisfaction of the Contracting Officer or shall be removed from the worksite and replaced with a new pipe section. Such repair or replacement shall be at the expense of the Contractor.

4.1.2 PIPE OPTIONS

The Contractor has the option of constructing pipelines for the siphon and wasteway with reinforced concrete pressure pipe, noncylinder prestressed concrete pipe, or embedded cylinder prestressed concrete pipe: Provided, That joints shall be rubber gasket joints with steel rings: Provided further, that the pipe furnished and laid by the contractor shall conform to the applicable paragraphs of these specifications.

Regardless of the pipe option the Contractor elects to use, one copy and one reproducible of the pipe and joint design and fabrication details he proposes to use shall be submitted to the Contracting Officer for approval. Any fabrication or procurement performed prior to approval of details shall be at the Contractor's risk. Approval by the Contracting Officer of the Contractor's design and fabrication details shall not be held to relieve the Contractor of any part of the Contractor's responsibility to meet all the requirements of these specifications or of the responsibility for the correctness of the Contractor's details.

4.1.3 PAYMENT FOR PIPE

Regardless of the pipe alternatives permitted, pipe, pipe fittings and pipe accessories required to be furnished and installed as designated on the drawings and specified in these specifications will not be paid for directly but all

costs therefor shall be included in the prices bid in the schedule for the work or structure in which the pipe, pipe fittings and pipe accessories are required.

4.1.4 MAINTENANCE WARRANTY OF PIPE

For maintenance warranty period of 1 year after acceptance of the work, the Contractor shall be responsible for the repair of all defects, leaks, or failures occurring in the pipe, pipe joints, and fittings from any cause whatsoever except for such leaks, defects, or failures which are as determined by the Contracting Officer due to negligence in the operation of the irrigation system by the Government, its agents, the District, acts of third parties, acts of God, or acts of the common enemy. The Contractor will be reimbursed the actual and necessary cost plus 15 percent for profit and general expense of any work or materials pertaining to repairs or replacements that are determined as not the responsibility of the Contractor.

The Contractor upon notice from the Government shall promptly commence and diligently prosecute the repair of any defects, leaks, or failures that develop during the maintenance warranty period. The work of repairing any defects, leaks, or failures includes the necessary excavation, pipe repair, backfill, compacting backfill, and replacement of any appurtenances destroyed or disturbed by reason of such work. Repairs as may be required in the opinion of the Contracting Officer shall be made by the Contractor in such a manner as to cause the least practicable interference with the use of the pipelines in service. The Contractor shall make necessary arrangements to have competent personnel and suitable equipment available so that repairs may be commenced within 48 hours after receipt of notice from the Government.

The obligations of the Contractor under this paragraph shall be enforceable against his surety or sureties for the Performance Bond under this contract, during the life of the contract and for 1 year after final acceptance of all work under the contract. If the Contractor fails or refuses to make required repairs or replacements with due promptness and diligence as determined by the Contracting Officer, the Government shall have the right to make repairs and replacements; and unless it is determined that the costs of such work is chargeable to the Government, the entire costs thereof shall be paid by the Contractor and may be collected from the Contractor or the Contractor's surety or sureties or both.

The cost of furnishing the maintenance warranty shall be included in the prices bid in the schedule for items of work for which the warranty is required.

4.1.5 FIELD TESTING PIPE SIPHON

a. General - After being completed, the siphon at Centennial Wash shall be tested for watertightness by being filled with water to an elevation of 1 foot above the top of the pipe at the inlet structure. Water for making the tests shall be furnished by the Contractor. After the siphon has been filled to the specified elevation, the water may be allowed to stand for a period not to exceed 15 days to saturate the siphon pipe prior to testing.

For testing, the water surface shall be maintained at the specified elevation for a period of 24 hours. The total amount of leakage from the siphon during this 24-hour period shall not exceed 50 gallons per inch of diameter per mile of siphon. If the leakage exceeds 60 percent of the maximum permitted, the Contracting Officer may, at his discretion, require the water to be maintained at the limiting elevation stated above for an additional 10 days to permit evidence of excessive leakage at any point to become apparent.

Individual leaks which, in the opinion of the Contracting Officer, might endanger the structures or damage the foundation or backfill around the structure shall be repaired by and at the expense of the Contractor even though the total leakage from the siphon may not exceed the allowable limit specified above. The Contractor shall do all calking and make all repairs that are necessary to secure the required watertightness, as approved by the Contracting Officer.

The tests shall be made as soon after completion of construction of the siphon as practicable, as determined by the Contracting Officer, but in no event before 20 days after the placing of any concrete that will be subjected to hydrostatic pressure during the tests. The Government will not be responsible for any damage to the structures, or otherwise, due to testing.

b. Cost - The cost of furnishing all materials, including water, and performing all work required in making the tests shall be included in the applicable prices bid in the schedule for the work or structure in which the siphon occurs.

SECTION 4.2 REINFORCED CONCRETE PRESSURE PIPE

4.2.1 REINFORCED CONCRETE PRESSURE PIPE

Reinforced concrete pressure pipe shall be manufactured and tested and data shall be submitted for approval in accordance with Bureau of Reclamation "Standard

Specifications for Reinforced Concrete Pressure Pipe," dated January 1974.

The following revisions are hereby made in the Standard Specifications:

a. Subparagraph 4.c.(2), page 1, right column, last line at bottom of page, after "Federal" delete "Test Method Standard" and insert "Specification SS-C-1960/3B".

b. Subparagraph 4.c.(2), page 2, left column, from top of page, delete lines 1 through 6.

c. Subparagraph 4.d.(1), page 2, left column, line 4 in the subparagraph, change "SS-C-192G" to "SS-C-1960/3B".

d. Subparagraph 4.d.(3), page 2, delete lines 9 through 12 and substitute therefor the following: "conforms to ANSI/ASTM C 494 for type A or D chemical admixture, except that type E chemical admixture will also be acceptable if it conforms to subparagraph 4.d.(1): Provided".

e. Subparagraph 4.f.(1)(b), page 3, right column, line 15 from top of page, change the word "Seventh" to "Eighth".

f. Subparagraph 4.f.(1)(c), page 3, right column, line 2, change "3.1" to "4.1".

g. Subparagraph 4.f.(2)(b), page 4, left column, line 12 from bottom of page, change "Seventh" to "Eighth".

h. Subparagraph 5.a., page 4, right column, line 14 from bottom of page, change "Seventh" to "Eighth".

i. In subparagraph 5.d., page 5, right column, line 18 from top of page, change "SS-C-192G" to "SS-C-1960/3B".

j. Subparagraph 7.c., page 13, line 5, delete the word "either" and the words "or intersection"; and in line 7, after the word "specimens" add the following:

"Reduction in the area of the circumferential reinforcement resulting from welding longitudinal reinforcement to circumferential reinforcement shall be held to a minimum. The circumferential reinforcement at the welded intersection shall develop a tensile strength not less than 90 percent of the specified ultimate strength of the steel furnished."

k. Subparagraph g., figure 3, page 19; figure 4, page 20; figure 5, page 21; figure 6, page 22; the note and dimension for the inside joint opening "Cement mortar required when joint opening averages greater than 3/8 inch" is deleted.

l. Subparagraph 10.c., page 25, after line 13, add the following:

"(6) Top and/or bottom of beveled end pipe."

m. Paragraph 14, page 26, right column, line 3 from top of page, change "220" to "270".

Cement for reinforced concrete pressure pipe shall meet the requirements of Federal Specification SS-C-1960/3B, for type II, portland cement, and shall meet the low-alkali requirements and false-set limitations specified therein.

Payment for furnishing reinforced concrete pressure pipe will be made as provided in paragraph 4.1.3.

4.2.2 FITTINGS FOR REINFORCED CONCRETE PRESSURE PIPE

a. General - Adapters, curves and bends, connections at structures and encasements, and closure sections shall be furnished and installed by the Contractor as shown on the drawings and in accordance with this paragraph and paragraph 4.2.3. Rubber gasket joints in tapers, adapters, curves, and bends, connections at structures and encasements, and closure sections shall conform to the "Standard Specifications for Reinforced Concrete Pressure Pipe" specified in paragraph 4.2.1.

If fittings are fabricated of reinforced concrete pressure pipe, hydrostatic test will not be required on tees, tapers, adapters, couplings, curves and bends, connections at structures and encasements, and closure joints after fabrication.

Welding shall conform to the requirements of AWS B3.0.

Fittings fabricated from steelplate shall be tested under hydrostatic pressure sufficient to stress the steel to 23,000 pounds per square inch. The pressure shall be held long enough to allow a thorough inspection of all welded joints, and any leaks shall be repaired by rewelding and the fitting shall then be retested. Fittings fabricated from tested steel pipe do not require hydrostatic testing; however, the girth butt welds shall be complete penetration welds and shall be given a dye penetrant test in accordance with ASTM designation: E 165. Defects in welds as disclosed by the dye penetrant test or hydrostatic test shall be chipped, flame gouged, or ground to sound metal;

and the resulting cavities shall be rewelded and retested. The Contractor shall furnish all equipment, supplies, and labor required for making the dye penetrant test and hydrostatic test.

Before installation, the exposed steel joint surface of metal fittings used for tapers, adapters, bends, connections at structures and encasements, and closure section shall be painted with coal-tar epoxy in accordance with paragraph 9.1.1.

After installation, the inside and outside annular joint spaces of metal fittings used for adapters, and bends shall be filled with preformed plastic sealing compound conforming to Federal Specification SS-S-210A: Provided, That for 21-inch and smaller diameter pipe the inside annular joint spaces shall be filled with preformed plastic sealing compound by placing the preformed plastic sealing compound onto the end of the metal fitting before the adjacent pipe is installed.

b. Approval of fittings - One copy and one reproducible of details for fittings showing exact dimensions of joints and diameter of rubber gasket including tolerances and other major dimensions shall be submitted by the Contractor for approval to the Construction Engineer.

Any fabrication or procurement performed before approval of details shall be at the Contractor's risk. Approval by the Government of the Contractor's details shall not be held to relieve the Contractor of any part of the Contractor's responsibility to meet all the requirements of these specifications or of the responsibility for the correctness of the Contractor's details.

c. Materials -

(1) Steel for adapters, bends, connections at structures and encasements, and closure sections shall conform to ANSI/ASTM A 283, grade C or D; and/or ANSI/ASTM A 570 grade 40, 45 or 50.

(2) Bolts and nuts shall conform to Federal Specifications FF-B-575c and FF-N-836D(1).

(3) Cement-mortar lining and cement-mortar coating shall conform to paragraph 9.2.1, Cement Mortar Lining and Cement Mortar Coating: Provided, That lining and coating thicknesses shall be as shown on the drawings and cementitious materials for mortar lining and coating shall conform to paragraph 5.3.2.

(4) Concrete in encasement shall conform to Division 5--Concrete.

(5) Mortar and grout for joints shall conform to subparagraph 4.2.3c.

d. Curves and bends -

(1) General - Where shown on the drawings, changes in alignment and grade shall be made with miter bends. Other changes in alignment and grade shall be made by pulling the pipe joints, by using beveled end pipe, by using a combination of pulling pipe joints and beveled end pipe, or with miter bends: Provided, That no direct payment will be made to the Contractor for concrete, including cement and reinforcing bars, in encasements and blocking for miter bends, and the cost shall be included in the cost of the pipe. The deflection angle in beveled end pipe joints shall not exceed 5°. Where pipe joints are pulled, a full laying length of pipe shall be used on each side of the joint. The allowable pull in pipe joints and all joint requirements are specified in paragraph 4.2.3.

(2) Miter bends - Miter bends shall be fabricated as shown on the Drawings. The class of pipe used in fabricating miter bends shall be not less than the class of pipe in the adjacent pipe units.

Miter bends shall be fabricated by cutting straight pipe units to one-half the required deflection and then fitting, welding, and mortaring the two pipe units together.

Reinforcement at bends shall be lapped or welded as shown on the above drawing. After the reinforcement has been lapped or welded, the space between the mitered pipe units shall be filled with mortar. The surfaces to receive mortar shall be prepared in accordance with chapter VII of the Eighth Edition of the Bureau of Reclamation's Concrete Manual. The mortar shall be placed from the outside of the pipe against a suitable form in the inside of the pipe. The space between the mitered pipe units shall be completely filled with mortar to the thickness of the pipe. The mortared space in the bend shall be wrapped with welded-wire fabric, which shall be covered with a mortar band as shown on the above drawing. The mortar shall be allowed to cure before the miter bends are encased or blocked with concrete.

Miter bends shall be encased or blocked with concrete as shown on the Drawings.

e. Connections at structures and concrete encasements - Reinforced concrete pressure pipe shall be connected to structures as shown on the drawings. Where reinforced

concrete pressure pipe adjoints a concrete structure or where reinforced concrete pressure pipe is encased in concrete except at concrete cutoff or thrust collars, a rubber gasket joint shall be provided at or adjacent to the nearest face of such structure or encasement and the distance between the pipe joint and the concrete face shall not exceed 18 inches for pipe 36 inches in diameter and smaller or one-half the diameter of the pipe for pipe larger than 36 inches in diameter. If type R-1 or R-2 joints are used at such locations, the inside and outside annular joint spaces shall be filled with a preformed plastic sealing compound conforming to Federal Specification SS-S-210A.

f. Payment - Payment for furnishing and installing fittings for reinforced concrete pressure pipe will be made as provided in paragraph 4.1.3.

4.2.3 LAYING REINFORCED CONCRETE PRESSURE PIPE

a. General - The Contractor shall employ for the work of laying the pipe only workmen who are skilled and experienced in laying pipe with the type of joint being furnished. The Contractor shall provide watertight pipe and pipe joints. The pipe shall be laid to the lines and grades shown on the drawings and to the following tolerances. Departure from and return to established alignment and grade shall not exceed 1/16 inch per foot of pipe with a total of not more than 1-inch departure.

Pipe trenches shall be kept free of water which might impair pipelaying operations at all times during laying operations. Pipe trenches shall be carefully graded so as to provide uniform support along the bottom of pipe. At joints involving bells or collars, holes at the joint shall be of ample size to prevent the bells or collars from coming in contact with the subgrade. On grades exceeding 10 percent, pipe shall be laid uphill. Pipe with elliptical reinforcement shall be laid with the axes of the reinforcement cages in the correct position as shown by marking on the pipe: Provided, That a maximum deviation of 10° from the correct position will be permitted.

The Contractor shall schedule his work so that at no time will pipe remain in the trench more than 7 days before backfill is placed in the pipe trench to the original ground surface or to other specified backfill limits shown on the drawings.

All backfill about pipe shall be placed carefully in accordance with paragraphs 3.3.3 and 3.3.4 to avoid lateral displacement of the pipe and damage to the joints. If adjustment of the position of a length of pipe is required after it has been laid, it shall be removed and relaid as for a new pipe. After all pipe laying and joining

operations are completed, the inside of the pipe shall be cleaned and all debris removed. When pipelaying is not in progress, the ends of the pipelines shall be kept closed.

b. Laying pipe - The pipe units shall be fitted together, spigot to bell; and the joints shall be drawn together so that the bells and spigots are as nearly fully engaged as shown on the figures in the "Standard Specifications for Reinforced Concrete Pressure Pipe" specified in paragraph 4.2.1 as practicable and as prescribed in subparagraph (1) and (2) below. The Contractor shall clean and roughen the surface of pipe that is in contact with concrete and/or mortar at connections at structures.

After the rubber gasket is placed in the spigot groove of the pipe, the rubber gasket cross section shall be equalized by inserting a tool or bar such as a large screwdriver or suitable round rod under the rubber gasket and moving it around the periphery of the pipe spigot. The gaskets shall be lubricated with a nontoxic, water-soluble lubricant before the pipe units are joined. The pipe units shall be fitted together in a manner to avoid twisting or otherwise displacing or damaging the rubber gasket. After reinforced concrete pressure pipe units have been joined, the Contractor shall insert a feeler gage between the pipe bell and pipe spigot and move it around the periphery of the pipe to determine the position of the rubber gasket.

Completion of outside joint grouting operations for joints with steel rings and backfilling of the pipe trenches shall follow pipelaying operations as closely as practicable. The outside joints, where steel rings are used, shall be completed at least 4 hours before compaction of the backfill is started.

(1) Type R-1 and R-2 joints - Pipe shall be fitted together when laid on tangent to provide inside and outside joint mortar and grout spaces as shown on the figures in the "Standard Specifications for Reinforced Concrete Pressure Pipe" specified in paragraph 4.2.1. When pipe with R-1 joints is laid on tangent, each joint shall be drawn together so that the distance A shown on the figures in the "Standard Specifications for Reinforced Concrete Pressure Pipe" specified in paragraph 4.2.1 shall not be less than one-half inch; and when laid on long-radius curves, the distance A shall not be less than one-fourth inch at any point in the circumference. When pipe with R-2 joints is laid on tangent, the distance A shall not be less than one-half inch; and when laid on long-radius curves, the distance A shall not be less than one-eighth inch: Provided, That the pipe shall be laid whether on tangent or curve so that at any point in the circumference the grout space on the outside of the

pipe is not less than one-half inch wide and the mortar space on the inside of the pipe is not less than one-fourth inch wide.

After the joints are fully engaged as described above, the outside portion of the joints shall be completed by being filled with grout against bands placed in such manner that there will be no leakage of grout. The outside grout space prior to filling with grout shall be flushed with water so that the surfaces of the joint to be in contact with grout filling will be thoroughly moistened when the grout is poured. Each joint shall be completely filled with grout in one operation, then rodded on both sides of the pipe alternately to settle the grout, and more grout added if necessary to fill the joint completely. The bands shall not be removed from about the joint, and the exposed portions of the joint after filling shall be coated with curing compound and then covered with wet burlap or moist earth.

Construction of the outside portions of the joints shall be kept as close behind the laying of the pipe as possible except that in no case shall it be within three joints of the pipelaying operation.

After the backfill has been placed to at least 1 foot over the top of the pipe, the inside joint space shall be cleaned and the joint surfaces shall be thoroughly wetted before being filled with stiff mortar, which shall be trowelled smooth and flush with the inside surfaces of the pipe and coated with a curing compound. The inside space on 21-inch and smaller diameter pipe shall be filled with mortar butted onto the end of the pipe before the pipe is laid, the pipe being laid shall be pushed to a normal tight closure, and all excess mortar shall be removed from the inside of the pipe joint.

(2) Type R-3 and R-4 joints - When 54-inch-diameter pipe and smaller is laid on tangent, each joint shall be fitted together so that the minimum joint opening is one-fourth inch and the maximum joint opening is one-half inch, and the distance A is not less than one-half inch.

When 60-inch-diameter pipe and larger is laid on tangent, each joint shall be fitted together so that the minimum joint opening is one-fourth inch and the maximum joint opening is three-fourths inch, and the distance A is not less than one-half inch.

When 54-inch-diameter pipe and smaller is laid on long-radius curves, the joints may be pulled such that

the joint opening on the inside of the curve shall be a minimum of one-fourth inch and a maximum of one-half inch; and the joint opening on the opposite side of the pipe shall not be more than one-half inch wider than the joint opening on the inside of the curve: Provided, That the distance A shall not be less than one-fourth inch at any point in the circumference of the joint.

When 60-inch-diameter pipe and larger is laid on long-radius curves, the joints may be pulled such that the joint opening on the inside of the curve shall be a minimum of one-fourth inch and maximum of three-fourths inch; and the joint opening on the opposite side of the pipe shall not be more than one-half inch wider than the joint opening on the inside of the curve: Provided, That the distance A shall not be less than one-fourth inch at any point in the circumference of the joint.

c. Mortar and grout for pipe joints - Mortar for pipe joints shall be mixed not richer than one part, by weight, of cementitious materials to one part, by weight, of clean, well-graded sand, not leaner than one part, by weight, of cementitious materials to two parts, by weight, of clean, well-graded sand, and with sufficient water to obtain the proper consistency. To improve workability of the mortar, the Contractor may replace not more than 7 percent, by weight, of cementitious materials with hydrated lime; may replace not more than 30 percent, by weight, of cementitious materials with an approved pozzolan; may add an air-entraining agent in the mortar; or use any approved combination of these. Cementitious materials and sand and admixture or pozzolan, if used, for mortar in joints shall conform to the requirements for these materials as used in the pipe. Hydrated lime shall be a standard commercial product as approved. Mortar shall be prepared in small batches so as to prevent stiffening before it is used. If any mortar has become so stiff that proper placement cannot be assured without retempering, it shall be wasted. Mortar for filling grooves shall be such consistency that it will adhere to the ends of the pipe.

Grout used for filling joints by pouring shall be mixed in the proportion of 1 part, by weight, of cementitious materials to not more than 1 part, by weight, of sand passing No. 16-mesh screen and thoroughly mixed to a consistency of thick cream.

d. Payment - Payment for laying reinforced concrete pressure pipe including fittings will be made as provided in paragraph 4.1.3.

SECTION 4.3 EMBEDDED CYLINDER PRESTRESSED CONCRETE PIPE

4.3.1 EMBEDDED CYLINDER PRESTRESSED CONCRETE PIPE

Embedded cylinder prestressed concrete pipe shall be manufactured and tested and data shall be submitted for approval in accordance with Bureau of Reclamation "Standard Specifications for Embedded Cylinder Prestressed Concrete Pipe," dated December 1974.

The following revisions are hereby made in the Standard Specifications:

a. Subparagraph 5.c.(2), page 2, line 7, after the word "Federal", delete remainder of line 7 and all of lines 8 through 14 and substitute "Specification SS-C-1960/3B" therefor.

b. Subparagraph 5.e.(1)(b), page 4, left column, line 10 from top of page, change the word "Seventh" to "Eighth".

c. Subparagraph 5.e.(2)(b), page 4, right column, line 15 from bottom of page, change the word "Seventh" to "Eighth".

d. Subparagraph 5.f.(1), page 5, line 4, delete the number "1".

e. Subparagraph 5.f.(2), page 5, line 3, change "B or C" to "30 or 36".

f. Subparagraph 5.f.(3), page 5, line 5, change the number "306" to "663"; and line 12, change the number "306" to "675".

g. Subparagraph 6.a., page 5, right column, line 18 from top of page, change the word "Seventh" to "Eighth".

h. Subparagraph 9.a., page 8, after line 11, add the following: "The ends of the pipe shall be in planes at right angles to the longitudinal centerline of the pipe, except where bevel-end pipe for deflections up to 5° is specified or indicated for bends."

i. Subparagraph 9.b., page 9, left column, line 6 from top of page, change the words "less than" to "less and".

j. Subparagraph 11.c., page 10, after line 7, add the following: "(5) Top and/or bottom of beveled end pipe."

Cement for embedded cylinder prestressed concrete pipe shall meet the requirements of Federal Specification SS-C-1960/3B, for type II, Portland cement, and shall meet the low-alkali requirements and false-set limitations specified therein.

Payment for furnishing embedded cylinder prestressed concrete pipe will be made as provided in Paragraphs 4.1.3.

4.3.2 FITTINGS FOR EMBEDDED CYLINDER PRESTRESSED CONCRETE PIPE

a. General - Adapters, couplings, curves and bends, and connections at structures and encasements shall be furnished and installed by the Contractor as shown on the drawings and in accordance with these specifications.

Welding shall conform with the requirements of the American Welding Society Code AWS B3.0. Temporary or permanent welding for the convenience of the Contractor will not be permitted on areas where the welding will damage the lining and coating. Lifting eyes and other handling devices shall be made a part of the fitting to be lined and coated before the lining and coating is applied.

All completed welds shall be given a dye penetrant test, or shall be hydrostatic tested which stresses the steel to 22,000 psi. Defects in welds as disclosed by the dye penetrant test or hydro test shall be chipped, flame gouged or ground to sound metal and the resulting cavities shall be rewelded and retested. The Contractor shall supply all equipment, supplies, and labor required for making the dye penetrant test and hydrostatic test.

One copy and one reproducible of details of all fittings shall be submitted to the Contracting Officer by the Contractor. Any fabrication or procurement performed prior to approval of details shall be at the Contractor's risk. Approval by the Contracting Officer of the Contractor's details shall not be held to relieve the Contractor of any part of the Contractor's responsibility to meet all of the requirements of these specifications or of the responsibility for the correctness of the Contractor's details.

b. Materials -

(1) Steel for adapters, bends, connections at structures and encasements, and closure sections shall conform to ANSI/ASTM A 283, grade C or D; and/or ANSI/ASTM A 570 grade 40, 45 or 50.

(2) Bolts and nuts shall conform to Federal Specifications FF-B-575c and FF-N-836D(1).

(3) Cement-mortar lining and cement-mortar coating shall conform to paragraph 9.2.1, Cement Mortar Lining and Cement Mortar Coating: Provided, That lining and coating thicknesses shall be as shown on the drawings

and cementitious materials for mortar lining and coating shall conform to paragraph 5.3.2.

(4) Concrete in encasement shall conform to Division 5--Concrete.

(5) Mortar and grout for joints shall conform to subparagraph 4.2.3c.

c. Adapters - Adapters shall not be shorter than the lengths shown on the drawings. Adapters shall have ends which will fit the type of joint in the adjacent pipeline. The thickness of the adapter and the thickness of the mortar lining and coating shall be as shown on the drawings. Flanges shall be approved by the Contracting Officer. Concrete collars shall be constructed on the adapters.

d. Curves and bends - Where shown on the plan and profile drawings, changes in alinement and grade shall be made with miter bends, steel pipe bends, or by using beveled end pipe. Pulling pipe joints for making vertical or horizontal curves in the alinement will not be allowed. The Contractor shall submit details of their proposed bends to the Contracting Officer for approval.

The deflection angle in beveled end pipe joints shall not exceed 5°. Miter bends shall be fabricated and encased with concrete as shown on the drawings.

e. Payment - Payment for furnishing and installing fittings for embedded cylinder prestressed concrete pipe will be made as provided in Paragraph 4.1.3.

4.3.3 LAYING EMBEDDED CYLINDER PRESTRESSED CONCRETE PIPE

a. General - The Contractor shall employ for the work of laying the pipe only workmen who are skilled and experienced in laying pipe with type of joint being furnished. It shall be the responsibility of the Contractor to provide watertight pipe and pipe joints. The pipe shall be laid to the lines and grades shown on the drawings and to the following tolerances.

Departure from and return to established alignment and grade shall not exceed 1/16 inch per foot of pipe with a total of not more than 1-inch departure.

When prestressed cylinder concrete pipe adjoins a concrete structure or is encased in concrete, except at concrete cutoff collars, a rubber gasket joint shall be provided at or adjacent to the nearest face of such structure or encasement and the distance between the pipe joint and the concrete face shall be as shown on the drawings or if not shown on the drawings the distance shall not exceed 18

inches for pipe 36 inches in diameter and smaller or one-half the diameter of the pipe for pipe larger than 36 inches in diameter. At such locations the inside and outside annular joint spaces shall be filled with a preformed plastic sealing compound conforming to Federal Specification SS-S-210A.

Pipe trenches shall be kept free of water which might impair pipelaying operations at all times during laying operations. Pipe trenches shall be carefully graded so as to provide uniform support along the bottom of pipe. On grades exceeding 10 percent, pipe shall be laid uphill.

The Contractor shall schedule his work so that at no time will pipe remain in the trench more than 7 days before being covered with backfill. If pipelaying operations are interrupted for more than 24 hours, all pipe laid in the trench shall be covered with backfill.

All backfill about pipe shall be placed carefully and simultaneously on each side of the pipe to avoid lateral displacement of the pipe and damage to the joints. If adjustment of the position of a length of pipe is required after it has been laid, it shall be removed and relaid as for a new pipe. After all pipe laying and joining operations are completed, the inside of the pipe shall be cleaned and all debris removed. When pipelaying is not in progress, the ends of the pipelines shall be kept closed.

b. Laying pipe - After the gaskets have been fitted properly in place, they shall be restretched and released to assure equalization and uniform tension throughout the length of the gaskets. The gaskets shall be lubricated with a nontoxic water-soluble lubricant. The pipe units shall be fitted together, spigot to bell, in a manner to avoid twisting or otherwise displacing or damaging the gaskets. As each unit of pipe is laid, a sufficient amount of selected backfill shall be placed carefully and tamped thoroughly about the lower portion of the pipe to hold it firmly in place. Completion of outside joint grouting operations and backfilling of the pipe trenches shall follow pipelaying operations as closely as practicable. The outside joints shall be completed at least 4 hours before compaction of the backfill is started.

The joint for embedded cylinder prestressed concrete pipe is shown on Figure 1 in the Standard Specifications specified in Paragraph 4.3.1. The pipe shall be fitted together to provide inside and outside joint mortar and grout spaces as shown on Figure 1. Each joint shall be drawn together so that the Distance A shown on the above Figure 1 shall not be less than 1 inch at any point in the circumference: Provided, That the pipe shall be laid so that at any point in the circumference the grout space on the outside of the

pipe is not less than one-half inch wide and the mortar space on the inside of the pipe is not less than one-fourth inch wide.

After the joints are fully engaged as described above, the outside of the joints shall be cleaned, thoroughly moistened, and wrapped with polyethylene diapers. The diaper shall be strapped securely to the pipe so that there will be no leakage of grout when the grout is poured. A flexible wire placed around the pipe shall be used to rod the grout or diaper may be manipulated by hand to remove air bubbles. Diapers shall be left in place to protect the joints.

Construction of the outside portions of the joints shall be kept as close behind the laying of the pipe as possible except that in no case shall it be within three joints of the pipelaying operation.

After the backfill has been placed to at least 1 foot over the top of the pipe, the inside joint space shall be cleaned and the joint surfaces shall be thoroughly wetted before being filled with stiff mortar which shall be trowelled smooth and flush with the inside surfaces of the pipe and coated with a curing compound: Provided, That the inside space on 21-inch and smaller diameter pipe shall be filled with mortar buttered onto the end of the pipe before the pipe is laid, and the pipe being laid shall be pushed to a normal tight closure, and all excess mortar shall be removed from the inside of the pipe joint.

The Contractor shall clean and roughen the surface of pipe that is in contact with concrete and/or mortar at connections at structures.

c. Mortar and grout for pipe joints - Mortar for pipe joints shall be mixed not richer than one part, by weight, of cement to one part, by weight, of clean well-graded sand, and not leaner than one part, by weight, of cement to two parts, by weight, of clean well-graded sand, and with just sufficient water to obtain the proper consistency. To improve the workability of the mortar, the Contractor may replace not more than 7 percent, by weight, of cement with hydrated lime, or may replace not more than 30 percent, by weight, of cement with an approved pozzolan, or may add an air-entraining agent in the mortar, or use any approved combination of these. Cement and sand and admixture of pozzolan, if used, for mortar in joints shall conform to the requirements for these materials as used in the pipe. Hydrated lime shall be a standard commercial product as approved. Any mortar which has become so stiff that proper placement cannot be assured without retempering shall be wasted, and mortar shall be prepared in small batches so as to prevent stiffening before it is used. Mortar for filling

grooves shall be of such consistency that it will adhere to the ends of the pipe.

Grout used for filling joints by pouring shall be mixed in the proportion of one part of cement, by weight, to not more than one part, by weight, of sand passing No. 16-mesh screen, and thoroughly mixed to a consistency of thick cream.

d. Payment - Payment for laying embedded cylinder prestressed concrete pipe, including fittings, will be made as provided in Paragraph 4.1.3.

SECTION 4.4 NONCYLINDER PRESTRESSED CONCRETE PIPE

4.4.1 NONCYLINDER PRESTRESSED CONCRETE PIPE

a. General - Noncylinder prestressed concrete pipe shall be manufactured and tested in accordance with this paragraph.

b. Basis of acceptance - The acceptability of the pipe will be determined by inspection during and after manufacture to determine whether the pipe conforms to these specifications, including design, freedom from defects, and the results of the physical test requirements, as specified in Subparagraph i. The Contracting Officer shall be given 48 hours advance notice that finished pipe units are ready for shipment. The Contracting Officer will inspect the pipe units and will accept those which have been manufactured in accordance with these specifications.

c. Materials -

(1) Water.--Water for concrete pipe shall conform to Paragraph 5.3.4.

(2) Cement.--Cement used in concrete pipe shall conform to Paragraph 5.3.2.

(3) Admixtures - All concrete in concrete pipe placed by the poured and vibrated method shall contain an air-entraining agent conforming to Paragraph 5.3.3. The amount of air-entraining agent used shall be such as will effect the entrainment of not more than 2 and 1/2 percent of air, by volume, of concrete as discharged from the mixer. Calcium chloride shall not be used.

(4) Steel reinforcement - Reinforcement shall conform to the requirements of Subparagraph g.

(5) Aggregate - Sand and coarse aggregate for concrete pipe shall conform to Paragraphs 5.3.5 and 5.3.6. The maximum size of coarse aggregate for each size of pipe

shall be the largest size the use of which is practicable from the standpoint of satisfactory placing of the concrete. Sand gradings as provided in ASTM Designation: C 33 may be approved when necessary for a manufacturing process to produce uniform high-quality pipe.

d. Concrete in pipe core -

(1) Mixture - The aggregates shall be so graded and proportioned and thoroughly mixed with such portions of cement and water as will produce a workable, uniform, and homogeneous concrete mixture of such quality that the pipe will conform to the test and design requirements of these specifications. Batching shall be by weighing. If concrete materials are weighed cumulatively, the cement shall be weighed before the other ingredients. The concrete ingredients shall be mixed in a rotating- or paddle-type batch mixer or other approved types. The concrete ingredients shall be mixed for not less than 1 and 1/2 minutes after all the ingredients, except the full amount of water, are in the mixer: Provided, That the mixing time may be reduced if, when determined in accordance with Designation 26 of the Eighth Edition of the Bureau of Reclamation Concrete Manual, the unit weight of air-free mortar in samples taken from the first and last portions of the batch as discharged from the mixer does not vary more than 0.8 percent from the average of the two mortar weights, the average variability for six batches does not exceed 0.5 percent, and the weight of coarse aggregate per cubic foot does not vary more than 5 percent from the average of the two weights of coarse aggregates. The Government reserves the right to increase the mixing time when the charging and mixing operations fail to produce a concrete batch throughout which the ingredients are uniformly distributed and the consistency is uniform. The concrete, as discharged from the mixer, shall be uniform in composition and consistency throughout the mixed batch, and from batch to batch, except where changes in composition or consistency are required. The slump of the concrete, after the concrete has been deposited but before it has been consolidated, shall not exceed 3 inches.

The concrete shall have a portland cement content of not less than 6 sacks (94 pounds each) per cubic yard of concrete. Concrete compressive strength at 28 days' age shall herein be designated f'_c. The average compressive strength of the concrete shall be sufficient to insure that the following requirements are met:

(a) Eighty percent of the test cylinders shall have a compressive strength at 28 days' age in excess of f'_c.

(b) The average strength of any five consecutive tests shall not be less than 92 percent f'_c.

(c) No test cylinders shall have a compressive strength at 28 days' age of less than 65 percent f'_c.

Except as hereinafter provided, the compressive strength of test cylinders at 28 days' age shall be determined by 6- by 12-inch concrete cylinders made from the concrete used in making the pipe, and prepared, cured, and tested in accordance with Designations 29 to 33, inclusive, of the Eighth Edition of the Bureau of Reclamation Concrete Manual.

(2) Forms - The forms shall be made with butt joints throughout and the surfaces of the forms adjacent to the pipe walls shall be smooth and true. All forms shall be sufficiently tight to prevent leakage of mortar. The forms shall be braced and sufficiently stiff to withstand, without detrimental deformation, all operations incident to the placement and compaction of concrete within the forms. The forms and end rings shall be so constructed that the pipe when manufactured will have circular and cylindrical inner surfaces, so that they may be stripped from the pipe without damage to the pipe or to its surfaces. Forms shall be cleaned and oiled before each filling. Forms, end rings, and snap rings shall be maintained to produce the specified product.

(3) Placement of concrete in pipe core - The transporting and placing of concrete shall be by methods that will prevent the separation of the concrete materials and the displacement of the longitudinal reinforcement steel in the forms. The concrete in the pipe shall be placed by centrifugally spinning, rolling, vibrating, by a combination of these, or by other approved methods. For concrete pipe that is manufactured by the placing and vibrating methods, the concrete shall be thoroughly consolidated by vibration until it is free from pockets, closes snugly against all surfaces, and is in complete contact with all reinforcement. Form vibrators, rigidly attached to the forms by bolting or clamping, shall be adequate in size and of sufficient frequency to properly consolidate the volume of concrete and shall be maintained in good operating condition. Each pipe unit shall be continually vibrated when concrete is entering the forms. Overvibration shall be avoided

when concrete is not entering the forms, particularly in the upper end and when the forms are full. Concrete in the pipe form may be revibrated briefly as late after completion of casting as the concrete can again be made plastic, but prior to the start of steam curing.

(4) Curing of pipe core - The pipe core shall be cured by steam or water as described in the following subparagraphs, or a combination of these methods. Adequate facilities shall be provided for all curing operations. The pipe core shall be cured so that a minimum strength of f'_{ci}, the minimum strength at the time of circumferential prestressing, is attained before prestressing. Strength of core concrete shall be determined by testing concrete test cylinders made in accordance with Subparagrah d.(1) and cured by methods comparable to those used to cure the pipe. Pipe and test cylinders shall be protected from temperatures below 40° F before and during curing operations.

At the start of manufacturing, six cylinders shall be made and cured as provided above from one single representative batch of concrete during each working shift. The cylinders shall be tested in pairs at appropriate time intervals during the curing cycle to establish the curing procedure required to attain a minimum strength of f'_{ci}.

After the curing cycle and procedure have been established, two cylinders from each of two batches during each shift shall be made and cured as provided above. One pair of cylinders consisting of one cylinder from each of two different batches shall be tested and the test strengths must equal or exceed f'_{ci} prior to circumferential prestressing. If the strength of either test cylinder is less than f'_{ci}, curing shall be continued and the remaining pair of cylinders tested after sufficient additional curing to insure the required strength of f'_{ci}. If the second pair of test cylinders does not meet the strength requirement, curing shall be continued for such additional time as determined necessary by the Engineer, to insure f'_{ci}.

Cylinders will be tested as soon as possible after removal from curing while still in the moist condition: Provided, That testing required after the curing period has been established may be reduced by the Engineer after it has been demonstrated that consistent strength results are being obtained in accordance with Subparagraph d.(1).

Water curing and steam curing may be used interchangeably on a time ratio basis of 4 hours of water curing to 1 hour of steam curing.

(a) Steam curing - Within 2 hours after the pipe core has been cast, it shall be enclosed within a suitable steam-curing chamber or enclosure that will protect the pipe from outside drafts. Enclosures shall allow full circulation of saturated vapor around the inside and outside of the pipe, and the curing shall keep all concrete surfaces continuously moist throughout the curing process. The ambient temperature rise about the pipe core at any time shall not exceed 40° F per hour. The ambient temperature within the enclosure shall not be raised above 100° F by the use of steam within 2 hours after completion of concrete placement; thereafter, the temperature shall be maintained between 90° and 150° F during the steam-curing period, except for the time necessary for removal of forms. The temperature in the steam-curing chamber shall be thermostatically controlled. Following the periods of steam curing, the pipe shall be protected from rapid drops in temperature which may damage the pipe.

(b) Water curing - Concrete in pipe core may be water cured by covering with water-saturated material or by a system of perforated pipes, mechanical sprinklers, porous hose, or by any other approved method that keeps the outside of the pipe continuously wet and maintains a minimum relative humidity of 60 percent inside the pipe during the specified curing period.

e. Cement-mortar coating - Portland cement paste shall be applied to the outside of the core and, immediately following, a cement-mortar coating having a minimum thickness of 1 inch measured from the outside surface of the pipe core or a minimum of three-fourths inch over the reinforcement, whichever is greater, shall be applied to the pipe core. The surface of the core shall be dry, but not so absorptive as to immediately dry the cement paste. The thickness of the cement-mortar coating may be reduced at the spigot. The cement paste shall be mixed in the proportions of 1 sack of cement to not more than 10 gallons of water. At the time of applying the cement paste, the surface of the pipe core and the reinforcement shall be clean and free from oil, grease, or other foreign substances. The cement paste, after application, shall not be allowed to dry prior to or during application of the cement-mortar coating. The cement-mortar coating shall be applied within 16 hours after reinforcement has been wound and shall be applied

pneumatically, by rotary brushes or belts, or by other approved methods. Mortar for the coating shall be mixed in the proportions of one part cement, by weight, to four parts, by weight, of surface-dry sand. Rebound not to exceed one-fourth of the total mix weight may be used: Provided, That the resulting mix proportions shall not be less than 1.4. Rebound not reused within 1 hour shall be discarded. The proportions may be modified by the Engineer to suit the work or the nature of the materials used. The sand and cement shall be thoroughly machine mixed before being fed into the placing machine. The amount of water used shall be that required to produce mortar of suitable consistency, quality, and uniformity with the minimum of rebound. After the cement-mortar coating has been applied, the completed pipe shall be cured by steam curing in accordance with Subparagraph d.(4)(a) for a period of 36 hours or water cured in accordance with Subparagraph d.(4)(b) for a period of 6 consecutive days.

f. Design - Noncylinder prestressed concrete pipe shall be designed in accordance with the details of these paragraphs and the requirements shown on the drawings. The maximum laying length of pipe which is acceptable is 24 feet.

g. Reinforcement -

(1) Circumferential reinforcement - The circumferential reinforcement shall be hand-drawn steel spring wire in accordance with ASTM Designation: A 648, Class III: Provided, That Class II may be used in designs submitted for approval.

(a) Single-layer wrapped pipe - After the concrete for the core in the pipe has been placed and properly cured and the concrete has obtained the design compressive strength of f'_{ci}, the steel wire shall be helically wound on the concrete core under a tension of 75 percent of the minimum ultimate strength of the wire: Provided, That a tolerance of 10 percent above or below the 75-percent tension will be allowed. The equipment for winding the wire under tension shall be subject to the approval of the Construction Engineer before use and shall provide ready means of determination and uniform control of the tension. The wire shall be continuous from end to end of the pipe unit. Where splices are required in the wire, the finished splices shall have a strength of not less than the strength of the wire. Special fasteners suitable for anchoring in the concrete shall be used at the ends of the wire. No welding shall be used.

(b) Two-layer wrapped pipe - Two-layer wrapped pipe shall be manufactured with one-half of the required circumferential reinforcement wound on the pipe in each of two layers. The first layer of circumferential reinforcement shall be wound on the pipe core in accordance with Subparagraph g.(1)(a) above. After the first layer of circumferential reinforcement has been wound on the pipe core, a cement paste and a mortar encasement having a thickness equal to the diameter of the first layer of circumferential reinforcement shall be applied to the pipe core in accordance with Subparagraph e. The first layer of mortar encasement shall be steam cured as specified in Subparagraph d.(4)(a) for a period of not less than 8 hours. After the first layer of mortar encasement has been cured, the second layer of circumferential reinforcement shall be wound on the first layer of mortar encasement in accordance with Subparagraph g.(1)(a) above. After the second layer of circumferential reinforcement has been wound on the pipe, a second layer of mortar encasement having a minimum thickness of three-fourths inch over the second layer of circumferential reinforcement shall be applied and cured in accordance with Subparagraph e.

(2) Longitudinal reinforcement - Longitudinal reinforcement consisting of reinforcement bars conforming to Federal Specification QQ-S-632c, Type I or II, Class B40, shall be provided in the pipe core. To prevent cracks and insure a watertight pipe, concrete tensile stresses shall not exceed those herein specified. Longitudinal prestressing of the core may be used to reduce tensile stresses. This may be accomplished by a minimum of eight longitudinal pretensioned wires, rods, or strands embedded in the core or by the use of temporary mechanical means for compressing the core to reduce temporary stresses during the time of wrapping. Where embedded pretensioned reinforcement is used, the pretension stress shall be maintained, by suitable supports, during the placing and curing of the pipe core until the concrete in the core has attained a strength equal to 1.8 times the longitudinal induced compression in the concrete. Suitable end anchorage devices shall be provided at each end of the longitudinal reinforcement capable of developing the full strength of the reinforcement. These anchorage devices shall be located as near the ends of the pipe as practicable. The ends of the reinforcement and the ends of anchors shall be completely covered with concrete, mortar, or an approved compound to insure no electrical contact of the longitudinal steel across the pipe joint. End

anchorage devices, the method of pretensioning and maintaining the stress in the longitudinal reinforcement as provided above, shall be subject to the approval of the Construction Engineer.

In computing longitudinal bending stresses induced by circumferential prestressing or wrapping the core, or the pressure from the rubber gasket, or hydrostatic pressure, nonuniformity in the thickness of the core shall be considered and longitudinal elements of the core shall be analyzed as beams on elastic foundations. The circumferential wrap shall be treated as a uniform partial load on the element which gradually increases in length corresponding to the manner in which the pipe is wrapped.

Stresses induced in the core during the time of wrapping but that disappear when the wrapping is completed shall be classed as temporary and tensile stresses for such shall not exceed 6 f'_{ct}.

Stresses that remain in the core after wrapping is completed shall be classed as steady stresses. To these shall be added stresses induced by hydrostatic pressure or by the pressure from the rubber gasket to those due to lifting and handling the pipe sections, or stresses that may be induced due to uneven bearing of the pipe in the trench. To determine the latter type of steady stress, a pipe section shall be assumed to be supported on a foundation with a foundation modulus equal to 75 percent of that for adjoining sections, and shall support a total load equal to the dead load of the pipe, the water in the pipe, and the earth cover. The above steady stresses or combination thereof shall not exceed 3 f'_{ct}: Provided, That near the end of the pipe where stresses are due to bending in the longitudinal elements in the core induced by wrapping, hydrostatic pressure, or rubber gasket loads, the stress shall not exceed 6 f'_{ct}.

The symbol f'_{ct} is the compressive strength of the concrete at the time the above loads occur and shall not be taken greater than f'_c. In the above analysis, a straight-line distribution of stress shall be assumed corresponding to that of a homogeneous material. Stress concentrations at sharp reentrant corners shall be considered.

h. Joints -

(1) General - The joint assemblies shall be so formed and accurately manufactured that when the pipes are drawn together in the trenches, the pipe shall form a continuous watertight conduit with smooth and uniform

interior surface, and shall provide for slight movements of any pipe in the pipeline due to expansion, contraction, settlement, or lateral displacement. The rubber gasket shall be the sole element of the joint depended upon to provide watertightness. The ends of the pipe shall be in planes at right angles to the longitudinal centerline of the pipe except where bevel end pipe is specified or indicated for bends. The ends shall be finished to regular smooth surfaces.

The joint design shall be similar to those shown on Figure 1 of the Standard Specifications for Embedded Cylinder Prestressed Concrete Pipe, December, 1974, and so proportioned that the spigot and gasket will readily enter the bell of the pipe. The bell of the joint shall be manufactured so that the surface over the Distance A on which the gasket may bear shall not extend less than 1 inch away from the edge of the gasket at full joint closure. When inspection indicates that the joint form has become worn or warped to the extent that the clearances in the joint exceed those specified, or the annular spaces between the bell-and-spigot surfaces become eccentric, the forms shall be reconditioned or replaced. The shape and dimensions of the joint shall be such as to provide the following minimum requirements:

(a) The rubber gaskets shall be solid gaskets of circular cross section.

(b) The gasket space provided in the engaged joint calculated for maximum spigot diameter, minimum bell diameter, and minimum depth of groove shall not be less than the volume of the gasket.

(c) The gasket shall be confined in an annular space formed in a groove so that movement of the pipe or hydrostatic pressure cannot displace the gasket and when the joint is assembled, the gasket shall be compressed to form a watertight seal.

(d) In joints where the volume of the gasket is less than 85 percent of the volume of the annular space in which the gasket is to be contained with the engaged joint in concentric position (area of groove plus area of space between spigot and bell with joint centered calculated to width of groove at surface of spigot), the gasket shall not be stretched more than 20 percent of its original length when seated on the spigot, and the gasket shall be of such size that when the outer surface of the spigot and the inner surface of the bell or sleeve come into contact at some point in their periphery, the deformation in the gasket shall not

exceed 40 percent at the point of contact and at the diametrically opposite point across the pipe shall not be less than 15 percent of the stretched gasket diameter. In joints where the volume of the gasket is 85 percent or more of the volume of the annular space in which the gasket is to be contained with the engaged joint in concentric position (area of groove plus area of space between spigot and bell with joint centered calculated to the width of groove at surface of spigot), the gasket shall not be stretched more than 30 percent of its original length when seated in the spigot groove and the gasket deformations as prescribed above shall not be more than 50 percent and less than 15 percent. Stretched gasket diameters shall be calculated as being the original diameter divided by the square root of (1 + x) where "x" equals the percent of gasket stretch divided by 100. Determination of the percent of gasket deformation in an offcenter joint shall be based on the most unfavorable limits of the pipe manufacturer's tolerances.

(e) Each gasket shall be manufactured to provide the volume of rubber required by the pipe manufacturer's joint design within a tolerance of plus or minus 2 percent for gaskets of less than 3/4-inch diameter and plus or minus 1 percent for gaskets of 3/4-inch diameter and larger. The actual stretch in each gasket will have to be varied from nominal stretch by an amount sufficient to compensate for manufacturing variation in the diameter of the gasket.

(f) The taper on all surfaces on the bell on which the rubber gaskets may bear during closure of the joint and at any degree of partial closure shall not exceed 2°.

(g) The surfaces of the bell and spigot in contact with the gasket, and adjacent surfaces that may come in contact with the gasket within a joint movement range of 1 inch, shall be free from airholes, chipped or spalled surfaces, laitance, or other defect, except that individual airholes may be repaired as provided in Subparagraph 1.

(h) The inside surface of the bell adjacent to the bell face shall be flared to facilitiate joining the pipe sections without damaging or displacing the gasket.

(i) Manufacture.--The steel joint rings shall be rolled and butt-welded to form a round steel collar. Resistance or electric-arc welding

conforming to requirements of AWS D1.0 shall be used. The surface of the weld shall be ground smooth and flush.

(j) The bell and spigot shall be so shaped and dimensioned that when the bell and spigot is engaged the distance between the inside shoulder of the bell and the end of the spigot shall not exceed 3/16 inch.

Except where resin coating is required, the exposed steel surface of the spigot ring shall be painted with one coat of approved paint.

(2) Other types of rubber gasket joints - The Contractor may submit other types of rubber gasket joint designs with steel rings and, if deemed satisfactory, will be approved by the Contracting Officer. Variations of joint details from those specified will be permitted to the extent that such variations will not impair the structural and operational function of the pipeline as determined by the Construction Engineer: Provided, That the proposed joint details shall conform to the requirements of Subparagraphs (a) through (j) above. The Contracting Officer may require shop tests on proposed joints, prior to approval, to demonstrate that the joint arrangement will satisfactorily withstand a pressure equivalent to 175 percent of the internal hydrostatic head for which its use is being proposed and the cost of such tests shall be borne by the Contractor.

(3) Approval of joints - Details of joints and pipe including longitudinal steel, showing exact dimensions, including tolerances, shall be submitted by the Contractor to the Construction Engineer for approval.

The Construction Engineer may require shop or field tests on any joint design, prior to approval, to demonstrate that the joint arrangement will satisfactorily withstand a pressure equivalent to 175 percent of the internal hydrostatic head for which its use is being proposed and the cost of such tests shall be borne by the Contractor. Any fabrication or procurement performed prior to approval of details shall be at the Contractor's risk. Approval by the Construction Engineer of the Contractor's details shall not be held to relieve the Contractor of any part of the Contractor's responsibility to meet all of the requirements of these specifications or of the responsibility for the design, manufacture, and performance of the joint. The maximum tolerances permitted in the construction of the joint shall be

that stated in the pipe manufacturer's design as approved.

(4) Steel for joint rings - Steel strips for bell rings less than one-fourth inch thick shall conform to ASTM Designation: A 283, Grade B; ASTM Designation: A 570, Grade B; ASTM Designation: A 663, Grade 60; or steel which meets the requirements of AISI 1012 for chemical components and has a minimum yield point of 27,000 pounds per square inch after being sized. Steel plates for bell rings one-fourth inch or more in thickness and for spigot rings shall conform to ASTM Designation: A 283, Grade B; ASTM Designation: A 675, Grade 60; or steel which meets the requirements of AISI 1012 for chemical components and has a minimum yield point of 27,000 pounds per square inch after being sized.

(5) Rubber gaskets - The term "rubber gaskets" as used in these specifications shall be construed to include natural rubber or any synthetic compound.

Rubber gaskets shall be extruded or molded and cured in such a manner that any cross section will be dense, homogeneous, and free from porosity, blister, pitting, and other imperfections. The gaskets shall be extruded or molded to the specified size within a tolerance of plus or minus 1/64 inch or plus or minus 1.5 percent of the diameter, whichever is the larger. The gaskets shall be fabricated from an elastomeric compound having the following physical properties:

Tensile strength, pounds per square inch, minimum	2,300
Elongation at break, percent, minimum	425
Shore durometer, Type A	35 to 65
Compression set (constant deflection) percent of original deflection, maximum	20
Change in weight, water immersion, percent, maximum (2 days at 70° C)	5
Accelerated aging, oxygen pressure test (48 hours, 158° F, 300 pounds per square inch), or air oven test (96 hours, 158° F):	

Tensile strength after aging, percent of original, minimum	80
Elongation after aging, percent of original, minimum	80
Increase in Shore durometer after oxygen pressure aging. Maximum increase over original Shore durometer	8

The physical properties of the rubber compound shall be determined by tests performed in accordance with appropriate sections of Federal Test Method Standard No. 601. At the option of the manufacturer, laboratory tests to determine physical properties of the rubber gaskets to be furnished under these specifications shall be performed on test specimens cut from (a) test units taken from the finished rubber product, or (b) substitute samples furnished in accordance with Paragraph 3.5 of Section 6, Federal Test Method Standard No. 601. Certified copies of the test reports of the physical properties of the rubber compound used in all rubber gaskets shall be furnished to the Contracting Officer.

If a splice is used in the manufacture of the gasket, the strength shall be such that the gasket shall withstand 100 percent elongation over the part of the gasket which includes the splice with no visable separation of the splice. While in the stretched position, the gasket shall be rotated in the spliced area a minimum of 180° in each direction in order to inspect for separation. In addition, any portion of the splice shall be capable of passing a bend test without visable separation. The bend test is defined as wrapping the portion of the gasket containing the splice a minimum of 180° and a maximum of 270° around a rod of a diameter equal to the cross-section diameter of the gasket. Not more than one splice per gasket will be allowed.

All gaskets shall be stored in as cool a place as practicable, preferably at 70° F or less, and in no case shall the gaskets be stored in the open, exposed to the direct rays of the sun. No gasket which shows any evidence of deterioration, such as surface checking or cracking, shall be installed in a pipe joint.

i. General physical test requirements - All pipe units and test cylinders for purpose of tests, all labor and materials for making the tests, and adequate equipment shall be furnished by the Contractor at no cost to the Government:

Provided, That pipe units which are used for testing and which satisfactorily pass testing procedures and conform to all provisions of these specifications including physical inspection, will be acceptable for installation in pipelines and structures. The strength of concrete will be determined as provided in Subparagraphs d.(1) and (4).

j. Miscellaneous requirements -

(1) Sizes and permissible variations - The internal diameter of the pipe shall not exceed plus or minus 3/4 inch.

The average diameter of any bell or spigot shall be within the minimum and maximum limits given by the manufacturer. The average diameter of a bell will be determined by taking the average of four equally spaced diametric measurements. The average spigot diameter will be determined by dividing the measured circumference by 3.1416. The minimum bell diameter of any unit of pipe, measured diametrically, shall not be less than the minimum. The maximum spigot diameter on any unit of pipe, measured diametrically, shall not be greater than the maximum given.

The core thickness shall not vary more than 5 percent at any point or five-eighths inch, whichever is less. Notwithstanding any of the above permissible variations, all pipe and joints shall be so manufactured that when the pipe is laid in the trenches the maximum offset on the inside of the pipe at any joint will not exceed 0.75 percent of the internal diameter of the pipe.

(2) Finish - Pipe shall have cylindrical interior surfaces and shall be free from fractures, excessive interior surface crazing and roughness. The interior and exterior surfaces shall be concentric at any normal cross section of pipe. Pipe manufactured by pouring and vibrating methods within stationary inside and outside forms shall have smooth glossy surfaces, relatively free from pits and airholes.

Pipe manufactured by a centrifugal spinning method shall be free from excessive brush marks, that indicate hard brushing of the interior surface of the removal of water and laitance, and which will markedly affect the water-carrying capacity of the finished pipeline. Float rock or other light materials such as clay balls or wood particles appearing on the inside surface of the pipe may be cause for rejection at the discretion of the Engineer.

(3) Markings - The following shall be clearly marked on the interior surface of the pipe.

(a) The symbol.

(b) Type of cement if more than one type of cement is specified.

(c) The date of manufacture.

(d) The name or trademark of the manufacturer.

(4) Hauling and handling - Pipe shall not be stored in the yard or on the jobsite under conditions which would cause injurious drying out of the concrete. Whenever necessary, in order to prevent cracking of the concrete or other objectionable effect of drying, pipe shall be adequately protected by means of shelter and application of water. The pipe shall not be dropped or subjected to any unnecessary jar, impact, or other treatment that might crack the shell or otherwise damage the pipe. No pipe shall be hauled to the site of the work until it has attained the strength after full curing specified in Subparagraphs d.(4) and e. unless otherwise approved by the Construction Engineer.

k. Rejections - Pipe that is damaged because of the Contractor's continuing carelessness in handling or failure to prevent recurrent imperfections in manufacture will be rejected. Pipe will be subject to rejection on account of failure to conform to any of the specifications requirements or because of the presence of detrimental defects such as, but not limited to, the following:

(1) Defects which indicate imperfect mixing or molding.

(2) Presence of honeycomb or open texture.

(3) Pipe containing blisters and drummy areas.

(4) Any pipe on which the ends have imperfections or damaged areas that extend more than one-fourth of the diameter of the pipe or 12 inches, whichever is less, around the circumference of the pipe in the gasket-bearing area of the bell and/or spigot.

(5) Any pipe showing scaling or loose, weak interior surfaces except minor areas of shallow depth which can be brushed out to the satisfaction of the Engineer.

(6) Surface defects such as nonfills or fallouts affecting more than approximately 2 square feet of surface area in each such defect.

(7) Any pipe having transverse cracks extending through the wall of the pipe.

(8) Any pipe showing a longitudinal crack extending through the wall of the pipe unless it successfully passes a hydrostatic test approved by the Construction Engineer.

1. Repairs - Individual pipe units may be repaired when the defects not subject to rejection under Subparagraph k. above are the result of occasional imperfections in manufacture or accidental injury during handling; and will be considered acceptable if, in the opinion of the Engineer, the repairs are sound and properly finished and cured by approved methods, and the repaired pipe conforms to the requirements of these specifications as to dimensions and tolerances. A hydrostatic test, performed at the Contractor's expense, may be required on any repaired pipe if deemed necessary by the Construction Engineer.

Individual airholes in gasket-bearing areas may be filled with hand-placed, stiff, preshrunk 1:1 mortar of cement and fine sand with no other preparation than thorough washing with water. Such filling shall be kept moist under wet burlap for at least 48 hours or steam cured for at least 12 hours. Airholes may be filled with an approved epoxy mortar.

m. Payment - Payment for furnishing noncylinder prestressed concrete pipe will be made as specified in Paragraph 4.1.3.

4.4.2 FITTINGS FOR NONCYLINDER PRESTRESSED CONCRETE PIPE

a. General - Adapters, couplings, curves and bends, encasements, and connections at structures shall be furnished and installed by the Contractor as shown on the drawings and in accordance with these paragraphs. Rubber gasket joints in curves and bends, and connections at structures shall conform to Subparagraph 4.4.1.h. Welding shall conform with the requirements of AWS B3.0. Fittings fabricated from steel plate shall be tested under hydrostatic pressure sufficient to stress the steel to 22,000 pounds per square inch. The pressure shall be held long enough to allow a thorough inspection of all welded joints and any leaks shall be repaired by rewelding and the fittings shall then be retested. Fittings fabricated from tested steel pipe do not require hydrostatic testing, however, the girth butt-welds shall be complete penetration welds and shall be given a dye penetrant test in accordance with ASTM Designation: E 165. Defects in welds as disclosed by the dye penetrant test or hydrostatic test shall be chipped, flame gouged, or ground to sound metal and the resulting cavities shall be rewelded and retested. The

Contractor shall furnish all equipment, supplies, and labor required for making the dye penetrant test and hydrostatic test.

b. Approval of adapters, couplings, curves and bends, encasements and connections - One copy and one reproducible of details showing exact dimensions of joints and diameter of rubber gasket including tolerances, and other major dimensions, shall be submitted by the Contractor to the Construction Engineer.

Any fabrication or procurement performed prior to approval of details shall be at the Contractor's risk. Approval by the Construction Engineer of the Contractor's details shall not be held to relieve the Contractor of any part of the Contractor's responsibility to meet all the requirements of these specifications or of the responsibility for the correctness of the Contractor's details.

c. Materials -

(1) Steel for adapters, bends, connections at structures and encasements, and closure sections shall conform to ANSI/ASTM A 283, canal C or D; and/or ANSI/ASTM A 570 grade 40, 45 or 50.

(2) Bolts and nuts shall conform to Federal Specifications FF-B-575c and FF-N-836D(1).

(3) Cement-mortar lining and cement-mortar coating shall conform to paragraph 9.2.1, Cement Mortar Lining and Cement Mortar Coating: Provided, That lining and coating thicknesses shall be as shown on the drawings and cementitious materials for mortar lining and coating shall conform to paragraph 5.3.2.

(4) Concrete in encasement shall conform to Division 5--Concrete.

(5) Mortar and grout for joints shall conform to subparagraph 4.2.3c.

d. Connections at structures shall be fabricated as shown on the drawings.

e. Curves and bends - Changes in alinement and grade shall be made by pipe bends, or by using beveled end pipe. Pulling joints for making changes in alinement or grade will not be allowed. The deflection angle between adjacent pipe units in place shall not exceed 5° to beveled end pipe.

f. Payment - Payment for furnishing and installing fittings for noncylinder prestressed concrete pipe will be made as provided in Paragraph 4.1.3.

4.4.3 LAYING NONCYLINDER PRESTRESSED CONCRETE PIPE

a. General - The Contractor shall employ for the work of laying the pipe only workmen who are skilled and experienced in laying pipe with type of joint being furnished. It shall be the responsibility of the Contractor to provide watertight pipe and pipe joints. The pipe shall be laid to the lines and grades shown on the drawings and to the following tolerances. Departure from and return to established alinement and grade shall not exceed 1/16 inch per foot of pipe with a total of not more than 1-inch departure.

Where noncylinder prestressed concrete pipe adjoins a concrete structure, a rubber gasket joint shall be provided at or adjacent to the nearest face of such structure or encasement and the distance between the pipe joint and the concrete face shall not exceed one-half the diameter of the pipe or as shown on the drawings. Where joints with steel rings are used, the outside annular joints spaces shall be filled with a preformed plastic sealing compound conforming to Federal Specification SS-S-210A.

Pipe trenches shall be kept free of water which might impair pipelaying operations at all times during laying operations. Pipe trenches shall be carefully graded so as to provide uniform support along the bottom of pipe. At joints involving bells or collars, excavation at the joints shall be of ample size to prevent the bells or collars from coming in contact with the subgrade. On grades exceeding 10 percent, pipe shall be laid uphill.

The Contractor shall schedule his work so that at no time will pipe remain in the trench more than 7 days before being covered with backfill. If pipelaying operations are interrupted for more than 24 hours, all pipe laid in the trench shall be covered with backfill.

All backfill about pipe shall be placed carefully and simultaneously on each side of the pipe to avoid lateral displacement of the pipe and damage to the joints. If adjustment of the position of a length of pipe is required after it has been laid, it shall be removed and relaid as for a new pipe. After all pipe laying and joining operations are completed, the inside of the pipe shall be cleaned and all debris removed. When pipelaying is not in progress, the ends of the pipelines shall be kept closed.

b. Laying pipe - After the gaskets have been fitted properly in place, they shall be restretched and released to assure uniform tension throughout the length of the gaskets. The gaskets shall be lubricated with a nontoxic water-soluble lubricant. The pipe units shall be fitted together, spigot to bell, in a manner to avoid twisting or

otherwise displacing or damaging the gaskets. As each unit of pipe is laid, a sufficient amount of selected backfill shall be placed carefully and tamped thoroughly about the lower portion of the pipe to hold it firmly in place. Completion of outside joint grouting operations for joints with steel rings and backfilling of the pipe trenches shall follow pipelaying operations as closely as practicable. The outside joints, where steel rings are used, shall be completed at least 4 hours before compaction of the backfill is started.

The joint for noncylinder prestressed pipe shall be similar to Figure 1, Standard Specification for Embedded Cylinder Prestressed Pipe, December, 1974. The pipe shall be fitted together to provide inside and outside joint mortar and grout spaces as shown in Figure 1. Each joint shall be drawn together so that Distance A shown on the above Figure 1 shall not be less than 1 inch on any point in the circumference: Provided, That the pipe shall be laid so that at any point in the circumference the grout space on the outside of the pipe is not less than one-half inch wide and the mortar space on the inside of the pipe is not less than one-fourth inch wide.

Construction of the outside portions of the joints shall be kept as close behind the laying of the pipe as possible except that in no case shall it be within three joints of the pipelaying operation.

After joints are fully engaged, the outside portion of the joints shall be completed by being filled with grout against diapers placed in such manner that there will be no leakage of grout. The outside group space, prior to filling with grout, shall be cleaned and flushed with water so that the surfaces of the joint to be in contact with grout filling will be thoroughly moistened when the grout is poured. Each joint shall be completely filled with grout in one operation, and then rodded on both sides of the pipe alternately to settle the grout, and more grout added, if necessary, to fill the joint completely. The diapers shall not be removed from about the joint, and the exposed portions of the joint, after filling, shall be coated with sealing compound and then covered with wet burlap or moist earth.

After the backfill has been placed to at least 1 foot over the top of the pipe, the inside joint space shall be cleaned and the joint surfaces shall be thoroughly wetted before being filled with stiff mortar which shall be trowelled smooth and flush with the inside surfaces of the pipe and coated with a curing compound.

The Contractor shall clean and roughen the surface of pipe that is in contact with concrete and/or mortar at connections at structures.

c. Mortar and grout for pipe joints - Mortar for pipe joints shall be mixed not richer than one part, by weight, of cement to one part, by weight, of clean well-graded sand, and not leaner than one part, by weight, of cement to two parts, by weight, of clean well-graded sand, and with just sufficient water to obtain the proper consistency. To improve workability of the mortar, the Contractor may replace not more than 7 percent, by weight, of cement with hydrated lime, or may replace not more than 30 percent, by weight, of cement with an approved pozzolan, or may add an air-entraining agent in the mortar, or use any approved combination of these. Cement and sand and admixture or pozzolan, if used, for mortar in joints shall conform to the requirements for these materials as used in the pipe. Hydrated lime shall be a standard commercial product as approved. Any mortar which has become so stiff that proper placement cannot be assured without retempering shall be wasted, and mortar shall be prepared in small batches so as to prevent stiffening before it is used. Mortar for filling grooves shall be of such consistency that it will adhere to the ends of the pipe.

Grout used for filling joints by pouring shall be mixed in the proportion of one part of cement, by weight, to not more than one part, by weight, of sand passing No. 16-mesh screen, and thoroughly mixed to a consistency of thick cream.

d. Payment - Payment for laying noncylinder prestressed concrete pipe, including fittings, will be made as provided in Paragraph 4.1.3.

SECTION 4.5 REINFORCED CONCRETE CULVERT PIPE

4.5.1 REINFORCED CONCRETE CULVERT PIPE

a. General - Reinforced concrete culvert pipe shall be used as the pipe for the turnout structure as shown on the Drawings. Except as otherwise provided herein, reinforced concrete culvert pipe shall be in accordance with ASTM designation: C 76. All pipe shall be circular. Reinforcement in pipe may be circular or elliptical.

b. Materials - The materials used in the manufacture of reinforced concrete culvert pipe shall conform to the following requirements:

(1) Cementitious materials - Cementitious materials shall be in accordance with paragraph 5.3.2.

(2) Admixtures - All concrete placed by the poured and vibrated method shall contain an air-entraining agent in accordance with paragraph 5.3.3. The amount of air-entraining agent used shall be such as will effect the entrainment of not more than 2-1/2 percent of air, by volume, of the concrete as discharged from the mixer. Calcium chloride shall not be used except as provided in paragraph 5.3.3.

(3) Aggregate - Sand and coarse aggregate for concrete shall be in accordance with paragraphs 5.3.5 and 5.3.6 except that other size separations may be used. The maximum size of coarse aggregate for each size of pipe shall be the largest size the use of which is practicable from the standpoint of satisfactory placing of the concrete.

c. Manufacture - Reinforced concrete culvert pipe shall be manufactured and tested in accordance with ASTM designation: C 76. Pipe shall be tested for acceptance in accordance with paragraph 4.1.1 of ASTM designation: C 76, except that tests to ultimate load will not be required. All pipe shall have either A or B wall thickness.

d. Type of joint - Joints shall be type R-4 joints with rubber gaskets conforming to paragraph 8 of the Bureau of Reclamation "Standard Specifications for Reinforced Concrete Pressure Pipe," dated January 1974.

e. Payment - Payment for furnishing reinforced concrete culvert pipe will be made as provided in paragraph 4.1.3.

4.5.2 FITTINGS FOR REINFORCED CONCRETE CULVERT PIPE

Fittings for reinforced concrete culvert pipe shall conform to paragraph 4.2.2.

4.5.3 LAYING REINFORCED CONCRETE CULVERT PIPE

a. General - The Contractor shall employ for the work of laying the pipe only workmen who are skilled and experienced in laying pipe with the type of joint being furnished. The Contractor shall provide watertight pipe and pipe joints. The pipe shall be laid to the lines and grades shown on the drawings and to the following tolerances. Departure from and return to established alignment and grade shall not exceed 1/16 inch per foot of pipe with a total of not more than 1-inch departure. The Contractor shall clean and roughen the surface of pipe that is in contact with concrete and/or mortar at connections at structures.

Pipe trenches shall be kept free of water which might impair pipe laying operations at all times during laying operations. Pipe trenches shall be carefully graded so as

to provide uniform support along the bottom of pipe. At joints involving bells or collars, excavation at the joint shall be of ample size to prevent the bells or collars from coming in contact with the subgrade. On grades exceeding 10 percent, pipe shall be laid uphill. Pipe with elliptical reinforcement shall be laid with the axes of the reinforcement cages in the correct position as shown by marking on the pipe: Provided, That a maximum deviation of 10° from the correct position will be permitted.

The Contractor shall schedule his work so that at no time will pipe remain in the trench more than 7 days before backfill is placed in the pipe trench to the original ground surface or to other specified backfill limits shown on the drawings.

All backfill about pipe shall be placed carefully and simultaneously on each side of the pipe to avoid lateral displacement of the pipe and damage to the joints. If adjustment of the position of a length of pipe is required after it has been laid, it shall be removed and relaid as for a new pipe. After all pipe laying and joining operations are completed, the inside of the pipe shall be cleaned and all debris removed. When pipelaying is not in progress, the ends of the pipelines shall be kept closed.

b. Laying pipe - The pipe units shall be fitted together spigot to bell and the joints shall be drawn together so that the bells and spigots are as nearly fully engaged as shown on the drawings as practicable and as prescribed below.

After the rubber gasket is placed in the spigot groove of the pipe, the rubber gasket cross section shall be equalized by inserting a tool or bar such as a large screwdriver or suitable round rod under the rubber gasket and moving it around the periphery of the pipe spigot. The gaskets shall be lubricated with a nontoxic water-soluble lubricant before the pipe units are joined. The pipe units shall be fitted together ina manner to avoid twisting or otherwise displacing or damaging the rubber gasket. After reinforced concrete culvert pipe units have been joined, the Contractor shall insert a feeler gage between the pipe bell and pipe spigot and move it around the periphery of the pipe to determine the position of the rubber gasket.

When pipe is laid on tangent, each joint shall be fitted together so that the minimum joint opening is 1/4 inch and the maximum joint opening is 1/2 inch, and the distance A shown on the figures in the Bureau of Reclamation "Standard Specifications for Reinforced Concrete Pressure Pipe" dated January 1974, is not less than 1/2 inch.

When pipe is laid on long-radius curves, the joints may be pulled such that the joint opening on the inside of the curve shall be a minimum of 1/4 inch and a maximum of 1/2 inch; and the joint opening on the opposite side of the pipe shall not be more than 1/2 inch wider than the joint opening on the inside of the curve: Provided, That the distance A shown on the figures in the Bureau of Reclamation "Standard Specifications for Reinforced Concrete Pressure Pipe" dated January 1974, shall not be less than 1/4 inch at any point in the circumference of the joint.

c. Payment - Payment for laying reinforced concrete culvert pipe will be made as provided in paragraph 4.1.3.

SECTION 4.6 CORRUGATED METAL PIPE

4.6.1 CORRUGATED METAL PIPE AND PIPE-ARCH CULVERTS

a. General - The Contractor shall furnish and install corrugated metal pipe and pipe-arch culverts of the sizes shown on the Drawings. The corrugated metal pipe and pipe-arch culverts shall have a minimum required thickness of 0.064 inches. The pipe shall be furnished and laid complete with coupling bands at the locations designated on the drawings. Metal cutoff collars shall be furnished and installed on the pipe where shown on the drawings.

b. Materials -

(1) Corrugated metal pipe - Corrugated iron or steel pipe including coupling bands, shall be in accordance with Federal Specification WW-P-405B, class I or II, shape 1. Pipe with helical corrugations shall have reformed ends consisting of not less than two full annular corrugations. Bituminous coated iron or steel pipe shall be furnished with coating A or at the Contractor's option asbestos-bonded pipe with coating G may be substituted. Pipe ends shall be beveled where required.

(2) Coupling bands - Coupling bands shall be corrugated type compatible for use with the reformed ends.

(3) Metal cutoff collars - Metal cutoff collars shall have the same composition. gage, and coating as the pipe to which they are attached and shall be fabricated as shown on the drawings.

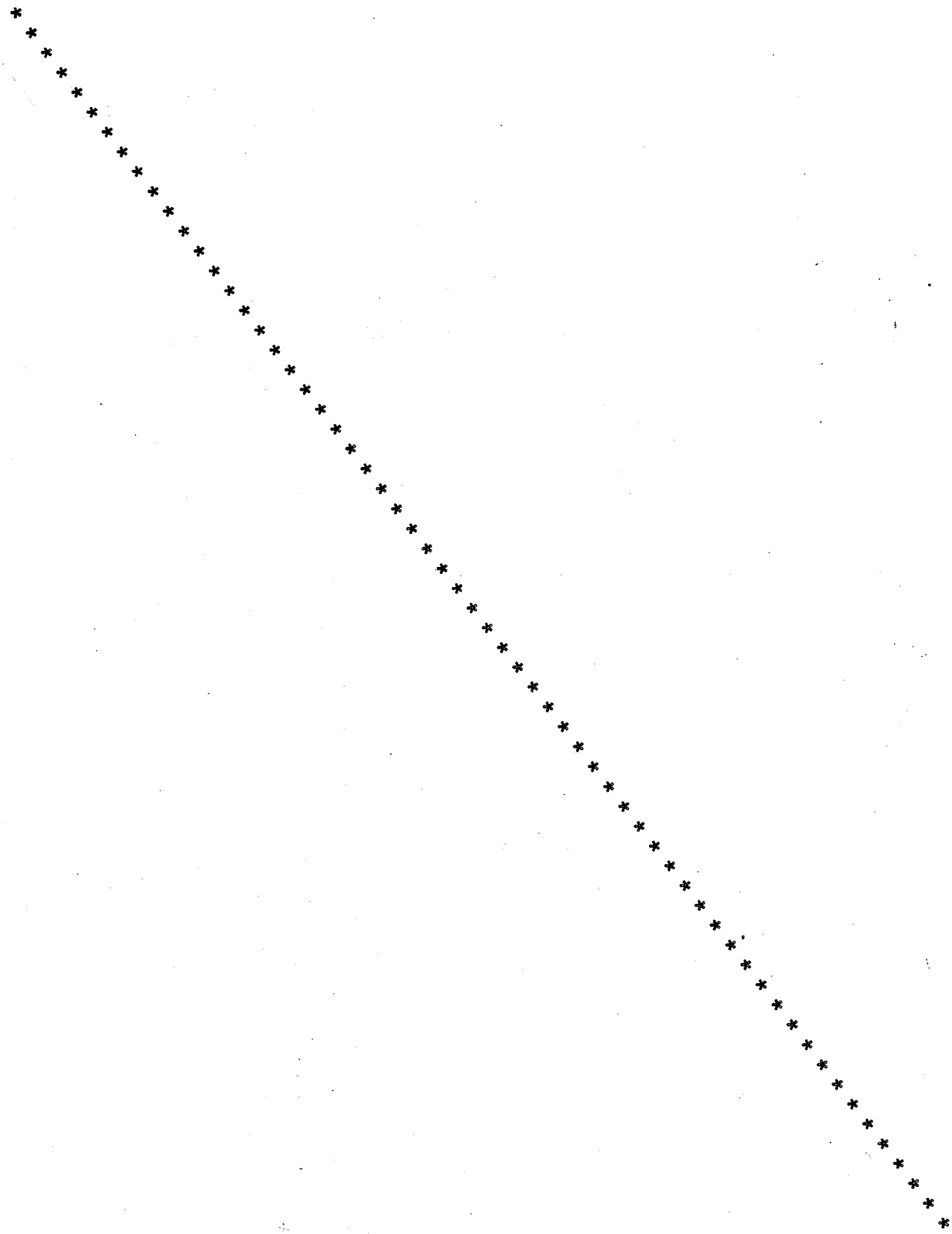
c. Hauling and handling - The pipe shall be hauled and handled in such a manner as to avoid damage to the galvanized or bituminous coating. The Contractor shall not use rope, cable, or chain slings for handling the pipe, but may use canvas slings not less than 12 inches in width.

Any damage to galvanized coating shall be repaired as specified in paragraph 9.1.1. Any damage to the bituminous coating shall be repaired by application of an approved bituminous coating material. Any unit that, in the opinion of the Contracting Officer, is damaged beyond repair in hauling, handling, or otherwise, shall be replaced and removed from the site of the work.

d. Laying - Corrugated metal pipe shall be laid to the lines and grades shown on the drawings. The pipe shall be laid with outside laps of circumferential joints pointing upstream and with longitudinal joints at the sides. All fastenings shall be drawn up tight. The pipe shall be laid in such manner that the departure from and return to established alignment and grade will not exceed one-eighth inch per foot of pipe but with not more than a 1-inch total departure. Pipe shall be carefully placed so as to be fully supported at all points over the bottom quarter of the circumference. Joints between units shall be coated with bituminous mastic before the coupling bands are placed to provide watertight joints as shown on the drawings. The coupling bands shall be installed properly, in a manner to insure tight joints, with the joints between sections approximately at the center of the couplings.

Cutoff collars shall be securely attached to the pipe in a manner that will provide a tight joint between the cutoff collar and the pipe. The collars shall be installed perpendicular to the pipe centerline.

e. Payment - No direct payment will be made for furnishing and installing corrugated pipe and pipe-arch culverts and all costs thereof, including excavation, backfill, compacting backfill, materials, tools, labor, and incidentals shall be included in other items in the schedule for which direct payment is made.



DIVISION 5
CONCRETE

SECTION 5.1 CONCRETE STRUCTURES

5.1.1 STRUCTURES TO BE CONSTRUCTED

a. General - The structures to be constructed under this contract include the following:

(1) Centennial Wash Siphon -
Sta. 357+17.50 to Sta. 379+47.50

(2) Canal Wasteway -
Sta. 355+25

(3) Deer Escape Ramps -
a. Sta. 233+00
b. Sta. 355+00

(4) Turnout Structure -
Sta. 191+07.91 Lt.

The structures will be located as shown above, and as indicated on the drawings. The structures shall be built to the lines, grades, and dimensions shown on the drawings. Where the thickness of any portion of a concrete structure is variable, it shall vary uniformly between the dimensions shown.

The Contractor will not be entitled to any additional allowances above the prices bid in the schedule by reason of any modifications or extensions of a minor character to adapt a structure to a structure site.

Furnishing and placing cast in place concrete and reinforcing steel for structures shall be in accordance with Section 5.3--General Concrete Requirements.

Construction joints in structural concrete shall be in accordance with applicable subparagraphs of Paragraph 5.3.15 and 5.3.16.

Furnishing, installing and constructing the various components of each listed structure shall be accomplished in accordance with the applicable sections of these specifications for the components to be furnished, installed or constructed as detailed in the drawings.

b. Payment - The structures listed in Paragraph 5.1.1a are contained in the Bid Schedule as separate and distinctive items of work to be bid as lump sums. Therefore, each lump sum bid under Item No. 6 through No. 9 in the schedule shall include all costs necessary to construct the above structures in accordance with the drawings and with these specifications. These prices shall include all equipment, labor, tools, materials and incidentals including, but not limited to, cast in place concrete, reinforcing steel, excavation for structures and pipe trench, backfill and compacted backfill, pipe and fittings, safety racks, trash racks, rip-rap, steel angles, and miscellaneous metalwork.

Payment for prewetting structure locations, hand placed canal lining at ends of structures, and furnishing and erecting fencing at structure locations, will be made under other items bid in the schedule as specified elsewhere in these specifications.

SECTION 5.2 CONCRETE CANAL LINING

5.2.1 TRIMMING EARTH FOUNDATIONS FOR CONCRETE LINING

a. General - The Contractor shall trim and finish earth surfaces of the canal prisms to provide a firm foundation for the concrete lining. The bottom and side slopes, including the surfaces of compacted embankment and compacted backfill, over which concrete lining is to be placed shall be finished accurately to the dimensions shown on the drawings. If at any point material has been excavated beyond the neatlines required to receive the concrete lining, the excess excavation shall be refilled in horizontal layers with selected material, moistened if required, and compacted in accordance with Section 3.1.3 (Compacting Earth Materials): Provided, That where placing and compacting refill on a sloping foundation, the layers may be placed parallel to the surface of the foundation. If at any point the foundation material is distributed or loosened during the excavation process or otherwise, it shall be moistened, if required, and throughly compacted by tamping, rolling, or other approved methods to form firm foundations upon which to place the concrete lining at the Contractor's expense.

b. Payment - Payment for trimming earth foundations for concrete lining will be in accordance with Paragraph 5.2.5.

5.2.2 CONCRETE IN CANAL LINING

a. General - Unreinforced concrete canal lining shall be constructed in the canal prism at the locations shown and as detailed on the Drawings.

Reinforced concrete canal lining shall be constructed as detailed on the Drawings. Reinforced concrete canal lining will be constructed at all structure transitions. The length of these transitions, as shown on the drawings, will be at the option of the Contractor.

Before placing the concrete in lining, the earthwork shall be completed to subgrade, and the foundations shall be trimmed as specified in paragraph 5.2.1.

Concrete in canal lining shall conform to the requirements of paragraphs 5.3.1 to 5.3.21, inclusive.

When concrete-lining placing operations for unreinforced concrete canal lining are stopped for the day, interrupted because of breakdown, or delayed by other causes, or where the Contractor elects to construct a joint, the edge of the fresh concrete lining shall be bulkheaded to a surface normal to the lining along longitudinal lines. Before placing operations are resumed, the surface of the hardened concrete shall be prepared as a construction joint, as provided in subparagragh 5.3.15(c). The fresh concrete shall then be placed against the existing concrete in accordance with the detail shown on the Drawings. The groove shall be sealed with elastomeric sealant as specified in Paragraph 5.2.3.

Where concrete lining joins a structure, sponge rubber filler and elastomeric sealant conforming to paragraph 5.3.15A shall be placed as shown on the drawings.

Contraction joints for unreinforced concrete canal lining shall be constructed and located as provided in Paragraph 5.2.3.

Contraction joints for reinforced concrete canal lining shall be constructed as shown on the Drawings, and in accordance with Section 5.3.15(d).

Where a panel of unreinforced concrete canal lining must be replaced, the old concrete shall be removed to the edges of the adjacent panels. The surfaces of the existing concrete shall be prepared as a construction joint as provided in subparagraph 5.3.15(c). The fresh concrete shall then be placed against the existing concrete with the full groove for the contraction joint shown on the drawings formed against the existing concrete. The groove shall be sealed with elastomeric sealant as specified in Paragraph 5.2.3.

Random cracks shall be repaired as approved by the Contracting Officer.

b. Payment - Payment for concrete in canal lining and all associated work described in Paragraph 5.2.2 will be in accordance with Paragraph 5.2.5.

5.2.3 CONTRACTION JOINTS FOR UNREINFORCED CONCRETE CANAL LINING

a. General - Contraction joints shall be constructed in unreinforced concrete lining as shown on the Drawings.

The Contractor may substitute other contraction joint alternatives to the joint shown on the Drawings: Provided, That it is determined by the Contracting Officer that the joint will accomplish the objective of inducing a contraction joint and providing a satisfactory degree of watertightness. Any royalties required by the use of any patented joint strip shall be paid by the Contractor. The joint shall be made along straight lines to the detailed dimensions shown and shall be maintained to the required shape and dimensions during any subsequent finishing operations until the concrete has hardened.

Joints shall be continuous across the canal section. Transverse contraction joints shall be terminated at the top of the side slopes and a 3/4-inch-minimum-depth groove shall be tooled across the concrete curb from the end of each transverse joint. No filler or sealant will be required for these tooled grooves.

To facilitate special conditions at structures and where concrete-lining placing operations are stopped for the day, interrupted because of breakdown, or delayed by other causes, transverse contraction joints may be placed at spacing that vary from the spacing shown on the drawings. The spacings shall not be less than one-half the spacing shown on the drawings.

b. Approval of joints - One print and one reproducible of drawings and data showing the joints the Contractor intends to construct, intersection, splice and bend details, and method of construction shall be submitted by the Contractor for approval to the Contracting Officer. The Contractor shall also submit one copy of all drawings and data and a copy of the transmittal letter to the Construction Engineer, Franzoy Corey Engineering Company, 1030 East Guadalupe Road, Tempe, Arizona 85283.

c. Materials - Elastomeric sealant - The sealant shall conform to Bureau of Reclamation "Specifications for Elastomeric Canal Joint Sealer", dated August 1, 1977, class R, Type II.

d. Sampling, testing, and certification - Elastomeric sealant - The Government will require certification of each batch of elastomeric sealant prior to use. However, acceptance of the joint sealant materials under clause No. 10 of the General Provisions will not be made until the materials have been satisfactorily applied at the jobsite.

Certifications shall identify the materials and shall provide detailed test results of laboratory tests and covering all of the applicable specifications requirements and a general statement that the materials comply with the requirements of these specifications.

The required certifications will be submitted to the Contracting Officer with a copy sent to the Construction Engineering.

e. Placing - Placing elastomeric sealant - The canal-lining concrete shall be cured at least 7 days before the two-component elastomeric sealant is placed in the joint grooves. Immediately before placing the sealant in the joint grooves, the joint grooves shall be thoroughly cleaned by approved methods to remove all mortar, liatance, scale, dirt, oil, curing compound, and other foreign materials. Where curing compound has been applied to the surfaces of joint grooves, the surfaces upon and against which the sealant is to be placed shall be sandblasted. The joint grooves that have been sandblasted and other joint grooves, were directed, shall be blown out with high-pressure compressed air to remove all residue. Elastomeric sealant shall not be placed while rain is falling. At the time of placing the joint sealant, the joint groove shall be clean and surface dry and the temperature of the concrete and the ambient temperature shall be not less than 50°F.

Before use, each component of the elastomeric sealant shall be thoroughly mixed, incorporating the entire contents of the containers and using equipment consistent with the size of the containers. At least once a day the stock tanks on the extrusion equipment shall be drained and scraped down.

The components shall be maintained at a temperature between 80 and 100°F in the stock tanks on the extrusion machine at the time of mixing and placement. Heating, if required, shall be by indirect means and use of a direct flame will not be permitted.

The extrusion machine for mixing and placing the sealant shall conform to the manufacturer's recommendations and shall deliver two semifluid components in equal volumes to a mixer and nozzle such that the ratio between the quantities of the components shall be 1 plus or minus 10 percent. The extrusion machine shall be equipped with accurate pressure gages with suitable ranges and inspection valves for flow

measurements so arranged as to permit convenient monitoring of pressures and proportioning. The proportioning shall be checked at normal operating pump pressures, flow rates, and other operating conditions at least every 2 hours or more frequently as determined by the Contracting Officer. Proportioning shall be checked by filling containers having a minimum depth of 6-1/2 inches (such as tall-form, cylindrical, 1-quart ice cream container, 3-3/8 inches inside diameter by 6-1/2 inches deep). The throughput rate of the mixing head shall not exceed the maximum specified by the equipment manufacturer.

The method of mixing and placing shall result in a homogeneous material. The sealant shall be extruded at the bottom of the joint groove and shall be tooled as necessary to work the sealant into intimate contact with the bonding surfaces without entrapping air bubbles. The top surface of the sealant shall be tooled to the shape shown on the drawing.

Elastomeric sealant which does not cure to a homogeneous, rubber-like compound, which does not bond to the joint groove faces, or which does not comply with any other requirements of this paragraph shall be removed. The joint groove shall then be recleaned and new sealant placed therein by the Contractor at no additional cost to the Government.

Sealant pulled out of joints or damaged by the Contractor's operations or otherwise damaged during the contract period, shall be replaced in accordance with the applicable provisions of these specifications at no cost to the Government.

f. Payment - Payment for providing contraction joints in unreinforced concrete canal lining as described in Paragraph 5.2.3 will be in accordance with Paragraph 5.2.5.

5.2.4 SAFETY LADDERS FOR CONCRETE-LINED CANALS

a. General - The Contractor shall furnish and install safety ladders along both sides of the canal at locations shown on the drawings and in accordance with this paragraph.

The canal safety ladders shall be fabricated from carbon steel, aluminum, or corrosion-resisting (stainless) steel.

Carbon steel or aluminum canal safety ladders shall be coated with fusion epoxy in accordance with paragraph 9.1.1.

All canal safety ladders shall be anchored to the canal lining with 3/8-inch-diameter by 3-inch-long,

corrosion-resisting (stainless) steel expansion anchors. PVC sleeves shall be placed between expansion anchors and those canal safety ladders which are fabricated of carbon steel or aluminum. PVC washers shall be placed at all expansion anchors on both sides of these canal safety ladders fabricated of carbon steel or aluminum.

PVC sleeves shall be 1/2-inch inside diameter, 3/8 inch long, with 0.06-inch wall thickness.

PVC washers shall be 13/32-inch inside diameter, 1-inch outside diameter, and 1/16-inch thick.

Expansion anchors shall be installed in holes drilled with carbide-tipped drill bits conforming to Federal Specifications GGG-D-650B and ANSI B94-12. Minimum installation depth and method of expansion shall be as recommended by the anchor manufacturer. The nuts holding ladders on the anchors shall be tack welded to the anchors.

Holes drilled in concrete canal lining for expansion anchors which "spall out" shall be repaired with epoxy-bonded epoxy mortar in accordance with the "Bureau of Reclamation Standard Specifications for Repair of Concrete," dated November 15, 1970, and the expansion anchors reset in their original position.

The concrete surfaces at all canal safety ladders shall be painted in accordance with applicable paragrahs of Division 9.

b. Materials -

(1) Structural shapes, plates, and bars - Federal Specification QQ-S-741D.

(2) Corrosion-resisting (stainless) steel - Federal Specification QQ-S-763D, class 304L, condition A.

(3) Aluminum alloy plate and sheet - Federal Specifications QQ-A-250E/GEN and QQ-A-250/11E, Aluminum Alloy 6061, T6.

(4) Expansion anchors - Federal Specification FF-S-325, group 11, type 3, class 3, or group 11, type 4, class 1, and subparagraph b.(2) above. Proof load test will not be required.

(5) Other materials - All materials not defined herein by detail specifications shall be of good commercial quality.

c. Payment - Payment for furnishing and installing safety ladders along canals as described in Paragraph 5.2.4 will be in accordance with Paragraph 5.2.5.

5.2.5 PAYMENT

Payment for all work described in Section 5.2--Concrete Canal Lining, will be made at the per lineal foot price bid in the schedule, under item No. 10.

This price shall include, but not be limited to, the costs of trimming and preparing foundation; furnishing and placing concrete, reinforcing fabric, construction and contraction joints, joint filler, joint sealer, safety ladders, and miscellaneous construction.

SECTION 5.3 GENERAL CONCRETE REQUIREMENTS

5.3.1 COMPOSITION

a. General - Concrete shall be composed of cementitious materials, sand, coarse aggregate, water, and admixtures as specified, all well mixed and brought to the proper consistency.

b. Nominal maximum size of aggregate - The coarse aggregate to be used in concrete shall be as large as practicable, consistent with required strength, spacing of reinforcement and embedded items, and placement thickness. The size of the coarse aggregate to be used will be determined by the Contractor in accordance with these specifications, subject to approval by the Contracting Officer, and may vary incrementally according to the conditions encountered in each concrete placement.

c. Mix proportions - The Contractor, through an approved testing laboratory shall design the mix for each strength of concrete required. The testing laboratory engaged by the Contractor shall be fully equipped and capable of performing the required tests and services. The mix design shall be based on representative samples of aggregates, cement, water and admixtures to be used on the project. A separate proposed mix design for each strength of concrete shall be submitted to the Engineer for review at least 15 days prior to placement of concrete in the work. If the Contractor elects to change aggregate source during the process of work, new mix designs meeting these requirements shall be submitted to the Engineer at least 15 days before such material is to be placed in the work.

Suitable strength for all concrete is that which will assure that 100 percent of all test cylinders will meet or exceed the design strength. Unless otherwise specified on the drawings or in these specifications, the design strength for

structural concrete shall be 4,000 pounds per square inch at 28 days, and the design strength for canal concrete and all other concrete shall be 3,000 pounds per square inch at 28 days.

Acceptance of the mix design by the Engineer does not relieve the Contractor of strength requirements specified herein.

The net water-cementitious materials ratio, exclusive of water absorbed by the aggregates, shall be sufficiently low to provide adequate durability in concrete. Table 15, page 135, Eighth Edition of the Concrete Manual will be used as a guide for determining the maximum water-cementitious materials ratio to ensure durability of concrete.

Where portland cement plus a pozzolan is used under subparagraph 5.3.2.b.(2), the pozzolan shall constitute 20 percent of the total cementitious materials.

d. Consistency - The slump of the concrete at the placement shall not exceed 2 inches for concrete in the tops of walls, bridge abutments, and parapets; in slabs that are horizontal or nearly horizontal; and shall not exceed 3 inches for concrete in canal lining and for all other concrete. If the specified slump is exceeded at the placement, the concrete is unacceptable.

To maintain concrete at the proper consistency, the amount of water and sand batched for concrete shall be adjusted to compensate for any variation in the moisture content of grading of the aggregates as they enter the mixer. Addition of water to compensate for stiffening of the concrete after mixing but before placing will not be permitted. Uniformity in concrete consistency from batch to batch will be required.

5.3.1A CONCRETE QUALITY CONTROL MEASURES AND CONCRETE QUALITY ASSURANCE TEST PROGRAM

a. Concrete quality control measures - As stated in clause No. 10 of the General Provisions, the Contractor shall be responsible for providing quality control measures to insure compliance of the concrete with the contract requirements.

b. Concrete quality assurance program - Independently of the Contractor's concrete quality control measures, the Government will conduct a concrete quality assurance program incorporating the tests and contractor-furnished sampling equipment, specified below. As a part of its concrete quality assurance program, the Government will conduct tests to the extent and frequency necessary to ascertain that the concrete constituents, as well as fresh and hardened concrete, meet the specified levels of quality.

(1) Tests - The Government will obtain samples and conduct tests in accordance with the test methods listed below:

(a) Sampling fresh concrete - ANSI/ASTM C 172.

(b) Density (unit weight) and yield - ANSI/ASTM C 138 except that a 0.25-cubic-foot container will be used for nominal aggregate sizes up to 1-1/2 inches.

(c) Air content - ANSI/ASTM C 231.

(d) Slump - ANSI/ASTM C 143.

(e) Temperature - Temperature will be determined by placing a thermometer in the concrete at the placement.

(f) Making and curing concrete test specimens in the field - ANSI/ASTM C 31.

(g) Capping cylindrical concrete specimens - ANSI/ASTM C 617.

(h) Compressive strength of cylindrical concrete specimens - ANSI/ASTM C 39.

(2) Sampling equipment - The Contractor shall provide sampling equipment and testing facilities, including those listed below, for use by the Government:

(a) Mechanical sampling devices for safely procuring and handling representative testing samples of aggregates and other concrete materials during batching and for obtaining representative concrete samples from a point in the discharge stream as the concrete is discharged from the mixers.

(b) Ample and protected working space near the placement site and a means for safely procuring and handling representative concrete samples.

(c) Concrete cylinder containers for concrete test specimens.

(3) Contractor-furnished drawings and data - Not less than 30 days prior to start of installation of the Contractor's plants and equipment for processing, handling, transporting, storing, and proportioning concrete ingredients and for mixing, transporting, and placing concrete, the Contractor shall submit drawings and data to the Contracting Officer, for approval,

showing plant arrangement and locations and descriptions of contractor-furnished sampling equipment for Government sampling and testing of concrete and concrete materials. The drawings and data shall provide a description in sufficient detail for an adequate review.

5.3.2 CEMENTITIOUS MATERIALS

a. General - For purposes of these specifications, cementitious materials shall be interpreted to mean any of the following: portland cement, or portland cement plus a pozzolan.

The provisions of this paragraph apply to cementitious materials for use in cast-in-place concrete required under these specifications. Portland cement required for items such as concrete pipe and other precast concrete products, for grout and mortar, and for other items exclusive of cast-in-place concrete is provided for in the applicable paragraphs of these specifications covering the items for which such portland cement is required.

All cementitious materials shall be furnished by the Contractor.

Cementitious materials shall be free from lumps and other deleterious matter and shall be otherwise undamaged when used. Before a concrete placement is started, sufficient cementitious materials shall be in storage at the batch plant to complete the placement.

Transportation from the place of manufacture to the batching plant shall be in weathertight rail cars, trucks, conveyors, and other means which will protect the cementitious materials completely from exposure to moisture. Immediately upon receipt at the jobsite, bulk cementitious materials shall be stored in dry, weathertight, properly ventilated bins until the cementitious materials are batched. The bins shall be emptied and cleaned by the Contractor when required; however, the intervals between required cleanings will normally be not less than 6 months. Each shipment of bagged cement shall be stored so that it may readily be distinguished from other shipments and shall be stored in a dry, enclosed area protected from moisture. To prevent undue aging of bagged cement after delivery, the Contractor shall use bags of cement in the chronological order in which they were delivered to the jobsite.

All storage facilities shall be constructed to permit easy access for inspection.

b. Cementitious materials options - Cementitious materials shall be furnished in accordance with one of the following options:

(1) Type II portland cement only.

(2) Type II portland cement plus a class N, F, or C pozzolan.

Concrete shall have a uniform appearance. Different cementitious materials may result in color variation in concrete placements. Therefore, the Contractor shall obtain prior written approval to use more than one of the above options for cementitious material in concrete.

c. Materials -

(1) Portland cement - Portland cement shall meet the requirements of ANSI/ASTM C 150 for type II cement, and shall meet the optional false-set limitation specified therein. Portland cement shall also conform to the low-alkali limitation.

(2) Pozzolan - Pozzolan used under the options specified in subparagraph b.(2) above shall meet the requirements of ANSI/ASTM C 618 for class N, F, or C with the following additional requirements:

(a) The maximum percent of sulfur trioxide shall be 4.0 percent for classes F and C.

(b) The maximum percent loss on ignition shall be 8.0 percent for class N and 2.5 percent for classes F and C.

(c) The pozzolanic activity index with time shall be determined using 2-inch cubes and the minimum strength at 7 days shall be 900 pounds per square inch.

(d) Unless the Contractor selects aggregates which are not potentially alkali reactive as stated below, pozzolan shall be tested for reduction of mortar expansion at 14 days as specified for class N pozzolan under the optional physical requirements in ANSI/ASTM C 618. However, the cement used in the test shall be low alkali. For the pozzolan to be acceptable, it shall result in an expansion reduction of zero percent or greater when compared to the control test.

Furthermore, pozzolan used under the option specified in subparagraph b.(2) above shall not decrease

the sulfate resistance of concrete. The following class N pozzolans have been found not to detract from sulfate resistance; therefore, either of them may be used under option specified in subparagraph b.(2) above:

(a) "Lassenite SR" pozzolan, as marketed by Lassenite Industries, Inc. 1475 Terminal Way, Reno NV 89502, from plant located near Herlong, California.

(b) "Sun" pozzolan, as produced by Oregon Portland Cement Co., 111 SE. Madison, Portland, OR 97214, from plant located near Lime, Oregon.

Bureau of Reclamation research on classes F and C pozzolans has correlated sulfate resistance to a resistance factor, "R". "R" is defined as "(C-5)/F" where "C" is the calcium oxide content of the pozzolan in percent and "F" is the ferric oxide content in percent. The higher the "R" factor, the lower the sulfate resistance expected for concrete containing the pozzolan. When a class F or C pozzolan is used with type 11 cement, the "R" factor shall be less than 2.5. Calcium and ferric oxide contents shall be determined in accordance with ANSI/ASTM C 114.

The Contractor shall inform the Contracting Officer, in writing, at least 30 days before first shipments of any cementitious materials are required of the following:

The names and addresses of cement and pozzolan shipping points.
The names and addresses of cement and pozzolan suppliers from which the Contractor will purchase cementitious materials.
The names and addresses of Contractors to whom cement and pozzolan will be shipped, if other than the prime Contractor.
The quantities of cement and pozzolan ordered.
Whether cement will be ordered in bulk or in bags.
The purchase order number, contract number, or other designation that will identify cement and pozzolan to be used by the Contractor.

Changes in production or handling of cementious materials which relate to the data previously submitted will not be implemented without written approval of the Contracting Officer.

d. Acceptance of cement - The cement may be sampled and tested by the Government in accordance with Department of Army Regulation No. ER 1110-1-2002, Cement and Pozzolan Acceptance Testing.

(1) Prequalified producer - If the cement is supplied from a producer who is prequalified, as described in appendix C of the above-noted regulation, for the specific cement type to be supplied, cement may be shipped directly from the product bin.

Prequalification shall include required optional low-alkali and false-set limitations when specified. A mill test report shall be submitted to the Bureau of Reclamation construction office for each lot of cement from which shipments are supplied.

All cement shipments shall be accompanied by shipping documents containing the following:

(a) Certification that the cement meets all applicable requirements of these specifications.

(b) Type of cement shipped, including optional limitations such as "MS", "false set", or "low alkali".

(c) Manufacturing location and dates.

(d) Lot (bin) number.

(e) Date of shipment.

(f) Quantity of cement shipped.

(2) Testing for non-pre-qualified producer - If the producer is not prequalified for the cement type to be supplied, the cement shall be sampled and stored in sealed silos at the place of manufacture, and will be tested by the Government for compliance before it is shipped from the sealed silos.

(3) Testing for other categories - When a producer is removed from the list of qualified producers for the cement type being supplied, or when the Contracting Officer determines that sealed-silo testing and acceptance are otherwise necessary, cement acceptance will be by successful tests on cement reserved for Government use in sealed silos at the point of manufacture.

(4) Basis for acceptance, removal, and reinstatement - Acceptance, removal, and reinstatement of a producer as a qualified cement source for a specific cement type are based primarily on project sample tests and statistical evaluations of past mill test results. These criteria are listed in Department of Army Regulation No. ER1110-1-2002.

When so directed by the Contracting Officer, the producer shall test cement for compliance for the false-set limitation at the latest time, prior to shipment, that the cement is still in possession of the cement company. Testing frequency shall be as directed by the Contracting Officer and may be as high as one test per truck (about 25 tons) of cement shipped. Cement failing to meet false-set requirements at any time prior to shipment shall not be shipped for Government use.

Cement not meeting specifications requirements may be rejected by the Government at any time prior to its use in concrete, and the Contractor shall be entitled to no adjustments in price or completion time by reason of any delays caused by rejection of unacceptable cement, nor for additional expense of handling and replacing rejected cement. Cement may be rejected if it fails to meet false-set tests either at the Government testing laboratory or at the cement plant. Concrete made with cement which is subsequently tested and does not meet specifications requirements may be rejected by the Government and shall, if rejected, be removed and replaced by the Contractor at his expense.

The Contractor may be charged the cost of testing of all cement which has been ordered in excess of the amount of cement used for the work under these specifications. The charges to be made for the Government expense invested in quality assurance of excess cement will be at the rate of $1.00 per ton and will be deducted from payments due to the Contractor.

e. Acceptance of pozzolan - Pozzolan added to the concrete as an admixture may be sampled and tested by the Government in accordance with Department of the Army Regulation No. ER1110-1-2002, Cement and Pozzolan Acceptance Testing. Acceptance tests will be made on a lot or lots of pozzolan which have been reserved for exclusive Government use in sealed bins at the point of manufacture or other storage site approved by the Contracting Officer. Untested lots shall not be intermingled or combined with tested and approved lots until such lots have been tested and approved.

Release for shipment and approval for use will be based on compliance with physical, chemical, and uniformity requirements for which tests can be completed within 8 days after tests begin. Release for shipment and approval for use on the above basis will be contingent on continuing compliance with the other requirements of the specifications. No pozzolan shall be shipped until notice has been given that the test results are satisfactory.

Pozzolan not meeting specifications requirements may be rejected by the Government at any time prior to the use in

concrete, and the Contractor shall be entitled to no adjustments in price or completion time by reason of any delays caused by rejection of unacceptable pozzolan, nor for additional expense of handling and replacing rejected pozzolan. Concrete may be rejected by the Government if it has been made with pozzolan from a lot which is subsequently tested and found to not meet specifications requirements. If concrete is rejected by the Government, it shall be removed and replaced by the Contractor at his own expense.

The Contractor may be charged the cost of testing of all Government-tested pozzolan which has been ordered in excess of the amount of pozzolan needed for the work under these specifications. The charges to be made for the Government expense invested in quality assurance of excess pozzolan will be at the rate of $1.00 per ton and will be deducted from payments due the Contractor.

f. Alternate testing procedure - In the event that the pozzolan supplier has an acceptable quality history as determined by the Contracting Officer and if the supplier is able to meet the criteria listed below, testing may occur less frequently and pozzolan may be used on the job before being tested by the Government. Pozzolan delivered from such a supplier to the project site or concrete producing plant will be sampled at the site by the Government. The pozzolan will be sampled at a frequency rate determined by the Contracting Officer. A supplier desiring this alternative testing procedure shall submit to the Contracting Officer for approval the following:

(1) A brief outline of the procedures used to evaluate the pozzolan, sampling and testing frequency, test sample preparation employed, and chemical analysis methods used such as X-ray, atomic absorption spectroscopy, and wet chemistry.

(2) Evidence that the laboratory that conducts quality control testing (except for fineness, loss on ignition, and specific gravity) is inspected on each inspection tour of the CCRL by submission of a copy of the inspection report or reports.

(3) Assurance that facilities equipped with the required apparatus and staff capable of performing the tests for fineness, loss on ignition, and specific gravity, as outlined in ASTM designation: C 311, are located at the pozzolan production/collection site.

(4) The results of all applicable chemical and physical tests as required by these specifications, on the most recent 40 samples (20 pairs) tested. These results shall be submitted in the format outlined in ASTM designation: C 183, in the table entitled "Test

Data" with the critical limits calculated as described. Critical limits may be updated at any time by the supplier submitting test data on additional pairs of samples.

(5) A copy of each shipping document (weight bill or bill of lading) shall be supplied semimonthly for pozzolan shipped to the project. Such a document shall contain the following information: (1) contract number, (2) consignee and destination, (3) specification and type, (4) producer, (5) silo or lot number, (6) quantity, (7) date shipped, (8) carrier identification, and (9) a copy of data from any tests that may have been done on the pozzolan in the shipment.

(6) A copy of the test results as required in subparagraph 7.3.4.b. for a lot (not to exceed 2,000 tons) of pozzolan from which material is shipped under this system shall be provided when requested.

Information requested in items (1 through 6, inclusively) shall be submitted to the Contracting Officer and a copy sent to: Waterways Experiment Station, Attn: Structures Laboratory, Cement and Pozzolan Group, P. O. Box 631, Vicksburg, MS 39180.

Frequency for testing of project samples will be approximately one sample per 400 tons or when the field performance of the pozzolan indicates the need for a test.

A pozzolan source may be removed from this status and sampling from sealed bins at the point of manufacture or other approved locations will be required. This may occur if results of tests of any 2 of a series of 10 consecutive project samples exceed the critical limit for any applicable specified property, or if an individual sample fails to meet the requirements of the specifications.

g. Payment - Payment for furnishing cementitious materials used in the production of concrete will not be made directly and all costs associated thereof shall be included for payment in accordance with Paragraph 5.3.21 and 5.3.22.

5.3.3 ADMIXTURES

a. General - The Contractor shall furnish air-entraining and chemical admixtures for use in concrete as hereinafter provided. Admixtures shall be of uniform consistency and quality, and shall be maintained by the jobsite at uniform strength of solution. Air-entraining and chemical admixtures shall be batched separately in liquid form in dispensers capable of measuring at one time the full quantity of each admixture required for each batch.

Measurement shall be either by weighing or by volumetric-admixture dispensers constructed and located such that the full batch quantity of each admixture can be observed in a visual gage by the plant operator. Each admixture shall be discharged separately into the batched mixing water as the water is being discharged into the mixer.

The Contractor shall notify the Contracting Officer, in writing, of the manufacturers and specific brand names of all admixtures to be used. Written notification of products to be used shall be furnished far enough in advance of planned use so that samples, if required, can be made available to the Government for a testing period of 45 days after receipt of the samples.

The Contractor shall submit a manufacturer's certification containing the following information:

(1) Name of admixture

(2) ASTM designation under which the admixture is formulated.

(3) Admixture type.

In addition, the manufacturer shall submit a product description, instructions, recommended dosage, chloride content, and precautions to be considered when using the admixture. If available, independent laboratory test data, confirming that the requirements of the applicable ASTM standard have been met, shall be submitted to the Government.

Final approval of an admixture will not be given until it has performed satisfactorily at the jobsite.

b. Chemical admixtures - Chemical admixtures which will introduce more than 1/10 of 1 percent chloride, by weight of cementitious materials, shall not be used in concrete in which aluminum, galvanized metalwork, or prestressed steel is to be embedded.

(1) Accelerator - Accelerating admixtures shall not be used in cast-in-place concrete.

(2) Water-reducing, set-controlling admixture - The Contractor shall use a water-reducing, set-controlling admixture, admixture, referred to herin as WRA, in all concrete. The admixture shall conform to ANSI/ASTM C 494 for type A or D chemical admixture.

If use of the WRA chosen by the Contractor is accompanied by abnormal setting of the fresh concrete,

or if the WRA does not perform in accordance with these specifications, the Contractor shall furnish and use other brands of WRA until an acceptable admixture is found.

The amount of WRA used shall be that amount necessary to effect the requirements of ANSI/ASTM C 494. The Contracting Officer reserves the right to adjust the quantities of WRA or eliminate its use, and the Contractor shall be entitled to no additional allowances for such adjustments.

c. Air-entraning admixture - An air-entraining admixture shall be used in all concrete. The admixture shall conform to ANSI/ASTM C 260.

The amount of air-entraining admixture used shall be that amount necessary to effect a total air content in the concrete as shown in table 5D.

TABLE 5D - Total Air Content

Nominal maximum size coarse aggregate	Total air, percent by volume of concrete
3/4 inch	6 plus or minus 1
1-1/2 inches	4.5 plus or minus 1

5.3.4 WATER

The water used in making and curing concrete, mortar, and grout shall be free from objectionable quantities of silt, organic matter, salts, and other impurities. Such determination will usually be made by comparison of compressive strength, water requirement, time of set, and other properties of concrete made with distilled or very clean water and concrete made with the water proposed for use. In no case shall mix water contain more than 3000 milligrams per liter soluble sulfate.

If any water to be used in concrete, mortar, or grout is suspected by the Contracting Officer of exceeding the soluble sulfate limitation, samples of the water will be obtained and tested by the Government. The water will be tested for soluble sulfate content in accordance with the

Bureau of Reclamation "Method of Test for Determining the Quantity of Soluble Sulfate in Solid (Soil or Rock) and Water samples", dated May 1, 1973.

5.3.5 SAND

a. General - The term "sand" is used to designate aggregate in which the maximum size particle will pass a 3/16-inch (No.4) test sieve. Sand shall be predominantly natural sand which may be supplemented with crushed sand to make up deficiencies in the natural sand gradings.

Sand, as delivered to the batching plant, shall have a uniform and stable moisture content of less than 6 percent free moisture. Variations of moisture in sand as batched shall not exceed one-half percent, by weight, in 30 minutes.

b. Quality - The sand shall consist of clean, hard, dense, durable, uncoated rock fragments. Sand may be rejected if it fails to meet any of the following quality requirements. The designations in parentheses hereinafter refer to methods of test described in the Eighth Edition of the Bureau of Reclamation Concrete Manual.

(1) Organic impurities in sand (ANSI/ASTM C-40) - color no darker than the specified standard.

(2) Sodium sulphate test for soundness (ANSI/ASTM C-88) 8 percent maximum by weight.

(3) Specific gravity (ANSI/ASTM C-128, saturated, surface dry basis) 2.60 minimum

(4) Deleterious substances - As shown in Table 5E.

TABLE 5E - Allowable percentage of deleterious substance in sand

Item	Maximum percent by weight, as batched
Material passing No. 200 sieve (ANSI/ASTM C-117)	3
Lightweight material (ANSI/ASTM C-123 using a zinc chloride solution)	2
Friable particles (ASTM C-142)	1

Item	Maximum percent by weight, as batched
Other deleterious substance (such as mica, coated grains, soft-flaky particles, and loam)	2
Sum of all the above deleterious substances	5

c. Grading - The sand as batched shall be well graded, and when tested by means of standard sieves (ASTM C-136), shall conform to the limits in table 5F.

TABLE 5F - Sand Grading Requirements

Sieve No.	Individual Percent by weight retained on sieve
4	0 to 5
8	5 to 15*
16	10 to 25*
30	10 to 30
50	15 to 35
100	12 to 20
Pan	3 to 7

* If the individual percent retained on the No. 16 sieve is 20 percent or less, the maximum limit for the individual percent retained on the No. 8 sieve may be increased to 20 percent.

The grading of the sand shall be controlled so that the fineness moduli (ASTM C-136) of at least 9 out of any 10 consecutive test samples of finished sand will not vary more than 0.20 from the average fineness modulus of the 10 test samples.

5.3.6 COARSE AGGREGATE

a. General - For the purposes of these specifications, the term "coarse aggregate" designates clean, well-graded

aggregate of particle sizes within the range of 3/16 of an inch to 1-1/2 inches or any size or range of sizes within such limits. Coarse aggregate for concrete shall consist of natural gravel or crushed rock or a mixture of natural gravel and crushed rock.

Coarse aggregate, as delivered to the batching plant, shall have a uniform and stable moisture content.

b. Quality - The coarse aggregate shall consist of clean, hard, dense, durable, uncoated rock fragments. Coarse aggregate may be rejected if it fails to meet any of the following quality requirements. The designations in parentheses hereinafter refer to methods of test described in the Eighth Edition of the Bureau of Reclamation Concrete Manual.

(1) Los Angeles abrasion loss (designation 21, using grading A) - Ten percent maximum loss of weight at 100 revolutions or 40 percent maximum loss of weight at 500 revolutions.

(2) Sodium Sulphate Test for soundness (ANSI/ASTM C-88) ten percent maximum weighted average loss by weight.

(3) Specific gravity (ANSI/ASTM C-127) saturated, surface-dry basis 2.60 minimum.

(4) Deleterious substances (in any size of coarse aggregate) - As shown in table 5G.

TABLE 5G - Allowable Percentages of deleterious substances in coarse aggregate

	Maximum percent by weight, as batched
Lightweight material (designation 18)	2
Friable particles (designation 13)	1/2
Other deleterious substances	1/2
Sum of all the above deleterious substances	2

c. Separation - The coarse aggregate shall be separated into nominal sizes during production of the aggregate. Just prior to batching, the coarse aggregate shall be rewashed by pressure spray and finish screened on multideck vibrating screens capable of simultaneously removing undersized and oversized aggregate from each of the nominal aggregate sizes. If variations in the water content of the aggregates entering the batcher occur during intermittent batching, then a dewatering screen will be required after the finish screens to remove the excess free moisture. Finish screens shall be mounted over the batching plant or on the ground adjacent to the batching plant. The finish screens shall be so mounted that the vibration of the screens will not be transmitted to the batching bins or scales and will not effect the accuracy of the weighing equipment in any other manner.

The method and rate of feed for finish screening shall be such that the screens will not be overloaded and will result in a finished product which meets the grading requirements of these specifications. Coarse aggregate shall be fed to the finish screens in a combination or alteration of nominal sizes which will not cause noticeable accumulation of poorly graded coarse aggregate in any batching bin. The finish-screened aggregates shall pass directly to the individual batching bins in such a manner as to minimize breakage. Minus 3/16-inch material passing through the finish screens shall be wasted unless it is routed back through a sand classifier in a manner which causes uniform blending with the natural sand being processed. Water from finish screening shall be drained in such a manner as to prevent aggregate wash water from entering the batching bins and weighing hoppers.

When provided adequate substantiation by the Contractor that coarse aggregate, as batched, will consistently meet specified grading requirements without final washing or finish screening, the Contracting Officer may waive final washing requirements or finish screening requirements or both for structural concrete. If such requirements are waived and grading requirements are not consistently met, the Contractor shall implement, within 14 days after notification by the Contracting Officer, final washing and finish screening as herein specified.

Coarse aggregate for concrete in canal lining to be placed with a lining machine shall be separated into 3/8-, 3/4-, and 1-1/2-inch nominal maximum sizes. Separation of the coarse aggregate into the specified sizes, after finish screening, shall be such that when tested in accordance with designations 5 and 16 in the Concrete Manual, coarse aggregate shall meet the grading requirements in table 5H.

TABLE 5H - Grading Requirements for Coarse Aggregate for Concrete in Machine-placed Concrete Lining

Nominal Size	3/8 inch	3/4 inch	1-1/2 inches
Nominal size range	3/16 to 3/8 inch	3/8 to 3/4 inch	3/4 to 1-1/2 inches
Maximum percent retained on (indicated) oversize test sieve*	0% (7/16 inch)	0% (7/8 inch)	0% (1-3/4 inches)
Percent retained on (indicated) test sieve*	Not Applicable	50 to 75% (1/2 inch)	25 to 50% (1-1/4 inches)
Maximum percent passing (indicated) undersize test sieve*	2% (No. 5)	2% (5/16 inch)	2% (5/8 inch)
Maximum percent passing the number 200 sieve*	1.0%	0.5%	0.2%

* Sieves used in grading tests will be standard square mesh sieves conforming to ANSI/ASTM E 11 with particular regard for permissible variations in average openings.

Coarse aggregate for concrete in structures and in canal lining not to be placed with a lining machine may be separated as previously herein specified or may be separated into 3/4- and 1-1/2-inch nominal maximum sizes. Separation of the coarse aggregate into the two sizes shall be such that when tested in accordance with designations 5 and 16 in the Concrete Manual, coarse aggregate shall meet the grading requirements in table 5I.

TABLE 5I - Grading Requirements for Coarse Aggregate for Concrete in Structures And Nonmachine Placed Lining

Nominal Maximum size	3/4 inch	1-1/2 inches
Nominal size range	3/16 to 3/4 inch	3/4 to 1-1/2 inches
Maximum Percent retained on (indicated) over-size test sieve*	0% (7/8 inch)	0% (1-3/4 inches)
Percent retained on (indicated) test sieve*	50 to 75% (3/8 inch)	25 to 50% (1-1/4 inches)
Maximum percent passing (indicated) undersize test sieve*	2% (No. 5)	2% (5/8 inch)
Maximum percent passing the No. 200 sieve*	0.5%	0.2%

* Sieves used in grading tests will be standard square-mesh sieves conforming to ANSI/ASTM E 11, with particular regard for permissible variations in average openings.

5.3.7 DELETED

5.3.8 BATCHING

a. General - The contractor shall notify the Contracting Officer 24 hours before batching concrete. Unless inspection is waived in each case, batching shall be performed only in the presence of a duly authorized Government inspector.

The Contractor shall provide equipment and shall maintain and operate the equipment as required to accurately determine and control the prescribed amounts of the various materials entering the concrete mixers. The amount of bulk cement, pozzolan, sand, and each size of coarse aggregate entering each batch of concrete shall be determined by individual weighing. Sand and coarse aggregate may be weighed with separate scales and hoppers or cumulatively with one scale and hopper. If the batch plant is equipped with automatic interlocking sequential batching controls, the cement and pozzolan may be weighed cummulatively with one scale and hopper so long as weighing is automatically

controlled within the specified tolerances and cement is weighed first. If the batch plant is not so equipped, cement and pozzolan shall be weighed separately with individual scales and hoppers. Water and admixtures shall be measured by weight or by volume in accordance with paragraphs 5.3.4 and 5.3.3. Where bagged cement is used, it need not be weighed if the concrete is proportioned on the basis of integral bags of cement.

When bulk cementitious materials and aggregates are hauled from a central batching plant to the mixers, each batch shall be protected during transit to prevent loss and to limit prehydration of the cementitious materials. Separate compartments with suitable covers shall be provided to protect the cementitious materials or they shall be completely enfolded in and covered by the aggregates to prevent wind loss. If cementitious materials are enfolded in moist aggregate or otherwise exposed to moisture and delays occur between batching and mixing, the Contractor shall at his own expense add extra cement to each batch in accordance with the schedule in table 5J.

TABLE 5J - Additional Cementitious Materials Requirements

Hours of contact between dry cementitious materials and moisture*	Additional cementitious materials required
0 to 2	0 percent
2 to 3	5 percent
3 to 4	10 percent
4 to 5	15 percent
5 to 6	20 percent
Over 6	Batch will be rejected

* The Government reserves the right to require the addition of cementitious materials for shorter periods of contact during periods of hot weather and the Contractor shall be entitled to no additional compensation by reason of the shortened period of contact.

b. Equipment -

(1) All weighing equipment shall be accurate to 0.40 percent over the working range. In addition, the construction and accuracy of the weighing equipment shall conform to the applicable requirements of Federal

Specifications AAA-S-121D. The Contractor shall schedule and perform monthly tests to assure that the operating performance of each scale and measuring device is within the 0.40 percent accuracy and shall provide standard test weights and any other equipment necessary to conduct these tests. The tests shall be made in the presence of a Government inspector. The Contractor shall make adjustments, repairs, or replacements as may be necessary to continue to meet the specified requirements for accuracy of measurement throughout the use of the equipment.

(2) Each weighing unit shall be springless and shall visibly register the actual weights during the weighing operation and not just indicate when a prescribed weight has been obtained. The clear interval for dial scale graduation shall be not less than 0.03 inch. Each scale graduation shall indicate increments no greater than 2.5 pounds for water and cementitious materials and no more than 10 pounds for aggregate for each cubic yard normally batched. Each batch weight indicator and volumetric dispenser shall be in full view of the operator. Batching controls shall be interlocked so that a new batch cannot be started until the weighing hoppers have been completely emptied of the last batch and the scales register zero weight.

(3) The equipment shall be capable of controlling the delivery of material so that the combined inaccuracies in feeding and measuring during normal operation will not exceed 1 percent for water, 1-1/2 percent for cementitious materials, 3 percent for admixtures, and 2 percent each for sand, 3/4-inch aggregate, and 1-1/2-inch aggregate. The weighing hoppers shall be constructed so as to permit the convenient removal of materials batched in excess of the prescribed mix design and the above tolerances.

(4) Measuring devices for air-entraining and chemical admixtures shall have sufficient capacity to measure at one time the full quantity of the properly diluted solution required for each batch and shall be maintained in a a clean and freely operating condition. If admixtures are measured by a method other than direct weighing, equipment shall be designed for confirmation of the accuracy of each batch quantity by use of visual-mechanical gages readily visible from the batch plant operator's station. Admixture batching equipment shall be so constructed that the required batch quantity can only be added once to each batch and so that each admixture is discharged separately into the batched mixing water as is being discharged into the mixer.

(5) Equipment for conveying batched materials from weighing hoppers into the mixer shall be constructed, maintained, and operated so as to prevent spillage of the batched materials and overlap of batches.

(6) Equipment for handling cementitious materials in the batching plant shall be constructed and operated so as to prevent noticeable dust during the measuring and discharging of each batch of material.

(7) Aggregate batch bins shall be so constructed as to be self-cleaning during drawdown.

(8) Coarse aggregate shall be deposited in the batch bins directly over the discharge gates.

(9) Convenient facilities shall be provided for readily and safely obtaining representative samples of cementitious materials, admixtures, sand, and each size of coarse aggregate from the discharge stream between batch bins and the weighing hoppers or between the batch hopper and the mixer.

(10) The water batching device shall be constructed so that the water will be discharged quickly and freely into the mixer without objectionable dribble from the end of the discharge pipe and shall be such that leakage will not occur when the valves are closed. In addition, equipment shall be capable of adjusting batch water by as little as 3 pounds per cubic yard. There shall be a means for introducing small increments of water into each mixer after batching for occasional final tempering of the concrete.

(11) The equipment shall be capable of adjustment to compensate for the varying moisture content of the sand and coarse aggregates and to adjust the mix proportions as needed.

(12) The Contractor shall inform a Government batch plant inspector prior to and after changes and ajustments in batching equipment and control instrumentation.

5.3.9 MIXING

a. General - The concrete ingredients shall be thoroughly mixed in mixers designed to positively insure uniform distribution of all the component materials throughout the concrete at the end of the mixing period.

The concrete, as discharged from the mixer, shall be uniform in composition and consistency from batch to batch. Mixers will be examined regularly by the Government for changes in

condition due to accumulation of hardened concrete or mortar or to wear of blades. The adequacy of the mixing will be in accordance with the concrete uniformity requirements of ANSI/ASTM C 94, annex A1. Samples of concrete for such tests will be taken from any size batch which is commonly mixed during concrete production. For testing purposes, the Contractor shall mix, in the mixers to be tested, the size of batch directd by the Government inspector at the batch plant, and shall assist in collection of required samples from that batch.

Any mixer that at any time produces unsatisfactory results shall not be used until repaired. If repair attempts are unsuccessful, a defective mixer shall be replaced.

Batch size shall be at least 10 percent of, but not in excess of, the rated capacity of the mixer.

b. Central mixers - Water shall be admitted prior to and during charging of the mixer with all other concrete ingredients. After all materials are in the mixer, each batch shall be mixed for not less than the time listed in table 5K.

TABLE 5K - Mixing Time

Capacity of mixer	Time of mixing (minimum)
2 cubic yards or less	90 seconds
3 cubic yards	120 seconds
4 cubic yards	150 seconds

The minimum mixing times specified are based on average mixer performance. The Contractor shall adjust the minimum mixing time required as need is indicated by results of the concrete uniformity tests. Excessive overmixing which requires additions of water to maintain the required concrete consistency will not be permitted.

The mixing equipment shall conform to the following additional requirements:

(1) Plant configuration shall be such that the mixing action of each mixer can be observed from a safe location which can be easily reached from the control station. Provisions shall also be made so that the operator can observe the concrete in the receiving hopper or buckets as it is being dumped from the mixers.

(2) Each mixer shall be controlled with a timing device which will indicate the mixing period and assure completion of the required mixing period.

(3) The batch plant shall be equipped with an interlocking mechanism which will prevent concrete batches from entering mixers which are not empty.

c. Truck mixers - Each truck mixer shall be equipped with an accurate watermeter, located between the supply tank and mixer and having a dial or digital indicator, and a reliable revolution counter, located near the watermeter, which can be readily reset to zero for indicating the total number of revolutions of the drum for each batch. Each mixer shall have affixed thereto a metal plate on which the drum capacities, in terms of volume, for both mixing and agitating and the maximum and minimum speeds of rotation of the drum are plainly marked.

Mixing shall be continued for not less than 50 revolutions nor more than 100 revolutions of the drum after all the ingredients, except approximately 5 percent of the water which may be withheld, are in the drum. The mixing speed shall be not less than 12 revolutions per minute nor more than 22 revolutions per minute. After mixing is completed, additional revolutions, if any, shall be at the agitation speed designated by the manufacturer of the equipment; except that after the addition of withheld water, mixing shall be continued at the specified mixing speed for a minimum of 30 revolutions. In no case shall the design water content be exceeded. After a period of agitation, a few revolutions of the drum at mixing speed will be required just prior to discharging.

Concrete shall be discharged within 1-1/2 hours after the introduction of the mix water and cementitious materials into the mixer. Each batch of concrete, when delivered at the jobsite from commercial ready-mix plants, shall be accompanied by a written certificate of batch weights and time of batching.

5.3.10 TEMPERATURE OF CONCRETE

Fresh structural concrete shall be placed at a temperature between 50 and 90°F. Fresh canal lining concrete shall be placed at a temperture between 50 and 80°F. The temperature will be determined by placing a thermometer in the concrete immediately after sampling at the placement site. The temperature of the concrete at the batch plant shall be adjusted to assure that the specified concrete temperature is attained at the placement.

The Contractor shall employ effective means, such as precooling of aggregates and mixing water and placing at

night, as necessary to maintain the temperature of the concrete, as it is placed, below the specified maximum. The Contractor shall be entitled to no additional compensation due to the foregoing requirements.

5.3.11 FORMS

a. General - Forms shall be used, wherever necessary, to confine the concrete and shape it to the required lines. The Contractor shall set and maintain concrete forms so as to insure completed work is within all applicable tolerance limits. If a type of form does not consistently perform in an acceptable manner, the type of form shall be changed and the method of erection shall be modified by the Contractor.

Plumb and string lines shall be installed before, and maintained during, concrete placement. Such lines shall be used by Contractor's personnel and shall be in sufficient number and properly installed. During concrete placement, the Contractor shall continually monitor plumb and string line form positions and immediately correct deficiencies.

Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall be maintained rigidly in position. Forms shall be sufficiently tight to prevent loss of mortar from the concrete. Chamfer strips shall be placed in the corners of forms and at the tops of wall placements to produce beveled edges on permanently exposed concrete surfaces. Interior angles of intersecting concrete surfaces and edges of construction joints shall not be beveled except where indicated on the drawings.

Forms for concrete surfaces for which finish F3 is specified shall, at the Contractor's option, be constructed either with or without goove strips at horizontal construction joints. If groove strips are used, they shall be spaced to form a continuous and uniform pattern of grooves across exposed surfaces of the concrete. If groove strips are not used, the forms shall not be constructed continuously from lift to lift but shall be removed after concrete in a lift has hardened and reset for the next lift. The reset forms shall overlap the hardened concrete in the lift previously placed by not more than 1 inch and shall be tightened snugly against the hardened concrete so that, when concrete placement is resumed, the forms will not spread and allow offsets or loss of mortar at construction joints. Additional bolts or form ties shall be used as necessary to hold the reset forms tight against the hardened concrete.

b. Form sheathing and lining - Wood sheathing or lining shall be softwood or plywood of such kind and quality, or shall be so treated or coated, that there will be no chemical deterioration or discoloration of the formed

concrete surfaces. The type and condition of form sheathing and lining, and the fabrication of forms for finishes F2, and F3, shall be such that the resulting concrete surfaces will have uniform texture and will meet all applicable finish and tolerance requirements. The ability of form sheathing and lining to withstand distortion caused by placement and vibration of concrete shall be such that formed surfaces will conform with specified tolerances. All voids of joints in the plywood form lining or sheathing for finish F3 finishes shall be filled and finished smooth. Where finish F3 is specified, the sheathing or lining shall be placed so that the joint marks on the concrete surfaces will be minimal and will be in alignment both horizontally and vertically. Where used for form sheathing, softwood lumber shall meet applicable requirements of the latest edition of the Grading Rules of the Western Wood Products Association for dressed lumber or worked lumber of the grade herinafter specified. All common boards shall be surfaced on both edges (S2E) in accordance with the standard grading rules. Plywood used for form sheathing or lining shall be concrete form, class 1, grade B-B, exterior, mill oiled and edge sealed, in accordance with the latest edition of Product Standard PS1 of the U.S. Department of Commerce. Materials used for form sheathing or lining shall conform with the requirements of table 5L or may be other materials producing equivalent results.

TABLE 5L - Form Sheathing or Lining Material Requirements

Required finish of formed surface	Wood Sheathing or lining	Steel Sheathing or lining*
F1	Any grade common board, or plywood	Steel sheathing permitted. Steel lining permitted.
F2	No. 2 Common or better shiplap, or plywood	Steel sheathing permitted. Steel lining permitted if approved
F3	Plywood	Steel sheathing not permitted. Steel lining not permitted.

*Steel "sheathing" denotes steel sheets not supported by a wood backing. "Lining" denotes thin sheets supported by a wood backing.

c. Uniformity of forming material - Forms for exposed concrete surfaces to receive finishes F2 and F3 shall be constructed so as to produce a uniform and consistent texture and patern on the face of the concrete. Metal patches on forms for these surfaces will not be permitted. The form sheathing or lining shall be placed so that all horizontal form marks are continuous across the entire surface. If forms are constructed of plywood form lining or of panels of board lumber, the vertical form marks shall be continuous for the entire height of the surface. If forms for concrete surfaces to receive F2 finishes are constructed of board lumber that is not paneled, the boards shall be cut square, and the vertical joints in the boards shall be staggered and shall be made only at studs. The Contractor shall use one type of form material for all exposed F2 surfaces and one type of form material for all F3 surfaces. If the Contractor elects to use board lumber for forms for F2 surfaces, the lumber shall either be all 6-inch or all 8-inch lumber.

d. Form ties and form anchors - Embedded ties for holding forms shall remain embedded and, except where F1 finish is permitted, shall terminate not less than 2 diameters or twice the minimum dimension of the tie, whichever is greater, from the formed surfaces of the concrete. Where F1 finish is permitted, ties may be cut off flush with the formed surfaces. The ties shall be constructed so that removal of the ends or end fasteners can be accomplished without causing appreciable spalling at the faces of the concrete. Unless backfill is to be placed against the concrete, recesses resulting from removal of the ends of form ties shall be filled in accordance with paragraph 5.3.20. Form anchors shall be provided in sufficient number to insure that concrete surfaces after stripping forms are within applicable tolerances. Form anchors embedded in concrete which are loosened prior to placement of adjoining concrete shall be replaced by other supports firmly embedded in the hardened concrete.

e. Cleaning and oiling of forms - At the time the concrete is placed in the forms, the surfaces of the forms shall be free from encrustations of mortar, grout, or other foreign material. Before concrete is placed, the surfaces of the forms, shall be oiled with a commercial form oil that will effectively prevent sticking and will not soften or stain the concrete sufaces, or cause the surfaces to become chalky or dust producing. For wood forms, form oil shall consist of refined mineral oil suitably compounded with ingredients which are appropriate for the purpose.

f. Removal of forms - To facilitate satisfactory progress with the specified curing and enable earliest practicable repair of surface imperfections, forms shall be removed within 24 hours after the concrete has hardened sufficiently

to prevent damage by careful form removal, and specified repair and curing shall be commenced immediately thereafter. The Contractor shall be liable for damage and injury caused by removing forms before the concrete has gained sufficient strength.

5.3.12 TOLERANCES FOR CONCRETE CONSTRUCTION

a. General - Tolerances are defined as allowable variations from specified lines, grades, and dimensions and as the allowable magnitude of the surface irregularities. Allowable variations from specified lines, grades, and dimensions are listed in table 5M in subparagraph b. below. Allowable magnitudes for concrete surface irregularities are listed in table 5N in subparagraph c. below.

The intent of this paragraph is to establish tolerances that are consistent with modern construction practice, yet are governed by the effect that permissible variations may have upon a structure. The Contractor shall, if possible, diminish the tolerances set forth herein if such tolerances impair the structural action, operational function, or architectural appearance of a structure or portion thereof.

Concrete shall be within all stated tolerances even though more than one tolerance may be specified for a particular concrete structure: Provided, That the specified variation for one element of a structure shall not apply when it will permit another element of the structure to exceed its allowable variation. Where tolerances are not specified or shown on the drawings for a particular structures, tolerances shall be those specified for similar work. As an exception to clause No. 2 of the General Provisions, specific tolerances shown on the drawings in connection with any dimension shall govern. The Contractor shall be responsible for finishing the concrete and for setting and maintaining concrete forms within the limits necessary to insure that the completed work will be within the tolerances specified. Concrete work that exceeds the tolerance limits specified shall be remedied in accordance with subparagraphs d. and e.

b. Variations from specified lines, grades, and dimensions of hardened concrete structures shall be checked by the Contractor and will be subject to such inspection and measurement as needed to determine that the structures are within the tolerances specified in table 5M.

Variation is defined as the distance between the actual position of the structure or any element of the structure and the specified position in plan for the structure or the particular element. Plus or minus variations shown as (±) indicate a permitted actual position up or down and in or out from the specified postion in plan. Variations not

designated as plus or minus indicate the maximum deviation permitted between designated successive points on the completed element of construction.

Specified position in plan is defined as the lines, grades, and dimensions described in these specifications or shown on the drawings

TABLE 5M - Variations from Specified lines, Grades and Dimensions

A. Tolerances for canal lining -

1. *Departure from established alignment. . . .±2 inches on tangents
. . . . .±4 inches on curves

2. *Departure from established profile grade. . . . . .±1 inch

3. Reduction in thickness of lining . . . . .10 percent of specified thickness: Provided, That average thickness is not less than specified thickness

4. Variation from specified width of section at any height . . . . . ±0.25 percent of specified width plus 1 inch

5. Variation from established height of lining . . . . . ±0.50 percent of established height plus 1 inch

* Any departure from alignment or grade shall be uniform and no correction in alignment shall be made in less than 100 feet.

B. Tolerances for canal structures -

1. Measuring wells:

(a) Departure from established alignment. . . . . ±1 inch

(b) Departure from established grade. . . . . ±1 inch

(c) Variation from plumb:

(1) When overall length of line or surface is:

10 feet or less. . . . . Exposed ±3/8 inch
. . . . . Buried ±3/4 inch
More than 10 feet. . . . . Exposed ±1/2 inch
. . . . . Buried ±1 inch

(2) For any two successive intermediate points on the line or surface separated by:

10 feet. . . . . Exposed 3/8 inch
. . . . . Buried 3/4 inch
10 feet or more . . . . . Exposed 1/2 inch
. . . . . Buried 1 inch

2. Variation from level for slabs:

(a) When overall length of line or surface is:

10 feet or less. . . . . Exposed ±3/8 inch
. . . . . Buried ±3/4 inch

(b) For any two successive intermediate points on the line or surface separated by:

10 feet. . . . . Exposed 3/8 inch
. . . . . Buried 3/4 inch

3. Variation in cross-sectional dimensions of columns, pier, and slab parts of the structures in B.1. above from those specified . . . . . -1/4 inch
. . . . . +1/2 inch

4. Variation from plumb of pipe erected vertically in any length of 10 feet. . . . . ±1/2 inch

C. Tolerances for bridges -

1. Departure from established alignment . . . . . ±1/4 inch

2. Footings:

(a) Variation in length and width dimensions from those specified . . . . . -1/2 inch
. . . . . +2 inches

(b) Horizontal misplacement or eccentricity:

(1) 2 percent of the footing width in the direction of misplacement but not more than. . . . . 2 inches

(c) Reduction in thickness. . . . . 5 percent of specified thickness

3. Variation from plumb or specified batter for lines and surfaces of walls:

   (a) Exposed construction:

      (1) When overall height of line or surface is:

         10 feet or less . . . . . ±3/8 inch
         More than 10 feet. . . . . ±1/2 inch

      (2) For any two successive intermediate points on the line or surface separated by:

         10 feet. . . . . 3/8 inch
         10 feet or more. . . . . 1/2 inch

   (b) Buried construction . . . . . .Twice the amounts listed in C.3.(a) above

4. Variation from level or specified grades for slabs; other than bridge deck; beams; and railing offsets:

   (a) Exposed construction:

      (1) When overall length of line or surface is:

         10 feet or less . . . . . ±3/8 inch
         More than 10 feet . . . . . ±1/2 inch

      (2) For any two successive intermediate points on the line or surface separated by:

         10 feet . . . . . 3/8 inch
         10 feet or more . . . . . 1/2 inch

   (b) For buried construction . . . . . Twice the amounts listed in C.4.(a) above

5. Departure of bridge deck and rails from specified grades . . . . . ±1/4 inch

6. Variation in cross-sectional dimensions from those specified for piers; slabs, other than bridge deck; walls; beams; and similar parts of bridge structures . . . . . -1/4 inch
   . . . . . +1/2 inch

7. Variation from that specified in the thickness of bridge slabs . . . . . -1/8 inch
   . . . . . +1/4 inch

c. Concrete surface irregularities -

(1) General - Bulges, depressions, and offsets are defined as concrete suface irregularities. Concrete surface irregularities are classifed as "abrupt" or "gradual" and are measured relative to the actual concrete surface.

(2) Abrupt surface irregularities - Abrupt surface irregularities are defined herein as offsets such as those caused by misplaced or loose forms, loose knots in form lumber, or other similar forming faults. Abrupt surface irregularities are measured using a short straightedge at least 6 inches long held firmly against the concrete surface over the irregularity and the magnitude of the offset is determined by direct measurement.

(3) Gradual surface irregularities - Gradual surface irregularities are defined herein as bulges and depressions resulting in gradual changes on the concrete surface. Gradual surface irregularities are measured using a template conforming to the design profile of the concrete surface being examined. Templates for measuring gradual surface irregularities shall be provided by the Contractor. Templates shall be at least 8 feet in length. The magnitude of gradual surface irregularities is defined herein as a measure of the rate of change in slope of the concrete surface. Gradual surface irregularities are measured as shown on figure 1 from a template held firmly against the concrete surface and the magnitude of gradual surface irregularity is computed as shown in figure 1.

The magnitude of gradual surface irregularities on concrete surfaces shall be checked by the Contractor to insure that the surfaces are within specified tolerances. The Government will also make such checks of hardened concrete surfaces as determined necessary to insure compliance with these specifications. Templates for these surfaces shall be furnished by the Contractor and shall be available for use by the Government at all times.

MEASUREMENT OF GRADUAL IRREGULARITIES ON CONCRETE SURFACES

Magnitude of Gradual Surface Irregularity (MGSI) = $\left| \frac{d_I - d_L}{l_L} + \frac{d_I - d_R}{l_R} \right|$

Where:

d_I = distance from template to concrete surface at an intermediate point, I.

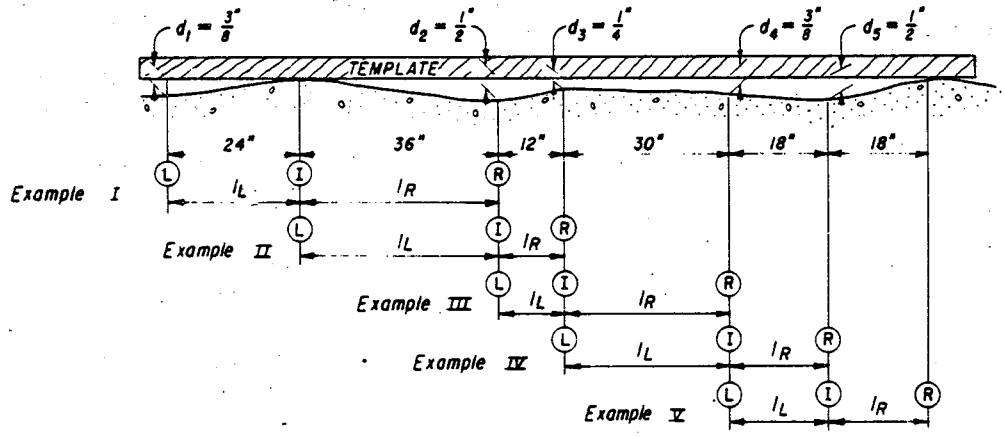
d_L = distance from template to concrete surface at left end point, L.

d_R = distance from template to concrete surface at right end point, R.

l_L = distance along template from left end point L to the intermediate point I.

l_R = distance along template from right end point R to the intermediate point I.

NOTE: The position of the template and the three points along the template shall be selected and adjusted to obtain the greatest MGSI, except that neither l_L nor l_R shall exceed 3 feet. The MGSI is an absolute value, and should be made positive only after all computations are completed. (See example IV below).



$$\text{Example I MGSI} = \frac{0 - d_1}{l_L} + \frac{0 - d_2}{l_R} = \frac{0 - \frac{3}{8}''}{24''} + \frac{0 - \frac{1}{2}''}{36''} = \frac{-\frac{3}{8}''}{24''} + \frac{-\frac{1}{2}''}{36''} = 0.0295 \text{ inch / inch}$$

$$\text{Example II MGSI} = \frac{d_2 - 0}{l_L} + \frac{d_2 - d_3}{l_R} = \frac{\frac{1}{2}'' - 0}{36''} + \frac{\frac{1}{2}'' - \frac{1}{4}''}{12''} = \frac{\frac{1}{2}''}{36''} + \frac{\frac{1}{4}''}{12''} = 0.0347 \text{ inch / inch}$$

$$\text{Example III MGSI} = \frac{d_3 - d_2}{l_L} + \frac{d_3 - d_4}{l_R} = \frac{\frac{1}{4}'' - \frac{1}{2}''}{12''} + \frac{\frac{1}{4}'' - \frac{3}{8}''}{30''} = \frac{-\frac{1}{4}''}{12''} + \frac{-\frac{1}{8}''}{30''} = 0.0250 \text{ inch / inch}$$

$$\text{Example IV MGSI} = \frac{d_4 - d_3}{l_L} + \frac{d_4 - d_5}{l_R} = \frac{\frac{3}{8}'' - \frac{1}{4}''}{30''} + \frac{\frac{3}{8}'' - \frac{1}{2}''}{18''} = \frac{\frac{1}{8}''}{30''} + \frac{-\frac{1}{8}''}{18''} = 0.0028 \text{ inch / inch}$$

$$\text{Example V MGSI} = \frac{d_5 - d_4}{l_L} + \frac{d_5 - 0}{l_R} = \frac{\frac{1}{2}'' - \frac{3}{8}''}{18''} + \frac{\frac{1}{2}'' - 0}{18''} = \frac{\frac{1}{8}''}{18''} + \frac{\frac{1}{2}''}{18''} = 0.0347 \text{ inch / inch}$$

FIGURE 1

TABLE 5N - Tolerances for Concrete Surface Irregularities

A. Abrupt irregularities -

1. F1 surfaces, depressions only. . . . . 1 inch
2. F2 surfaces. . . . . 1/4 inch
3. F3 surfaces . . . . . 1/8 inch
4. U1 surfaces . . . . . 1/4 inch
5. U2 surfaces . . . . . .1/32 inch
6. U4 surfaces . . . . . .1/16 inch

B. Gradual irregularities -

1. F2 surfaces . . . . . .1/8 inch per inch
2. F3 surfaces . . . . . 1/16 inch per inch
3. U2 surfaces . . . . . 1/8 inch per inch

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d. Repair of hardened concrete not within specified tolerances - Hardened concrete which is not within specified tolerances shall be repaired to bring it within those tolerances. Such repair shall be in accordance with paragraph 5.3.20. Concrete repair to bring concrete within tolerances shall be done only after consultation with a Government inspector regarding the method of repair. The Government shall be notifed as to the time when repair will be performed.

Concrete which will be exposed to public view shall be repaired in a manner which will result in a concrete surface with a uniform appearance. Grinding of concrete surfaces exposed to view shall be limited in depth such that no aggregate particles are exposed more than 1/16 inch in cross section at the finished surface. Where grinding has caused or will cause exposure of aggregate particles greater than 1/16 inch in cross section at the finished surface, concrete shall be repaired by excavating and replacing the concrete.

e. Prevention of repeated failure to meet tolerances - When concrete placements result in hardened concrete that does not meet specified tolerances, the Contractor shall prepare and submit to the Government an outline of all preventative actions, such as modifications to forms, modified procedure for setting screeds, and different

finishing techniques, to be implemented by the Contractor to avoid repeated failures. The Contractor shall delay affected concrete placements until such preventative actions can be implemented.

5.3.13 REINFORCING BARS AND FABRIC

a. General - Reinforcing bars and fabric shall be placed in the concrete where shown on the drawings or where directed. The Contractor shall furnish all reinforcing bars and fabric required for completion of the work.

b. Materials -

(1) Reinforcing bars - Reinforcing bars shall be deformed bars conforming to ANSI/ASTM A 615; grade 60, including supplementary requirements, except reinforcement for the precast prestressed concrete beams shall be in accordance with paragraph 5.4.1.

(2) Fabric - Fabric shall be electrically welded-wire fabric and shall conform to ASTM designation: A 185 for smooth steel wire or ASTM designation: A 497 for deformed steel wire, except that for wire with a specified yield strength exceeding 60,000 pounds per square inch, the yield strength shall be the stress corresponding to a strain of 0.35 percent.

c. Placing reinforcing bars and fabric - The reinforcement shall conform to the requirements shown on the Drawings.

The Contractor may splice bars at additional locations other than those shown on the drawings. In order to meet design and space limitations on splicing, some bent bars may exceed usual shipping clearances. Cutting and bending of such bars from stock lengths may be required at the site.

Unless otherwise prescribed, placement dimensions shall be to the centerlines of the bars. Reinforcement will be inspected for compliance with requirements as to size, shape, length, splicing, position, and amount after it has been placed.

Before reinforcement is embedded in concrete, the surfaces of the bars and fabric and the surfaces of any supports shall be cleaned of heavy flaky rust, loose mill scale, dirt, grease, or other foreign substances which are objectionable. Heavy flaky rust that can be removed by firm rubbing with burlap, or equivalent treatment, is considered objectionable.

Reinforcement shall be accurately placed to meet the following tolerances:

(1) The amount of concrete covering reinforcement in bridge decks shall not deviate from that specified by more than 1/4 inch if the cover specified is more than 2-1/2 inches, nor by more than 1/8 inch if the cover specified is 2-1/2 inches or less.

(2) The amount of concrete cover protecting reinforcement in all other concrete shall not deviate from that specified by more than 1/2 inch if the specified cover is more than 2-1/2 inches, nor by more than 1/4 inch if the cover specified is 2-1/2 inches or less.

(3) The spacing of reinforcing bars shall not deviate from the required spacing by more than 1 inch.

Reinforcement shall be secured in position so that it will not be displaced during the placing of the concrete, and special care shall be exercised to prevent any disturbance of the reinforcement in concrete that has already been placed. Bars shall not be field bent during construction to the extent of permanent set, nor straightened, except as shown on the drawings. Bars bent without approval shall be replaced in conformance with the drawing. Welding or tack welding of reinforcing bars will not be permitted except at locations shown on the drawings. Chairs, hangers, spacers, and other supports for reinforcement shall be of concrete, metal, or other approved material. Where portions of such supports will be exposed on concrete surfaces designated to receive F2 or F3 finish, the exposed portion of the supports shall be galvanized or other corrosion-resistant material, except that concrete supports will not be permitted. Unless otherwise shown on the drawings, reinforcement in structures shall be so placed that there will be a clear distance of at least 1 inch between the reinforcement and any anchor bolts, form ties, or other embedded metalwork.

d. Reinforcement drawings to be prepared by the Contractor - The Contractor shall prepare and submit to the Government, for approval and for informational purposes, reinforcement detail drawings, including bar-placing drawings, bar-bending diagrams, and bar lists, in accordance with the following provision.

The Contractor's reinforement detail drawings shall be prepared from reinforcement design drawings included with these specifications.

At least 30 days before scheduled concrete placement, the Contractor shall submit to the Construction Engineer, Franzoy Corey Engineering Company, 1030 East Guadalupe Road, Tempe, Arizona 85283, for approval, one reproducible and one print of each of his reinforcement detail drawings for all structures and applications.

The Government will require 25 calendar days for review of reinforcement detail drawings and this review time will apply to each separate submittal or resubmittal as provided in paragraph 1a of the Special Provisions.

The Contractor's reinforcement detail drawings shall be prepared following the recommendations established by the American Concrete Institute's "Manual of Standard Practice for Detailing Reinforced Concrete Structures" (ACI 315-74) unless otherwise shown on the reinforcement design drawings. The Contractor's drawings shall show necessary details for checking the bars during placement.

The Contractor's reinforcement detail drawings shall be clean, legible, and accurate and checked by the Contractor before submittal. If any reinforcement detail drawing or group of drawings requiring approval is not of a quality acceptable to the Government, the entire set or group of drawings will be returned to the Contractor, without approval, to be corrected and resubmitted. Acceptable reinforcement detail drawings will be reviewed by the Contracting Officer for adequacy of general design and controlling dimensions. Errors, omissions, or corrections will be marked on the prints or otherwise relayed to the Contractor, and one print of each drawing will be returned to the Contractor for correction. The Contractor shall make all necessary corrections shown on the returned prints. The corrected drawings need not be resubmitted unless corrections are extensive enough, as determined by the Contracting Officer, to warrant resubmittal. Such Government review and approval shall not relieve the Contractor of his responsibility for the correctness of details or for conformance with the rquirements of these specifications.

5.3.14 DELETED

5.3.15 PREPARATION FOR PLACING

a. General - No concrete shall be placed until all formwork, installation of items to be embedded, and preparation of surfaces involved in the placement have been approved.

All surfaces of forms and embedded materials shall be free from curing compound, dried mortar from previous placements, and other foreign substances before the adjacent or surrounding concrete placement is begun.

Prior to beginning concrete placement, the Contractor shall make ready a sufficient number of properly operating vibrators and operators, and shall have readily available additional vibrators to replace defective ones during the progress of the placement.

b. Foundation surfaces - All surfaces upon or against which concrete is to be placed shall be free from water, mud, and debris.

(1) Rock surfaces shall be free from oil, objectionable coatings, and loose, semidetached and unsound fragments. Immediately prior to placement of concrete, surfaces of rock shall be washed with an air-water jet and shall be brought to a uniform surface-dry condition.

(2) Earth foundations shall be damp when concrete is placed against them. Surfaces shall be wet to a depth of 6 inches or to impermeable material, whichever is less, before concrete is placed.

c. Construction joints - Construction joints are defined as concrete surfaces upon or against which concrete is to be placed and to which new concrete is to adhere but which have become so rigid that the new concrete cannot be incorporated integrally with that previously placed. Construction joints shall be clean, rough, and surface dry when covered with fresh concrete. Cleaning shall consist of the removal of all laitance, loose or defective concrete, coatings, sand, curing compound, and other foreign material. Construction joints shall be wet sandblasted, washed thoroughly with air-water jets, and surface dried prior to placement of adjoining concrete. The sandblasting, washing, and surface drying shall be performed at the last opportunity prior to placing of concrete. Drying of the surface shall be uniform and may be accomplished by air jet.

d. Contraction joints - Contraction joints serve to provide for volumetric shrinkage of monolithic concrete and for movement between monolithic units at established joints, thus preventing formation of objectionable shrinkage cracks elsewhere in the concrete. Prior to application of wax-base curing compound to contraction joints, the surfaces of all joints shall be cleaned thoroughly of accreations of concrete or other foreign material by scraping or chipping. Curing compound shall not be removed, but shall remain on these joints and be kept intact until adjoining concrete is placed. Waterstops, reinforcing bars, and other embedded items shall be free of curing compound when adjoining concrete is placed.

5.3.15A SPONGE RUBBER FILLER FOR CONCRETE JOINTS

a. General - Elastic filler material consisting of sponge rubber shall be furnished and placed in the joints in concrete where shown on the drawings. Elastomeric sealer shall also be furnished and placed in the joints where shown.

b. Materials -

(1) Sponge rubber - Sponge rubber shall conform to Federal Specification HH-F-341F, type 11, class A, sponge rubber: Provided, That the load required to compress the test specimen to 50 percent of its thickness before test shall be not less than 50 pounds per square inch or greater than 150 pounds per square inch. Sponge rubber shall be stored in as cool a place as practicable, preferably at 70°F or less, and in no case shall the rubber be stored in the open exposed to the direct rays of the sun.

(2) Copper nails - Copper nails shall conform to Federal Specification FF-N-105B for common copper wire nails.

(3) Adhesive - Adhesive for fastening the sponge rubber in place shall be a nonbituminous adhesive as recommended by the manufacturer of the filler material.

(4) Elastomeric sealant - Elastomeric sealant shall conform to Bureau of Reclamation "Standard Specifications for Elastomeric Canal Joint Sealer", dated August 1, 1977, Class R, Type II.

c. Installation - The sponge rubber filler shall be cut to the size and shape of the joint surface. The filler shall be secured to the concrete in an approved manner, with copper nails embedded in the first-placed concrete in such a manner that the nails will protrude from the joint surface to be covered at approximately 12-inch centers, or by adhesive applied between the filler and the first-placed concrete.

Joints between adjoining portions of the filler material shall be sufficiently tight to prevent concrete from seeping through such joints. Where sealer material is required, the joint filler shall be set back from the edge of the joint to provide the proper recess for installing sealer material. Elsewhere, unless otherwise shown on the drawings, the edges of the sponge rubber filler shall be placed flush with the finished surface of the concrete or to the bottom edge of chamfers.

5.3.16 PLACING

a. General - The Contractor shall notify the Contracting Officer before batching begins for placement of concrete. Unless inspection is waived for that specific placement, placing shall be performed only in the presence of an authorized Government inspector. Placement shall not begin until after all preparations are complete.

All surfaces upon or against which concrete is to be placed shall be prepared in accordance with paragraph 5.3.15.

Retempering of concrete will not be permitted. Any concrete which has become so stiff that proper placing cannot be assured shall be wasted.

Concrete shall not be placed in standing or running water, and shall not be subject to such until after the concrete has hardened.

Concrete shall be deposited as nearly as practical in its final position and shall not be allowed to flow in such a manner that the lateral movement will cause segregation of the coarse aggregate from the concrete mass. Methods and equipment employed in depositing concrete in forms shall minimize clusters of coarse aggregate. Clusters that occur shall be scattered before the concrete is vibrated.

Forms shall be constantly monitored and their position adjusted as necessary during concrete placement is accordance with paragraph 5.3.11.

All concrete shall be placed in approximately horizontal layers. The depths of layers shall not exceed 20 inches. All construction joints which intersect exposed concrete surfaces shall be made straight and level or plumb except as shown otherwise on the drawings.

Except as shown otherwise on the drawings, construction joints intersecting sloping exposed concrete surfaces shall be inclined near the exposed surface to prevent featheredges. The angle between such inclined surface and the form shall be not less than 50° nor more than 130°, and that surface angle shall extend into the concrete member for at least 3 inches.

To facilitate consolidation at construction joints, structural concrete placements may be started with an oversanded mix containing 3/4-inch-maximum-size aggregate; a maximum net water-cementious materials ratio of 0.47, by weight; 2 percent additional sand, by weight of total aggregate, based on standard 3/4-inch mix; 6 percent air, by total volume of concrete; and having a maximum slump of 4 inches. The oversanded mix shall be placed 2 to 6 inches deep on the joint at the bottom of the placement.

In placing concrete on unformed slopes so steep as to make internal vibration of the concrete impractical without forming, the concrete shall be placed ahead of nonvibrating slip-form screed extending approximately 2-1/2 feet back from its leading edge. Concrete ahead of the slip-form screed shall be consolidated by internal vibrators so as to insure complete filling under the slip-form.

A cold joint is an unplanned joint resulting when a concrete surface hardens before the next batch is placed against it. Cold joints are undesirable and should be avoided. However, in the event of equipment breakdown or other unavoidable prolonged interruption of continuous placing, cold joints are permitted. If such unavoidable delays in placing occur which make it appear that unconsolidated concrete may harden to the extent that later vibration will not fully consolidate it, the Contractor shall immediately consolidate such concrete to a stable and uniform slope. If delay of placement is then short enough to permit penetration of the underlying concrete, placement shall resume with particular care being taken to thoroughly penetrate and revibrate the concrete surface placed before the delay. If concrete cannot be penetrated with a vibrator, the cold joint shall be then treated as a construction joint.

Care shall be taken to prevent cold joints when placing concrete in any part of the work. The concrete-placing rate shall insure concrete is placed while the previously placed, adjacent concrete is plastic so that the concrete can be made monolithic by normal use of the vibrators.

Concrete shall not be placed in rain sufficiently heavy or prolonged to wash mortar from concrete. A cold joint may necessarily result from prolonged heavy rainfall.

The Contractor shall be entitled to no additional payment by reason of any limitations in the placing of concrete required under the provision of this paragraph.

b. Transportation - The methods and equipment used for transporting concrete from the batch plant to its final position in the placement and the time that elapses during transportation shall not cause measureable segregation of coarse aggregate or slump loss during transportation exceeding 2 inches.

Concrete shall be deposited as near as practical to its final position by use of buckets, conveyors, or concrete pumps. The use of aluminum pipe or chutes for delivery of concrete will not be permitted. Concrete buckets shall be capable of promptly discharging concrete of the specified mix design and the dumping mechanism shall be capable of discharging at one location small portions of concrete from a full bucket. Buckets and conveyors shall be designed for attaching drop chutes or tremies which shall be used to deposit concrete whenever the concrete must be dropped more than 10 feet from the bucket to the placing surface.

If used to transport concrete, truck mixers shall meet the applicable requirements of paragraph 5.3.9 for truck mixers.

Just prior to discharging, a few revolutions of the drum at mixing speed will be required.

Buckets, chutes, hoppers, pumps, transit mix trucks, and other equipment shall readily handle and place concrete of the specified slump. The Contractor shall replace inadequate transporting equipment with acceptable equipment.

c. Consolidation - Concrete shall be consolidated by vibration. The vibration shall be sufficient to remove all undesirable air voids from the concrete, including the air voids trapped against the forms. After consolidation, the concrete shall be free of rock pockets and honey comb areas and shall be closed snugly against all surfaces of forms, construction joints, and embedded materials. All concrete shall be properly consolidated before it hardens.

Except as hereinafter provided, consolidation of all concrete shall be by immersion-type vibrators. Immersion-type vibrators shall be operated in nearly vertical position and the vibrating head shall penetrate and revibrate the concrete in the upper portion of the underlying layer. Care shall be exercised to avoid contact of the vibrating head with embedded items and with formed surfaces which will later be exposed to view. Concrete shall not be placed upon other plastic concrete until the previously placed concrete has been thoroughly consolidated.

Form vibrators shall be used in conjunction with slip-form lining machines to consolidate concrete in unreinforced canal lings. Such vibrators shall be arranged for effective uniform consolidation of the concrete. The Government may remove samples of the hardened concrete for testing and examination, and the Contractor shall repair, at no cost to the Government, concrete from which such samples are removed.

Immersion-type vibrators shall be operated at speeds of at least 7,000 revolutions per minute when immersed in concrete. The Contractor shall immediately replace improperly operating vibrators with acceptable vibrators.

5.3.17 FINISHES AND FINISHING

a. General - The classes of finish and the requirements for finishing of concrete surfaces shall be as specified in this paragraph or as otherwise indicated on the drawings. Concrete surfaces will be tested by the Government in accordance with paragraph 5.3.12 where necessary to determine whether the concrete surface is within the specified tolerances. Finished concrete which is not within the specified tolerances shall be repaired in accordance with paragraph 5.3.20.

b. Formed surfaces - The classes of finish for formed concrete surfaces are designated by the symbols F1, F2, and F3. Unless otherwise specified or indicated on the drawings, the classes of finish shall apply as follows:

(1) F1 - Finish F1 applies to formed surfaces upon or against which fill material or concrete is to be placed. Holes left by the removal of fasteners from the ends of tie rods shall be filled after form removal as required in paragraph 5.3.20.

(2) F2 - Finish F2 applies to all formed surfaces not permanently concealed by fill material or concrete, or not required to receive finish F3.

(3) F3 - Finish F3 applies to formed surfaces, the appearance of which is considered by the Government to be of special importance, such as surfaces of structures prominently exposed to public view.

Surfaces to receive finish F3 include:

(a) Formed surfaces of bridges exposed to view, except that surfaces of all bridge parapets shall receive a sack-rubbed surface.

c. Unformed surfaces - The classes of finish for unformed concrete surfaces are designated by the symbols U1, U2 and U4. Interior surfaces shall be sloped for drainage where shown on the drawings or directed. Surfaces which will be exposed to the weather, and which would normally be level, shall be sloped for drainage. Unless the use of other slopes or level surfaces is indicated on the drawings or directed, narrow surfaces, such as tops of walls and curbs, shall be sloped approximately three-eighths of an inch per foot of width; and broader surfaces, such as walks, roadways, platforms, and decks, shall be sloped approximately one-fourth of an inch per foot. Unless otherwise specified or indicated on the drawings, these classes of finish shall apply as follows:

(1) U1 - Finish U1 (screeded finish) applies to unformed surfaces that will be covered by fill material or by concrete. Finish U1 is also used as the first stage of finishes U2 and U3. Finishing opreations shall consist of sufficient leveling and screeding to produce even uniform surfaces.

(2) U2 - Finish U2 (floated finish) applies to unformed surfaces not permanently concealed by fill material or concrete, or not required to receive finish U1 or U4.

Floating may be performed by use of hand- or power-driven equipment. Floating shall be started as soon as the screeded surface has stiffened sufficiently and shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture.

After the surfaces of roadway slabs of concrete bridges have been wood floated, the surfaces shall be given a broom finish. The finish shall be applied when the water sheen has practically disappeared. The broom shall be drawn transversely across the pavement with adjacent strokes slightly overlapping. The brooming shall be completed before the concrete is in such condition that the surface will be torn or unduly roughened by the operation. The finished surface shall have a uniform appearance and shall be free of corrugations exceeding 1/16 of an inch in depth.

(3) U4 - Finish U4 applies to canal linings. The finished surface shall be equivalent in evenness, smoothness, and freedom from rock pockets and surface voids to that obtainable by effective use of a long-handled steel trowel. Light surface pitting and light trowel marks will not be considered objectionable. Where the surface produced by a lining machine meets the specified requirements, no further finishing operations will be required.

5.3.18 PROTECTION

The Contractor shall protect all concrete against damage until final acceptance by the Government.

Fresh concrete shall be protected from precipitation. The Contractor shall provide such protection to prevent erosion of fresh concrete whenever such precipitation, either periodic or sustaining, is imminent or occurring.

When precipitation appears imminent, the Contractor shall immediately make ready at the placement site all materials which may be required for protection of fresh concrete. The Contractor shall delay placement of concrete until adequate provisions for protection against weather are made.

All fresh concrete surfaces shall be protected from contamination and from foot traffic until the concrete has hardened. Hardened concrete surfaces which receive U2 finish shall be protected against damage from foot traffic and other construction activity by covering with protective mats, plywood, or by other effective means.

Concrete curing membranes shall be kept intact, and other curing materials and processes shall be maintained as

necessary to assure continuous curing for the minimum specified curing time. Protection of curing membranes and other curing methods shall be as described in paragraph 5.3.19.

5.3.19 CURING

a. General - The Contractor shall furnish all materials and perform all work required for curing concrete.

Concrete shall be cured either by water curing in accordance with subparagraph d. or by the use of wax-base or water-emulsified, resin-base curing compound, except as otherwise specified below. The curing compound shall be white.

Surfaces of construction joints shall be cured by application of Type I, class A or Type II, class A curing compound in accordance with subparagraph e. and shall immediately, prior to placement of concrete on or against the joints, be prepared in accordance with paragraph 5.3.15.

Contraction joint surfaces shall be cured by application of Type I curing compound in accordance with subparagraph e. All extraneous concrete accretions and other foreign materials shall be removed from the surfaces of contraction joints to provide a smooth clean surface prior to application of Type I curing compound.

Surfaces of concrete in canal linings shall be cured by application of Type I, class A or Type II, class A curing compound in accordance with subparagraph e.

All concrete surfaces shall be treated as specified to prevent loss of moisture from the concrete until the required curing period has elapsed or until immediately prior to placement of other concrete or backfill against those surfaces. Only sufficient time to prepare construction joint surfaces and to bring them to a surface-dry condition shall be allowed between discontinuance of curing and placement of adjacent concrete.

As soon as unformed concrete surfaces have been finished as specified and have attained a dull appearance free from bleed water and moist sheen they shall be treated as specified herein.

Forms shall be removed within 24 hours after the concrete has hardened sufficiently to prevent structural collapse or other damage by careful form removal. Where required, repair of all minor surface imperfections shall be made immediately after form removal and prior to curing. Minor surface repair shall be completed within 2 hours after form removal and shall be immediately followed by the initiation

of curing by the applicable method specified herein. Concrete surfaces shall be kept continuously moist after form removal until initiation of curing.

b. Materials - Materials used for curing shall meet the following requirements:

(1) Water - Water used for curing shall meet the requirements of paragraph 5.3.4 for water used in mixing concrete.

(2) Curing compound - Type I curing compounds shall conform to the requirements of Bureau of Reclamation "Specifications for Concrete Curing Compound" dated October 1, 1980.

c. Sampling, testing, and certification - The Government will require approved manufacturer's certification of all curing compound prior to use. However, acceptance of the material under clause No. 10 of the General Provisions, "Inspection and Acceptance", will not be made until the material has been satisfactorily applied at the jobsite.

Manuafacturer's certification shall be furnished to the Contracting Officer's representative at the jobsite. The manufacturer shall certify that the material is within 1 percent (by weight of each individual constituent) of the same composition as material which previously has been found to comply with the specifications when completely tested and shall specify identification data including Bureau of Reclamation specifications number, batch number, materials identification, and quantity.

The Contractor shall be responsible for the accuracy of all certifications submitted and data contained therein whether submitted by him, a manufacturer, or a subcontractor. The costs and delays that result from rejection of materials or inadequate certifications shall be the responsibility of the Contractor.

d. Water curing - Concrete cured with water shall be kept wet for at least 14 days from the time the concrete has attained sufficient set to prevent detrimental effects to the concrete surfaces. The concrete surfaces to be cured shall be kept wet by covering them with water-saturated material; by using a system of perforated pipes, mechanical sprinklers, or porous hose; or by other methods which will keep all surfaces continuously (not periodically) wet.

Water curing of concrete may be reduced to 6 days during periods when the mean daily temperature in the vicinity of the worksite is less than 40±F. If during the prescribed period of water curing ambient temperatures are such that

concrete surfaces may freeze, water curing shall be temporarily discontinued.

e. Curing with Type I or II compound - Curing by the method shall be by application to designated concrete surfaces to provide a water-retaining film. The curing compound shall be reapplied as necessary to maintain a continuous water-retaining film on the surfaces. The curing compound shall be mixed thoroughly and spray applied to the concrete surfaces in one coat to provide a continuous uniform film over the concrete. The coverage shall not exceed 150 square feet per gallon. On rough surfaces, the coverage rate shall be decreased as necessary to obtain the required continuous film. Special care shall be taken to insure ample coverage with the compound at edges, corners, and rough surfaces; and to keep curing compound off waterstops and reinforcing bars. Equipment for applying curing compound and the method of application shall be in accordance with the provisions of chapter VI of the Eighth Edition of the Bureau of Reclamation Concrete Manual.

The Contractor shall remove excessive form oil and other contaminants from concrete surfaces by washing with a solution of trisodium phosphate followed by a thorough rinsing of the surfaces with clear water. The Contractor shall prevent exposed concrete surfaces including those below the work area from becoming stained during the washing operations. The trisodium phosphate wash will be required only when form oil on the concrete will impair the bond of the curing compound or when the surface is unsightly due to other contamination.

Where curing compound is to be applied, formed concrete surfaces shall be kept continuously moist by repeated light spraying with water until immediately prior to application of the curing compound. Curing compound shall be applied as soon as the surface film of moisture has disappeared but while the concrete still has a damp appearance.

After application of the curing compound has been completed and the coating is dry to touch, all remaining required concrete repairs shall be performed without delay in accordance with paragraph 5.3.20. Completed repairs shall be moistened and coated with curing compound in accordance with the foregoing requirements.

f. Protection of curing membranes - Wax-base compound and resin-base compound shall be maintained to provide a moistureproof membrane for curing concrete for the minimum period specified. Any curing compound that is damaged or that peels from concrete surfaces within 28 days after application, shall be repaired without delay by moistening the concrete and applying additional compound.

Where foot traffic and other construction activity is necessary on concrete being cured by wax-base compound or resin-base compound, the curing membrane shall be protected by covering with sand or earth not less than 1 inch thick with plywood or by other effective means. Any protective covering shall not be placed on curing compound until the compound is dry. The Contractor shall remove all such protective coverings before final acceptance of the work.

5.3.20 REPAIR OF CONCRETE

a. General - Concrete shall be repaired in accordance with this paragraph, paragraph 5.3.12 (Tolerances for Concrete Construction), and Bureau of Reclamation "Standard Specifications for Repair of Concrete", dated January 4, 1982.

Minor formed surface repairs, such as sack rubbing or surface grinding shall be completed within 2 hours after form removal. Dry-pack, concrete replacement less than 10 inches thick, and portland cement mortar repairs shall be completed within 7 days of the original concrete placement or shall utilize approved epoxy-resin bonding systems. Repairs involving epoxy-resin bonding systems shall be performed after 7 days and before 60 days from the original placement. Concrete replacement over 10 inches thick and all other repairs shall be completed within 60 days after the original placement.

Recesses resulting from removal of tie rod ends shall be filled with dry pack or other approved material unless the recesses are later to be covered by concrete; or are later to be covered by fill material and are above the maximum water table elevation.

All other repairs shall be made with concrete replacement, dry pack, or portland cement mortar; or with epoxy-bonded concrete, epoxy-bonded epoxy mortar, or injected epoxy resin; where and as applicable for the type of repair involved, as provided in the "Standard Specifications for Repair of Concrete".

When concrete surfaces are repaired with epoxy-bonded epoxy mortar, the surfaces of the finished epoxy mortar shall, in areas visible to the public, be lightly ground, or otherwise prepared to eliminate gloss and produce a surface color and texture that closely matches the surrounding concrete surfaces.

5.3.21 PAYMENT FOR CONCRETE IN STRUCTURES

The costs of furnishing all materials and performing all work associated with structures, as shown on the drawings and as specified in Section 5.3; including but not limited

to, furnishing all materials for the production of concrete, batching, transporting, preparing, reinforcing, placing, finishing, protecting, curing, and repairing of concrete; will not be paid for directly but shall be included in the lump sum prices bid under Items No. 6 through 9 in the schedule for respective structures of which concrete in structures is an integral part.

5.3.22 PAYMENT FOR CONCRETE IN CANAL LINING

No direct payment will be made for concrete in canal lining. The costs of furnishing all materials and performing all work associated with unreinforced concrete canal lining and reinforced concrete canal lining at the structure transitions as shown on the drawings and as specified in Section 5.3; including but not limited to, furnishing all materials for the production of concrete, batching, transporting, trimming, preparing foundation, reinforcing, if required, placing, finishing, protecting, providing contraction joints, curing, sealing, and repairing of lining, shall be included in the per lineal foot price bid in the schedule under Item No. 10.

SECTION 5.4 DELETED

SECTION 5.5 GROUTING MORTAR FOR EQUIPMENT AND METALWORK

5.5.1 GROUTING MORTAR FOR EQUIPMENT AND METALWORK

a. General - Nonsettling grouting mortar shall be furnished and placed as required and shall be in accordance with this paragraph.

b. Nonsettling grouting mortar - Nonsettling grouting mortar shall be composed of cement, water, sand, and aluminum powder. Cement shall be type II portland cement in accordance with ANSI/ASTM C 150, and shall meet the false-set limitation specified therein. Water and sand shall be in accordance with paragraphs 5.3.4 and 5.3.5, respectively, except that sand passing a No. 16 screen shall be used when clearances are such that the specified grading for sand is not suitable. Aluminum powder for use in the mortar shall be ground; shall contain no polishing agents, such as stearates, palmitates, and fatty acids; and shall effectively produce the desired expansion.

It is contemplated that the mix portions for the nonsettling grouting mortar will be 1 part cement to 1 1/2 parts sand, by weight, for a fluid mortar; and 1 part cement to 2 parts sand, by weight, for a plastic mortar; each containing a small amount of preblended expansive material. The water-cement ratio of the mortar shall not exceed 0.50, by weight, and the slump of the mortar shall be the lowest practicable for the space to be filled. The quantity of

preblended expansive material to be used in the mortar will be governed by the quantity and characteristics of the cement used and will vary as the placing temperature varies, from about 5.5 ounces of preblended material per bag of cement for 70° F placing temperature to about 8.5 ounces at 40° F placing temperature. The preblended expansive material shall be a uniform blend of 1 part aluminum powder to 50 parts cement, by weight. The actual batch of expansive mortar will contain approximately 50 to 100 parts aluminum powder per million parts of cement.

c. Preparation of surfaces and placing mortar - Before placing mortars, the surface of base concrete to which the mortar will be bonded shall be roughened and shall be cleaned of all laitance, loose or defective concrete, curing compound and other coatings, and other foreign material by effective means, followed by thorough washing with water. If any delay occurs between the washing of the concrete and placing of the mortar, the surfaces of the concrete shall be lubricated by washing with water immediately before placing of the mortar. Forms shall be used where required to confine the nonsettling grouting mortar. The mortar shall be placed completely filling spaces adjacent to equipment and metalwork as shown on the drawings.

d. Curing - The exposed surfaces of mortar shall be cured for 72 hours by keeping them covered with moist burlap, damp sand, or by other effective means.

Loads shall not be applied to the mortar sooner than 72 hours after placement and shall be applied only after the mortar has attained a compressive strength of at least 3,000 pounds per square inch. Care shall be taken when applying loads on the hardened mortar and the Contractor shall be responsible for any damage thereto resulting from impact loads when positioning equipment or metalwork.

e. Cost - The cost of all work in connection with placing nonsettling grouting mortar and the cost of the cement, aluminum powder, water, and sand for mortar shall be included in the prices bid in the schedule for the items or work for which the mortar is required.

DIVISION 6
METALWORK

SECTION 6.1 METALWORK

6.1.1 FABRICATED AND MISCELLANEOUS METALWORK

a. General - The Contractor will be required to fabricate, furnish and install all metalwork indicated in the drawings, required by any standard construction practice, or required by these specifications. Metalwork to be provided shall be in accordance with this section and shall include, but not be limited to, the following:

(1) Safety racks

(2) Trash racks

(3) Safety ladders

(4) All steel pipe and pipe sleeves not specified elsewhere

(5) Expansion anchors, bolts, nuts, screws, capscrews, washers, and accessory material required for installation of the metalwork.

Painting of all metalwork shall conform to the applicable sections of Division 9--Painting, Lining and Coating.

b. Materials -

(1) Structural steel - ANSI/ASTM A 36.

(2) Expansion anchors - Federal Specification FF-S-325, group II, type 4, class 1 or 2. Where the length of the bolt is not indicated on the drawings, the bolt length shall be the minimum length recommended for that bolt diameter in the Federal Specification. Expansion anchors, bolts and fasteners that will be in the water shall be stainless steel. All exposed metal surfaces should be galvanized or painted with VR-3 or VR-6.

(3) Arc-welding electrodes - All arc-welding electrodes shall be in accordance with the latest edition of AWS specifications for steel arc-welding electrodes, and shall be suitable for the position and other conditions of intended use.

(4) Steel pipe - ANSI/ASTM A 53 of A 120. Except where extra-strong pipe is called for on the drawings, pipe shall be standard weight pipe. Except where galvanized pipe is called for on the drawings, pipe shall be black pipe. Hydrostatic tests will not be required.

(5) Bolts - ANSI/ASTM A 307. The length of bolt threads shall be in accordance with ABSI B 18.2.1. Threads shall be class 2 free fit. American National coarse-thread series.

(6) Nuts - ANSI/ASTM A 563.

(7) Washers shall be steel or wrought-iron washers.

(8) Stud anchors - Stud anchors shall be of the sizes and shapes shown on the drawings and shall be suitable for end welding to steel with automatically timed stud-welding equipment.

(9) Metal safety steps - Metal safety steps for ladders shall be equal to safety step bar No. 627, as manufactured by Bustin Industrial Products Inc., P. O. Box 388, East Stroudsburg, PA 18301.

c. Fabrication - All work shall be equal to the best modern practice in the manufacture and fabrication of materials of the type covered by these specifications, notwithstanding any omissions from these specifications or drawings. Fabrication of metalwork shall be in accordance with the applicable provisions of the latest AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" including all supplementary provisions and with the details shown on the drawing. All welding and work related thereto shall be performed in accordance with the latest edition of AWS "Structural Welding Codes." Before being laid off or worked, material shall be straight and free from sharp kinks and bends.

Shearing and cutting by torch or electric arc shall be performed carefully and all portions of the work which will be exposed to view after completion shall be finished neatly. Stud anchors shall be welded in place with automatically timed stud-welding equipment. After fabrication, all material shall be straight and true and free from kinks, twists, and warps. If straightening is necessary, it shall be done by methods that will not injure the metal. All ladders and handrailings shall be fabricated with standard butt-welding fittings where possible and all joints shall be equal in appearance to joints made with shaped nipples. All welds on ladders and handrailings shall be ground smooth.

All guardrails shall be galvanized after fabrication. Galvanize other items of metalwork as indicated on the drawings.

Hot-dip galvanizing, where required after fabrication, shall be in accordance with the applicable provisions of ANSI/ASTM A 123, A 385, and A 386.

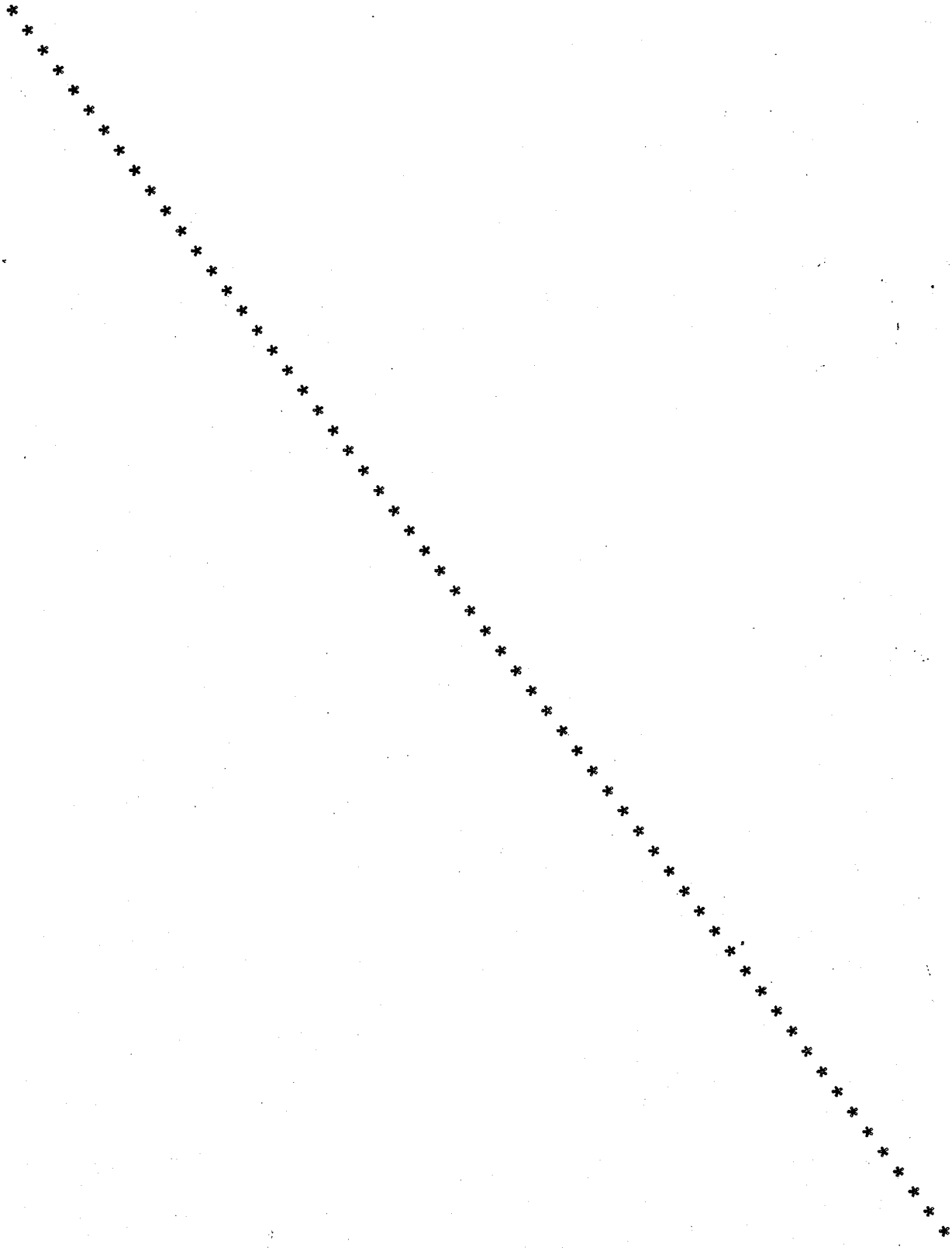
d. Installation - The surfaces of metalwork to be embedded in concrete shall be thoroughly cleaned of all dirt, grease, loose scale, grout, mortar, loose rust, weld slag, and other foreign substances immediately before the concrete is placed.

All embedded metalwork shall be set accurately in position and shall be supported rigidly to prevent displacement during placing of the concrete. Suitable blockouts shall be constructed in the concrete where required for installation of the metalwork. After installation of the metalwork, blockouts shall be filled with concrete or grout as shown on the drawings. The Contractor shall drill, or drill and tap as required, all holes in metalwork required for installation of the metalwork.

Anchor bolts shall be set and held in position before concrete is placed. Where it is impracticable to embed anchor bolts or anchors for the installation of ladders, or other comparatively light metalwork before the concrete is placed and when it is necessary to anchor parts where inserts or anchor bolts have been provided, holes shall be drilled in the concrete and expansion anchors shall be installed as directed. All holes for the expansion anchors shall be straight and true to the diameter recommended by the manufacturer of the expansion anchors. If expansion anchors do not fit securely, the Contractor will be required to use diamond bits, or equal, to achieve true holes. Holes shall be core drilled where called for on the drawings. If drilling water is used, surfaces of concrete to remain exposed shall be cleaned immediately so as to prevent discoloration of the concrete by the drilling water and cuttings.

e. Painting - Surfaces of miscellaneous metalwork exposed after installation except cast iron, shall be painted in accordance with paragraph 9.1.1. Galvanized items of metalwork do not require painting unless otherwise noted in the painting tabulation.

f. Payment - No direct payment will be made for work and materials described in Division 6--Metalwork. The costs therefor shall be included in the prices bid in the schedule for the work for which the metalwork is required.



DIVISION 7
SPECIAL CONSTRUCTION

SECTION 7.1 SPECIAL STRUCTURE REQUIREMENTS

7.1.1 MISCELLANEOUS DRAINAGE CULVERTS

a. General - The Contractor shall construct corrugated metal pipe-arch culverts at the locations shown on the drawings. Construction of the drainage culverts shall be as shown on the drawings and as specified herein.

b. Materials - Corrugated Metal Pipe-Arch Culverts and connections shall be in accordance with Paragraph 4.6.1.

Concrete for saddles shall be in accordance with Division 5 - Concrete, as it pertains to structural concrete.

c. Pipes shall be constructed, laid, and backfilled in accordance with the applicable portions of Division 3 - Earthwork, Division 4 - Pipe, and Division 5 - Concrete.

d. Payment - No direct payment will be made for the work described in Paragraph 7.1.1. All costs thereof shall be included in other items for which direct payment is made.

7.1.2 TEMPORARY BULKHEAD

a. General - The Contractor shall construct a temporary bulkhead in the outlet transition of the Centennial Wash siphon.

b. Construction - The temporary bulkhead shall be constructed of concrete block and masonry, and shall be plastered on the outside face to make the bulkhead as watertight as is practical.

c. Payment - No direct payment will be made for furnishing all materials and performing all work as described in Paragraph 7.1.2, and all cost thereof shall be included in the lump sum price bid in the schedule for the structure in which the bulkhead is required.

SECTION 7.2 EROSION CONTROL AND MISCELLANEOUS CONSTRUCTION

7.2.1 BANK PROTECTION

a. General - The Contractor shall be required to furnish and place bank protection to the prescribed outlines and thicknesses as shown on the drawings for the protection of channels, dikes, and structures.

b. Material - The material shall be hard, dense, and durable. Either quarried rock or boulders may be used for bank protection. The material shall be reasonably well graded from a minimum size of 2-inch nominal to a maximum size of 6-inch nominal.

c. Placing - The rock in bank protection need not be hand placed, but shall be dumped and smoothed by moving rocks into position in such a manner as to insure that the material when in place is stable and without tendency to slide, and so that there will be no unfilled spaces within the bank protection. The inclusion of earth, sand, or rock dust in excess of 5 percent, by volume, in bank protection will not be permitted.

d. Payment - No direct payment will be made for bank protection. The costs of furnishing all materials and performing all work as specified in Paragraph 7.2.1, shall be included in the prices bid in the schedule for the work for which bank protection is required

7.2.2 GROUTED ROCK RIPRAP

a. General - The Contractor shall construct grouted rock riprap at the locations, and to the dimensions, shown on the drawings.

b. Materials -

(1) Rock - The rock shall be hard, dense, and durable. Either quarried rock or boulders may be used for grouted riprap. The rock shall be graded as follows:

Particle Size (inch)	Percent Passing (by dry wt.)
15	100
12	70-100
9	75-80
6	50-75
4	0-50

Any royalties or other charges required to be paid for materials taken from deposits not owned by the Government and controlled by the Bureau of Reclamation shall be paid by the Contractor. The approval of deposits by the Contracting Officer shall not be construed as constituting approval of all or any specific materials taken from the deposits and the Contractor will be held responsible for the suitability of all materials used in the work.

(2) Grout - Cement, water, and sand for grout shall conform to the applicable provisions of Paragraphs 5.3.2, 5.3.4, and 5.3.5.

c. Subgrade Preparation - Preparation of subgrade underlying grouted rock riprap shall be in accordance with Paragraph 3.2.4 - Excavation for Structures.

d. Construction - All rock shall be bedded in a continuous layer of sand and gravel, or sand and crushed rock, 6 inches thick, reasonably well graded to a maximum of 1-1/2 inches in size.

The rock shall be placed on the surfaces and to the depths specified in such a manner as to avoid displacement of the underlying materials. The rock may be equipment or hand placed as necessary to insure that the material when in place is stable and without tendency to slide, and so that there will be no unreasonably large unfilled spaces within the riprap.

Grout for grouting the riprap shall be mixed in the proportion of one part cement to three parts, by weight, of sand and just sufficient water to obtain the proper consistency which will penetrate and fill the voids of the riprap.

Batching, mixing, and placing of the grout shall be in accordance with this paragraph and with applicable paragraphs of Division 5 - Concrete.

The grout mix shall not be placed until the rock riprap has been inspected and approved.

Rock to be grouted shall be kept wet for at least 2 hours prior to, and wetted immediately prior to, grouting.

The rock shall be kept moist just ahead of the actual placing, but the grout shall not be placed in standing or flowing water. Grout placed on inverts or other nearly level areas may be placed in one course. On slopes, the grout shall be placed in two (2) courses in successive lateral strips approximately ten (10) feet in width starting at the toe of the slope and progressing to the top. The grout shall be delivered to the place of final deposit by approved means and discharged directly on the surface of the rock, using a splash plate of metal or wood to prevent displacement of the rock directly under the discharge. The flow of grout shall be directed with brooms, spades or baffles to prevent it from flowing excessively along the same path and to assure that all intermittent spaces are filled. Sufficient barring shall be done to loosen tight pockets of rock and otherwise aid the penetration of grout so that all voids shall be filled and the grout fully penetrates the rock blanket. All brooming on the slopes shall be uphill and after the grout has stiffened, the entire surface shall be rebroomed to eliminate runs and to fill voids caused by sloughing.

After completion of any strip or panel, no workman or other load shall be permitted on the grouted surface for a period of twenty-four (24) hours. The grouted surface shall be cured in accordance with Paragraph 5.3.19 of these Specifications.

e. Measurement and Payment - Measurement for payment for grouted rock riprap shall be the actual square yards of grouted riprap installed, measured to the neat lines shown on the drawings or as directed by the Construction Engineer.

Payment will be made at the per square yard price bid in the Schedule under Item No. 13. This price shall include all equipment, material labor, tools and incidentals necessary to perform the work specified in Paragraph 7.2.2.

7.2.3 GRAVEL SURFACING

a. General - The Contractor shall furnish and place gravel surfacing on the 16' operation and maintenance road or as directed. The surfacing material shall be placed to the width and thickness shown on the drawings or as directed.

b. Materials - The gravel surfacing materials shall conform to the requirements for Type I, Gradation C, surface-coarse materials, ASTM Designation: D1241, except that a minimum of 8 percent shall pass the No. 200 sieve in lieu of the minimum percentage shown in Table 1 for Gradation C, and the fraction passing the No. 40 sieve shall have a maximum liquid limit of 35 and plasticity index range from 4 to 9 in lieu of the limits specified for fine aggregate.

c. Placing - Before the gravel surfacing material is placed, the subgrade shall be free from depressions and soft spots, and shall conform strictly to the grades shown on the drawings. The gravel surfacing shall not be placed until the subgrade has been approved by the Construction Engineer.

The gravel surfacing material shall be a minimum of three (3) inches in thickness when compacted.

The gravel surfacing material shall be placed, moistened, and compacted in accordance with the applicable provision of Section 3.2, except that for gravel surfacing materials with more than 50 percent of the materials passing the No. 4 screen, the density shall be not less than 90 percent of Proctor Compaction Test in lieu of 95 percent; that for gravel surfacing materials with 50 percent or more of the materials retained on the No. 4 screen, the density shall be not less than 85 percent as determined by the Proctor Compaction Test in lieu of 95 percent; and that prior to and during compaction operations the material shall have a moisture content not less than 3 percent dry of optimum

moisture content. The surface of the gravel surfacing shall be kept free from corrugations and waves at all times during compaction and until all of the work under these specifications has been completed and accepted.

d. Measurement and payment - Measurement, for payment, of gravel surfacing will be made in place to the outlines of the areas covered and to the specified thickness. Payment for gravel surfacing will be made at the unit price per cubic yard bid therefore in the schedule, which unit price shall include the cost of furnishing or procuring the gravel with binder, preparing the subgrade, and of hauling, moistening, spreading, and compacting the material.

7.2.4 FLOODWAY CROSSINGS

a. General - The Contractor shall be required to construct floodway crossings as described in this paragraph and as shown on the Drawings.

b. Concrete Curtain Walls - All materials and construction of the concrete curtain walls shown on the Drawings shall be in accordance with the applicable sections of Division 5 - Concrete.

c. Bank Protection - Bank protection to be installed for floodway crossings as shown on the Drawings shall be in accordance with Paragraph 7.2.1 - Bank Protection.

d. Surfacing - Surfacing for the floodway crossings shall be asphaltic concrete conforming to these specifications and where required to the Arizona Department of Transportation (ADOT) "Standard Specifications for Road and Bridge Construction," 1969 edition, and the supplemental specifications of July 1977 or any later revisions thereto.

The Contractor shall furnish a certified laboratory analysis with each shipment of liquid asphalt to the Construction Engineer prior to incorporating the material into the work. The certification shall include: material identification, quantity represented, and certified test results performed by the manufacturer or other laboratory covering all of the test requirements of the specifications. The accuracy of all laboratory analyses shall be guaranteed by the Contractor.

Prior to incorporation of the material in the work, samples may be obtained by the Government at the jobsite for testing purposes. Although use of the asphaltic materials will be permitted upon presentation of the properly certified analysis, such usage shall be at the risk of subsequent rejection should the Government's test results indicate failure of the materials to conform with the specifications requirements. The costs of any delay or damage due to

failure of the asphaltic materials to comply with the specifications requirements shall be borne by the Contractor.

The Government reserves the right to test any or all materials acceptable on certification when, in the opinion of the Government, such tests are necessary.

All aggregate materials for the roadway surfacing shall be furnished by the Contractor. The Contractor will be held responsible for the specified quality of all such materials used in the work. He shall make all necessary arrangements with the suppliers and shall pay all costs connected with procuring aggregate materials.

The source of supply of each of the materials furnished by the Contractor shall be subject to approval of the Contracting Officer before the delivery is started. Only approved materials conforming to the requirements of the ADOT standards specifications as set forth in these specifications paragraphs shall be used in the work. All materials proposed for use may be inspected or tested at any time during their preparation and use. If, after trial, it is found that sources of supply which have been approved do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the Contractor shall furnish approved material from other approved sources. No material which, after approval, has in any way become unfit for use shall be used in the work.

Before aggregate base course material is placed, the subgrade shall be made to conform to prescribed grades and cross sections by means of blade graders or motor patrols and shall be compacted so that these materials when placed, will not mix with the subgrade material. Where directed, water shall be added to the subgrade and the subgrade shall be rolled.

The Contractor shall furnish and place aggregate base course material on the crossings as shown on the Drawings.

Mineral aggregate shall be uniform in quality and grading. The aggregate shall be free from adobe, vegetable matter, loam, and other deleterious substances and shall be of such quality that it will compact thoroughly when watered and rolled to form a firm well-bonded base.

The aggregate base course, AB-5, shall be crushed as necessary and in conformance with gradation tables 702-1 and 702-2 (ADOT supplemental specifications) and to the other requirements set forth in section 702 of the ADOT standard specifications.

The aggregate base course, when thoroughly compacted, shall conform to the grades and dimensions shown on the Drawings or otherwise established. Work on each course shall be handled in a similar manner. Depositing and spreading the material shall commence at the point farthest from the point of loading and shall progress continuously without breaks except as other directed. The material shall be spread from the hauling vehicle by hand, from spreading boxes, or from self-spreading vehicles. Dumping in piles on the subgrade or on a preceding course will not be permitted. The material for each course shall be deposited and spread in a layer of uniform thickness and of such depth, that after being compacted, the course will be of the required thickness. After the material for any course has been spread, it shall be mixed thoroughly, by a heavy-blade grader having a wheel base not less than 15 feet long, until the material shows a uniform mixture of all sizes of particles. Wetting may be necessary to obtain proper mixing.

Rolling of the material shall commence immediately after it has been mixed as described above. Rollers shall weigh from 7 to 12 tons and shall be of the steel, smooth-wheel type. Rolling shall commence at the outer edges of a course and shall progress toward the center. Under no circumstances shall the center of a course be rolled first. Sufficient water to obtain compaction shall be applied during the rolling operations. Each course shall be rolled until it is compacted thoroughly and is true to grade and cross section.

The Government may use either AASHTO T 180, method D, or Bureau of Reclamation Relative Density of Cohesionless Soils Test procedures for the compaction control of base materials. The aggregate base course shall be leveled and compacted to not less than 95 percent of the maximum density determined in accordance with AASHTO T 180 or to an equivalent Bureau of Reclamation relative density as determined by the Contracting Officer.

The Contractor shall furnish and apply a liquid asphalt prime coat to the compacted base course in advance of placing asphaltic concrete surfacing.

Liquid asphalt, grade MC-70 shall be in accordance with Federal Specification SS-A-671c or section 705 of the ADOT standard specifications.

Liquid asphalt shall be applied to the full width of the area to be surfaced at a temperature of 105 to 175° F. and at the rate of 0.45 gallon per square yard or as determined by the Construction Engineer. The prime coat shall be allowed to dry prior to placing of asphaltic concrete surfacing. The prime coat shall not be applied during rainy

weather or when the atmospheric temperature in the shade is less than 70° F.

Hot plant mix asphaltic concrete may be obtained from commercial sources approved by the Contracting Officer.

Unless otherwise specified in these paragraphs, or otherwise directed by the Construction Engineer, the asphaltic concrete construction shall conform to the applicable provisions of Section 406 of the ADOT standard specifications.

The Contractor shall submit the gradation formula he proposes to use for the asphaltic concrete to the Construction Engineer for approval a minimum of 14 days prior to placing of any material.

Paving asphalt, grade AR-4000, conforming to Section 705 of the ADOT standard specifications shall be used in the mix unless otherwise designated by the Construction Engineer.

The completed asphaltic pavement shall be acceptable to the Construction Engineer in both composition and construction quality.

e. Payment for Floodway Crossings - The costs of furnishing all materials and performing all work associated with floodway crossings as shown on the Drawings and as specified in this paragraph; including, but not limited to, concrete, reinforcing steel, bank protection, subgrade preparation, base course, prime coat, asphaltic concrete, and all materials, labor, equipment, tools and incidentals necessary, shall not be paid for directly but shall be included in the Lump Sum Prices Bid under Item No. 14 in the Schedule for "Construct Floodway Crossings".

DIVISION 8
MECHANICAL

SECTION 8.1 MECHANICAL, GENERAL

8.1.1 DRAWINGS, DATA, AND TEST REPORTS, TO BE FURNISHED BY THE CONTRACTOR

a. General - All drawings submitted by the Contractor shall have the Contractor's or supplier's title and drawing number on each drawing. Drawings, data, and test reports shall show the Bureau of Reclamation specifications number and the schedule item number. All dimensions shall be in feet and inches and all wording, signs, symbols, etc., shall be in English.

b. Approval drawings and data - As soon as practicable after date of receipt of notice to proceed and before proceeding with fabrication or procurement of material, the Contractor shall submit, to the Government for approval, four copies of checked drawings and data listed below under the heading "Approval of the following is required." Any fabrication or procurement performed, or shipment made, prior to approval of the drawings and data, shall be at the Contractor's risk. The Government shall have the right to require the Contractor to make any changes in the equipment design which the Government determines necessary to make the equipment conform to the requirements of these specifications without additional cost to the Government. Approval by the Government of the Contractor's drawings or data shall not be held to relieve the Contractor of any part of the Contractor's responsibility to meet all of the requirements of these specifications or of the responsibility for the correctness of the Contractor's drawings.

Where approval data are required for commercial products or equipment, the Contractor shall submit complete identifying data giving the manufacturer's name, type, model, size, and characteristics of the equipment. When a catalog sheet is submitted, the particular item proposed shall be underlined or marked. The data shall be comprehensive and shall fully demonstrate that all equipment specified and required will be provided. If the equipment is accepted, one approved print will be returned to the Contractor.

Approval of the following is required:

Turnout gate and lift.--Drawings and data showing assembly, type, size, lift, capacity, and detail dimensions.

c. Final drawings, data, and test reports - As soon as practicable, but no later than the date the equipment is ready for shipment, the Contractor shall submit to the Government all final drawings, data, and test reports that are required.

Final drawings shall show all changes and revisions, with revision dates, made up to the time the equipment is completed and ready for shipment.

Service manuals are required. Eight bound copies shall be furnished and each shall contain complete parts identification lists; and detailed instructions for the installation, operation, lubrication, and maintenance of the equipment.

d. Mailing address - All drawings, data, and test reports shall be forwarded to the Construction Engineer, Arizona Projects Office, Valley National Plaza, 201 N. Central Ave., Suite 2200, Phoenix, Arizona 85073.

e. Cost - The cost of all drawings and data required under this paragraph shall be included in other applicable items of work and no separate payment will be made for such drawings and data.

8.1.2 MANUFACTURE

a. Materials and workmanship - Materials and workmanship shall be in accordance with Section 6.1--Metalwork.

B. Tolerances - The following tolerances shall be held for dimensions between finished surfaces, unless otherwise specified or shown on the drawings:

From 0 to 6 inches plus or minus 0.010 inch
Over 6 to 24 inches plus or minus 1/64 inch
Over 24 to 60 inches plus or minus 1/32 inch
Over 60 inches plus or minus 1/16 inch

c. Inspection and test of materials - No material or equipment shall be shipped until all required tests, analyses, and shop inspections are completed, except when inspection at the shipping point is waived in writing or when certified test reports, warranties, or other evidence of compliance with these specifications is accepted by the Engineer.

Unless otherwise specified, tests of all metals shall be in accordance with Federal Test Method Standard No. 151a.

Permission to ship material or equipment or waiving of inspection shall not relieve the Contractor of his

responsibility for conforming to all of the requirements of these specifications.

d. Marking - All parts not permanently connected in shop assembly shall be legibly marked to show their relative position in the unit to facilitate final assembly. When more than one complete assembly is being furnished, an additional identification shall be used. All such marks shall be made with heavy steel stamps and with paint. Painted marks only will not be acceptable. Electrical etching may be used on light sections or on parts which could be damaged by using heavy steel stamps.

e. Preparation for shipment and handling - All materials and articles shall be prepared for shipment in such manner as to protect them from damage and the Contractor shall be responsible for and make good any and all damage due to improper preparation or loading for shipment. Heavy or bulky parts or equipment shall be provided with eye bolts, lugs, or other lifting devices to facilitate handling with a crane, and if necessary, shall be mounted on skids or crated. Where parts are boxed or crated and it is unsafe to attach slings to the box or crate, slings shall be attached to the parts and the slings shall project through the box or crate so that attachment can be readily made. Instructions for handling and lifting all parts, boxes, and crates shall be clearly painted on or attached to the part or crate. Any articles or materials that otherwise might be lost shall be boxed or bundled and plainly marked for identification.

8.1.3 SURFACE ROUGHNESS AND FINISH

Except where specifically noted otherwise, the surfaces of parts, where the roughness is specified by numbers in check-type marks on the surface, shall be machine finished and shall conform to the surface quality specified in ANSI 846.1.

8.1.4 STEEL SLIDE GATES

a. General - The Contractor shall furnish and install steel slide gates complete with frames, seats, slides, stems, stem guides, lifts, stop nuts, stem covers, position indicators, and anchor bolts, in accordance with the requirements of these specifications and drawings. The slide gates and lifts shall be manufactured to the standards of commercial equipment, and the Contractor shall assume responsibility for coordinated and adequate design conforming to the best engineering practice for the requirements of the work under these specifications.

b. Steel slide gates - The slide gates shall be constructed from fabricated rolled steel plates, bars, and shapes suitably reinforced to withstand applicable face

pressure head as indicated on the drawings. A pressure head shall be the vertical distance from the center of the gate to the water surface.

Steel slide gates for turnouts shall be as manufactured by Fresno Valve and Casting, Inc., Model 5-00 or Waterman Model R-5f-SJ or an approved equal.

Gates shall be a complete unit for embedment in concrete. Gates will be fabricated from steel shapes and plates to the lines and dimensions shown in the plans. Gate slide will be of galvanized steel and will seal with a neoprene gasket or "J" bulb seal at the gate opening. Gate will operate with a geared crank sufficient to operate the slide with a maximum of 25 lbs. of force.

Painting for gate will be per Division 9, with frame painted and slide with stem galvanized, except that Contractor may option to galvanize entire gate.

c. Installation - The gates shall be installed as shown on the drawings and in such manner as will prevent leakage about the seats. There shall be no leakage between gate frame and concrete. The seal shall be accomplished with "Silkaflex-1a" elastic sealant/adhesive as manufactured by Sika Corporation of Lyndhurst, New Jersey, or an approved equivalent. Application shall be in accordance with manufacturer's recommendations.

Anchor bolts and other metalwork to be embedded in concrete shall be supported firmly and accurately in position while the concrete is being placed. Each lift shall be installed complete and the stem and lift shall be lubricated in accordance with the manufacturer's instructions.

After the gates and lifts have been completely installed, each gate shall be tested by the Contractor by raising and lowering the gate through its full range of operation. Any required changes or adjustments shall be made until the operation of each gate and lift is approved by the Engineer.

d. Payment - No direct payment will be made for furnishing and installing steel slide gates and all costs thereof shall be included in the item or items of work for which the gates are required.

DIVISION 9 - PAINTING

SECTION 9.1 - PAINTING

9.1.1 PAINTING, GENERAL

a. General - The Contractor shall submit all purchase orders, certifications, and samples; furnish all materials; clean surfaces; and apply the approved paint and protective coatings in accordance with this paragraph and paragraphs 9.1.2 Painting Tabulation, and 9.1.3 Color Schedule for Painting.

(1) Protection of adjacent surfaces and equipment - Items or surfaces not required to be painted or coated but which are adjacent to surfaces to be cleaned and painted shall be protected against contamination and damage during the cleaning and painting operations. This includes surfaces and equipment which are subject to contact by airborne contaminants as well as those which are in physical contact with the areas being cleaned or painted. Examples include: mechanical and electrical equipment (open or enclosed), instruction and similar plates, and wet and newly painted surfaces. Newly painted items shall not be moved until the paint is dry through.

(2) Interior painting of machinery and equipment - Unless otherwise specified, the Contractor will not be required to disassemble machinery, equipment, or other metalwork for the purpose of painting the interiors.

(3) Damage caused by the Contractor - Any items or surfaces which are in the Contracting Officer's opinion damaged or contaminated by the Contractor's operations shall be returned to their original condition by and at the expense of the Contractor. Before topcoating any coated surfaces, the Contractor shall reclean any exposed surfaces and apply paint as necessary to restore damaged or defective surfaces to the specified condition. Manufacturer painted equipment shall be restored to the original appearance of the equipment by appropriate methods.

Temporary or permanent welding for the convenience of the Contractor shall not be done on areas where the welding will damage paint or other protective coatings unless the areas of coatings which would be damaged thereby are accessible for repairing and inspection.

(4) Safety - The Contractor shall provide adequate ventilation, lighting, and the necessary safety equipment for the protection of the workmen during

painting and coating operations. See Bureau of Reclamation's publication "Construction Safety Standards."

b. Paint and coating materials approval -

(1) General - Prior to use or application of materials, the Contractor shall submit to the Government, for approval, copies of purchase orders, certifications, and/or samples of all coatings and related materials, as specified herein. However, acceptance of the material under the clause of the General Provision entitled "Inspection and Acceptance" will not be made until the material has been satisfactorily applied and the equipment, metalwork, and prepainted and precoated items are installed at the jobsite.

Each purchase order, certification, and sample shall be identified with the material specification, the batch or lot represented, the quantity ordered, and the Bureau of Reclamation solicitation/specifications numbers and schedule item numbers under which the material is to be used.

(2) Submittals - Except for the submittal requirements in paragraph 1.4.5 (Submission of Material Safety Data Sheets for Hazardous Materials), the Contractor shall furnish complete submittals of paint and coating materials to allow the Government not less than 45 days for evaluation prior to use of the associated paint and coating materials.

The Government will notify the Contractor whether the materials are approved or not approved.

(a) Purchase orders - The Contractor shall furnish copies of all purchase orders for paint and related materials, except thinners. Thinners may be used on the basis of label identification as to the required material or manufacturer's specified product.

(b) Certification - Manufacturer's certification shall be furnished for all paint and related materials, except thinners, for each type, batch, lot, and color of material. The certification shall state that the material is of the same composition as material which previously has been found to comply with the specifications when tested completely, or that the material complies with the specifications based on complete tests which the manufacturer has conducted on the particular batch or lot.

For materials specified in subparagraph c. below, as required to be listed on a QPL (Qualified Products List), the Contractor shall furnish the manufacturer's certification(s) that the coal-tar epoxy coating, epoxy coating for nonpotable water, and cement, epoxy corrosion-preventive compound being furnished is of the same composition as was qualified under the QPL.

The Contractor shall be responsible for the accuracy of all certifications or data contained therein whether submitted by it, a manufacturer, a supplier, a subcontractor, or others.

In accordance with the clause of the General Provisions entitled "Inspection and Acceptance," the Government reserves the right to require submittals of samples and to test any material furnished on certification when, in the opinion of the Government, such tests are necessary.

(c) Samples - In accordance with the following requirements, the Contractor shall furnish samples from the batches or lots to be used, except thinners.

Included with each sample shall be a certification that the sample is from the actual batch or lot to be furnished.

(aa) Liquid and mastic materials - A 1-quart sample shall be furnished of each type, batch, lot, and color of liquid and mastic used in quantities of 10 gallons or more. The constituents of two-component paints shall be furnished separately and shall include enough material to make a 1-quart sample of the finished product.

(bb) Coal-tar enamel and related material - Samples shall be furnished from each batch or lot of coal-tar enamel and related materials to be used. Samples shall consist of 25 pounds of coal-tar enamel with at least 12 linear feet each of asbestos felt, fibrous glass mat, and Kraft paper. In addition, each sample of coal-tar enamel shall be accompanied by a sample of the primer to be used. With each set of samples of coal-tar enamel and primer for enamel, the Contractor shall furnish the detailed information listed in sections 2.3.4 and 2.3.5 of AWWA standard C203.

(cc) Machine and/or manually applied polyethylene tape system(s) - Sample requirements for the machine and/or manually applied tape systems shall consist of any or all of the test samples required to perform the tests in AWWA standards C214 and C209. Sample requirements will be determined by the Government after purchase orders for the materials are received.

(d) Submittals and approval of small quantities of paint - To obtain approval of a proposed substitution of commercial paint for certain specified paint in quantities of 20 gallons or less, as permitted in subparagraph c. below, the Contractor shall identify the items to be painted and submit to the Government the manufacturer's certification showing the composition (by percentages) of the paint and stating that the paint is the manufacturer's best quality paint which is of substantially the same composition as the specified paint, and will meet the performance and color requirements of the specified paint.

When the substitution of commercial paint is for quantities of 10 to 20 gallons, the Contractor shall submit for examination a 1-pint sample of the proposed paint.

(3) Mailing addresses - Purchase orders; required certifications, except for the two copies of all MSDS required in paragraph 1.4.5 (Submission of Material Safety Data Sheets for Hazardous Materials); and samples shall be sent, shipping costs prepaid by the Contractor, to the Bureau of Reclamation, Attn D-1521, P O Box 25007, Denver CO 80225.

One copy of all correspondence shall be sent to the Construction Engineer, Bureau of Reclamation, Arizona Projects Office, Suite 2200, Valley Center, 201 N. Central Ave., Phoenix, AZ 85073, and a copy shall be sent to the Contracting Officer.

c. Materials - All pigmented paints and primers shall be purchased in containers not larger than 5 gallons as packaged by the manufacturer unless the Contractor is equipped at the painting site to handle and thoroughly mix paints which are delivered in larger containers. Containers shall be labeled with the material specification number and the batch number. Colors of finish paints shall be in accordance with paragraph 9.1.3 (Color Schedule for Painting). All colors and tints shall be prepared by the manufacturer. Tinting at the jobsite shall not be done.

The Contractor shall purchase the total quantity of each construction material that is expected to be used in a reasonable length of time (i.e., 1 year, or the minimum specified storage stability period of the material, whichever is shorter) to avoid repetitive purchases that would impose additional testing expense on the Government. The costs and delays from additional testing required as a result of either unnecessary small purchases or rejection of the materials submitted shall be the responsibility of the Contractor.

Except as specified above regarding colors of finish paints and certain small quantities of paint, materials shall be in accordance with the specifications listed below or may be in accordance with subsequent revision thereto: provided, that the samples or certifications are identified with the proper specifications revision.

Where the quantities of each type and color of paint materials listed in this subparagraph which are superscripted with an asterisk(*) will be 20 gallons or less, the Contractor may propose to substitute similar commercial paint having the same resin base and general composition as the paint specified herein, subject to the approval of the Government. Subparagraph b.(2)(d) above describes the requirements for obtaining approval of the commercial paint.

(1) Federal Specifications -

(a) Iron oxide primer - TT-P-636D.

(b) Red lead priming paint - TT-P-86G, type IV (red lead mixing pigment-phenolic varnish).

(c) Zinc dust - zinc oxide primer - TT-P-641G, type II (phthalic alkyd resin primer, for galvanized surfaces).

(d) Zinc-dust chlorinated rubber primer - TT-P-1046A.

(e) Silicone-alkyd enamel, gloss - TT-E-1593B.

(f) Silicone-alkyd enamel, semigloss - TT-E-490E.

(g) Rubber paint for concrete surfaces at canal safety ladders - TT-P-95C, type 1 (chlorinated rubber base), class 2 (semigloss), or equal, proprietary chlorinated rubber-base paint recommended for continuous immersion.

(2) Bureau of Reclamation specifications -

(a) Vinyl resin paint, VR-3 and thinner - Bureau of Reclamation "Specifications for VR-3 Vinyl Resin Paint."

(b) Vinyl resin paint, VR-6 and thinner - Bureau of Reclamation "Specifications for Vinyl Resin Paints, VR-6 System."

(c) VR-6 gray body coat paint - The gray body coat paint specified under Bureau of Reclamation "Specifications for Vinyl Resin Paints, VR-6 System."

(3) AWWA standards -

(a) Manually applied polyethylene tape system (including primer, tape, and mastic) for special sections, connections, and fittings - AWWA standard C209, type I or II, except as specified herein. The tape shall have a thickness of 35 mils, plus or minus 4 mils, including a 5-mil-minimum-thickness polyethylene backing. Adhesion of the tape to primed steel shall be at least 50-ounce-per-inch width. The mastic shall be coal-tar derivative and compatable with the tape. The primer, mastic, and tape shall be produced by the same manufacturer.

(b) Coal-tar enamel protective coatings and linings - Type B (chlorinated rubber) primer, type II coal-tar enamel, coal-tar saturated asbestos felt, fiber glass mat, coal-tar enamel tape, whitewash, and Kraft paper shall be in accordance with AWWA standard C203-78, except that the initial penetration of the enamel shall be 15 to 20. The coating for couplings shall be coal-tar enamel. The penetration tests on coal-tar enamel shall be made on a sample from which approximately 1/32 inch of the exposed surface has been removed by cutting or scraping. The primer and enamel shall be produced by the same manufacturer.

(4) Military Specifications -

(a) Coal-tar epoxy coating - DOD-P-23236A, Type I (general use), except type III (limied solvent where air-pollution regulations apply), class 2 (coal-tar epoxy), black. The coal-tar epoxy coating being furnished shall be listed on the current applicable QPL.

(b) Epoxy coating for nonpotable water - MIL-C-4556D, white. The epoxy coating being furnished shall be listed on the current applicable QPL.

(c) Corrosion-preventive compound - MIL-C-16173D, grade 1 (hard film), or grade 2 (soft film), as specified in the painting tabulation. The corrosion-preventive compound being furnished shall be listed on the current applicable QPL.

(5) Miscellaneous specifications -

(a) Thinners and solvents - All thinners and solvents shall be industrial grade. Selection of type shall be consistent with prevailing pollution regulations and paint manufacturer's recommendations unless otherwise specified.

(b) Knot sealer - Knot sealer shall be any good quality, commercial shellac-base knot sealer.

(c) Clear water repellent - Clear water repellent shall be concrete barrier, type B, flat finish, with 36 percent solids, as manufactured by National Chemical Corp., 950 Waterton Street West, Newton MA 02165 (or Carboline 2109 as manufactured by Carboline Co., 328 Hanley Industrial Court, St. Louis MO 63144); or equal. Thinner for the clear water repellent shall be as recommended by the manufacturer of the water repellent.

(d) Fusion epoxy - Scotchkote 203 and liquid-applied repair coating Scotchkote 306, as manufactured by 3M Co., 3M Center, St. Paul MN 55101; or equal.

(e) Paint and coating materials required to be used on work covered by these specifications but are not covered by this paragraph shall also be subject to certification, sampling, and testing in accordance with subparagraph b. above.

d. Preparation of surfaces -

(1) Metalwork and equipment - Surface preparation shall be in accordance with the methods herein and as indicated in the painting tabulation. Any coatings not required by and not shown in the painting tabulation shall be removed from the surfaces by suitable and effective means, unless otherwise directed. All surfaces not specifically covered herein shall be prepared by methods common to good practice for the

particular surface. If rust forms or the surfaces become otherwise contaminated in the interval between cleaning and painting, or between coats of paint, recleaning shall be performed by the Contractor.

Weld spatter, slag burrs, or other objectionable surface irregularities shall be removed or repaired before cleaning. Any contaminants to the paint coating, from cleaning operations or other sources, shall be removed before the surfaces are painted.

All oil and grease, if present, shall be removed from steel surfaces to be painted by the use of clean solvent and clean, lint-free wiping material. Cleaning solvent shall be miniral spirits or sylene except that xylene shall be used for surfaces which require coal-tar coatings. Cleaning cloths and solvents shall be discarded before they become contaminated to the extent that a greasy film would remain on the surface being cleaned.

(2) Specific surface preparation - Following initial surface preparation, specific surface preparation shall be by one of the following methods, as specified for each item in the painting tabulation.

Method A - Dirt, scum, and any other contamination shall be removed by solvent cleaning, water washing, or other effective means. Surfaces with gloss or semigloss paints shall also be sanded lightly.

Method B - Following the solvent cleaning, the surfaces shall be cleaned of all defective or damaged areas of existing paint, and of all loose rust, loose mill scale, and other foreign substances by scraping, chipping, wire brushing, gritblasting, commercial grade sandblasting, or other effective means. Commercial grade sandblasting shall be defined as conforming to National Association of Corrosion Engineers standard TM-01-70, NACE No. 3 or Steel Structures Painting Council Specification SSPC 6-63.

Method C - Following the solvent cleaning, the surfaces shall be blast cleaned to base metal, using dry, hard, sharp, sand or steel grit, to produce a near-white sandblasted surface free of all foreign substances. The blasting material shall pass a No. 16 United States Standard screen and at least 85 percent shall be retained on a No. 50 United States Standard screen. The surface shall be cleaned to equal or exceed National Association of Corrosion Engineers standard

TM-01-70, NACE No. 2, or Steel Structures Painting Council specification SSPC 10-63T.

Method D - Following the solvent cleaning, loose corrosion products or other foreign substances, if any, shall be removed by chipping, scraping, wire brushing, light etch blasting, or other equally effective means and the surface shall be cleaned again with solvent. After the second solvent cleaning, the surfaces shall be treated with metal conditioner which has been diluted in acid-resistant containers with three parts (by volume) of clear water to one part (by volume) of metal conditioner. The solution shall be applied by spray, dip, or brush, allowed to remain on the metal surface for 2 to 10 minutes, then vigorously rinsed off with water (preferably hot), and the surface allowed to dry thoroughly. (Note: Solution is strongly acidic and proper safety precautions shall be exercised in handling and use.)

Method E - Following the solvent cleaning, all high spots, raised welds, and weld spatter shall be removed by grinding. The surfaces shall be cleaned of all defective or damaged areas of existing paint, and of all loose rust, loose mill scale, and other foreign substances by scraping, chipping, wire brushing, grit blasting, commercial grade sandblasting, or other effective means. Low spots and surface indentations shall be built up with epoxy cement applied in accordance with the manufacturer's instructions. After the cement has set, the surface shall be sanded smooth with 150-grit sandpaper, followed by 280-grit sandpaper, and then 380-grit sandpaper. After removal of sanding residue, any remaining defects shall be refilled and resanded.

Method F - After fabrication of stainless steel or stainless-clad steel items, the stainless steel surfaces shall be precleaned, descaled, cleaned, and passivated as recommended in ANSI/ASTM A 380 to remove all grease, oil, paint, flux, weld spatter, slag, burrs, scale, corrosion products, foreign metals, and other surface contaminants. The cleaning and passivating methods selected shall be consistent with the surface finish specified, the size of the part, and the specific alloy material. The surfaces shall be protected as necessary to preserve the finish until placed into service. Immediately prior to placement in service, all surface protection (wrappings and seals) provided shall be removed and the surfaces

recleaned and repassivated to remove all contaminants. If painting or coating or stainless stell surfaces is specified herein, the cleaning and passivating shall immediately precede the coating application.

(3) Concrete surfaces - Any contaminants to the paint coating, from cleaning or other sources, shall be removed before the surfaces are painted. Any necessary preparation of surfaces not covered by the following subparagraphs shall be prepared by methods common to good practice for the particular surface being prepared. The surfaces shall be kept clean until the final coat is dry. Any coatings not required by and not shown in the painting tabulation shall be removed from the surfaces by suitable and effective means, unless otherwise directed. Specific surface preparation shall be in accordance with one of the following methods, as indicated in the painting tabulation.

Method T (concrete and concrete masonry) - All required repair of concrete shall be performed in accordance with paragraph 5.3.20 (Repair of Concrete). All protruding surface irregularities shall be removed, and joints in concrete masonry where mortar is loose or missing shall be repointed with a 1:1 (by weight) cement-sand grout. Sand used in the grout shall all pass a No. 50 screen. New concrete and concrete masonry shall be aged not less than 3 weeks before application of any paint system.

Surfaces to be painted shall be cleaned until they are free of dirt, excess mortar, loose particles, and any other foreign material. Hosing with clean water may be employed to remove dirt. Grease and oil stains shall be removed by solvent washing, followed by caustic or detergent cleaning and thorough rinsing with clear water.

Wax-base and water-emulsified, resin-base curing compounds shall be removed by sandblasting prior to painting with any material (except asphalt emulsion). Clear resin-base curing compound shall be cleaned of all contaminants but need not be removed prior to painting, except that all types of curing compounds, form oil, or other coatings shall be removed by sandblasting prior to application of cement-base coating.

Glaze, surface laitance, or efflorescence, if present, shall be removed and the surface etched by brush-sandblasting or by the application of a

10-percent water solution of hydrochloric or muriatic acid (1 part, by volume, concentrated acid to 9 parts, by volume, water) to the affected area. The acid-etching solution shall remain on the surface for at least 5 minutes or until the bubbling stops. The treated surface shall then be washed with fresh water and scrubbed briskly with a stiff bristle brush during the wash. Thereafter, the surface shall be rinsed thoroughly with clear water after scrubbing. In the event that one application of acid does not thoroughly prepare the surface, the process shall be repeated until the surface is properly etched. A properly etched surface will be slightly granular and free from any glaze.

Unless otherwise specified, the surfaces shall be allowed to dry thoroughly before application of the paint. The surfaces shall be damp (saturated surface dry) for the first coats of all waterborne (acrylic emulsion, cementitious, etc.) materials. Surfaces to receive oil-base paint, and which are less than 1 year old, shall be neutralized with a 3-percent phosphoric acid pretreatment and dried thoroughly before painting.

e. Application -

(1) General - Materials shall be thoroughly mixed at the time of application. Surfaces shall be clean and, unless otherwise specified, free from moisture at the time of application. Items of metalwork to be painted that are not thoroughly dry at the time of paint application shall be heated to a sufficient temperature (80°F) to drive off any moisture present before paint is applied. Heating, if used, shall be by a method such as the use of space heaters which does not bring products of combustion into contact with surfaces being coated.

Care shall be exercised during spray application to hold the nozzle sufficiently close to the surfaces being painted to produce a continuous wet coat, and to avoid excessive evaporation of the volatile constituents and loss of material into the air, or bridging over crevices and corners. Effective means shall be provided for removing free oil and moisture from the air-supply lines of all spraying equipment. Spray equipment shall be eqipped with mechanical agitators, pressure gages, and pressure regulators. Nozzle pressure consistent with acceptable finish results shall be employed when spray painting.

Each coat shall be applied in such a manner as to produce an even film of uniform thickness which will completely cover irregularities, fill crevices, and be tightly bonded to the substrate or previous coat. When registers and grills are being painted, care shall be taken not to clog openings or otherwise excessively coat the surfaces. Each coat shall be free from runs, pinholes, sags, laps, brush marks, voids, and other defects. Each coat shall be allowed to dry or to harden before the succeeding coat is applied.

The thickness on steel surfaces shall be measured by approved gages and shall be not less than the minimum specified thickness at any point on the coating. Acceptance will be based on specified coverages, or on the specified total dry-film thickness as measured by an Elcometer, Mikrotest, or other suitable dry-film thickness gage after the complete paint system has thoroughly dried.

If necessary to improve application properties, cold-applied paints may be heated by means of a hot-water bath to temperatures not exceeding 100°F. Paint shall not be applied when the temperature of the item to be painted or of the surrounding air is under 45°F, except that vinyl resin paints shall not be applied when metal or air temperatures are above 110 or below 40°F. Painting shall proceed only when the humidity and the temperatures of atmosphere and of surfaces to be painted are such that evaporation rather than condensation will result. Brush coats may be applied by the conventional brushing procedure, or the paint may be delivered to the surface in a fluid stream by means of spray equipment employing air pressure only on the material and the paint then spread immediately by brushing to a smooth uniform coating.

Thinning of paints to facilitate satisfactory application shall be kept to a minimum but in no event shall it exceed 1 pint per gallon of paint, except as otherwise specified; only thinner approved for the type of paint shall be used.

All Contractor-applied coatings exposed to public view shall present a uniform texture and color-matched appearance.

Methods of preparing and applying paints and coatings not included in these specifications shall be in accordance with the manufacturer's instructions and the general requirements of these specifications.

(2) Coating of embedded surfaces - Unless otherwise specified, dielectric (electrically insulating)

coatings on buried piping, part of which will be embedded in concrete through anchor blocks, walls, and related concrete structures shall extend through the embedded section. Similarly, for piping and other painted or coated exposed metalwork, part of which will be embedded, the embedded part shall be painted or coated approximately 6 inches into the concrete prior to embedment.

(3) Application of specific materials shall be as follows:

(a) Priming paints - Iron oxide priming paint shall be applied at a maximum coverage of 500-square-feet-per-gallon per coat and red lead priming paint, type IV, shall be applied at a maximum coverage of 450-square-feet-per-gallon per coat, but the dry-film thickness shall not be less than 1.0 mil for the first coat of either paint. Zinc dust-zinc oxide priming paint and zinc-dust chlorinated rubber primer shall be applied at a maximum coverage of 500-square-feet-per-gallon per coat. Following the first coat of priming paints, an additional "edge" coat shall be applied over all rivets, welds, bolts, seams, sharp corners, and edges before subsequent painting. The first coat shall be applied by brush or roller and subsequent coats shall be applied by either brush, roller, or spray, except that iron oxide priming paint may be applied by spraying when method B surface preparation is specified and the surface is cleaned by "commercial" grade blast cleaning. Drying time between coats of type IV red lead, or between type IV red lead and a phenolic aluminum topcoat, shall not exceed 48 hours over that required for the paint film to become dry through. A paint film shall be considered dry through when it cannot be distorted or removed by exerting moderate pressure with the thumb and turning the thumb through 90° in the plane of the paint film.

(b) Enamels - For ferrous surfaces, enamels shall be spray applied to produce a minimum dry-film thickness of 1.5 mils per coat, and the total minimum dry-film thickness of the coating system shall be 4.0 mils. For nonferrous surfaces, the enamels shall be spray applied at a maximum coverage of 500-square-feet-per-gallon per coat.

(c) Aluminum paints - Aluminum paints except aluminum paints for VR-3 and VR-6 vinyl resin seal coats shall be applied by spraying at a maximum coverage of 400-square-feet-per-gallon per coat for phenolic-resin aluminum paint. The paints

shall be prepared by mixing 2 pounds of aluminum paste per gallon of mixing varnish and only enough paint for each day's use shall be prepared at one time. The final coat of aluminum paint shall be "stripe'free" with a uniform appearance.

(d) Vinly resin paint VR-3 - Application of the VR-3 vinyl resin paint system shall be in accordance with table P-1 (VR-3 application).

Table P-1 - VR-3 Application

Coat*	Application method	Minimum drying time
1	Brush or roller.	12 hours.
2	Spray	12 hours.
Edge coats.**	**	**
3	Spray	12 hours if a fourth coat is to be applied or at least 10 days before placing in service if only three coats are used.
4	Spray	At least 10 days before placing in service.

* Colors as shown in the painting tabulation.

** After the second coat, two or more edge coats of VR-6 gray body-coat paint shall be spray applied to produce an additional 4-mil-minimum, dry-film thickness over all rivets, welds which are not ground flush, bolts, seams, sharp corners and edges, and as a fillet between adjacent metal parts in the absence of a weld. The edge coats shall be allowed to dry 4 hours minimum between coats and 12 hours minimum after the last coat.

As a guide, 225-square-feet-per-gallon per coat usually gives a dry-film thickness of about 1.7

mils, but is not required to do so by the materials specifications. Variables such as solids content, surface roughness, application technique, amount of overspray, etc., affect the final coverage rates.

Paint applied by brush or roller shall be applied generously and quickly spread smooth before significant evaporation of solvents occurs and before drag develops. Airless or conventional pressure-pot sprays equipment shall be used for spray application and the equipment shall be capable of operating at air atomization pressures up to 100 pounds per square inch. Application shall be such as to avoid excessive loss of volatiles before the paint spray strikes the surface. Each stroke of the spray gun shall lap over the previous stroke so that a continuous wet film is obtained on the surface. To prevent sagging and to ensure the minimum dry-film thickness, it may be necessary to make repeated passes with the spray gun. Where this is necessary, additional passes shall be by strokes at right angles to the previous pass. Accumulated overspray or dust shall be removed by brushing, light sanding, or vacuuming, as required, before application of additional paint.

Where color coats are scheduled, the minimum total dry-film thickness of the final two coats shall be 2.5 mils, and specific color matches will be required. In any instance where additional coats are necessary to obtain the required dry-film thickness, the color of the final coats shall be as scheduled.

Shop application of only a portion of this paint system will not be permitted. All vinyl paint material, including thinner, for any VR-3 coating shall be made by the same manufacturer. Thinning shall be as recommended by the manufacturer but tinting will not be permitted. The VR-3 and VR-6 paint shall be ready miuxed except aluminum paint. Aluminum paint shall be prepared, immediately prior to use, by mixing 1-1/2 pounds of the aluminum past3 specified for the VR-3 paint to each 1 gallon of clear vehicle solution. The final coat of aluminum paint shall be "stripe-free" with a uniform appearance.

To ensure safe use of these volatile materials, the Contractor shall comply with the manufacturer's recommended safety precautions in handling, storing, and applying this material.

(e) Vinyl resin paint VR-6 - Application of th VR-6 vinyl resin paint system shall be in accordance with table P-2 (VR-6 application).

Table P-2 - VR-6 application

Type of coating	Number of coats and colors	Application methods	Minimum drying time
Primer.	1 coat of white.	Brush or	4 hours.
Body.	3 or more body coats alternated red, gray, red, beginning with red.	Spray.	12 hours each coat.
Edge coats.*	*	*	*
Finish.	2 or more, color as scheduled.	Spray.	12 hours between each coat and at least 10 days after the last coat before placing in service.

*After the first body coat, two or more "edge" coats of VR-6 gray body-coat paint shall be spray applied to produce an additional 4-mil minimum dry-film thickness over all rivets, welds which are not ground flush, bolts, seams, sharp corners and edges, and as a fillet between adjacent metal parts in the absence of a weld. The edge coats shall be allowed to dry 4 hours minimum between coats and 12 hours minimum after the last coat.

As a guide, coverages of 250 square feet per gallon for the primer, 150-square-feet-per-gallon per coat for the body coats, and 200-square-feet-per -gallon per coat for the finish coats usually give the minimum dry-film thicknesses specified below, but are not required to do so by the materials specifications. Variables such as solids content, surface roughness, application

technique, amount of overspray, etc., affect the final coverage rates required. Paint applied by brush or roller shall be applied generously and quickly spread smooth before significant evaporation of solvents occurs and before drag develops. Airless or conventional pressure-pot spray equipment shall be used for spray application and the equipment shall be capable of operating at air atomization pressures up to 100 pounds per square inch. Application shall be such as to avoid excessive loss of volatiles before the paint spray strikes the surface. Each stroke of the spray gun shall lap over the porevious stroke so that a continuous wet film is obtained on the surface. To prevent sagging and to ensure the minimum dry-film thickness, it may be necessary to make repeated passes with the spray gun. Where this is necessary, additional passes shall be of strokes at right angles to the previous pass. Accumulated overspray shall be removed by brush or vacuum, and any overspray or dust adhering to the surface shall be removed by light sanding before application of additional paint.

The minimum acceptable dry-film thickness through the last body coat shall be 8.0 mils in areas not covered by edge coats and 12 mils in areas where edge coats are applied. The minimum acceptable dry-film thickness for the two final coats shall be 2.0 mils over all surfaces and specific color matches will be required. In any instance where additional coats are necessary to obtain the required thickness, the color of the final coats shall be as scheduled.

Shop application of only a portion of this paint system will not be permitted. All vinyl paint material, including thinner, for any VR-6 coating shall be made by the same manufacturer. Thinning shall be as recommended by the manufacturer, but tinting will not be permitted. The VR-6 paint shall be ready mixed except aluminum paint. Paint for aluminum finish coats shall be prepared, immediately prior to use, by mixing 1-1/2 pounds of the aluminum paste specified for VR-6 vinyl resin paint to each 1 gallon of clear seal-coat solution. The final coat of aluminum paint shall be "stripe-free" with a uniform appearance.

To ensure safe use of these volatile materials, the Contractor shall comply with the manufacturer'r recommended safety precautions in handling, storing, and applying this material.

(f) Epoxy coating for nonpotable water - The epoxy coating shall be mixed and applied according to the manufacturer's instructions, except as otherwise specified. The first (primer) coat shall be applied according to the manufacturer's instructions, then one or more finish coats shall be applied as required to produce the specified total minimum dry-film thickness for the complete coating. The first coat shall be applied by brush or roller and succeeding coats by spray. Prior to applying the first coat, all welds and rough or irregular surfaces shall be given a vigorously brushed coat to ensure complete coverage free of pinholes; the first general coat may then be applied over the wet brush coat. All coats shall be applied in rigid adherence to the manufacturer's time-temperature limits on time between coats. Air and substrate temperatures shall be above 50°F during application and the curing period. The minimum final curing times shall be 10 days between 50 and 60°F, or 5 days above 60°F. The complete coating shall be applied in the field.

Damaged areas or other areas requiring touchup painting shall be sanded to roughen the surface, and thereafter the manufacturer's special instructions regarding special solvent wiping or other preparation for touchup repair shall apply; areas in which the specified drying time between coats is exceeded shall be treated and prepared by the same method.

The manufacturer's recommended safety procedures shall be followed when applying epoxy paints. Skin contact must be avoided. Protective clothing and rubber gloves shall be worn, and all exposed skin areas protected with a barrier cream such as Ply No. 9 as manufactured by Milburn Co., 3000 Woodbridge, Detroit MI 48207, or Kerodex No. 71 manufactured by Ayerst Laboratories, Inc., 20 East 40th Street, New York NY 10016; or equal. During any application of epoxy coatings, the applier shall wear approved air mask with external air supply.

(g) Coal-tar epoxy coating - Coal-tar epoxy coating shall be mixed and applied according to the manufacturer's instructions, except as otherwise specified. The first coat shall be applied by brush or roller and succeeding coats by brush, spray, or roller. Prior to applying the first coat, all welds and rough or irregular surfaces shall be given a vigorously brushed coat

to ensure complete coverage free of pinholes; the first general coat may then be applied over the wet brush coat. The second and any following coats shall be applied after the preceding coat has become tack free, but time between coats shall not exceed the firm-to-touch time by more than 50 percent. Air and metal temperatures shall be above 50°F during application and the curing period. The minimum final curing times shall be 5 days between 50 and 60°F, or 3 days above 60°F. The complete coating shall be applied either in the shop or in the field.

Damaged areas or other areas requiring touchup coating shall be sanded to roughen the surface, and thereafter the manufacturer's special instructions regarding special solvent wiping or other preparation for touchup repair shall apply; areas in which the specified drying time between coats is exceeded shall be treated and prepared by the same method.

Coal-tar, epoxy-coated metalwork shall be protected against exposure to direct sunlight until permanent submergence or until installation under cover. Protection may be by covering or shading, except that surfaces which will be exposed to sunlight in their installed position and eventually will be submerged shall be protected by a heavy coat of phenolic aluminum paint spray applied approximately 1 week after applying the last coat of coal-tar epoxy. The reflective aluminum coating shall be renewed if necessary.

Certain safety precautions are necessary when using coal-tar epoxy coating. Skin contact must be avoided. Protective clothing and rubber gloves shall be worn, and all exposed skin areas protected with a barrier cream such as Ply No. 9 as manufactured by Milburn Co., 3000 Woodbridge, Detroit MI 48207, or Kerodex No. 71 manufactured by Ayerst Laboratories, Inc., 20 East 40th Street, New York NY 10016; or equal. During any application of coal-tar epoxy coatings, the applier shall wear an approved air mask with external air supply.

(h) Machine-applied pipeline polyethylene tape system (cold applied). - Pipe preparation and tape system application shall be as specified in AWWA standard C214, except that the system shall be factory applied.

The system shall be applied to 80 mils, plus or minus 8 mils, and shall consist of one wrap of inner-layer tape and two wraps of outer-layer tape.

The tape wrapping system shall be inspected; holiday detected; stored; shipped; handled, including field procedures; and repaired, in accordance with AWWA standard C214.

(i) Manually applied polyethylene-tape system, including primer tape, and mastic for special sections, connections, and fittings - Primer, mastic, and tape shall be applied in accordance with the manufacturer's instructions, except as specified herein. Two copies of the manufacturer's product data and application sheets shall be submitted to the Construction Engineer and Contracting Officer prior to application.

Mastic shall be applied to all required surfaces, paying particular attention to irregular surfaces such as bolts and crevices. It shall be applied to obtain a minimum dry-film thickness of 10 mils.

The tape shall be applied to provide at least two thicknesses of tape over each point on the surface to obtain a wrap with a 62-mil minimum thickness. Spiral and circumferential turns shall overlap at least 2 inches, longitudinal and end wraps shall overlap at least 3 inches, and tape shall be lapped a minimum of 4 inches over adjoining coatings or other surfaces. Felt and Kraft paper shall be stripped from the lap area of coal-tar enamel coatings. The tape shall be molded to the contours of all surfaces to eliminate or minimize voids under the tape. Tape for mechanical couplings and other highly irregular surfaces shall be sufficiently conformable to ensure complete coverage of all required surfaces.

After application, the tape shall be protected from excessive exposure to direct sunlight to prevent tape degradation or shrinkage. Sunlight shall be shaded from the tape by Kraft paper or other equally effective means, if directed by the Contracting Officer.

(j) Type II coal-tar enamel, type B primer, and related materials - Type II coal-tar enamel, type B primer, and all materials relating thereto shall be applied in accordance with the applicable sections of AWWA standard C203. For field priming

and enameling, applicable sections shall include pertinent parts of section 2.

Shop priming only will not be permitted. The type B primer shall be applied by spray or brush to a dry-film thickness of about 1 mil in a uniform coat free of overspray.

The enamel, when applied to the pipe, shall have a penetration of not less than nine at 77°F when tested as specified in subparagraph b. The bond of the coating after application to the steel pipe shall be equivalent to that required for the coatings on the laboratory test plates. A heat lamp or other suitable means shall be used, if needed, to bring the enameled surface to the temperatures required for making the bond test.

Enameled pipe to be joined by mechanical couplings shall have the enamel lining at the section ends beveled back between 10° to 45° to prevent chipping during installation and coupling.

Enameled pipe shall be protected at all times to ensure that the temperature of the pipe does not rise above 150°F or drop below 0°F, and shall not be moved or handled at ambient temperatures below 15°F. The provisions of section 2.14.1 of AWWA standard C203 shall apply to the transportation and handling of enameled pipe.

Where glass mat is specified, the glass mat shall be embedded and bonded in the coal-tar enamel at not more than half the enamel thickness from the surface of the coating, and each turn shall overlap the previous turn by at least 1 inch. Hand application of glass mat, asbestos felt, and Kraft paper shall be by an approved method and shall be equal to that specified for mechanical application in the appendix of the AWWA standard. During shop application of asbestos felt, enamel shall bleed out at the overlaps, and the bead so formed shall be flattened. Tack bonding of Kraft paper shall be by the enamel bleedout between the felt overlaps or other continuous spiral of enamel between the felt and Kraft.

The use of special glass mops for the application of the coal-tar enamel to large diameter pipe will be permitted in lieu of tampico fiber daubers: Provided, That their use shall be confined to the bottom 120°(60° either side of the lowest point of the pipe), that the inclination of the pipe does not exceed 25° above the horizontal during enamel

application, and that the coating otherwise meets all requirements of these specifications.

The completed coating shall be free of voids and discontinuities. Electrical inspection shall be performed by means of an approved electrical flaw detector delivering approximately 8,000 to 10,000 volts at low amperage.

(k) Coal-tar enamel tape - Coal-tar enamel tape shall be applied to provide at least two thicknesses of tape over each point on the surface. Spiral or circumferential turns shall overlap each other by at least 1/2 inch, and longitudinal and end laps shall be at least 2 inches. The tape wrap shall be lapped a minimum of 3 inches over adjoining coatings or other surfaces; felt and Kraft paper wraps shall be stripped from the first 1 inch of coal-tar enamel coatings over which tape is to be lapped. At all pipe joints, the tape shall be molded while warm to the contours of the surfaces to minimize or eliminate voids under the tape. Application and drying of the primer, and handling and application of the tape, shall be according to the manufacturer's instructions. The completed tape wrap shall be inspected by the use of an approved electrical flaw detector delivering approximately 8,000 to 10,000 volts at low amperage, and shall be free of voids or discontinuities.

(l) Fusion epoxy - The fusion epoxy coating shall be applied to sandblasted surfaces, to the specified minimum dry-film thickness, in accordance with the manufacturer's recommended procedures and standards, except as otherwise specified herein. Weld spatter, slag burrs, and other objectionable surface irregularities shall be removed, and sharp corners and edges rounded to a 1/8-inch radius. The fusion-applied coating shall be applied by the fluidized bed process, and redipping will not be permitted.

The repair coating shall be applied in accordance with the manufacturer's instructions and to the thickness specified for the fusion-applied coating. The repair coating shall be used for repair of small defective or damaged areas, but not for coating weld areas or correcting deficient thickness of the fusion-applied coating. Exposed metal to receive the repair coating shall be reblasted, and coated surfaces requiring repair shall be roughened by sanding or light blasting prior to repair.

The applicator of the coating shall provide the equipment and inspect the coating and lining for pinholes, using a dry detector set at about 125 volts per mil of actual coating thickness or a 67-volt wet sponge detector, and shall repair the pinholes. Manufacturer's standards for testing coating cure and other properties shall apply.

Application of the fusion epoxy coating will not be permitted if the shape of the metalwork precludes obtaining a coating meeting these specifications or if any coated surfaces are not accessible for coating inspection and effective application of the repair material. The Contractor shall install flanged joints as necessary to provide access or allow effective coating application to pipefittings. Welding of coated segments will not be permitted.

The metalwork shall be handled with belt slings or otherwise protected against coating damage by methods satisfactory to the Contracting Office.

After field repair of any coated areas damaged in handling, and prior to placing backfill, a plastic wrap shall be applied over valves, sleeve-type couplings, or any other fittings in accordance with subparagraph 10 (Plastic Wrap).

The manufacturer of a coating proposed as equal shall furnish to the Contracting Officer satisfactory data regarding surface preparation, coating composition, performance record, and an effective repair coating and procedure for repairing damaged areas.

(m) Plastic wrap - Plastic wrap shall consist of one or more wraps of sheet polyethylene plastic to produce a minimum thickness of 8 mils over all surfaces. The wrap shall be sufficiently loose so that it will contact all surfaces without tension after backfilling. The wrap shall extend 1 foot over adjacent surfaces. The overlap at edges of the plastic shall be a minimum of 1 foot, and the laps shall be secured in place. Ends of the wrap shall be secured by circumferential bands of 1-inch-wide polyethylene plastic tape applied under light tension.

Prior to backfilling over any plastic wrap, specified for valves, sleeve-type couplings, or any other fittings, except those having a fusion epoxy coating, 15-pound felt shall be laid over the plastic as a rock shield and secured

sufficiently to retain its positions during backfilling. The operating nut of valves shall be left exposed.

Backfill shall be placed so as to prevent puncture of the plastic wrap or plastic wrap and asbestos-felt shield.

(n) Vitreous enamel - Vitreous enamel shall be the pump manufacturer's standard fired-on, opaque, glossy vitreous enamel coating, applied to produce a minimum dry-film thickness of 8 mils.

Prior to wrapping insulating flange joints, the flange joints shall be cement-mortar coated to a minimum thickness of 2 inches.

(o) Corrosion-preventive compound - Corrosion-preventive compound shall be applied by any convenient method to ensure complete coverage with a heavy uniform coating.

(p) Acrylic emulsion paint - Acrylic emulsion paint shall be spray applied at a maximum coverage rate of 400-square-feet-per-gallon per coat to produce a minimum dry-film thickness of 1.5 mils per coat. When applied over concrete, masonry, asbestos cement, or cement-base coating, the surfaces shall be dampened (saturated surface dry) prior to application. Air and surface temperature shall be 50°F or higher during application and for 2 hours or more thereafter as necessary under ambient conditions to produce a firm film. In the event that rainfall or moisture condensation produces a visible effect on the coating, an additional coat shall be applied at no additional cost to the Government.

(q) Clear water repellent - Immediately before applying the clear water repellent, the concrete masonry unit walls shall be sprayed with water and the surface water allowed to evaporate to a saturated surface dry condition.

Concrete barrier, type B, water repellent contains 36 percent solids in mineral spirits. Before application, the material shall be thinned with mineral spirits to 18 percent solids.

The clear water repellent shall be spray applied in two coats at a maximum coverage rate of 200-square-feet-per-gallon per coat. Each coat shall be free from runs, pinholes, sags, voids, and other defects.

(r) Rubber paint for concrete surfaces at canal safety ladder shall be applied in two heavy coats at a maximum coverage of 350 square feet per gallon in accordance with the manufacturer's recommendations.

Costs - The cost of furnishing, preparing, and applying all materials for the cleaning, paint repairing, painting, or coating operations; of providing the services of the paint manufacturer's representative where such services are required; and of furnishing and submitting manufacturer's instructions, purchase orders, certifications, and samples of materials shall be included in the applicable prices bid in the schedule for furnishing and installing the items to be painted or coated.

9.1.2 PAINTING TABULATION

a. General - Contractor furnished items shall receive the cleaning, painting, and coating systems shown in the tabulation below. Paint and coatings shall be applied as required under paragraph 9.1.1.

Notes, preceded by asterisks, that follow the group of items listed under a particular number of the tabulation cover special information or painting requirements pertinent to items listed under this particular number. The asterisks shown after an item, surface preparation method, or paint or coating system or material, refer to the notes with the corresponding asterisks.

Except as otherwise noted in the tabulations, finish coats of paint shall be of the color and gloss specified in paragraph 9.1.3 (Color Schedule for Painting).

Tabulation	Item	Surface preparation method	Paint or coating material	Number of coats
1	a. Manually operated slide gates (bronze and stainless steel surfaces shall not be painted); b. Trashracks c. Safety racks	C	VR-6 vinyl resin paint and edge coats (color as scheduled for two final coats).	6 or more to produce a minimum dry-film thickness of 10
2	Carbon steel and aluminum canal safety ladders.	C	Fusion epoxy.	1 (Thickness range: 12-30 mils.)
3	Aluminum surfaces against which grout, concrete, or mortar will be placed. Aluminum surfaces in contact with steel.	A	Any commercial bituminous paint.	1 or more coats to produce a 5-mil minimum dry-film thickness.
4	Damaged areas of galvanized surfaces, due to making ground connections or other causes, that do not require finish painting.	B	Zinc dust-zinc oxide, or zinc-chlorinated rubber priming paint (for surfaces to be in normal atmospheric exposure).	2 or more to produce a minimum dry-film thickness of 4 mils.
			Zinc-dust chlorinated rubber priming paint (for surfaces to be immersed, buried, or exposed to damp conditions).	2 or more to produce a minimum dry-film thickness of 6 mils.

Tabulation	Item	Surface preparation method	Paint or coating material	Number of coats
5	All machine-finished surfaces of ferrous metalwork, including screw threads, that will be exposed during shipment and while awaiting installation.	A	Corrosion-preventive compound, grade 1.*	1 heavy coat
	* Compound shall be removed prior to installation of equipment.			
6	Ferrous surfaces to be encased concrete. Ferrous surfaces against which concrete, mortar, or grout is to be placed. This tabulation number does not include metalwork otherwise tabulated.	B, except preparation of reinforcing steel surfaces shall be in accordance with paragraph 5.3.13 (Reinforcing Steel).	Painting is not required.	
7	Stainless steel and stainless steel-clad surfaces.	G	Do not paint unless specifically listed elsewhere in these tabulations.	

b. Concrete, concrete masonry, gypsum plaster and wallboard, wood, and other nonmetallic surfaces -

Tabulation	Item	Surface preparation method	Paint or coating material	Number of coats
1	Concrete surfaces at canal safety ladders.	T	Rubber paint. (Color as shown in color schedule.)	2

9.1.3 COLOR SCHEDULE FOR PAINTING

The colors and gloss of finish coats shall be in accordance with Schedule A (Color Schedule).

The numbers (Alphanumeric) in the "Color Number" column of the color schedule refer to the Munsell system of color notation as referenced in the "Munsell Book of Color," 1976, publishd by Macbeth Division of Kollmorgen Corp., Baltimore MD 21218.

If an item is required to be painted but is not listed in the color schedule, the color or colors to be used will be selected by the Contracting Officer from the colors listed in the color schedule.

It shall be the Contractor's responsibility to ensure that a true match of color and gloss is obtained for all painted surfaces of items required by these specification to have the same color and gloss.

Gloss abbreviations:

SG - Semigloss

Schedule A - Color Schedule

No.	Item surface	Color	Color Number	Gloss
1	Manually operated slide gates, trashracks, and safety racks	Gray	5Y6/1	SG
2	Ladders	Yellow	5.3Y8/12	SG
3	Aluminum surfaces	Match Adjacent Color	--	--
4	Concrete surfaces at canal safety ladders	Yellow	5.3Y8/12	SG
5	Miscellaneous metal work, except aluminum, stainless steel, and galvanized.	Gray	5Y6/1	SG

SECTION 9.2 CEMENT-MORTAR LINING AND CEMENT-MORTAR COATING

9.2.1 CEMENT-MORTAR LINING AND CEMENT-MORTAR COATING

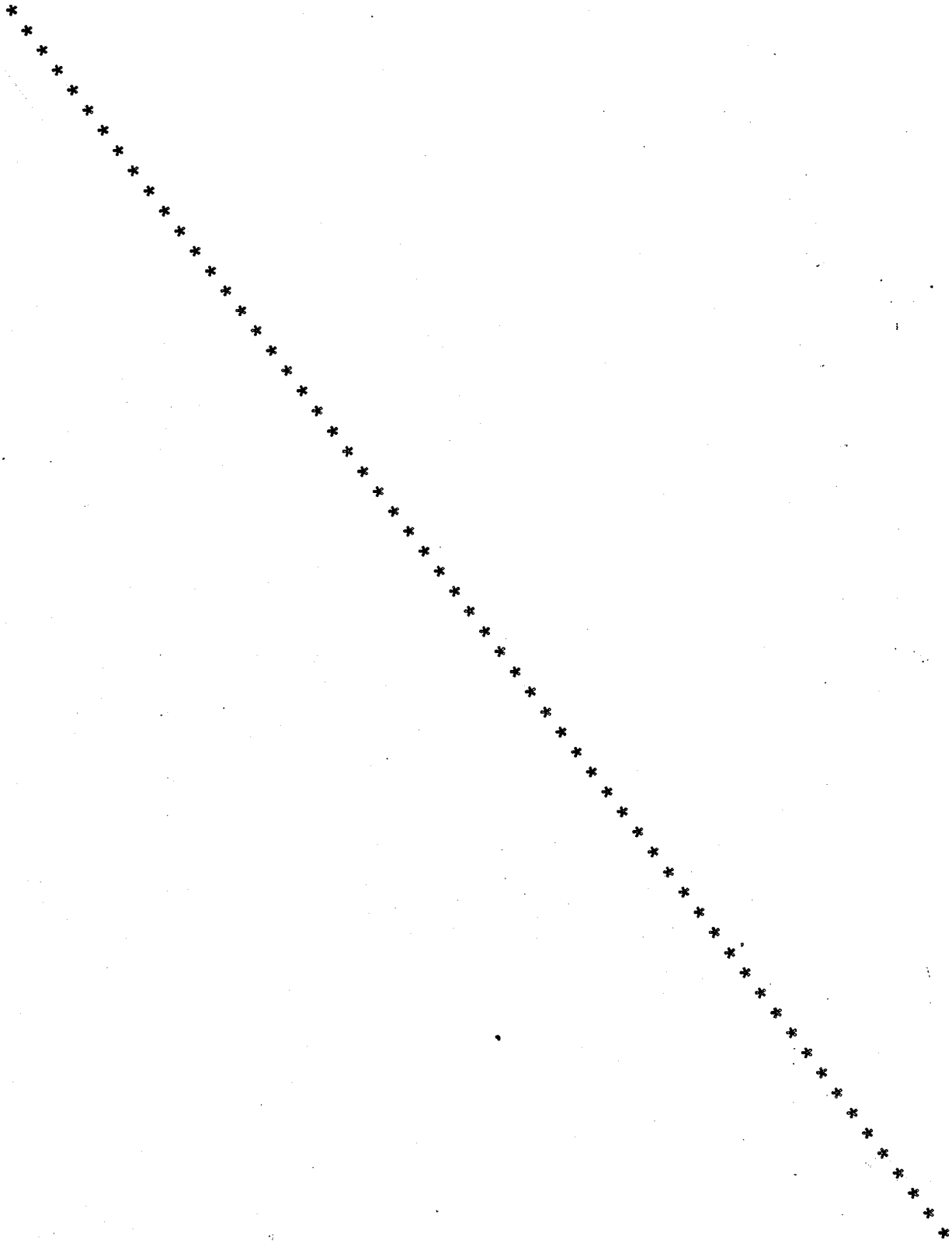
Cement-mortar lining and cement-mortar coating shall conform to AWWA Standard C205, including the Appendix, except as otherwise shown on the drawings: Provided, That cement-mortar lining may be applied in accordance with AWWA Standard C602.

Miter bends in pipe larger than 42 inches that cannot be satisfactorily lined by machine shall have a wire-reinforced, pneumatically or hand-applied lining with a hand-troweled finish equal to the finish obtained by machine placement.

The curing time for cement-mortar lining applied in accordance with AWWA Standard C602 shall not be less than 7 days. Paragraph 4.7.3 of AWWA Standard C602 is not a part of these specifications. All water required for applying and curing the cement-mortar lining shall be furnished by the contractor.

Cement - Cement mortar coating shall be type V portland cement, rather than type I or II as specified in AWWA C205. Cement in mortar lining shall be type II. All cement shall meet the applicable requirements of ASTM Designation: C150.

Cost - The cost of furnishing, preparing, and applying all materials for the lining and coating shall be included in the applicable prices bid in the schedule for the items for which the lining and coating are required.



DIVISION 10 - DRAWINGS

SECTION 10.1 DRAWINGS

10.1.1 DRAWINGS, GENERAL

a. General - The drawings which form a part of these specifications show the work to be done under these specifications.

Specifications and details shown on these drawings which are not applicable under these specifications shall be disregarded. Where details shown differ from the requirements of these specifications, the specifications shall govern. In the event there are minor differences as determined by the Contracting Officer between details and dimensions shown on the drawings and those of existing features at the site, the details and dimensions of existing features at the site shall govern.

The Contractor shall check all drawings carefully and advise the Contracting Officer of any errors or omissions discovered.

b. Additional or revised drawings - Except as otherwise provided in these specifications for drawings to be furnished by the Contractor, the specifications drawings will be supplemented by such additional or revised general and detail drawings as may be necessary or desirable as the work progresses; and the Contractor shall do no work without proper drawings and instructions. The additional or revised general and detail drawings furnished by the Engineer will show dimensions and details necessary for construction purposes more completely than are shown on the specifications drawings for all features of the work. The Contractor will be required to perform the work in accordance with the additional general and detail drawings or revisions furnished by the Engineer at the applicable prices bid in the schedule for such work.

c. Additional copies of drawings - The Contractor will be furnished such additional copies of the specifications and drawings as may be required for carrying out the work. Full-size contact prints of the original drawings from which the attached reproductions were made will be furnished to the Contractor for construction purposes upon request.

d. Mailing address - All drawings and data submitted by the Contractor for which a specific mailing address is not given in these specifications shall be submitted to Construction Engineer, Bureau of Reclamation, Suite 2200, 201 North Central Avenue, Phoenix, Arizona 85073. Number

of prints of each drawing furnished to the Contractor will be limited to (10) contact prints and 1 reproducible.

10.1.2 LIST OF DRAWINGS

The following drawings are made a part of these specifications:

Centennial Reach of Westside Canal
Harquahala Valley Irrigation Project, Arizona
Central Arizona Project

Sheet No.	U.S.B.R. Drawing No.	Sheet Title	FC&A Sheet No.
		General	
1	344-330-4461	Location Map and Sheet Index	05012/G-1
2	344-330-4462	General Notes	05012/G-2
		Plan and Profile	
3	344-330-4463	Westside Canal - Sta. 117+90.30 to Sta. 168+00	05012/P-1
4	344-330-4464	Westside Canal - Sta. 168+00 to Sta. 233+00	05012/P-2
5	344-330-4465	Westside Canal - Sta. 223+00 to Sta. 280+00	05012/P-3
6	344-330-4466	Westside Canal - Sta. 280+00 to Sta. 333+00	05012/P-4
7	344-330-4467	Westside Canal - Sta. 333+00 to Sta. 379+47.50	05012/P-5
8	344-330-4468	Westside Floodway - Sta. 0+00 to Sta. 30+00	05012/P-6
9	344-330-4469	Westside Floodway - Sta. 30+00 to Sta. 85+00	05012/P-7
10	344-330-4470	Westside Floodway - Sta. 85+00 to Sta. 140+00	05012/P-8
11	344-330-4471	Westside Floodway - Sta. 140+00 to Sta. 195+00	05012/P-9
12	344-330-4472	Westside Floodway - Sta. 195+00 to Sta. 239+10.13	05012/P-10

Civil

13	344-330-4473	Typical Sections: Floodway, Dike and Canal	05012/C-1
14	344-330-4474	Canal, Floodway, and Dike Alignment Plan at Cent. Wash	05012/C-2
15	344-330-4475	Dike Grading Plan Cent. Wash and Typical Sections	05012/C-3
16	344-330-4476	Siphon at Centennial Wash: Plan and Section	05012/C-4
17	344-330-4477	Floodway Maintenance Crossing and Dike Ramps	05012/C-5
18	344-330-4478	Deer Escape Ramp: Plan, Sections, and Details	05012/C-6
19	344-330-4479	Grouted Rock Discharge and Roadway Drainage	05012/C-7

Structures

20	344-330-4480	Centennial Wash Siphon: Plan, Section, and Details	05012/S-1
21	344-330-4481	Wasteway: Plan, Sections, and Details	05012/S-2
22	344-330-4482	Turnout: Plan, Sections, and Details	05012/S-3
23	344-330-4483	Turnout: Miscellaneous Details	05012/S-4

Miscellaneous

24	344-330-4484	Waste Area and Pipe Trench Earthwork	05012/V-1
25	344-330-4485	Safety Rack, Safety Ladder, and Fence: Plans, Sections, and Details	05012/V-2
26	344-330-4486	General Concrete Notes and Details	05012/V-3
27	344-330-4487	Concrete Reinforcement Notes and Details	05012/V-4
28	344-330-4500	Pipe Bend Details	05012/V-5

Geological

29	344-330-4488	General Geologic Legend Explanation and Notes	05012/X-1
30	344-330-4489	Log of Test Pit or Auger Holes TP-1002 to TP-1005	05012/X-2
31	344-330-4490	Log of Test Pit or Auger Holes TP-1006 to TP-1009	05012/X-3
32	344-330-4491	Log of Test Pit or Auger Holes TP-1010 to TP-1013	05012/X-4
33	344-330-4492	Log of Test Pit or Auger Holes TP-1014 to TP-1017	05012/X-5
34	344-330-4493	Log of Test Pit or Auger Holes TP-1018 to TP-1021	05012/X-6
35	344-330-4494	Log of Test Pit or Auger Holes TP-1022 to TP-1025	05012/X-7
36	344-330-4495	Log of Test Pit or Auger Holes TP-1026 to TP-1029	05012/X-8
37	344-330-4496	Log of Test Pit or Auger Holes TP-1030 to TP-1033	05012/X-9
38	344-330-4497	Log of Test Pit or Auger Holes TP-1034 to TP-1037	05012/X-10
39	344-330-4498	Log of Test Pit or Auger Holes TP-1038 to TP-1040	05012/X-11
40	344-330-4499	Log of Test Pit or Auger Holes WS-C1 to WS-C4	05012/X-12