

ENGINEERING DIVISION

KARAN

LIBRARY

Property of  
Flood Control District of MC Library  
Please Return to  
2301 W. Durango  
Phoenix, AZ 85009

CONTRACT DOCUMENTS  
AND  
SPECIAL PROVISIONS  
FOR

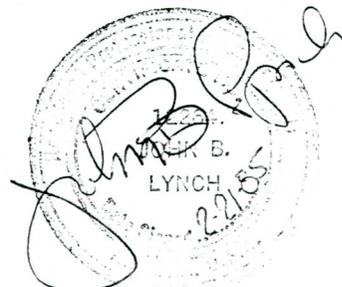
AGUA FRIA RIVER IMPROVEMENTS  
PHASE I: ROOSEVELT IRRIGATION DISTRICT  
CANAL RECONSTRUCTION AND SIPHON  
PHASE II: AGUA FRIA RIVER  
CHANNELIZATION AND BANK PROTECTION  
CONTRACT NO. FCD 85-10

SUPPLEMENTARY TO MAFICCPA ASSOCIATION OF GOVERNMENTS UNIFORM  
STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION EDITION OF  
1979 AND REVISIONS AND SUPPLEMENTS THERETO.



CONTRACT DOCUMENTS  
AND  
SPECIAL PROVISIONS  
FOR  
AGUA FRIA RIVER IMPROVEMENTS  
PHASE I: ROOSEVELT IRRIGATION DISTRICT  
CANAL RECONSTRUCTION AND SIPHON  
PHASE II: AGUA FRIA RIVER  
CHANNELIZATION AND BANK PROTECTION  
CONTRACT NO. FCD 85-10

SUPPLEMENTARY TO MARICOPA ASSOCIATION OF GOVERNMENTS UNIFORM  
STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION EDITION OF  
1979 AND REVISIONS AND SUPPLEMENTS THERETO.

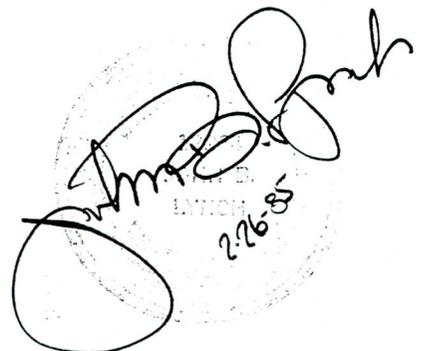


FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CONTRACT NO. FCD 85-10

TABLE OF CONTENTS

1. Invitation for BiDs
2. Bid Form
3. Clean Air and Water
4. Equal Opportunity
5. Title VI, Civil Rights Act of 1964
6. Certification of Nonsegregated Facilities
7. Construction Special Provisions
8. No Collusion Affidavit
9. Contract
10. Statutory Payment Bond
11. Statutory Performance Bond
12. Certificate of Insurance



A handwritten signature in black ink is written over a circular stamp. The signature is cursive and appears to read "John D. ...". The circular stamp contains the date "2-26-85" and some faint, illegible text around the perimeter.

INVITATION FOR BIDS  
(Construction Contract)

Project: Agua Fria River Improvements	Ref. Invitation FCD 85-10
Phase I: Roosevelt Irrigation District	Date: <u>March 4, 1985</u>
Canal Reconstruction and	Issued By: Flood Control
Siphon	District Maricopa
Phase II: Agua Fria River Channeli-	County
zation and Bank Protection	

Location: Along the Agua Fria River from 500 feet south of Thomas Road to 2900 feet north of Indian School Road and along the Roosevelt Irrigation District Canal System 3000 feet east and west of the Agua Fria River in Sections 24, 25, 26, and 36, Township 2 North, Range 1 West and Section 30, Township 2 North, Range 1 East, Gila and Salt River Base and Meridian, Maricopa County, Arizona.

SEALED BIDS, IN SINGLE COPY FOR THE WORK DESCRIBED HEREIN WILL BE RECEIVED UNTIL 2:00 P.M. LOCAL TIME AT THE PLACE OF THE BID OPENING APRIL 4, 1985 IN THE OFFICE OF THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, 3335 WEST DURANGO STREET, PHOENIX, ARIZONA 85009, AND AT THAT TIME PUBLICLY OPENED.

A PRE-BID CONFERENCE WILL BE HELD AT THE OFFICE OF THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, 3335 WEST DURANGO STREET, PHOENIX, ARIZONA ON MARCH 20, 1985 AT 10:00 A.M. ALL PROSPECTIVE BIDDERS ARE URGED TO ATTEND.

BID SECURITY IN AN AMOUNT OF NOT LESS THAN FIVE PERCENT (5%) OF THE TOTAL BID PRICE MUST BE SUBMITTED WITH EACH BID. THE BID SECURITY MAY BE IN THE FORM OF A BID BOND, CASHIERS CHECK, POSTAL MONEY ORDER, OR CASH. THE BID SECURITY WILL BE MADE PAYABLE TO THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY AS A GUARANTEE THAT IF THE WORK IS AWARDED TO THE BIDDER, HE WILL WITHIN TEN (10) DAYS FROM THE DATE OF SUCH AWARD, ENTER INTO PROPER CONTRACT AND BOND CONDITIONS FOR THE FAITHFUL PERFORMANCE OF THE WORK. OTHERWISE, SAID AMOUNT WILL BE FORFEITED TO THE FLOOD CONTROL DISTRICT. BID SECURITY WILL BE RETURNED AS PRESCRIBED BY MAG 103.

THE SUCCESSFUL BIDDER SHALL BE REQUIRED TO FURNISH PERFORMANCE AND PAYMENT BONDS IN PENAL SUMS NOT LESS THAN ONE HUNDRED PERCENT (100%) RESPECTIVELY, OF THE ORIGINAL AMOUNT OF THE CONTRACT.

DESCRIPTION OF WORK:

THE PROPOSED PROJECT INVOLVES CHANNELIZATION OF THE AGUA FRIA RIVER BETWEEN THOMAS ROAD AND 2900 FEET NORTH OF INDIAN SCHOOL ROAD AND IMPROVEMENTS TO THE ROOSEVELT IRRIGATION DISTRICT CANAL SYSTEM. THE WORK CONSISTS OF FURNISHING ALL MATERIAL, LABOR, AND

EQUIPMENT NECESSARY TO CONSTRUCT LEVEES, SOIL-CEMENT BANK PROTECTION, AND A SOIL-CEMENT GRADE-CONTROL STRUCTURE, UTILITY TOWER PROTECTION MEASURES, CHANNEL AND CANAL EXCAVATION, CANAL EMBANKMENT, SHOTCRETE CANAL LINING, INVERTED SIPHON, GRAVEL PIT BACKFILL, CULVERTS, FLAPGATES, AND OTHER INCIDENTAL ITEMS AS SHOWN ON THE PLANS OR AS SPECIFIED HEREIN.

THE WORK SHALL COMMENCE WITHIN SEVEN (7) CALENDAR DAYS AND BE COMPLETED WITHIN FOUR HUNDRED (400) CALENDAR DAYS AFTER RECEIPT OF THE NOTICE TO PROCEED.

NOTICE: THE BID SCHEDULE, SPECIAL PROVISIONS, INSTRUCTIONS TO BIDDERS, UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 1979 EDITION (MAG) AND REVISIONS AND SUPPLEMENTS THERETO, DRAWINGS LISTED UNDER THE CONTENTS, WILL BE INCORPORATED IN AND BECOME A PART OF THE RESULTANT CONTRACT.

CHERIE ELLIG, CLERK  
BOARD OF DIRECTORS  
FLOOD CONTROL DISTRICT OF  
MARICOPA COUNTY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
INVITATION FOR BIDS, FCD NO. 85-10  
INSTRUCTIONS TO BIDDERS

1. Explanation to Bidders. Any explanations desired by the Bidder, questions, or items for clarification regarding the meaning or interpretation of the Invitation for Bids, Drawings, Specifications, etc., may be addressed to the Chief Engineer and General Manager, preferably in writing, prior to the pre-bid conference. Any answers, interpretations, or clarifications affecting the cost will be addressed to all bidders in an addendum to the invitation. The receipt of an addendum by the Bidder must be acknowledged in the space provided on the bid form or by letter or telegram received before the time set for the bid opening. 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 of the work, the general and local conditions which can affect the work and 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 (see MAG 102.4).
3. Bidders Qualifications. Before a bid is considered for award, a Bidder may be requested by the Chief Engineer and General Manager of the Flood Control District 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 (see Section 102 - Bidding Requirements and Conditions as modified by the Special Provisions).
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.

If the successful bidder, upon acceptance of his bid by the Flood Control District with the period specified herein for acceptance (sixty days if no period is specified) fails to 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 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. 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.

No bid will be considered unless all items in the bid schedule are priced. In case of an error in the extension of price, the unit price shall govern. The quantities listed on the bid schedule on which unit prices are requested are estimates only.

Unless called for, alternate bids will not be considered.

Modifications of bids already submitted will be considered if received at the office designated in the Invitation for Bids by the time set for opening bids.

6. Submission of Bids. Bids must be sealed, addressed to the Chief Engineer and General Manager, Flood Control District of Maricopa County, 3335 West Durango, Phoenix, Arizona 85009, and marked to identify the bid to the referenced Contract FCD Number. Failure to appropriately identify the bid may result in a premature opening of, or a failure to open, such bid. The name of the Bidder shall be on the outside of the envelope (see MAG 102.9).
7. Withdrawal of Bids or Modifications. Bids may be withdrawn by written request received from the Bidder prior to the time set for the opening of bids.
8. Public Opening of Bids. Bids will be publicly opened at the time and place set for the 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.
9. Award of Contract. Award and execution of a contract shall be in accordance with MAG Section 103.
10. Specifications. Specifications referred to herein shall include all revisions and amendments in effect on the date of issuance of the invitation for bids. These instructions, Special Instructions to Bidders, and the herein contained Construction Special Provisions supplement the Uniform Standard Specifications herein referred to by "MAG" section number of paragraph number; however, in case of conflict, these instructions and Special Provisions supersede the Uniform Standard Specifications (MAG).

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
INVITATION FOR BIDS, NO. FCD 85-10  
SPECIAL INSTRUCTIONS TO BIDDERS

Location of the Work:

The location of the proposed work is along the Agua Fria River from 500 feet south of Thomas Road to 2900 feet north of Indian School Road, and along the Roosevelt Irrigation District Canal 3000 feet east and west of the Agua Fria River, in Sections 24, 25, 26, and 36, Township 2 North, Range 1 West and Section 30, Township 2 North, Range 1 East, Gila and Salt River Base and Meridian, Maricopa County, Arizona.

Contract Plans, Special Provisions, and Contract Documents:

Plans, Special Provisions, and forms for proposal, Bidding Schedule, Contract Agreement and Performance Bond may be obtained from the Flood Control District of Maricopa County, 3335 West Durango Street, Phoenix, Arizona, upon payment of \$35.00 by check payable to the FLOOD CONTROL DISTRICT OF MARICOPA COUNTY. This payment will not be refunded.

The project consists of furnishing all materials, labor, and equipment necessary to construct levees, soil-cement bank protection, a soil-cement grade-control structure, utility tower protection measures, channel and canal excavation, canal embankment, shotcrete canal lining, inverted siphon, gravel pit backfill, culverts, flapgates, and such other pertinent items as are necessary for the completion of the project as shown on the plans or as called for in the Special Provisions or in the Maricopa Association of Governments Uniform Standard Specifications for Public Works Construction.

CHERIE ELLIG, CLERK  
BOARD OF DIRECTORS  
FLOOD CONTROL DISTRICT OF  
MARICOPA COUNTY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
(Construction Contract)

BID FORM

Project: Agua Fria River Improvements  
Phase I: Roosevelt Irrigation District  
Canal Reconstruction and  
Siphon  
Phase II: Agua Fria River Channeli-  
zation and Bank Protection

Ref. Invitation FCD 85-10  
Date: March 4, 1985  
Issued By: Flood Control  
District Maricopa  
County

Location: Along the Agua Fria River from 500 feet south of Thomas Road to 2900 feet north of Indian School Road and along the Roosevelt Irrigation District Canal System 3000 feet east and west of the Agua Fria River in Sections 24, 25, 26, and 36, Township 2 North, Range 1 West and Section 30, Township 2 North, Range 1 East, Gila and Salt River Base and Meridian, Maricopa County, Arizona.

To: Chief Engineer and General Manager  
Flood Control District of Maricopa County  
3335 West Durango  
Phoenix, Arizona 85009

The following Proposal is made on behalf of \_\_\_\_\_  
\_\_\_\_\_ and no others. The total  
contract amount of this proposal is (in words) \_\_\_\_\_  
\_\_\_\_\_ and \_\_\_\_\_/100 dollars,  
(in figures) \_\_\_\_\_. This amount being  
the sum total of the extended amount for each pay item on the  
Bidding Schedule.

Evidence of authority to submit the Proposal is herewith furnished. The Proposal is in all respects fair and is made without collusion on the part of any person, firm, or corporation mentioned above, and no member or employee of the Flood Control District Board of Directors is personally or financially interested, directly or indirectly in the Proposal, or in any purchase or sale of any materials or supplies for the work in which it relates or in any portion of the profits thereof.

The Undersigned certifies that the approved Plans, Uniform Standard Specifications for Public Works Construction, 1979 Edition (MAG) and revisions and supplements thereto, together with the Special Provisions, forms of Contract and Bond authorized by the Board of Directors and constituting essential parts of this Proposal, have been carefully examined, and also that the site of the work has been personally inspected.

The Undersigned declares that the amount and nature of the work to be done is understood and that at no time will misunderstanding of the Plans, Specifications, Special Provisions, or conditions to be overcome, be plead. On the basis of the Plans, Specifications, Special Provisions, the forms of Contract, and the Bond proposed for use, the Undersigned proposes to furnish all the necessary machinery, equipment, tools, apparatus, and other means of construction, to do all the work and to furnish all the materials in the manner specified and to finish the entire project within the time hereinafter proposed and to accept, as full compensation therefore, the sum of various products obtained by multiplying each unit price, herein bid for work or materials, by the quantity thereof actually incorporated in the completed project, as determined by the Chief Engineer and General Manager, Flood Control District of Maricopa County.

The Undersigned understands that the quantities mentioned herein are approximate and are subject to increase or decrease and hereby proposes to perform all quantities of work, as either increased or decreased, in accordance with the provisions of the Specifications, at the unit price bid in the Bidding Schedule.

BIDDING SCHEDULE

Project: Agua Fria River Improvements  
 Phase I: Roosevelt Irrigation District Canal Reconstruction and Siphon  
 Phase II: Agua Fria River Channelization and Bank Protection

Contract: FCD 85-10

Item No.	Approximate Quantity	Unit	Description	Unit Cost (in writing) and /100 dollars	Unit Cost	Extended Amount
201	1	L.S.	Clearing and Grubbing			
203	1,930,790	C.Y.	Channel Excavation (Includes Fill, See Section 211)			
212	387,125	C.Y.	Dike Embankment (Includes Traverse Dikes)			
215.1	2,500	C.Y.	Canal Excavation			
215.2	192,900	C.Y.	Embankment (R.I.D. Canal)			
215.3	52,000	S.Y.	Geotextile Fabric			
215.4	60	DAY	Dewatering			
220.1	17,800	C.Y.	Dumped Riprap (Includes Tower Protection)			
220.2	360	C.Y.	Grouted Riprap			
220.3	1,690	C.Y.	Gravel Filter Blanket			
221.1	164,610	C.Y.	Soil Cement (Levees, Dikes, Towers, & Grade Control)			

The Bidder hereby acknowledges receipt of and agrees his proposal is based on the following Addenda

---

BIDDING SCHEDULE

Project: Agua Fria River Improvements  
 Phase I: Roosevelt Irrigation District Canal Reconstruction and Siphon  
 Phase II: Agua Fria River Channelization and Bank Protection

Contract: FCD 85-10

Item No.	Approximate Quantity	Unit	Description	Unit Cost (in writing) and /100 dollars	Unit Cost	Extended Amount
221.2	31,080	TON	Cement for Soil Cement			
350.1	1	L.S.	Removal of Existing Improvements			
350.2	1	L.S.	Removal of Existing Flume-1040 L.F.			
421.1	310	L.F.	Barbed Wire Fence			
421.2	1	EA	14' Wire Gate			
505.1	860	C.Y.	Structural Concrete (Class AA)			
505.2	85,200	LBS	Steel Reinforcement			
515.1	1	EA	Safety Rack (For Siphon Inlet Transition)			
515.2	8	EA	Debris Racks (Pipes)			
515.2	1	EA	Debris Racks (Drop Inlet)			
515.2	4	EA	36" Flap Gate			
515.2	2	EA	42" Flap Gate			

The Bidder hereby acknowledges receipt of and agrees his proposal is based on the following Addenda

---

BIDDING SCHEDULE

Project: Agua Fria River Improvements  
 Phase I: Roosevelt Irrigation District Canal Reconstruction and Siphon  
 Phase II: Agua Fria River Channelization and Bank Protection

Contract: FCD 85-10

Item No.	Approximate Quantity	Unit	Description	Unit Cost (in writing) and /100 dollars	Unit Cost	Extended Amount
515.2	2	EA	60" Flap Gate			
515.3	3	EA	Sluice Gates (42"x42" with Lifts and Stems)			
515.4	1	EA	Catwalk			
520	225	L.F.	Safety Handrail			
526	28,050	S.Y.	Shotcrete Canal Lining			
527	900	L.F.	Slipformed Concrete Lining			
535	3	EA	Hazard Warning Signs			
601	700	L.F.	Relocate 16" Water Line			
618.1	330	L.F.	2 - 60" R.C.P. (D-1250)			
618.1	122	L.F.	42" R.C.P. (D-1250)			
618.1	380	L.F.	2 - 53"x34" R.C.P. (D-1250)			
618.1	312	L.F.	36" R.C.P. (D-1250)			

The Bidder hereby acknowledges receipt of and agrees his proposal is based on the following Addenda

---

BIDDING SCHEDULE

Project: Agua Fria River Improvements  
 Phase I: Roosevelt Irrigation District Canal Reconstruction and Siphon  
 Phase II: Agua Fria River Channelization and Bank Protection

Contract: FCD 85-10

Item No.	Approximate Quantity	Unit	Description	Unit Cost (in writing) and /100 dollars	Unit Cost	Extended Amount
618.2	180	L.F.	108" R.C.P. (D-2000)			
619.1	572	L.F.	108" Siphon Conduit (15' Earth Cover, 50' Head)			
619.2	400	L.F.	108" Siphon Conduit (20' Earth Cover, 50' Head)			
619.3	85.5	L.F.	108" Siphon Conduit (32' Earth Cover, 50' Head)			
619.4	2	EA	Bend Structure (For Siphon Conduit)			
622	101	L.F.	7'3"x14' Aluminum Arch (0.175")			
901	1	L.S.	Mobilization			
902	1	L.S.	Field Office			
903.1	1	L.S.	Construction Surveying & Layout			
			TOTAL			
903.2*	_____	HR.	Two-Person Survey Party			_____
903.3*	_____	HR.	Three-Person Survey Party			_____

The Bidder hereby acknowledges receipt of and agrees his proposal is based on the following Addenda

\*Quote for hourly rate only. Not to be included in Bid Total.

The Undersigned further proposes to execute the Contract Agreement and furnish satisfactory Bonds within ten (10) days from the date of award, time being of the essence. The Undersigned further proposes to begin the work as specified in the Contract attached hereto, and to complete the work within the time limits as specified in the Special Provisions and maintain at all times a Contract Bond, approved by the Board of Directors, in an amount equal to one hundred percent (100%) of the total bid. This bond shall serve not only to guarantee the completion of the work on the part of the Undersigned, but also to guarantee the excellence of both workmanship and material and the payment of all obligations incurred, said Bond to be in full force and effect until the work is finally accepted and the provisions of the Plans and Specifications, and Special Provisions are fulfilled.

A Proposal guaranty in the amount and character named in the Invitation for Bids is enclosed amounting to not less than five percent (5%) of the total bid, which Proposal guaranty is submitted as a guaranty of the good faith of the Bidder and that the Bidder will enter into written contract, as provided, to do the work, if successful in securing the award thereof; and it is hereby agreed that if at any time other than as provided in the Proposal requirements and conditions the Undersigned should withdraw this Proposal, or if the Proposal is accepted and there should be failure on the part of the Undersigned to execute the Contract and furnish satisfactory Bond as herein provided, the Flood Control District of Maricopa County in either of such events, shall be entitled and is hereby given the right to retain the said Proposal guaranty as liquidated damages.

Date: \_\_\_\_\_, 19\_\_.

IF BY AN INDIVIDUAL:

\_\_\_\_\_  
(Name)

\_\_\_\_\_  
(Address)

IF BY A FIRM OR PARTNERSHIP:

\_\_\_\_\_  
(Firm Name)

\_\_\_\_\_  
(Firm Address)

By: \_\_\_\_\_

\*Name and Address of Each Member:

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Date: \_\_\_\_\_, 19\_\_.

IF BY A CORPORATION:

\_\_\_\_\_  
(Corporate Name) (Corporation Address)

By: \_\_\_\_\_

\*\*Incorporated under the Laws of \_\_\_\_\_

Names and Addresses of Officers:

\_\_\_\_\_  
(President) (Address)

\_\_\_\_\_  
(Secretary) (Address)

\_\_\_\_\_  
(Treasurer) (Address)

\*The name and post office address of each member of the firm or partnership must be shown.

\*\*The name of the State under which the laws of the Corporation was chartered and names, title, and business address of the President, Secretary, and Treasurer must be shown.

## CLEAN AIR AND WATER

The Contractor agrees as follows:

1. To comply with all the requirements of Section 114 of the Clean Air Act, as amended (42 USC 1857 et seq., as amended by Public Law 91-604) and Section 308 of the Federal Water Pollution Control Act (33 USC 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 execution of this contract.
2. That no portion of the work required by this contract will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date when this contract was executed unless and until the EPA eliminates the name of such facility or facilities from such listing.
3. To use its best efforts to comply with clean air standards and clean water standards at the facility where the contract work is being performed.
4. To insert the substance of provisions of this article into any nonexempt subcontract, including this paragraph (4).

The terms used in this Article have the following meanings:

1. The term "Air Act" means the Clean Air Act, as amended (42 USC 1857 et seq., as amended by Public Law 91-604).
2. The term "Water Act" means Federal Water Pollution Control Act, as amended (33 USC 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 11738, an applicable implementation plan as described in Section 110(d) of the Clean Air Act (42 USC 1857c-5(d)). An approved implementation procedure or plan under Section 111(c) or Section 111(d), respectively, of the Air Act (42 USC 1857c-6(c) or (d)), or an approved implementation procedure under Section 112(d) of the Air Act (42 USC 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 USC 1342), or by local government to ensure compliance with pretreatment regulations as required by Section 307 of the Water Act (33 USC 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, plan, 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. Were a location or site of operations contains or includes more than one building, plant, installations, 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 collocated in one geographical area.

## EQUAL OPPORTUNITY

The Contractor hereby agrees to incorporate, or cause to be incorporated, into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR, Chapter 60, which is paid for, in whole or in part, with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan, insurance or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance or guarantee, the following Equal Opportunity (Federally Assisted Construction) clause:

### Equal Opportunity (Federally Assisted Construction)

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

1. 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 for setting forth the provisions of this nondiscrimination (Federally Assisted Construction) clause.
2. 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.
3. 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 advising the said labor union or workers' representative of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. 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.
5. 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 for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
6. In the event of the Contractor's noncompliance with the nondiscrimination (Federally Assisted Construction) clauses 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 or Federally assisted construction 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.
7. The Contractor will include the portion of the sentence immediately preceding paragraph 1 and the provisions of paragraphs 1 through 7 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 the Contracting Officer may direct 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 by the Contracting Officer, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

The Contractor further agrees that it will be bound by the above Equal Opportunity (Federally Assisted Construction) clause with respect to its own employment practices when it participates in Federally assisted construction work; provided, that if the Contractor so participating is a State or local government, the above Equal Opportunity clause is not applicable to any agency, instrumentality, or subdivision of such government which does not participate in work on or under the contract.

The Contractor agrees that it will assist and cooperate actively with the Contracting Officer and the Secretary of Labor in obtaining the compliance of Contractors and Subcontractors with the Equal Opportunity (Federally Assisted Construction) clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the Contracting Officer and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the Contracting Officer in the discharge of his primary responsibility for securing compliance.

TITLE VI, CIVIL RIGHTS ACT OF 1964

The Contractor agrees that it will comply with Title VI of the Civil Rights Act of July 2, 1964, (78 Stat. 241), and all requirements imposed by or pursuant to the Department of the Interior Regulation (43 CFR 17) issued pursuant to that title, to the end that, in accordance with Title VI of that Act and the Regulation, no person on the United States shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Contractor receives financial assistance from the United States and hereby gives assurance that it will immediately take any measures to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of Federal financial assistance extended to the Contractor by the United States this assurance obligates the Contractor, or in the case of any transfer of such property, any transferee for the period during which the real property or structure is used for a purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance obligates the Contractor for the period during which it retains ownership or possession of the property. In all other cases, this assurance obligates the Contractor for the period during which the Federal financial assistance is extended to it by the United States.

This assurance is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts, or other Federal financial assistance extended after the date hereof to the Contractor by the United States, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The Contractor recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall reserve the right to seek judicial enforcement of this assurance. This assurance is binding on the Contractor, its successors, transferees, and assignees.

## CERTIFICATION OF NONSEGREGATED FACILITIES

The Contractor hereby certified that it does not maintain or provided for its employees any segregated facilities at any of its establishments, and that it does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. It certified further that it will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it will not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The Contractor 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, restrooms and washrooms, restaurants and other eating areas, timeclocks, 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, creed, color, or national origin, because of habit, local custom, or otherwise. The Contractor further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) it will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause; that it will retain such certifications in its files; and that it will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications from proposed subcontractors for specific time periods) it will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provision of the Equal Opportunity clause; that it will retain such certifications in its files, and that it 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 USC 1001.

CONSTRUCTION SPECIAL PROVISIONS

AGUA FRIA RIVER IMPROVEMENTS

CONTRACT FCD NO. 85-10

PHASE I: Roosevelt Irrigation District Canal Reconstruction and Siphon

PHASE II: Agua Fria River Channelization and Bank Protection

GENERAL

Location of Work:

The location of the proposed work is along the Agua Fria River, from 500 feet south of Thomas Road to 2900 feet north of Indian School Road, and along the Roosevelt Irrigation District Canal 3000 feet east and west of the Agua Fria River, in Section 24, 25, 26, and 36, Township 2 North, Range 1 West and Section 30, Township 2 North, Range 1 East, Gila and Salt River Base and Meridian, Maricopa County, Arizona.

Scope of Work:

The project consists of furnishing all material, labor, and equipment necessary to construct levees, soil-cement bank protection, a soil-cement grade-control structure, utility tower protection measures, channel and canal excavation, canal embankment, shotcrete canal lining, inverted siphon, gravel pit backfill, culverts, flapgates, and other incidental items as shown on the plans or as specified herein.

Specifications:

The work embraced herein shall be performed in accordance with the requirements of the following separate document:

Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction, Edition of 1979, inclusive of all revisions and amendments in effect on the date of issuance of the invitation for bids, which is herein referred to as the "Standard Specifications."

Intent and Purpose:

The intent and purpose of these Special Provisions is to interpret, correct, and supplement the Standard Specifications to the extent and in the manner necessary and to provide additional specifications for items of work not found in the Standard Specifications.

### Permits and Approvals:

Prior to the start of construction, the Contractor shall procure all permits and licenses, pay all charges, fees and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the work. Copies of the fully executed permits shall be furnished to the Engineer.

### Work Standards:

The Contractor shall comply with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330) as supplemented by Department of Labor Regulations (29 CFR Part 5).

### Contract Time:

The Contractor shall start work within seven (7) calendar days and complete all work on the project within four hundred (400) calendar days after the date of Notice to Proceed.

### Water, Light, Power, Heat, Telephone:

All water for construction purposes, drinking water, lighting, temporary electric power, heat and telephone service shall be arranged for and provided for the requirements of the work by the Contractor at his expense.

### General Comment:

The cost of all work required under this contract as shown on the plans for which there are no specific items shown on the Bidding Schedule, shall be included in the prices bid for related items.

### Ground and Surface Water:

The water-table elevations at the site during certain periods of the year may create a need for dewatering during the construction of the Agua Fria River channelization bank protection, inverted siphon, tower protection, and grade-control structure. It is the Contractor's responsibility to make provisions for the removal and/or control of ground and surface water during the course of construction. No direct payment will be made for dewatering ground water or channelizing and diverting surface water. Costs for this work shall be considered incidental to and included in the bid items for Channel Excavation and the various bid items for bank protection.

Dewatering of the existing gravel yard waste pits to facilitate construction of the Roosevelt Irrigation District canal will be paid for in accordance with the requirements of Section 215 of these Special Provisions.

Prior to the commencement of construction, the Contractor shall submit to the Engineer an acceptable plan for handling ground and surface waters within the channelization limits during construction.

Connection of New Canal to Existing Canal:

Although the majority of the Phase I work can be constructed while the existing Roosevelt Irrigation District flume and canal remain in service, it will be necessary to take the flume out of service to construct the connections of the new canal to the existing canal (Stations 0+00 to 3+53.60 and 57+47.64 to 60+97.14). The existing canal and flume will be shut down by the Roosevelt Irrigation District, for approximately a 30 day period during the month of December. It is during this time period that the Contractor shall construct the connections to the existing canal. Phase I work shall be closely coordinated with the Roosevelt Irrigation District.

The Contractor's proposed progress schedule, required under Sub-section 108.4 of these Special Provisions, shall detail the scheduling of the work needed to construct the canal connections, including, but not limited to, removal of the existing flume along the connections, canal embankment, and placement of shotcrete canal lining. The siphon and the remainder of the new canal shall be constructed, tested, and accepted by the Engineer prior to the commencement of connection construction, unless otherwise specified, in writing, directed by the Engineer.

The Contractor shall be responsible for all costs of water delivery to Roosevelt Irrigation District customers incurred due to the Contractor's inability to complete the canal connections within the aforementioned shut-down period.

SECTION 101 - ABBREVIATIONS AND DEFINITIONS

101.2 - Definitions and Terms:

Superseding the Standard Specifications definition of "Engineer":

Engineer: The individual, firm, partnership, corporation, or combination thereof designated by the Flood Control District of Maricopa County to act as the Engineer, on the District's behalf, either directly or through a duly authorized representative.

Superseding the Standard Specifications definition of "Budget Project":

Budget Project: A project financed by funds set aside in the annual budget or otherwise approved by the Board of Directors of the Flood Control District of Maricopa County.

Superseding the Standard Specifications definition of "Owner":

Owner: The Flood Control District of Maricopa County, acting through its legally constituted officials, officers, or employees.

## SECTION 102 - BIDDING REQUIREMENTS AND CONDITIONS

In addition to the requirements of Subsection 102.1 - Eligibility and Preference of the Standard Specifications:

Each bidder shall furnish the owner satisfactory evidence of his competency to perform the proposed work. Such evidence of competency, unless otherwise specified, shall consist of: (1) statements covering the bidder's past experience on similar work; (2) a list of equipment that would be available for the work; and, (3) a list of key personnel that would be available and their past experience on similar work. In addition, each bidder shall furnish the owner satisfactory evidence of his financial responsibility. Such evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder's financial resources and liability as of the last calendar year or the Contractor's last fiscal year. Such statement or report shall be certified by a public accountant. At the time of submitting such financial statement or report, the bidder shall further certify whether his financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder's financial responsibility has changed, the bidder shall qualify the public accountant's statement or report to reflect his (bidder's) true financial condition at the time such qualified statement or report is submitted to the owner.

Unless otherwise specified, a bidder may submit evidence that he is prequalified with the State Highway Division and is on the current "bidder's list" of the State in which the proposed work is located. Such evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility and competency to perform the proposed work in lieu of the statement or report hereinbefore specified.

Each bidder shall submit "evidence of competency" and "evidence of financial responsibility" to the owner at the time of bid opening.

If awarded the Contract, the bidder will furnish certificates from the owners of leased equipment to the effect that in case of default, the bidder has the right to take over the leased equipment for use in completing the work.

In addition to the requirements of Subsection 102.5 - Preparation of Proposal:

It shall be the responsibility of prospective bidders to determine, prior to submission of a bid, if any addenda have

been issued. This may be accomplished by calling 602-262-1501. Any addendum issued, if not already bound into the Special Provisions, must be included as a part of the Special Provisions, and any quantities on the Bidding Schedule requiring change shall be adjusted by pen and ink to the new figure.

Bids that do not include appropriate addenda and show appropriate changes to the Bidding Schedule shall be invalid.

SECTION 103 - AWARD AND EXECUTION OF CONTRACT

Additional to the Standard Specification requirements of Subsection 103.6.1 - Contractor's Insurance:

Concurrently with the execution of the Contract, the Contractor shall furnish Certificates of Insurance to the Flood Control District of Maricopa County. The types of insurance and the limits of liability shall be as follows:

Bodily injury per person.....	\$ 1,000,000.00
Bodily injury each occurrence.....	\$ 5,000,000.00
Property damage.....	\$ 1,000,000.00

On all policies, the Flood Control District of Maricopa County shall be named as an additional insured.

SECTION 104 - SCOPE OF WORK

Additional to the requirements of Subsection 104.2 - Alterations of Work:

No adjustment in the contract unit price for a minor item will be made unless it becomes a major item in accordance with the provisions of Section 101 of the Standard Specifications.

## SECTION 105 - CONTROL OF WORK

Additional to the requirements of Subsection 105.1 - Authority of the Engineer:

In an emergency affecting the safety of life or of the adjoining property, the Contractor, without special instruction or authorization from the Engineer, is hereby permitted to act at his discretion to prevent such threatened loss or injury, and he shall so act, without appeal, if so instructed or authorized. Any compensation claimed by the Contractor on account of emergency work shall be determined by the Engineer.

Additional to the requirements of Subsection 105.2 - Plans and Shop Drawings:

The number of copies of plans/shop drawings required for review and/or approval shall be as follows:

Initial submittal: Three (3) copies. One (1) copy will be returned to the Contractor.

Final Submittal: Five (5) copies. Two (2) copies will be returned to the Contractor.

Additional to the requirements of Subsection 105.6 - Cooperation With Utilities:

Utility locations, as shown on the plans, were compiled based on the best information available. Utility locations are not intended to be exact or complete. Prior to commencing construction, the Contractor shall verify the location of all utilities with the appropriate organization.

The Contractor's attention is directed to Subsection 105.6 (Cooperation With Utilities) and to Subsection 107.11 (Contractor's Responsibility For Utility Property And Services) of the Standard Specifications. In addition, the Contractor's attention is directed to the requirements of Arizona Revised Statutes 40-370.21 through 40-370.29 requiring all parties excavating in public streets, alleys or utility easements to first secure the location of all underground facilities in the vicinity of the excavation.

Whenever any work is scheduled which may affect a utility, the Contractor will be required to give the respective owner sufficient advance notice so that the owner may provide an Inspector to prevent damage to the utility. The following utilities are known to have facilities in the area of the construction:

Arizona Public Service	932-2300
City of Avondale	932-2400
Mountain Bell	235-3278
Roosevelt Irrigation District	935-4271
Salt River Project	273-8888
Southern Pacific Pipeline	278-8565
Tucson Electric Power Company	1-622-6661
Western Area Power Administration	(702) 293-8844
El Paso Natural Gas Company	438-1675

At least forty-eight (48) hours prior to commencing excavation, the Contractor shall call Blue Stake Center between the hours of 7:30 a.m. and 4:30 p.m., Monday through Friday, for information concerning the location of buried utilities in the area of construction. The telephone number to call is: 263-1100. It shall be the responsibility of the Contractor to contact the utility companies in order to determine if there is a need for any bracing or shoring of facilities on the project. If bracing or shoring is necessary, the Contractor shall do so to the satisfaction of the utility company. No measurement or direct payment will be made for such bracing or shoring.

Additionally, Tucson Electric Power Company, the Salt River Project, and the U.S. Department of Energy, Western Area Power Administration maintain energized aerial electric power lines in the vicinity of this project. Do not consider these lines to be insulated. Construction personnel working in proximity to these lines are exposed to an extreme hazard from electrical shock. Contractors, their employees, and all other construction personnel working on this project shall be aware of the danger and instructed to take adequate protective measures as required by the NES code for 345 kv transmission lines and OSHA Standard 1926.550(a)15. Fill material is not allowed on or near steel components of towers. Vehicular ingress and egress shall be maintained to the towers both during and after construction.

Additional to the requirements of Subsection 105.10 - Inspection of Work:

It shall be the responsibility of the Contractor and/or Materials Supplier to maintain in-house quality control. The Contractor shall submit a request for density testing forty-eight (48) hours in advance. Should a density test prove unsatisfactory, one additional test will be conducted on that location, after reworking, at the Contractor's request. Should this test also yield unacceptable results, additional re-testing will be done at the Contractor's expense. The cost of additional density testing beyond that stipulated as being covered in the Contract will be deducted from the Contractor's payment estimate. The unit charges for these re-tests are available from the Engineer.

## SECTION 106 - CONTROL OF MATERIAL

Additional to the Standard Specification requirements of Subsection 106.1 - Source of Materials and Quality:

### Construction of Stockpile:

The Engineer or his representative will inspect the construction of all stockpiles to insure that the following requirements are complied with at all times.

Stockpiles shall be constructed on level, firm ground free of brush, trees, stumps, roots, rubbish, debris and other objectionable or deleterious material. Sufficient access shall be provided around the entire stockpile to sample and remove material in accordance with these provisions.

Stockpiles shall be constructed in layers, each layer not exceeding two (2) feet in thickness.

The total height of the stockpile shall not exceed fifteen (15) feet or the reach of the equipment employed to remove material for sampling and utilization, whichever is less.

### Sampling:

During construction of stockpiles to be utilized in the production of soil cement, the Contractor will be solely responsible for monitoring the uniformity of the material being placed therein to assure conformance with the gradation requirements specified for said soil material. The Contractor's attention is directed to the soils reports prepared for this project and which are on file at the office of the Flood Control District of Maricopa County, 3335 West Durango Street, Phoenix, Arizona. The aforementioned reports indicate that the upper three (3) to five (5) feet of material in overbank areas adjacent to the present Agua Fria channel are very fine, falling outside the specified gradation band for soil cement. The Contractor is advised that these fine-grained soils cannot be incorporated into the stockpile without prior blending with courser material. Upon completion of the stockpile, the Contractor shall notify the Engineer in order to allow for verification of the soil-cement mix design determined during design from random site sampling. The Contractor shall provide the manpower and equipment necessary to sample the stockpile in accordance with the following procedure:

Under the direction of the Engineer, the Contractor shall use a front-end loader to excavate a face for the full height of the stockpile, extending into the stockpile a distance specified by the Engineer, at four (4) different locations around the perimeter of the stockpile. The front-end loader shall then be used to channel the total excavated

face at each location from the bottom to the top in one operation, and the material obtained shall be dumped on the ground in piles.

The Engineer or his representative will then sample each of the four (4) piles by channeling it with a hand shovel at four (4) locations equally spaced around the perimeter.

Approval of a stockpile shall not relieve, in any degree, the full responsibility of the Contractor to furnish in its final position, a material conforming to all the specification requirements.

#### Utilization of Stockpiles:

Stockpiles of material may be used for any item for which it is acceptable.

Material removal from accepted stockpiles for project utilization shall be by side excavation for the full height of the stockpile unless otherwise approved, in writing, by the Engineer.

Unless otherwise stipulated, the Contractor shall provide and pay for all supplies, materials, labor, water, tools, equipment, light, power, transportation, and other facilities necessary for execution and completion of the project. Unless otherwise specified, all materials and supplies shall be new and of the best quality. The Contractor, if required, shall furnish satisfactory evidence as to the kind and quality of supplies and materials.

Additional to the Standard Specification requirements of Subsection 106.2 - Samples and Tests of Materials:

It shall be the responsibility of the Contractor and/or materials supplier to maintain in-house quality control of processed materials.

The Contractor shall submit a request for materials testing forty-eight (48) hours in advance. All re-testing of materials or material sources shall be done at the Contractor's expense. The unit charges for these re-tests are available from the Engineer.

SECTION 107 - LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

Additional to the requirements of Subsection 107.2 - Permits:

The Contractor shall be responsible for obtaining all permits and licenses, pay all charges, fees, taxes and give all notices necessary and incidental to the due and lawful prosecution of the work. Permits for earth moving may be obtained from the Bureau of Air Pollution Control, Maricopa County Department of Health Services, 1845 East Roosevelt, telephone number 258-6381.

Additional to the requirements of Subsection 107.5 - Safety, Health, and Sanitation Provisions:

The Contractor shall protect, indemnify and defend Maricopa County, the Engineer and his employees, officers, and agents against any claims of liability arising from or based on the violation of the U.S. Occupational Safety and Health Act or any other safety provisions in law or equity.

The Contractor shall provide, at the site, such equipment and medical facilities as are necessary to supply first-aid service to anyone who may be injured in connection with the work.

The Contractor must promptly report, in writing, to the Engineer all accidents whatsoever, arising out of or in connection with the performance of the work, whether on or adjacent to the site, which caused death, personal injury, or property damages, giving full details and statements of witnesses. In addition, if death or serious damages are caused, the accident shall be reported immediately by telephone or messenger to the Engineer.

If any claim is made by anyone against the Contractor or any Subcontractor on account of any accident, the Contractor shall promptly report the facts, in writing, to the Engineer, giving full details of the claim.

Additional to the requirements of Subsection 107.9 - Protection and Restoration of Property and Landscape:

All existing drainage channels of any size disturbed by construction, whether shown on the plans, or not, shall be reconstructed, at their original location, to drain properly without unnecessary erosion.

Before removing any fences, enclosed yards, or structures confining any livestock such as horses, cows, etc., the Contractor shall notify the property owner with adequate time for their safe removal or confinement elsewhere.

When requested by the property owner or the Engineer, the Contractor shall be required to erect temporary fencing, at no cost to the County or property owner, to prevent the escape or injury of said livestock during construction.

The Contractor shall be responsible for all damaged and/or destroyed Land Monuments and Property Marks. Said Monuments and Marks shall be replaced or restored by the Contractor. Final acceptance by the Engineer will not relieve the responsibility of the Contractor to protect said Monuments and Marks. The Contractor shall receive no compensation for restoring damaged or obliterated Land Monuments.

Additional to the requirements of Subsection 107.10 - Contractor's Responsibility for Work:

The Contractor shall guarantee the work against defective workmanship or materials for a period of (1) year from the date of its final acceptance under the contract, ordinary wear and tear and unusual abuse or neglect excepted.

Any omission on the part of the Engineer to condemn defective work or materials at the time of construction shall not be deemed an acceptance, and the Contractor will be required to correct defective work or materials at any time before full acceptance and within one (1) year thereafter.

Should any defects develop within one (1) year from the date of final acceptance due to faults in workmanship or materials, the Contractor shall, within fourteen (14) calendar days of receipt of written notice from the Flood Control District of Maricopa County, begin making the necessary repairs to the satisfaction of the Engineer. Such work shall include the repair or replacement of other work or materials damaged or affected by making the above repairs or corrective work, all at no additional cost to Maricopa County.

In case of work, materials, or equipment for which written warranties are required by the Standard Specifications or Special Provisions, the Contractor shall provide or secure from the appropriate Subcontractor or supplier such warranties addressed to and in favor of the Flood Control District of Maricopa County and deliver same to the Engineer prior to final acceptance of the work. Delivery of such warranties shall not relieve the Contractor from any obligation assumed under any other provisions of the contract.

The warranties and guaranties provided in this subsection of the contract documents shall be in addition to and not in limitation of any other warranties, guaranties or remedies required by law.

In the event that the Contractor should fail to make such repairs, adjustment, or other work that may be made necessary by such defects, the Flood Control District may do so and charge the Contractor the cost thereby incurred. The performance bond shall remain in full force and effect through the guarantee period.

Additional to the requirements of Subsection 107.11 - Contractor's Responsibility for Utility Property and Services:

The Contractor shall take full responsibility for costs incurred due to damage to utilities as a result of grading or excavation operations.

Utility locations shown on the plans are approximate and all utilities are not necessarily shown. The possibility of conflicts with utilities exists. If these conflicting utilities interfere with the Contractor's normal progress towards completion of this project, the Engineer may authorize the Contractor to relocate said conflicting utilities by Actual Cost Work as detailed in Subsection 109.5 of the Standard Specifications.

The Contractor shall be responsible for coordination and cost of all utility relocations indicated on the plans as to be done by the Contractor.

## SECTION 108 - COMMENCEMENT, PROSECUTION, AND PROGRESS

In addition to the requirements of the Standard Specifications:

### 108.4 - Contractors Construction Schedule:

The Contractor shall furnish, at the preconstruction conference, a proposed progress schedule for the work including miscellaneous items of construction which make up this project. The progress schedule shall be updated and submitted to the Engineer prior to approval of monthly payment requests.

After the work is in progress, the Contractor shall submit weekly work schedules indicating the number of personnel, type of equipment, and location and nature of the work to be performed. Changes in the Contractor's progress schedule requiring an increase in the Flood Control District's engineering and/or technical personnel on the project will not be put into effect for fifteen (15) days after submission of the schedule change to the Engineer or until the Engineer has made arrangements for the additional personnel, whichever is the shorter time.

### 108.5 - Limitation of Operations:

Should the Contractor elect to perform any work after regular working hours, on weekends, or legal holidays, any charges incurred by the District for inspection of the work, surveys, or tests of materials will be deducted from monies due or to become due to the Contractor.

### 108.7 - Determination and Extension of Contract Time:

The Contractor shall complete all work on the project within 400 calendar days after receipt of the Notice to Proceed.

The contract time may be changed only by an executed Change Order. The Contractor must request, in writing, any extension of the contract time in accordance with Subsection 108.7 of the Standard Specifications within ten (10) days of the occurrence of the event for which the extension is requested. Delays beyond the reasonable control of the Contractor, as stated in Standard Specifications 108.7, are further defined as: war, government regulations, labor disputes, strikes, fires, floods, adverse weather necessitating cessation of work, other similar action of the elements, inability to obtain materials, equipment or labor because of Federal Government restrictions arising out of the national defense or war program, required "extra work," or other specific reasons as may be further described in the specifications, which may constitute such a delay.

If delays beyond the Contractor's control are caused by reasons other than those mentioned above, but substantially equal in gra-

vity to those enumerated, and an extension of time is deemed by the Engineer to be in the best interests of the Flood Control District, an extension of time may be granted, but the Contractor shall not be entitled to damages or additional payment due to such delays. If delays beyond the Contractor's control are caused solely by action or inaction by the Flood Control District of Maricopa County or its agents, such delays will entitle the Contractor to an extension of time only.

Extension of time, when granted, will be based upon the effect of delays to the project as a whole and will not be granted for non-controlling delays to minor included portions of work unless it can be shown that such delays did, in fact, delay the progress of the project as a whole.

No work on Saturdays, Sundays, or holidays will be permitted unless written permission is obtained from the Engineer at least 48 hours in advance. If the Contractor receives permission to work on a Saturday, Sunday, or holiday, said time shall be charged against the contract time for "working day" contracts.

#### 108.8 - Guarantee and Warrantee Provisions:

In case of work, materials, or equipment for which written warranties are required by the Standard Specifications or Special Provisions, the Contractor shall provide or secure from the appropriate Subcontractor or supplier such warranties addressed to and in favor of the Flood Control District of Maricopa County and deliver same to the Engineer prior to final acceptance of the work.

In the event that the Contractor should fail to make such repairs, adjustments, or other work that may be made necessary by defects in workmanship or materials, the Flood Control District of Maricopa County may cause the work to be properly done in accordance with the provisions of the Contract Documents and to pursue whatever recourse it deems necessary to recover from the Contractor any additional expense or cost it may have incurred. The Performance Bond shall remain in full force and effect throughout the guarantee period.

#### 108.9 - Failure to Complete on Time:

In addition to the requirements of Subsection 108.9 of the Standard Specifications:

Traffic Control will not be paid for by the Flood Control District of Maricopa County after the expiration of the Contract time specified for the completion of the work under Subsection 108.7 of the Special Provisions, including any time extensions granted, although necessary traffic control devices and personnel shall remain in place and be modified and maintained as required

by the Standard Specifications, Special Provisions, and the Engineer.

The schedule of Liquidated Damages, Table 108, of the Standard Specifications shall be the basis for computing the amount of liquidated damages should such be assessed on this project.

When the work specified in the contract is not completed within the number of calendar days or working days specified therein, engineering and inspection expenses incurred by the Flood Control District of Maricopa County upon the work from the contract time originally fixed in the contract to the final date of completion of the work may be charged to the Contractor and may be deducted by the Flood Control District from the final monies due to the Contractor. Consideration of any extra work or change order added to the original contract, as well as extenuating circumstances beyond the control of the Contractor, will be given due consideration by the Flood Control District before assessing engineering and inspection charges against the Contractor. Such charges will be assessed, however, in cases where the work has been unduly delayed by the Contractor because of unwarranted reasons, inefficient operation or for any other reason for which the Flood Control District determines the Contractor liable.

The assessing of engineering charges shall be in addition to Liquidated Damages as provided for above.

Nothing contained in this section shall prohibit the Flood Control District from deducting from monies due or to become due to the Contractor any other costs incurred by the Flood Control District directly attributable to the delay in completing the Contract.

#### 108.10 - Forfeiture and Default of Contract:

If, in the judgement of the Engineer, the Contractor, in connection with any job or jobs assigned hereunder, refuses or fails to supply a sufficient number of workmen, or the proper quality of material, or the required equipment, or refuses or fails in any respect to carry on the work in a workmanlike manner with promptness and diligence, or violates any of the terms or conditions of the Contract Documents, such refusal, failure or violation shall constitute a default by the Contractor under this Contract, and in such event the Owner may give the Contractor twenty-four (24) hours written notice to remedy such default. Upon the failure of the Contractor to remedy such default within such time, the Owner shall be relieved of any further duties or obligations hereunder and the Owner reserves the right to remove the Contractor from the job, to take over any or all labor, materials and appliances on the ground, and to complete or have completed any part or all of the individual work assignments then in progress.

108.12 - Temporary Suspension of Work:

The Engineer shall have the authority to suspend the work wholly or in part, for such period as he may deem necessary, due to unsuitable weather, or to such other conditions as are considered unfavorable for the suitable prosecution of the work, or for such time as he may deem necessary due to the failure on the part of the Contractor to carry out orders given, or to perform any provision of the Contract. The Contractor shall immediately comply with the written order of the Engineer to suspend the work wholly or in part. The suspended work shall be resumed when conditions are favorable and methods are corrected, as ordered or approved in writing by the Engineer.

In the event that a suspension of work is ordered as provided above, and should such suspension be ordered by reason of the failure of the Contractor to carry out orders or to perform any provision of the Contract, or by reason of weather conditions being unsuitable for performing any item or items of work, which work, in the sole opinion of the Engineer, could have been performed prior to the occurrence of such unsuitable weather conditions had the Contractor diligently prosecuted the work when weather conditions were suitable, the Contractor, at his expense, shall do all the work necessary to provide a safe, smooth, and unobstructed passageway through construction for use by public traffic during the period of such suspension as provided in Subsection 107.6, "Public Convenience and Safety," and as specified in the Special Provisions for the work. In the event that the Contractor fails to perform the work above specified, the County will perform such work and the cost thereof will be deducted from moneys due or to become due the Contractor.

In the event that a suspension of work is ordered by the Engineer due to unsuitable weather conditions, and in the sole opinion of the Engineer, the Contractor has prosecuted the work with energy and diligence prior to the time that operations were suspended, the cost of providing a smooth and unobstructed passageway through the work will be paid for as extra work as provided in Subsection 104.2 - Alteration of work, or at the option of the Engineer, such work will be performed by the Department at no cost to the Contractor.

If the Engineer orders a suspension of all of the work or a portion of the work which is the current controlling operation or operations, due to unsuitable weather or to such other conditions as are considered unfavorable to the suitable prosecution of the work, the days on which the suspension is in effect shall not be counted against the Contract time set forth under Subsection 108.7.

If suspension of work is ordered by the Engineer, due to the failure on the part of the Contractor to carry out orders given

or to perform any provision of the Contract, the days on which the suspension order is in effect shall be counted against the Contract time set forth under Subsection 108.7

In the event of a suspension of work under any of the conditions set forth in this Subsection, such suspension of work shall not relieve the Contractor of his responsibilities as set forth in Section 107, "Legal Relations and Responsibility to the Public."

## SECTION 109 - MEASUREMENTS AND PAYMENTS

In lieu of the requirements for Subsection 109.5 - Actual Cost Work, the following shall apply:

The value of extra work performed in accordance with the requirements and provisions of Section 109 shall be determined by the Engineer in one or more of the following ways:

(A) By unit bid prices or lump sum, either as set forth in the original proposal or as agreed upon by both the Contractor and the Engineer and stipulated in the change orders authorizing the work. Should both parties fail to agree on a basis of payment, the Engineer may order the work done on an actual cost basis.

(B) By actual cost, for which reimbursement will be based in the following manner.

- (1) LABOR: The actual wages paid as shown by the payrolls of the Contractor plus 15 percent, for labor and foreman in direct charge of the work, or a proportionate amount of wages paid to foreman directly in charge of the work, but not exclusively engaged in direct supervision of such work.
- (2) MATERIALS: The invoice costs, plus 15 percent, for materials actually used in the work and accepted by the Engineer including any transport charges paid by the Contractor.
- (3) EQUIPMENT: For other than small tools and manual equipment, the use of which has been authorized by the Engineer, the Contractor will be paid in accordance with the latest approved schedule of Equipment Rental Rates of the Arizona Department of Transportation, unless another rate is agreed upon, in writing, before the work is started. No percentage will be added to any of these equipment rental rates.
- (4) BONDS, INSURANCE, AND TAXES: The actual cost, plus six percent (6%), when such can be shown to have been paid for property damage, liability, and Workman's Compensation Insurance premiums, unemployment insurance contributions and social security taxes.
- (5) STATEMENTS: No payment will be made for work performed until the Contractor has furnished the Engineer with duplicate, itemized statements of the cost of such work, detailed as follows:
  - a. Name, classification, date, daily hours, total hours, rate and extension for each laborer and foreman.

- b. Quantities of materials, prices, extensions, and transportation costs. These charges shall be submitted with the reports or, if not available, they shall be submitted with subsequent reports. In the event vendor's invoices are not submitted within fifteen (15) days after acceptance of the work, the Maricopa County Flood Control District reserves the right to establish the cost of such materials at the lowest current price at which said materials are available in the quantities concerned, delivered to the location of the work.
  - c. Designation, dates, daily hours, total hours, rental rate, and extension for each unit of equipment.
  - d. Cost of property damage, liability, and Workman's Compensation Insurance premiums, unemployment insurance contribution and social security taxes.
- (6) Labor and equipment hours, and materials incorporated into the work shall be documented on a daily basis on a form approved by the Engineer. The Engineer will compare his records with the statements furnished by the Contractor, resolve any differences and make the necessary adjustments. When the actual equipment hours, labor hours, and materials are agreed upon and signed by both parties, it shall become the basis of payment for the work performed.
- (7) In the case where the actual cost work is performed by a Subcontractor, the above percentages will be added only once to the actual statement costs of the work; however, the Contractor may add five percent (5%) to the Subcontractor's costs, for labor and materials only, to cover his own overhead.
- (8) The Engineer is in charge of actual cost work and has the authority to direct which labor and equipment will be used, suspend operations, and refuse to pay for any labor and/or equipment which he feels is not doing productive work.

(C) By Force Account. Should both parties fail to agree on the above basis of payments, the Engineer may have the work done or cause the work to be done, by in-house forces or by parties or means other than the Contractor, by force account. This work shall not invalidate the Contract nor release the surety.

## SECTION 120 - CORRECTIVE REQUIREMENTS FOR DEFICIENCIES

### 120.1 - General:

It is recognized that variations from specifications may be classified as defects and vary in degree in their effect on the quality of the work.

In cases of failure to meet specifications, the Contractor may be given the option of removing and replacing the material at his own expense or accepting a payment adjustment. This option will be determined by the Engineer.

Penalties described below are for acceptance procedure only, not for approval procedure. On approval stage any material which is not within specifications will be rejected. For additional testing of corrected materials, the Contractor will be charged, said charges being deducted from his payment estimate. The quantity of defective material that the Contractor will be penalized for will be based on the ratio of tests showing deficiencies to the total number of tests taken.

In addition to the assessment of penalties, if defective material is found during production, production shall cease immediately and shall not begin again until calibration tests indicate that material is within specification limits.

### 120.3 - Portland Cement Concrete Lining:

Corrective requirements for deficiencies under this Subsection shall apply to Portland Cement concrete bank protection, spillways, aprons and sidewalks, shotcrete, gunite, and other similar items as required by the Engineer.

Concrete lining, which is cracked, damaged during the course of construction, or fails to meet the straightedge requirements of Subsection 340.3 (sidewalk only) shall be removed from joint to joint, or if the cracking or damage is confined to the middle portion of a panel, sawcut, so long as the remainder of the panel is not less than seven (7) feet wide, and replaced, all at no cost to the Flood Control District of Maricopa County.

When, in the opinion of the Engineer, there is reason to believe that the concrete lining is deficient in thickness, one core will be taken by the Engineer for every 500 linear feet, or fraction thereof, of the lining in question. When a deficiency of more than 1/4 inch is found, additional cores will be taken in order to isolate the deficient area.

Where lining thickness is deficient by 1/4 inch or less, payment will be made at the Contract unit price.

Where the deficiency exceeds 1/4 inch, but is less than or equal to 25 percent of the design thickness shown on the plans, payment for the deficient area will be adjusted based on the following formula.

$$\frac{\text{Core Thickness}}{\text{Design Thickness}} \times \text{Contract Unit Price} = \text{Adjusted Unit Price}$$

Where the deficiency exceeds 25 percent of the design thickness, the lining shall be removed and replaced, from joint to joint, at no additional cost to the Flood Control District of Maricopa County.

## SECTION 201 - CLEARING AND GRUBBING

This work shall consist of clearing, grubbing, removing, and disposing of all trees, brush, stumps, roots, rubbish, debris, and miscellaneous structures not covered under other contract items within the construction area. The Contractor shall clear such additional areas within the limits of the right-of-way and easement lines as specified or directed. Work under this item shall be progressed on the basis that NO BURNING will be permitted on or off the contract site. All wood and brush shall be disposed of within seven (7) calendar days after cutting or felling unless otherwise approved. Clearing and grubbing within the limits of easement lines will be delineated by the Engineer. Additionally, the Contractor shall remove all trash, brush, stumps, building materials, tires, sludge, and other miscellaneous debris from gravel pits within the "levee foundation area" as delineated in the project plans. Material removed from the "levee foundation area" may be disposed of in areas of the gravel pit that are not within the proposed channel or levee foundation, yet within the right-of-way.

The Contractor shall take care to confine his operations to the areas so specified. Cacti shall be removed by the Contractor. Removal of cacti by the Contractor shall be in accordance with the "Arizona Native Plant Law," A.R.S. Chapter 7.

Superseding the requirements of Subsection 201.5 - Payment, of the Standard Specifications:

Payment for clearing and grubbing will be made on a lump sum basis for work satisfactorily completed. Monthly payments will be made in proportion to the amount of work done as determined by the Engineer. Damages to existing facilities incurred during this work shall be repaired by the Contractor at no additional cost to the Flood Control District.

All other details for this item of work shall conform to Section 201 of the Standard Specifications.

## SECTION 203 - CHANNEL EXCAVATION

This item of work shall include excavation, removal of existing levees and bank protection, gravel pit backfill, watering, grading, shaping, and compaction. Excavated material, exclusive of old tires, rubbish, and other objectional materials, shall be used in fill areas and other areas within the project limits as directed by the Engineer. The Contractor's notice is directed to the fact that the upper four (4) feet of existing overbank material west of the channel control line between station 0+00 and Station 25+00 of the west levee construction centerline shall not be incorporated into any soil stockpile or soil-cement mixture, unless blending with the clean in-situ sands from the channel is done as necessary to obtain the required soil gradation. Material excavated from this area may be utilized to backfill existing gravel pits, construct the earthen portion of levees, or be disposed of within the project limits as directed by the Engineer.

Embankment/fill, where designated, shall be placed in eight (8) inch loose lifts and compacted to 90.0 percent of maximum density as determined by Arizona Test Method 225.

At the time of compaction, the moisture content of material to be used in fill areas shall be such that the specified relative compaction will be obtained and the fill will be firm and unyielding. Material containing excessive moisture shall not be compacted until the material is dry enough to obtain the required relative compaction. Compensation for additional work involved in drying fill material to the required moisture content shall be considered as included in the contract price for Channel Excavation and no additional compensation will be allowed.

In areas of embankment/fill, material shall be placed such that side slopes do not exceed a 2 to 1 slope, except as noted on the plans or approved or directed, in writing, by the Engineer.

Prior to commencing any excavation work, the Contractor shall notify the appropriate utility companies and arrange to have company line spotters present. The Contractor shall take full responsibility for costs incurred due to damage to utilities as a result of excavation or embankment operations. Utility locations shown are approximate and all utilities are not necessarily shown.

The Contractor shall provide for continued access to private property during and after grading of the right-of-way has been accomplished, as indicated in the Plans. Any deviation from the Plans necessary for this purpose shall first be approved, in writing, by the Engineer. The Contractor shall secure written permission from the appropriate property owner prior to undertaking any work outside the designated right-of-way necessary for

this purpose. No direct payment will be made for this work, the cost being included in the price for Channel Excavation.

Measurement and Payment:

The quantities of Channel Excavation will be measured by the cubic yard, in the original position within the payment limits indicated on the Plans. The Engineer will compute the quantities of Channel Excavation by a method which in his opinion is best suited to obtaining an accurate determination of the material moved. Over-excavation shall not be paid for unless authorized, in writing, by the Engineer.

The Contract unit price for all pay items of work encompassed by this Section, shall be full compensation for furnishing all equipment, labor, and materials as necessary to complete the work of the item, except where specific costs are designated or included in another pay item of work. All incidental costs, such as acquisition of borrow pits or material outside of the right-of-way, rock drilling and blasting, compaction and special test requirements, stockpiling and rehandling of materials, precautionary measures to protect private property and utilities, to form and trim graded surfaces, and any delays caused by corrective work, shall all be included in the unit price of the pay item where such costs are incurred. When there is no pay item for Construction Water in the itemized proposal, the work shall be performed in accordance with the specifications for the appropriate items but, the costs thereof shall be included in those pay items that require the application of water. Payment shall be made at the Contract unit price for Item 203-Channel Excavation and shall cover all costs of excavation and fill as indicated on the Project Plans. No additional compensation will be made for overhaul required to complete the work.

SECTION 211 - FILL CONSTRUCTION

Subsection 211.5 - Measurements and Subsection 211.6 - Payment are hereby deleted. No measurement or direct payment will be made for fill construction, the cost being considered as incidental to and included in the cost of channel excavation.

Wheel rolling with construction hauling equipment will not be an acceptable method of compaction. Equipment specifically designed for earthwork compaction will be acceptable. If a steel wheel roller is used the resulting smooth surface shall be sufficiently roughened after compaction to insure bond to the succeeding layer.

## SECTION 212 - LEVEES

This item of work shall consist of the construction of earthen levees including watering, grading, shaping and compaction. Levees shall be constructed to a reasonably smooth and uniform surface and in reasonably close conformity to the lines, grades, dimensions, and cross sections shown on the Plans or established by the Engineer.

Levee construction shall not be started until clearing and grubbing for the levee area is completed in accordance with the requirements of Section 201.

Earth material for levees shall be placed in uniform horizontal layers not exceeding eight (8) inches in depth before compaction. Compaction shall be accomplished by rolling, tamping, or other suitable means utilizing equipment specifically designed for earthwork compaction. Wheel rolling with construction hauling equipment shall not be considered an acceptable method of compaction. Each layer of earth material shall be compacted to the specified density before the next layer is placed. Effective spreading equipment shall be used on each layer to obtain uniform thickness prior to compacting. As the compaction of each layer progresses, continuous leveling and manipulation of the material will be required to assure uniform density. Water shall be added or removed, if necessary, in order to obtain the required density. It shall be the Contractor's responsibility to properly place and compact all materials in the levee section, and to correct any deficiencies resulting from improper or insufficient compaction of such materials throughout the contract period.

The top six inches of ground on which levees are to be constructed shall be compacted to a density of not less than 95.0 percent of the maximum density.

Each layer of earth material for levee construction shall be compacted to a density of not less than 95.0 percent of the maximum density.

All determinations of density will be made in accordance with the requirements of Arizona Test Method 225.

During the progression of the work, the Engineer will review the Contractor's operations with regard to the following items:

1. Lift thickness not exceeding the maximum allowed as herein stated. Thinner lifts than the maximum allowed may be necessary to obtain satisfactory results on some materials.
2. The compactive effort is uniformly applied.

3. Significant rutting, under the action of the compactor, on the final passes on a layer does not occur.
4. Proper compaction on a layer is obtained in accordance with the specifications.

Whenever a deficiency is noted in the Contractor's operations, the Engineer will prohibit placement of an overlaying lift until the Contractor takes effective corrective action. When the Engineer determines that density tests are necessary, the Contractor shall provide any assistance requested to facilitate such tests. Such assistance shall include, but will not be limited to, excavation and backfill of test pits and holes. This work shall be considered to be incidental construction.

Damage to any compacted lift at any time during the course of construction, such as rutting under the loads imposed by earth moving equipment, shall be fully repaired by the Contractor, at his own expense, prior to placement of any overlaying material.

#### Measurement and Payment:

The quantities of earth material for levees will be measured by the cubic yard, computed in the final compacted position. Any additional quantity of material required to compensate for foundation settlement, compaction, erosion, or other cause shall not be included in the measurement of this item. The quantities of earth material for levees shall exclude the total volume of pipes, culverts, and bank protection. Quantities shall be computed from the payment lines shown on the Plans. Cross-sectioning, for the exclusive purpose of determining quantities for payment, shall be employed only where payment lines are not shown on the plans, and cannot be reasonably established by the Engineer.

The Contract unit price for Item 212 - Levees, shall include the costs of furnishing all equipment, labor, and materials as necessary to complete the work of the item, except where specific costs are designated or included in another pay item of work. All incidental costs, such as acquisition of borrow pits or material outside of the right-of-way, rock drilling and blasting, compaction and special test requirements, stockpiling and rehandling of materials, precautionary measures to protect private property and utilities, to form and trim graded surfaces, and any delays caused by corrective work, required during the course of construction shall all be included in the unit price of the pay item where such costs are incurred. When there is no pay item for Construction Water in the itemized proposal, the work shall be performed in accordance with the specifications for the appropriate items but the costs thereof shall be included in those pay items that require the application of water. Payment shall be made at the Contract unit price for Item 212 - Levees and shall cover all costs of earthwork placement necessary for levee construction.

## SECTION 215 - EARTHWORK FOR OPEN CHANNELS

In addition to the requirements of the Standard Specifications:

### 215.1 - Description:

Earthwork for open channels shall consist of stripping, canal excavation, and canal embankment, which shall include all excavation and embankment for canals, earthen ditches, wasteways, and other earthwork items appurtenant to canal construction, exclusive of structure excavation and backfill.

### 215.2 - Stripping:

Stripping may be required to remove a layer of very plastic clay, approximately three to four feet deep, where the north canal embankment encroaches into existing gravel yard waste pits. The area that may require stripping extends approximately from Station 11+75 to Station 20+50.

The actual extent and depth of the stripping operations shall be as determined by the Engineer.

### 215.4 - Fill and Backfill:

The material used within the top six (6) feet and the outer six (6) feet of canal embankments shall have a PI less than 10 and meet the following gradation requirements.

<u>Sieve Size</u>	<u>Percent Passing</u>
3"	97 - 100
No. 4	50 - 100
No. 200	5 - 25

The Contractor shall be responsible for providing certification, from an independent testing laboratory, that the above material specifications are being met. At least one (1) test shall be taken on every five (5) thousand tons of material, and in no case less than three (3) tests per material source.

Rounded or sub-rounded cobbles shall not be allowed to exist on finished slopes.

Compaction of embankment material shall conform to the requirements of Section 211, except that the upper two (2) feet of any embankment upon which shotcrete or concrete lining is to be placed shall be compacted to at least 95 percent of maximum density.

Where the north canal embankment encroaches into the existing gravel yard waste pits, between approximate Stations 11+75 and

20+50, a layer of geotextile fabric shall be placed between the new canal embankment and the waste pit material, as shown on the plans. The geotextile fabric shall be Mirafi 2100HP, or approved equal, and shall be installed in accordance with the details shown on the plans, the direction of the Engineer, and the manufacturers recommendations.

Dewatering of the gravel yard waste pit may be required, between approximate Stations 11+75 and 18+15, depending upon conditions encountered at the time of construction. If required, dewatering shall be performed in a manner and to an extent acceptable to the Engineer.

#### 215.7 - Measurement:

Canal excavation will be measured by the cubic yard of material excavated, in its original position, to the lines and grades shown on the plans. Stripping, if required, will be considered incidental to the canal excavation, thus no direct payment will be made for this work.

Canal embankment will be measured by the cubic yard placed, compacted, and in its final position to the lines and grades shown on the plans.

Geotextile fabric will be measured by the square yard, placed as shown on the plans.

Dewatering will be measured on the basis of a dewatering day inclusive of all labor, equipment, and materials necessary to dewater the construction area to the satisfaction of the Engineer. A dewatering day shall be defined as any calendar day during which dewatering of the site is ongoing, exclusive of equipment mobilization and setup and as approved by the Engineer.

#### 215.8 - Payment:

Canal excavation will be paid for at the Contract unit price per cubic yard.

Canal embankment will be paid for at the Contract unit price per cubic yard.

Geotextile fabric will be paid for at the Contract unit price per square yard.

Dewatering, if required, will be paid for on a calendar day basis, as approved by the Engineer.

These prices shall be full compensation for the items complete, including furnishing all material, tools, manpower, equipment, water, and other items necessary to complete the work. No additional compensation will be made for overhaul.

## SECTION 220 - RIPRAP CONSTRUCTION

The requirements of Section 220 of the Standard Specifications are hereby superseded. A new section, Section 220 - Riprap Construction, is hereby established.

### 220.1 - Description:

This work shall consist of furnishing all plant, labor, equipment, and materials and performing all work necessary, including toe excavation, backfill, and dewatering, to place a protective covering of erosion-resistant material on the slopes of embankments, riverbanks, or levees, at culvert inlets and outlets, on bottoms and side slopes of channels, at abutment wings, at structure foundations, at other locations shown on the plans, or as directed by the Engineer. The work shall be done in accordance with these specifications and in conformity with the lines and grades shown on the plans or established by the Engineer. The types of riprap included in this specification are:

- (a) **Dumped Riprap:** Dumped riprap consists of rock that is dumped in place on a filter blanket or prepared slope to form a well graded mass with a minimum of voids.
- (b) **Grouted Riprap:** Grouted riprap consists of dumped riprap with all or part of the rock interstices filled with Portland Cement grout.

### 220.2 - Materials:

#### 220.2.1 - Riprap:

Rock used for riprap shall be sound and durable, free from clay or shale seams, cracks, or other structural defects and shall have a specific gravity of at least 2.50. Rock used to construct riprap shall be angular in shape. Rock shall have a least dimension not less than one third of its greatest dimension. Gradation of riprap shall be as follows:

<u>Rock Size</u>	<u>Percent of Total Smaller Than The Given Size</u>
36"	100
18"	50-70
9"	15-30
4"	0-5

Control of gradation will be by visual inspection. The Contractor shall provide two samples of rock of at least five (5) cubic yards each, meeting the gradation specified herein. One sample shall be provided at the quarry and one

sample at the construction site. The sample at the construction site may be a part of the furnished riprap covering. These samples shall be used as a frequent reference for judging the gradation of the riprap supplied. Any difference of opinion between the Engineer and the Contractor shall be resolved by dumping and checking the gradation of two random truck loads of rock. Mechanical equipment, a sorting site, and labor needed to assist in checking gradation shall be provided by the Contractor at no additional cost to the Flood Control District. No source of rock is designated. It shall be the Contractor's responsibility to negotiate for the material, obtain the right-of-way and pay all applicable royalties and damages.

The source from which the rock will be obtained shall be selected well in advance of the time when the rock will be required in the work. The acceptability of the rock will be determined by the Engineer. If testing is required, suitable samples of rock shall be taken in the presence of the Engineer at least 45 days in advance of the time when the use of the rock is expected to begin. The approval of some rock fragments from a particular quarry site shall not be construed as constituting the approval of all rock fragments taken from the quarry. In the absence of test results from either government agencies or private testing laboratories, resistance to disintegration from the type of exposure to which the rock will be subjected will be determined by any or all of the following tests:

<u>Test</u>	<u>Test Method</u>	<u>Requirement</u>
Specific Gravity (Bulk SSD)	ASTM C127	2.50 (Minimum)
Absorption	ASTM C127	2.0% (Maximum)
Wetting & Drying	Corps of Engineers Std. Test Procedure	No Fracturing After 15 Cycles
Sulfate Soundness	ASTM C88	10% Loss (Maximum)
Abrasion	ASTM C535	50% Loss (Maximum)

In addition, rock shall be subjected to a petrographic and x-ray diffraction analysis if required by the Engineer. Rock shall contain no swelling type clay.

#### 220.2.2 - Gravel Filter Blanket:

The gravel filter blanket shall consist of one or more layers of gravel, crushed rock, or sand of the thickness

shown on the plans. All material shall be composed of durable particles, free of thin, flat, and elongated pieces, and shall contain no organic matter or soft, friable particles in quantities in excess of those approved by the Engineer. Gravel filter material shall meet the following gradation requirements:

<u>Size</u>	<u>Percent Passing Sieve</u>
4"	100
3"	85-100
2"	35-70
1"	0-15
1/2"	0-5

The material shall be tested for durability and soundness in accordance with ASTM C131 with a percentage of wear not to exceed 50% after 500 revolutions.

#### 220.2.3 - Grout:

Grout shall consist of one part Portland Cement, three parts fine aggregate and one-fifth part hydrated lime, by volume. These materials shall be thoroughly dry mixed and sufficient water shall be added to provide a mixture of thick workable consistency.

Portland Cement, fine aggregate and water shall conform to the requirements of Section 725 of the Standard Specifications. Hydrated lime shall conform to the requirements of ASTM C207, Type N.

#### 220.2.4 - Filter Fabric:

Filter fabric for riprap construction shall be Mirafi 600X or approved equal. The Contractor's attention is directed to Standard Specifications Subsection 106.4, Trade Names and Substitutions, when considering the use of an alternate or substitute filter fabric.

Securing pins used to secure the filter fabric in place shall be steel or fiberglass. Each pin shall be 12 inches minimum length and shall be formed as a "U", "L", or "T" shape or contain "ears" to prevent total penetration. Grommets or steel washers with an outside diameter of 1 1/2 inches shall be provided for all but "U" shaped securing pins.

All brands of filter fabric shall be accepted on the following basis:

The Contractor shall furnish the Engineer, in duplicate, a mill certificate or affidavit signed by a

legally authorized official from the company manufacturing the fabric. The mill certificate or affidavit shall attest that the fabric delivered to the site meets the chemical, physical, and manufacturing requirements stated herein and shall contain the following information:

- A. Name of manufacturer.
- B. Name of fabricator.
- C. Chemical composition of geotextile and coating, if any.
- D. Product description and life expectancy.
- E. Statement of specification compliance including the name of this project.
- F. Signature of authorized official attesting to the information presented.
- G. Manufacturer's recommendations for field sewing and repairs.

At least 30 days prior to delivery of geotextile materials to the site, the Contractor shall inform the Engineer of the manufacturer and/or supplier from which he intends to obtain the geotextile materials. The Engineer shall have free access to the site of manufacture and subsequent area of storage for the purpose of obtaining samples for testing. All materials shall be subject to the approval of the Engineer.

During all periods of shipment and storage, the filter fabric shall be protected from direct sunlight, ultra-violet rays, temperatures greater than 140°F, and all objectionable substances. To the extent possible, the cloth shall be maintained wrapped in a heavy duty protective covering.

### 220.3 - Construction Requirements:

#### 220.3.1 - General:

Areas on which riprap is to be constructed shall be cleared, grubbed, excavated, or backfilled in accordance with the Standard Specifications and these Special Provisions. The areas shall be graded and dressed to produce a ground surface in reasonable conformance with the lines and grades shown on the plans or established by the Engineer. All soft or spongy material shall be removed to the depth directed by the Engineer and replaced with approved material. Filled areas shall be compacted as specified in Section 212-Levees.

Placement of riprap, filter fabric, or gravel filter blanket through water will not be permitted unless otherwise approved, in writing, by the Engineer.

#### 220.3.2 - Dumped Riprap:

Rock for riprap shall be placed on the prepared slope or area in a manner which will produce a reasonably well-graded mass of rock with the minimum practicable percentage of voids. The entire mass of rock shall be placed so as to be in conformance with the lines, grades, and thicknesses shown on the plans. Riprap shall be placed to its full course thickness at one operation and in such a manner as to avoid displacing the underlying material. Placing the riprap in layers, or by dumping into chutes, or by similar methods likely to cause segregation, will not be permitted.

The larger rocks shall be well distributed and the entire mass of rock shall conform to the gradation specified in Subsection 220.2.1. All material going into riprap bank protection shall be so placed and distributed that there will be no large accumulations of either the larger or smaller sizes of rock.

It is the intent of these specifications to produce a fairly compact riprap protection in which all sizes of material are placed in their proper proportions. Hand placing or rearranging of individual rocks by mechanical equipment may be required to the extent necessary to secure the results specified.

The Contractor shall maintain the riprap protection until accepted, and any material displaced by any cause shall be replaced to the lines and grades shown on the plan at no additional cost to the Flood Control District.

#### 220.3.3 - Grouted Riprap:

Dumped riprap shall be placed on the prepared slope or area in accordance with the dimensions shown on the plans. The rock shall be thoroughly moistened and any excess fines shall be sluiced to the underside of the riprap prior to grouting.

The grout may be delivered to the place of final deposit by any means that will insure uniformity and prevent segregation of the grout. If penetration of grout is obtained by gravity flow into the interstices, the grout shall be spaded or rodded into the interstices to completely fill the voids in the rock blanket. Pressure grouting shall not unseat the rocks, and after placing by this method, the grout shall be spaded or rodded into the voids. Penetration of

the grout shall be to at least 1/2 the thickness of the dumped riprap. Grout shall fill the interstices to within 1/2 inch of the surface.

The grouted surfaces shall be kept continuously moist for at least seven days, beginning immediately after finishing, by means of either a water spray or fog system capable of being applied continuously or by liquid membrane-forming compound or by polyethylene sheeting conforming to the requirements specified in ASTM C 171 for Moisture Loss and for Thickness. If polyethylene sheeting is used, it shall be white opaque and adjoining sheets shall overlap at least 12 inches and the laps secured to provide an airtight and windproof joint. If liquid membrane-forming compound is used it shall be Type I conforming to the requirements of ASTM C 309 and the application rate shall be 100 square feet per gallon.

At the option of the Contractor, pneumatically placed mortar conforming to the requirements of Section 525 of the Standard Specifications may be furnished in lieu of grout.

#### 220.3.4 - Gravel Filter Blanket:

When indicated on the plans, a gravel filter blanket shall be placed on the prepared slope or area to the full specified thickness of each layer in one operation, using methods which will not cause segregation of the material. The surface of the finished layer shall be reasonably even and free from mounds, depressions, or windrows. Gradation of the gravel filter material shall conform to the requirements of Subsection 220.2.2 of these Special Provisions.

#### 220.3.5 - Filter Fabric:

When filter fabric is required, it shall be placed in the manner and at the locations shown on the project plans. Filter fabric shall be rejected if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation or storage. Filter fabric stored at the site shall be covered with an ultraviolet stabilized tarp to protect it. Filter fabric shall not be exposed to direct sunlight for more than two days. The surface to receive the fabric shall be graded to a relatively smooth condition free of obstructions, projections, depressions, debris, and soft or yielding areas. The fabric shall be placed to provide a minimum 24 inches of overlap for each joint. Where overlaps do not lie flat against each other and the possibility exists that rock could move between the laps, a greater overlap shall be used to insure at least two (2) feet of matted overlap. Fabric shall be laid smooth and free of tension, stress, folds, wrinkles, and creases. On horizontal joints, the uphill strip shall overlap the

downhill strip. On vertical joints, the upstream strip shall overlap the downstream strip.

At vertical laps, securing pins shall be inserted through both layers along a line through the approximate midpoint of the overlap. At horizontal laps, securing pins shall be inserted through the bottom layer only. The pins shall be placed at not greater than four (4) foot intervals. Securing pins shall be placed along a line approximately four (4) inches in from the edge of the outer limits of the completed filter fabric area at intervals not greater than four (4) feet. Additional pins, regardless of location or spacing, shall be installed as necessary to prevent slippage of the filter fabric.

Rock shall be carefully placed on the gravel filter blanket and filter fabric in such a manner as not to damage the fabric. If, in the opinion of the Engineer, the fabric is damaged or displaced to the extent that it cannot function as intended, he will order the Contractor to remove the rock, regrade the area if necessary, and replace the filter fabric.

#### 220.4 - Measurement:

Dumped riprap will be measured by the cubic yard of material placed by computing the surface area measured parallel to the riprap surface and the total thickness of the riprap measured normal to the surface.

Grouted riprap will be measured by the cubic yard of material placed by computing the surface area measured parallel to the riprap surface and the total thickness of the riprap measured normal to the surface.

Gravel filter blanket will be measured by the cubic yard of material placed by computing the surface area measured parallel to the riprap surface and the total thickness of the blanket measured normal to the surface. Filter fabric (i.e., geotextile fabric) will be measured by the square yard, placed as shown on the plans or as directed by the Engineer.

Riprap or gravel filter blanket placed outside the specified limits will not be measured or paid for, and the Contractor may be required to remove and dispose of the excess material without cost to the County.

#### 220.5 - Basis of Payment:

The accepted quantities of dumped riprap, grouted riprap, and gravel filter blanket, and geotextile fabric measured as provided in Subsection 220.4, will be paid for at the Contract unit price per cubic yard, as designated in the bidding schedule. Geotex-

tile fabric shall be paid for at the Contract unit price per square yard as provided in the bidding schedule as Item No. 215.3 - Fabric. These unit prices shall be full compensation for the work, complete in place, including preparation of the work area, toe excavation, backfill, dewatering, and furnishing and installing rock, filter fabric, gravel filter blanket, grout, and other incidental items and operations.

SECTION 221 - SOIL-CEMENT BANK PROTECTION, GRADE-CONTROL STRUCTURE & UTILITY TOWER PROTECTION

221.1 - Description:

The work shall consist of the construction of soil-cement bank protection, grade-control structures, and utility tower protection as required by the Plans, including trench excavation, structure excavation and backfill, and dewatering.

221.2 - Materials:

221.2.1 - Portland Cement:

Portland Cement shall comply with the latest Specifications as approved by the Engineer, for Portland Cement (ASTM C150, CSA A-5, or AASHTO M85). *Low Alca (1)*

221.2.2 - Water:

Water shall be clear and free from injurious amount of oil, acid, alkali, organic matter, or other deleterious substances.

221.2.3 - Aggregate:

The soil used in the soil-cement mix shall not contain any material retained on a one and one-half (1-1/2) inch sieve, nor any deleterious material. Soil for soil-cement shall be obtained from the required excavations, or from other borrow areas approved by the Engineer and stockpiled on the job site as specified herein. The actual soil to be used shall be analyzed by laboratory tests in order to determine the job mix as set forth herein. The distribution and gradation of materials in the soil-cement lining shall not result in lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from surrounding material.

221.3 - Proportioning:

The Contractor shall use the soil aggregate, fly ash content, cement content, and moisture content determined by the Engineer in accordance with laboratory tests. The Contractor shall allow a minimum of eight (8) days for the cement content results. During the course of the work, the Engineer shall adjust the job mix proportions whenever necessary in order to achieve the minimum design strength shown in Subsection 221.8. The Contractor may have a blend overbank silty soils with the clean in-situ sands to maintain ideal soil gradations as specified below and avoid cement overrun. Special blending shall require constructing separate stockpiles for materials to be blended and it shall

be performed by the utilization of the separate storage feed bins at the plant to the satisfaction of the Engineer.

<u>Sieve Size</u>	<u>Percent Passing (Dry Weight)</u>
1-1/2"	98% - 100%
#4	60% - 90%
#200	5% - 15%

Clay and silt lumps larger than one-half (1/2) inch shall be screened out of the raw soil prior to mixing.

The amount of cement required shall be determined by tests performed by the Engineer in accordance with the procedure specified in Subsection 221.11 herein. The required cement content is shown in Subsection 221.9 herein. Testing during the life of the project may require changes in the cement requirements which shall be made promptly by the Contractor at the direction of the Engineer.

#### 221.4 - Equipment:

The soil-cement bank protection, grade-control structure, and utility tower protection may be constructed with any combination of machines and/or equipment, except as noted herein, that will produce a completed soil-cement lining meeting the requirements for soil pulverization, cement and water application, mixing, transporting, placing, compacting, finishing, and curing as provided in these Specifications.

#### 221.5 - Construction Requirements:

##### 221.5.1 - Required Contractor Submittals:

Prior to the start of construction, the Contractor shall submit, in writing, for approval, the following items:

1. The approximate length of soil cement to be placed prior to starting compaction operations.
2. The type of compaction equipment to be used.
3. The number and type of watering equipment to be used.
4. The method used to keep surfaces continually moist until subsequent layers of soil cement are placed.
5. The method used to cure permanently exposed surfaces.
6. The proposed source of soil, if other than required excavations.

#### 221.5.2 - Preparation:

Before soil-cement processing begins, the area on which soil-cement will be placed shall be graded and shaped to lines and grades as shown on the Plans or as directed by the Engineer. The subgrade shall be compacted to a minimum of ninety (90%) percent.

Immediately prior to placement of the soil-cement mixture, the subgrade shall be moistened if necessary. Soft or yielding subgrade shall be corrected and made stable before construction proceeds.

#### 221.5.3 - Mixing:

Soil cement shall be central-plant mixed in an approved twin shaft continuous-flow or batch-type pugmill. The plant shall be equipped with screening, feeding and metering devices that will add the soil, cement (Fly Ash, if utilized), and water into the mixer in the specified quantities. It should also be equipped with a hydraulically or mechanically operated discharge hopper having a minimum capacity of six (6) cubic yards. Scales are required at both the cement feed, and either the soil or total mix feed locations. Each scale shall record weight of the material and have a digital readout, such that the total discharged weight per hour is displayed. Scales shall be calibrated and certified by the Contractor at least forty-eight (48) hours prior to the start of production. The Engineer shall observe the calibration of the plant and scales and approve of same prior to the production of soil cement for the project. The Contractor shall notify the Engineer at least 48 hours in advance of plant calibration. Each scale shall be calibrated to an accuracy of plus/minus 2.0%. Soil and cement shall be mixed sufficiently to prevent cement balls from forming when water is added.

The mixing time shall be that time which is required to secure a homogeneous, intimate, uniform mixture of the soil, cement, and water.

Free and safe access to the plant must be provided to the Engineer at all times for inspection of the plant's operation and for sampling the soil-cement mixture and its components.

#### 221.5.4 - Required Moisture:

At the time of compaction, the moisture content shall not be below optimum and shall not be more than two (2) percentage points above optimum when the mean air temperature during construction hours does not exceed 90 degrees F. When the

mean air temperature does exceed 90 degrees F, or there is a breeze or wind which promotes the rapid drying out of the soil-cement mixture, the moisture content of said mix shall be increased as needed at the direction of the Engineer, but shall be less than that quantity that will cause the soil cement to become unstable during compaction and finishing operations.

#### 221.5.5 - Handling:

The soil-cement mixture, if transported, shall be transported from the mixing area to the embankment in clean equipment provided with suitable protective devices in unfavorable weather. The total elapsed time between the addition of water to the mixture and the start of compaction shall be the minimum possible. In no case shall the total elapsed time exceed thirty (30) minutes. (This time may be reduced by the Engineer when the air temperature exceeds 90 degrees F or when there is a breeze or wind which promotes rapid drying of the soil-cement mixture.)

The Contractor shall take all necessary precautions to avoid damage to completed soil cement by the equipment and to avoid the deposition of raw earth or foreign materials between layers of soil cement. Earth ramps crossing completed soil cement must have at least two (2) foot compacted thickness. Where ramps are constructed over soil cement that is not to grade, all foreign materials and the uppermost one (1) inch of the previously placed soil-cement mixture must be removed prior to continuation of the soil-cement construction.

#### 221.5.6 - Placing:

The mixture shall be placed on the moistened subgrade embankment, or previously completed soil cement with spreading equipment that will produce layers of such widths and thicknesses as are necessary for compaction to the required dimensions of the completed soil-cement layers. The compacted layers of soil-cement shall not exceed eight (8) inches in thickness, nor be less than four (4) inches in thickness.

Each successive layer shall be placed as soon as practicable after the preceding layer is completed and certified.

All soil-cement surfaces that will be in contact with succeeding layers of soil cement shall be kept continuously moist by fog spraying until placement of the subsequent layer, provided that the Contractor will not be required to keep such surfaces continuously moist for a period longer than seven (7) days.

Mixing shall not proceed when the soil aggregate or the area on which the soil-cement is to be placed is frozen. Soil cement shall not be mixed or placed when the air temperature is below forty-five (45) degrees F (7 degrees C), unless the air temperature is at least forty (40) degrees F (5 degrees C) and rising.

#### 221.5.7 - Compaction:

Soil cement shall be uniformly compacted to a minimum of 98% of maximum density as determined by field density tests. Optimum moisture and maximum density shall be determined in accordance with Arizona 221, 222B procedures. Wheel rolling with only hauling equipment shall not be an acceptable method of compaction.

At the start of compaction, the mixture shall be in a uniform, loose condition throughout its full depth. Its moisture content shall be as specified in Subsection 221.5.4 herein. No section shall be left undisturbed for longer than thirty (30) minutes during compaction operations. Compaction of each layer shall be done in such a manner as to produce a dense surface, free of compaction planes, in not longer than one (1) hour from the time water is added to the mixture. Whenever the Contractor's operation is interrupted for more than two (2) hours, the top surface of the completed layer, if smooth, shall be scarified to a depth of at least one (1) inch with a spike-tooth instrument prior to placement of the next lift. The surface, after said scarifying, shall be swept using a power broom or other method approved by the Engineer to completely free the surface of all loose material prior to actual placement of the soil-cement mixture for the next lift.

#### 221.5.8 - Finishing:

After compaction, the soil cement shall be further shaped, if necessary, to the required lines, grades, and cross sections and rolled to a reasonably smooth surface. The face of soil cement above the riverbed shall be trimmed at the end of each days placement.

#### 221.5.9 - Curing:

Temporarily exposed surfaces shall be kept moist as set forth in Subsection 221.5.6.

Care must be exercised to ensure that no curing material other than water is applied to the surfaces that will be in contact with succeeding layers.

Permanently exposed surfaces shall be kept in a moist condition for seven (7) days, or they may be covered with some

suitable curing material, subject to the Engineer's approval. Any damage to the protective covering within seven (7) days shall be repaired to the satisfaction of the Engineer.

Regardless of the curing material used, the permanently exposed surfaces shall be kept moist until the protective cover is applied. Such protective cover is to be applied as soon as practicable, with a maximum time limit of twenty-four (24) hours between the finishing of the surface and the application of the protective cover or membrane. When necessary, the soil cement shall be protected from freezing for seven (7) days after its construction by a covering of loose earth, straw, or other suitable material approved by the Engineer.

#### 221.5.10 - Construction Joints:

At the end of each day's work, or whenever construction operations are interrupted for more than two (2) hours, a transverse construction joint shall be formed by cutting back into the completed work to form a full-depth vertical face.

#### 221.5.11 - Maintenance:

The Contractor shall be required, within the limits of the Contract, to maintain the soil cement in good condition until all work is completed and accepted. Maintenance shall include immediate repairs of any defects that may occur. This work shall be done by the Contractor at his own expense and repeated as often as necessary. Faulty work shall be replaced for a full depth of the layer.

#### 221.6 - Inspection and Testing:

The Engineer, with the assistance and cooperation of the Contractor, will make such inspections and tests as he deems necessary to insure the conformance of the work to the Contract Documents. These inspections and tests may include, but will not be limited to: (1) the taking of test samples of the soil cement and its individual components at all stages of processing and after completion, and (2) the close observation of the operation of all equipment used on the work. Only those materials, machines, and methods meeting the requirements of the Contract Documents shall be approved by the Engineer.

All testing of soil cement or its individual components, unless otherwise provided specifically in the Contract Documents, shall be in accordance with the latest applicable ADOT, ASTM, or AASHTO Specifications in effect as of the date of advertisement for bids on the project.

Testing for proper compaction shall be done on at least every other lift of compacted soil cement at any location chosen by the testing personnel. If the lift being tested does not pass the minimum 98% density requirements, it must be reworked as directed by the Engineer until it passes or be removed at the Contractor's expense. The Contractor shall not be permitted to continued placing lifts of soil cement on any lift which has failed the compaction tests until such time as that lift has been reworked, retested, and passed as to meeting density requirements.

The initial acceptance of material shall in no way preclude further examination and testing at any time, during the course of construction or subsequent warranty period, the Engineer suspects that the material is no longer properly represented by the acceptance sample. The acceptance at any time of any material incorporated into the work shall not bar its future rejection if it is subsequently found to be defective in quality or uniformity.

#### 221.7 - Measurement and Payment:

##### 221.7.1 - Measurement:

This work shall be measured (1) in Cubic Yards of completed-in-place soil-cement slope protection, grade-control structure, and/or utility tower protection as determined by the specified lines, grades, and cross sections shown on the Plans; and (2) in tons of cement incorporated into the soil cement used for tests and for the slope protection, grade-control structure, and/or utility tower protection in accordance with the instructions of the Engineer. Any waste of cement and/or soil cement by the Contractor during the handling, mixing, placing, etc., operations shall not be paid for.

##### 221.7.2 - Payment:

This work shall be paid for at the Contract unit price per cubic yard of soil-cement protection, grade-control structure, and/or utility tower protection and at the Contract unit price per ton of cement furnished, multiplied by the quantities obtained in accordance with Subsection 221.7.1. Such payment shall constitute full reimbursement for all work necessary to complete the soil-cement slope protection, grade-control structures, utility tower protection, dewatering, trench excavation, watering, mixing, placing, compacting, curing, inspection and testing assistance, and all other incidental operations.

#### 221.8 - Mix Design Methodology:

The design requirements for the soil-cement bank protection shall be such that it has a compressive strength of 750 psi at the end

of seven (7) days plus 2% additional cement added for erosion resistance. The minimum acceptance strength shall be that developed as a result of adding 2% cement to the base amount determined. For example, if the mix design shows that 6% cement is required to achieve 750 psi in seven (7) days, the total cement content shall be  $6.0\% + 2.0\% = 8.0\%$ . Hence, the governing strength shall be that strength which is acquired by the mix design at 8%. A 24-hour test will be run to monitor the mix design on a daily basis. Experience has shown that 24-hour compressive strength results for moist cured samples are approximately 50 to 60 percent of the corresponding seven (7) day compressive strength results [moist cured for six (6) day and soaked in water for 24 hours]. In the example cited herein, once the design strength mix of  $6.0\% + 2.0\%$  or  $8.0\%$  cement is determined, a 24-hour test will be run using the mix to obtain a 24-hour compressive strength which will be used to monitor the daily output of the central plant. Seven (7) day samples will also be taken for final acceptance. The amount of cement thus determined by laboratory testing shall continue to be monitored throughout the life of the project with modification as required to meet existing field conditions. This methodology shall also pertain to the development of a mix design for grade-control structures and utility tower protection with the exception that soil cement utilized for the aforementioned purposes shall have a compressive strength of 1000 psi at the end of seven (7) days plus 2% additional cement.

221.9 - Mix Design for This Project:

For bidding purposes only, the estimated mix design for this project shall be as follows:

	<u>Bank Protection</u>	<u>Grade Control &amp; Utility Tower Protection</u>
Base Cement Content	8%	12%
Addition for Durability & Erosion	<u>2%</u>	<u>2%</u>
<u>TOTAL CEMENT REQUIRED</u>	10%	14%

The percent of cement to be used in the mix shall be calculated to be the weight of cement divided by the total weight of the dry compacted soil cement. The actual mix design used on this project shall be determined by laboratory tests on material stockpiled after construction of the stockpile has been completed in accordance with Section 106 - Control of Material.

Fly ash may be used with the approval of the Engineer. A maximum of fifteen (15) percent of the total weight of cement may be replaced with fly ash, in accordance with the requirements detailed in Section 725 of the Standard Specifications. An addi-

tional scale shall be required for the fly ash and shall conform to Section 221.5.3 - Mixing, of these Special Provisions. Fly ash shall be paid for per ton used, at the Contractor's cost plus 15% for handling and profit.

221.10 - Stockpiling of Aggregate:

Soil aggregate stockpile shall be constructed on level, firm ground free of brush, trees, stumps, roots, rubbish, debris, and other objectionable or deleterious material and shall be located so as to provide a distance of not less than fifty (50) feet from the outside bottom edge of the conical stockpile built up under the processing plant conveyor or any other existing stockpile. The stockpile shall be constructed in layers, each layer not exceeding two (2) feet in thickness. Ramps formed for stockpile construction shall be of the same material as that being stockpiled, and will be considered a part of the stockpile. Before steepening a ramp, any contaminated surface material shall be removed.

Stockpiled material should be thoroughly mixed throughout its depth, width, and length before utilization. The material should be homogeneous and uniform in color, gradation, and moisture throughout. Stockpiled material shall conform to the requirements of Section 106 - Control of Material, as revised by these Special Provisions.

Stockpile sampling will be done by the Engineer after the required amount of soil aggregate for the entire soil-cement job has been excavated and stockpiled. After the stockpile has been sampled and approved, no material will be added to it without approval of the Engineer.

Stockpile(s) shall be completed and approved at least eight (8) days prior to start of soil-cement production. Mix design shall then be performed by the Engineer, to determine job mix proportions.

221.11 - Testing Procedure for Determination of Cement Content Required for Soil-Cement Mixtures (A Modification of Arizona 220 Test Method):

221.11.1 - Description:

- (A) This method of test is intended for determining the percentage of Portland Cement required in developing soil-cement mixtures by the determination of the compressive strength of molded specimens at varying cement contents.
- (B) Equipment Required:

- (1) Mold - A cylindrical metal mold having a capacity of 1/30 cubic foot with an internal diameter of 4.0 plus/minus .005 inch and a height of 4.585 plus/minus .005 inch equipped with a detachable collar approximately 2-1/2 inches in height.
- (2) Rammer - A metal rammer materially or mechanically operated having a 2 inch diameter circular face and weighing 5.5 lbs. The rammer shall be equipped with a suitable arrangement to control the height of drop to a free fall of 12 inches above the elevation of the cement treated mixture.
- (3) Balance - A balance or scale of at least 5 kg. capacity sensitive to 0.5 gm.
- (4) Drying Oven - A thermostatically controlled drying oven capable of maintaining a temperature of 230 degrees plus/minus 9 degrees F (110 degrees plus/minus 5 degrees C).
- (5) Straightedge - A rigid steel straightedge 12 inches in length having one beveled edge.
- (6) Sieve - 3/4 inch sieve conforming to the requirements of the Specifications for sieves for Testing Purposes (ASTM E11-81 and AASHTO M92).
- (7) Miscellaneous mixing tools and pans.
- (8) Speedy Moisture Tester (optional).
- (9) Equipment required for the determination of the Compressive Strength of Cylindrical Concrete Specimens (ASTM C39, C42, C511).

#### 221.11.2 - Sample Preparation:

- (A) If the sample is damp when received, it shall be dried until it becomes friable under a trowel. Drying may be accomplished by air drying or by the use of drying apparatus such that the temperature of the sample does not exceed 140 degrees F (60 degrees C).
- (B) After drying prepare the sample for testing by separating the aggregate retained on the 3/4 inch sieve and breaking up the remaining soil aggregations to pass the 3/4 inch sieve in a manner which will avoid reducing the natural size of individual particles.
- (C) Select and prepare eight separate test charges of dry soil cement of approximately 2500 gm. each. Two

samples are to be made for every cement percentage selected.

- (D) Add the first of the cement contents to be used and mix thoroughly together.

Example: If the percent cement selected is 10%

Dry Soil Weight = 2250 gms. (90%)

Portland Cement = 250 gms. (10%)

TOTAL = 2500 gms. (100%)

- (E) The moisture content to be added to each test charge is determined by making a maximum density-optimum moisture determination with the anticipated required cement content (according to AASHTO T 99-74 Method C) and using this developed optimum-moisture thereafter for all specimens prepared.

### 221.11.3 - Compaction:

- (A) Form a specimen by compacting a prepared mixture in the mold with the collar attached in three equal layers to give a total compacted depth of 5 inches. Compact each layer by applying 25 uniformly distributed blows from a 5.5 lb. (2.5 kg.) rammer dropping free from a height of 12 inches (305 mm). Following compaction, remove the extension collar, carefully trim the compacted mixture even with the top of the mold by means of a straightedge and weigh. Multiply the weight of the specimen (in gms.) by 0.06614 to obtain the wet weight per cubic foot. The factor 0.06614 is valid only if the volume of the mold is 1/30 cubic foot. If calibration shows any change in volume, a new factor shall be calculated.

NOTE: Assuming the mold has a volume of 1/30 (0.0333) cubic foot the factor is derived as follows:

$$.06614 = \frac{1}{0.0333 \text{ cu. ft.} \times 453.6 \text{ g./lb.}}$$

In case of a change in volume of the mold 0.0333 cu. ft. shall be replaced by the decimal fraction for the new volume.

- (B) Compact a duplicate specimen in the same manner as Step (A).
- (C) Extrude both samples from their respective molds using caution and place on glass or non-absorptive plates and

store for curing in a moist condition, (i.e., a moist cabinet or a Moist Room meeting the requirement of ASTM C511-80).

- (D) Determine the moisture content of the prepared samples from the residue.
- (E) Determine the Wet Density and Dry Density of the samples.
- (F) Repeat steps (A) through (D) on additional samples with increased cement content (in 2% increments) until a complete bracketing of specification requirements is met.

221.11.4 - Determination of Compressive Strength:

- (A) All specimens must be cured as specified in a moist condition for six (6) days and then immersed for a period of 24 hours in water maintained at 73.4 plus/minus 3 degrees F (23 plus/minus 1.7 degrees C).
- (B) Specimens shall then be prepared for the compression test in accordance with ATSM C617.
- (C) The compressive strength of the cylinders shall then be determined in accordance with ASTM C39 and ASTM C42.
- (D) The results shall be reported in a format similar to that shown in the following report form.

MARICOPA COUNTY FLOOD CONTROL DISTRICT  
SOIL-CEMENT COMPRESSIVE STRENGTH TEST REPORT

MATERIAL \_\_\_\_\_ PROJECT NAME \_\_\_\_\_  
 IDENTIFICATION \_\_\_\_\_ LOT NUMBERS \_\_\_\_\_  
 SOURCE OF SAMPLE \_\_\_\_\_ CONTRACTOR \_\_\_\_\_  
 LOCATION OF SUPPLY \_\_\_\_\_ SAMPLED BY \_\_\_\_\_ DATE \_\_\_\_\_

% Cement By Weight									
I.D. Number									
Diameter (D)									
Area (In <sup>2</sup> )									
Height (L)									
Max. Load (LBS.)									
Compressive Strength (PSI)									
ASTM C42	L/D								
	Correction Factor								
Corrected Compressive Strength (PSI)									
Moisture %									
Wet Density - PCF									
Dry Density - PCF									
Time Sampled									
Location Placed (STA.)									

Tested By \_\_\_\_\_ Date \_\_\_\_\_ Reviewed By \_\_\_\_\_ Date \_\_\_\_\_

Remarks \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

SECTION 225 - WATERING

In addition to the requirements of the Standard Specifications:

225.1 - Description:

The work under this section shall consist of furnishing and applying all water required for the control of dust as considered necessary, by the Engineer, for the safety and convenience of the traveling public, for the reduction of the dust nuisance to adjacent property, and for other purposes as directed by the Engineer.

The Contractor shall obtain the necessary permits required under the County Air Pollution Statutes. It shall be the responsibility of the Contractor to keep the construction site sufficiently moistened to the satisfaction of the Engineer, in order to control dust pollution.

225.3 - Construction Equipment:

The use of pressure pumps and spray bars on all sprinkling equipment used for the application of water will be required. The use of gravity flow spray bars and splash plates will not be permitted.

## SECTION 350 - REMOVAL OF EXISTING IMPROVEMENTS

In addition to the requirements of the Standard Specifications:

### 350.1 - Description:

This work shall consist of the removal of portions of the existing Roosevelt Irrigation District flume within the transition areas specified on the plans and in the vicinity of the Agua Fria River levees, the removal and relocation of an existing 7'x14' bridge, well abandonment, and the removal of existing fence, buildings, concrete pads, irrigation structures, canal and ditch lining, culverts, conveyor conduit, and other miscellaneous items as shown on the plans as being within the limits of the transition area between the new canal and the existing canal. The flume structure existing outside the transition and levee areas shall be removed by the Roosevelt Irrigation District at a future time. The Contractor shall closely coordinate the removal of the existing flume with the Engineer and the Roosevelt Irrigation District. Removal of the existing flume structure from service shall be scheduled during the Irrigation District's approximate 30 calendar day shutdown occurring approximately during December. The Contractor's attention is directed to the requirements regarding removal of the existing flume structure found on Page SP-3 of these Special Provisions.

### 350.2 - Construction Methods:

The existing Roosevelt Irrigation District flume structure shall be removed to a minimum depth of three (3) feet below finished grade; however, the piers and pile caps shall in any case be completely removed. Existing piles, where necessary shall be cut at or below the specified depth. All material removed from the flume structure shall remain the property of the Roosevelt Irrigation District and shall be stored in areas approved by the Irrigation District or as directed by the Engineer.

All other materials, unless designated on the plans or by the Engineer as to be salvaged or relocated, shall become the property of the Contractor and shall be immediately removed from the job site.

### 350.4 - Payment:

Payment for removal of all existing improvements except the Roosevelt Irrigation District flume will be made at the Contract lump sum price for Removal of Existing Improvements. Payment for removal of the Roosevelt Irrigation District flume within the limits specified on the plans will be made at the Contract lump sum price for Removal of Existing Flume. These lump sum prices shall be full compensation for the items complete, as described herein or on the plans.

## SECTION 421 - WIRE FENCE

### 421.1 - Description:

The work under this section shall consist of furnishing all material and constructing barbed wire fence and gates at the locations and in accordance with the details shown on the plans. Fences and gates shall be of the types and sizes shown on the plans and shall be constructed in accordance with the requirements of these specifications.

### 421.2 - Materials:

#### General:

All fencing material will require written approval by the Engineer prior to being incorporated into the work.

#### Posts and Braces:

Line posts shall conform to the requirements of ASTM A702, except that packaging of posts will not be required. Posts shall be not less than six (6) feet long. The type of post furnished, tee, channel or U, or Y type, shall be the same throughout the project.

End, corner, pull, latch and gate posts, and braces shall conform to the requirements of ASTM A702, for uprights and braces.

Posts and braces shall be painted green.

#### Concrete:

Concrete for post footings shall be Class B concrete conforming to the requirements of Section 725.

#### Barbed Wire:

Barbed wire shall be 2 strand, 12 1/2 gauge steel wire with 2 point, 14 gauge barbs spaced five inches apart and shall be either zinc coated or aluminum coated. Zinc-coated steel wire shall conform to the requirements of ASTM A121, Class 1 coating. Aluminum-coated steel wire shall conform to the requirements of ASTM A585, Type I, Class 1 coating.

#### Stays and Fasteners:

Stays shall be 9 gauge twisted wire designated for screw-on type installation. Stays shall be zinc-coated steel of good commercial quality. The minimum weight of zinc coating shall be 0.3 ounce per square foot of uncoated wire surface.

Tie wires, hog rings, and post clips shall be zinc-coated steel of good commercial quality and shall be of the same gauge as the fence fabric being fastened. The minimum weight of zinc coating shall be 0.3 ounce per square foot of uncoated wire surface.

Gates:

Gates shall be constructed so that each line of wire will be securely attached to the corner post and to the gate stay. The two vertical wire stays, placed within the gate shall be equally spaced. Below the bottom fence wire, a double strand of steel wire shall be placed around the gate-stay corner post, forming a loop of such size that it will accept the bottom end of the gate stay. A gate closer shall be attached to the gate stay corner post, as shown on the plane, so as to draw the fence to a taut position when the gate is closed.

The gate stay shall be clear select Douglas fir, four inches in diameter. The steel gate closer shall be manufactured from the same grade of steel as for the line posts.

421.3 - Construction Requirements:

General:

In areas where there is livestock, the Contractor shall take all measures necessary to restrict the livestock to the land where it is being kept when such measures are made necessary by the removal of existing fences, gates, or cattle guards during the performance of the Contractor's work. The Contractor shall furnish all materials and construct temporary fence, gates, and cattle guards as may be necessary to restrict the livestock as specified.

Existing fences that are to remain in place and which have been damaged by the Contractor's operations shall be replaced or restored by the Contractor at his expense in accordance with the provisions of Subsection 107.9.

The Contractor shall clear the fence lines of all earth, trees, brush, and other obstructions which interfere with the proper construction of the fences, unless the Engineer orders certain trees to remain in place. Disposal of removed material shall be in accordance with the requirements of Section 201.

Setting Fence:

Fence posts shall be spaced at the intervals and set to the depths shown on the plans.

In determining the post spacing, measurements shall be made parallel to the ground slope, and all posts shall be placed in a

vertical position, except in unusual locations where the Engineer may direct that the posts be set perpendicular to the ground surface.

Line posts may be driven into undisturbed earth providing driving does not injure the posts. All voids around the post shall be backfilled and the material thoroughly tamped.

End, corner, pull, latch and gate posts, and braces shall be set in concrete footings crowned at the top to shed water.

Any high points which interfere with the placing of wire-fence fabric shall be excavated to provide the clearances shown on the plans.

Changes in the horizontal alignment of the fence line where the angle of deflection is 15 degrees or more shall be considered as corners and a corner post assembly shall be installed. Changes in fence alignment where the angle of deflection is less than 15 degrees but more than five degrees shall be considered as alignment angles and diagonal tension wires shall be installed. The diagonal tension wires shall consist of two twisted steel wires and shall be attached to the adjacent line posts.

Where the fence line intersects a cross fence, the wires of the existing cross fence shall connect to an end post assembly as shown on the plans.

Connecting fence assemblies with braces for every direction of strain shall be placed at the junction with new fences.

Intermediate posts assemblies shall be installed at not more than 650-foot intervals between other braced posts. After post assemblies have been placed, the barbed wire shall be pulled taut to the satisfaction of the Engineer, and each longitudinal wire shall be cut and securely fastened to the braced post with devices customarily used for the purpose. Barbed wire shall not be carried past a post assembly, but shall be cut and fastened to the post independently of the adjacent spans. A maximum of two splices on barbed wire will be permitted between post assemblies, but not on the same wire. No splice shall be placed closer than 100 feet to any post assembly.

Where fence lines are interrupted by openings for gates and cattle guards, intermediate post assemblies shall be installed at both sides of the opening at a distance of one panel width from the end of the opening.

After the tensioning of the barbed wire between two post assemblies, all longitudinal wires shall be attached to each intervening line post at the height and spacing as shown on the plans. The distance from the bottom wire to the ground may vary

at any one point from that shown on the plans four inches plus or minus. Where abrupt changes occur in the fence line grade, intermediate line posts may be required to maintain proper distances between the bottom wire and the ground.

Spacing of the twisted vertical wire stays shall be as shown on the plans. The vertical wire stays shall be woven into every horizontal wire.

At all grade depressions where stresses tend to pull the posts from the ground, the affected fence posts shall be anchored in concrete or the fence wires shall be weighted with concrete sag weights. The volume of concrete required to anchor the posts shall be not less than one cubic foot. Fence sag weights shall weigh not less than 100 pounds and shall be made with a wireloop hanger embedded in the concrete. A double strand of wire shall be attached to each horizontal line of barbed wire and tied to the wire loop hanger of the sag weight.

#### 421.4 - Method of Measurement:

Barbed wire fence will be measured by the linear foot. Measurement will be made along the top of the completed fence from outside to outside of end posts, excluding the widths of gate and cattle guard openings. Corner posts will be considered as included in the measurement of the completed fence.

Gates will be measured as a complete unit in place by the width of the gate opening. A gate unit complete in place shall include the wire gate with vertical stays, gate stay, and gate closer.

#### 421.5 - Basis of Payment:

The accepted quantities of fences and gates, measured as provided above, will be paid for at the Contract unit price per linear foot for barbed wire fence and per each for gates, designated in the bidding schedule, complete in place.

The Contract unit price paid per linear foot for fence and for gates shall be full compensation for clearing the fence line and disposing of the resulting material; excavating and backfilling holes; furnishing and placing concrete footings; connecting new fences to structures and existing cross fences; and constructing temporary fences, gates, and cattle guards to control livestock.

## SECTION 505 - CONCRETE STRUCTURES

In addition to the requirements of the Standard Specifications:

### 505.1 - Description:

The work under this Section shall include constructing the concrete wasteway structure, side channel spillway, sand trap, outfall apron, siphon inlet transition, siphon outlet transition, conveyor conduit saddle, headwalls, and other concrete structures not specifically covered under other sections, as shown on the plans and in conformance with the requirements of the Standard Specifications.

### 505.10 - Payment:

Concrete structures will be measured by the cubic yards of concrete and pounds of reinforcing steel, placed to the lines and grades shown on the plans or as directed by the Engineer.

The accepted quantities of concrete structures, measured as provided above, will be paid for at the Contract unit prices specified in the bidding schedule, which prices shall be full compensation for the items, complete in place, including furnishing all materials, labor, tools and equipment, and performing all work necessary to completed the item in accordance with the details shown on the plans, the requirements of the Standard Specifications and Special Provisions, and the direction of the Engineer.

## SECTION 515 - STEEL STRUCTURES

In addition to the requirements of the Standard Specifications:

### 515.1 - Description:

The work under this section shall consist of the construction and/or installation of the siphon inlet transition safety rack, debris racks, catwalk, sluice gates, gate lifts, and flap gates.

Where the Contract Documents contain proprietary references pertaining to the items of work under this section, the Contractor's attention is directed to Subsection 106.4 - Trade Names and Substitutions of the Standard Specifications.

### 515.6 - Measurement:

Steel structures will be measured by the unit installed, placed at the locations shown on the plans and the direction of the Engineer.

### 515.7 - Payment:

The siphon inlet transition safety rack, catwalk, and flap gates will be paid for at the Contract unit price per each. Sluice gates will be paid for at the Contract unit price per each, including gate lifts and lift stems. These prices shall be full compensation for the work, including furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in furnishing and placing the materials, complete in place, as shown on the plans, specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

## SECTION 526 - SHOTCRETE CANAL LINING

### 526.1 - Description:

The work under this section shall consist of furnishing all materials and applying shotcrete on prepared surfaces of canals, ditches, slopes under bridge structures and to other similar construction at the locations and in accordance with the details shown on the plans and the requirements of these specifications.

Shotcrete shall be concrete conveyed through a hose and pneumatically applied using the wet-mix process.

The wet-mix process shall consist of premixing by mechanical methods a proportional combination of Portland Cement, aggregate, and water required to produce concrete, and conveying the concrete through the delivery hose to the special nozzle where additional compressed air is added at the nozzle prior to its discharge.

### 526.2 - Materials and Equipment:

#### Portland Cement and Water:

Portland Cement and mixing water shall conform to the requirements of Section 725.

#### Fine Aggregate:

Fine aggregate shall conform to the requirements of Section 725, except that it shall conform to the following gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>
3/8 inch	100
No. 4	95 - 100
No. 8	80 - 100
No. 16	50 - 85
No. 30	25 - 60
No. 50	10 - 30
No. 100	2 - 10

#### Coarse Aggregate:

Coarse aggregate shall conform to the requirements of Section 725, except that it shall conform to the following gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>
1/2 inch	100
3/8 inch	85 - 100
No. 4	10 - 30
No. 8	0 - 10
No. 16	0 - 5

**Admixtures:**

Admixtures may be used with the concrete and shall conform to the requirements of Section 725.

**Reinforcing Steel:**

Reinforcing steel bars or welded wire fabric shall conform to the requirements of Section 727.

**Equipment:**

Equipment for use with the wet-mix process shall be the pneumatic feed type; however, a positive displacement type may be used if permitted in writing by the Engineer. The pneumatic feed type shall be capable of discharging the premixed concrete accurately, uniformly and continuously through the delivery hose and to the gunning nozzle. The nozzle shall be fitted with an air ring for injecting additional compressed air into the premixed material flow. The size of the delivery hose shall be within the range of 1 1/4 to 2 1/2 inches.

**Air Supply:**

The air compressor shall have ample capacity to furnish an adequate supply of clean dry air for maintaining sufficient nozzle velocity for all phases of the work while simultaneously operating a blow pipe for clearing away the rebound. The air hose shall be equipped with a filter to prevent any oil or grease from contaminating the shotcrete.

A constant air pressure of not less than 80 pounds per square inch shall be maintained at the nozzle when using the wet-mix process and when the delivery hose length is 100 feet or less. The pressure shall be increased at least five pounds per square inch for each additional 50 feet of hose or fraction thereof.

**526.3 - Construction Requirements:**

**Concrete:**

The Contractor shall determine the mix proportions and shall furnish concrete for pneumatic placement which contains a minimum of 658 pounds of Portland Cement per cubic yard of concrete, and

which attains a minimum 28-day compressive strength of 4000 psi. Fine aggregate and coarse aggregate shall conform to the requirements of Subsection 526.2. The total mix shall contain, by weight, 15 to 20 percent coarse aggregate. In no case shall the slump be greater than four inches.

If ready-mixed concrete is used, it shall conform to the requirements of ASTM C94.

#### Preparation of Surfaces:

The surfaces on which shotcrete is to be placed shall be finely graded to the lines and grades shown on the project plans or established by the Engineer. The surfaces shall be thoroughly compacted and shall be uniformly moistened so that water will not be drawn from the freshly placed shotcrete.

#### Forms and Ground Wires:

Forms shall be of plywood sheathing or other suitable material and shall be true to line and grade and sufficiently rigid to resist deflection during placement of the shotcrete. Forms shall be constructed to permit the escape of air and rebound during the gunning operation.

Ground or gauging wires shall be installed where necessary to establish the thicknesses, surface planes, and finish lines of the shotcrete.

#### Steel Reinforcement:

Steel reinforcement shall be as shown on the project plans and shall conform to the requirements of Subsection 505.5.

#### Placement:

The velocity of the shotcrete as it leaves the nozzle shall be maintained uniform and at a rate approved by the Engineer for the given job conditions. The nozzle shall be held as nearly perpendicular to the working surface and at a proper distance, generally between two and five feet, to insure maximum compaction with minimum rebound of the shotcrete.

Rebound or previously expended material in the shotcrete mix shall not be used in any portion of the work. All rebound shall be removed prior to final set and before placement of the shotcrete on adjacent surfaces.

Shotcrete shall not be applied during any precipitation which is of sufficient intensity to cause the in-place shotcrete to run. Shotcrete shall not be applied during wind conditions that cause separation of the nozzle flow.

Shotcrete shall not be applied when a descending ambient air temperature falls below 40 degrees F nor until an ascending air temperature rises above 35 degrees F. Temperature shall be taken in the shade away from artificial heat.

#### Quality Control Testing:

Tests to determine the physical quality of the shotcrete will be performed by the Engineer periodically during the work as required. Test panels and cores shall be prepared by the Contractor.

Test panels at least 12 inches square and as thick as the structure being constructed but not less than three inches shall be prepared by gunning shotcrete mix on to a piece of plywood form. Cores shall be taken from the panels for compressive strength tests and for visual examination. Cores shall have a minimum diameter of three inches and an L/D of at least one.

The cores will be tested for a minimum compressive strength of 4000 psi at 28 days. Core strengths will be corrected for L/D as specified in ASTM C42.

Acceptance will be based on both the compressive strength and the thickness of shotcrete placed. Conditions for compressive strength acceptance shall be as specified under Subsection 725.11 of the Standard Specifications. Conditions for thickness acceptance shall be as specified under Subsection 120.3 of these Special Provisions.

The cut surfaces of the test specimens will be carefully examined for soundness and uniformity of the material and shall be free from laminations and sand pockets.

#### Construction Joints:

As soon as practicable after placing, and before the shotcrete has attained initial set, the finish surface shall be floated with a wood float. Expansion joints and contraction joints shall be formed or tooled in the shotcrete in conformance with the requirements of the plans and Section 730 of these Special Provisions.

#### Finishing:

After the shotcrete has been placed as nearly as practicable to the required thickness and shape outlined by forms and ground wires, the surface shall be checked with a straightedge and any low spots or depressions shall be brought up to proper grade by placing additional shotcrete in such a manner that the finished surface shall be smooth and uniform.

Surfaces of existing concrete or shotcrete against which new shotcrete is to be placed shall be thoroughly cleaned and moistened immediately prior to placing the new shotcrete. Construction joints shall be constructed as shown on the plans.

Curing:

The shotcrete surfaces shall be kept continuously moist for at least seven days, beginning immediately after finishing, by means of either a water spray or fog system capable of being applied continuously or by liquid membrane-forming compound or by polyethylene sheeting conforming to the requirements specified in ASTM C171 for Moisture Loss and for Thickness. If polyethylene sheeting is used, it shall be white opaque and adjoining sheets shall overlap at least 12 inches and the laps secured to provide an airtight and windproof joint. If liquid membrane-forming compound is used, it shall be Type I conforming to the requirements of ASTM C309 and the application rate shall be 100 square feet per gallon.

526.4 - Method of Measurement:

Shotcrete will be measured by the square yard of actual exposed surface areas placed to the required thickness.

No measurement will be made of unexposed surfaces, such as support slabs at joints, integral curb faces, or cutoff walls.

526.5 - Basis of Payment:

Payment for shotcrete will be made at the Contract unit price per square yard, complete in place, including reinforcement, joint construction, and all other materials, labor, tools, and equipment and performing all work necessary to complete the item in accordance with the details shown on the plans, the requirements of the Standard Specifications and Special Provisions, and the direction of the Engineer. Canal excavation and embankment will be paid for in accordance with the requirements of Section 215.

Any Contract unit price adjustments for compressive strength and thickness deficiencies will be made in accordance with the requirements of Subsection 725.11 of the Standard Specifications and Subsection 120.3 of these Special Provisions, respectively.

## SECTION 527 - SLIPFORMED CONCRETE DITCHES

### 527.1 - Description:

The work under this section shall consist of furnishing all materials and placing, by means of suitable equipment and competent operators, Portland Cement concrete lined irrigation ditches, at the locations shown on the plans in accordance with the details shown on the plans, these Special Provisions, the applicable requirements of the Standard Specifications, and as directed by the Engineer.

### 527.2 - Materials:

Portland Cement concrete for slipformed concrete ditches shall be Class A, and shall conform to the requirements of Section 725 of the Standard Specifications.

### 527.3 - Construction Methods:

Excavation, fill, and backfill for the construction of slipformed concrete ditches shall be in accordance with the requirements of Section 215, except that the material on which the concrete lining is to be placed shall be compacted to 95 percent of maximum density.

Slipforming equipment shall be designed specifically for the work. The results shall be equal to or better than that produced by the use of fixed forms. If the results are not satisfactory to the Engineer, the use of the equipment shall be discontinued.

The slipforming equipment shall be controlled as to line and grade by means of automatic sensing and control devices, such that the machine automatically senses and follows a taught guideline or other reference, performing any necessary corrective maneuvers in order to establish the correct grade and alignment. The Contractor shall set the guideline from survey marks provided by the Engineer.

The subgrade shall be lightly watered immediately in advance of slipforming operations, so that it will be in a moistened condition when concrete lining is placed.

Following the placement of concrete by the slipforming equipment as closely as practical, one or more applications of curing compound shall be applied to all exposed surfaces. The curing compound shall be applied at the rate of not less than one gallon per 100 square feet of surface area, and in such a manner as to entirely cover and seal all exposed surfaces of concrete with a uniform film.

### 527.4 - Measurement:

Slipformed concrete ditches will be measured by the linear foot along the flow line.

527.5 - Payment:

Slipformed concrete ditches will be paid for at the Contract unit price per linear foot, which price shall be full compensation for the item, complete in place, including furnishing all labor, material, tools, and equipment and performing all work necessary to complete the item in accordance with the details shown on the plans, the requirements of the Standard Specifications and Special Provisions, and the direction of the Engineer. Canal excavation and embankment will be paid for in accordance with the requirements of Section 215.

## SECTION 535 - HAZARD WARNING SIGNS

### 535.1 - Description:

The work under this section shall consist of furnishing, constructing, and installing hazard warning signs at the locations and in accordance with the requirements shown on the plans or as directed by the Engineer.

### 535.2 - Materials and Construction Requirements:

Materials and construction requirements for hazard warning signs shall be as shown on the plans or directed by the Engineer. Any deviation from the requirements of the plans or the Engineer shall not be incorporated into the work until such deviation has been approved, in writing, by the Engineer.

### 535.3 - Measurement:

Hazard warning signs will be measured by the unit, installed in conformance with the requirements of the plans and the direction of the Engineer.

### 535.4 - Payment:

Hazard warning signs will be paid for at the Contract unit price per each, which price shall be full compensation for the item, complete in place, including furnishing all labor, materials, tools, equipment, other items incidental to the work, and doing all work required to complete the item in accordance with the details shown on the plans and the direction of the Engineer.

# WATER AND SEWER

## SECTION 601

### TRENCH EXCAVATION, BACKFILLING AND COMPACTION

#### 601.1 DESCRIPTION:

The work covered by this specification consists of furnishing all plant, labor, equipment, appliances and materials, and performing all operations in connection with the excavation and backfilling of trenches in accordance with the plans and special provisions.

Excavation for appurtenance structures, such as manholes, inlets, transition structures, junction structures, vaults, valve boxes, catch basins, etc., shall be deemed to be in the category of trench excavation.

#### 601.2 EXCAVATION:

**601.2.1 General:** The Contractor shall perform all excavation of every description and of whatever substances encountered, to the depths indicated on the plans, and including excavation ordered by the Engineer of compacted backfill for the purpose of making density tests on the lower portion of the lift.

All excavation shall be open cut unless otherwise shown on the plans or approved by the Engineer.

**601.2.2 Trench Widths:** Trenches for other than cast-in-place concrete pipe shall conform to the following dimensions, unless otherwise specified in the special provisions, indicated on the plans, and/or approved by the Engineer.

Size Of Pipe (I.D.)	Maximum Width At Top Of Pipe Greater Than O.D. Of Barrel	Minimum Width At Springline Each Side Of Pipe
Less than 18"	16"	6"
18" to 24" inclusive	19"	7½"
27" to 39" inclusive	22"	9"
42" to 60" inclusive	½ O.D.	12"
Over 60"	36"	12"

The width of the trench shall not be greater than the maximum indicated above, at and below the level of the top of the pipe. The width of the trench above that level may be made as wide as necessary for sheeting and bracing, and for proper installation of the work.

If the maximum trench width as specified above is exceeded at the top of the pipe the Contractor shall provide, at no additional cost to the Contracting Agency, the necessary additional load bearing capacity by means of bedding, having a higher bedding factor than that specified, higher strength pipe, a concrete cradle, cap or encasement, or by other means approved in writing by the Engineer.

**601.2.3 Trench Grade:** Alignment and elevation stakes shall be furnished the Contractor at set intervals and agreed upon offsets. On water main projects, elevation stakes will be furnished only when deemed necessary by the Engineer. In all cases where elevation stakes are furnished, the Engineer will also furnish the Contractor with cut sheets.

## SECTION 601

For all pipe 12 inches or greater in diameter, the Contractor shall excavate for and provide an initial granular bedding at least 4 inches or 1/12 the O.D. of the pipe whichever is greater. This bedding material shall be placed at a uniform density with minimum compaction and fine graded as specified below.

Bell or coupling holes shall be dug after the trench bottom has been graded. Such holes shall be of sufficient width to provide ample room for caulking, banding, or bolting. Holes shall be excavated only as necessary to permit accurate work in the making of the joints and to insure that the pipe will rest upon the prepared bottom of the trench, and not be supported by any portion of the joint.

Depression for joints, other than bell-and-spigot, shall be made in accordance with the recommendations of the joint manufacturer for the particular joint used.

**601.2.4 Fine Grading:** Unless otherwise specified in the plans and/or special provisions, the bottom of the trench shall be accurately graded to provide uniform bearing and support for each section of the pipe at every point along its entire length, except for portions of the pipe where it is necessary to excavate for bells and for proper sealing of pipe joints.

**601.2.5 Overexcavation:** Except at locations where excavation of rock from the bottom of the trench is required, care shall be taken not to excavate below the depth indicated.

Unauthorized excavation below the specified grade line shall be refilled at the Contractors expense with ABC material compacted to a uniform density of not less than 95 percent of the maximum density as determined by AASHTO T-99 and T-191 or ASTM D-2922 and D-3017. When AASHTO T-99, method A or B, and T-191 are used for density determination, MAG Detail 190 will be used for rock correction.

Whenever rock is encountered in the trench bottom, it shall be overexcavated to a minimum depth of six inches below the O.D. of the pipe. This overexcavation shall be filled with granular material placed with the minimum possible compaction.

Whenever unsuitable soil incapable of supporting the pipe is encountered, the Contractor will notify the engineer and a field determination will be made as to the depth of overexcavation and the granular fill required.

**601.2.6 Excavation for Manholes, Valves, Inlets, Catch Basins and Other Accessories:** The Contractor may excavate to place the concrete structure directly against the excavated surface, provided that the faces of the excavation are firm and unyielding and are at all points outside the structure lines shown on the plans. If the native material is such that it will not stand without sloughing or if precast structures are used, the Contractor shall overexcavate to place the structure and this overexcavation shall be backfilled with the same material required for the adjoining pipe line trench and compacted per Table 601.2.

Any excavation below the elevation indicated for the foundation of any structure shall be filled with ABC and compacted to at least 95% at the expense of the Contractor.

## SECTION 601

No ripping or rooting will be permitted outside limits of cuts. Surfacing materials removed shall be hauled from the job site immediately, and will not be permitted in the backfill.

**601.2.8 Grading and Stockpiling:** All grading in the vicinity of trench excavation shall be controlled to prevent surface water from flowing into the trenches. Any water accumulated in the trenches shall be removed by pumping or by other approved methods.

During excavation, material suitable for backfilling shall be piled in an orderly manner, a sufficient distance back from the edges of trenches, to avoid overloading and to prevent slides or cave-ins. Material unsuitable for backfilling, or excess material, shall be hauled from the job site and disposed of by the Contractor.

The Contractor shall, prior to final acceptance of the work, submit a letter to the Contracting Agency stating the location of each disposal site for all excess or unsuitable material and certify that he has obtained the property owner's permission for the disposal of all such materials.

Where the plans and/or special provisions provide for segregation of topsoil from underlying material for purposes of backfill, the material shall not be mixed.

**601.2.9 Shoring and Sheeting:** The Contractor shall do such trench bracing, sheathing, or shoring necessary to perform and protect the excavation as required for safety and conformance to governing laws. The bracing, sheathing, or shoring shall not be removed in one operation but shall be done in successive stages as determined by the Engineer to prevent overloading of the pipe during backfilling operations. The cost of the bracing, sheathing, or shoring, and the removal of same, shall be included in the unit price bid per foot for the pipe.

All shoring and sheeting deemed necessary to protect the excavation and to safeguard employees, shall be installed. See Section 107.

**601.2.10 Open Trench:** Except where otherwise noted in the special provisions, or approved in writing by the Engineer, the maximum length of open trench, where the construction is in any stage of completion (excavation, pipe laying or backfilling), shall not exceed 1320 feet in the aggregate at any one location.

Any excavated area shall be considered open trench until all ABC for pavement replacement has been placed and compacted. With the approval of the Engineer, pipe laying may be carried on at more than one separate location, the restrictions on open trench applying to each location.

Trenches across streets shall be completely backfilled as soon as possible after pipe laying.

Substantial steel plates with adequate trench bracing shall be used to bridge across trenches at street crossings where trench backfill and temporary patches

**601.3 PROTECTION OF EXISTING UTILITIES:**

**601.3.1 Utilities:** Unless otherwise shown on the plans or stated in the specifications, all utilities, both underground or overhead, shall be maintained in continuous service throughout the entire contract period. The Contractor shall be responsible and liable for any damages to or interruption of service caused by the construction.

If the Contractor desires to simplify his operation by temporarily or permanently relocating or shutting down any utility or appurtenance, he shall make the necessary arrangements and agreements with the owner and shall be completely responsible for all costs concerned with the relocation or shutdown and reconstruction. All property shall be reconstructed in its original or new location as soon as possible and to a condition at least as good as its previous condition. This cycle of relocation or shutdown and reconstruction shall be subject to inspection and approval by both the engineer and the owner of the utility.

The Contractor shall be entirely responsible for safeguarding and maintaining all conflicting utilities that are shown on the plans. This includes overhead wires and cables and their supporting poles whether they are inside or outside of the open trench. If, in the course of work, a conflicting utility line that was not shown on the plans is discovered, the Contracting Agency will either negotiate with the owner for relocation, relocate the utility, change the alignment and grade of the trench or as a last resort, declare the conflict as "extra work" to be accomplished by the Contractor.

**601.3.2 Irrigation Ditches, Pipes and Structures:** The Contractor shall contact the owners of all irrigation facilities, and make arrangements for necessary construction clearances and/or dry-up periods.

All irrigation ditches, dikes, headgates, pipe, valves, checks, etc., damaged or removed by the Contractor, shall be restored to their original condition or better, by the Contractor at no additional cost to the Contracting Agency.

**601.3.3 Building, Foundations and Structures:** Where trenches are located adjacent to building, foundations, and structures, the Contractor shall take all necessary precaution against damage to them. The Contractor shall be liable for any damage caused by the construction.

Except where authorized in the special provisions or in writing by the Engineer, water settling of backfill material in trenches adjacent to structures will not be permitted.

**601.3.4 Permanent Pipe Supports:** Permanent pipe supports for the various types and sizes of sewer, water and utility lines shall conform to the Standard Details or the details shown on the plans. Such pipe supports shall be erected at the locations shown on the plans and/or at any other locations as necessary as determined by the Engineer.

## SECTION 601

### 601.4 FOUNDATION, BEDDING, BACKFILLING AND COMPACTION:

**601.4.1 Foundation:** The material upon which the conduit or structure is to be placed shall be accurately finished to the grade or dimensions shown on the plans or as directed by the engineer. The bottom portion of the trench shall be brought to grade so that the conduit or structure will be continuously in contact with the material on which it is being placed. If rocky or unsuitable soil is encountered, Subsection 601.2.5 applies.

**601.4.2 Bedding:** Bedding shall consist of granular material containing no pieces larger than 1½ inches and free of broken concrete, broken pavement, wood or other deleterious material. Open graded rock will not be used without the written approval of the Engineer.

Where water consolidation is used, bedding for conduits, 24 inches or less in I.D., may be placed in one lift. For larger conduits the first lift shall not exceed the springline of the pipe.

Where mechanical compaction is used, the moisture content shall be such that the specified compaction can be obtained. The first lift shall be 8 inches or ⅓ of the distance to the springline whichever is greater. Succeeding lifts shall not exceed 2 feet loose and extreme care will be taken to prevent damage to or movement of the conduit by the compaction equipment.

**601.4.3 Backfill:** Backfill shall be sound earthen material free from broken concrete, broken pavement, wood or other deleterious material. Unless otherwise specified, this may be native material with no piece larger than 8 inches, select material or aggregate base course. Under pavement, parking lots, sidewalks, etc., pieces larger than 3 inches will not be used in the final 12 inches below the pavement subgrade.

Where water consolidation is used, backfill will be placed in lifts as required in the following table prior to settlement.

Trench Width	Backfill Lifts
18" to 24"	Not to exceed 4'
25" to 36"	Not to exceed 6'
Over 36"	Not to exceed 8'

The above backfill lift limitations are not applicable when water saturation is done by the jetting method.

Where mechanical compaction is used, backfill shall be placed in lifts the height of which shall not exceed that which can be effectively compacted depending on the type of material, type of equipment and methods used, and under no circumstances shall exceed 4 feet.

Backfill, around utilities that are exposed during trench excavation, shall be placed in accordance with the bedding methods.

**601.4.4 Compaction Densities:** Unless otherwise provided in the plans and/or special provisions, the trench backfill shall be thoroughly compacted to not less than the following densities when tested and determined by AASHTO T-99 and T-191 or ASTM D-2922 and D-3017. When AASHTO T-99, method A or B, and T-191 are used for density determination, MAG Detail 190 will be used for rock correction.

**SECTION 601**

The density required will depend on the Type shown on the plans and/or called for in the special provisions. Density required for each Type is as follows:

TABLE 601-2				
MINIMUM DENSITY REQUIRED				
Backfill Type	Location	From Surface To 2' Below Surface	From 2' Below Surface To 1' Above Top of Pipe	From 1' Above Top of Pipe to Bottom of Trench
I	Under any existing or proposed pavement, curb, gutter, sidewalk, or such construction included in the contract, or when any part of the trench excavation is within 2' of the above.	100% for granular 95% for non-granular	90%	90%
II	On any utility easement street, road or alley right-of-way outside limits of (1).	85%	85%	90%
III	Around any structures or exposed utilities	95%	in all cases	

Note: The type required will generally be shown on the plans and the plans will govern. Where no type is shown on the plans the type shall comply with the above.

A consideration in determining the backfill Types as shown on the plans, is based on the trench widths as shown in the Contract Documents. If these trench widths increase beyond those widths referred to above and fall within the 2-foot limit of paved surfaces and other improvements due to construction exigencies, the backfill designation for that portion within the 2-foot limit of such improvements shall be Type I even though Type II backfill is shown on the plans.

**601.4.5 Compaction Methods:** Water consolidation by jetting shall be accomplished with a 1½" pipe of sufficient length to reach the bottom of the lift being settled with adequate hose attached and a water pressure of not less than 30 psi. All jetting shall be accomplished transversely across the trench at intervals of not more than 6 feet with the jetting locations on one side of the trench offset to the jetting locations on the other side of the trench. The entire lift shall be leveled and completely saturated working from the top to the bottom.

Jetting shall be used as the consolidation method for all conduit bedding. The Contractor shall be entirely responsible for establishing each lift depth so as to avoid floating the conduit being placed and shall make any repair or replacement at no cost to the Contracting Agency. However, for conduit larger than 24 inches I.D. the first lift shall not exceed the springline of the conduit.

Flooding is not acceptable as a water consolidation method unless authorized in the specification or by a written change order. It will consist of the inundation of the entire lift with water and then puddled with poles or bars to insure saturation of the entire lift.

Where jetting or flooding is utilized and the surrounding material is such that it does not permit proper drainage, the Contractor shall provide, at his expense a sump and a pump at the downstream end to remove the accumulated water.

## SECTION 601

The use of water consolidation does not relieve the Contractor from the responsibility to make his own determination that such methods will not result in damage to existing improvements. The Contractor shall be responsible for any damage incurred.

Where water consolidation is not permitted or does not result in adequate compaction, the backfill material shall be compacted with hand and/or mechanical work methods using equipment such as rollers, pneumatic tamps, hydro-hammers or other approved devices which secure uniform and required density without injury to the pipe or related structures.

Where Type I backfill is required, water consolidation will not be permitted for non-granular material, except in the following situation. In a new development prior to paving and prior to opening the area to public traffic, water consolidation, will be permitted for non-granular material at the Contractor's discretion and responsibility.

**601.4.6 Specifications for Granular Material:** For purposes of this specification, granular material shall mean material for which the sum of the plasticity index and the percent of the material passing a No. 200 sieve shall not exceed 23. The plasticity index shall be tested in accordance with AASHTO T-90.

**601.4.7 Rights-Of-Way Belonging to Others:** Backfill and compaction for irrigation lines of the Salt River Valley Water Users' Association and Roosevelt Irrigation Districts and for trenches in State of Arizona and Maricopa County rights-of-way outside the limits of the Contracting Agency shall be accomplished in accordance with their permit and/or specifications.

**601.4.8 Test Holes:** Boring logs shown on the plans do not constitute a part of the contract and are included for the Contractors' convenience only. It is not intended to imply that the character of the material is the same as that shown on the logs at any point other than that where the boring was made. The Contractor shall satisfy himself regarding the character and amount of rock, gravel, sand, silt, clay and water to be encountered in the work to be performed.

**SECTION 610**

**WATER LINE CONSTRUCTION**

**610.1 DESCRIPTION:**

The construction of all water lines shall conform to applicable standard specifications and details, except as otherwise required on the plans or as modified in the special provisions.

**610.2 GENERAL:**

All pipe shall be delivered, handled and installed in accordance with the manufacturer's recommendations and/or applicable provisions of AWWA standards

## SECTION 610

for installation of the various types of water mains specified, insofar as such recommendations and provisions are not in variance with the standard specifications and details.

Where waterlines are to be constructed in new subdivisions or in conjunction with street repaving projects, the streets shall be pre-graded to within 6 inches of the new street subgrade prior to trenching or cut stakes shall be set for trenching.

### 610.3 MATERIALS:

All pipe for water lines shall be of the classes shown on the plans or as specified below.

(A) The 4 through 16 inch pipe shall be asbestos-cement, ductile iron or cast iron, except where a particular material is specified. All pipe shall be Class 150 unless otherwise specified.

(B) Pipe larger than 16 inches may be either ductile iron or reinforced concrete water pipe – steel cylinder type – pretensioned unless an additional option is provided in the special provisions.

Cast iron water pipe and fittings – Section 750. Ductile iron water pipe and fittings – Section 750. Asbestos-cement water pipe and fittings – Section 752. Reinforced water pipe – steel cylinder type and fittings – AWWA C303.

### 610.4 CONSTRUCTION METHODS:

Cover for water mains will be measured from existing or proposed finished grade of pavement or from natural ground, whichever is deeper.

No water main shall be deflected, either vertically or horizontally, in excess of that recommended by the manufacturer of the pipe or coupling, without the appropriate use of bends or offsets.

If adjustments of the position of a length of pipe is required after it has been laid, it shall be removed and rejoined as for a new pipe.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. At all times when pipe laying is not in progress, the open ends of the pipe line shall be closed by a water-tight plug or other means approved by the Engineer.

Except as otherwise required in this specification, the special provisions, or by the Engineer, trench excavation, backfilling and compaction shall be in accordance with the requirements of Section 601. Backfilling may be accomplished as soon as the pipe line has been installed to the satisfaction of the Engineer, subject to the requirements for testing, as contained below.

Hydrostatic testing shall be in accordance with this specification.

All corporation stops used for testing and chlorination shall be left in the pipe line with the stop closed and all connecting pipe removed.

## SECTION 610

Thrust blocks shall be installed in accordance with this specification.

Valve boxes and covers shall be according to standard details.

Asbestos-cement pipe shall be installed in accordance with AWWA C-603, except pipe and fittings shall be in accordance with Section 752.

Cast iron pipe shall be installed in accordance with AWWA C-600, except pipe and fittings shall be in accordance with Section 750.

Ductile iron pipe shall be installed in accordance with this specification and pipe and fittings shall be in accordance with Section 750.

### 610.5 POLYETHYLENE CORROSION PROTECTION:

**610.5.1 General:** Where called for in the plans and specifications or directed by the Engineer, pipe, valves and fittings shall be protected from corrosion by encasement in a polyethylene protective wrapping referred to hereafter as polywrap. Although not intended to be a completely air and water tight enclosure the polywrap shall provide a continuous barrier between the pipe and surrounding bedding and backfill.

**610.5.2 Materials:** The polywrap shall be of virgin polyethylene, not less than 8 mils in thickness, formed into tubes or sheets as may be required. Naturally pigmented material may be used where exposure to ultra violet light will be less than 48 hours. Otherwise the material shall be pigmented with 2 to 2½ percent of well dispersed carbon black with stabilizers.

The polywrap shall be secured as specified below with 2 inch wide pressure sensitive plastic tape not less than 10 mils thick. Tape shall be Scotchrap No. 50. Polyken No. 900. Tapecoat CT, Johns-Manville No. V-10 Trantex, or approved equal.

The minimum tube size for each pipe diameter shall be as listed below.

<b>TABLE 610</b>		
Nominal Pipe Diameter (Inches)	Polywrap Flat Tube Width (Inches)	
	Cast Iron Or Ductile Iron With Push-On Joints	Cast Iron Or Ductile Iron With Mechanical Joints
4	14	16
6	17	20
8	21	24
10	25	27
12	29	30
14	33	34
16	37	37
18	41	41
20	45	45
24	53	53

**610.5.3 Installation:** The polyethylene tubing shall be cut into lengths approximately 2 feet longer than the pipe sections. With the pipe suspended from the center the tube shall be slipped over the spigot end and bunched up between the point of support and the spigot end. After the pipe is installed into the bell of the adjacent pipe the pipe shall be lowered to the trench bottom and the supporting sling removed from the center of the pipe. The pipe shall then be

## SECTION 610

raised at the bell end enough to allow the tube to be slipped along the full length of the barrel with enough left at each end to overlap the adjoining pipe about 1 foot. A shallow bell hole must be made at each joint to facilitate installation of the polywrap.

Pull the bunched-up polywrap from the preceding length of pipe, slip it over the end of the new length of pipe, and secure in place with one circumferential turn of tape plus enough overlap to assure firm adhesion. Then slip the end of the polywrap from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Tape it in place.

The loose wrapping on the barrel of the pipe shall be pulled snugly around the barrel of the pipe, and excess material folded over the top of the pipe and the folds held in place by means of short strips of adhesive tape, at about 3 foot intervals along the pipe.

Repair any rips, punctures or other damage to the tube with the adhesive tape or pieces of tube material secured with tape.

Bends and reducers in the line shall be covered with polyethylene in the same manner as pipe.

Valves, tees, crosses and outlets shall be wrapped with flat sheets of the same material. The sheets shall be passed under valves and brought up around the body to the stem. Edges shall be brought together, folded twice and secured with the adhesive tape.

**610.5.4 Payment:** Payment for this item shall be per the provisions of Articles 109.4 and 109.5 of the specifications unless this item is specifically called for on the plans or in the supplemental specifications or special provisions as a specific component and pay item for a given project.

### **610.6 VALVES:**

Valves shall be installed in accordance with AWWA C-600 or AWWA C-603 modified as follows:

All tapping sleeves, gate valves, butterfly valves, air release and vacuum valves and corporation stops shall be in accordance with Section 630.

Just before installation in the trench, valves shall be fully opened and closed to check the action, and a record made of the number of turns required to fully open or close the valve. For valves 16 inches and larger, a member of the water utility shall be present to check the action and record the number of turns. The inside of all valves shall then be thoroughly cleaned and the valve installed. Valves 12 inches and smaller in size shall be supported by concrete blocks, in accordance with the standard details.

Valves 16 inches and larger in size along with their bypass valves, shall be supported on concrete slabs, and/or concrete piers, as indicated on the plans.

Concrete supports shall be provided under valves in vaults and manholes, and shall be constructed an inch low, then grouted with non-shrink grout. Adjustable pipe supports shall be as indicated on the plans. Buried valves shall be supported on concrete blocks as detailed on the plans.

Valve boxes shall be installed over all buried valves in accordance with standard details.

Standard couplings or matching joints shall be used when more than one length

## SECTION 610

of pipe is required, or when two or more pieces are joined, to form the valve box riser. Install extension stems on all valves where the operating nut is 5 feet or more below grade.

## SECTION 610

### 610.7 MANHOLES AND VAULTS:

Construction shall consist of furnishing all materials and constructing manholes or vaults complete in place, as detailed, including foundation walls, cast iron steps, frames, covers, and any incidentals thereto, at location shown on the plans.

Manholes shall be constructed to conform with the requirements of Section 625 and standard details, except the inside diameter shall be 60 inches.

Vaults shall be constructed of reinforced concrete conforming to Section 725 and of concrete pipe conforming to ASTM C-76 Wall A or B. Vaults shall be kept moist for 7 days before backfilling.

### 610.9 CONNECTION TO EXISTING MAINS:

Existing pipe to which connections are to be made shall be exposed by the Contractor as directed by the Engineer, to permit field changes in line, grade or fittings, if necessary.

All connections to existing mains shall be constructed according to the plans.

Valves connecting new work to the existing system shall be kept closed at all times.

If it is necessary to obtain water from a utility system, clearance must be obtained from the Superintendent of Water Distribution. Valves shall not be operated until such clearance is obtained.

After disinfected samples have been taken and the new work passes the bacteriological tests, the new line shall then be turned over to the Contracting Agency with all branch lines and tie-in valves closed.

When shutdown of an existing water main is necessary in order to connect to the new lines, the Contractor shall make application and pay the required charges to the Contracting Agency. A conference between the Contractor's representative, Engineering Inspection, and Water Distribution personnel shall establish the time and procedures to insure that the shutdown will be for the shortest possible time. If necessary to minimize inconvenience to customers, shutdowns may be scheduled during other than normal working hours. The water supply to some customers, such as hospitals, cannot be shut off at any time. Provisions to furnish a continuous supply of water to such establishments will be required. After the procedures and time for a shutdown are agreed upon, it shall be the Contractor's responsibility to notify all customers in advance that the water will be turned off. When possible, customers shall be notified 24 hours in advance and in no case, except in emergency, shall notification be less than 30 minutes. Notification shall be in writing, giving the reason for the shutdown and the time and duration the water service will be shut off.

## SECTION 610

The Contracting Agency will close existing valves, but will not guarantee a bone-dry shutdown.

### 610.10 METER SERVICE CONNECTIONS:

All new meters must be installed by the Contracting Agency after the proper application as required by Code with fees paid at prevailing rates.

When plans call for connections from a new water main to an existing water meter, the work shall include new copper pipe or polyethylene pipe and fittings except as follows:

(A) Wrapped galvanized pipe shall be used to connect or extend existing galvanized service pipe. Type K soft copper pipe or tubing shall be used to connect or extend existing copper service pipe except when otherwise called for in the plans.

(B) When the existing main is not abandoned, and the existing meter is to be connected to the new line, the corporation stop at the old main shall be closed and the abandoned service line cut 6 inches from the old main.

(C) Taps and service connections to the new main shall not be made until after testing and disinfection is completed.

(D) Meter service piping may be installed by drilling in place of open cut construction when approved by the Engineer.

When called for on the plans, the meter and box shall be relocated by the Contractor as directed by the Engineer. Existing meters which are shown on the plans to be relocated shall be located and installed in accordance with standard details.

Water meter boxes which are broken during construction shall be replaced by the Contractor at no additional cost to the Contracting Agency. Existing meter boxes which are already broken prior to start of construction shall be replaced by the Contractor with boxes furnished by the Contracting Agency. Boxes may be picked up by the Contractor after written authorization is received from the Engineer. The written authorization shall include the street address of each broken meter box and the size of meter box required. All water meter boxes shall conform to the standard details.

### 610.12 COUPLINGS, JOINTS, GASKETS AND FLANGES:

(A) Couplings: The couplings used to join the pipe to flanged valve adapters shall be Dresser Style 38, Smith-Blair 411 or an approved equal.

(B) Joints: The joints and fitting shall conform to Sections 750 and 752.

(C) Bolts and Nuts:

(1) For pipe 12 inches and smaller: Bolts and nuts for use in field connections or for connecting fittings shall be carbon steel equivalent to ASTM A-307, Grade B, with cadmium plating in accordance with ASTM A-165, except that the minimum thickness of the plating shall be .00020 inches. Cadmium plated bolts shall have Class 2A

## SECTION 610

threads and the nuts used with them shall have Class 2B threads. All bolt diameters shall normally be  $\frac{1}{8}$  inch smaller than the bolt hole diameter. High strength, heat treated cast iron tee-head bolts with hexagon nuts, all in accordance with the strength requirements of AWWA C-111, may be used in lieu of the cadmium plated bolts and nuts for jointing mechanical joint cast iron or ductile iron pipe and fittings only.

(2) For pipe 16 inches and larger: All bolts and nuts on flanges for valves and flexible couplings shall be carbon steel equivalent to ASTM A-307, Grade B. Bolt diameters shall normally be  $\frac{1}{8}$  inch smaller than the bolt hole diameters.

These bolted joints shall be protected as follows: Following installation and before backfilling, all couplings, steel flanges, bolts, nuts, anchor bolts and rods, bolting of all flanged valves, and all exposed steel shall be protected from corrosion by either of the two methods outlined below at the Contractor's option.

(a) Below ground installations shall be coated with NO-OX-ID "A" with a film of not less than  $\frac{1}{32}$  inch thick and then coated with cement mortar not less than 1 inch thickness before backfilling. Cement mortar shall be composed of 1 part cement, ASTM C-150, Type II, low alkali, to 3 parts sand. Before application of the cement mortar coating the area to be protected shall be covered with a layer of 2 x 2 inch No. 14 gage welded wire fabric, firmly wired in place.

(b) Below ground installations shall be protected by the application of hot coal-tar enamel. The coal-tar enamel shall be in accordance with AWWA C-203 and shall be applied to the top part of the pipe or fittings by daubers for at least 2 coats for a total minimum thickness of  $\frac{1}{16}$  inch. The coal-tar for under side of the pipe flanges or fittings shall be applied by the pan or cocoon method as described below and in AWWA Manual M-11, Steel Pipe.

**Pan Method:** The coating pan is securely anchored in place on the underside of the pipe and straddling the connection to be coated. The pan shall be wide enough so that the entire connection will be coated.

Hot coal-tar enamel is poured into the pan, from one side only, until the pan is completely filled. The drain plug or valve, is then opened and the excess coal-tar drained out. The pan can then be removed. Details of the coating pan and corresponding dimensions are given in AWWA Manual M-11.

The upper portion of the connection, and all remaining exposed steel pipe, will then be coated by the use of a dauber. The coal-tar coating shall be applied in at least 2 coats for a minimum thickness of  $\frac{1}{16}$  inch. The daubers and method of application conform to AWWA C-203. No thinning will be allowed.

**Cocoon Method:** The cocoon is formed by placing glass fiber cloth or roofing paper, of the proper width, around the underside of the connection and adjacent exposed steel pipe. The edges of the cocoon shall be securely fastened to the pipe. Backfill is lightly placed to the spring line, and the top of the cocoon is opened and layed back on the filled area and hot coal-tar enamel poured, from one side only, until the cocoon is completely filled. The loose backfill prevents rupture of the cocoon. The upper portion of the connection and remaining exposed steel pipe shall be coated as above.

(D) Gaskets: Except as other wise provided, all gaskets for pipe lines shall be one piece full faced gaskets from one-ply cloth inserted SBR rubber material. Gaskets for flanges 20 inch and smaller shall be from  $\frac{1}{16}$  inch thick material. Gaskets for flanges 24 inches and larger shall be from  $\frac{1}{8}$  inch thick material. Gasket material shall be J-M 109 as manufactured by Johns-Manville Corporation or an approved

## SECTION 610

equal. Physical characteristics of the rubber compound shall meet ASTM D-2000, Class 4AA805A13.

(E) Flanges: Cast iron flanges shall conform to AWWA C-110 as to material, diameter, thickness, drilling, etc. Steel flanges shall be ring or hub type, and shall conform to AWWA C-207, Class D. All flanges shall be drilled and have flange diameters and bolt circles conforming to AWWA C-110, except bolt holes will be  $\frac{1}{8}$  inch larger than the bolts given for the various sizes. All bolts shall be as specified above and all flanges shall have a flat facing.

### 610.13 BLOCKING:

All pipe lines, valves and fittings 16 inches and smaller in diameter shall be blocked with concrete thrust blocks in accordance with standard details. Thrust block areas for pipe, valves and fittings larger than 16 inches in diameter shall be calculated for each size pipe, valve and fitting to be installed and shown on the plans.

Thrust block areas shall be calculated on the basis of Class 150 pipe tested at 188 psi bearing against undisturbed 3,000 psf soil.

If soil or pressure conditions other than those stated above are encountered, the thrust block areas shall be calculated and submitted for approval. The areas stipulated in the standard details are minimum and shall not be decreased.

### 610.14 TESTING:

All pipelines shall be tested for watertightness by subjecting each section to hydrostatic tests in accordance with applicable provisions of AWWA C-600, except as modified below, and shall consist of pressure test and leakage tests. The Contractor shall provide all vents, piping, plugs, bulkheads, valves, bracing, blocking, pump, including measuring device, and all other equipment necessary for making the tests, except pressure gages, and shall pay the Contracting Agency for water used in the tests.

(A) Pressure Tests: All pipe lines shall be tested for watertightness by subjecting each section to a pressure test, measured at the lowest end of the section under test. The test pressure shall be at least 125 percent of class rating of pipe under test. The duration of each pressure test shall be at least 2 hours. Each section of a new line between sectionalizing valves or between the last sectionalizing valve and the end of the project shall be tested separately as required in AWWA C-600, and/or as modified in these specifications, except that any such section less than 500 feet in length may be tested with the adjacent section, if both sections of line have the same pipe class rating. No section greater than  $\frac{1}{2}$  mile in total pipe length shall be tested without special written permission of the Engineer.

The test may be made before or after backfilling. However, if mechanical compaction is to be used in the backfilling operations as spelled out in AWWA C-600, the test shall not be made until the backfilling is completed and compacted. All connections, blowoffs and hydrants and valves shall be tested with the main as far as is practicable.

The test section shall be slowly filled with potable water and all air shall be vented from the line. The rate of filling shall be as determined by the Superintendent of Water Distribution, with at least 24 hour notice required before tests are scheduled. While the test section is under test pressure, a visual inspection for leaks may be made along the pipe line, and all visible leaks repaired. The pressure test shall not begin until the pipe has been filled with water for at least 24 hours to allow for absorption.

## SECTION 610

(B) Leakage Tests: Leakage tests shall be made after pressure test has been satisfactorily completed and all backfilling and compaction is completed to top of trench. The Contractor shall furnish the necessary apparatus and assistance to conduct the test.

The duration of each leakage test shall be at least 2 hours. To pass the leakage test, the leakage from the pipe line shall not exceed the leakage allowed by the following formula:

$$L = \frac{ND\sqrt{P}}{4500}$$

in which .

L = allowable leakage in gallon per hour.

N = number of joints in the pipe line being tested, this "N" being the standard length of pipe furnished divided into the length being tested, with no allowance for joints at branches, blowoff, fittings, etc.

D = nominal diameter of pipe in inches.

P = average observed test pressure of the pipe being tested, equal to at least 100 percent of the class rating of pipe being tested, in psi gage, based on the elevation of the lowest point in the line or section under test and corrected to the elevation of the test gage.

Should the test on any section of the pipe line show leakage greater than specified above, the Contractor shall locate and repair the defective pipe, fittings, or joint until the leakage is within the specified allowance of 2 hour duration.

Leakage is defined as the quantity of water necessary to be supplied into the pipe line section under test to maintain the specified leakage test pressure after the pipe line has been filled with water and all air expelled. All repairs and retests, if required, shall be made at the Contractor's expense.

Connections to the existing pipelines or existing valves shall not be made until after that section of new construction has satisfactorily passed the hydrostatic tests.

Cast iron and Ductile pipe used in conjunction with ACP will be tested to the ACP standards, unless otherwise directed by the engineer. High pressure systems of all cast iron or Ductile iron will be tested in accordance with AWWA C-600, Section 4.1.

### 610.15 DISINFECTING WATER LINES:

After pressure testing and before placing in service, all water lines shall be disinfected. Disinfection shall be accomplished in accordance with Section 611. All valves in the lines being disinfected shall be opened and closed several times during the 24 hour period of disinfection.

### 610.16 PAVEMENT AND SURFACING REPLACEMENT:

Pavement and surfacing replacement shall be in accordance with the requirements of Section 336.

### 610.17 CLEANUP:

When testing, chlorination, compaction, and cleanup do not follow pipe laying in an orderly manner, the Engineer reserves the right to close down trenching and pipe laying until these operations are adequately advanced.

## SECTION 610

### 610.18 MEASUREMENT AND PAYMENT:

#### (A) Pipe:

(1) Measurement of all pipe shall be of the linear feet of pipe installed, measured along the centerline of the pipe, through all valves and fittings, from the centerline of the fittings or centerline of valves on ends of pipe to the centerline of fittings, centerline of valves on ends of pipe or to the end of pipe, as the case may be, for all through runs of pipe. Measurement shall be to the nearest 0.1 foot.

Measurement of branch line pipe shall start at the centerline of valve at connection to the main. Branches of tees that are valved and capped will not be measured.

Measurement of meter service pipe shall be from the centerline of the new main to the connection at the meter, along the centerline of service pipe.

(2) Payment will be made at the unit price bid per linear foot of each type and size of pipe called for in the proposal. Such payment shall be compensation in full for furnishing and installing the pipe and fittings, specials, adapters, etc., complete in place, as called for on the plans and/or on the standard details, and shall include all costs of excavation, removal of obstructions, shoring and bracing, bedding, backfilling, compaction, maintenance of traffic, testing, disinfecting, connections to existing lines or works, and all work not specifically covered in other pay items.

A contingent item for cast iron fittings not shown on the plans shall be included in the proposal. Payment will be made at the unit price bid per pound on the theoretical weight of the fittings installed, which shall be compensation in full for furnishing and installing the fittings.

#### (B) Service Connection To Existing Water Meters:

(1) Measurement shall be of the number of unit connections made for water meter services, as called for in the proposal. Each proposal item unit shall consist of the connection to the water main and to the meter, as required in standard details.

(2) Payment will be made at the unit price bid for each unit water meter service connection and shall be compensation in full for labor materials (other than pipe) equipment, tapping, and all necessary incidentals. Payment for new service pipe required to make the connection will be made separately, as stipulated above.

(C) Relocation of Existing Meters and Boxes: Measurement shall be of the number of meters and boxes moved and reinstalled. Payment will be made at the unit price bid in the proposal for each meter and box relocated and installed.

(D) Permanent Pipe Supports and Encasement of Existing Pipes: Measurement shall be of each unit included in the proposal, and payment shall be compensation in full for supporting or encasing existing pipe, as required on the plans, including excavation, form work, reinforcing, concrete, handling and controlling flows in the existing pipe, removing and replacing existing pipe where necessary, supporting, backfilling and compaction, and pavement and/or surfacing replacement required in excess of pay width(s) allowed in Section 336.

(E) Concrete Thrust Blocks: Concrete thrust blocks and anchors for all pipe 16 inch and larger shall be measured by the cubic yard(s) of concrete placed, as required on the plans and/or as directed by the Engineer. Payment will be made at the unit price bid per cubic yard, and shall be compensation in full for excavation, formwork, placing and finishing concrete, reinforcing, backfilling and compaction, and pavement and/or surfacing replacement required in excess of pay width(s) allowed in

## SECTION 610

Section 336. All thrust blocks and anchors for 12 inch and smaller pipe shall be included in the linear foot cost of the pipe.

(F) Valves: Measurement of and payment for valves, tapping sleeves and valves, and valve boxes shall be for each item furnished and installed, as designated in Section 630.

(G) Fire Hydrants: Measurement shall be the number of fire hydrants installed. Payment will be at the unit price bid for the installation of each fire hydrant complete in place and in operating condition. The 6 inch cast iron pipe and fittings, required for making the connection from the main to the hydrant, shall be a separate pay item in the proposal as described above.

(H) Pavement and/or Surfacing Replacement: Payment for pavement and/or surfacing replacement will be made as stipulated in Section 336, except as otherwise established in this specification. The cost of pavement and/or surface replacement required for meter service installations shall be included in the price bid for meter service pipe.

## SECTION 611

### DISINFECTING WATER MAINS

#### 611.1 CLEANING AND TREATING PIPE:

The interior of all pipe and fittings shall be kept as free as possible of all dirt and foreign material at all times, until the pipe is placed in the new line.

If in the opinion of the Engineer, the pipe contains dirt that will not be removed during the flushing operation, the interior of the pipe shall be cleaned and swabbed, as necessary, with a .005 to .010 percent chlorine solution.

#### 611.2 LAYING PIPE:

If the Contractor or pipe-laying crew cannot install the pipe in the trench without getting earth into it, the Engineer may require that, before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size be placed over each end of the pipe and left there until the connection is to be made to the adjacent pipe.

At the close of each day's work, the end of the last laid section of pipe shall be plugged, capped, or otherwise tightly closed to prevent the entry of foreign material of any nature.

#### 611.3 PREVENTING TRENCH WATER FROM ENTERING PIPE:

At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or other means approved by the Engineer. Joints of all pipe in the trench shall be completed before the work is stopped. If water is in the trench, the seal shall remain in place until the trench is pumped dry.

#### 611.4 PACKING MATERIAL:

Only such packing materials as are included in the list of acceptable materials in AWWA C-600 for installation of cast iron water main, shall be used. The packing materials shall be handled in such a manner as to avoid contamination, and shall be dry when placed in the joints. All such materials shall be free of oil, tar, or greasy

## SECTION 611

substances, except that treated paper packing material, jute, cement, or sulphur compound caulking will not be permitted.

### 611.5 FLUSHING COMPLETED PIPELINES:

(A) Preliminary Flushing: All mains 12 inches and smaller shall be flushed, prior to chlorination, as thoroughly as possible with the water pressure and outlets available. Flushing shall be done after the pressure test has been made. It must be understood that flushing removes only the lighter solids and cannot be relied upon to remove heavy material allowed to get into the main during laying. It is difficult to flush mains over 12 inches in diameter, so in such instances the requirements above, must be rigidly adhered to.

Heavy duty, factory bushed, tapped couplings, with corporation stops shall be located at all high points in the lines to allow the air to be removed prior to testing the waterlines and at disinfection points as may be required. Field taps will not be permitted.

The couplings, at high points and disinfection points, shall be left exposed during backfilling until the testing is complete. Couplings and corporation stops shall be left on the mains upon completion of water mains.

(B) Valve Damage by Foreign Material: Unless proper care and thorough inspection are practiced during the laying of water mains, small stones, pieces of concrete, particles of metal, or other foreign material may gain access to mains newly laid or repaired. If it is believed that such foreign material(s) may be in the main, all hydrants on the line shall be thoroughly flushed and carefully inspected after flushing to see that the entire valve operating mechanism of each hydrant is in good condition.

### 611.6 CHLORINE RESIDUAL:

Before being placed in service, all new mains and repaired portions of, or extensions to existing mains shall be chlorinated so that a chlorine residual of not less than 10 ppm remains in the water after 24 hours standing in the pipe.

### 611.7 METHODS OF APPLYING CHLORINE:

Any of the following methods of application of chlorine (arranged in order of preference) may be used, subject to the approval of the Engineer:

Liquid chlorine gas-water mixture.

Direct chlorine feed.

Calcium or sodium hypochlorite and water mixture.

### 611.8 APPLICATION OF LIQUID CHLORINE:

A chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device or: if approved by the Engineer, the dry gas may be fed directly through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding solutions of the chlorine gas or of the gas itself must provide means for preventing the backflow of water into the cylinder.

### 611.9 CHLORINE-BEARING COMPOUNDS IN WATER:

On approval of the Engineer, a mixture of water and a chlorine-bearing compound of known chlorine content may be substituted for liquid chlorine.

## SECTION 611

(A) Compounds to be Used: The chlorine-bearing compounds that may be used are: Calcium hypochlorite\*, and sodium hypochlorite\*\*.

(B) Preparation of Mixture: High-test calcium hypochlorite must be prepared as a water mixture for introduction into the water mains. The powder should first be made into a paste and then thinned to approximately a 1 percent chlorine solution (10,000 ppm). The preparation of a 1 percent chlorine solution requires the following proportions of powder to water:

Product	Amount of Compound	Quantity of Water (Gallons)
High-test calcium hypochlorite (65-70% Cl)	1 lb.	7.50
Liquid laundry bleach (5.25% Cl)	1-2 pts.	12.6

### 611.10 POINT OF APPLICATION:

The preferred point of application of the chlorinating agent is at the beginning of the pipeline extension or any valved section of it and through a corporation stop inserted in the top of the newly laid pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap on the pressure side of the gate valve controlling the flow into the pipeline extension.

### 611.11 RATE OF APPLICATION:

Water from the existing distribution system or other source of supply shall be controlled so the rate of flow shall not exceed 500 gpm, unless approved by the Superintendent of Water Distribution, through a suitable measuring device into the newly laid pipeline during the application of chlorine. The rate of chlorine solution flow shall be in such proportion to the rate of water entering the pipe that the chlorine dose applied to the water entering the newly laid pipe shall produce at least 10 ppm of residual chlorine after 24 hours standing in the pipe. This may be expected with an application of 50 ppm, although some conditions may require more.

On lines 12 inches in diameter or less, determination of the rate of flow of water into the line to be treated may be made by starting with the line full of water and measuring the rate of discharge at a hydrant located at the end of the pipe farthest away from the point of chlorine application.

For lines larger than 12 inches in diameter, the disinfection operation is generally started with the line empty.

Measurement of the flow of water into and out of all lines shall be made by means of a pitot gage, current type meter, or other approved device.

### 611.12 PREVENTING REVERSE FLOW:

Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves shall be used to accomplish this.

\*Comparable to commercial products known as HTH, Perchloron, and Pittchlor.

\*\*Known commercially as liquid laundry bleach.

## SECTION 611

### 611.13 RETENTION PERIOD:

Treated water shall be retained in the pipe long enough to destroy all nonspore-forming bacteria. This period should be at least 24 hours and should produce no less than 10 ppm residual chlorine at the extreme end of the line at the end of the retention period.

NOTE: If the circumstances are such that less than a 24 hour retention period must be used, the chlorine concentration shall be increased to 100 ppm. Under these conditions, special care should be taken to avoid attack on pipes, valves, hydrants and other appurtenances.

### 611.14 CHLORINATING VALVES AND HYDRANTS:

In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent.

### 611.15 FINAL FLUSHING, SAMPLING AND TESTING:

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipeline at its extremities until the replacement water throughout its length shall, upon testing, be proved comparable in quality to the water served to the public from the existing water system. This satisfactory quality of water delivered by the new main shall continue for a period of at least 2 full days as demonstrated by laboratory examination of samples taken from a tap located and installed in such a way as to prevent outside contamination. Such samples for laboratory examination shall not be taken until flushing of the pipe shall have reduced the residual chlorine to 0.6 ppm or less throughout its length. Samples shall never be taken from an unsterilized hose or fire hydrant, because such samples will seldom meet bacteriological standards.

Water and Sewers Department laboratory technicians will perform sampling for tests of new water mains upon receipt, from the inspector, of a written request by the Contractor. The written request should be made to the Water and Sewers Department not later than 4:00 p.m. on the day prior to that on which samples are to be taken, so that the Department can properly schedule laboratory work.

Waterlines up to but less than 150 feet in length require one sampling riser installed near the end; lines 150 feet to 300 feet in length, two sampling risers, one near each end of the line; lines 300 to 3,000 feet in length, a minimum of three sampling risers.

Two samples shall be taken on separate days at each sampling location.

Results of all tests shall be sent by the laboratory to the Water and Sewers Department. Results of laboratory analysis will be interpreted by the Water and Sewers Department, and reported to the Engineer. Under no circumstance shall the Contractor or Engineering Division personnel contact the laboratory. If there is need for test results before written reports are submitted, such information shall be obtained only from the Water and Sewers Department.

### 611.16 REPETITION OF CHLORINATION PROCEDURE:

Should the initial treatment fail to result in the conditions specified above, the original chlorination procedure shall be repeated until satisfactory results are obtained.

### 611.17 PAYMENT:

No separate pay item shall be contained in the proposal for disinfecting water mains. This operation shall be included in the price bid for the water mains, installed complete in place, as specified in the proposal.

## SECTION 618 - STORM DRAIN CONSTRUCTION WITH CONCRETE PIPE

In addition to the requirements of the Standard Specifications:

### 618.1 - Description:

The work under this section shall consist of furnishing and installing reinforced concrete pipe and reinforced concrete pipe end sections.

### 618.2 - Materials:

Reinforced concrete pipe end sections shall conform to the details shown on the plans; the design shall conform to standards for pipe of the type and strength with which the end section is installed.

### 618.3 - Construction Methods:

Reinforced concrete pipe bedding shall conform to the culvert installation details shown on the plans.

Reinforced concrete pipe end section joint configuration shall match that of the host pipe. Embankment slopes shall be warped as necessary to match the slope of end sections.

### 618.5 - Measurement:

Reinforced concrete pipe shall be measured by the linear feet of pipe laid, measured along the pipe axis.

Reinforced concrete pipe end sections shall be measured by the unit installed.

### 618.6 - Payment:

Reinforced concrete pipe will be paid for at the Contract unit price per linear foot, for each size and strength of pipe, complete in place.

Reinforced concrete pipe end sections will be paid for at the Contract unit price each, for each size of host pipe, complete in place.

These prices shall be compensation in full for furnishing and installing the various items as specified and shown on the plans, including removal of obstructions, materials, labor, excavation, shoring, bedding, backfilling, compacting, water, testing, joint materials, joining, collars, field closures, and all other items incidental to the work.

## SECTION 619 - SIPHON CONDUIT

### 619.1 - Description:

The work under this section shall consist of furnishing, installing, and testing siphon conduit and special fittings (bends) for siphon conduit.

### 619.2 - Materials:

Siphon conduit shall be AWWA C300 reinforced concrete cylinder pipe, AWWA C301 prestressed concrete cylinder pipe, or ASTM C361 reinforced concrete low-head pressure pipe. Siphon conduit shall conform in all respects to the requirements of the current edition, as of the date of issuance of the invitation for bids, of the above-referenced standard for the type of pipe selected, except as may be modified herein. Special fittings shall meet all of the design, testing, performance, and installation requirements for the host pipe. The Contractor shall furnish Certificates of Compliance, in accordance with the requirements of Subsection 106.2, for all siphon conduit and special fittings.

The Contractor shall submit detailed design drawings and schedules, showing full details of reinforcement, concrete, joint dimensions, and the methods proposed to seal pipe joints, to the Engineer, for siphon conduit and special fittings. The design shall be based on the earth cover and internal design pressure shown on the plans, except that when the standard for the pipe selected specifies a minimum value for earth cover or internal design pressure, and the minimum value is greater than that shown on the plans, the greater value shall be used for the design of siphon conduit and special fittings.

Mortar for pipe joints shall consist of one to two parts, by weight, cement to one part, by weight, clean, well graded sand, with just sufficient water to obtain a workable consistency. To improve mortar workability, the Contractor may replace not more than 7 percent, by weight, of the cement with hydrated lime, or replace not more than 30 percent, by weight, of the cement with an approved pozzolan, or add an air-entraining agent in the mortar, or use any combination of the above, as approved by the Engineer. All materials for mortar shall conform to the requirements for the materials as used in the manufacturing of pipe, except that hydrated lime shall be a standard commercial product approved by the Engineer. Mortar shall be prepared in small batches to prevent stiffening before it is used. No retempering of mortar that has become so stiff that proper placement cannot be assured will be permitted; stiffened mortar shall be wasted. 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, by weight, of cement to not more than one part, by weight, of sand passing a No. 16 mesh screen and thoroughly mixed to a consistency which will flow uniformly yet remain workable.

### 619.3 - Construction Methods:

During transporting, storing, and laying, the pipe and fittings shall not be dropped or subjected to any unnecessary jar, impact, or other treatment that could crack or otherwise damage the pipe and fittings.

Pipe shall not be stored 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 Engineer, is damaged beyond repair by the Contractor in hauling, handling, unloading, storing, 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 employ for the work of laying the pipe only workmen who are skilled and experienced in laying pipe of the type selected. 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 or established by the Engineer. 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 pipe-laying operations at all times during laying operations. Holes for bells shall be of ample size to prevent bells from coming in contact with the subgrade. 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.

Pipe joining shall be performed in accordance with the details shown on the design drawings submitted by the Contractor, and approved by the Engineer, as required by Subsection 619.2. If joints are to be grouted, completion of outside joint grouting operations shall follow pipe-laying operations as closely as practicable. The outside joints shall be completed at least 4 hours before compaction of the backfill is started. The outside portion of the joints shall be completed by being filled with grout against bands placed in such a 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, 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 band 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 pipe-laying operation.

Bedding for siphon conduit shall conform to the requirements of the siphon bedding details shown on the plans. 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 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 moistened before being filled with mortar which shall be troweled smooth and flushed with the inside surfaces of the pipe and coated with a curing compound.

After all pipe-laying and joining operations are completed, the inside of the pipe shall be cleaned and all debris removed. When pipe laying is not in progress, the ends of the pipeline shall be kept closed.

During the installation of siphon conduit, the maximum length of open trench shall be 300 feet, or the Contractor's daily installation length, whichever is greater. The Contractor shall install and maintain vertical panels with flasher lights at 25-foot intervals along both sides of open trench during non-working hours as hazard warning devices.

#### 619.4 - Testing:

- (A) General - In addition to the hydrostatic test requirements of the AWWA or ASTM standard for the type of pipe selected, the installed siphon conduit shall be subjected to field hydrostatic testing.
- (B) Test Pressures - Field hydrostatic testing shall be conducted at a maximum test pressure equal to the design operating pressure of 50 feet of head.
- (C) Pretest Soaking - After being completed, the siphon shall be filled with water to the siphon outlet tran-

sition, after which the water may be allowed to stand for a period not to exceed fifteen (15) days to saturate the siphon conduit prior to testing. Water for soaking and testing will be made available from the Roosevelt Irrigation District at no charge to the Contractor.

- (D) Testing Equipment - The Contractor shall provide bulkheads, specifically designed for the work and approved by the Engineer prior to testing, to maintain test pressure in the siphon conduit during the test period. The Contractor shall supply all meters, gauges, pumps, tools, and other equipment and perform all work, required for field testing as specified herein and directed by the Engineer.
- (E) Testing - The siphon shall be maintained completely full, and pressurized so that the lowest portion of the siphon is subjected to the maximum test pressure, 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 conduit. If the leakage exceeds 60 percent of the maximum allowed, the Engineer may, at his discretion, require that the siphon be maintained at the test pressure for an additional 10 days to permit evidence of excessive leakage to become apparent.

Individual leaks in the siphon which, in the opinion of the Engineer, might endanger the structure or damage the bedding and/or backfill shall be repaired by, and at the expense of, the Contractor even though the total leakage from the siphon may not exceed the specified maximum. The Contractor shall make all repairs as are necessary to secure watertightness, as approved by the Engineer.

Testing shall be performed as soon as possible after construction of the siphon, as determined by the Engineer, but in no event before 20 days after the placing of any concrete that will be subjected to hydrostatic pressure during testing. The Contractor will be responsible for any damage to the siphon or other structures incurred as a result of testing.

619.5 - Measurement:

Siphon conduit will be measured by the linear foot installed, along the pipe axis.

Special fittings will be measured by the unit installed.

619.6 - Payment:

Siphon conduit will be paid for at the Contract unit price per linear foot.

Special fittings will be paid for at the Contract unit price each.

These prices shall be compensation in full for furnishing and installing the items as specified and shown on the plans, including removal of obstructions, materials, labor, excavation, shoring, bedding, backfilling, compacting, testing, joint materials, joining, hazard warning devices, and all other items incidental to the work.

## SECTION 622 - STRUCTURAL PLATE ARCHES

### 622.1 - Description:

The work under this section shall consist of furnishing and erecting structural plate arches of the types, sizes, thicknesses, and dimensions shown on the plans. They shall be installed at the locations specified on the plans, or as directed by the Engineer, in reasonably close conformity to the lines and grades shown on the plans or as established by the Engineer, and in accordance with the applicable requirements of the Standard Specifications and these Special Provisions.

### 622.2 - Materials:

Plates shall be fabricated in accordance with the requirements of either AASHTO M167 or Federal Specifications WW-P-405.

Certificates of Compliance shall be furnished in accordance with the requirements of Subsection 106.2.

Structural plate (aluminum alloy) for arches and the accessories for connecting the plates shall conform to the requirements of AASHTO M219.

When specified on the project plans or directed by the Engineer, structural plates (aluminum alloy) shall be bituminous coated in accordance with the requirements of AASHTO M243. Unless otherwise specified, the coating shall be applied to the outside only.

Concrete for footings and bulkhead shall be Class A, and shall conform to the requirements of Section 725. Reinforcing steel shall conform to the requirements of Section 727.

### 622.3 - Construction Requirements:

Plates shall not be set in place until the arch footings have cured a minimum of seven days.

Backfill shall be native material approved by the Engineer. No backfill shall be placed until arch footings, the concrete saddle, and the bulkhead have, in the opinion of the Engineer, cured sufficiently to allow backfill operations to commence.

Backfill material shall first be placed at the concrete saddle, forming as narrow a ramp as possible, until the top of the arch is reached. The ramp shall be constructed evenly from both sides and the material shall be compacted as it is placed. After the two ramps have been constructed to the top of the arch, the remainder of the material shall be placed from the top of the arch both ways from the center to the ends and as evenly as possible on both sides of the arch.

Plates shall be formed to provide lap joints with the upstream plate lapping over the downstream plate. The bolt hole shall be so punched that all plates having like dimensions, curvature, and the same number of bolts per foot of seam shall be interchangeable. Each plate shall be curved to the proper radius so that the cross-sectional dimensions of the finished structure will be as indicated on the project plans.

Aluminum plates shall be punched so that bolt holes along those edges of the plates that will form longitudinal seams in the finished structure will be on a double row with a center to center dimension of 1 3/4". In all structures the longitudinal seam shall be comprised of two bolts in each valley and crest of each corrugation. The standard center to center dimensions of bolt holes that will form the circumferential seam in the finished structure shall be 9 5/8". The minimum distance from the center of hole to the edge of the plate shall not be less than 1 3/4 times the diameter of the bolt.

Tolerance of all hole diameters and spacing shall be as per manufacturer's recommendations.

Plates shall be erected in their final position by connecting the plates with bolts at longitudinal and circumferential seams. Drift pins may be used to facilitate matching of holes. All plates shall be placed in the order recommended by the manufacturer with joints staggered so that not more than three plates come together at any one point. All bolts shall be drawn tight, without overstress, before beginning the backfill.

The bolts for aluminum structural-plate sections shall be torqued during installation to a minimum of 100-foot-pounds and a maximum of 200-foot-pounds. Bolts shall be of sufficient length to provide a full nut.

After structural arch has been erected, all spots where damage has occurred to spelter shall be given two coats of an approved hot asphalt paint, or shall be wire brushed and given two coats of Paint No. 4, as directed by the Engineer.

#### 622.4 - Method of Measurement:

Structural plate arches will be measured by the linear foot, installed in place, completed and accepted. Measurement will be made along the average of the springing line lengths.

#### 622.5 - Basis of Payment:

The accepted quantities of work under this section, measured as provided above, will be paid for at the Contract unit price per linear foot for the different sizes and thickness of structural

plate arches designated in the bidding schedule, complete in place, including excavating, furnishing, placing, and compacting backfill material, footings, bulkhead, and all other items incidental to the work.

Concrete saddles for structural plate arches will be paid for as specified under Section 505 - Concrete Structures.

## SECTION 730 - JOINT SEALANT

### 730.1 - General:

#### Description:

This section describes the requirements for contraction joints and expansion joints in the canal lining and for contraction joints at surfaces of pipes penetrating the lining.

#### Shop Drawings:

Copies of manufacturer's product data on materials and installation instructions shall be submitted to the Engineer.

#### Delivery, Storage, Handling:

Sealant shall be delivered and stored in sealed, unopened containers bearing manufacturer's name and designation. Sealant shall be stored as recommended by the manufacturer. Sponge rubber shall be stored under cover and protected from the direct rays of the sun and high temperatures.

#### Job Conditions:

Sealant shall not be applied at temperatures below 40 degrees F or above 90 degrees F. Sealant shall be protected from freezing after it is applied until it has completely cured.

### 730.2 - Materials:

#### Sealant:

Sealant shall conform to the requirements of the Standard Specifications for Elastomeric Canal Joint Sealer of the United States Department of the Interior, Bureau of Reclamation, Class R, Type II, except that tack free time shall be 6 hours. Primer shall be as recommended by the sealant manufacturer.

#### Backup Material:

Backup material shall be sponge rubber conforming to the requirements of ASTM D1752, Type I.

### 730.3 - Construction:

#### General:

Surfaces shall be prepared, and sealant shall be mixed and applied in accordance with the manufacturer's instructions and as specified herein.

Preparation:

Joints shall have all curing compound and foreign matter removed and shall be dry and clean prior to application of primer. Surfaces to be sealed shall be coated with primer prior to application of sealant.

Application:

Backup material shall be installed under 30 percent compression.

Sealant shall be applied to completely fill the joint and to form a smooth surface. Joints shall be tooled to remove excess sealants and leave finish joints smooth and watertight.

Sealant left on adjacent surfaces shall be cleaned using cleaners as recommended by sealant manufacturer.

## SECTION 901 - MOBILIZATION

### 901.1 Description:

The work under this section shall consist of preparatory work and operations, including but not limited to, the movement of personnel, equipment, plant, supplies, and incidentals to the project site; the establishment of all offices, buildings, and other facilities necessary for work on the project; and for all other work and operations that must be performed and costs incurred prior to beginning work on the various items on the project.

### 901.2 Method of Measurement:

Mobilization will be measured for payment by the lump sum as a single complete unit of work.

### 901.3 Basis of Payment:

The amount bid for mobilization shall not exceed three percent (3%) of the total Contract bid price excluding the bid price for mobilization. Should the bidder exceed the foregoing three percent (3%), the Flood Control District will make the necessary adjustment to determine the total amount bid based on the arithmetically correct Proposal.

The amount bid shall include the furnishing and maintaining of services and facilities noted under Subsection 901.1 - Description, to the extent and at the time the Contractor deems them necessary for his operations, consistent with the requirements of the work and the Contract.

The amount bid shall be payable to the Contractor whenever he shall have completed ten percent (10%) of the contract work. For the purposes of this item, 10% of the work shall be considered completed when the total of payments earned, as reflected by estimates of the work done, as set forth in Subsection 109.7 - Payment for Bond Issue and Budget Projects, not including the amount bid for this work, shall exceed 10% of the total amount of the Contractor's bid for this Contract.

Unless provided for elsewhere, the cost of required insurance, bonds, and permits and/or any initiation of the Contract work may be included in this work.

The adjustment provisions in Section 104 and the retention of funds provisions in Section 109 shall not apply to the item of Mobilization.

When other Contract items are adjusted as provided in Section 104, and if the costs applicable to such items of work include mobilization costs, such mobilization costs will be considered as recovered by the Contractor in the lump sum paid for mobilization, and will be excluded from consideration in determining compensation under Section 104.

## SECTION 902 - FIELD OFFICE

### 902.1 - Description:

This work shall consist of providing and maintaining a furnished Field Office for the exclusive use of and occupancy by Flood Control District and/or Consultant field personnel.

The office shall be a building or mobile trailer, meeting the requirements specified, which shall be erected at a location convenient to the Project. The office may be in the same building or mobile trailer as office space of the Contractor provided that such office is separated from the area used by the Contractor by a wall or door with an adequate locking device and has at least one door to the outside.

The Contractor may furnish equivalent facilities in an existing building provided such facilities and buildings are located to provide convenient service.

### 902.2 - Materials:

General Construction: The Field Office shall be an approved and weatherproof building or mobile trailer meeting the specified requirements. The structures shall have a minimum ceiling height of seven (7) feet and shall be provided with a weatherproof door equipped with adequate locking devices. Windows shall also be provided with adequate locking devices.

#### 902.2.1 - General Requirements:

- (A) Lighting - Electric light, non-glare type luminaires to provide a minimum illumination level at desk height level.
- (B) Heating & Cooling - Adequate equipment to maintain an ambient air temperature of 72 degrees F plus or minus 8 degrees.
- (C) Telephone - A separate phone for the exclusive use of Department and/or Consultant personnel. Long distance phone calls made on this line will be paid for by the Flood Control District.
- (D) Toilet - A separately enclosed room, properly ventilated and complying with applicable sanitary codes. Said facilities may be portable and separate but adjacent to the Field Office.
- (E) Maintenance - The Contractor shall maintain all facilities and furnished equipment in good working condition.

(F) Fire Extinguisher - Non-toxic, dry chemical, fire extinguisher meeting Underwriters Laboratories, Inc. approval for Class A, Class B, and Class C fires with a minimum rating of 2A:10B:10C.

#### 902.2.2 - Specific Requirements:

In addition to the general requirements, the office shall have a minimum of 140 square feet of floor space with one outside door. The furnishings shall be as follows:

1 - Suitable office desk with drawers and locks.

2 - Office chairs.

1 - Table, three feet by six feet.

1 - Stool.

#### 902.3 - Construction Details:

The office shall be fully equipped and made available for use and occupancy by Flood Control District personnel as well as comparable personnel employed by a Consultant prior to the start of any Contract work. The Engineer will notify the Contractor, in writing, of the acceptability of the Field Office provided.

All buildings shall be maintained in good condition and appearance by the Contractor for the designated period, after which all portable buildings or trailers, fencing, surfacing, and utilities shall be removed from the site, the areas cleaned and seeded if required and left in a neat and acceptable condition.

#### 902.4 - Payment:

Payment will be by the Lump Sum for all services specified. However, incremental payment of 1/13 the Lump sum shall be made for each month of occupancy by the field engineers during the period of Contract. Payment will begin the first month that the office is fully equipped, serviced as specified, and made available for occupancy.

No payment will be made for occupancy and services during periods of Contract extension of time where engineering charges are assessed.

The Lump Sum price shall include the cost of all labor, material, equipment, ground rental and utility charges (including monthly service charges, but excluding charges for long distance phone calls) necessary to complete the work.

## SECTION 903 - CONSTRUCTION SURVEYING AND LAYOUT

### 903.1 - Description:

The work under this section shall consist of furnishing all materials, personnel, and equipment necessary to perform all surveying required to construct all elements of the project as shown on the Plans, specified in the Contract Documents, or as directed by the Engineer. This shall include, but shall not be limited to stake out, layout, and elevations for roadways, channels, bank protection, structures, forms, and appurtenances as shown and required, consistent with the current practices of the Flood Control District. The work shall be performed by competently qualified personnel acceptable to the Flood Control District. All work shall be done under the direction of a registered land surveyor employed by the Contractor. All right-of-way monuments, lines, and property corners shall be established by a registered land surveyor employed by the Contractor.

Measurement of all pay quantity items will be the responsibility of the Flood Control District or its designated agent.

When utility adjustments are a part of the contract, the Contractor shall perform all layout work and set all control points, stakes, and references necessary for carrying out all such adjustments.

The Contractor shall not employ or engage the services of any person or persons in the employ of the Flood Control District or its designated agent on the project for the performance of any of the work as described herein.

### 903.2 - Materials, Personnel, and Equipment:

Materials and equipment shall include, but not necessarily be limited to, vehicles for transporting personnel and equipment; properly adjusted and accurate survey equipment; straightedges, stakes, flagging, and all other devices necessary for checking, marking, establishing, and maintaining lines, grades, and layout to perform the work called for in the contract. The Contractor shall furnish competent personnel to perform the survey work and layout.

The Contractor shall furnish all necessary traffic control including flagging for survey and staking operations. Traffic control shall be in accordance with the requirements of Section 401 of the Standard Specifications.

The type of field book used for recording data and field notes shall be approved by the Flood Control District prior to use. Field notes, maps of survey, etc. shall be stamped by a registered land surveyor and all set monuments shall be tagged or

stamped pursuant to Arizona Revised Statute 32-101, Article 5. All field notes, sketches, etc. shall be neat, well organized and legible. Erasures shall not be permitted in the field book. If it is determined that the original figure is incorrect, a line shall be drawn through it and the correction will be made above it.

### 903.3 - Construction Requirements:

Prior to beginning any survey operations, the Contractor shall furnish to the Engineer for his approval, a written outline detailing the method of staking and marking of stakes, grade control for various courses of materials, referencing, structure control, etc.

The Contractor shall trim trees, brush, and other interfering objects, not inconsistent with the plans, from survey lines in advance of all survey work to permit accurate and unimpeded work by his stake-out survey crews.

The location and length shown on the plans for pipe and structural plate culverts shall be considered to be approximate. The ordered length of culverts will be determined by the Engineers after the Contractor accurately stakes the proposed culvert in the planned location as approved by the Engineer and after appropriate and necessary engineering study.

The exact position of all work shall be established from control points, baseline transit points, or other points of similar nature which are shown on the plans and/or modified by the Engineer. Any error, apparent discrepancy, or absence in or of data shown or required for accurately accomplishing the stake-out survey shall be referred to the Engineer for interpretation or furnishing when such is observed or required.

The Contractor shall place two offset stakes or references at each centerline station and at such intermediate locations as the Engineer may direct. From computations and measurements made by the Contractor, these stakes shall be clearly and legibly marked with the correct centerline station number, offset and cut or fill so as to permit the establishment of the exact centerline location and elevation during construction. If markings become faded or blurred for any reason the markings shall be restored by the Contractor and at the request of the Engineer. He shall locate and place all cut, fill, slope, fine grade, or other stakes and points, as the Engineer may direct for the proper progress of the work. All control points shall be properly guarded and flagged for easy identification.

Drainage structures shall be staked out by the Contractor at the locations and elevations shown on the plans or specified by the Engineer.

Structures shall be accurately profiled and structure control points shall be set and checked to assure the proper construction or installation of each structure. Profiles shall be approved by the Engineer prior to constructing or installing each structure. All profile survey data shall be entered in furnished field books and preserved as a permanent project record.

All required rights-of-way and easement limits shall be established, staked, and referenced by the Contractor concurrent with the construction stake-out survey. Rights-of-Way and easement limits shall be staked by or under the direction of a registered land surveyor. The Contractor shall supply proof to the Engineer that such work is being performed by or supervised by a registered land surveyor.

Reference points, baselines, stakes, and bench marks for borrow pits shall be established by the Contractor.

Permanent survey marker locations, if required, shall be established and referenced by the Contractor.

The Contractor shall be responsible for the accuracy of his work and shall maintain all reference points, stakes, etc. throughout the life of the contract. Damaged or destroyed points, bench marks or stakes, or any reference points made inaccessible by the progress of the construction shall be replaced or transferred by the Contractor. Any of the above points, which may be destroyed or damaged shall be transferred by the Contractor before they are damaged or destroyed. All control points shall be referenced by ties to acceptable objects and recorded. Any alterations or revisions in the ties shall be so noted and the information furnished to the Engineer immediately. All stake-out survey work shall be referenced to the centerline shown on the Plans. All computations necessary to establish the exact position of the work from control points, shall be made and preserved by the Contractor. All computations, survey notes and other records necessary to accomplish the work shall be neatly made. Such computations, survey notes, and other records shall be made available to the Engineer upon request and shall become the property of the Flood control District and delivered to the Engineer not later than the date of acceptance of his work.

Any discrepancies in grade, alignment, earthwork quantities, locations, and/or dimensions detected by the Contractor shall immediately be brought to the attention of the Engineer. No changes in the project plans will be allowed without the approval of the Engineer and a supplemental agreement to the contract.

During the progress of the construction work, the Contractor will be required to furnish all of the surveying and stake-out incidental to the proper location by line and grade for each phase of the work. For paving and any other operation requiring extreme

accuracy, the Contractor will restake with pins or other acceptable hubs located directly adjacent to the work at a spacing directed by the Engineer.

Any existing stakes, iron pins, survey monuments, or other markers defining property lines which may be disturbed during construction, shall be property tied into fixed reference points before being disturbed and accurately reset in their proper position upon completion of the work.

Just prior to completion of the contract, the Contractor shall re-establish if necessary and retie all control points as permanently as possible and to the satisfaction of the Engineer.

#### 903.4 - Method of Measurement:

Construction surveying and layout will be measured as a single complete unit of work.

Two and three person survey party will be measured by the hour to the nearest half hour.

#### 903.5 - Basis of Payment:

Payment for construction survey and layout will be by the lump sum and will be made as follows:

For each of the first and second months of the contract, a payment in the amount of either \$10,000.00 or 15 percent of the contract amount bid for construction survey and layout, whichever is the lesser amount, will be made.

Ninety percent of the remaining contract amount for construction survey and layout will have been paid when 80 percent of the total contract amount, excluding the items of construction surveying and layout, and mobilization, has been paid. The 90 percent will be paid on a monthly basis prorated on the basis of the Contractor's progress.

The remaining portion of the contract amount bid for construction survey and layout will be paid upon completion and acceptance of the contract work.

The total amount to be paid under the item of construction surveying and layout shall not exceed the contract amount bid for that item.

The items of two and three person survey party are contingent items and are established for the purpose of compensating the Contractor for additional staking and layout required as a result of extra work ordered by the Engineer. The Engineer will be the sole judge as to whether the addi-

tional work shall be performed by the Contractor or by the Flood Control District.

The amount bid per hour for a two-person or three-person survey party shall include the cost of all materials, equipment, labor, subsistence, and benefits necessary to complete the extra work. The amount bid shall include the cost necessary to mobilize the crews and the travel time to and from the project for one time only, for each instance of extra work required.

Payment for traffic control and flagging required for surveying and layout shall be considered as included in the lump sum amount bid for construction surveying and layout.

Traffic control and flagging necessary because of the additional staking and layout required as a result of extra work ordered by the Engineer, shall conform to the requirements of Section 401 - Traffic Control. No direct payment will be made for traffic control, its cost being considered incidental to the survey work.

No payment will be made for resetting of stakes, references, bench marks, and other survey control.

Payment will be made as follows:

<u>Pay Item</u>	<u>Pay Unit</u>
Construction Surveying and Layout	Lump Sum
Two-Person Survey Party	Hour
Three-Person Survey Party	Hour

R40/R577



CONTRACT

CONTRACT

THIS AGREEMENT, made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_, by and between \_\_\_\_\_

of the City of \_\_\_\_\_, County of \_\_\_\_\_, State of \_\_\_\_\_, party of the first part, hereinafter designated the CONTRACTOR, and the FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, acting by and through its BOARD OF DIRECTORS, a political subdivision of the State of Arizona, a body politic with corporate power, party of the second part, hereinafter designated OWNER.

WITNESSETH: That the said Contractor, for and in consideration of the sum to be paid him by the said owner, in the manner and at the time hereinafter provided, and of the other covenants and agreements herein contained, and under the penalties expressed in the bonds provided, hereby agrees, for himself, his heirs, executors, administrators, successors, and assigns to as follows:

ARTICLE I-SCOPE OF WORK: The Contractor shall furnish any and all labor, materials, equipment, transportation, utilities, services and facilities required to perform all work for the construction of Project No. \_\_\_\_\_

and to completely and totally construct the same and install the material therein for the Owner, in a good and workmanlike and substantial manner and to the satisfaction of the Owner through its Engineers and under the direction and supervision of the Engineer, or his properly authorized agents and strictly pursuant to and in conformity with the Plans and Specifications prepared by the Engineers for the Owner, and with such modifications of the same and other documents that may be made by the Owner through the Engineer or his properly authorized agents, as provided herein.

ARTICLE II-CONTRACT DOCUMENTS: The Invitation for Bids, Plans, Standard Specifications and Details, Special Provisions, Addenda, if any, and Proposal, as accepted by the BOARD OF DIRECTORS, Performance Bond, Payment Bond, Certificates of Insurance, and Change Orders, if any are by this reference made a part of this Contract to the same extent as if set forth herein in full.

ARTICLE III-TIME OF COMPLETION: The Contractor further covenants and agrees at his own proper cost and expense, to do all work as aforesaid for the construction of said improvements and to completely construct the same and install the material therein, as called for by this agreement free and clear of all claims, liens, and charges whatsoever, in the manner and under the conditions specified within the time, or times, stated in the proposal pamphlet.

ARTICLE IV-PAYMENTS: For and in consideration of the faithful performance of the work herein embraced as set forth in the Contract Documents, which are a part hereof and in accordance with the directions of the owner, through its Engineer and to his satisfaction, the Owner agrees to pay the said Contractor the amount earned, computed from actual quantities of work performed and accepted or materials furnished at the unit bid price on the Proposal made a part hereof, and to make such payment within forty (40) days after final inspection and acceptance of the work.

IN WITNESS WHEREOF: Four (4) identical counterparts of this contract each of which shall for all purposes be deemed an original thereof, have been duly executed by the parties hereinabove named, on the date and year first above written.

The Contractor Agrees that this Contract, as awarded, is for the stated work, and understands that payment for the total work will be made on the basis of the indicated amount(s), as bid in the Proposal.

FLOOD CONTROL DISTRICT OF  
MARICOPA COUNTY  
PARTY OF THE SECOND PART

\_\_\_\_\_  
By: \_\_\_\_\_  
Chairman, Board of Directors

Date: \_\_\_\_\_

RECOMMENDED BY:

ATTEST:

\_\_\_\_\_  
Chief Engineer and  
General Manager  
Flood Control District of  
Maricopa County

\_\_\_\_\_  
Clerk of the Board

Date: \_\_\_\_\_

LEGAL REVIEW

Approved as to form and within the powers and authority granted under the laws of the State of Arizona to the Flood Control District of Maricopa County.

By: \_\_\_\_\_

Date: \_\_\_\_\_

STATUTORY PAYMENT BOND PURSUANT TO TITLE 34  
CHAPTER 2, ARTICLE 2, OF THE ARIZONA REVISED STATUTES  
(Penalty of this bond must be 100% of the Contract Amount)

KNOW ALL MEN BY THESE PRESENTS:

That, \_\_\_\_\_  
(hereinafter called the Principal, as Principal, and

\_\_\_\_\_ a corporation organized and existing under the laws of the State of \_\_\_\_\_ with its principal office in the City of \_\_\_\_\_, (hereinafter called the Surety), as Surety, are held and firmly bound unto the Flood Control District of Maricopa County, State of Arizona (hereinafter called the Obligee) in the amount of \_\_\_\_\_

\_\_\_\_\_ dollars ( \_\_\_\_\_ ), for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_, for \_\_\_\_\_

\_\_\_\_\_ which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION IS SUCH, that if the said Principal shall promptly pay all moneys due to all persons supplying labor or materials to him or his sub-contractors in the prosecution of the work provided for in said contract, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Title 34, Chapter 2, Article 2, of the Arizona Revised Statutes, and all liabilities on this bond shall be determined in accordance with the provisions, of said Title Chapter, and Article, to the extent as if it were copied at length herein.

The prevailing party or any party which recovers judgement on this bond shall be entitled so such reasonable attorney's fees as may be fixed by the court or a judge thereof.

Witness our hands this \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_.

\_\_\_\_\_  
PRINCIPAL SEAL

BY: \_\_\_\_\_

\_\_\_\_\_  
AGENCY OF RECORD

\_\_\_\_\_  
SURETY SEAL

\_\_\_\_\_  
AGENCY ADDRESS

BY: \_\_\_\_\_

\_\_\_\_\_  
POWER OF ATTORNEY SEAL

CONTRACT NO. FCD 85-10  
PAYMENT BOND

BY: \_\_\_\_\_

STATUTORY PERFORMANCE BOND PURSUANT TO TITLE 34  
CHAPTER 2, ARTICLE 2, OF THE ARIZONA REVISED STATUTES  
(Penalty of this bond must be 100% of the Contract Amount)

KNOW ALL MEN BY THESE PRESENTS:

That, \_\_\_\_\_  
(hereinafter called the Principal, as Principal, and

\_\_\_\_\_ a corporation organized and existing under the laws of the State of \_\_\_\_\_ with its principal office in the City of \_\_\_\_\_, (hereinafter called the Surety), as Surety, are held and firmly bound unto the Flood Control District of Maricopa County, State of Arizona in the amount of \_\_\_\_\_

dollars ( \_\_\_\_\_ ), for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Flood Control District of Maricopa County, dated the \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_, for \_\_\_\_\_

\_\_\_\_\_ which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION IS SUCH, that if the said Principal shall faithfully perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term of said Contract and any extension thereof, with or without notice to the Surety, and during the life of any guaranty required under the Contract, and shall also perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the Surety being hereby waived; the then the above obligation shall be void, otherwise to remain in full force and effect;

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Title 34, Chapter 2, Article, to the extent as if it were copied at length herein.

The prevailing party in a suit on this bond shall be entitled to such reasonable attorney's fees as may be fixed by the judge of the court.

Witness our hands this \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_.

\_\_\_\_\_  
PRINCIPAL SEAL

BY: \_\_\_\_\_

\_\_\_\_\_  
AGENCY OF RECORD

\_\_\_\_\_  
SURETY SEAL

\_\_\_\_\_  
AGENCY ADDRESS

BY: \_\_\_\_\_

\_\_\_\_\_  
POWER OF ATTORNEY SEAL

CONTRACT NO. FCD 85-10  
PERFORMANCE BOND

BY: \_\_\_\_\_

It is further agreed that:  
INDEMNIFICATION AND INSURANCE

- a. Contractor shall indemnify, defend and save harmless the Flood Control District of Maricopa County and/or any of its agents, officials and employees, from any and all claims, demands, suits, actions proceedings, loss, cost, and damages, including any attorney's fees and/or litigation expenses, which may be brought or made against or incurred by the Flood Control District of Maricopa County on account of loss of or damage to any property or for injuries to or death of any person, caused by, arising out of, or contributed to, in whole or in part by reasons of any alleged negligent act, professional error or omission, or negligence of Contractor, its employees, agents, representatives, or subcontractors, their employees, agents or representatives in connection with or incident to the performance of this Agreement, or arising out of Workers' Compensation claims, Unemployment Compensation Claims or Unemployment Disability Compensation Claims of Employees of Contractor and/or its Subcontractor or claims under similar such laws or obligations. Contractor's obligation under this Section shall not extend to any liability caused by the negligence of the Flood Control District of Maricopa County, or its employees.
- b. The Contractor shall provide and maintain, and cause its subcontractors to provide and maintain, the following minimum insurance coverage:
  - (1) Comprehensive General Liability Insurance with the minimum combined single limit of Fifty Million Dollars (\$50,000,000) each occurrence. The policy shall include coverage for bodily injury and personal injury, broad form property damage, blanket contractual, contractor's protective and products and completed operations.
  - (2) Comprehensive Automobile Liability Insurance with a combined single limit for bodily injury and property damage of not less than Five Million Dollars (\$5,000,000) each occurrence with respect to Contractor's vehicles (whether owned, hired, non-owned), assigned to or utilized in the performance of this Contract.
- c. The policies required by Sections b(1) and (2) shall name the Flood Control District of Maricopa County, its agents, officials and employees as additional insured and shall specify that the insurance afforded Contractor shall be primary insurance and that any insurance coverage carried by the Flood Control District of Maricopa, shall be excess coverage and not contributory insurance to that provided by the Contractor. Said policy shall contain a severability of interest provision.
- d. Failure on the part of the Contractor to procure and maintain the required liability insurance and provide proof thereof to the Flood Control District of Maricopa County within Thirty (30) days following the commencement of a new policy, shall constitute a material breach of the contractor upon which the department may immediately terminate this Agreement. Prior to the effective date of this Contract, the Contractor shall furnish the Flood Control District of Maricopa County with copies of a Certificate of Insurance drawn in conformity with the above insurance requirements. The Flood Control District of Maricopa County reserves the right to request and receive certified copies of any or all of the above policies and/or endorsements.

Date

Contractor