CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS

Contract 9
WATER TRANSMISSION MAIN AND SANITARY SEWER EXTENSIONS

Paradise Park Regional Industrial Authority

JUNE 2023

OF KENTUCKY
PROJECT NO. 2083-03

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PART VIII

Technical Specifications:

PART IX

SECTION 00020

ADVERTISEMENT FOR BIDS

Paradise Park Regional Industrial Development Authority, Inc.
P.O. Box 636
Greenville, KY 42345

Separate sealed bids for Contract 9 will be received by the Paradise Park Regional Industrial Development Authority, Inc. (Kathy Switzer, Vice Chairman), 50 Career Way, Central City, Ky until **2:00 p.m. (Local time), July 13, 2023** at which time the sealed bids will be publicly opened and read aloud.

Contract 9 will consist of the Construction of approximately 2,300 feet of 12 inch waterline and appurtenances and 1,700 feet of 8" gravity sewers. Excavation is unclassified. The Contractor shall furnish all materials, equipment and labor necessary to complete the renovation of the station and construction of the waterline including equipment, labor, materials and any other action or materials required for a complete station and waterline installation. Time of completion will be 60 Calendar Days.

The information for Bidders, Form of Bid, Form of Contract, Plans, Specifications, and Forms of Bid Bond, Performance and Payment Bond, and other contract documents may be examined at the following:

Paradise Park Regional Industrial Development Authority, 50 Career Way, Central City, KY
MSE of Kentucky, Inc., 624 Wellington Way, Lexington, KY
A.B.C., 2020 Liberty Road, Bldg A, Suite 110, Lexington KY
F. W. Dodge Corporation / AGC of Kentucky, 950 Contract St., Suite 100A, Lexington KY
Builders Exchange, 2300 Meadow Drive, Louisville KY

Copies of the Contract Documents may be obtained at Lynn Imaging, located at 328 Old Vine Street, Lexington, Ky upon receipt of a non-refundable printing and shipping/handling charge of $100.00 for Contract 9. All orders must be pre-paid. There will be a 24-hour turn-around on all orders. Phone number is (859) 226-5850.

Contractors must submit their bid in an opaque sealed envelope, marked "SEALED BID FOR Paradise Park Regional Industrial Authority" and showing the name and address of the Bidder and accompanied by the bid security and other required documents. If forwarded by mail, the sealed envelope must be addressed to Paradise Park Regional Industrial Development Authority, Inc., P.O. Box 636, Greenville, KY 42345, Attn: Barbara Williams. If shipped by carrier the sealed envelope must be addressed to Paradise Park Regional Industrial Development Authority, Inc., Career Advancement Center, 50 Career Way, Central City, Ky 42330, Attn: Barbara Williams.

No Bidder may withdraw his bid for a period of ninety (90) days after the date set for the opening of bids. Bids may be withdrawn in person, prior to the closing date for the receipt of bids.

Sealed proposals for the Contract shall clearly marked on the outside of the envelope as follows: **"Contract 9 - Water Transmission Main and Gravity Sewer Extensions, not to be opened until July 13, 2023, 2:00 p.m. (local time)".**

All bids shall be accompanied by a bid guarantee of not less than five (5%) percent of the base bid amount. A 100 percent performance bond and payment bond will be required of the low bidder. Bidders shall submit qualifications, list of materials and equipment, and list of subcontractors with the Bid Proposal.

Any bid received after the time and date specified shall not be considered and will be returned unopened to the bidder.

The Contractor's attention is called to the fact that any contract awarded under this Advertisement for Bids is expected to be funded by in part by the Kentucky Cabinet for Economic Development and the Kentucky Infrastructure Authority.

The Paradise Park Regional Industrial Authority may consider informal any bid not prepared and submitted in accordance with the provisions of this advertisement and/or the specifications and may waive any informalities or reject any and all bids.

Award will be made to the lowest, responsive, responsible bidder.

Paradise Park Regional Industrial Development Authority, Inc.
Tommy Caskey, Chairman

INFORMATION FOR BIDDERS

BIDS will be received by the Paradise Park Regional Industrial Development Authority (herein called the "Owner")at the Career Advancement Center, 50 Career Way, Central City, Ky 42330 until **2:00 p.m., (local time), July 13, 2023** and then at said office publicly opened and read aloud.

Each BID must be submitted in a sealed envelope, addressed to Paradise Park Regional Industrial Development Authority, Career Advancement Center, 50 Career Way, Central City, Ky 42330 or Paradise Park Regional Industrial Authority, P.O. Box 636, Greenville, KY 42345 . Each sealed envelope containing a BID must be plainly marked on the outside as BID FOR CONTRACT NO. 9 and the envelope should bear on the outside the BIDDER'S name and address, and the name of the project for which the BID is submitted. If forwarded by mail or shipped, the sealed envelope containing the BID must be enclosed in another envelope addressed to the OWNER at one of the above addresses.

All BIDS must be made on the required BID form. All blank spaces for BID prices must be completed, in ink or typewritten, and the BID form must be fully completed and executed when submitted. Only one copy of the BID form is required.

Telegraphic / Facsimile Modification: Any bidder may modify his/her bid by telegraphic or facsimile communication at any time prior to the scheduled closing time for receipt of bids, provided such communication is received by the OWNER prior to the closing time, and provided further, the OWNER is satisfied that a written confirmation of the telegraphic/facsimile modification over the signature of the BIDDER was mailed prior to the closing time. The communication should not reveal the bid price but should provide the addition or subtraction or other modification so that the final prices or terms will not be know by the OWNER until the sealed bid is opened. If written confirmation is received within two days from the closing time, no consideration will be given to the telegraphic/facsimile modification.

The OWNER may waive any informalities or minor defects or reject any and all BIDS. Any BID may be withdrawn prior to the above scheduled time for the opening of BIDS or authorized postponement thereof. Any BID received after the time and date specified shall not be considered. No BIDDER may withdraw a BID within ninety (90) days after the actual date of the opening thereof. Should there be reasons why the contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the Owner and the Bidder.

BIDDERS must satisfy themselves of the accuracy of the **estimated** quantities in the BID SCHEDULE by examination of the site and a review of the drawings and specifications including ADDENDA. After BIDS have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of WORK or of the nature of the WORK to be done.

The OWNER shall provide to BIDDERS prior to BIDDING, all information which is pertinent to, and delineates and describes, the land owner and rights-of-way acquired or to be acquired.

The CONTRACT DOCUMENTS contain the provisions required for the construction of the PROJECT. Information obtained from an officer, agent, or employee of the OWNER or any other person shall not affect the risks or obligations assumed by the CONTRACTOR from fulfilling any of the conditions of the CONTRACT.

Each BID must be accompanied by a BID bond payable to the OWNER for five percent of the total

amount of the BID. As soon as the BID prices have been compared, the OWNER will return the bonds of all except the three lowest responsible BIDDERS. When the AGREEMENT is executed the bonds of the two remaining unsuccessful BIDDERS will be returned. The BID BOND of the successful BIDDER will be retained until the PAYMENT BOND and PERFORMANCE BOND have be executed and approved, after which it will be returned. A certified check may be used in lieu of a BID BOND.

A PERFORMANCE BOND and a PAYMENT BOND each in the amount of 100 percent of the CONTRACT PRICE, with a corporate surety approved by the OWNER, will be required for the faithful performance of the contract.

Attorney-in-fact who sign BID BONDS or PAYMENT BONDS and PERFORMANCE BONDS must file with each BOND a certified and effective dated copy of their POWER OF ATTORNEY.

The party to whom the contract is awarded will be required to execute to AGREEMENT and obtain the PERFORMANCE BOND and PAYMENT BOND within ten (10) calendar days from the date when NOTICE OF AWARD is delivered to the BIDDER. The NOTICE OF AWARD shall be accompanied by the necessary AGREEMENT and BOND forms. In case of failure of the BIDDER to execute the AGREEMENT, the OWNER may consider the BIDDER in default, in which case the BID BOND accompanying the proposal shall become the property of the OWNER.

The OWNER, within ten (10) days of receipt of acceptable PERFORMANCE BOND, PAYMENT BOND and AGREEMENT signed by the party to whom the AGREEMENT was awarded shall sign the AGREEMENT and return to such party an executed duplicate of the AGREEMENT. Should the OWNER not execute the AGREEMENT within such period, the BIDDER may by WRITTEN NOTICE withdraw the signed AGREEMENT. Such notice of withdrawal shall be effective upon receipt of the notice by the OWNER.

The NOTICE TO PROCEED shall be issued within ten (10) days of the execution of the AGREEMENT by the OWNER. Should there be reasons why the NOTICE TO PROCEED cannot be issued within such period, the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the NOTICE TO PROCEED has not been issued within the ten (10) day period or within the period mutually agreed upon, the CONTRACTOR may terminate the AGREEMENT without further liability on the part of either party.

The OWNER may make such investigations as deemed necessary to determine the ability of the BIDDER to perform the WORK, and the BIDDER shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any BID if the evidence submitted by, or investigation of, such BIDDER fails to satisfy the OWNER that such BIDDER fails to satisfy the OWNER that such BIDDER is properly qualified to carry out the obligations of the AGREEMENT and to complete the WORK contemplated therein.

A conditional or qualified BID will not be accepted.

Award will be made to the lowest responsible BIDDER.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the PROJECT shall apply to the contract throughout. Each Bidder is responsible for inspecting the site and for reading and being thoroughly familiar with the CONTRACT DOCUMENTS. The failure or omission of any BIDDER, to do any of the foregoing shall in no way

relieve any BIDDER from any obligation in respect to its BID.

The low BIDDER shall supply the names and addresses of major material SUPPLIERS and SUBCONTRACTORS when required to do so by the OWNER.

Contract 9 - BID PROPOSAL

Proposal of _____ (hereinafter called BIDDER), organized and existing under the laws of the State of _____doing business as _____* to the Paradise Park Regional Industrial Development Authority, Inc., P.O. Box 636, Greenville, KY 42345 (hereinafter called Owner).

In compliance with your Advertisement for Bids, BIDDER herebyproposes to perform all WORK for the construction of water and sewer main extensions and accessories in strict accordance with the CONTRACT DOCUMENTS, within the time set forth herein, and at the prices stated below.

By submission of this BID, each BIDDER certifies, and in the case of a joint BID, each party thereto certifies as to its own organization, that this joint BID has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this BID with any other BIDDER or with any competitor.

BIDDER hereby agrees to commence WORK under this contract on or before a date to be specified in the NOTICE TO PROCEED and to fully complete the PROJECT within sixty (60) consecutive calendar days. BIDDER further agrees to pay as liquidated damages, the sum of $500 for each consecutive working day thereafter, until completion, for each phase as provided in the General Conditions and Section VII, Special Conditions.

BIDDER acknowledges receipt of the following ADDENDUM:

_____

BIDDER agrees to perform all the WORK described in the CONTRACT DOCUMENTS for the unit prices contained in the following BID SCHEDULE: *Insert "corporation", "partnership", or "individual" as applicable.

BID SCHEDULE – PART 1 WATER LINE WORK

ITEM & DESCRIPTION		ESTIMATED QUANTITY		UNIT PRICE	TOTAL
1.	Furnishing, delivery and installing water line, including trenching, all fittings, standard bedding, laying, backfilling, tracer wire, thrust-blocking and any other subsidiary work. Excavation is unclassified. Mechanical joint, cast iron fittings (elbows, tees, etc.) are required.				
	A. 12" PVC Pipe, CL 200	2,325	L.F.	$_____	$_____
2	Furnishing, delivery and installing new steel casing or cover pipe for highway crossing where open cutting is allowed. Does not include carrier pipe which is pain under Item 1.				
	A. Steel Casing Pipe Open-Cut	80	L.F.	$_____	$_____
3..	Gate Valves and boxes set complete as specified including trenching, tracer wire, backfilling and concrete collars. Mechanical joint, cast iron only.				
	A. 12" Gate Valves	2	EA.	$_____	$_____
4.	Furnishing, delivery and installing Fire Hydrant assemblies including thrust blocking, excavation and backfilling. Excavation is unclassified. Mechanical joint, cast iron only.				
	A. 6" Fire Hydrant Assembly	1	EA.	$_____	$_____
5.	Removal, replacement, repair or reconstruction of miscellaneous concrete structures as required by the Engineer.				
	A. Class "B" Concrete (includes 200# reinforcing per C.Y.)	10	C.Y.	$_____	$_____
	B. Class "B" Concrete (no reinforcing)	10	C.Y.	$_____	$_____
6.	Installation of "Special" creek crossings with casing pipes as shown on the plans or as required by the Engineer. Does not include cost of carrier pipe.				
	A. Type "A" Creek Crossing (with casing pipe)	60	LF	$_____	$_____
7.	Installation of a sewer crossing including casing pipe				
	A Sewer Main Crossing	40	LF	$_____	$_____

BID SCHEDULE - CONTRACT 9 Contd.

ITEM & DESCRIPTION		ESTIMATED QUANTITY		UNIT PRICE	TOTAL
8.	Installation of hot tap tie-in to existing 12" PVC mains. Includes taping valve and sleeves and all appurtenances and excavation, pipe bedding and cleanup of the connection.				
	A 12" x 12" connection	1	EA	$_____	$_____

SubTotal – PART 1 Water Construction (Items 1 through 8) $_____

BID SCHEDULE – PART 2 SEWER LINE WORK

ITEM & DESCRIPTION	ESTIMATED QUANTITY		UNIT PRICE	TOTAL
1. Sanitary Sewer. Furnish all labor, equipment and materials and install 8" PVC SDR 35 sanitary sewer main, including all trenching, bedding, backfill, testing and related work. Unclassified excavation.				
A. Sanitary Sewer 0-6.0' Deep	386	L.F.	$_____	$_____
B. Sanitary Sewer 6.1-8.0' Deep	67	L.F.	$_____	$_____
C. Sanitary Sewer 8.1-10.0' Deep	583	L.F.	$_____	$_____
D. Sanitary Sewer 10.1-12.0' Deep	677	L.F.	$_____	$_____
2. Standard Manhole. Furnish all labor, equipment and materials and install four foot diameter standard manholes, up to six feet in depth.				
Standard Manhole	5	Ea.	$_____	$_____
3. Vertical Extension for Manhole. Furnish all labor, equipment and materials and extend standard four foot diameter manhole, greater than six feet in depth.				
Vertical Extension	8	V.F.	$_____	$_____

4. Connection to Existing Manhole. Furnish all labor, equipment and materials and connect force main to existing manhole. Reshape invert of existing manhole for new line.

Connection to Existing Manhole	2	Ea.	$_____	$_____

5. Surface Restoration. Includes furnishing all labor, equipment and materials and fertilizing, seeding and mulching disturbed lawns and other grassed areas.

Surface Restoration		L.S.	$_____	$_____

6. Other Costs. Mobilization, demobilization, project sign and other costs.

Other Costs		L.S.	$_____	$_____

SubTotal – PART 2 Sewer Construction (Items 1 through 6) $_____

TOTAL BID – PART 1 AND PART 2 COMBINED $_____

RESPECTFULLY SUBMITTED:

_____ _____
Signature Address

_____ _____
Title Phone Number

_____ _____
License Number (if applicable) Email Address

SEAL - (if bid is by a corporation)

ATTEST_____

SECTION 00320 - BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____, as Principal, hereinafter called the Principal, and _____ as Surety, hereinafter called the Surety, are held and firmly bound unto _____, as Obligee, hereinafter called the Obligee, in the sum of _____ _____ dollars for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents. The Condition of the above obligation is such that whereas the Principal has submitted to ,
a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for the construction of .

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or contract documents with good and sufficient surety for the faithful performance of said contract, and for the prompt payment of labor and materials furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this _____ day of _____, 20__.

_____
Principal

By:_____ _____
Witness

_____
Surety

By:_____ _____
Attorney-in-Fact Witness

IMPORTANT: SURETY companies executing BONDS must appear on the Treasury Department's most current list (circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

End of Section

BIDDER'S QUALIFICATIONS

The Bidder's Qualifications are required by the Owner to be submitted as set forth herewith:

1. Permanent place of business is maintained at:

   _____

2. Under the headings shown below, Bidder is requested to list and describe all equipment (i.e. backhoes, trenching machines, pipe pushing machines, air compressors, trucks, tractors, power shovels, concrete mixers pumping equipment, etc.) which he plans to use to perform the proposed work. If any of the equipment is not owned by the Bidder he must furnish the Owner's written evidence that he has obtained a firm commitment from the equipment owner to use or purchase such equipment. Attach a rider if necessary.

Quantity	Equipment Type	Manufacturer	Capacity	Age and Condition	Location of Equipment

3. Experience of Contractor on other similar work (description of work, owner, location, if pipeline list type of pipe):

_____ $ _____

_____ $ _____

_____ $ _____

_____ $ _____

_____ $ _____

_____ $ _____

We now have the following jobs under contract and bonded (list all construction now under contract):

JOB	LOCATION	TOTAL AMOUNT
_____	_____	$ _____
_____	_____	$ _____
_____	_____	$ _____
_____	_____	$ _____
_____	_____	$ _____
_____	_____	$ _____

Respectfully Submitted:

_____
(Name of Contracting Firm)

By _____

_____
(Title)

_____
(Date)

SUBCONTRACTORS

The following list of proposed subcontractors is required by the Owner to be executed complete and submitted with the Bidder's Proposal. All Subcontractors are subject to approval of the Owner and/or the funding agency. **Failure to submit this list, completely filled out, may be cause for rejection of the bid.** If certain categories of the work are performed by the Contractor, so state.

CATEGORY OF WORK	NAME OF SUBCONTRACTOR AND ADDRESS
Excavation, Filling & Grading	_____
Electrical	_____
Mechanical	_____
Paving	_____
Concrete	_____
Painting	_____
Seeding	_____
Roofing	_____
Plumbing	_____
Blasting	_____
Boring	_____

_____

_____

_____

_____

_____

_____

PART II
Contract Documents

SECTION 00490 - NOTICE OF AWARD

To: _____

_____

_____

PROJECT Description: _____

_____

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids dated _____, 20_____, and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of $_____.

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR's Performance Bond, Payment Bond and Certificates of Insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said Bonds within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER's acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____ day of _____, 20_____.

_____
Owner

By _____

Name/Title _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by

this the _____ day of _____, 20_____.

By _____

Name/Title _____

SECTION 00500 - AGREEMENT

This Agreement, made this _____ day of _____, 2023, by and between the _____ _____, hereinafter called "Owner" and _____, doing business as ___ _____ (insert "a corporation", "a partnership", or "an individual" as applicable) hereinafter called "Contractor".

Witnesseth: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The Contractor will commence and complete the construction of: _____ -

_____

2. The Contractor will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the Project described herein.

3. The Contractor will commence the work required by the Contract Documents within 10 calendar days after the date of the Notice to Proceed and will complete the same within 60 calendar days unless the period for completion is extended otherwise by the Contract Documents.

4. The Contractor agrees to perform all of the Work described in the Contract Documents and comply with the terms therein for the sum of $ _____, or as shown in the Bid Schedule.

5. The term "Contract Documents" means and includes the following:
   - A. Advertisement for Bids
   - B. Information for Bidders
   - C. Bid
   - D. Bid Bond
   - E. Agreement
   - F. General Conditions
   - G. Supplemental General Conditions
   - H. Payment Bond
   - I. Performance Bond
   - J. Notice of Award
   - K. Notice to Proceed
   - L. Change Order
   - M. Drawings prepared by MSE of Kentucky, Inc. numbered _____ through _____, and dated ___ _____, 20 ___.
   - N. Specifications prepared or issued by MSE of Kentucky, Inc., dated _____ , 20___.

O. Addenda:

No. ____ dated _____ No. ____ dated _____

No. ____ dated _____ No. ____ dated _____

6. The Owner will pay to the Contractor in the manner and at such times as set forth in the General Conditions such amounts as required by the Contract Documents.

7. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

In Witness Whereof, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in (_____ [number of copies]) each of which shall be deemed an original on the date first above written.

_____	_____
(Owner)	(Contractor)
_____	_____
(Signature) (Date)	(Signature) (Date)
_____	_____
(Name, Title)	(Name, Title)
ATTEST:	ATTEST:
_____	_____
(Signature) (Date)	(Signature) (Date)
_____	_____
(Name, Title)	(Name, Title)

SECTION 00600 - PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____ , hereinafter called Principal, and
(Corporation, Partnership or Individual)

_____ , hereinafter called Surety, are held and firmly bound unto
(Name of Surety)

_____
(Name of Owner)

_____
(Address of Owner)

hereinafter called OWNER, in the penal sum of _____

_____ Dollars, ($_____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

The CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, 20___, a copy of which is hereto attached and made a part hereof for the construction of:

_____

_____

_____

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the by the OWNER, with or without notice to the Surety and during the one year guaranty period, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any wise affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER, and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in ____ counterparts, each one of which shall be deemed and original, this the _____ day of _____, 20___.

ATTEST:

(Principal)

By:

(Principal) Secretary

(SEAL)

(Street Address)

(Witness as to Principal)

(City, State, Zip)

(Street Address)

(City, State, Zip)

ATTEST:

(Surety)

(Witness as to Surety)

(Attorney-in-Fact)

(Street Address)

(Street Address)

(City, State, Zip)

(City, State, Zip)

Note: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: SURETY companies executing BONDS must appear on the Treasury Department's most current list (circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

SECTION 00602 - PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____ , hereinafter called Principal, and
(Corporation, Partnership or Individual)

_____ , hereinafter called Surety, are held and firmly bound unto
(Name of Surety)

_____
(Name of Owner)

_____
(Address of Owner)

hereinafter called OWNER, in the penal sum of _____

_____ Dollars, ($_____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

The CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, 20___, a copy of which is hereto attached and made a part hereof for the construction of:

_____

_____

_____

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the by the OWNER, with or without notice to the Surety and during the one year guaranty period, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any wise affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER, and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in ____ counterparts, each one of which shall be deemed and original, this the _____ day of _____, 20__.

ATTEST:

(Principal)

By:

(Principal) Secretary

(SEAL)

(Street Address)

(Witness as to Principal)

(City, State, Zip)

(Street Address)

(City, State, Zip)

ATTEST:

(Surety)

(Witness as to Surety)

(Attorney-in-Fact)

(Street Address)

(Street Address)

(City, State, Zip)

(City, State, Zip)

Note: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: SURETY companies executing BONDS must appear on the Treasury Department's most current list (circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

SECTION 00680 - NOTICE TO PROCEED

TO: _____ Date: _____

_____ Project: _____

_____ _____

_____ _____

You are hereby notified to commence WORK in accordance with the Agreement dated _____, 20_____ on or before _____ , 20___ , and you are to complete the WORK within _____ consecutive calendar days thereafter. The date of completion of all WORK is therefore _____, 20_____ .

_____
Owner

_____
Signature

_____
Title

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by _____

_____ this the _____ day of _____ , 20____.

_____
Contractor

_____
Signature

_____
Title

End of Section

PART III
General Conditions

SECTION 00700 - GENERAL CONDITIONS

1. Definitions
2. Execution, Correlation and Intent of Documents
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1. Definitions

Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

Addendum - Written or graphic instrument issued prior to the execution of the agreement which modifies or interprets the Contract Documents, drawings and specifications.

Agreement - The written agreement between Owner and Contractor covering the work to be performed; other Contract Documents are attached to the Agreement.

Application for Payment - the form furnished by Engineer which is to be used by Contractor in requesting progress payments and which is to include the schedule of values required by Article 42.

Engineer - The person, firm or corporation named as such in the Agreement.

Bid - The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the work to be performed.

Bidder - Any person, firm or corporation submitting a Bid for the work.

Bonds - Bid, performance and payment bonds and other instruments of security, furnished by Contractor and his surety in accordance with the Contract Documents.

Change Order - A written order to Contractor signed by Owner authorizing an addition, deletion or revision in the work, or an adjustment in the Contract Price or the Contract Time issued after execution of the Agreement.

Contract Documents - The Advertisement for Bids, Agreement, Addenda (whether issued prior to the opening of Bids or the execution of the Agreement), Instructions to Bidders, Contractor's Bid, the Bonds, the Notice of Award, these General Conditions, the Supplementary Conditions, the Specifications, Drawings and Modifications.

Contract Price - The total moneys payable to Contractor under the Contract Documents.

Contract Time - The number of days stated in the Agreement for the completion of the work.

Contractor - The person, firm or corporation with whom Owner has executed the Agreement.

Day - A calendar day of twenty-four hours measured from midnight to the next midnight.

Drawings - The drawings which show the character and scope of work to be performed and which have been prepared or approved by Engineer and are referred to in the Contract Documents.

Field Order - A written order issued by Engineer to the Contractor which clarifies or interprets the Contract Documents or orders minor changes in the work without involving a change in the contract price or time.

Modification - (a) A written amendment of the Contract Documents signed by both parties, (b) a Change Order, (c) a written clarification or interpretation issued by Engineer, or (d) a written order for a minor change or alteration in the work issued by Engineer. A Modification may only be issued after execution of the Agreement.

Notice of Award - The written notice by Owner to the apparent successful bidder stating that upon compliance with the conditions precedent to be fulfilled by him within the time specified, Owner will execute the Agreement with him.

Notice to Proceed - A written notice given by Owner to Contractor (with a copy to Engineer) fixing the date on which the contract time will commence to run and on which Contractor shall start to perform his obligations under the Contract Documents.

Owner - A public body or authority, corporation, association, partnership, or individual for whom the work is to be performed.

Project - The entire construction to be performed as provided in the Contract Documents.

Resident Project Representative - The authorized representative of Engineer who is assigned to the Project site or any part thereof.

Shop Drawings - All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by Contractor, a Subcontractor, manufacturer, supplier or distributor and which illustrate the equipment, material or some portion of the work.

Specifications - Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the work.

Subcontractor - An individual, firm or corporation having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the work at the site.

Substantial Completion - The date as certified by Engineer when the construction of the project or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the project or specified part can be utilized for the purposes for which it was intended.

Work - Any and all obligations, duties and responsibilities necessary to the successful completion of the project assigned to or undertaken by Contractor under the Contract Documents, including all labor, materials, equipment and other incidentals, and the furnishing thereof.

Written Notice - A notice in writing to any party of the Agreement and considered delivered and the service thereof completed, when posted by certified or registered mail to said party at his last given address or delivered in person to said party or his authorized representative.

2. Execution, Correlation and Intent of Documents

At least six copies of the Agreement and such other Contract Documents as practicable will be executed and delivered to the Owner by the Contractor within ten days of the Notice of Award. Owner shall execute and deliver one counterpart to Contractor within ten days after receipt of the executed Agreement from Contractor. Engineer will identify those portions of the Contract Document not signed and such identification will be binding on all parties.

Contractor shall also deliver to Owner such Bonds as he may be required to furnish when he delivers the executed agreement to Owner.

It is the intent of the Specifications and Drawings to describe a complete project to be constructed in accordance with the Contract Documents. The Contract Documents comprise the entire Agreement between Owner and Contractor. They may be altered only by a modification.

The Contract Documents are complementary; what is called for by one is as binding as if called for by all. If Contractor finds a conflict, error or discrepancy in the Contract Documents, he shall call it to Engineer's attention in writing at once and before proceeding with the work affected thereby; however, he shall not be liable to Owner or Engineer for his failure to discover any conflict, error or discrepancy in the Specifications or Drawings. In resolving such conflicts, errors and discrepancies, the documents shall be given precedence in the following order: Agreement, Modifications, Addenda, Special Conditions, Instructions to Bidders, General Conditions, Specifications and Drawings. Figure dimensions on Drawings shall govern over general Drawings. Any work that may reasonably be inferred from the Specifications or Drawings as being required to produce the intended result shall be supplied whether or not it is specifically called for. Work, materials or equipment described in words which so applied have a well-known technical or trade meaning shall be deemed to refer to such recognized standards.

3. Starting the Project

Before undertaking each part of the work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. He shall at once report in writing to Engineer any conflict, error or discrepancy which he may discover; however, he shall not be liable to Owner or Engineer for his failure to discover any conflict, error or discrepancy in the Drawings or Specifications.

Within ten days after delivery of the executed Agreement by Owner to Contractor, Contractor shall submit to Engineer for approval, an estimated progress schedule indicating the starting and completion dates to the various stages of the Work, and a preliminary schedule of Shop Drawing submissions.

Before starting the Work at the site, Contractor shall furnish Owner and Engineer certificates of insurance as required by Article 7. Within twenty days after delivery of the executed Agreement by Owner to Contractor, but before starting the work at the site, a conference will be held to review the above schedules to establish procedures for handling Shop Drawings and other submissions and for processing Applications for Payment, and to establish a working understanding between the parties as to the Project. Present at the conference will be Owner or his representative, Engineer, Resident Project Representative, Contractor and his Superintendent.

Contractor shall start to perform his obligations under the Contract Documents on the date when the Contract Time commences to run. No Work shall be done at the site prior to the date on which the contract time commences to run.

4. Contract Documents

Unless otherwise provided in the Special Conditions, the Owner or his representative will furnish the Contractor, free of charge, up to six copies of drawings and specifications and other Contract Documents. Additional copies shall be provided for the cost of reproduction.

5. Contractor's Pre-Start Representations

Contractor represents that he has familiarized himself with, and assumes full responsibility for having familiarized himself with, the nature and extent of the Contract Documents. Work, locality, and with all local conditions and federal, state and local laws, ordinances, rules and regulations that may in any manner affect performance of the work, and represents that he has correlated his study and observations with the requirements of the Contract Documents. Contractor also represents that he has studied all surveys and investigation reports of subsurface and latent physical conditions referred to in the Plans and Specifications and made such additional surveys and investigations as he deems necessary for the performance for the work at the Contract Price in accordance with the requirements of the Contract Documents and that he has correlated the results of all such data with the requirements of the Contract Documents.

6. Indemnity

The Contractor shall indemnify and hold harmless the Owner and the Engineer and their agents and employees from and against all claims, damages, losses and expenses including attorney's fees arising out of or resulting from the performance of the work, providing that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, diseases or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom and (b) is caused in whole or in part by any negligent act or omission of the Contractor and Subcontractor, anyone directly or indirectly employed by any of them or any one

for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

In any and all claims against the Owner or the Engineer or any of their agents or employees by any employee of the Contractor, any Subcontractor, any one directly or indirectly employed by any of them or any one for whose acts any of them may be liable, the indemnification obligation under these General Conditions shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts.

The obligations of the Contractor under these General Conditions shall not extend to the liability of the Engineer, his agents or employees arising out of (a) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications or (b) the giving of or the failure to give instructions or directions by the Engineer, his agents or employees provided such giving or failure to give is the primary cause of injury or damage.

7. Insurance

Contractor shall purchase and maintain such insurance as will protect him from claims under workmen's compensation laws, disability benefit laws or other similar employee benefit laws; from claims for damages because of bodily injury, occupational sickness or disease, or death of his employees, and claims insured by usual personal injury liability coverage; from claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees including claims insured by usual personal injury liability coverage; and from claims for injury to or destruction of tangible property, including loss of use resulting therefrom -- any or all of which arise out of or result from Contractor's operations under the Contract Documents, whether such operations be by himself or by any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be legally liable. This insurance shall include the specific coverages and be written for not less than any limits of liability and maximum deductibles specified in the Special Conditions or required by law, whichever is greater, shall include contractual liability insurance and shall include Owner and Engineer as additional insured parties. Before starting the Work, Contractor shall file with Owner and Engineer certificates of such insurance, acceptable to Owner; these certificates shall contain a provision that the coverage afforded under the policies will not be canceled or materially changed until at least fifteen days' prior written notice has been given to Owner and Engineer.

The Contractor shall procure and maintain, at his own expense, during the contract time, liability insurance as hereinafter specified; and in the amounts listed in the Special Conditions.

a. Compensation Insurance - The Contractor shall take out and maintain during the life of this contract Workmen's Compensation Insurance for all of his employees employed at the site of the project, and, in case any work is sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all of the

latter's employees unless such employees are covered by the protection afforded by the Contractor.

b. Public Liability and Property Damage Insurance - The Contractor shall take out and maintain during the life of this contract such Public Liability and Property Damage Insurance as shall protect him and any subcontractor performing work covered by this contract, from claims for damages for personal injury, including accidental death, as well as for claims for property damages which may arise from operations under this contract, whether such operations be by himself or by any subcontractor or by anyone directly or indirectly employed by either of them. The insurance will include as additional named insured: the Owner and Engineer and his Consultants; and each of their officers, agents and employees.

c. Contingent Public Liability and Property Damage Insurance - If any subcontracts are awarded, subparagraph "b" above shall be interpreted to require that the General Contractor shall take out and maintain Contractor's contingent public liability and property damage insurance in the amounts required under the "Special Conditions".

d. Builder's Risk Insurance or Installation Floater - The Contractor shall provide "All Risk" type Builder's Risk Insurance including coverage for fire, lightning, explosion, wind, hail, riot, aircraft, smoke, collapse, extended coverage, vandalism and malicious mischief. Unless specifically authorized by the Owner, the amount of such insurance shall not be less than the contract price totaled in the bid. Deductible amount shall not exceed $250.

In case of pipeline contracts, this coverage shall be provided by an installation floater for the full cash value of materials and accessories on hand to be used in conjunction with the project. Coverage shall include insuring against transportation loss or damage. The policy shall name as the insured the Contractor, the Engineer and the Owner.

e. Railroad Protective Liability Insurance - Where work on railroad rights-of-way is involved, the Contractor shall also be covered by Railroad Protective Liability Insurance with limits of liability as required by the railroad company on whose property the work is being performed.

f. Flood Hazard Insurance - The Contractor will be required to acquire and maintain during the life of the Contract any flood insurance made available under the National Flood Insurance Act of 1968, as amended. The insurance shall be in an amount at least equal to the contract amount costs excluding cost of uninsurable improvements, or to the maximum limit of coverage made available under the National Flood Insurance Act of 1968, as amended, whichever is less.

8. Guaranty Bond

Contractor shall furnish performance and payment bond as security for the faithful performance and payment of all his obligations under the Contract Documents. These Bonds shall be in

amounts at least equal to the contract price, and (except as otherwise provided in the Supplementary Conditions) in such form and with such sureties as are licensed to conduct business in the state where the project is located and are named in the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Federal Register by the Audit Staff Bureau of Accounts, U.S. Treasury Department.

If the surety on any Bond furnished by Contractor is declared a bankrupt or becomes insolvent or its rights to do business is terminated in any state where any part of the Project is located is revoked, Contractor shall within five days thereafter substitute another Bond and Surety, both of which shall be acceptable to Owner.

9. Additional Bonds and Insurance

Prior to delivery of the executed Agreement by Owner to Contractor, Owner may require Contractor to furnish such other Bonds and such additional insurance, in such form and with such sureties or insurers as Owner may require. If such other Bonds or such other insurance are specified by written instructions given prior to opening of bids, the premiums shall be paid by Contractor: if subsequent thereto, they shall be paid by Owner (except as otherwise provided in Article 15.)

10. Availability of Lands

Prior to issuance of Notice to Proceed, the Owner shall obtain all land and rights-of-way necessary for carrying out and for the completion of the work to be performed pursuant to the Contract Documents, unless otherwise mutually agreed.

The Owner shall provide the Contractor information which delineates and describes the land owned and rights-of-way acquired.

The Contractor shall provide at his own expense and without liability to the Owner any additional land and access thereto that the Contractor may desire for temporary construction facilities, or for storage of materials.

11. Unforeseen Physical Conditions

Contractor shall promptly notify Owner and Engineer in writing of any subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents. Engineer will promptly investigate those conditions and advise Owner in writing if further surveys or subsurface test are necessary. Promptly thereafter, Owner shall obtain the necessary additional surveys and tests and furnish copies to Engineer and Contractor. If Engineer finds that the results of such surveys or test indicate that there are subsurface or latent physical conditions which differ materially from those intended in the Contract Documents, and which could not reasonably have been anticipated by Contractor, a Change Order shall be issued incorporating the necessary revisions.

12. Reference Points

Owner shall provide engineering surveys for construction to establish reference points which in his judgment are necessary to enable Contractor to proceed with the work. Contractor shall be responsible for surveying and laying out the work (unless otherwise provided in the Special Conditions), and shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of Owner. He shall report to Engineer whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or location. Contractor shall replace and accurately relocate all reference points so lost, destroyed or moved.

13. Superintendence - Supervision

The Contractor shall keep on his work, during its progress, a competent Superintendent and any necessary assistants, all satisfactory to the Engineer. The Superintendent shall not be changed without written notice to the Owner and Engineer except under extraordinary circumstances. The Superintendent shall represent the Contractor in his absence and all directions given to him shall be as binding as if given to the Contractor.

The Contractor shall give efficient supervision to the Work, using his best skill and attention. He shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but he shall not be solely responsible for the negligence of others in the design or selection of a specific means, method, technique, sequence or procedure of construction which is indicated in and required by the Contract Documents. Contractor shall be responsible to see that the finished Work complies accurately with the Contract Documents.

The Contractor shall see that for his own Work and for the Work of each subcontractor, proper templates and patterns necessary for the coordination of the various parts of the Work are prepared, and shall furnish, or require subcontractors to fit together and execute fully their respective portions of the Work.

14. Materials, Appliances, Employees

The Contractor shall provide and pay for all materials, labor, water tools, appliances, fuel, heat, sanitary facilities, equipment, light, power, telephone, transportation and other facilities necessary for the execution, testing, initial operation and completion of the Work.

Approval of manufacturer's Shop Drawings of materials and equipment shall not mean final acceptance, but they shall be subject to inspection and test or delivery and installation. The Contractor shall repair, replace, or adjust any materials or equipment found defective or not operating properly, due to improper materials, workmanship, and adjustment on his part, during the correction period.

Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the work. Stored materials and equipment to be incorporated in the work shall be located so as to facilitate prompt inspection.

Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directly by the manufacturer.

The Contractor shall provide competent, suitably qualified personnel to survey and lay out the work and perform construction as required by the Contract Documents. The Contractor shall at all times enforce strict discipline and good order among his employees, and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him.

15. Substitute Materials or Equipment

Wherever the words "or equal", appear in the Specifications or on the Drawings, they shall be interpreted to mean an item of material or equipment equal in quality to that named and which is suited to the same use and capable of performing the same function as that named.

The burden of proof of equal quality or service shall be on the Contractor. Proof of inequality is not implied by the Specifications and is not a burden of the Engineer. His duty shall be to properly weigh the proven facts of equality in fairness to all parties involved.

Inclusion of a certain make or type of materials or equipment in Contractor's bid or estimate shall not obligate the Owner to accept such material or equipment if it does not meet the requirements of the Plans and Specifications.

If the Contract, Specifications, law, ordinance or applicable rules or regulations permit Contractor to furnish or use a substitute that is equal to any material or equipment specified, and if Contractor wishes to furnish or use a proposed substitute, he shall prior to 30 days before such substitute is required make written application to Engineer for approval of such a substitute certifying in writing that the proposed substitute will perform adequately the functions called for by the general design, be similar and of equal substance to that specified and be suited to the same use and capable of performing the same function as that specified; stating whether or not its incorporation in or use in connection with the project is subject to the payment of any license fee or royalty; and identifying all variations of the proposed substitute from that specified and indicating available maintenance service. No substitute shall be ordered or installed without the written approval of Engineer who will be the judge of equality and may require Contractor to furnish such other data about the proposed substitute as he considers pertinent. No substitute shall be ordered or installed without such performance guarantee and bonds as Owner may require which shall be furnished at Contractor's expense.

In case where one or more specified brands, makes or manufacturers are named and these names are not qualified by the "or equal" clause, it is intended that the Contractor be restricted to one of those named unless otherwise set out.

16. Subcontracts

Contractor shall not employ any Subcontractor or other person or organization (including those who are to furnish the principal items of materials or equipment), whether initially or as a substitute, against whom Owner or Engineer may have reasonable objection.

The Contractor will not be permitted to sublet any portion of his contract to any individual, copartnership or corporation without the prior written consent of the Owner and the approval of the Engineer.

The Contractor shall not sublet more than fifty percent (50%) of the work without the written consent of the Owner and approval of the Engineer prior to the receipt of bids.

Contractor shall be fully responsible for all acts and omissions of his Subcontractor and of persons and organizations directly or indirectly employed by them and of persons and organizations for whose acts any of them may be liable to the same extent that he is responsible for the acts and omissions of persons directly employed by him. Nothing in the Contract Documents shall create contractual relationship between Owner or Engineer and any Subcontractor or other person or organization having a direct contract with Contractor, nor shall it create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any Subcontractor or other persons or organization, except as may otherwise be required by law. Owner or Engineer may furnish to any Subcontractor or other person or organization, to the extent practicable, evidence of amounts paid to Contractor on account of specific Work done in accordance with the schedule of values.

The divisions and sections of the Specifications and the identifications of any drawings shall not control Contractor in dividing the Work among Subcontractors or delineating the Work to be performed by any specific trade.

Contractor agrees to bind specifically every Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of Owner.

All work performed for Contractor by a Subcontractor shall be pursuant to an appropriate agreement between Contractor and the Subcontractor which shall contain provisions that waive all rights the contracting parties may have against one another for damages caused by fire or other perils covered by insurance provided in accordance with Article 7, except such rights as they may have to the proceeds of such insurance held by Owner as trustee.

17. Patent Fees and Royalties

Contractor shall pay all license fees and royalties and assume all costs incidental to the use in the performance of the work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling

for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents. Contractor shall indemnify and hold harmless Owner and Engineer and anyone directly or indirectly employed by either of them from and against all claims, damages, losses and expenses (including attorney's fees) arising out of any infringement of patent rights or copyrights incidental to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents, and shall defend all such claims in connection with any alleged infringement of such rights.

18. Permits, Laws and Regulations

Contractor shall obtain and pay for all construction permits and licenses and shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of his bid. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall also pay all public utility charges.

Contractor shall give all notices and comply with all laws, ordinances, rules and regulations applicable to the Work. If Contractor observes that the specifications or drawings are at variance therewith, he shall give the Engineer prompt written notice thereof, and any necessary changes shall be adjusted by an appropriate modification. If Contractor performs any Work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to Engineer, he shall bear all costs arising therefrom; however, it shall not be his primary responsibility to make certain that the Specifications and Drawings are in accordance with such laws, ordinances, rules and regulations.

19. Taxes

Contractor shall pay all sales, consumer use and other similar taxes required to be paid by him in accordance with the law of the place where the Work is to be performed.

20. Safety and Protection

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. He shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

a. All employees on the Work and other persons who may be affected thereby.

b. All the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site.

c. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. He shall erect and maintain, as required by the conditions and progress of the Work, all necessary safeguards for its safety and protection. He shall notify owners of adjacent utilities when prosecution of the work may affect them. All damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall be remedied by Contractor; except damage or loss attributable to the fault of Owner or Engineer or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor. Contractor's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor that the Work is acceptable.

Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be Contractor's Superintendent unless otherwise designated in writing by Contractor to Owner

In emergencies affecting the safety of persons or the Work or property at the site or adjacent thereto, Contractor, without special instruction or authorization from Engineer or Owner, is obligated to act, at his discretion, to prevent threatened damage, injury or loss. He shall give Engineer prompt written notice of injury or loss. He shall give Engineer prompt written notice of any significant changes in the Work or deviations from the Contract Documents caused thereby, and Change Order shall thereupon be issued covering the changes and deviations involved. If Contractor believes that additional Work done by him in an emergency which arose from causes beyond his control entitles him to an increase in the Contract Price or an extension of the Contract Time, he may make a claim therefor as provided in these Specifications.

21. Shop Drawings and Samples

After checking and verifying all field measurements, the Contractor shall submit with such promptness as to cause no delay in the Work two (2) copies of all Shop Drawings and schedules required for the Work, and the Engineer will pass upon them with reasonable promptness, making necessary corrections. The Contractor shall then revise the drawings as required by the Engineer and file with him five (5) corrected copies for final approval (or one (1) reproducible copy).

Drawings shall have been checked by and stamped with the approval of Contractor and identified as Engineer may require. The data shown on the Shop Drawings will be complete with respect to dimensions, design criteria, materials of construction and the like to enable Engineer to review the information as required.

The Contractor shall also submit to Engineer for approval with such promptness as to cause no delay in work, all samples required by the Contract Documents. All samples will have been

checked by and stamped with the approval of Contractor, identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended.

At the time of each submission, Contractor shall in writing call Engineer's attention to any deviations that the Shop Drawings or sample may have from the requirement of the Contract Documents.

The Engineer will review and approve with reasonable promptness Shop Drawings and samples, but his review and approval shall be only for conformance with the design concept of the project and for compliance with the information given in the Contract Documents. The approval of a separate item as such will not indicate approval of the assembly in which the item functions. Contractor shall make any corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and resubmit new samples until approved. Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections called for by Engineer on previous submissions. Contractor's stamp of approval on any Shop Drawing or sample shall constitute a representation to Owner and Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or he assumes full responsibility for doing so, and that he has reviewed or coordinated each Shop Drawing or sample with the requirements of the Work and the Contract Documents.

Where a Shop Drawing or sample submission is required by the Specifications, no related Work shall be commenced until the submission has been approved by Engineer. A copy of each approved Shop Drawing and each approved sample shall be kept in good order by Contractor at the site and shall be available to Engineer.

The following items of Work and other such items as required shall have Shop Drawings submitted:

a. All concrete reinforcement, water stops, pre cast concrete and location of construction joints.

b. Structural steel, miscellaneous metal and fencing.

c. Windows and doors.

d. Piping layouts, including small piping layouts.

e. Mechanical equipment.

f. Pumps and related equipment, including pump control equipment.

g. Building service equipment.

h. Control and instrumentation, metering equipment.

i. Electrical equipment and wiring diagrams.

j. Plumbing, heating, ventilating and air conditioning equipment.

No fabrication, erection, installation or construction shall commence until drawings and details have been approved by the Engineer.

Engineer's approval of Shop Drawings or samples shall not relieve the Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless Contractor has in writing called Engineer's attention to such deviation at the time of submission and Engineer has given written approval to the specific deviation, nor shall any approval by Engineer relieve Contractor from responsibility for errors or omissions in the Shop Drawings.

22. Record Drawings

The Contractor shall keep an accurate record of the location, size, and material for all piping, both interior and exterior, concealed and exposed; size and routing of conduits, size and location of pull boxes and number and size of conductors installed therein; and changes in equipment dimensions, structural openings, foundations and any other variations between the Work actually provided and that shown on the Contract Drawings. The representation of such variations shall conform to standard drafting practices and shall include such supplementary notes, legends and details as may be necessary for legibility and clear portrayal of the as-built construction. Upon completion, the Contractor shall have these drawings and records certified as to their completeness and correctness by the Resident Inspector and deliver them to the Engineer for incorporation into the tracings. Final As-Built alignment, invert elevations and locations including the location of service connections for water and sewer lines are to be supplied by the Contractor.

As-Built information shall be provided monthly to the Engineer and submitted with the partial pay request.

23. Use of Premises

The Contractor shall confine his apparatus, the storage of materials and the operation of his workmen to limits indicated by law, ordinances, permits or direction of the resident Engineer and shall not unreasonably encumber the premises with his materials.

The Contractor shall not load or permit any part of any structure to be loaded with weights that will endanger the structure, nor shall he subject any part of the Work to stresses or pressures that will endanger it.

The Contractor shall enforce all applicable regulations and any additional requirements of the Owner regarding signs, advertisements, fires and smoking.

24. Cleaning

Contractor shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work, and at the completion of the Work he shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, construction equipment and machinery, and surplus materials, and shall leave the site clean and ready for occupancy by Owner. Contractor shall restore to their original condition those portions of the site not designated for alteration by the Contract Documents.

25. Work By Others

The Owner reserves the right to perform additional work related to the project by himself or to let other contracts in connection with the Work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall property connect and coordinate his work with theirs.

If any part of the Contractor's Work depends on proper execution or results upon the Work of any other Contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such Work that render it unsuitable for such proper execution and results. His failure to inspect and report shall constitute an acceptance of the other Contractor's Work as fit and proper for the reception of his Work, except as to defect which may develop in the other Contractor's Work after the execution of his Work.

To insure the proper execution of this subsequent Work, the Contractor shall measure Work already in place and shall at once report to the Engineer any discrepancy between the executed Work and the Drawings.

Whenever Work being done by the Owner's forces or by other Contractors is contiguous to Work covered by this Contract, the respective rights of the various interest involved shall be established by the Engineer, to secure the completion of the various portion of the Work in general harmony.

The Contractor shall do all cutting, fitting and patching of his Work that may be required to make its several parts come together properly and fit it to receive or be received by such other Work. Contractor shall not endanger any Work of others by cutting, excavating or otherwise altering their Work and will only cut or alter their Work with the written consent of Engineer and of the other Contractors whose Work will be affected.

If the performance of additional Work by other Contractors or Owner is not noted in the Contract Documents prior to the execution of the contract, written notice thereof shall be given to Contractor prior to starting any such additional Work. If Contractor believes that the performance of such additional Work by Owner or others involves him in additional expense or entitles him to an extension of the Contract Time, he may make a claim thereof as provided in these Specifications.

26. Engineer's Status During Construction

The Engineer will be the Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of the Engineer as Owner's representative during construction as defined in these General Conditions shall not be extended without written consent of the Owner and the Engineer.

The Engineer will make periodic visits to the site to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. He will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. His efforts will be directed toward providing assurance for Owner that the completed project will conform to the requirements as an experienced and qualified design professional, he will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defects and deficiencies in the Work of Contractors.

The Engineer will issue with reasonable promptness such written clarifications or interpretations of the Contract Documents (in the form of Drawings or otherwise) as he may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. If Contractor believes that a written clarification and interpretation entitles him to an increase in the Contract Price, he may make claim therefore, as provided in these Specifications.

The Engineer will have authority to disapprove or reject Work which is "defective" (which term is hereinafter used to describe Work that is unsatisfactory, faulty or defective, or does not conform to the requirements of the Contract Documents or does not meet the requirements of any inspection, test or approval referred to in these Specifications or has been damaged prior to approval of final payment.) He will also have authority to require special inspection or testing of the Work as provided in these specifications whether or not the Work is fabricated, installed or completed.

The Engineer is responsible for review and approval of Shop Drawings and samples in accordance with Article 21 of these General Conditions.

The Engineer has responsibilities for preparation of Change Orders for execution by the Owner in accordance with Article 29 of these General Conditions.

In accordance with Article 27 of these General Conditions, the Engineer shall decide claims of the Owner or Contractors and interpret the Contract Documents.

The Engineer shall faithfully discharge his responsibilities with regard to Applications for Payment as described in Articles 42, 43, 44 and 46 of these General Conditions.

If Owner and Engineer agree, the Engineer will furnish a Resident Project Representative and/or inspector to assist the Engineer in carrying out his responsibilities at the site. The duties,

responsibilities and authority of any such representative shall be as set forth in Article 28 of these General Conditions.

Neither Engineer's authority to act under this Article 26 or elsewhere in the Contract Documents nor any decision made by him in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of Engineer to Contractor, any Subcontractor, any material man, fabricator, supplier, or any of their agents or employees or any other person performing any of the work.

The Engineer will not be responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and he will not be responsible for Contractor's failure to perform the work in accordance with the Contract Documents.

The Engineer will not be responsible for the acts or omissions of Contractor, or any Subcontractors, or any of his or their agents or employees, or any other persons at the site or otherwise performing any of the work.

27. Engineer's Decision on Disagreements

Engineer will be the interpreter of the requirements of the Contract Documents and the judge of the performance thereunder. In his capacity as interpreter and judge, he will exercise his best efforts to insure faithful performance by both Owner and Contractor. He will not show partiality to either and will not be liable for the result of any interpretation or decision rendered in good faith. Claims, disputes and other matters relating to the execution and progress of the work or the interpretation of or performance under the Contract Documents shall be referred to Engineer for decision; which he will render in writing within a reasonable time.

Either Owner or Contractor may request arbitration with respect to any such claim, dispute or other matter that has been referred to Engineer, except any which have been waived by the making or acceptance of final payment as provided in Article 46, such arbitration to be in accordance with Article 50. However, no request for arbitration of any such claim, dispute or other matter shall be made until the earlier of (a) the date on which Engineer has rendered his decision, or (b) the tenth day after parties have presented their evidence to Engineer if he has not rendered his written decision before that date. No request for arbitration shall be made later than thirty days after the date on which Engineer rendered his written decision in respect of the claim, dispute or other matter as to which arbitration is sought; and the failure to request arbitration within said thirty days' period shall result in Engineer's decision being final and binding upon Owner and Contractor. If Engineer renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but shall not supersede the arbitration proceedings, except where the decision is acceptable to the parties concerned.

28. Status of Engineer's Project Representative

Resident Project Representative is Engineer's Agent and shall act as directed by and under the supervision of Engineer. He shall confer with Engineer regarding his actions. His dealings in

matters pertaining to the on-site work will in general be only with Engineer and Contractor. His dealings with Subcontractors will only be through or with the full knowledge of Contractor or his Superintendent. He shall generally communicate with Owner only through or as directed by Engineer.

Resident Project Representative shall:

a. Schedules: Review the progress schedule, schedule of Shop Drawing submissions, schedule of values and other schedules prepared by Contractor and consult with Engineer concerning their acceptability.

b. Conferences: Attend pre construction conferences. Arrange a schedule of progress meetings and other job conferences as required in consultation with Engineer and notify in advance those expected to attend. Attend meetings, and maintain and circulate copies of minutes thereof.

c. Liaison:

    1. Serve as Engineer's liaison with Contractor working principally through Contractor's Superintendent and assist him in understanding the intent of the Contract Documents. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-site operations.

    2. As requested by Engineer, assist in obtaining from Owner additional details or information, when required at the job site for proper execution of the work.

    3. In the interest of preserving the proper channels of communication, advise Engineer of any direct communication between Owner and Contractor.

d. Shop Drawings and Samples:

    1. Receive and record date of receipt of Shop Drawings and samples which have been approved by Engineer.

    2. Receive samples which are furnished at the site by Contractor for Engineer's approval, and notify Engineer of their availability for examination.

    3. Advise Engineer and Contractor or his Superintendent immediately of the commencement of any Work requiring a Shop Drawing or sample submission if the submission has not been approved by Engineer.

e. Review of Work, Rejection of Defective Work, Inspections and Tests:

1. Conduct on-site observations of the Work in progress to assist Engineer in determining that the project is proceeding in accordance with the Contract Documents and that completed Work will conform to the Contract Documents.

2. Report to Engineer whenever he believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents, or has been damaged, or does not meet the requirements of any inspections, tests or approvals required to be made; and advise Engineer when he believes Work should be corrected or rejected or should be uncovered for observation, or requires special testing or inspection.

3. Verify that tests, equipment and system's startups and operating and maintenance instructions are conducted as required by the Contract Documents and in presence of the required personnel, and that Contractor maintains adequate records thereof; observe, record and report to Engineer appropriate details relative to the test procedures and startups.

4. Accompany Owner and visiting inspectors representing public or other agencies having jurisdiction over the Project, record the outcome of these inspections and report to Engineer.

f. Interpretation of Contract Documents: Transmit to Contractor clarification and interpretation of the Contract Documents as issued by Engineer.

g. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report them with recommendations to Engineer.

h. Records:

1. Maintain at the job site orderly files for correspondence, reports of job conferences, Shop Drawings and sample submissions, reproductions of original Contract Documents including all addenda, change orders, field orders, additional Drawings issued subsequent to the execution of the Contract, Engineer's clarifications and interpretations of the Contract Documents, progress reports and other project-related documents.

2. Keep a diary or log book, recording hours on the job site, weather conditions, data relative to questions of extras or deductions, list of principal visitors, daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures. Send Copies to Engineer.

3. Record names, address and telephone numbers of all Contractors, Subcontractors and major suppliers of equipment and materials.

4. Advise Engineer whenever Contractor is not currently maintaining an up-to-date copy of Record Drawings at the site.

i. Reports:

1. Furnish Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the approved progress schedule, schedule of Shop Drawing submissions and other schedules.

2. Consult with Engineer in advance of scheduled major tests, inspections or start of important phases of the Work.

j. Payment Requisitions: Review Applications for Payment with Contractor for compliance with the established procedure for their submission and forward them with recommendations to Engineer, noting particularly their relation to the schedule of values, Work completed and materials and equipment delivered at the site.

k. Guarantees, Certificates, Maintenance and Operation Manuals: During the course of the Work verify that guarantees, certificates, maintenance and operation manuals and other data required to be assembled and furnished by Contractor are applicable to the items actually installed and deliver these data to Engineer for his review and forwarding to Owner prior to final acceptance of the Project.

l. Completion:

1. Before Engineer issues a Certificate of Substantial Completion, submit to Contractor a list of observed items requiring correction.

2. Conduct final inspection in the company of Engineer, Owner and Contractor and prepare a final list of items to be corrected.

3. Verify that all items on final list have been corrected and make recommendations to Engineer concerning acceptance.

Except upon written instructions of Engineer, Resident Project Representative:

a. Shall not authorize any deviation from the Contract Documents or approve any substitute materials or equipment.

b. Shall not undertake any of the responsibilities of Contractor, Subcontractor or Contractor's Superintendent.

c. Shall not expedite Work for the Contractor.

d. Shall not advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents.

e. Shall not advise on or issue directions as to safety precautions and programs in connection with the Work.

f. Shall not authorize Owner to occupy the Project in whole or in part.

g. Shall not participate in specialized field or laboratory tests or inspections conducted by others.

h. Shall not assist Contractor in maintaining up-to-date copy of Record Drawings.

29. Changes in the Work

Without invalidating the Agreement, Owner may, at any time or from time to time, order additions, deletions or revisions in the Work; these will be authorized by Change Orders. Upon receipt of a Change Order, Contractor shall proceed with the Work involved. All such Work shall be executed under the applicable conditions of the Contract Documents. If any Change Order causes an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, an equitable adjustment will be made as provided in Article 30 on the basis of a claim made by either party.

Engineer may authorize minor changes or alterations in the Work not involving extra cost and not inconsistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order. If Contractor believes that any minor change or alteration authorized by Engineer entitles him to an increase in the Contract Price, he may make a claim therefore, as provided in Article 30.

Additional work performed by Contractor without authorization of a Change Order will not entitle him to an increase in the Contract Sum or an extension of the Contract Time, except in the case of an emergency as provided in Article 20.

Owner shall execute appropriate Change Orders prepared by Engineer covering changes in the Work to be performed, work performed in an emergency and any other claim of the Contractor for a change in the Contract Time or the Contract Sum which is approved by the Engineer.

It is the Contractor's responsibility to notify his surety of any changes affecting the general scope of the Work or change in the Contract Sum and the amount of the applicable bonds shall be adjusted accordingly. Contractor shall furnish proof of such adjustment to Owner.

30. Changes of Contract Price

The Contract Price constitutes the total compensation payable to Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at his expense without change in the Contract Price.

The Contract Price may only be changed by a Change Order. Any claim for an increase in the Contract Price shall be based on written notice delivered to Owner and Engineer within fifteen days of the occurrence of the event giving rise to the claim. Notice of the amount of the claim with supporting data shall be delivered within forty-seven days of such occurrence unless Engineer allows an additional period of time to ascertain accurate cost data. All claims for adjustment in the Contract Price shall be determined by Engineer if Owner and Contractor cannot otherwise agree on the amount involved. Any change in the Contract Price resulting from any such claim shall be incorporated in a Change Order.

The value of any Work covered by a Change Order shall be determined in one or more of the following ways:

a. By estimate and mutual acceptance in a lump sum.

b. By unit prices named in the Contract or subsequently agreed upon.

c. On the basis of the cost of the Work plus a Contractor's fee for overhead and profit as provided in this Article.

In Case "c", the Contractor shall keep and present in such form as the Engineer may direct, a correct account of all items comprising the net cost of such work, together with vouchers. The determination of the Engineer shall be final upon all questions of the amount and cost of extra work and changes in the work.

The term Cost of the Work means the sum of all costs necessarily incurred and paid by the Contractor in the proper performance of the Work. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in paragraph 30.6.

30.1 Payroll cost for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. Such employees shall include superintendents and foreman at the site. The expenses of performing work after regular working hours, on Sunday or legal holidays shall be included in the above to the extent authorized by Owner.

30.2 Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and manufacturer's field service required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds, and all returns from sale of surplus materials

and equipment shall accrue to Owner and Contractor shall make provisions so that they may be obtained.

30.3 Payments made by Contractor to the Subcontractors for work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from Subcontractors acceptable to him and shall deliver such bids to Owner who will then determine with the advice of Engineer, which bids will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work, plus a Fee, the Cost of the Work shall be determined in accordance with paragraphs 30.4 and 30.5. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

30.4 Cost of special consultants (including, but not limited to, Engineers, architects, testing laboratories, surveyors, lawyers and accountants) employed for services specifically related to the Work.

30.5 Supplemental costs including the following:

The proportions of necessary transportation, traveling and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

Costs, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workmen, which are consumed in the performance of the work, and cost less market value of such items used but not consumed which remain the property of Contractor.

Rentals of all construction equipment and machinery and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer and the costs of transportation (shall not exceed 100 miles), loading, unloading, installation, dismantling and removing thereof ; all in accordance with terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

Sales, use or similar taxes related to the Work, and for which Contractor is liable, imposed by any governmental authority.

Deposits lost for causes other than Contractor's negligence, royalty payments and fees for permits and licenses.

Losses, damages and expenses, not compensated by insurance or otherwise, sustained by Contractor in connection with the execution of, and to, the Work, provided they have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's Fee. If, however, any such loss or damage requires reconstruction and Contractor is

placed in charge thereof, he shall be paid for his services a fee proportionate to that stated in paragraph 30.6.

The cost of utilities, fuel and sanitary facilities at the site.

Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

Cost of premiums for bonds and insurance which Owner is required to pay.

30.6 The term Cost of the Work shall not include any of the following:

Payroll costs and other compensation of Contractor's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, lawyers, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks and other personnel employed by Contractor whether at the site or in his principal or a branch office for general administration of the work and not specifically included in the schedule referred to in subparagraph 30.1 -- all of which are to be considered administrative costs covered by the Contractor's Fee.

Expenses of Contractor's principal and branch offices other than his office at the site.

Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the work and charges against Contractor for delinquent payments.

Cost of premiums for all bonds and for all insurance policies whether or not Contractor is required by the Contract Documents to purchase and maintain the same (except as otherwise provided in subparagraph 30.5).

Cost due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including, but not limited to, the correction of defective work, disposal of materials or equipment wrongly supplied and making good any damage to property.

Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraphs 30.1 - 30.5.

30.7 The Contractor's Fee which shall be allowed to Contractor for his overhead and profit shall be determined as follows:

A mutually acceptable fixed fee; or if none can be agreed upon,

A fee based on the following percentages of the various portions of the Cost of the Work:

a. For costs incurred under paragraph 30.1 and 30.2, the Contractor's Fee shall be ten (10%) percent.

b. For costs incurred under paragraph 30.3, the Contractor's Fee shall be five (5%) percent; and if a subcontract is on the basis of Cost Plus a Fee, the maximum allowable to the subcontractor as a fee for overhead and profit shall be ten (10%) percent.

c. No fee shall be payable on the basis of costs itemized under paragraph 30.4, 30.5 and 30.6.

The amount of credit to be allowed by Contractor to Owner for any such change which results in a new decrease in cost, will be the amount of the actual net decrease. When both additions and credits are involved in any one change, the combined overhead and profit shall be figured on the basis of the net increase, if any.

Whenever the cost of any work is to be determined pursuant to Article 30, Contractor will submit in form prescribed by the Engineer an itemized cost breakdown together with supporting data.

In all cases where Extra Work or Changes are covered by unit prices set forth in the Contract, the value of such Extra Work or Changes shall be determined only upon the basis of such unit prices.

Pending final determination of value, payments on accounts of Extra Work or Changes shall be made only upon the estimate of the Engineer.

30.8 All Change Orders to the construction contract (if required) must be negotiated pursuant to 40 CFR 35.938.5.

31. Cash Allowance

The Contractor shall include in the contract sum all allowances named in the Contract Documents and shall cause the Work so covered to be done by such Contractors and for such sums as the Engineer may direct, the contract sum being adjusted in conformity therewith. The Contractor declares that the contract sum includes such sums for expenses and profit on account of cash allowance as he deems proper. No demand for expense or profit other than those included in the contract sum shall be allowed.

32. Delays and Extension of Time

The Contract Time may only be changed by a Change Order. Any claim for an extension in the Contract Time shall be based on written notice delivered to Owner and Engineer within fifteen (15) days of the occurrence of the event giving rise to the claim. Notice of the extent of the claim with supporting data shall be delivered within forty-five (45) days of such occurrence unless Engineer allows an additional period of time to ascertain more accurate data. All claims for adjustment in the Contract Time shall be determined by Engineer if Owner and Contractor

cannot otherwise agree. Any change in the Contract Time resulting from any such claim shall be incorporated in a Change Order.

The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of Contractor if he makes a claim therefore as provided in this Article. Such delays shall include, but not be restricted to, acts or neglect by any separate Contractor employed by Owner, fires, floods, labor disputes, epidemics, abnormal weather conditions, or acts of God.

All time limits stated in the Contract Documents are of the essence of the Agreement. The provisions of this Article shall not exclude recovery for damages (including compensation for additional professional services) for delay by either party.

33. Warranty and Guarantee

Contractor warrants and guarantees to Owner and Engineer that all materials and equipment will be new unless otherwise specified and that all work will be of good quality and free from faults or defects and in accordance with the requirements of the Contract Documents and of any inspections, tests or approval referred to in Article 34. All unsatisfactory Work, all faculty or defective Work, and all Work not conforming to the requirements of the Contract Documents at the time of acceptance thereof or of such inspection, tests or approvals, shall be considered defective. Prompt notice of all defects shall be given to Contractor. All defective Work, whether or not in place, may be rejected, corrected or accepted as provided in these Contract Documents.

34. Tests and Inspections

If the Contract Documents, Laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to specifically be inspected, tested, or approved by some public body, Contractor shall assume full responsibility therefor, pay all costs in connection therewith and furnish Engineer the required certificates of inspection, testing or approval. All other inspections, tests and approvals required by the Contract Documents shall be performed by organizations acceptable to Owner and Contractor and the costs thereof shall be borne by Owner unless otherwise specified.

The Contractor shall give Engineer timely notice of readiness of the Work for all inspections, tests or approvals. If such Work required so to be inspected, tested or approved is covered without written approval of Engineer, it must, if requested by Engineer, be uncovered for observation, and such uncovering shall be at Contractor's expense unless Contractor has given Engineer timely notice of his intention to cover such Work and Engineer has not acted with reasonable promptness in response to such notice.

Neither observations by Engineer nor inspections, tests or approvals by persons other than Contractor shall relieve Contractor from his obligations to perform the Work in accordance with the requirements of the Contract Documents.

35. Access to Work

Engineer and his representatives and other representatives of Owner will at reasonable times have access to the work. Contractor shall provide proper and safe facilities for such access and observation of the Work and also for any inspection or testing thereof by others.

36. Uncovering Work

If any Work should be covered contrary to the written request of the Engineer, it must, if required by the Engineer be uncovered for examination and replace at the Contractor's expense.

If any Work has been covered which Engineer has not specifically requested to observe prior to its being covered, or if Engineer considers it necessary or advisable that covered Work be inspected or tested by others, Contractor at Engineer's request, shall uncover, expose or otherwise make available for observation, inspection or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, Contractor shall bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, including compensation for additional professional services, and an appropriate deductive Change Order shall be issued. If, however, such Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction if he makes a claim therefore as provided in these Specifications.

37. Stopping the Work

If the Work is defective, or Contractor fails to supply sufficient skilled workmen or suitable materials or equipment, or if Contractor fails to make prompt payments to Subcontractors or for labor, materials or equipment, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor or any other party.

38. Correction of Work Before Final Payment

If required by Engineer prior to approval of final payment, Contractor shall promptly, without cost to Owner and as specified by Engineer, either correct any defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by Engineer, remove it from the site and replace it with non-defective Work. If Contractor does not correct such defective Work or remove and replace such rejected Work within a reasonable time, all as specified in a written notice from Engineer, Owner may have the deficiency corrected or the rejected Work removed and replaced. All direct or indirect costs of such correction or removal and replacement, including compensation for additional professional services, shall be paid by Contractor and an appropriate deductive Change Order shall be issued. Contractor shall also bear

the expense of making good all Work of others destroyed or damaged by his correction, removal or replacement of his defective Work.

39. One Year Correction Period

If, after the approval of final payment and prior to the expiration of one year after the date of substantial completion or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, any Work is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions, either correct such defective Work, or, if it has been rejected by Owner, remove it from the site and replace it with non-defective Work. If Contractor does not promptly comply with the terms of such instructions, Owner may have the defective Work corrected or the rejected Work removed and replaced, and all direct and indirect costs of such removal and replacement, including compensation for additional professional services, shall be paid by Contractor.

40. Acceptance of Defective Work

If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to approval of final payment, also Engineer) prefers to accept it, he may do so. In such case, if acceptance occurs prior to approval of final payment, a Change Order shall be issued incorporating the necessary revisions in the Contract Documents, including appropriate reduction in the Contract Price; or, if the acceptance amount shall be approval of final payment, an appropriate amount shall be paid by Contractor to Owner.

41. Neglected Work By Contractor

If Contractor should fail to prosecute the work in accordance with the Contract Documents, including any requirements of the progress schedule, Owner, after seven (7) days' written notice to Contractor may, without prejudice to any other remedy he may have, make good such deficiencies and the cost thereof (including compensation for additional professional services) shall be charged against Contractor if Engineer approved such action, in which case a Change Order shall be issued incorporating an appropriate reduction in the Contract Price. If the payments then or thereafter due Contractor are not sufficient to cover such amount, Contractor shall pay the difference to Owner.

42. Application for Payment

At least ten days prior to submitting the first Application for a progress payment, Contractor shall submit a progress schedule, a final schedule of Shop Drawing submission and a schedule of values of the Work. These schedules shall be satisfactory in form and substance to Engineer. The schedule of values shall include quantities and unit prices aggregating the Contract Price, and shall subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Upon approval of the schedules of values by Engineer, it shall it shall be incorporated into the form of Application for Payment furnished by Engineer.

At least ten days before each progress payment falls due (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such data and schedules as Engineer may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by such data, satisfactory to Owner, as will establish Owner's title to the material and equipment and protect his interest therein, including applicable insurance. Each subsequent Application for Payment shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied to discharge in full all of Contractor's obligations reflected in prior Applications for Payment.

Retainage shall be an amount equal to 10% of the Work completed until 50% of the Work has been completed. At 50% completion, further partial payments shall be made in full to the Contractor and no additional amounts may be retained unless the Engineer certifies that the job is not proceeding satisfactorily, but amounts previously retained shall not be paid to the Contractor. At 50% completion or any time thereafter when the progress of the Work is not satisfactory, additional amounts may be retained but in no event shall the total retainage be more than 10% of the value of the work completed. Upon substantial completion of the work, any amount retained may be paid to the Contractor. When the Work has been substantially completed except for Work which cannot be completed because of weather conditions, lack of materials or other reasons which in the judgment of the Owner are valid reasons for non-completion, the Owner may make additional payments, retaining at all times an amount sufficient to cover the estimated cost of the Work still to be completed.

Contractor warrants and guarantees that title to all Work, materials and equipment covered by any Application of Payment, whether incorporated in the Project or not, will pass to Owner at the time of payment free and clear of all liens, claims, security interests and encumbrances (hereafter in these General Conditions referred to as "Liens").

43. Approval of Payments

Engineer will, within ten days after receipt of each Application for Payment, either indicate in writing his approval of payment and present the Application to Owner, or return the Application to Contractor indicating in writing his reasons for refusing to approve payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application. Owner shall, within thirty days of presentation to him of an approved Application for Payment, pay Contractor the amount approved by Engineer.

Engineer's approval of any payment requested in an Application for Payment will constitute a representation by him to Owner, based on Engineer's on-site observations of the Work in progress as an experienced and qualified design professional and on his review of the Application for Payment and the accompanying data and schedules that the Work has progressed to the point indicated; that, to the best of his knowledge, information and belief, the quality of the

Work is in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning Project upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents and any qualifications stated in his approval); and that Contractor is entitled to payment of the amount approved. However, by approving any such payment Engineer will not thereby be deemed to have represented that he made exhaustive or continuous on-site inspections to check the quality or the quantity of the Work, or that he has reviewed the means, methods, techniques, sequences, and procedures of construction, or that he has made any examination to ascertain how or for what purpose Contractor has used the moneys paid or to be paid to him on account of the Contract Price, or that title to any Work, materials or equipment has passed to Owner free and clear of any Liens.

Engineer's approval of final payment will constitute an additional representation by him to Owner that the conditions precedent to Contractor's being entitled to final payment as set forth in Article 46 has been fulfilled.

Engineer may refuse to approve the whole or any part of any payment if, in his opinion, it would be incorrect to make such representation to Owner. He may also refuse to approve any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously approved, to such extent as may be necessary in his opinion to protect Owner from loss because:

a. The Work is defective, or completed Work has been damaged requiring correction or replacement.

b. Claims or Liens have been filed or there is reasonable cause to believe such may be filed.

c. The Contract Price has been reduced because of Modifications.

d. Owner has been required to correct defective Work or complete the Work in accordance with Article 41.

e. Unsatisfactory prosecution of the Work, including failure to furnish acceptable submittals or to clean up.

When the above grounds are removed, payment shall be made for amounts withheld because of them.

44. Substantial Completion

Prior to final payment, Contractor may, in writing to Owner and Engineer, certify that the entire Project is substantially complete and request that the Engineer issue a certificate of Substantial Completion. Within a reasonable time thereafter, Owner, Contractor and Engineer shall make an inspection of the Project to determine the status of completion. If Engineer does not consider the Project substantially complete, he will notify Contractor in writing giving his reasons therefore. If Engineer considers the Project substantially complete, he will prepare and deliver to Owner a

tentative certificate of Substantial Completion which shall fix the date of Substantial Completion and the responsibilities between Owner and Contractor for maintenance, heat and utilities. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment, and the certificate shall fix the time within which such items shall be completed or corrected, said time to be within the Contract Time. Owner shall have seven (7) days after receipt of the tentative certificate during which he may make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the project is not substantially complete, he will within fourteen days (14) days after submission of the tentative certificate to Owner notify Contractor in writing, stating his reasons therefore. If, after consideration of Owner's objections, Engineer considers the project substantially complete, he will within said fourteen days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as he believes justified after consideration of the objections from Owner. The Owner may reduce the retainage to five (5%) percent of the total Contract Price after substantial completion. Owner shall have the right to exclude Contractor from the Project after the date of Substantial Completion, but Owner shall allow Contractor reasonable access to complete or correct items on the tentative list.

45. Partial Utilization

Prior to final payment, Owner may request Contractor in writing to permit him to use a specified part of the Project which he believes he may use without significant interference with construction of other parts of the Project. If Contractor agrees, he will certify to Owner and Engineer that said part of the Project is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Project. Within a reasonable time thereafter Owner, Contractor and Engineer shall make an inspection of that part of the Project to determine its status of completion. If Engineer does not consider that it is substantially complete, he will notify Owner and Contractor in writing giving his reasons therefore. If Engineer considers that part of the Project to be substantially complete, he will execute and deliver to Owner and Contractor a certificate to that effect, fixing the date of Substantial Completion as to that part of the Project, attaching thereto a tentative list of items to be completed or corrected before final payment and fixing the responsibility between Owner and Contractor for maintenance, heat and utilities as to that part of the Project. Owner shall have the right to exclude Contractor from any part of the Project which Engineer has so certified to be substantially complete, but Owner shall allow Contractor reasonable access to complete or correct items on the tentative list.

Insurance carrier shall be informed by the Contractor of occupancy and adjustments made so that coverage of construction will not be invalidated.

46. Final Payment

Upon written notice from Contractor that the Project is complete, Engineer will make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in

which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to remedy such deficiencies.

After Contractor has completed all such corrections to the satisfaction of Engineer and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection and other documents -- all as required by the Contract Documents, he may make Application for final Payment following the procedure for progress payments. The final Application for Payment shall be accompanied by such date and scheduling as Engineer may reasonably require, together with complete and legally effective releases or waivers (satisfactory to Owner) of all Liens arising out of the Contract Documents and the labor and services performed and the material and equipment furnished hereunder. In lieu thereof and as approved by Owner, Contractor may furnish receipts or releases in full, an affidavit of Contractor that the releases and receipts include all labor, services, material and equipment for which a Lien could be filled, and that all payrolls, material and equipment bills, and other indebtedness connected with the work for which Owner or his property might in any way be responsible, have been paid or otherwise satisfied; and consent of the Surety, if any, to final payment. If any Subcontractor, material man, fabricator or supplier fails to furnish a release or receipt in full, Contractor may furnish a Bond or other collateral satisfactory to Owner to indemnify him against any Lien.

If, on the basis of his observation and review of the Work during construction, his final inspection and his review of the final Application for Payment -- all required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor has fulfilled all of his obligations under the Contract Documents, he will, within ten (10) days after receipt of the final Application for Payment, indicate in writing his approval of payment and present the Application to Owner for payment. Thereupon Engineer will give written notice to Owner and Contractor that the Work is acceptable. Otherwise, he will return the Application to Contractor, indicating in writing his reasons for refusing to approve final payment, in which case Contractor shall make the necessary corrections and resubmit the Application. Owner shall, within ten (10) days of presentation to him of an approved final Application for Payment, pay Contractor the amount approved by Engineer.

If after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of Contractor and Engineer so confirms, Owner shall, upon certification by Engineer and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work is not fully completed or corrected and is less than the retainage stipulated in the Agreement, and if Bonds have been furnished, the written consent of the Surety to the payment of the balance due for that portion of the Work fully completed and accepted, shall be submitted by the Contractor to the Engineer prior to certification of such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

The making and acceptance of final payment shall constitute:

a. a waiver of all claims by Owner against Contractor other than those arising from unsettled Liens, from defective Work appearing after final inspection or from failure to comply

with the requirements of the Contract Documents or the terms of any special guarantees specified therein, and

b. a waiver of all claims by Contractor against Owner other than those previously made in writing and still unsettled.

Contractor's obligation to perform the Work and complete the Project in accordance with the Contract Documents shall be absolute. Neither approval of any progress or final payment by Engineer, nor the issuance of a certificate of Substantial Completion, nor any payment by Owner to Contractor under the Contract Documents, nor any use or occupancy of the Project or any part thereof by Owner, nor any act of acceptance by Owner nor any failure to do so, nor any correction of defective Work by Owner shall constitute an acceptance of Work not in accordance with the Contract Documents.

47. Owner's Right to Suspend Work

Owner may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than ninety (90) days by notice in writing to Contractor and Engineer which shall fix the date on which Work shall be resumed. Contractor shall resume the Work on the date so fixed. Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if he makes a claim therefore as provided in these Contract Documents.

48. Owner's Right to Terminate Contract

If the Contractor should be adjudged a bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper material, or if he should fail to make prompt payment to subcontractors or for material or labor, or persistently disregard laws, ordinances or the instruction of the Engineer, or otherwise be guilty of a substantial violation of any provision of the Contract, then the Owner, upon the certificate of the Engineer that sufficient cause exists to justify such action, may without prejudice to any other right or remedy and after giving the Contractor and his Surety a minimum of seven (7) days from delivery of a written notice, take possession of the premises and of all materials, tools and appliances thereof and finish the Work by whatever method he may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price shall exceed the expense of finishing the Work including compensation for additional managerial and administrative services, such excess shall be paid to the Contractor. If any such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the Owner. The expense incurred by the Owner as herein provided, and the damage incurred through the Contractor's default, shall be certified by the Engineer and incorporated in a Change Order.

Where the Contractor's services have been so terminated by the Owner, said termination shall not affect any right of the Owner against the Contractor then existing or which may thereafter accrue. Any retention or payment of moneys by the Owner due the Contractor will not release the Contractor from compliance with the Contract Documents.

After ten (10) days from delivery of a written notice to the Contractor and the Engineer, the Owner may, without cause and without prejudice to any other right or remedy, elect to abandon the Project and terminate the Contract. In such case, the Contractor shall be paid for all Work executed and any expense sustained plus reasonable profit.

49. Contractor's Right to Stop Work or Terminate

If, through no act or fault of Contractor the Work is suspended for a period of more than ninety (90) days by Owner or under an order of court or other public authority, or Engineer fails to act on any Application for Payment within thirty (30) days after it is submitted, or Owner fails to pay Contractor any sum approved by Engineer or awarded by arbitrators within thirty (30) days of its approval and presentation, then Contractor may, upon fifteen (15) days' written notice to Owner and Engineer, terminate the Agreement and recover from Owner payment for all Work executed and any expense sustained plus a reasonable profit. In addition and in lieu of terminating the Agreement, if Engineer has failed to act on an Application for Payment or Owner has failed to make any payment as aforesaid, Contractor may upon fifteen (15) days' notice to Owner and Engineer stop the Work until he has been paid all amounts then due.

50. Arbitration by Mutual Consent

All claims, disputes and other matters in question arising out of, or relating to, this Agreement or the breach thereof except for claims which have been waived by the making or acceptance of final payment, may be decided by arbitration if the parties mutually agree. Any agreement to arbitrate shall be specifically enforceable under the prevailing arbitration law. The award rendered by the arbitrators shall be final, and judgment may be entered upon it in any court having jurisdiction thereof.

Notice of the request for arbitration shall be filed in writing with the other party to the Agreement and a copy shall be filed with Engineer. Request for arbitration shall in no event be made on any claim, dispute or other matter in question which would be barred by the applicable statute of limitations.

The Contractor will carry on the Work and maintain the progress schedule during any arbitration proceedings, unless otherwise mutually agreed in writing.

51. Computation of Time

When any period of time is referred to in the Contract Documents by days, it shall be computed to exclude the first and include the last day of such period. If the last day of any such period falls

on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day shall be omitted from the computation.

52. Assignments

Neither the Contractor nor the Owner shall sell, transfer, assign or otherwise dispose of the Contract or any portion thereof, or of his right, title of interest herein, or his obligations thereunder, without written consent of the other party.

53. Ownership of Drawings

All Drawings, Specifications and copies thereof furnished by the Engineer are the property of the Engineer. They are not to be used on other work and, with the exception of the signed Contract set, are to be returned to the Engineer or his representative upon request, at the completion of the Work.

54. Compliance With Prevailing Wage Law (Where Applicable)

Full compliance by the Contractor and any Subcontractor as to their duties prescribed by the applicable State or Federal Minimum Wage Laws is required in the performance of Work under this Contract.

The Contractor will be required to accept liability for payment of all payroll taxes or deductions required by local and federal law, including old age pension, social security or annuities. Workmen's Compensation Insurance shall be carried to the full amounts as required by local statutes.

Incorporated within the Labor Regulations and Wage Rates is a classified list of labor positions used in this work. Opposite the positions are shown the general prevailing hourly rates of wages as ascertained for this contract.

In case it shall become necessary for the Contractor or any Subcontractor to employ on the work under this contract any person in a trade or occupation (except executive, administrative or supervisory workers) for which no wage rates are specified herein, the Contractor shall immediately notify the Engineer who will promptly thereafter furnish the Contractor with the general prevailing rates. The rates thus furnished shall be applicable for such trade or occupation from the time of initial employment of the person or persons affected and during the continuance of such employment.

The Contractor and any Subcontractor shall post and keep posted in a conspicuous place at the site of the Work a copy of the prevailing rates of wages and work hours for each classification of laborers employed in the performance of this Contract.

55. Measurement and Computation of Quantities

Computation of quantities that will be the basis for payment estimates, both monthly and final, will be made by the Engineer. In general, all payment-estimates will be checked and approved by a representative of the funding agency before payment.

No extra measurements of any kind, unless specially noted shall be allowed in measuring the Work under these Specifications; but the length, area solid contents or number only shall be considered as the basis for payment as hereinafter specified.

Where the computation of areas or volumes by exact geometric methods is unduly laborious or refined, the planimeter shall be held an instrument of precision and may be used in the determination of quantities upon which payments are based.

The measurements of the Engineer as to the amount of Work done shall be final and conclusive. Payments shall be made upon the Work done within the lines prescribed by the Drawings or Specifications and in accordance with the unit prices for the items under which the Work is done.

56. Project Signs

The Contractor shall erect a project sign at a prominent location on the Project. The sign shall be four feet by eight feet, two color and shall contain the name of the Project, the Owner, the Engineer, and the Contractor. The lettering shall be approved by the Engineer prior to making the signs.

End of Section

PART IV

Supplemental General Conditions
Do Not Apply

PART V

State Wage Rates
Do Not Apply

PART VI

Federal Wage Rates Do Not Apply

PART VII
Special Conditions

PART VII
SPECIAL CONDITIONS

1. DESCRIPTION OF THE WORK AND DESIGNATION OF OWNER

These specifications and accompanying plans describe the work to be done for the system improvements of waterline for the Paradise Park Regional Industrial Authority.

All references to the Owner in these specifications, Contract Documents and plans shall mean the Paradise Park Regional Industrial Development Authority, Inc.

2. AVAILABLE FUNDS

The attention of all bidders is directed to the fact that the funds will be made available from the Kentucky Cabinet for Economic development and the Kentucky Infrastructure Authority for the award of the contract from the Paradise Park Regional Industrial Development Authority, Inc.

3. TIME OF COMPLETION

The time allowed for completion of Contract 9 is 60 Calendar Days.

The Contract completion time stipulated above includes an allowance for an average number of inclement weather days as follows:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Precip.	7	7	9	8	8	8	8	7	6	5	6	7
Freeze	10	6	1								1	5

When number of days (including Saturdays, Sundays and Holidays) of precipitation is in excess of 0.1" per day or the number of days that the temperature does not reach 32°F exceeds those shown above in any month, the Contractor shall be entitled to an equal number of additional days for Contract Completion.

The time allowed for completion shall begin at midnight, prevailing local time, on the date which the Owner, or his authorized representative, the Engineer, shall instruct the Contractor, in writing, to start work, but not later than 10 days after Notice to Proceed.

Additional time will be allowed the Contractor to cover approved over-runs or additions to the contract in the same proportions that the said over-run or addition in net monetary value bears to the original amount; the total of said additional time to be computed to the nearest whole working day.

4. LIQUIDATED DAMAGES

It is understood that time is the essence of this contract and that the Owner will sustain damages, monetary and otherwise, in the event of delay in completion of the work hereby contracted.

Therefore, if the said Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as part consideration for the awarding of these contracts, to pay the Owner the amount

specified in the contract, not as a penalty, but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work.

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the extreme difficulty in fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

Liquidated damages are fixed at $500 per day for each calendar day of overrun beyond the date set for completion or authorized extension thereof for each contracts.

5. INSURANCE

Insurance is to be furnished by the Contractor for the benefit of the Owner, Contractor and subcontractors as their interests may appear. The minimum amounts of insurance coverage to be furnished under these contracts, in accordance with the applicable provisions of the General Conditions are:

(a) Workmen's Compensation ---------- Statutory

(b) Comprehensive General Liability - Including coverage for the explosion, collapse, and underground hazards where applicable; also including contractual liability and also products and/or completed operations liability coverage (no deductible clauses are acceptable for these coverages).

Bodily Injury Liability	-	$100,000 each person $500,000 each occurrence
Property Damage Liability	-	$100,000 each occurrence $300,000 each policy period

(c) Comprehensive Automobile Liability -Including hired car and employers' non-ownership liability coverage:

Bodily Injury Liability	-	$220,000 each person $500,000 each occurrence
Property Damage Liability	-	$100,000 each occurrence

(d) Builder's Risk (Building Construction) - Including coverage for fire, extended coverages, vandalism, and malicious mischief; 100% of insurable values.

(e) Installation Floater (Non-Building Construction) - Such as water and sewer pipelines: 100% of insurable values.

(f) Flood Hazard Insurance - In accordance with General Conditions.

In addition to the general insurance requirements, an insurance bond in the amount of $2,000 to the

Kentucky Department of Highways is not required for Contract 9. Release of the bond and approval by DOT at the request of the Contractor is required for final payment.

All policies shall providefor a minimum of fifteen (15) days written cancellation notice with notice to be given both to the Owner and the Engineer. "Endeavor to notify" is not acceptable.

The Owner and Engineer shall be included as additional insured parties.

6. PERFORMANCE AND PAYMENT BOND

The Contractor shall furnish separate performance and payment bonds issued by an approved bonding company (in accordance with the General Conditions) in an amount at least equal to one hundred (100%) percent of the contract price, as security for the faithful performance of this contract and for the payment of persons performing labor and furnishing materials in connection with this contract. These bonds shall be executed by a company authorized to do business in the State of Kentucky and shall be signed or countersigned by a Kentucky resident agent. Bonds shall remain in effect for one year after date of final acceptance of the work.

7. ADDITIONAL BONDS AND INSURANCE

Prior to delivery of the executed Agreement by the Owner to the Contractor, the Owner may require the Contractor to furnish such other Bonds and such additional insurance, in such forms and with such sureties or insurers as the Owner may require. If such other Bonds or such other insurance are specified by written instructions given prior to opening of the bids, the premium shall be paid by the Contractor; if subsequent thereto, they shall be paid by the Owner (except as otherwise provided for bonding of substitute materials or equipment).

8. SEQUENCE OF WORK

Contract 9 shall apply their initial forces to the point of connection to the existing system and proceed to the ending point.

9. SITE DIMENSIONS

All Contractors furnishing materials and equipment for this contract shall obtain exact dimensions and measurements at the site. Scale or figure dimensions on the drawings and details show the correct size under ideal conditions and shall not, under any circumstances, be so construed as to relieve the Contractor from responsibility for taking measurements at the site and furnishing materials or equipment of the correct size or dimensions. Contractors are responsible for re-stocking fee/costs for over-ordering of materials.

10. DAMAGE TO EQUIPMENT STORED AND/OR IN PLACE PRIOR TO INITIAL OPERATION

Any equipment damaged or which has been subjected to possible damage by reason of inundation, improper storage and/or protection during the construction period of a project, shall be replaced with new equipment, or with the approval of the Engineer, be returned to the manufacturer of the

equipment, or his authorized repair agency, for inspection and repair; provided, however, that such repair after inspection will place the equipment in new condition and restore the manufacturer's guarantee the same as for new equipment.

11. EQUIPMENT RENTAL - CHARGES FOR EXTRA WORK

Equipment rental charges by the Contractor for rented equipment units used on "Extra Work" or "Changes in Work" as may be ordered and authorized by the Owner shall not exceed those charges listed in the latest edition of the "Green Book," compiled and distributed by Associated Equipment Distributors, 615 West 22nd Street, Oak Brook, Illinois 60523.

12. SALVAGED MATERIALS AND EQUIPMENT

All materials and/or equipment to be removed from existing structures and not specifically specified to be reused shall remain the property of the Owner. Such materials and/or equipment shall be stored on site by the Contractor as directed by the Owner.

13. SANITARY FACILITIES

Each Contractor shall construct and maintain, in a sanitary condition, sanitary facilities for his employees and also employees of his subcontractors. At completion of the contract work, these sanitary facilities shall be properly disposed of.

14. UTILITIES

The obtaining of all utilities for construction, including power and water, shall be the responsibility of the Contractor and he shall bear the cost of all utilities used for construction. Cost of all connections and facilities for use of utilities shall be borne by the Contractor.

Where the existing utilities must be disturbed during construction under this contract, their operation and function shall be maintained by the Contractor to such a degree that service to customers will be interrupted for minimum time periods only. Such disturbances and any maintenance use of these lines shall constitute no cost to the Owner. The Owner shall be notified of interruptions in sufficient time to prepare for them, and shall agree to the hour, date, and duration of them before they are undertaken.

15. CASH ALLOWANCES

No cash allowances are included in this project. However, the Contractor is required to make labor and material allowances for unforeseen repairs, to the existing improvements as described in these specifications.

16. NON-DISCRIMINATION IN EMPLOYMENT

During the performance of this contract, the Contractor shall not discriminate against any employee

or applicant for employment because of race, creed, color 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, creed, color or national origin.

17. MINIMUM WAGE RATES

If available, the prevailing minimum wage rates are contained in Part V of these specifications. However, applicable wage rates may be provided at any time before bids are received. In that event the wage rates will be provided by addendum to these specifications.

The Contractor will be required to pay not less than the higher of the State or Federal minimum wage rate for each job classification as and if set forth in Part V of these specification or in an addendum to the specifications. The stipulated wage rates represent prevailing minimum rates of pay allowable as determined by the appropriate governing agency and shall not be construed to mean that the Contractor may not have to pay higher rates to secure labor. No contract adjustment is permissible should this condition become applicable.

18. PROPERTY PROTECTION

Care is to be exercised by the Contractor in all phases of construction to prevent damage and injury to the Owner's or other property.

In connection with work performed on "private property" (property other than that belonging to the Owner), the Contractor shall confine his equipment and stored materials to lands and rights-of-way provided for the project by the Owner and shall take every precaution to avoid damage to the private property owner's buildings, grounds and facilities.

Fences, hedges, shrubs, etc., within the construction limits shall be carefully removed, preserved and replaced when the back filling has been completed. If sod is damaged or not handled properly, it shall be replaced with new sod equal to existing sod at the Contractor's expense. Grassed areas, other than lawns, shall be graded, fertilized and seeded when construction is completed. When construction is completed the private property owner's facilities and grounds shall be restored to as good or better condition than found as quickly as possible at the Contractor's expense.

When directed by the Engineer, large trees or other facilities that cannot be replaced or preserved shall be removed by the Contractor. The Owner will assume responsibility for settling with the property owner for such loss. The Contractor shall be solely and entirely responsible for any damage to all other trees or facilities. The Contractor, in the use of easements and rights-of-way, will comply with any and all agreements between the Owner and the property owner.

Carelessness on the part of the Contractor or his employees in leaving gates open, parking cars, trucks or vehicles in such a way as to interfere with farming operations will not be tolerated. Contractor shall use existing roads to transport pipe, materials and workmen to and from the job.

Foundations, adjacent to where an excavation is to be made below the bottom of the foundation, shall be supported by shoring, bracing and underpinningas long as the excavation shall remain open and the Contractor shall be held strictly responsible for any damage to said foundation.

Highway rights-of-way, railroad rights-of-way, public parks, school yards and other such properties shall be considered "private properties" for the purpose of this section.

19. ROCK EXCAVATION

It is specifically noted that separate payment for solid rock excavation will not be made under this contract, all excavation being considered "unclassified."

20. EXTRA FILL MATERIAL

Extra fill material required to complete the finished grading to the line and grade shown on the plans shall be obtained by the Contractor at no extra cost to the Owner above that included in the unit price bid.

21. LAYOUT OF THE WORK

The layout of the work shall be the responsibility of the Contractor and shall be subject to checking by the Engineer. All instruments, stakes, batter boards, barricades, traffic signs, flags and other materials necessary and personnel needed for establishing and marking lines, grades and structure location during construction, shall be furnished and paid for by the Contractor. The Contractor's personnel engaged in the layout work described herein and any aides used shall be fully capable of performing the duties set out herein.

22. CONFLICT WITH OR DAMAGE TO EXISTING UTILITIES AND FACILITIES

Insofar as location data is available to the Engineers, existing underground utilities (such as water lines, sewer lines, gas lines, telephone conduits, etc.) are accurately locatedon the drawings. Due, however, to the approximate nature of much of this data, the location of any particular facility can not be certified to be correct. In general, locations and elevations shown are approximate only.

Repair to existing utilities and facilities damaged by the Contractor's construction forces shall be considered as a part of the Contract covered only by the price bid for the new construction. The only exceptions to this provision, wherein extra compensation will be authorized, are relocation of an existing facility due to direct conflict with the new pipeline, and relocation (outside of limits of maximum allowable trench widths) of an existing facility presently located within the bounds of maximum allowable trench width, where necessitated for assurance against future damage due to settlement or to permit reasonable access to the new work.

Before proceeding with the work, the Contractor shall confer with all public or private companies, agencies, or departments that own and operate utilities in the vicinity of the construction work to verify the location of and possible interference with, the existing utilities that are shown on the Plans, arrange for necessary suspension of service and make arrangements to locate and avoid interference with all utilities (including house connections) that are not shown on the Plans.

Where the existing utilities must be disturbed during construction under this contract, their operation and function shall be maintained by the Contractor to such a degree that service to customers will be interrupted for minimum time periods only. Such disturbances and any maintenance use of these lines

shall constitute no cost to the Owner. The Owner shall be notified of interruptions in sufficient time to prepare for them and shall agree to the hour, date and duration of them before they are undertaken.

Should shut-downs in service be in excess of the time of duration agreed upon and such excessive shut-down time be due to the Contractor's negligence, faulty work and/or inability to perform, then and in that event, the Contractor shall be held liable to the Owner, by reason of such excessive shut-down periods. When existing utilities or appurtenant structures, either underground or above ground, are encountered, they shall not be displaced or disturbed unless necessary andin such case shall be replaced in as good or better condition that found, as quickly as possible. Temporary relocation and replacement of all utilities and appurtenant structures to accommodate the construction work shall be at the Contractor's expense and permanent relocation of such facilities as described herein to accommodate the construction work shall be at the Owner's expense, unless such temporary or permanent relocation and replacement is by statute or agreement the responsibility of the Owner. It is expected that the Contractor will be diligent in his efforts and use every possible means to locate existing utilities.

Payment for necessary disconnection and reconnection of utility services shall be included as a part of the Contractor's bid and no extra compensation will be made for same.

The Contractor shall at all times maintain on hand an adequate supply of repair materials and tools with which to make repair to damaged water, gas and sewer lines. Should the Contractor inadvertently damage existing utilities, he shall make immediate repair thereto and in no event shall he leave the site before such repair has been made and proven to be successful. Repair to damaged utilities must meet the requirements of the agency in charge of that particular utility.

The intent of this article is to assure compensation to the Contractor for changes in existing utilities reasonably necessary and at the same time, to protect the Owner against excessive damage due to carelessness of the Contractor's construction force.

23. PERSONAL LIABILITY OF PUBLIC OFFICIALS

In carrying out any of the provisions of the Contract or in exercising any power or authority granted to them thereby, there shall be no personal liability upon the Engineer, or its authorized agents or employees, or upon any other officer or employee of the Owner, it being understood that in such matters they act as the agent and representative of that Owner.

24. BLASTING

All blasting operations shall be conducted in strict accordance with Kentucky Revised Statutes 351.320 to 351.340 and the rules and regulations promulgated under KRS 351.320 to 351.340, effective October 6, 1972, which shall be deemed to be included in these Specifications the same as though herein written out in full. The Contractor shall also comply with applicable municipal ordinances, Federal safety regulations and Section 9 of the Manual of Accident Prevention in Construction published by the Associated General Contractor's of America, Inc. All explosives shall be stored in conformity with said ordinances, laws and safety regulations. No blasting shall be done within five feet of any water mains, except with light charges of explosives. Any damage done by blasting is the responsibility of the Contractor and shall be promptly and satisfactorily repaired by him.

To implement these requirements and unless otherwise required by ordinance or law, each excavation crew shall be provided with two metal boxes equipped with suitable locks. One of these boxes shall be for storing explosives and one for caps. The boxes shallalways be locked except when in actual use. They shall be painted a bright color and stenciled with appropriate warning signs. At night explosives and caps shall be stored in separate magazines.

All shots shall be covered with heavy timber, steel or rope blasting mats to prevent flying material. Unless otherwise specified or directed, delay caps shall be used to reduce earth vibration and noise. In sparsely populated areas, the Engineer may permit the Contractor to use regular type caps.

The Contractor shall keep a blasting log and, for each blast, shall record the date, time of blast, number of holes, type of explosive, number of delays, amount of charge per delay, stemming and number and type of caps. An inventory of all explosives handled and stored shall also be kept. Blasting operations shall be covered by comprehensive general liability insurance or separate public liability insurance to cover blasting as set forth in the General Conditions.

25. CONTROL OF EROSION

The Contractor shall be responsible for control of siltation and erosion from the project work in accordance with the Kentucky Erosion Prevention and Sediment Control Guide, the State General Permit and Section 308(b) of the Clean Water Act (CWA). Control shall include all necessary ditching, check dams, mulching, etc. to prevent silting and erosion. The Owner shall incur no extra costs from such work. The contractor shall as applicable:

1. Submit a signed Notice of Intent (NOI) form to Kentucky Division of Water at least 48 hours before construction activity involving possible erosion begins.
2. Submit a copy of the NOI to the municipal operator of any municipal separate storm sewer system (MS4) the site discharges into.
3. Develop and implement a "Storm Water Pollution Prevention (BMP) Plan" in accordance with the Kentucky Erosion Prevention and Sediment Control Guide, the State General Permit and Section 308(b) of the Clean Water Act (CWA).
4. Continue to implement the plan during construction activity, including inspections every 7 days and after each significant rain as required.
5. Submit a signed Notice of Termination (NOT) form to Kentucky Division of Water after the site has been finally stabilized.

26. OCCUPATIONAL SAFETY AND HEALTH

It shall be the Contractor's responsibility to be informed of and comply with all Kentucky Department of Labor, Division of Occupational Safety and Health requirements for this type of construction. He shall also comply with all reporting requirements of the Occupational Safety and Health Law. The Contractor shall provide adequate protection against accidents due to special hazards caused by blasting, deep trenches, excavations, heavy equipment or vehicle operation, electrical work, work in dangerous atmospheres, work above the ground, traffic control, work with augering and drilling equipment and any other construction work which he might undertake as a part of this project.

The Contractor shall provide safety controls for protection of the life and health of employees. He will utilize precautionary methods for the prevention of damage to property, materials, supplies and

equipment and for avoidance of work interruptions in the performance of this contract. In order to provide such safety controls aforesaid, the Contractor shall comply with all pertinent provisions of the Kentucky Safety Standards of the Division of Occupational Safety, Department of Labor, that are in effect at the time this contract is entered into and during the period in which the contract is to be performed. The Contractor shall also take or cause to be taken such additional measures as the Division of Occupational Safety may determine to be reasonably necessary for the purpose.

The Contractor shall maintain an accurate record of, and shall report to the Division of Occupational Safety in the manner and on the forms prescribed by the Division; exposure date and all accidents resulting in death, traumatic injury, occupational disease and/or damage to property, materials, supplies and equipment incident to work performed under this contract.

The Division of Occupational Safety will notify the Contractor through the Owner of any noncompliance with the foregoing provisions and the action to be taken. The Contractor shall, after receipt of such notice, immediately correct conditions. Such notice when delivered to the Contractor or his representative at the site of the work, shall be deemed sufficient for the purpose.

If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory or corrective action has been taken. Failure or refusal to comply with the order will be grounds for stopping all payments due under the contract to the Contractor. No part of the time lost due to any such stop order shall be made the subject of claim or extension of time or for excess cost or damages to the Contractor.

Compliance with the provisions of the foregoing sections by subcontractors will be the responsibility of the Contractor.

The Contractor shall provide necessary first aid facilities and employees trained to provide first aid as required by the Occupational Safety and Health Law. In addition to the reporting requirements of other agencies, the Contractor must report promptly 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 injuries or serious damages are caused, such shall be reported to both the Engineer and the Owner.

27. CONSTRUCTION WARNING SIGNS

The Contractor shall provide construction warning signs for each location where he is working in the highway right-of-way. Safety rules, including size, type and placement of construction signs, shall be equal to those required by the Kentucky Department of Highways.

28. PIPELINE RIGHT-OF-WAY

The Owner will attempt to obtain all pipeline right-of-way before construction is begun However, the Contractor must be prepared to work in right-of-way which have been acquired and shall not be entitled to a time extension due to delay over lack of particular right-of-way unless he has been provided no other place to work.

29. RESPONSIBILITY FOR TRENCH SETTLEMENT

Where the pipelines installed under this contract are located within existing or proposed street right-of-way the Contractor shall be responsible for any settlement of the street surfacing, curbs, or sidewalks caused by the pipeline construction, that occurs within one year after the final acceptance of this contract. Repair of any damage caused by settlement shall meet the approval of the Owner.

30. PERMISSION TO USE PROPERTY OTHER THAN THAT PROVIDED BY OWNER

Should the Contractor desire or elect to use, pass over and/or encroach on private property title or right-of-way for a specific purpose, he shall obtain such rights and permission at his own expense and risk.

31. RESOLVING CONFLICTS IN CONTRACT DOCUMENTS

Anything called for inthe specifications and not shown on the drawings or shown on the drawings and not called for in the specifications shall be included in the Contractor's work, the same as if includedin both. Where the details and general drawings do not agree, the Contractor shall notify the Engineer at least five (5) days before the date of the receipt of bids and the Engineer will have the Owner issue an addendum to all Contractors as to which of the two methods of construction shall be followed. Failure to make this determination shall make the Contractor subject to furnishing either method as may be later called for by the Engineer. In case of discrepancies between the various parts of the plans and the specifications, the detailed drawings shall take precedence over the general layouts or elevations and the written specifications shall take precedence over all other documents.

Figure dimensions on the drawings shall govern over scale dimensions. Work, materials or equipment described in words which so applied have a well-known technical or trade meaning shall be deemed to refer to such recognized standards.

In resolving conflicts, errors and discrepancies in the Contract Documents, the documents shall be given precedence in the following order: Agreement, Modifications, Addenda, Funding Agency Specifications or Contract Documents (EPA, EDA, FmHA, Etc.), Special Conditions, Special Provisions, Supplementary General Conditions, Information for Bidders, General Conditions, Technical Specifications and Drawings.

32. ACCESS TO THE WORK

The Engineer and the Owner shall have access to the work wherever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and inspection.

33. LUBRICATION

The Contractor shall make suitable provision for the proper lubrication of all equipment furnished under this Contract. Accessible grease fittings shall be provided where required. A supply of oil, grease and other lubricants of proper quality, as recommended by the manufacturer of the equipment, shall be furnished. Lubricants shallbe furnished in their original, unopened containers, in sufficient quantity for initial fillings and for at least one (1) year of operation.

34. LABOR REGULATIONS

All public works projects bid and constructed in the State of Kentucky are subject to the provisions of Chapter 337 of the Kentucky Revised Statutes entitled Wages and Hours. In addition, if the project to which these specifications apply is funded in whole or in part by a Federal grant program whereby the U.S. Department of Labor is required to prescribe predetermined prevailing minimum wages, compliance with the applicable Federal labor regulations is also required.

All Contractors and subcontractors on the work will be required to comply with all applicable provisions of State and Federal regulations as outlined in the Supplemental General Conditions.

35. PRECONSTRUCTION CONFERENCE

A preconstruction conference shall be held prior to issuance of notice to proceed. The Contractor shall be represented by at least one (1) principal of the firm and the job superintendent. The Contractor shall at that time present the construction schedule, progress payment format and estimates, any available subcontractor approval requirements, required insurance and any other documents deemed necessary.

36. RECORD DRAWINGS

The Contractor shall keep an accurate record of the location, size and material for all piping and changes in dimensions, and any other variations between the work actually provided and that shown on the Contract Drawings. The representation of such variations shall conform to standard drafting practice and shall include such supplementary notes, legends and details as may be necessary for legibility andclear portrayal of the construction. Upon completion, the Contractor shall have these drawings and records certified as to their completeness and correctness by his superintendent and deliver them to the Engineer.
This requirement shall not be deleted regardless of therecord keeping practices of the Engineer or the Owner. No final payment will be made without the receipt of the final record drawings from the Contractor.

37. QUANTITIES OF ESTIMATE

Wherever the estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of the documents including the proposal, they are given for use in comparing bids and the right is especially reserved except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this Contract, and such increase or diminution shall in no way vitiate this Contract, nor shall any such increase or diminution give cause for claims or liability for damages.

PART VIII
Technical Specifications

PART VIII
TECHNICAL SPECIFICATIONS
SECTION AA
TRENCHING AND WATER LINE INSTALLATION

PART 1 - GENERAL

The CONTRACTOR shall furnish all labor, materials and equipment to install the water lines as shown on the plans and as specified herein.

The water lines may be pressure-rated plastic pipe (PVC), municipal plastic pipe (MPVC), cast iron (CI), ductile iron (DI), or river crossing pipe, all as specified hereinafter. The bid documents shall show the amounts of each type and class of pipe to be provided by the CONTRACTOR.

The OWNER will obtain all rights-of-way for operations through private property. It will also secure building permits and the permits for all pipe laid in highway rights-of-way. Any charges for inspection or other fees required will be the responsibility of the CONTRACTOR since the amounts of these are dependent upon the operation of the CONTRACTOR.

PART 2 - HAULING AND STORAGE

The CONTRACTOR shall notify the ENGINEER when pipe will be received on the job so that proper arrangements may be made for inspecting the unloading and stringing, as well as inspecting and examining the pipe materials.

The CONTRACTOR will be required to deliver all equipment and other materials and place same as and where required for installation. Care must be exercised in the handling of all materials and equipment and the CONTRACTOR will be held responsible for all breakage or damage to same caused by his workmen, agents, or appliances for handling or moving. Pipes and other castings shall in no case be thrown or dropped from cars, trucks, or wagons to the ground, but shall be lowered gently and not allowed to roll against or strike other castings and unyielding objects violently. Pipe and other castings may be distributed at places that will not interfere with other building operations and unloaded, or yarded and distributed as required, as the CONTRACTOR may elect.

Valves, castings, fabricated metal, reinforcing steel, etc., shall be yarded or housed in some convenient location by the CONTRACTOR and delivered on the ground as required. All equipment and materials subject to damage from the weather, dampness, changes in temperature, or exposure shall be protected by a dry, weatherproof enclosure until ready for installation or use. The cost of all hauling, handling, and storage shall be included in the prices bid for equipment and materials in place. The OWNER takes no risk or responsibility for fire, flood, theft, or damage until after the final acceptance of the work.

PART 3 - LINES AND GRADES

The location of all new pipelines are shown on the plans. The ENGINEER will assist the CONTRACTOR in marking such locations in the field. The CONTRACTOR will be required to accomplish any detailed layout, including that required for establishing the grade of the pipeline.

PART 4 - TRENCH EXCAVATION

4.01 General

The CONTRACTOR shall include in his unit price bid, all trenching necessary for installation of all pipelines as planned and specified. Trenching shall include all clearing and grubbing, including all weeds, briars, small trees, stumps, etc., encountered in the trenching. The CONTRACTOR shall dispose of any such material by burning, burial, or hauling away (or as noted on the drawings), at no extra cost to the OWNER. It shall be the CONTRACTOR's responsibility to notify the appropriate state and local air pollution control agencies when he conducts open burning of refuse. Ornamental shrubs shall be removed, protected and replanted. Trenching also includes such items as minor street, road, sidewalk, pipe and small creek crossings; cutting, moving or repairing damage to fences, poles, or gates and other surface structures regardless of whether shown on the plans.

The CONTRACTOR shall protect existing facilities against danger or damage while pipeline is being constructed and backfilled, or from damage due to settlement of this backfill. In case of damage to any existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structures will be in as good condition and serve its purpose as completely as before and such restoration and repair shall be done without extra cost to the OWNER. The use of trench-digging machinery will be permitted except where its operation will cause damage to trees, buildings or existing structures above or below the ground. At such locations hand methods shall be employed to avoid damage. All excavated material shall be piled in a manner that will not endanger the work and will avoid obstructing sidewalks and driveways. Gutters shall be kept clear or other satisfactory provisions shall be made for street drainage.

All excavation shall be open trenches, except where the drawings call for tunneling, boring, or jacking under structures, railroads, sidewalks and roads. The construction procedure for these types of excavation is described elsewhere in these specifications.

4.02 Clearing

The CONTRACTOR shall accomplish all clearing and/or grubbing as required for the construction under this contract. Clearing and grubbing shall include the cutting and removal of trees, stumps, brush, roots, logs, fences and other loose or projecting material and natural obstructions which, in the opinion of the ENGINEER, must be removed to properly prosecute the construction and operate the facilities upon completion of construction. Trees, unless designated otherwise on the plans, shall remain and be properly protected. Ornamental shrubs, plantings, fences, walls, etc. shall be removed and replanted or replaced or protected from the construction activity. Clearing and/or grubbing shall be incidental to the various bid items and no additional compensation will be paid for same.

4.03 Trench Depth

Trenches shall be excavated to the line and grade required for the installation of pipe at the elevations indicated on the plans. The minimum depth of cover shall be 30 inches above the top of

the pipe, unless shown otherwise onthe plans or on the Standard Details. When the pipe is laying in or on solid rock, the minimum depth of cover shall also be 30 inches above the top of the pipe. No additional compensation will be made for extra depth where required by the plans or due to CONTRACTOR error. Excavation, except as required for exploration, shall not begin until the proposed work has been staked out. Materials which are notrequired for backfill and site grading shall be removed and disposed of as directed by the ENGINEER. Hauling, bedding and backfilling shall be considered incidental to thevarious bid items and will not be paid for directly. Excavation shall be of sufficient depth to allow the piping to be laid on the standard pipe bedding in accordance with the Article 4.7 of this section. The trenches shall be excavated to a minimum of six (6) inches below the bottom of the pipe barrel in rock. In all cases where lines are under traffic, a minimum cover of thirty-six (36) inches shall be provided. Should it be necessary to avoid existing utilities, culverts, outlets, or other structures, the water line shall be carried deeper at no additional expense to the OWNER.

Where the plans call for extra trench depth, this extra depth shall be provided at no extra cost.

4.04 Trench Width

Trench widths shall exceed the minimum width that will provide free working space, on each side of the pipe and to permit proper backfilling around the pipe as shown in the accompanying table and unless specifically authorized by the ENGINEER, shall not be excavated to wider than two (2) feet plus the nominal diameter of the pipe at the top of the trench. Before laying the pipe, the trench shall be opened far enough ahead to reveal any obstruction that may necessitate changing the line and grade of the pipe. Should the CONTRACTOR fail to accomplish this, and changes are required, they shall be at his sole expense. In rock, all ledge rocks, boulders and large stones shall be removed to provide six (6) inches of clearance on each side and below all pipe and fittings.

MINIMUM TRENCH WIDTH IN EARTH
AND PAY WIDTH FOR ROCK EXCAVATION

Size	Width	Size	Width
Up to 4" Pipe	1' - 6"	15" Pipe	2' - 8"
6" Pipe	2' - 0"	16" Pipe	3' - 0"
8" Pipe	2' - 0"	18" Pipe	3' - 0"
10" Pipe	2' - 4"	20" Pipe	3' - 2"
12" Pipe	2' - 6"	21" Pipe	3' - 4"
14" Pipe	2' - 6"	24" Pipe	3' - 8"

4.05 Shoring, Sheeting and Bracing of Excavation

Where unstable material is encountered, or wherethe depth of the excavation in earth exceeds five (5) feet, the sides of the trench or excavation shall be supported by substantial sheeting, bracing, or shoring. The design and installation of all sheeting, sheet piling, bracing or shoring shall be based

on computations of pressure exerted by the materials to be retained. Adequate and proper shoring of all excavations will be the entire responsibility of the CONTRACTOR. The Standards of the Federal Occupational Safety and Health Act and the Kentucky Department of Labor shall be followed.

4.06 Removal of Water

The CONTRACTOR shall provide adequate removal of all water and the prevention of surface water from entering the excavation. The CONTRACTOR shall maintain dry conditions within the excavations until the backfill is placed. No additional compensation will be paid for replacement and/or stabilization of prepared excavations due to flooding and/or deterioration from extended exposure. All water pumped or drained from the excavation shall be disposed of in a suitable manner without damage to adjacent property or to other work under construction.

4.07 Bedding of Pipeline

In all cases the foundation for pipe shall be prepared so that the entire load of the backfill on top of the pipe will be carried uniformly on the barrel of the pipe. The bells of the pipe shall not carry any of the load of the backfill. The CONTRACTOR should refer to the Standard Details for pipe bedding shown in the plans. The bedding specifications shall govern the backfill from the bottom of the trench up to the centerline or spring line of the pipe.

4.7.1. Stable Earth Foundation

On all galvanized or copper lines, the CONTRACTOR may use either the "solid trench bottom method" or the "undercutting method"as shown in the Standard Details. The solid trench bottom method allows support of the pipe barrel by the trench bottom with holes dug out for the bells. The bottom must be leveled with soil and free of irregularities. The undercutting method calls for 4 inches of excavation below the barrel and then refill with evenly spread earth cushion or other standard bedding.

On all PVC pipelines, the trench bottoms shall be smooth and free of frozen material, dirt clods and stones over ½" diameter. Bottom dirt left by trenching equipment will usually provide adequate material to level the trench bottom and provide bedding support for the pipe barrel. If the trench bottom is free of dirt, soft material may be shoveled off the side walls or shoveled under the pipe to ensure proper pipe barrel bedding. In areas where the trench bottom is hard, a layer of soft backfill must be provided to ensure the pipe barrel is properly cushioned. See the plans for proper bedding material depth.

If the foundation is good firmearth the pipe may be laid directly on the undisturbed earth provided the pipe barrel is supported for its full length.

Bedding No. 9 stone, fine gravel, sand or compacted finely graded select earth shall be used to correct irregularities in the subgrade. Where bell and spigot is involved, bell holes shall be excavated to prevent the bells from being supported or undisturbed earth.

As an alternative to the above method, excavation in earth may be undercut to a depth below the

required invert elevation that will permit laying the pipe on a bed of granular material or finely graded select earth to provide continuous support for the pipe barrel. Bedding depth shall be as shown on the plans.

All cast iron or ductile iron lines 4 inches above in size will be installed using the undercutting method and a crushed stone bedding in accordance with the Standard Details. The crushed stone bedding is not a separate pay item and shall be included as incidental expense in the unit price for the pipe bid per foot of pipe. Cast iron or ductile iron lines less than 4 inches may be installed using the undercutting method and earth refill.

4.7.2. Trenches in Rock

All installation in rock willutilize the undercutting method. Bedding will be with 6 inches crushed stone as shown in the Standard Details. The only exception to this will be with PVC, copper, or galvanized iron pipe 4 inches in diameter or smaller. These may be bedded on 6 inches of evenly spread earth backfill.

4.7.3. Unstable Trenches

If unstable material is encountered which may not provide a suitable foundation for the pipe, the unstable material will be removed and an adequate layer of encasement concrete or other special bedding shall be placed for the pipe foundation in accordance with the Standard Details in the plans. Such "special pipe foundation" shall only be installed if directed by the ENGINEER in writing or on the plans. This special pipe foundation shall be considered a pay item and shall be paid for by lineal foot at the contract price for the type of bedding required.

4.7.4. Smooth Trench Beds

In installations where a smooth trench bed on grade with no irregularities is required, the CONTRACTOR shall use a notched wood plank or similar device to check the bed before each length of pipe is laid. Plank shall be at least 4 feet longer than the laying length of pipe being installed.

4.08 Pavement Removal

Pavement removal shall be as indicated on the plans or directed by the ENGINEER. When so required, or when directed by the ENGINEER, only one-half (½) of the street crossings or road crossings shall be excavated before placing temporary bridges over the side excavated, for the convenience of the traveling public. All backfilled ditches shall be maintained in such a manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and the property owners abutting the improvements shall be taken into consideration. All public or private drives shall be promptly backfilled or bridged at the direction of the ENGINEER. Pavement replacement shall be in accordance with Section AC of these specifications. Excavated materials shall be disposed of so as to cause the least interference and in every case the disposition of excavated materials shall be satisfactory to the ENGINEER.

4.09 Traffic Maintenance

The CONTRACTOR must "red light" and guard all open trenches or obstructions placed on the streets or sidewalks. The lights must be burning from sunset to sunrise in order to effectively warn and safeguard the public against dangers connected with open trenches, excavations and other obstructions. The CONTRACTOR shall be held responsible for any damage that may occur to persons or property by reason of the failure of the CONTRACTOR to properly "red light" and guard all open trenches or obstructions along the routes of the water lines. The CONTRACTOR at his own expense shall also maintain warning signs, barricades and a watchmen or flagmen to control traffic at such times as his work would interfere with the flow of traffic. No excavation shall begin that may present a safety hazard unless the signs, barricades, lights, etc. are available to protect the open excavation at the conclusion of the day. The CONTRACTOR will comply with all Federal and State Occupational Safety and Health requirements for this type of construction. The CONTRACTOR shall also comply with all local and Kentucky Department of Highways requirements for signing and traffic control.

4.10 Solid Rock Excavation

The method for payment for solid rock excavation is provided in the Bid. Rock excavation and trenching in earth may be combined into a single "unclassified" bid and no extra payment for rock shall be made in this case. Where provision is made for extra compensation solid rock excavation is defined as the removal of materials of one-half (½) cubic yard or more in one location through the use of explosives. Boulders which can be moved economically without explosives; decomposed, shattered, or weathered rock; pavement; and shale rock will not be included when rock excavation is encountered. The CONTRACTOR shall notify the ENGINEER for the purpose of obtaining an accurate survey of rock excavation required beforeblasting is done. No payment will be made for rock excavation which is not inspected by the ENGINEER. Whenever blasting is necessary, ample precautions shall be taken to prevent accidents to life and property from flying rock or debris by either covering the trench or excavating with heavy timbers, or mats or by using other suitable means. The CONTRACTOR should referto the blasting requirements contained in Section AC of these specifications. Any damages to pipelines of this or other contractors or to any structures caused by blasting done under this contract shall be repaired promptly by the CONTRACTOR at his expense and to the satisfaction of the ENGINEER.

4.10.1. Where applicable, the basis for payment for rock excavation shall be computed by multiplying the average depth of rock strata by the length of strata and by the width of trench used. The maximum allowable pay width of trench is determined from Paragraph 4.4 of these specifications. Measurements of strata depth willbe from top of strata to six (6) inches below the bottom of pipe barrel when the pipe is laid in accordance with these specifications. Rock excavations below the minimum grades, unless authorized by the ENGINEER, will be at the CONTRACTOR's expense. The depth measurements will be taken at each end of the strata and at 25 foot intervals. The lengthof the strata will be the distance between intersections of the bottom of the trench with each end of the strata.

4.10.2. Unclassified excavation by trenching includes removal of all rocks, earth, boulders, masonry, hidden concrete, etc. There will be no extra payment for rock excavation in pipeline trenches of any kind where unclassified excavation is specified. All excavation costs shall be included in the unit

price for the contract.

4.11 Maintenance of Flow of Drains and Sewers

Adequate provision shall be made for the flow of sewers, drains and water courses encountered during construction. Any structures which are disturbed shall be satisfactorily restored by the CONTRACTOR.

4.12 Interruption of Utility Services

No valve, switch or other control on any existing utility system shall be operated for any purpose by the CONTRACTOR without approval of the ENGINEER and the Utility. All consumers affected by such operations shall be notified by the CONTRACTOR as directed by the ENGINEER and utility before the operation and advised of the probable time when service will be restored.

4.13 Fencing

Where water supply line is being constructed in fields where stock is being grazed, CONTRACTOR shall provide temporary fence as approved by the ENGINEER around open trenches to prevent stock from falling in trenches. Where trenching operations should isolate grazing stock from their source of water, CONTRACTOR will either provide temporary bridging over trench or else provide water for such stock.

Where trench crosses near sound existing corner posts and existing fence is in good condition, fence may be taken loose, rolled back and stored until pipeline is completed at this point, then replaced by stretching tightly and thoroughly stapling. Additional posts will be provided and additional new fence shall be provided when it is necessary to place the fence crossed by the water line in a condition equal to existing fence before water line was constructed.

Where it is necessary to cut existing fence, new end posts shall be installed on each side of the water line and the old fence thoroughly stapled to these new posts before cutting. After pipeline is completed at this point, a newfence of galvanized wire (No. 9 gauge with No. 11 filler wires) shall be stretched between these new end posts and thoroughly stapled to existing posts and any new intermediate posts necessary to provide a good fence. Replacement of fences shall be on a replacement in-kind basis, and shall be considered incidental to laying of the lines and any additional cost shall be included in the unit price bid per lineal foot of pipe.

PART 5 - PIPE AND FITTINGS

5.01 Polyvinyl Chloride Rigid Pipe and Fittings

This specification cover rigid, pressure-rated, polyvinyl chloride pipe and fittings, hereinafter called PVC pipe and PVC fittings, for sizes ½ inch through 12 inch.

5.1.1. PVC Pipe

PVC pipe shall be extruded from Type 1, Grade 1, polyvinyl chloride material with a hydrostatic

design stress of 2000 PSI for water at 73.4 degrees Fahrenheit, designated as PVC 1120, meeting ASTM Specifications D-1784 for material and D-2241 for pipe, latest revisions. Pipe shall also meet all applicable provisions of the Product Standards and shall bear the National Sanitation Foundation (NSF) seal of approval in compliance with NSF Standard No. 14. PVC pipe having a maximum hydrostatic working pressure of 160 psi (SDR26), 200 psi (SDR21), 250 psi (SDR17), or 315 psi (SDR13.5) shall be used as shown in the Bid Documents and Plans.

Samples of pipe and physical and chemical data sheets shall be submitted to the ENGINEER for review and determination of compliance with these specifications before pipe is delivered to job. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects.

The workmanship, pipe dimensions and tolerances, outside diameters, wall thickness, eccentricity, sustained pressures (ASTM D-1598), burst pressures (ASTM D-1599), flattening, extrusion quality (ASTM D-2152), marking and all other requirements of the Product Standard PS 22-70 shall be conformed with in all respects. No pipe 2 inches in diameter or larger with a wall thickness less than 0.090 inches may be used.

Pipe shall be furnished in 20 foot or 40 foot lengths. The pipe may be double plain end or with bell on one end. Male ends of pipe must be beveled on the outside. Pipe shall have a ring painted around the male end or ends in such a manner as to allow field checking of setting depth of pipe in the socket. This requirement is made to assist construction superintendents and inspectors in visual inspection of pipe installation.

Pipe must be delivered to job site by means which will adequately support it, and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical. Pipe must not be exposed to the direct rays of the sun for an extended period of time. If pipe is not to be installed shortly after delivery to the job site, it stored in a shaded location and strung as needed.

5.1.2. PVC Pipe Jointing

Pipe shall be joined with slip-type joints with rubber gaskets. Pipes with bells shall have all part of the bell, including the gasket groove, made from the same extruded piece, integral with the pipe, and shall be thickened to meet standard dimension ratios of wall thickness to outside diameter. The gasket groove shall be constructed such that gasket roll-out will not occur. Rubber gasket shall conform to ASTM 1869. The pipe manufacturer shall have an experienced representative on the job for a minimum of one day at the commencement of joining and laying operations. Joint lubricant shall be of a type recommended by the manufacturer for their pipe subject to the ENGINEER's approval. Lubricant shall be water soluble, non-toxic and have no objectionable properties.

5.1.3. PVC Couplings

Where PVC couplings are used, they shall be of the same material as the pipe and may be of the molded, or extruded type. PVC couplings shall have a minimum rating of 200 psi for continuous

operation at 73.4 degrees F. Ductile iron fittings are required for Class 250 PVC installations.

5.1.4. Fittings

5.1.4a. Cast Iron

Cast or ductile iron mechanical joint type fittings with appropriate adapters may be used with PVC pipe. All such fittings shall be approved by the pipe manufacturer, and complete data sent to the ENGINEER, including the manufacturer's approval, for review. Fittings shall comply with AWWA C-110 or C-111 and shall be manufactured for the size and pressure class of the line on which they are used. Use of transition gaskets will not be allowed unless specifically approved by the pipe manufacturer.

5.1.4b Payment

The cost of fittings, rings and all associated connecting costs for all fittings shown on the plans shall be included in the unit cost per foot of pipe. Payment for extra PVC or cast iron fittings not shown on the plans but requested or approved by the ENGINEER shall be at fitting cost plus $4.00 per inch of largest nominal fitting diameter.

5.1.5. Service Connections

All service connections on PVC lines shall be made by means of tees, factory tapped couplings, or bronze service clamps manufactured specifically for use with PVC pipe, with Mueller threads, Mueller Catalog No. H-134 or approved equal. Whenever possible, corporation stops shall be installed in plastic lines before conducting hydrostatic tests. Service lines shall have the same pressure rating as its main line. The specifications for Copper and PVC service lines are contained else where in this section.

5.02 Municipal Polyvinyl Chloride (MPVC) Pressure Pipe

This specification covers the requirements for AWWA approved Polyvinyl Chloride Pressure Pipe for water supply and distribution systems.

5.2.1. MPVC Pipe

MPVC pipe shall meet the requirements of AWWA C900-75, latest revision, "Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4" through 12" for Water" and shall be furnished in cast iron pipe equivalent outside diameters with rubber-gasketed separate couplings.

MPVC pipe and couplings shall be made from Class 12454-A or Class 12454-B virgin compounds as defined in ASTM D-1784. The standard code designation shall be PVC 1120. The PVC compounds shall be tested and certified as suitable for potable water products by the NSF Testing Laboratory and shall carry the NSF approval marking.

Solvent-cement couplings or joints shall not be used. PVC joints using elastomeric gaskets shall be tested as assembled joints and shall meet the laboratory performance requirements specified in

ASTM D-3139.

Pipe and couplings shall be pressure Class 100, DR 25 (Dimension Ratio), pressure Class 150, DR 18, or pressure Class 200, DR 14 as shown on the plans or the bid form.

Pipe and couplings shall be marked as follows:

a. Nominal size and OD base.
b. Material code designation (PVC 1120).
c. Dimension ratio number.
d. AWWA pressure class.
e. AWWA designation number (AWWA C900).
f. Manufacturers name or trade-mark and production record code.
g. Seal of the NSF Laboratory.

Pipe and couplings shall meet or exceed the following test requirements:

Sustained Pressure DR	ASTM D-1598 (1000 Hrs.) Sustained Pressure
14	650 psi
18	500 psi
25	350 psi

Burst Pressure DR	ASTM-1599 (60-70 seconds) Minimum Burst Pressure
14	985 psi
18	755 psi

Hydrostatic Integrity - Each standard and random length of pipe shall be proof-tested at four times its rated class pressure for a minimum of 5 seconds. Bells or couplings shall be tested with pipe.

Flattening - The pipe shall not split, crack, or break when tested by the parallel-plate method as specified by ASTM D-2241.

Extrusion quality - The pipe shall not flake or disintegrate when tested by the acetone-immersion method as specified in ASTM D-2241.

Standard length - Pipe shall be furnished in standard laying lengths of 20 ft. + 1in. A maximum of 15 percent of each pipe size may be furnished in random lengths of not less than 10 feet each.

5.2.2. MPVC Pipe Jointing

Pipe shall be joined with slip-type joints with rubber gaskets. Procedures shall be as recommended by the manufacturer and as described for PVC pipe in this section.

5.2.3. Fittings

Fittings for municipal PVC shall be cast-iron or ductile iron only. Either mechanical joints may be used. Fittings shall be manufactured for the size and pressure class of the line on which they are used and shall comply with AWWA C-110 or C-111.

5.2.4. Service Connections

Service connections shall be made by means of bronze service clamps manufactured specifically for use with municipal PVC pipe. Clamps shall be Mueller Catalog No. 11-161 or approved equal.

5.03 Cast Iron Pipe

These specifications cover cast iron pipe 3 inch diameter and greater to be used in water transmission systems with mechanical joints, rubber ring slip type joints or flanged joints.

5.3.1. General - Gray cast iron pipe shall be designed in accordance with AWWA HI, (ASA A21.1) and for pressures and conditions as stated in these specifications.

Cast iron pipe shall be centrifugally cast and conform to AWWA C-106 for metal molds and C-108 for sand-lined molds. Mechanical joints shall conform to AWWA Specification C-111 (ASA A21.11.)

5.3.2. Metal Design Strength-

Minimum Bursting Tensile	21,000 psi
Minimum Modulus of Rupture	45,000 psi
Maximum Modulus of Elasticity	10 million psi

5.3.3. Minimum Nominal Thickness

The specific wall thickness will be determined for the given internal and external loading requirements in accordance with ASA Specification A21.1 (AWWA H1). The class of pipe required will be shown on the plans and/or bid documents. All pipe used for potable water service shall be cement-lined.

5.3.4. Lengths

Pipe may be furnished in 12, 16, 16 ½. 18 or 20 feet nominal laying lengths.

5.3.5. Tests

Hydrostatic and acceptance tests shall be in accordance with AWWA Specification C-106 for "Cast Iron Pipe Centrifugally Cast in Metal Molds" or C-108 for sand molds. The ENGINEER shall be provided with five (5) copies of each of the following tests for each contract involved:

a. Talbot strip test.
b. Ring and full length bursting tests.
c. Chemical analysis of pipe.
d. Certification that pipe was hydrostatically tested.

Any pipe not meeting the AWWA Specifications quoted above shall be rejected in accordance with the procedure outlined in the particular specification.

5.3.6. Marking

The net weight, class or nominal thickness and sampling period shall be marked on each pipe.

5.3.7. Pipe Joints for Gray Iron Pipe

Pipe joints shall be mechanical joint, rubber ring slip joint, flanged, or locked mechanical joint as specified in Section IX.

Mechanical joints are to be furnished according to AWWA Specifications C-III. All pipe joints must be furnished complete with all accessories. Mechanical joint bolts and nuts shall be of alloy cast iron or alloy steel (Corten type such as U.S. Alloy) or approved equal. Rubber gaskets shall be made of plain first grade rubber, free of imperfections and porosity. Hardness shall be 70 to 75 durometer.

Rubber ring slip joints shall be equal to AWWA C-111-64 or latest revision. The joints shall be of the following materials:

5.3.7a. Rubber ring gasket compressed in groove in bell of pipe.

5.3.7b Beveled spigot end of pipe for initial centering into rubber gasket in bell.

Locked mechanical joints shall be equal to Clow Corporation's "Locked Mechanical Joint".
All items used for jointing pipe shall be furnished with the pipe and tested before shipment. The joints shall be made with tools and lubricant in strict conformity with the manufacturer's instructions. Three (3) copies of such instruction shall be delivered to the ENGINEER at start of construction.

5.3.8. Lining and Coating Gray Iron Pipe

All cast iron pipe for water service shall be bituminous coated outside and cement lined with seal coat on the inside per the above specifications. Cement mortar lining and bituminous seal coat inside shall conform to ANSI 21.4.-64 (AWWA C-104-71).

5.3.9. Mechanical Joint, Rubber Ring Slip and Flanged Joints Fittings

Cast iron mechanical, rubber ring slip and flanged joints shall conform to ASA Specifications A21.10 (AWWA C-110) for centrifugally cast iron water pipe. Mechanical joints shall also conform in all respects to ASA 21.11 (AWWA C-111). Fittings shall be manufactured for the size and

pressure class of the pipeline in which they are to be used. Fittings shall be bituminous coated outside and lined on the inside same as the line on which they are installed.

5.3.10. Cast Iron Flanged Pipe and Special Coupling

5.3.10a. Flanged Pipe

All cast iron flanged pipe shall have flanges faced and drilled, 125 pound in accordance with ASA A21.10 (AWWA C- 110) unless otherwise specified. Flanges may be cast integrally with the pipe or they may be screwed on specially designed long hub flanges, refaced across both face of flange and end of pipe. Flanged pipe shall be in accordance with ASA A21.6 (AWWA C-106) Specifications, latest revisions, and be the class called for on the plans or bid forms. Where plain ends of flanged and plain end pipe fit into mechanical joint bells, centrifugally cast pipe shall be used. Flanged pipe for water service shall be cement lined and bituminous coated the same as written herein for bell-joint pipe.

5.3.10b. Special Coupling

Flexible couplings for flanged pipe shall be a mechanical joint cast to a special flanged joint using a neoprene O-ring in place of the usual 1/16 inch rubber ring gasket. The mechanical bell and special flanged joint piece shall be of high grade gray cast iron (ASTM A48-56), AWWA C-100-54T) with bolt circle, bolt size and spacing or ASA Specifications. Mechanical joint follower flange shall be of ductile iron ASTM A399 or malleable iron ASTM A47, Grade 35018 or 32510, latest revision, with high strength/weight ratio design.

Bolts shall be fine grained high tensile malleable iron with malleable iron hexagon nut. Stainless steel nuts shall be used in vaults and wet wells. Where pressures may exceed 20 pounds, anchor studs shall be included with spigots of pipes connected drilled to receive ends of studs.

5.4 Ductile Iron Pipe

These specifications cover ductile iron pipe (3 inch diameter and greater) to be used in water transmission systems with mechanical joints, rubber ring slip type joints or flanged joints.

5.4.1. General

Ductile iron pipe shall be designed in accordance with AWWA 113 (ASA A21.50) and for pressures and conditions as stated in these specifications or called for on the plans. Ductile cast iron pipe shall conform to AWWA C-151 (ASA A21.51).

5.4.2. Minimum Nominal Thickness

The specified thickness will be determined for the given internal and external loading requirements in accordance with ASA A21.50. The class of pipe, wall thickness, and coatings required will be shown on the plans or the bid form for all ductile iron pipe installation. Ductile iron pipe will normally be class 2 for fill depths up to 16 feet and pipe diameters up to 12 inches.

5.4.3. The requirements for cast iron pipe shall also apply to ductile iron pipe with regard to lengths, tests, marking, joints, fittings, and lining or coatings. All ductile iron pipe used for potable water service shall be cement-lined and bituminous coated as specified for cast-iron pipe.

5.05 Copper Pipe and Fittings

These specifications govern the use of copperpipe where it is required for interior or exterior use.

5.5.1. Inside, Rigid with Solder Joint Connections

Small piping inside structures shall consist of standard copper tubing for water; Type "L" for general plumbing purposes. All fittings shall be "solder joint connection" cast or wrought bronze for water service for inside diameterof pipe size given. All stops, valves, hose bibs, and unions shall be made with same joints or threaded inside pipe standard, and be of brass or copper. Use 95-5 tin-antimony solder for "solder joints".

5.5.2. Outside, Underground Tubing with Compression Joints

Small piping in the ground shall be of standard soft copper tubing for water service pipe, ASTM Specifications B-88, Type "K", with bronze fittings, stops, and valves having compression connections for flared copper tubing.

5.06 Galvanized Threaded Steel Pipe and Galvanized Threaded Malleable Fittings

Galvanized threaded steel pipe shall be equal to "National" standard galvanized pipe in strength, coating, chemical and physical properties, threads and thickness, as manufactured by the National tube Company, Pittsburgh, Pennsylvania. Fittings shall be equal to Crane's standard malleable galvanized iron fittings in case of pressure lines and Crane's cast iron threaded drainage fittings in case of drains. Cast iron pipe may be substituted for galvanized pipe where authorized by the ENGINEER.

5.07 Black Steel Pipe

Pipe for natural or bottle gas service shall be black steel pipe, Schedule 40, threaded connections for use inside buildings. It is to be coated with "Trucoat" or equal when used outside in ground.

5.08 Threaded or Welded Steel Air and Gas Pipe

Air piping shall be beveled for welding or, upon the ENGINEER's approval, be threaded and coupled. In either case, pipe 3 inches and over shall be seamless or electric weld type. Pipe less than 3 inches may be seamless, steel butt weld, or electric weld type. All air or gas pipe installed under this contract shall comply with the latest revision of ASTM Specification A-53, Grade "B" for air, and American Petroleum Institute Standards 5 L, for gas, latest revision, as applicable to the threaded or welded joint pipe. Threaded steel pipe shall be furnished with couplings "handling tight".

5.8.1. Manufacturer's Stamp and API Monogram

Each length of pipe installed under this contract shall be stamped or marked with manufacturer's name, type of pipe, pipe length and API monogram.

5.8.2. Weights, Dimensions and Test Pressures

All piping installed under this contract shall conform to the following minimum specification:

Nominal Size, Inches	Wall Thickness, Inches	Weight Lb./Ft.	Test Pressure psi, Minimum
1	0.133	1.68	700
¼	0.140	2.27	1100
½	0.145	2.72	1100
2	0.154	3.65	1100
3	0.216	7.58	1100
4	0.237	10.79	1300
6	0.280	18.97	1300

5.09 River Crossing Pipe

River crossing pipe shall be Clow Ball Joint Pipe, or equal. Pipe shall meet all provisions of ASA Specifications A-21.6. Pipe bells and glands shall be 70-50-05 ductile iron with suitable rubber sealing gaskets.

5.10 Polyethylene Plastic Pipe

Polyethylene plastic pipe for use as service lines in water distribution systems shall have copper tube size outside diameter, meeting ASTM D-2737. Pipe shall rated for 200 PSI working pressure unless a higher rating is called for in the plans. Pipe shall meet all applicable provisions of the Commercial Standards and shall bear the National Sanitation Foundation (NSF) seal of approval. Polyethylene connections shall be made by compression fittings only.

5.11 Restrained Joint PVC

Restrained Joint PVC for use for bridge crossings in water distribution systems shall meet ASTM D-2241. Pipe shall be Class 12454B rated for 250 psi; (SDR17) unless a higher rating is called for in the plans. Pipe shall be extruded from Type 1, Grade 1 material. Pipe shall meet all applicable provisions of the Commercial Standards and shall bear the National Sanitation Foundation (NSF) seal of approval. Couplings shall consist of rubber gasketed PVC couplings with nylon splines. Coupling shall provide a locked joint which will not pull apart under pressure conditions. This is accomplished by inserting a nylon spline through the spline hole in the assembled joint which engages with the spline groove in the pipe end. Rubber rings shall meet ASTM F-477, Standard Specification for elastomeric seals (gaskets) for joining PVC pipe.

All pipe material shall be, Certainteed PVC Yelomine Pressure Pipe (IPS), tapered end with Certa-Lok coupling and two gaskets or approved equal.

PART 6 - PIPE LAYING

6.01 General

Proper instruments, tools and facilities satisfactory to the ENGINEER shall be provided and used by the CONTRACTOR for the safe and convenient prosecution of the work. Each pipe manufacturer shall have an experienced representative on the job for at least one day at the commencement of jointing and laying operations.

Before any length of pipe is placed in the trench, a careful inspection shall be made of the interior of the pipe to see that no foreign material is in the pipe. In order to properly remove any foreign materials, a swab of necessary length is to be available at all times.

All pipe shall be lowered carefully into the trench, properly aligned and properly jointed by use of suitable tools and equipment, in such manner as to prevent damage to water line materials and protective coatings and linings. Excessive scratching of the exterior surface of the pipe will be cause for rejection of the pipe.

Under no circumstances shall pipeline materials be dropped or dumped into the trench. The pipe and fittings shall also be inspected for the purpose of determining if they are sound and free from cracks. Laying of pipe shall be commenced immediately after excavation is started. Pipe shall be laid with bell ends facing in the direction of laying.

When pipe laying is not in progress, the open ends of pipe shall be closed by approved means to prevent entrance of trench water into the line. Whenever water is excluded from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent floating. Any pipe which has floated shall be removed from the trench and re-laid as directed by the ENGINEER. No pipe shall be laid in water or on frozen trench bottom or whenever the trench conditions or the weather are unsuitable for such work.

If any defective pipe and fittings shall be discovered after the pipeline is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge to the OWNER. Open ends of unfinished pipelines shall be securely plugged or closed at the end of each day's work or when the line is left temporarily at any other time.

6.02 Laying Cast Iron Pipe or Ductile Iron Pipe

Cast or ductile iron bolted joint, rubber ring slip joint, and ball and socket river crossing pipe shall first be thoroughly cleaned at joints, then joined according to instructions and with tools recommended by the manufacturer. Three (3) copies of instructions shall be furnished the ENGINEER and one (1) copy shall be available at all times at the site of the work. The lining inside cast iron or ductile pipe must not be damaged by handling.

All pipes must be forced and held together, or “homed” at the joints, before sealing or bolting. Pipe must be aligned as each joint is placed, so as to present as nearly true, straight lines and grades as is practical, and all curves and changes in grades must be laid in such a manner that the manufacturer's recommended maximum deflection is not exceeded at any joint.

Cutting of pipe may be done by wheeled pipe cutters or saws, or by hammer and chisel, as the CONTRACTOR may elect, but the CONTRACTOR will be held responsible for breakage or damage by careless cutting or handling.

Cast iron or ductile iron pipe four (4) inch diameter and larger, shall be laid on an evenly spread and compacted crushed stone cushion four (4) inches deep above bottom of trench uniformly supporting the pipe. Six (6) inches of crushed stone bedding shall be used in rock. When cast iron or ductile iron pipe less than four (4) inch diameter is used, granular compacted earth may be substituted for crushed stone. Sufficient space (limited to 2 feet longitudinally) shall be left out of 4 or 6 inch custom for tightening of bolts where bolted joints are used. No pipe shall be laid resting on rock, blocking, or other unyielding objects. Jointing before placing in trench, and subsequent lowering of more than one section jointed together may be allowed, subject to the ENGINEER's approval and direction.

When using pipe with push-on joints, care must be exercised to make certain that the correct gasket is being used for the type of joint installed and that the gasket faces the proper direction. Before inserting the gasket, the groove and bell socket should be carefully cleaned of all dirt. If sand or dirt is permitted to remain in the groove, leaks may occur. Lubricant must be applied to bell socket, gasket and plain-end of pipe as required by manufacturer. Plain-end must be beveled before joint is made. Deflection required at the joint shall be obtained after the joint is made. Bell and spigot pipe with caulked joints may be used for special cases only.

Where this type of pipe is required the joints shall be made as described in this paragraph. After placing a length of pipe on the prepared grade in the trench, the yarning material shall be held around the bottom of the spigot end of the next length so that it will enter the bell of the previously laid pipe as the pipe is shoved into position. Thespigot shall be centered there with earth carefully tamped under and on each side of it, excepting at the bell holes. Care shall be taken to prevent dirt from entering the joint space. Two or more joints of pipe shall be in place ahead of each joint before it is poured. Yarning material for bell and spigot joints shall be rubber rings, or treated paper rope. Joint material for bell and spigot pipe, unless otherwise shown on the drawings, shall be of the sulfur compound type "Leadite", "Mineralead", or approved equal. Jute shall not be used for joint material. Yarning material shall be thoroughly caulked into the joint to ensure centering of the spigot and within the ball and prevent loss of molten jointmaterial into the interior of the pipe, but in no event shall a depth of less than 2-1/2 inches be left for the joint compound. Each length of material shall be such as to pass completely around the pipe and provide a lap of two inches. Joint compound shall be heated in accordance with the directions of the manufacturer, care being taken to prevent under and over heating and burning. Joints shall be run with the aid of a runner and metal pouring gate thoroughly clayed to the pipe to prevent the molten compound from breaking out of the joint. Each jointshall be run full to the top of the pouring gate in one continuous pour. Material contained in the pouring gate when it is cut free from the joint may be reused. No joint shall be run in a wet trench and no water shall be allowed to come in contact with the joint until it is thoroughly hardened. If, upon inspection by the ENGINEER, imperfect joints are disclosed, the compound shall be cut out or otherwise removed and the joint re-run.

6.03 Laying Plastic Pipe

The trench bottom must be smooth and uniform and the alignment must conform with the plans.

Bedding and cover as specified herein and shown in the Standard Details is required.

To make a clean and unobstructed joint, it is necessary to wipe the ring, groove and pipe spigot free from all foreign materials at the time of assembly (welded joints will be allowed only in special cases and will be required as shown on the plans). the ring must be positioned properly in the fitting to receive the pipe by a worker who is notin contact with the lubricant. In general, the lubricant is applied to the spigot (not the ring or groove.) However, the manufacturer's instructions are to be followed in all cases. Only an approved lubricant may be used in accordance with the manufacturer's recommendations. All plastic pipe shall be joined by hand.

Where good bedding conditions are attained, PVC pipe smaller than four inches may be assembled outside the trench in longer sections (as conditions allow) and then lowered into the trench. At any time when improper bedding is discovered or the pipe is severely deflected the pipe will be removed from the trench and the condition corrected. Pipe in sizes 4 inch and above may be assembled outside the trench but must be lowered into the trench as each joint is assembled. Regardless of installation methods of couplings must be inspected after laying in trench for proper insertion and alignment. Field cuts and bevels will be allowed in accordance with the manufacturer's recommendations for these operations.

A new reference mark shall be installed before joining any field cut pipe. The same requirements for clearance from rock or other objects, thrust blocking and deflections shall apply to PVC pipe as for other pipe materials. Municipal PVC pipe of all sizes must be assembled in the trench in strict accordance with the manufacturer's requirements.

6.04 Installing Flanged or Threaded Pipe and Fittings

The CONTRACTOR shall clean off all rust and dirt and paint all threads with red lead, before assembling. This pipe shall be installed by skilled pipe men, with flanges and pipes plumb and level, showing no leakage. Unions shall be included to allow for the taking down of all runs of pipes. All valve operating devices shall be in locations and of types shown on the plans. They shall be accurately plumbed, leveled, supported and braced for smooth operation.

6.05 Installing Copper Pipe and Fittings

Exterior copper pipe shall be laid of Type K pipe, with compression fittings. Joints shall be neatly reamed and flared and joints drawn up firmly. Pipe shall have at least 30-inch cover under regrade. Joints shall be tested before backfilling and all leakage stopped.

Interior pipe shall be installed of Type L copper, with sweat joint fittings. Pipe shall be tested and all leaks stopped. Pipe shall show no dents or bends. Sweat joints shall present a neat appearance. Pipe shall be parallel to walls, floors and ceilings with unions near beginning of all runs and branches. Pipe shall be secured to walls and ceiling by clamps and hangers manufactured for the purpose. Strap hangers are not acceptable. Unions and valves shall be placed on each outlet to facilitate dismantling and shutting off.

Wherever copper pipes pass through walls or floors, they shall have wrought or cast iron sleeves, so that they may be removed. See "Standard Details" in the plans for detailed specifications on joints

to walls and floors. Pipes passing through structural beams shall be placed as near as possible to bottoms of floor slabs in the center of the span. Copper pipe must be installed by an experienced plumber.

Yard hydrants must be installed by the CONTRACTOR, in locations shown on the drawings. Care shall be exercised to obtain true vertical setting with exposed portions as near uniform as practicable. In excavating for yard hydrants, a hole at least 1 foot square must be dug to a depth of at least 12 inches below grade of pipe trench. This hole must be immediately below hydrant and filled with broken stone to a depth of 18 inches from bottom of hole. The excavation below bottom of yard hydrant shall be omitted where rock is encountered and 1-1/2 cubic feet of crushed rock backfill about the base of the hydrant will be used.

There shall be installed ahead of water outlet on all plumbing and water lines 1-1/2 inches and smaller in size, an all brass gate valve and a union between the valve and outlet connection or fixture.

6.06 Thrust Blocking and Anchorage

All angles or bends in the pipeline, either vertical or horizontal, shall be braced or anchored against the tendency of movement with concrete thrust blocking per the Standard Details, or approved equivalent joint harness or anchors to the satisfaction of the ENGINEER. Where joint harness is used, all component parts shall be stainless steel. Concrete thrust blocking or joint harness materials shall be considered incidental to the expense of installing the line and shall be included in the unit price bid for the pipeline. No separate payment will be made for these items.

Thrust blocks for plastic pipe will not be attached to couplings. Where thrust blocks are used for extra fittings ordered by the ENGINEER, payment shall be made using the bid price for Class "E" concrete and the thrust block dimensions shown in the Standard Details. This payment shall cover all work required for extra thrust blocks.

6.07 Testing Pressure Lines

The CONTRACTOR will be required to test all pipelines and appurtenances with water at pressure class of pipe installed. The pipe shall be slowly filled with water, care being taken to expel all air from the pipes. If necessary, the pipe shall be tapped at high points to vent the air. Pressure at least equal to 150 PSI (or the operating pressure if higher) as measured at the point of lowest elevation shall be applied for not less than one hour and all pipes, fittings, valves, hydrants and joints shall be carefully examined for defects or leakage. Any observed leakage shall be corrected.

The pipe pressure must be held at 150 PSI for one hour before beginning the test for leakage. No pipe shall be accepted unless or until the leakage, determined by this test, is less than 10 U.S. gallons over 24 hours, per mile, per inch nominal diameter of pipe. The leakage test shall be applied to the pipe for a period of not less than 4 hours.

The test shall be made between valves as far as practical in sections of pipe approximately 1,000 to 3,000 feet in length as may be directed by the ENGINEER and shall, in general, be made within

twelve working days of the completion of each section of line.

To determine the rate of leakage, the CONTRACTOR shall, as required, furnish a suitable pump, pressure gauge and water meter or other appliance for measuring the amount of water pumped. The instrument used to measure leakage shall be tested for accuracy as frequently as directed by the ENGINEER. The CONTRACTOR shall furnish all necessary labor and materials to make the test and to perform any work incidental thereto.

Where it is impractical to test between the valves, the CONTRACTOR shall as directed, at his own expense and cost, temporarily place caps and plugs on the lines and test sections of the new line.

Wherever practicable, corporations stops and service lines shall be installed before testing. If these items are installed after the main is tested, then a visual inspection of the tap and service line must be permitted while under pressure before backfilling service line.

Where any section of the main is provided with concrete reaction blocking, the hydrostatic pressure test shall not be made until at least five days have elapsed after the concrete reaction blocking was installed. If high early strength cement is used in the reaction blocking, the hydrostatic pressure test shall not be made until at least two days have elapsed.

Should there be leakage over the allowable amount, the CONTRACTOR will be required to locate and repair the leaks and retest the section. It is suggested, but not required, that the CONTRACTOR have a geophone (underground listening device) on the job at the time of testing.

If the leakage of the section of pipeline being tested is below the allowable amount, but leakage is obvious in the opinion of the ENGINEER, due to water at the surface of the ground, or by listening the leak can be heard underground with a geophone, or any other means of determining a leak, the CONTRACTOR will be required to repair these leaks.

The CONTRACTOR shall furnish a meter or suction tank, pipe test plugs and by-pass piping and make all connections for conducting the above tests. The pumping equipment used shall be centrifugal pump, or other pumping equipment which will not place shock pressures on the pipeline. Power plunger or positive displacement pumps will not be permitted for use on closed systems for any purpose.

Inspection of pipe laying shall in no way relieve the CONTRACTOR of the responsibility for stopping leakage or correcting poor workmanship.

6.08 Backfilling

Backfilling must be started as soon as practicable after pipe has been laid and joints hardened sufficiently, and jointing and alignment approved. Spading of crushed rock, sand, or mechanical tamping of earth, around pipe (as specifically required) between joints shall be the usual procedure as the laying progresses. This is in order to avoid danger or misalignment from slides, flooding or other causes. The ENGINEER shall be given a minimum of 24 hours for inspection before backfilling. The backfill shall be crushed rock, sand, or finely divided earth free from debris, organic material and stones, placed simultaneously on both sides of pipe to the same level by hand.

The backfilling of the lower part of the trench beginning at the top of the bedding, the backfill material shall be carefully and solidly tamped by hand or approved mechanical methods in 6 inch layers around the pipe and up to a point 8 inches higher than the top of the pipe. For PVC only the backfill shall be select material and may be walked-in. Walking or working on the completed pipeline, except as necessary in tamping or backfilling, shall not be permitted until the trench has been backfilled to a point one diameter higher than the top of the pipe. The filling of the trench and the tamping of the backfill shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipeline will not be disturbed and injurious side pressures do not occur.

After the above specified backfill is hand placed, rock may be used in the backfill in pieces no larger than 18 inches in any dimension and to an extent not greater than one-half (1/2) the backfill materials used. If additional earth is required, it must be obtained and placed by the CONTRACTOR. Filling with rock and earth shall proceed simultaneously, in order that all voids between rocks may be filled with earth. Above the hand placed backfill, machine backfilling may be employed without tamping, (if not contrary to specified conditions for the location) provided caution is used in quantity per dump and uniformity of level of backfilling. Backfill material must be uniformly ridged over trench and excess hauled away, with no excavated rock over 1-1/2 inch in diameter or pockets of crushed rock or gravel in top 6 inches of backfill. Ridged backfill shall be confined to the width of the trench and not allowed to overlap onto firm original earth and its height shall not be in excess of needs for replacement of settlement of backfill. All rock, including crushed rock or gravel from construction, must be removed from yards and fields. Streets, roadways and walks shall be swept to remove all earth and loose rock immediately following backfilling.

In the case of street, highway, railroad, sidewalk and driveway crossings or within any roadway paving or about manholes, valve and meter boxes, the backfill must be machine tamped in not over 4-inch layers, measured loose in accordance with the Standard Details. Where backfill is under paved driveways, streets, highways, railroads, sidewalks, paved parking areas and other areas where settlement is not allowed, crushed stone or coarse sand backfill only shall be used up to the paving surface. Crushed stone shall be Kentucky Department of Highways Standards Specification No. 78 or finer. Tunnels shall be backfilled in not over 3-inch layers, measured loose, with selected material suitable for mechanically tamping. If material suitable for tamping cannot be obtained, sand, gravel or crushed rock (No. 78) shall be blown, packed or sluiced to completely fill all void spaces.

Coarse sand backfill shall be spread in layers not over 4 inches thick and thoroughly compacted. Sand may be moistened to aid compaction.

Where local conditions permit, pavement shall not be placed until 30 days have passed since placing backfill. Crushed stone as specified for roads and parking areas and sidewalks or their bases shall be placed and compacted to the top of trench. Backfill shall be maintained easily passable to traffic at original ground level, until acceptance of project or replacement of paving or sidewalks. CONTRACTOR should refer to Section AC of these specifications for procedures to be followed in replacing pavement.

Where the final surfacing is to be crushed stone, compacted earth backfill may be used in the trench to within 6 inches of the top as shown in the Standard Details.

Railroad Company and Highway Department requirements in regard to backfilling will take precedence over the above general specification where they are involved.

Excavated materials from trenches and tunnels in excess of quantity required for trench backfill shall be disposed as shown on the plans or as directly by the ENGINEER.

The CONTRACTOR shall protect all sewer, gas, electric, telephone, water and drain pipes or conduits, power and telephone poles and guy wires from danger of damage while pipelines are being constructed and backfilled, or from danger due to settlement of the backfill.

In case of damage to any such existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structure will be in as good condition and serve its purpose as completely as before uncovering and such restoration and repair shall be done without extra charge.

Before completion of contract, all backfill shall be reshaped, holes filled and surplus material hauled away, and all permanent walks, street, driveway and highway paving, and sod, replaced (if such surface replacement items are included in the contract) and reseeding performed.

The CONTRACTOR shall be responsible for clean-up, grading, seeding, sodding or otherwise restoring all areas that he disturbs within the work limits of other contractors on this project.

Any deficiency in the quantity of material for backfilling the trenches or for filling depressions caused by settlement, shall be supplied by the CONTRACTOR.

6.09 Tie-Ins to Existing Pipelines

This work shall consist of connecting new water pipes to the existing system where shown on the plans and shall include the necessary fittings, tapping sleeves, valves and necessary equipment and material required to complete the connection.

Knowledge of pipe sizes in the existing system may not be accurate, therefore, it is recommended that the CONTRACTOR check outside diameters of existing pipe and types of pipe prior to ordering the required accessories. No additional payment will be allowed for machining pipe and/or accessories when the proper size is not ordered.

Neither the OWNER nor the ENGINEER can guarantee the location of the existing lines. The CONTRACTOR shall verify the location of all existing water mains and valves pertaining to the proposed improvements before excavation is started.

The necessary regulation or operation of thevalves on existing mains, to allow for the connections being made, shall be supervised by the ENGINEER. Before shutting down an existing water main or branch main for a proposed connection, prior approval fora specific time and time interval shall be obtained from the OWNER. At no time shall an existing main be shut without the OWNER's knowledge and permission.

Excavation to existing water mains shall be carefully made, care being exercised not to damage the pipe. The excavation shall not be of excessive size or depth beneath the pipe. The sides of the excavation shall be as nearly vertical as possible.

The CONTRACTOR shall be responsible for any damage to the existing system and any such damage shall be repaired to the satisfaction of the ENGINEER at the CONTRACTOR's expense.

The CONTRACTOR shall verify, by field inspection, the necessary sizes, lengths and types of fittings needed for each inter-connection. Typical connections are shown on the plans and any modifications or changes shall be subject to the approval of the ENGINEER. The exact length of the proposed water main needed for this work shall also be determined by field measurement as required. The probing required to locate existing mains is not a separate pay item.

6.10 Pipe Entering Structures

Cast iron, steel, or PVC pressure pipe, 4-inch diameter or larger, entering structure below original earth level, unsupported by original earth for a distance of more than six (6) feet, shall be supported by Class E concrete, where depth of such support does not exceed three (3) inches in accordance with the Standard Details. All other pressurepipe entering buildings or basins below original earth level, which have more than 3 feet span between wall and original earth and having a cover of more than 24 inches of earth, or under roadway, shall be supported as shown on Standard Detail drawings, in order to prevent breakage from settlement of backfill about the structure. Concrete and reinforcing steel for such supports are to be included in the unit price of work to which it is subsidiary, and not as extra concrete. Pipe entering structures shall have flexible joint within 16 inches of exterior of structure.

6.11 Ownership of Old Materials

6.11.1 Pipe

Unless otherwise indicated, all existing pipe that is to be abandoned that interferes with construction or is easily removed shall become the property of the CONTRACTOR. All pipe that is not easily removed or not required to be removed as a result of the new construction, shall be abandoned in place by the CONTRACTOR.

6.11.2 Pipe Line Fittings and Appurtenances

All pipeline fittings, valves, hydrants and other like appurtenances that are removed as a result of a new construction shall be removed by the CONTRACTOR but shall become the property of the OWNER. All such fittings and appurtenances shall be delivered to a point by the CONTRACTOR. Said point shall be on the OWNER's property and shall be designated by the ENGINEER.

6.11.3 Other Material

All other material or items that are to be removed, demolished, or abandoned as a part of this contract shall become the property of the CONTRACTOR and shall be disposed of by him.

PART 7 - MEASUREMENT AND PAYMENT

Payment for supplying, transporting and storing pipe, trenching, standard bedding, pipe installation, thrust-blocking, testing, backfilling, disinfection, seeding, crop damage, regular stream crossings, clean-up, tie-ins to other structures and other incidental items in this section shall be made on the basis of the unit price per lineal foot for the type and size of pipe installed. Payment will include all those items not specifically covered by another proposal. Pipe will be measured along the centerline of the pipe as installed with no deduction for valves and fittings.

Extra cast iron pipe fittings used with any type of pipe material where not shown on the plans and

required by the ENGINEER will be paid for on the basis of the unit price per pound. The basis of weights will be those shown by the Clow Corporation. Otherwise, fittings shall be include unit price for pipe.

Where thrust blocks are installed for extra fittings, they shall be paid for on the basis of the Class "E" concrete unit price bid and the thrust block dimensions shown in the Standard Details. All other thrust blocks shall be included in the unit price bid for pipe installed.

Rock excavation if extra payment allowed, will be paid for on a cubic yard basis in accordance with these specifications for rock which must be blasted for removal. The estimating procedure is described elsewhere in these specifications. If trenching is bid "Unclassified", payment for any and all rock excavation must be included in the CONTRACTOR's unit price bid for pipe installed.

Service lines where required between the center of main line and 4 feet from the near side of the meter setter will be paid for under the appropriate unit price for the type and size of service line required regardless of open cut road crossings or other crossings involved. Where service lines are bored or jacked with no casing or with casing a unit price bid is established.

End of Section

PART VIII - SECTION AB
TECHNICAL SPECIFICATIONS
INSTALLATION OF WATER LINE ACCESSORIES

PART 1 - GENERAL

The CONTRACTOR is to supply and install all valves, hydrants, blowoffs and other equipment at the locations shown on the plans in complete accordance with these specifications.

PART 2 - GATE VALVES (THREE INCHES AND LARGER)

2.01 Underground

All underground gate valves shall be iron body, bronze-mounted non-rising stem, tar-coated outside and suitable for working water pressures of 200 PSI. Valves shall be of standard manufacture and of the highest quality both of materials and workmanship and shall conform to the latest revision of AWWA Specification C-500. Valves shall be furnished with bell, flanged or mechanical joint end connections suitable for connection to the pipe with which they are to be used.

Underground valves shall be nut operated, unless otherwise shown on the plans. CONTRACTOR shall furnish three standard stem iron wrenches for turning nut operated valves. All underground valves which have nuts deeper than 30 inches below the top of valve box shall have extended stems with nuts located within 2 feet of valve box cap.

The valve maker is to supply the ENGINEER, through the bidder, within one week after award is made, complete catalogs or other material giving complete details and dimensions of valves and accessories. The ENGINEER's approval shall be received by manufacturer prior to shipment of materials.

2.02 Housed

Gate valves, 3" and larger, for fabricated pipe systems shall be double-disc, parallel seat-type, iron body, flanged, fully bronzemounted with O-ring seals, tar-coated outside and suitable for working water pressures of 150 PSI. Valves shall be of standard manufacture and of the highest quality both of materials and workmanship and shall conform to the latest revision of AWWA Specification C-500. Unless otherwise shown on the plans, all housed gate valves shall be O. S & Y. Unless otherwise shown on the plans, all housed valves and valves in basins shall be handwheel operated. Handwheels shall have not less than the following diameters:

Size Valves	Diameter
3"	8"
4"	10"
6"	12"
8"	14"
10"	16"
12"	18"
14"	20"
16"	22"
18"	24"

Valve stand handwheels and handwheels on extended stems, shall have the same minimum diameters as those shown for handwheels directly on valves. Extension stems for O. S & Y valves shall be non-rising, with clamp to valve handwheel and hollow shaft for rising stem of valve, with adjustable cast iron guides per each ten (10) feet of extensions stem length. All extension stems shall be connected with suitable coupling castings for connection to and removal from valves and stands. Nuts and bolts on all extensions stem connections shall be stainless steel.

PART 3 - GATE VALVES (2-1/2" AND SMALLER)

Gate valves 2-1/2" and smaller to be installed in fabricated pipe systems shall be bronze body with handwheel. They shall have inside I.P. threads and be suitable for a minimum water working pressure of 150 PSI. Valves shall have a solid wedge gate.

Underground 2-1/2" and smaller gate valves shall be iron body, bronze mounted, double-disc, parallel seat, having bronze faces and disc rings, with wedge mechanism simple and direct. They shall be similar in all other ways to the larger valves.

PART 4 - CHECK VALVES

4.01 Mechanical

Check valves shall be swing gate type. All check valves shall be standard iron body with straightway passage of full pipe area when swing gate is open. The valve shall be of the outside lever weight-operating type with an adjustable closure rate. The valve must be tight seating and must operate without hammer or shock. The seat ring or lining must be renewable. The valve should be bronze-mounted and may contain a rubber or neoprene lining in accordance with the manufacturer recommendations.

4.02 Electric

Electric solenoid operated check valves shall be installed where shown on the plans. The check valve shall be of cast iron body and cover with all bronze or non-corrosive trim construction. The valve shall be flanged, faced and drilled to conform to 125 lb. ASA Standards. The required valve sizes are shown on the plans. The valve shall be constructed with a non-corrosive lining and a bronze piston. The pilot shall be three-way type, allbronze. The design of the valve shall be such as to prevent hammer and shock. Speed of valve closing and opening shall be adjustable. The valve shall provide full pipe line flow when open. The valve shall provide for emergency closing on electrical outage. It shall also provide manual control for opening main valve. The valve shall be as manufactured by the Golden-Anderson Valve Co., Figure No. 173-D for globe body or Figure No. 174-D for angle body.

The sequence of operation for the electric check valve shall be as follows:

A. Valve openings:
   - Pump motor starter, three-way solenoid pilot, emergency solenoid pilot simultaneously energized by control circuit.

- ? Valve opens as pump reaches full speed.
- ? Limit switch contacts close interlocking with motor starter circuit.

B. Valve closing:
- ? Three-way solenoid pilot de-energized by control circuit.
- ? Pump motor circuit and emergency solenoid pilot remain energized.
- ? Valve starts to close, pump running.
- ? As piston nears its seat, limit switch contacts open, de-energizing pump circuit and emergency solenoid pilot.

In the event of a power failure, the motor starter circuit solenoid operated three-way pilot and the solenoid operated two-way pilot will become de-energized simultaneously. De-energizing both pilots simultaneously will cause the main valve piston to move rapidly to its seat. The speed of emergency closing is adjustable by regulating valve. The emergency closing speed is always at a faster rate than that of the normal closing speed.

The emergency sequence of operation would also pertain in the event of a motor under voltage, motor overload, or by depressing the emergency stop button if same is used.

PART 5 - AIR RELEASE VALVES

A valve designed to allow exhaust of small pockets of air from the water main while in use shall be installed where shown on the plans or where directed by the ENGINEER. The air release valve shall have a 3/4" iron pipe thread inlet, cast iron body construction, bronze trim, with all internal parts of stainless steel or bronze. The valve shall have an orifice size of 5/64" or greater. Valves shall be suitable for a working water pressure of 150 PSI. The air release valve shall be mounted on 3/4", Schedule 80, galvanized steel riser pipe. The riser pipe shall be connected to the water main by use of a service clamp and a corporation stop as shown in the standard details. The riser pipe shall be connected to the water main by use of a service clamp and a corporation stop as shown in the standard details. The riser shall also have a 3/4", bronze gate valve with a tee-handle, solid wedge type, inside I.P. threads, suitable for a 150 PSI working water pressure. Equipment shall be as manufactured by Mueller, Ford, Crane, Valve and Primer or approved equal.

PART 6 - VALVE BOXES

All valves (gate, air release, check, etc.) installed underground shall be installed in an approved valve box. Each gate valve shall be installed in a vertical position with a valve box. Valve boxes shall be of a cast iron, two or three-piece, slip-type consisting of a base, a center section and a top section with a covered marked "water". Where valve box is constructed in a paved area, the box shall be a screw type box. The entire assembly shall be adjustable for elevation and shall be set vertically and be properly adjusted sothat the cover will be in the same plane as the finished street surface (no more than ½" above ground in yards or pastures or 2" in unsodded areas.)The assembly must provide for the required cover over the pipe at the installation site and shall rest on concrete pads as shown in the Standard Details.

Air release valves will be installed in the same type of box as is used for meters. As described in these specifications the box may be cast iron, concrete, or concrete pipe. The box must allow for adequate cover over the pipe at the installation.

Check valves installed underground will be installed in the meter box type installation using concrete pipe and a meter box cover. The installation will utilize a suitable pipe diameter to accommodate the valve and accessories in accordance with the standard details. The box must allow for adequate cover over the pipe at the installation.

PART 7 - FLUSH HYDRANTS

Flush hydrants shall be installed in accordance with the details and the specifications at locations shown on the plans or as directed by the ENGINEER. In general, flush hydrants are located at the end of mains for the purpose of clearing the main of sediment, obstacles or impure water. The CONTRACTOR should refer to the Standard Details for flush hydrant installation.

PART 8 - HYDRANTS

All fire hydrants shall be of the compression type, with cast iron body, fully bronze-mounted, suitable for working pressure of 150 pounds per square inch and shall be in accordance with the latest specifications of the AWWA and the State Inspection Bureau. Hydrants shall have two 2-1/2" hose connections and a 4-1/2" steamer connection with National Standard threads.

Hydrants shall be constructed in a manner permitting withdrawal of internal working parts without disturbing barrel or casing. Hydrants shall have dry-top design and non-rising stem and be frost-proof. Valve, when shut, shall be reasonably tight if upper portion of barrel should be broken off. Waterway of hydrants shall be not less than 6" throughout and valve opening shall be at least 5 1/4" in diameter. There shall be no chattering under any conditions of operation. Each hydrant shall be tested to a hydrostatic pressure of 300 PSI with valve in both opened and closed position. The direction of opening shall be cast in the head of the hydrant. Hydrants shall be painted with one coat of red lead and two finishing coats of Koppers Ponkote Enamel for hydrants or approved equal, color to be selected by ENGINEER.

Hydrants shall have mechanical connection directly to lines. Valves supplied with hydrants shall have mechanical joints and may be connected directly to hydrant or may be on hydrant service as shown in the Standard Details. One operating and spanner wrench shall be furnished with each hydrant with a maximum of three provided on any one project. Extensions for extra depth shall be included in the cost of hydrants. One disassembly wrench shall be supplied for the project. Concrete thrust blocking, hydrant bedding and main line tee as shown in the Standard Details are to be included in the unit price for hydrant installation.

Hydrants shall be set so that outlets are not less than 15 inches above the ground, plumb and at a distance of 18 inches from the outside of the curb. If no curb exists, hydrant is to be set four feet from the property line or as shown on the plans.

PART 9 - SPECIAL PURPOSE VALVES

Pressure reducing valves sustaining valves, surge relief valves and other automatic, special-purpose valves which are to be installed as a part of the water line contract will conform with the details shown on the plans. The valves will be installed in water proof manholes or other structures as shown in the Standard Details and as described in the "Miscellaneous Structures" section of these

specifications. These valves are to be hydraulically operated and of the self-contained differential-piston type. The valve body shall be cast iron of the globe or angle type. The valve is to be bronze fitted with renewable lining and seating components. The valve shall be pilot controlled and diaphragm operated. The valve shall be air and water cushioned to prevent hammer or shock. Bronze castings shall conform to ASTM B-62 and the cast iron body and lid shall conform to ASTM A-126, Class B.

Individual meter pressure reducing valves will be installed for individual services only where shown on the plans. These valves shall be a Mueller, Model No. H-9000l, 3/4" Regulator No. 3 or approved equal, complete with a bronze strainer. Each regulator is to have an adjustable pressure range of 60-125 PSI and is to be set at 80 PSI or as shown on the plans or directed by the ENGINEER. These regulators shall be installed on the inlet side of the meter. The CONTRACTOR should note that some prefabricated meter boxes do not allow space for these regulators and a box of sufficient size must be used where they are required.

PART 10 - METERS AND SERVICES

10.1 Service Lines Not Crossing A Road

All service lines shall be 3/4" Type K Copper Tubing, PVC pipe, or polyethylene plastic pipe as specified in Section IX, using a corporation stop in accordance with the Standard Details.

10.2 Service Lines Crossing a County Road or City Street

Same as above except that in general all pipe may be jacked beneath certain paved or blacktopped city streets or county roads, unless solid rock prevents using this method in which case, the open trench method will be used. The open trench method generally will be used on all unpaved city streets, county roads and private driveways. In general, blacktopped private driveways shall also be jacked under. In all cases where lines are under traffic, a minimum cover of thirty-six (36) inches shall be provided. All backfill shall be compacted by air tampers in layers no greater than 6-inch depth. Specific instructions as to the type of crossing to be installed will be shown on the plans.

10.3 Service Lines Crossing a State Highway

Services shall be jacked or pushed under paving. Pipe under 2" shall be Type K Copper or PVC pipe. If solid rock is encountered, trench will be open-cut, pipe placed and back-filled all in accordance with current requirements of the State Highway Department or the crossing will be relocated to permit boring or jacking. Specific details will be shown on the plans. Where required on the plans or by the ENGINEER, service pipe shall be encased under highways.

Schedule 40 steel pipe shall be used as casing pipe unless otherwise indicated by the plans. Polyethylene pipe will normally be encased. Where permitted rigid PVC pipe will not be encased but soft connections with polyethylene pipe will be required on either side of the boring length.

10.4 Meters

It is the intent of these specifications to obtain water meters which are cold water rotating disc type with hermetically-sealed and magnetically-driven registers. Meters shall be first line quality of the manufacturer. The latest specifications of the AWWA shall be complied with, except in the cases of conflict with these specifications. Any type or make of meter offered must have been manufactured and marketed in the U.S. for at least five (5) years and evidence will be required to indicate the name of places where meters have established satisfactory service records of five (5) years or more. (Check Section IX for specific owner requirements.)

The main case shall be high grade waterworks bronze, with hinged, single lid cover and raised characters cast on them to indicate the direction of flow. Each meter must have a manufacturer's serial number stamped on the lid. They must have a working pressure of 150 PSI. Standard frost bottom model meters shall be furnished. Non-ferrous strainers shall be provided which fit tightly against the main case.

The measuring chamber shall be bronze alloy composition and stainless steel or monel trimmed. The chamber shall be of the two piece design, equipped with a disc made of hard rubber and as near to the specific gravity of water as possible.

The register shall be straight reading U.S. Gallon type. The register unit shall be completely encased and hermetically sealed and driven by permanent magnets. Registers shall be guaranteed by the manufacturer for a period of at least 15 years.

All meters shall measure water within 2% of aseparately measured volume. Ten percent of all the meters on the project will be tested after delivery in the presence of the ENGINEER or his designated representative. Testing shall be done by means of test bench and calibrated test tanks as approved by the ENGINEER. If any meter fails this test, the ENGINEER will require that all meters will be tested. The cost of any and all such testing will be at the CONTRACTOR's expense.

Meters shall include box and cover, meter, coppersetter (including cut-off valve), four feet of pipe and corporation stop plus two foot of pipe and plug or cap on the customer's side of meter. (This latter item is to prevent the customer or his plumber from disarranging or loosening the meter after the CONTRACTOR has already set the meter in its proper position). Where the main line is in the highway right-of-way, meters shall be set as close to the right-of-way fence as practicable but no meter on the same side of the roadas the main line shall be set with more than 6 feet of service line unless directed by the ENGINEER or shown on the plans. The Standard Details show the required meter setting.

Meters for regular service shall be 5/8" x 3/4" unless otherwise shown onthe plans. Large service connections shall havea disc meter similar and equal to the 5/8" x 3/4" meters and shall include the tap and connection, a gate valve or corporation stop the same size as the line pipe, sufficient unions and a meter box of sufficient size to house the meter as shown in the Standard Details. Meters 2 inches and larger in size shall be compound type meters.

Meter boxes for 5/8" x 3/4" meters shall be cast iron, concrete, concrete pipe, or plastic as specified in Section IX. All meter boxes shall be a minimum of 24 inches deep and 18 inches I.D.. Cast iron meter box cover for use with 18 inch I.D. plastic, concrete or vitrified clay pipe or cylinder boxes shall be stamped with thewords "WATER METER," and shall be Ford No. C32, or equal. Where individual pressure reducing valves are required, the meter box must be of adequate size to accommodate the meter setting, shut-off valve and pressure regulator as shown in the Standard Details.

Meters shall be set in a workmanlike manner with backfill neatly compacted in place. In yards, pastures and other grassed areas, top of meter box may be placed no higher than ½ inch above original ground and no lower than flush with original ground. Boxes in sidewalks or other concrete areas shall be flush with surface. In areas which have not been sodded, top of box shall be 2 inches above grade. The service line must meet the same cover requirements as the main line as described in these specifications except thatthe service line may raised within two (2) feet of each side of the meter installation to a depth which accommodates installation at the bottom of the meter box in accordance with the Standard Details. As shown in the Standard Details, after 2 feet from box service pipe must return to 30 inches (36 inches in traffic or 24 inches in rock). If meter box area is subject to traffic, a deeper box will be required to maintain 36 inches of cover over the service pipe.

PART 11 - TRUCK LOADING STATIONS

Truck loading stations for filling water truckswill be constructed as shown in the Standard Details at the location shown on the plans or as directed by the ENGINEER.

PART 12 - MEASUREMENT AND PAYMENT

Payment for gate valves, check valves and other special valves installed underground shall include all work necessary for a complete installation and shall include all valve stem boxes or other valve boxes and box covers. Payment will be made at the unit price bid for the type and size of valve installation. Often valves are included in the fabricated piping of a structure and separate payment will not be madeunless provided in the Bid Form. Costs of those is to be included in the bid for work to which they are subsidiary.

Fire hydrants include the cost of a complete installation as shown on the plans. The cost of the main line tee will be included in the unit price bid for these items. The line between tee and hydrant gate valve shall be paid for at unit price for line work.

Meters and boxes include all items for a complete installation. These are meter, box and covers, setter, shut-off valve, six (6) feet of service line, corporation stop and the plug and adapter at the end of customers service stub. Additional service line will be paid for under a separate item.

Flush hydrants and air release valves will be paid for under their respective bid price. Excess pipe will be paid under bid price for pipe installed.

Truck loading stations, where required by the plans, shall consist of a complete installation as shown in the Standard Details and will include gate valve, meter, fire hose section, support pipe, fire hydrant, cast iron tee, connecting pipe and any crushed stone or other material incidental to the installation or construction of an approach roadway to the station. The bid price for "truck loading station" shall cover all of this work and material.

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PART VIII - SECTION AC
TECHNICAL SPECIFICATIONS
SPECIAL ITEMS OF CONSTRUCTION IN WATER LINE INSTALLATION

PART 1 - General

These specifications govern special crossings, installations and construction procedures required to deal with unusual construction items or special requirements of governing agencies.

PART 2 - State Highway Crossings

In all cases, these crossings will be made in compliance with the requirements of the State Highway Department. Such requirements will normally be described by the appropriate District Highway Office. In general, unless otherwise shown on the plans or otherwise directed by the ENGINEER, the crossing of all State Highways shall be accomplished by boring under the roadway. In addition, the crossing of service lines 1-1/2 inches and greater under rigid and flexible surfaced paved roads shall be accomplished by boring and jacking a casing pipe under said roadway. In certain cases, as shown on the plans, service lines of all sizes will require casing pipe installed with the crossing.

In general, the crossing of city streets and certain county roads with main lines and the crossing of unpaved streets with main lines or service lines shall be accomplished by open trenching.

2.01 Open Trench Crossings

The trench shall be excavated to a minimum width that will allow the pipe installation. The trench walls shall be kept as nearly vertical as possible. The minimum specified cover above the pipe shall be maintained. The Standard Details section of the plans shows the requirements for open trench crossings.

The backfill in the trench under any roads, driveways, or parking areas where the open trench method is used shall be of the type shown in the Standard Details and shall be deposited and compacted in uniform layers not to exceed the depth shown in the Standard Details.

The surface of the road, driveway, or parking areas shall be replaced with the same type of material as specified under pavement replacement.

2.02 Boring and Jacking

The work is herein defined as the operations in which both the boring by auger and the jacking of the casing pipe are done mechanically and in which the diameter of the casing pipe is too small to permit hand working at the heading of the casing pipe. Two basic methods are; (1) pushing the casing pipe into the fill or earth simultaneously as the boring auger drills out the ground; and (2) drilling the hole through the fill or earth and pushing the casing or carrying pipe into the hole after the drill auger has completed the bore.

A suitable approach trench shall be opened adjacent to the slope of the embankment, or adjacent

to point of bored and jacked section as shown on the plans. The approach trench shall be long enough to accommodate the selected working room. Guide timbers or rails for keeping the casing pipe on line and grade shall be accurately set and maintained in the bottom of the approach trench and with heavy timber back-stop supports installed at the rear of the approach trench to adequately take thrust of the jacks without any movement or distortion. It is paramount to the securing of acceptable tolerance limits of workmanship in the boring and jacking operation that extreme care be taken in the setting of all guides, rails and jacks to the end that the casing pipe in final position be within the limits of acceptability for the placing and laying of the carrier pipe. The minimum cover of 36 inches under the roadway must be maintained. Additional depth may be required as shown on the plans.

In general, the diameter, thickness, style, joints and materials selected for casing pipe shall be as shown on the plans and shall be considered as "minimum" requirements, all subject to prior approval of the ENGINEER. In all cases, the approval for construction by agreement with the private company and/or construction permit issued by the State, County, or Municipal agency will be required before construction starts.

Steel casing pipe for road and railroad crossings using the boring and jacking method shall be steel, plain end, uncoated and unwrapped, and shall be furnished in at least 18-foot lengths. Steel pipe shall meet the requirements of ASTM Specification A-120. Pipes up to and including 4 inches in diameter shall be Schedule 40. Pipe larger than 4 inches shall have a wall thickness equal or greater than 0.250 inches. The diameter of all casing pipes shall be as noted in Standard Details section of the plans.

The steel casing pipe shall be bored and/or jacked in place at the locations as shown on the plans or as directed by the ENGINEER. All joints between lengths shall be solidly welded with a smooth nonobstructive joint inside. The casing pipe may be extended beyond the boring limits by open trenching as shown in the Standard Details. This would apply when the casing is required from right-of-way or ditch line to ditch line. Open trenching at jacked or bored locations will be allowed no closer than 3 feet from edge of pavement. Sand backfilling of the annular space between the carrier pipe and the casing pipe shall be mechanically placed by suitable method when required and where shown on the plans. After the water main has been installed inside the casing pipe, inspected and tested, both ends of the casing pipe shall be sealed completely with concrete or other material as shown in the plans in a manner acceptable to the ENGINEER.

Where road crossings are made using plastic pipe or copper the location of joints under the roadway should be avoided by using lengths of adequate dimension for the crossing. This principle also applies to other types of pipe where sufficiently long lengths are available.

PART 3 - RAILROAD CROSSINGS

At all railroad crossings, cover pipe (casing) for water lines (carrier pipe) shall be jacked or pushed beneath tracks and the carrier pipe jointed and pushed through the cover pipe. Detailed drawings of railroad crossings including the length of casing and depth below track are shown in the plans. CONTRACTOR shall obtain and pay for services of a representative of the railroad to direct the CONTRACTOR's operations while on the railroad property when required by the railroad.

PART 4 - CREEK CROSSINGS

4.01 Special Creek Crossing

Where required on the plans or instructed by the ENGINEER, the CONTRACTOR shall construct a special creek crossing either Type A or B as shown in the Standard Details. Where the crossing is made in a creek which has a solid rock floor, the trench shall be cut in rock of such depth as to provide a cover all around the pipe of encasement class concrete as shown in the Standard Details. Concrete shall be thoroughly puddled in place. Where the crossing is in loose rock or unstable earth where bed movement is expected, the special crossing shall be the concrete anchor type shown in the Standard Details. Two short sections of pipe shall be used within eight (8) feet of each side of the stream crossing. Crossings shall be scheduled for construction in times of low flow, if practicable, otherwise cofferdams of sand bags or clay shall be used to divert the stream flow while crossing is made. For sharp vertical curves, short lengths of pipe shall be used as much as possible to avoid use of rigid fittings. Concrete shall not be placed under water and CONTRACTOR shall provide suitable pumps to keep water out of trench excavation during stream crossing construction. Mud and water shall not be allowed to enter the carrier pipe installation. Waterproof plugs shall be provided, if necessary, to prevent water entry. A typical stream crossing section is shown in the Standard Details.

4.02 Normal Earthen Creek Crossing

Where the stream crossing is made in earth or other beds which are stable (no casing or anchorage required), then the pipe will be laid in a narrow trench at the depth specified in the Standard Details to maintain the required cover between pipe and stream bed. Initial backfill will be mechanically compacted. Trench backfill in any stream crossing area from one (1) foot above the top of the pipe shall consist of trench excavated rock, if available. No extra payment will be made above normal construction for this type of creek crossing.

4.03 Materials

The type of water line installed at the Crossing will be specified in the plans. Concrete encasement locations and limits for stream crossings are shown on the plans for information only. The actual limits in locations where concrete encasement shall be required shall be determined in the field by the ENGINEER. The CONTRACTOR shall notify the ENGINEER of any rock excavation encountered in the area of the stream, ditch, or other area where erosion could jeopardize the pipe cover. Upon such notification, the ENGINEER shall instruct the CONTRACTOR as to whether concrete encasement should be used and the limits therefore. Failure by the CONTRACTOR to notify the ENGINEER in the above areas may result in re-excavation for placement of concrete encasement.

PART 5 - RIVER OR LAKE CROSSINGS

Crossings in rivers or lakes where the pipe cannot be laid in a trench shall normally be made with cast iron pipe having ball and socket joints. Details for any required installations of this type including pipe required, number, size and location of anchors, and installation technique are shown

in the plans.

PART 6 - BRIDGE CROSSINGS

Wherever possible bridges will not be utilized for stream crossings. However, where it is necessary for the water line to be attached to bridges, the pipe shall be securely fastened to bridge stringers or beams using supports as dimensioned and located in the plans. The carrier pipe shall be insulated with Vermiculite or other approved material to prevent freezing. Expansion joints to allow for movement of the bridge will be required as shown on the plans.

PART 7 - PIPE BEDDING

7.01 Standard Pipe Bedding

Whenever the "undercutting method" is used to bed pipe lines, the CONTRACTOR shall furnish the standard pipe bedding for the continuous support of pipe. The standard pipe bedding shall be evenly spread fine granular earth material or shall be bank run sand and gravel or dense graded aggregate and shall be placed as shown on the drawings and Standard Details in accordance with the following pipe materials and under normal stable earth trenching conditions:

Pipe	Bedding
PVC (4 inches and smaller), copper, galvanized	earth trench bottom (leveled)
PVC (above 4 inches)	compacted earth backfill
C.I. and D.I. (less than 4 inches)	compacted earth backfill
C.I. and D.I. (4 inches diameter and above)	compacted crushed stone backfill

No substitutions for standard pipe bedding will be allowed unless approved in writing by the ENGINEER. Standard pipe bedding is not a separate pay item and is to be included in the unit price bid per foot of pipe.

7.02 Special Pipe Foundation

When ordered by the ENGINEER, yielding and mucking material in subgrade shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. In such locations, a special pipe foundation shall be constructed utilizing encasement class concrete in accordance with the Standard Details. This special pipe foundation is a separate pay item. The special foundation or other special laying conditions may be required because of soil conditions, depth, traffic or other reasons. These will be extra pay items.

7.30 Standard Concrete Encasement

Concrete encasement of pipe shall be placed as directed by the ENGINEER in accordance with the Standard Details. Concrete pipe shall be mixed sufficiently wet to permit it to flow under the pipe and to form a continuous bed. In tamping concrete, care should be taken not to disturb the grade or line of the pipe or injure the joints. Concrete placed outside the specified limits or without

authorization from the ENGINEER will not be subject to payment.

Concrete for encasement is described elsewhere in these specifications. Standard concrete encasement is a separate pay item.

PART 8 - WATER LINE AND SEWER LINE SEPARATION

8.01 General

Wherever sewer lines and water lines cross, or are adjacent to, each other, special precautions shall be taken.

8.02 Parallel Water and Sewer Lines

Water lines must, if possible, be locateda minimum lateral distance of 10 feet from any existing or future sewer lines measured from outside diameters. Where water lines and sewer lines must be placed in the same trench, the water line must be located on a shelf, 2 feet above and 2 feet to the side of the sewer line. Whenever this condition cannot be met, and upon direction from the ENGINEER, the water line shall be uncovered and encased with concrete per the standard encasement detail.

8.03 Crossing Water and Sewer Lines

Wherever sewer lines and water lines cross, it is desirable, if practical, that the sewer line be at least 24 inches below the water line.

Where it is not practical to provide such a separation, care shall be taken to ascertain that the existing water line or existing sewer line is in good sound condition and that no evidence of joint leakage is known in that vicinity. If any such evidence does exist, the existing line shall be exposed by the CONTRACTOR at least 10 feet each side of the new pipe crossing, carefully examined and any defects positively corrected. The OWNER will arrange for examining and correcting any defects in the existing lines, but the CONTRACTOR shall cooperate in every way possible.

When the water line must be below or less than 2 feet above the sewer line, the CONTRACTOR shall encase the water line 5 feet in each direction from the crossing as directed by the ENGINEER. This encasement should only be accomplished when directed by the ENGINEER and shall be accomplished in accordance with the detailsshown on the drawings. The encasement is a separate pay item.

PART 9 - NOTIFICATION OF UTILITY COMPANIES

The ENGINEER assumes no responsibility for the exact location of underground utilities and the CONTRACTOR shall locate such utilities to his own satisfaction. The CONTRACTOR shall notify the appropriate utility company for location of said utility lines in the field before excavation begins.

The CONTRACTOR shall be solely liable for any damages to any utilities or private property during construction and for arranging for coordination with utility representatives.

PART 10 - BLASTING

When rock excavation is encountered, the CONTRACTOR shall notify the ENGINEER before any blasting is done. Whenever blasting is necessary, ample precautions shall be taken to prevent accidents to life and property from flying rock and debris by covering the trench or excavation with heavy timbers or mats, or by using other suitable means. Any damages caused by blasting done under this contract, shall be repaired by the CONTRACTOR at his expenses and to the satisfaction of the ENGINEER.

All blasting operations shall be conducted in strict accordance with the existing laws, ordinances and/or regulations relatives to State and/or local rock blasting and storage and use of explosives and Section 9 of the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, Inc. Any rockexcavation within 15 feet of water or gas mains of any size shall be done with very light charges of explosives and the utmost care shall be used to avoid disturbing the main.

Where there are no local ordinances governing blasting and the storage of explosives, all blasting supplies shall be stored in a manner approved by the rules and regulations of the Federal and State Occupational Safety and Health Regulations.

The CONTRACTOR shall maintain and keep in full force and effect blasting insurance to protect and indemnify the OWNER and/or his agents or representatives, including the ENGINEER and his representatives, from claims and damages and shall defend all suits at law.

PART 11 - DISINFECTION OF WATER LINES

All water piping shall be thoroughly disinfected before being placed in service, by the use of chlorine or chlorine compounds in such amounts as to produce an initial concentration of at least 50 ppm and a residual of at least 25 ppm at the end of 24 hours, followed by thorough flushing. If for some reason, the initial disinfection fails to result in a 25 ppm residual, or the initial concentration does not achieve at least 50 ppm, the process shall be repeated until said 25 ppm residual is obtained after the 24 hour period. All disinfection shall be accomplished in a manner satisfactory to the ENGINEER and the State Department of Health.

All valves in the lines including check and altitude valves will be opened several times during the sterilization process.

The CONTRACTOR shall be responsible for sterilization of both water lines and water storage tanks. After sterilization, the tanks shall be drained and cleaned of all debris prior to putting the unit back in service.

PART 12 - SEEDING AND SODDING

Upon completion of the installation of the work, the CONTRACTOR shall remove all debris and surplus construction materials resulting from the work. The CONTRACTOR shall fine grade all the disturbed surfaces around the area of the work in a uniform and neat manner leaving the construction area in a condition as near as possible to the original ground line or to the lines as directed by the ENGINEER. All graded areas shall be left smooth and thickly sown with a mixture of grasses. The mixture of grasses shall consist of one-third (1/3) Rye grass, one-third (1/3) Kentucky Fescue and one-third (1/3) Kentucky Bluegrass by weight, and shall be applied to the graded areas at a rate of not less than 1 pound of seed perone thousand square feet of area. When the final grading has been completed, the entire graded area to be seeded shall be fertilized with 12-12-12 fertilizer, applied at the rate of 6 pounds per one thousand square feet ofarea. After the seed and fertilizer have both been applied, the CONTRACTOR shall then lightly cover the seed by use of a drag or other approved device. The seeded area shall then be covered with straw to a depth of approximately one inch.

Where existing lawns have been disturbed, the existing sod will be removed and stored and replaced to its original position once the work is in place. If the CONTRACTOR damages or destroys the original sod, it shall be replaced with a sod having at least 60% good quality Kentucky Bluegrass, strongly rooted and free of pernicious weeds and shall be so laid that no voids occur between strips. When replacing sod, it shall be tamped or rolled immediately after it is laid and the finished surface shall be true to grade, even and equally firm at all points. Well screened top soil shall be lightly sprinkled over the sodded areas and shall be thoroughly watered. Sod damaged by the CONTRACTOR shall be replaced with new sod by the CONTRACTOR at no cost to the OWNER.

The fine grading, seeding, sodding and clean-up shall be considered as incidental expense and shall not be separate pay items.

Meadows and hay fields will require replacement in kind unless the CONTRACTOR secures a release from the property owner agreeing to no replacement or alternate replacement.

PART 13 - PAVEMENT AND OTHER STRUCTURE REPLACEMENT

The CONTRACTOR shall replace all pavement cut or disturbed, with pavement similar in all respects to existing pavement in accordance with the Standard Details and at those locations approved by the ENGINEER. Every effort shall be made to avoid cutting the pavement. In restoring pavement, new pavement is required, except that granite paving blocks, sound brick or sound asphalt paving blocks may be reused. No permanent paving shall be placed within thirty (30) days after the backfilling has been completed. All concrete and asphalt paving materials shall be in conformance with the Standard Details shown in the plans.

13.1 Classification of Pavements

1. Concrete Pavement Replacement - This pavement replacement shall be Portland cement concrete construction in accordance with the requirements shown in the Standard Details. It shall include all pavement replacement on concrete surfaced roads, concrete driveways,

concrete sidewalks and concrete parking areas, both public and private.

2. Heavy-Duty Bituminous Pavement Replacement - This type of asphalt pavement replacement shall be bituminous concrete surface over concrete base in accordance with the Standard Details. This type of pavement replacement shall be used on all heavily trafficked roads having an existing pavement greater than 2", whether public or private, or in other locations as directed by the ENGINEER.
3. Light-Duty Bituminous Pavement Replacement - This type of pavement replacement shall be bituminous concrete constructed in accordance with the Standard Details. This item shall include all light-duty bituminous concrete roadways, bituminous driveways and bituminous parking lots, both public and private.

4. Gravel Surface Replacement - This type of surface replacement shall include all graveled roadways, driveways, parking areas, or other gravel surfaced areas, both private and public. This type of surfacing may also be required as a base course for other pavement replacement.

13.2 Materials

The crushed stone backfill as noted on the drawings shall be dense graded aggregate (Class A Aggregate, Grading D) per Kentucky Department of Highways Specifications. The CONTRACTOR shall be responsible for the maintenance of the aggregate and the surface of the trenches until the pavement replacement is completed.

Portland cement concrete shall be as described in Section D of these specifications for Class "A" concrete. A set of cylinders shall be made and tested for each 25 yards of concrete placed, or fraction thereof, to supply representative sampling and testing of the concrete, upon the direction of the ENGINEER. The CONTRACTOR shall produce a broomed, or burlaped, uniformly smooth and nonskid surface, consistent with the existing pavement.

Bituminous materials and mixes shall be consistent with the recommended practice of the Asphalt Institute and it shall conform to the requirements of the Kentucky Department of Highways for prime coat and Class 1 bituminous concrete. The bituminous concrete shall consist of a binder or base course and a surface course.

13.3 Installation of Pavement Replacement

The CONTRACTOR shall cut back the surfacing adjacent to the trench for 12 inches on both sides of the trench and shall cut down the dense graded aggregate he has placed to a depth required for either type of pavement replacement. The resulting surface shall be rolled to yield a smooth, dense surface and a uniform depth.

The concrete shall be placed in accordance with standard practice, with the welded wire mesh if required in proper position and thoroughly vibrated into place. The CONTRACTOR shall produce a surface consistent with the existing pavement. The CONTRACTOR shall apply a liquid curing component, sprayed on the surface of the concrete, and shall provide adequate protection to the

pavement until it has set.

For bituminous concrete, the CONTRACTOR shall clean and broom the prepared surface, then apply the prime coat at the rate of 0.20 to 0.25 gallons per square yard,with a pressure distributor or approved pressure spray method. When the prime coat has become tacky but not dry and hard, the bituminous binder course, or base course, whichever applies, shall be placed and compacted. The CONTRACTOR shall then apply the surface course. It is recommended, but not required, that the base course remain in place for approximately one week before placing the surface course. The finished course shallbe compacted and the completed surface shall match the grades and slopes of the adjacent exiting surfacing and shall be free of offsets, depressions, raised places and all other irregular surfaces.

l3.4 Seasonal and Weather Limitations for Pavement Replacement

In the event the progress and scheduling of the work is such that the bituminous pavement replacement would occur in the winter months, during adverse cold weather and/or during such times the asphalt plants are not in operation, then the final pavement replacement shall be postponed until favorable weather occurs in the spring and the asphalt plants resume normal operations. No bituminous concrete shall be laid when the temperature is below 40° F except by written permission of the ENGINEER.

Concrete pavement shall not be placed when the temperature is such that the pavement placed will freeze before it has had adequate time to set and shall be placed in conformance with the temperature conditions specified in Section D of these specifications.

The CONTRACTOR shall be responsible for replacement of pavement which he has placed which has been damaged by cold weather or freezing without additional compensation.

In the meantime, the CONTRACTOR will be required to maintain the temporary surfacing until the permanent pavement is placed. Such labor, materials and equipment as is required for temporary maintenance of the streets, roadways and driveways shall be provided at the CONTRACTOR's expense and is <u>not</u> a pay item. The CONTRACTOR will be required to use a cold mix asphaltic concrete as a temporary surface for trenches under heavy traffic use.

13.5 Guarantee

The one year guarantee as specified in the contract documents is also applicable to trench settlement and pavement replacement.

PART 14 - SIDEWALK REPLACEMENT

Sidewalks will be replaced if damaged by the CONTRACTOR in any way. Payment will be made for those sidewalks necessarily damaged by the line installation in accordance with the Standard Details. No sidewalks are to be replaced over a backfilled trench for at least 30 days after filling. Sidewalks damaged otherwise are to be replaced immediately at the CONTRACTOR's expense.

Materials and dimensions are to be at least equal to existing walk and are to conform with the

Standard Details.

PART 15 - FINAL CLEAN-UP

The work shall not be considered as complete until the right-of-way of roads and all private property has been cleared of all rubbish and loose stone, and also all equipment, excess material and temporary structures. All property, both private and public, which has been damaged in the course of the work, shall be restored in a manner fully acceptable to the property owner. Ditches shall not be obstructed from draining nor will any rubbish or other material be left to obstruct culverts, bridges or other structures.

PART 16 - MEASUREMENT AND PAYMENT

Payment for crushed stone, black top and concrete pavement replacement will not be based on the quantities purchased by the CONTRACTOR. Payment for crushed stone will be made on the basis of that necessary to fill the trench to the dimensions shown in the Standard Details. Crushed stone sub-grade under paving shall be included in paving price and not paid for separately. Payment for blacktop or concrete will be based on the quantities in place as shown by the limiting dimensions in the Standard Details. Any additional cost estimated by the CONTRACTOR must be included in the cost of pipe in place.

Payment for special creek crossings will be at the unit price bid per lineal foot for that item and shall include encasement pipe, crushed stone, concrete, solid rock excavation and all other work necessary for a satisfactory installation. The carrier pipe installed in the casing shall be paid separately under the unit price bid for pipe installed.

Additional costs for normal earth creek crossings shall be included in the unit price bid for pipe installation and no special payment will be made for these crossings.

Casing pipe unit price bids shall include the cost of boring or jacking under railroads and highways and shall include the cost of steel casing pipe. Carrier pipe will be paid for under the unit price bid for installing lines as described in Article 2.2 of this section. PVC shall be equal to steel for casing county crossings.

Where service pipe with no casing is pushed or bored under Federal, State, or County highways or other roads as required by the plans or directed by the ENGINEER, the cost will be paid under the bid for the appropriate type of service pipe pushed and bored. This payment will be based on the required pushing or boring length and will include all related work. Where rigid PVC service pipe is installed in this manner, the payment will include connection to polyethylene service pipe at each end of the rigid section. Length of pipe considered for payment under this bid will not be included in other pipeline quantities.

Unit price bids for special pipe bedding items are to include the cost per lineal foot of installing concrete or other special pipe bedding where required by the ENGINEER. This to be an additional cost to be added to the basic furnishing and laying unit price bid for water lines.

Sidewalk crossings when included as a bid item shall include the extra cost of boring under or the removal and disposal of existing concrete sidewalk and replacement with new construction. Unit price bid is on the square yards of sidewalk replaced basis. Width for payment for a standard trench crossing is shown in the Standard Details.

If CONTRACTOR elects to bore or jack pipe under sidewalk, extra cost shall be paid for on the basis of square yards of sidewalk which would normally have been removed by the crossing. Cost of pipe installation should not be included in sidewalk crossing bid. When sidewalk crossings or replacement are not included as a bid item their costs shall be considered subsidiary to the bid for pipe installation.

Extra pay items may be established for crushed stone bedding when it is required as an extra. The price will be on a lineal foot basis.

Where required by the Special Provisions or the Bid Proposal, the cost of pavement replacement, boring, crossings of all types and other incidental construction shall be included in the unit price bid for pipe line installation and shall comprise total compensation for all such work.

End of Section

SECTION 02731 - GRAVITY SEWERS

PART 1. GENERAL

1.1 Work Included

The Contractor shall furnish all labor, materials and equipment required to install the gravity sewer system as shown on the plans and as specified herein.

1.2 Submittals

Submit manufacturer's specifications for materials and installation instructions. Include test reports showing compliance with project requirements where test method is indicated.

1.3 Delivery and Storage

Notify the Engineer when pipe will be received on the job so that proper arrangements may be made for inspecting the unloading operations and examining the pipe materials.

PART 2. PRODUCTS

2.1 Polyvinyl Chloride Sanitary Sewer Pipe

Pipe and fittings shall meet or exceed all of the requirements of ASTM D-3034. All pipe shall be marked with the manufacturer's name, production lot number, ASTM designation, and nominal diameter.

All fittings and accessories shall be the product of the same company as the pipe manufacturer. All in-line fittings shall be integral wye-tee combination with rubber ring joint. No saddle type fittings will be allowed.

2.2 Ductile Iron Sanitary Sewer Pipe

Pipe and fittings shall meet or exceed all of the requirements of ASTM A-746. All pipe shall be marked with the manufacturer's name, production lot number, ASTM designation, and nominal diameter.

All fittings and accessories shall be the product of the same company as the pipe manufacturer. All in-line fittings shall be integral wye-tee combination with rubber ring joint. No saddle type fittings will be allowed.

2.3 Manholes

A. Manhole Sections. Manholes shall consist of precast reinforced concrete sections, a conical or flat slab top section and a base section conforming with the manhole details shown on the drawings.

Manhole sections shall be manufactured, tested and marked in accordance with the latest provisions of ASTM C-478.

The minimum compressive strength of the concrete for all sections shall be 4,000 psi.

Joints of manhole sections shall be of the tongue and groove type with performed plastic gasket meeting the requirements of Federal Specification SS-S-00210, "Sealing Compound, Preformed Plastic for Pipe Joints" Type 1, Rope Form. The sealing compound shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents, irritating fumes, or obnoxious odors. The compound shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength. It shall be supplied in extruded

rope-form of suitable cross-section and of such sizes as to seal the joint space when the manhole sections are set. Joint shall be double-sealed (inside and outside). Con-Seal is an acceptable sealant.

Each section of the precast manhole shall have not more than two holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with rubber stoppers or mortar after installation.

B. Manhole Castings. Manhole rims, toe pockets and covers shall be cast iron conforming to ASTM A-48, Class 30 or 35 for gray iron castings. All castings shall be made accurately to the required dimensions, sound, smooth, clean and free from blisters and other defects.

Manhole frames and covers shall be heavy duty, with machined bearing surfaces. The words "Sanitary Sewer" shall be cast on the top in letters 2 inches high. They shall be as manufactured by JRHoe MC-350, or equal.

C. Manhole Frame Seals. Manhole frame seals shall consist of a flexible internal rubber sleeve and extension and stainless steel compression bands, all conforming to the following requirements:

1. Rubber Sleeve and Extension – The flexible rubber sleeve, extensions, and wedge strips shall be extruded or molded from a high grade rubber compound conforming to the applicable requirements of ASTM C-923, with a minimum 1,500 psi tensile strength, maximum 18% compression set and a hardness (durometer) of 48.5”.

2. The sleeve shall be either double or triple pleated, with a minimum unexpanded vertical height of 8 inches and 10 inches respectively and a minimum thickness of 3/16 inches. The top and bottom section of the sleeve shall contain an integrally formed expansion band recess and multiple sealing fins.

3. The top section of the extension shall have a minimum thickness of 3/32 inches and shall be shaped to fit into the bottom band recess of the sleeve under the bottom chimney seal band and the remainder of the extension shall have a minimum thickness of 3/16 inches. The bottom section of the extension shall contain an integrally formed expansion band recess and multiple sealing fins matching that of the rubber sleeve. Any splice used to fabricate the sleeve and extension shall be hot vulcanized and have a strength such that the sleeve shall withstand a 180 degree bend with no visible separation.

5. The continuous wedge strip used to adapt the rubber sleeve to sloping surfaces shall have the slope differential needed to provide a vertical band recess surface, be shaped to fit into the band recess and have an integral band restraint. The length of the wedge strip shall be such that, when its ends are butted together, it will cover the entire inside circumference of that band recess needing slope adjustment.

6. The expansion bands used to compress the sleeve against the manhole shall be integrally formed from 16 gauge stainless steel conforming to ASTM A-240 Type 304, with no welded attachments and shall have a minimum width of 1 inches. The bands shall have a minimum adjustment range of 2 diameter inches and the mechanism used to expand the band shall have the capacity to develop the pressures necessary to make a watertight seal. The band shall be permanently held in this expanded position with a positive locking mechanism. Any studs and nuts used for this mechanism shall be stainless steel conforming to ASTM F-923 and 594, Type 304.

D. Steps. Steps shall be built into the walls of all manholes. They shall be approximately twelve inches wide and shall be uniformly spaced at intervals of twelve to sixteen inches. Steps shall be cast aluminum, polypropylene coated #4 re-bar, or other approved material.

E. Line Connectors. All new manholes shall have rubber and/or neoprene line connectors for the installation of the line such as "A-Lok" or as recommended by the manufacturer. For connection to an existing manhole, a rubber boot type connector such as "Kor-n-seal" is required.

2.4 Waterproof Manhole Inserts

Manhole inserts, designed to prevent inflow of water through and around the manhole cover, shall be provided. Inserts shall be manufactured from a corrosion-resistant material able to withstand the

environment of a sanitary sewer system, road salts, oils and fuels. Inserts shall be as manufactured by Southwestern Packing & Seals Co. or equal.

PART 3. EXECUTION

3.1 Lines and Grades

A. General. The Engineer will establish the locations of all manholes by reference to landmarks on the ground and will establish a system of bench levels to be used in the construction of the sewer lines.

B. Laser Beam Method of Laying Sewer. Laser beams shall be used for laying gravity sewer lines. The equipment shall be maintained in a good operating condition. The allowable error shall be plus or minus 0.02 feet.

3.2 Water and Sewer Separation

Wherever sewer lines and water lines cross, or are adjacent to each other, special precautions shall be taken.

Sewer lines which are parallel to a water line must, if possible, be located a minimum lateral distance of 10 feet from any water lines measured from outside diameters. Where it is not practical to provide such a separation, care shall be taken to ascertain that the existing water line or existing sewer line is in good sound condition and that no evidence of joint leakage is known in that vicinity. If any such evidence does exist, the existing line shall be exposed by the Contractor at least 10 feet each side of the new pipe crossing, carefully examined, and any defects positively corrected. The Owner will arrange for examining and correcting any defects in the existing lines, but the Contractor shall cooperate in every way possible.

When sewer lines cross water lines, the sewer line shall be installed at least 24 inches below the water line. If this condition cannot be met, the Contractor shall expose the existing water line a distance of 5 feet each side of the new sewer line crossing, and shall encase the water line in concrete in accordance with the details shown on the drawings.

3.3 Installing Sanitary Sewer Pipe

A. Excavation. The Contractor shall not excavate trench beyond what is necessary for pipe installation to minimize risk of accident or trench collapse.

B. Bedding. Bedding shall be with No. 9, No. 67 or No. 78 crushed stone. Pipe shall be laid with bottom quadrant of barrel and bells of pipe underlain by at least a four inch depth of stone on earth subgrade and at least six inch depth of stone on rock subgrade. If trenches are dug too deep, they must be brought up to grade with crushed stone.

C. Pipe Installation. All pipe must be inspected for uniform diameter, straightness and defects. Rejected pipe must be removed from the project.

Pipe shall be laid to required lines and grades. The pipe lengths shall be fitted together and matched, so that they will form a sewer with a smooth and uniform invert. Laying will begin at the lowest point and proceed upstream with the bells of the pipe pointing upstream.

Tees and wyes shall be located at such points in the sewer so as to facilitate the service connection.

No backfilling (except for securing pipe in place) will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade. Such inspection shall not relieve the Contractor of further liability in case of defective joints.

D. Backfilling. Backfilling of excavated trenches shall be commenced as soon as possible after the sewer is installed and the jointing and alignment are approved.

Backfill in trenches within the limits of existing or proposed paved surfaces shall be compacted DGA up to the paved surface. Where open-cutting of a state maintained paved surface is allowed, the backfill shall be controlled density fill with a 28 day compressive strength of 50 pounds per square inch.

Backfill in trenches outside the limits of existing or proposed paved surfaces shall be either compacted DGA or No. 9 crushed stone, to twelve inches above the top of the pipe. The remaining backfill shall be compacted soil, capable of supporting growth of either seed or sod.

3.4 Manhole Installation

Manhole inverts shall of factory made concrete construction and smooth. Where manhole inverts must be constructed, they shall be of 1:2 grout mix, in accordance with details on drawings. Inverts shall have the same cross-section as the invert of the sewer which they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit.

The cast iron frame for the manhole cover shall be set at the required elevation and properly anchored to the masonry. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted to conform to the exact slope, crown and grade of the existing adjacent pavement. Manhole frame seals are required. See Section 2.3 C.

After backfilling has been completed, the excavated area, if located in a street, alley or sidewalk, shall be provided with a temporary surface.

3.5 Testing

A. Pipe Pressure Testing. The Contractor shall conduct low-pressure air tests of all pipe laid under this contract before putting the new sewers into service. The Contractor shall furnish all the necessary equipment and personnel required to conduct the tests, including pneumatic plugs, which shall have a sealing length equal to or greater than the diameter of the pipe to be tested.

The sewer line to be tested shall be flushed with water prior to the test. All pneumatic plugs shall be seal-tested before being used in the actual test installation.

Tests shall be made from manhole to manhole at an average pressure of 3.0 PSI greater than the average back pressure of any ground water present and shall be conducted in accordance with the test procedure outline below.

Plug all pipe outlets with suitable test plugs. Brace each plug assembly. If the sewer line to be tested is submerged in ground water, insert a pipe probe (by boring or jetting) into the backfill material adjacent to the center of the pipe, determine the pressure in the probe when air passes slowly through it. This is the back pressure due to ground water submergence over the end of the probe. All gauge pressures in the test shall be increased by this amount.

Add air slowly to the portion of the sewer line installation under test until the internal pressure is raised to 4.0 PSI. Allow at least two minutes for the air temperature to stabilize, adding only the amount of air required to maintain pressure.

When the pressure decreases to 3.5 PSI, start timing with a stop watch. Determine the time, in seconds, that is required for the internal air pressure to reach 2.5 PSI. Minimum permissible time for the 1.0 PSI drop (from 3.5 PSI to 2.5 PSI) shall not be less than 3 min. 57 sec.

The air test may be dangerous if a line is improperly prepared. It is extremely important that the various plugs be installed and braced in such a way as to prevent blowouts. Since an internal pressure of 5 PSI exerts a force of 250 pounds on an 8-inch plug, it should be realized that the sudden expulsion of a plug can be very dangerous. No one shall be allowed in the manholes of the section being tested until the lines have been depressurized.

Pressurizing equipment shall include a regulator set at 5 PSI to avoid over pressurizing and damaging an otherwise acceptable line.

B. Pipe Deflection Testing. After all backfill is in place, any pipe with stiffness (F/Y) of less than 100 psi shall be measured for vertical deflection. Maximum deflection of the installed pipe shall be limited to four percent of the internal pipe diameter. If the pipe is measured more than six months after all backfill has been placed, a deflection of five percent of the internal pipe diameter will be allowed. All pipe exceeding the allowable deflection shall be replaced or re-rounded by the Contractor.

C. Manhole Testing. Manholes shall be tested after installation with all connections in place. The test shall include testing of the seal between the cast iron frame and the concrete cone, slab or grade rings. Lift holes, if any, shall be plugged with an approved, non-shrink grout prior to testing.

Temporarily plug, with the plugs being braced to prevent the plugs or pipes from being drawn into the manhole, all pipes entering the manhole at least eight inches into the sewer pipe. The plug must be inflated at a location past the manhole/pipe gasket.

The test head shall be placed inside the frame at the top of the manhole and inflated, in accordance with the manufacturer's recommendations.

A vacuum of 10 inches of mercury shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and disconnect the vacuum line.

The pressure gauge shall be liquid filled, having a 3.5 inch diameter face with a reading from zero to thirty inches of mercury.

The manhole shall be considered to pass the vacuum test if it holds at least 9 inches of mercury for the following time duration:

	Time (minutes)		
Manhole Depth	4' Dia.	5' Dia.	6' Dia.
20 feet or less	1	2	3
20.1 to 30 feet	2	3	4

No joints will be accepted that show leakage and if after backfilling and inspection any joints are found that are allowing ground water to enter the sewer, such joints must be dug up and corrected.

All lines or sections of lines that are found to be laid improperly with respect to line or grade, that are found to contain broken or leaking sections of pipe, or are obstructed in such a manner that they cannot be satisfactorily corrected otherwise, shall be removed and replaced.

End of Section

PART VIII
SECTION D
TECHNICAL SPECIFICATION
CONCRETE

1. SCOPE

This specification covers the furnishing of all materials, except as may be otherwise provided in the contract, equipment, labor and plant, and performing all operations specified herein, including the manufacturing, transporting, placing, finishing and curing of the concrete. The furnishing and placing of reinforced steel when specified is covered in a separate technical specification.

2. COMPOSITION

Concrete shall be composed of Portland cement, water, fine aggregate, coarse aggregate and when specified or approved in writing by the ENGINEER, admixture for entraining air or retarding agents. The design of the concrete mixture will be based on the water-cement ratio necessary to secure (a) a plastic workable mixture suitable for the specific conditions of placement and (b) when properly cured, a product having durability, impermeability and strength, in accordance with all the requirements of the structures covered by these specifications. The concrete mixture shall be designed so that the concrete placed according to plans shall produce a minimum laboratory cylinder compressive strength equal to the strength designated in paragraph 3 for the class of concrete specified.

3. CLASSIFICATION

Concrete shall be classified as Class A, Class B, Class C and Class D or E. The class or classes of concrete will be shown on the drawings and/or in the bid schedule.

The basis of classification of concrete shall be the minimum compressive strength at twenty-eight (28) days as listed below. Other minimum design requirements are also shown.

	Minimum Strength		Cement/Factor	
Class	(7-day)	(28-day)	(Bags/C.Y.)	Air Entrainment
A	2850	4000 psi	6.0	4½ + 1½%
B	2200	3000 psi	5.2	4½ + 1½%
C	1800	2500 psi	4.8	4½ + 1½%
D	1500	2000 psi	4.5	-
E	-	-	3.5	-

4. CEMENT

4.1 Portland Cement

Portland cement shall meet the requirements of ASTM Designation: C-150 for the type of cement specified.

4.2 Air-Entraining Portland Cement

Air entraining Portland cement shall meet the requirements of ASTM Designation: C-175 for the type of cement specified.

4.3 Storage of Cement on the Site

Cement shall be properly stored and protected from weather, dampness or other destructive agents and any cement which is damaged will be rejected and not permitted to be used in the work.

4.4 Sampling and Testing

Portland cement shall be subject to sampling and testing in accordance with ASTM Designation: C-150.

Air-entraining Portland cement shall be subject to sampling and testing in accordance with ASTM Designation: C-175.

5. AGGREGATES

5.1 Fine and Coarse Aggregates

Shall conform to the provisions of ASTM Designation: C-136 and ASTM Designation: C-33. Sand shall consist of clean, well graded particles of hard, durable stone and shall contain limited amount of deleterious substances. It shall be equivalent to washed Ohio, Scioto, or Cumberland River sand.

Coarse aggregate shall be washed river gravel or crushed limestone of hard durable particles and shall contain limited amounts of deleterious substances. The maximum size of coarse aggregate will be limited to one and one-half (1 1/2) inches.

5.2 Handling and Measurement of Materials

Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size will be avoided and that various sizes will not become intermixed before proportioning. Methods of handling and transporting aggregates shall be such as to avoid contamination, excessive breakage, segregation or degradation, or intermingling of various sizes.

Scales for weighing aggregates and cement shall be beam type or springless dial type. They shall be accurate within 1 percent under operating conditions. All exposed fulcrums, clevises and similar working parts of scales shall be kept clean. The quantities of cement and aggregates in each batch of concrete as indicated by the scales, shall be within the following percentages of the required bath weights:

Cement - plus or minus 1.0 percent

Aggregates - plus or minus 2.0 percent

Measuring tanks for mixing water shall be of adequate capacity to furnish the maximum amount of mixing water required per batch and shall be equipped with outside taps and valves to provide for checking their calibration unless other means are provided for readily and accurately determining the amount of water in the tank.

Cement - shall be measured by weight or in bags of 94 lbs. each. When cement is measured by weight, it shall be weighed on scale separate from that used for other materials and in a hopper entirely free and independent of the hopper used for weighing the aggregates. Then cement is measured in bags, no fraction of a bag shall be used unless weighed.

Mixing Water - shall consist of water added to the batch, ice added to the batch, water occurring as surface moisture on the aggregates and water introduced in the form of admixtures. The added water shall be measured by weight or volume to an accuracy of 1 percent of the required total mixing water. Added ice shall be measured by weight. Wash water shall not be used as a portion of the mixing water for succeeding batches.

Dry Admixtures - shall be measured by weight and past or liquid admixtures by weight or volume, within a limit of accuracy of 3 percent.

5.3 Sampling and Testing

When testing is required, the sampling shall be done in accordance with and the testing results shall conform to, the ASTM Standards reference herein. The source from which the aggregates are to be obtained shall be selected well in advance of the time when the material will be required in the work. Samples of the aggregates, when the placing of concrete is expected to begin.

Usually 150 pounds of sand for initial tests and 150 pounds for periodic tests will be sufficient. Usually 200 pounds of coarse aggregate for initial test and 200 pounds for periodic tests will begin.

Unless otherwise specified, all test samples shall be taken under the supervision of the ENGINEER and delivered to the designated point by the CONTRACTOR at his expense. Tests will be made by and under the supervision of the ENGINEER. Routine control tests and

analysis of the aggregates at various stages in the processing operations will be made by the ENGINEER. The CONTRACTOR shall provide such facilities as the ENGINEER may consider necessary for the ready procurement of representative test samples.

It shall be the responsibility of the OWNER to pay for the necessary tests. Once a material has been tested and approved for use, it shall be the CONTRACTOR's responsibility to use material throughout the job which is equal in all respect and from the same source as that approved material be delivered to the testing laboratory.

The ENGINEER shall order additional material tests, if in his opinion the material stored or being used is not equal to the approved tested material. The CONTRACTOR shall pay for additional tests if the material is not suitable in accordance with these specifications or if the characteristics of the material are such that redesign of concrete mix is necessary.

If the CONTRACTOR desires to change supplier and/or source of materials after materials have been tested and approved, the ENGINEER may order additional material tests, the cost of which shall be charged to the CONTRACTOR.

In rare instances, a material may meet the requirements of these specifications, but have unusual characteristics which render it unsuitable for the use intended. Therefore, the OWNER reserves the right to reject materials if adequate reason is furnished. The OWNER also reserves the right to reject material suppliers and sources if quality, uniformity, and other important considerations are not and/or cannot be acceptably maintained. If suppliers or sources of material are rejected after work begins, it may be necessary to test materials from different suppliers and/or sources. If the ENGINEER deems that tests are necessary, the CONTRACTOR shall pay the cost of the necessary tests and all concreting shall be stopped until material is approved for use by the ENGINEER.

Each material must come from a single source, unless otherwise approved in writing by the ENGINEER.

All materials must be tested in accordance with these specifications and approved by the ENGINEER in writing before used in the work, unless the ENGINEER established that some or all of the tests will not be required because of the size of the project or for other reasons. Reports of test results shall be submitted to the ENGINEER in four (4) copies. It is the intent that the OWNER shall pay for material tests necessary to insure suitability for the work, but the OWNER shall not pay for material tests caused by negligence, indecision, or carelessness on the part of the the CONTRACTOR, his subcontractors, or his suppliers.

In the case of ready-mixed concrete, the requirements for design mix and testing shall be the same unless waived by the ENGINEER. After award of the contract, the CONTRACTOR shall submit in writing to the ENGINEER the name, address and qualifications of the ready mix supplier who will furnish concrete for the project. The CONTRACTOR shall also submit the supplier and source of the sand, coarse aggregate, cement and admixture. The ENGINEER shall

then select a testing laboratory and request proposed mixes from the CONTRACTOR or ready-mix plant. The ENGINEER will then indicate tests and design mixes required, to the testing laboratory. The testing laboratory shall also receive a copy of the materials specifications. After receiving the requisition for tests, the CONTRACTOR shall send materials per these specifications to the testing laboratory.

6. WATER

Water used in mixing concrete shall be fresh, clean and free from injurious amounts of sewage, oil, acid, alkali, salts, or organic matter, and its source shall be subject to the approval of the ENGINEER. The water used in mixing must be a minimum required for a plastic mix. No water will be permitted for purposes of hastening mixing and reducing tamping or vibration.

7. ADMIXTURES

7.1 Air-Entrainment

The air-entraining admixtures shall fully meet the requirements of ASTM Designation: C-260 and shall be subject to tests in accordance with ASTM Designation: C-233.

7.2 Retarding Agents

Approved types of retarding agents shall be included in the concrete mix when specified on drawings or authorized in writing by the ENGINEER.

7.3 Other Compounds

The use of calcium chloride or other accelerators or anti-freeze compounds will not be allowed.

8. CONSISTENCY

The consistency of any concrete shall be such that it can be worked readily into the corners and angles of the forms and around reinforcement with the method of placing employed on the work, but without permitting the materials to segregate or excess free water to collect on the surface. The following ranges represent the extreme limits of allowable slump when tested, in accordance with ASTM Designation: C-143. Where vibrators are used, the ENGINEER may allow a slightly less slump than the specified minimum.

Class of Concrete	Slump Range (Inches)
Class A	1½ to 3
Class B	2 to 4
Class C	2 to 4
Class D	3 to 6
Class E	3 to 6

The quantity of mixing water shall not be changed without the consent of the ENGINEER.

9. AIR-ENTRAINED CONCRETE

9.1 General

When air-entrained concrete is specified, air-entrainment shall be accomplished by using an air-entrained Portland cement or by using an air-entraining admixture with normal Portland cement. If the entrained air content falls below the specified limit when using air-entrained cement, an air-entraining admixture shall be added in sufficient quantity to bring the entrained air content within the specified limits. If the entrained air content is found to be greater than the maximum specified, when using an air-entrained cement, the use of an air-entraining cement shall be prohibited and air-entrainment shall be accomplished by using an air-entraining admixture with normal Portland cement. Air-entraining admixtures shall be added in solutions to a portion of the mixing water by means of a mechanical batcher in a manner that will insure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be determined as a percentage of the volume of the concrete by following the methods specified in ASTM Designation: C-138, C-173, or C-231. Air content determination shall be made on samples of concrete during placement of the concrete in the forms.

Unless otherwise specified, the air content (by volume) of the concrete at the time of placement shall be:

Maximum Size Aggregate	Air Content (%)
3/8 inch to ½ inch	6 to 9
Over ½ inch to 1 inch	5 to 8
Over 1 inch to 2½ inches	3 to 6

9.2 Adjustment of Mix Proportions

When air-entrained concrete is specified, the amount of water and fine aggregate prescribed for normal concrete shall be reduced to compensate for the increased volume of air contained in the air-entrained concrete. This is to maintain the concrete's strength.

10. QUALITY OF CONCRETE

10.1 Control

The CONTRACTOR shall be responsible for the design of the concrete mixtures and the quality of the concrete including ready-mix. Prior to any concrete construction or any change in the mix during construction, the CONTRACTOR shall furnish a statement to the ENGINEER giving the proportions by dry weight of cement and of fine and coarse aggregate that will be used in the manufacture of each class of concrete contained in the contract. The CONTRACTOR will also furnish material samples to the laboratory for testing a design mix. Based on laboratory evidence, the ENGINEER will either approve the proposed mix or indicate the necessary proportions to meet the specified requirements.

10.2 Measurements

All materials entering into the concrete shall be mechanically measured by weight except the air-entraining admixture and water which may be measured by volume.

10.3 Delivery Ticket

Where truck mixers or ready-mix are used, the CONTRACTOR shall submit, for each load, a certified delivery ticket giving the quantities of cement, fine and coarse aggregate, water, admixture, and the time that water was added to the batch.

11. DESIGN MIX CYLINDER TESTS

Standard tests of the strength of the concrete may be made by the ENGINEER at any time he elects to do so. The following tests will be performed by the methods indicated:

Test	Method ASTM Designation
Sampling	C-172
Slump Test	C-143
Air Content	C-231 or C-173
Compression Test Specimens	C-31 or C-42
Compressive Strength	C-39 or C-42
Unit Weight	C-138

Test of a portion of a batch may be made on samples representative of that portion for any of the following purposes:

(1) Determining uniformity of the batch.

(2) Checking compliance with requirements for slump and air content when the batch is discharged over an extended period of time.

(3) Checking compliance of the concrete with the specifications when the whole amount being placed in a small structure, or a distinct portion of a larger structure, is less than a full batch.

11.1 Slump Test

At least one slump test shall be made before first concrete pour, at the start of pouring any

concrete and at each seven cubic yards deposited during one operation. These shall be made from same samples as those taken for cylinder tests and records of same kept therewith. Tests shall be made according to ASTM Designation C-143 and as required under ASTM Designation C-94 for ready-mixed concrete. The CONTRACTOR shall furnish the necessary equipment and labor for making slump tests. Water in excess of the maximum required for a practical concrete mix will have adverse effects on shrinkage, durability, and strength of concrete. Concrete which has a greater slump than specified or directed by the ENGINEER can be rejected by the ENGINEER without cost to the OWNER.

11.2 Entrained Air Tests

The CONTRACTOR shall furnish and have on the job at all times, one (1) LA-345 Chase Air Indicator Kit, one (1) LA-340 Spare Chase Air Indicator and two (2) quarts of isopropyl alcohol (rubbing alcohol) for the ENGINEER's use in making entrained air measurements. The alcohol can be obtained locally at any drug store and the one (1) LA-345 and one (1) LA-340 can be procured from Forney's Inc., Route 18 R.D. No. 2, Wampum, Pennsylvania 16157, for approximately $40.00.

The amount of measured entrained air shall be recorded by the ENGINEER. Mortar shall be sampled only from concrete taken directly from the mixer. At least one (1) air measurement shall be made for each test cylinder taken. Concrete which has more or less entrained air than specified or directed by the ENGINEER can be rejected by the ENGINEER without cost to the OWNER.

11.3 Initial Design Mix Cylinder Tests

Where more than 50 cubic yards of concrete are placed: the testing laboratory selected by the OWNER shall make a set of six (6) test cylinders from the design mix. Three (3) shall be tested at 7 days and three (3) shall be tested at 29 days per ASTM Designation C-39. Test cylinders shall have a compressive strength per Article 3 of this section. The OWNER shall pay the cost of the design mix and design mix cylinder tests, but the OWNER shall not pay for additional design mixes and design cylinder tests, caused by negligence, indecision, or carelessness on the part of the CONTRACTOR or his suppliers.

It is important for the CONTRACTOR to pursue all concrete testing requirements with dispatch so that approval of concrete can be granted by the ENGINEER after all tests are completed. 11.4 Periodic Cylinder Tests

All cylinders shall be made per ASTM C-31 and tested per ASTM C-39. The CONTRACTOR shall furnish all labor and equipment for sampling and curing cylinders on the job site and transportation to the laboratory for testing. The OWNER shall select the laboratory and bear the cost for testing the concrete cylinders.

At the start of concreting, three cylinders shall be made. One shall be tested at 7 days and two shall be tested at 28 days.

Throughout the remainder of the job, the ENGINEER shall direct when cylinders shall be taken and in what number they shall be taken. At each time when twenty (20) or more cubic yards of concrete are placed during one operation and when the sum of smaller deposits of concrete equal thirty (30) cubic yards since previous test and at any change in mix, three (3) cylinders shall be made. One (1) shall be tested at 7 days and two (2) shall be tested at 28 days.

For a strength test, three (3) test specimens will be made from a composite sample. The test result will be the average of the strength of the thee specimens, except that, if one specimen in a test shows manifest evidence of improper sampling, molding, or testing, it shall be discarded and the remaining two strengths averaged. Should more than one specimen, representing a given test, show definite defects due to improper sampling, molding, or testing, the entire test shall be discarded.

The ENGINEER will ascertain and record the batch number for the concrete and the exact location in the work at which each batch represented by a strength test is deposited.

The ENGINEER shall have free entry to the plant and equipment furnishing concrete under the contract. Proper facilities shall be provided for the ENGINEER to inspect materials, equipment and process and to obtain samples of the concrete. All tests and inspections will be conducted so as not to interfere unnecessarily with the manufacture and delivery of the concrete.

12. FAILURE TO MEET STRENGTH REQUIREMENTS

If cylinders do not meet strength requirements, the ENGINEER can order shutdown on all concreting and redesign of concrete mix by the laboratory selected by the OWNER. The cost of mix redesign shall be paid for by the CONTRACTOR. The ENGINEER can also order additional tests, such as load tests, Swiss Hammer tests and/or core tests in the areas of the work represented by unacceptable cylinders. If areas of work are found to be under strength requirements, the ENGINEER can order the CONTRACTOR to strengthen or replace those areas at the expense of the CONTRACTOR.

When it is determined that such concrete shall be removed and replaced the CONTRACTOR shall be notified in writing, stating the extent of the replacement to be made.

13. BATCHING AND MIXING

13.1 Equipment

The CONTRACTOR shall provide at the site of the work a modern and dependable bath-type mixing plant with a capacity consistent with the size of the job. The equipment shall be capable of combining the aggregate, cement and water into a uniform mixture and of discharging this mixture without segregation. Adequate facilities shall be provided for the accurate measurement and control of each of the material entering the concrete. The complete plant assembly shall include provisions to facilitate the inspection of all operations at all times. ready-mix concrete may be used, if approved by the ENGINEER, in which case the mixing plant at the site will not be required. All mixing requirements specified herein for concrete mixed at the site shall be applicable to ready-mixed concrete. Measurements of materials for ready-mixed concrete shall conform to ASTM Designation: C-94. The ENGINEER shall have free access to the mixing plant at all times. Truck mixers will be allowed, provided the use of this method will cause no violation of any applicable provisions of specifications for concrete contained herein. Truck mixers, unless otherwise authorized by the ENGINEER, shall be of the revolving drum-type, watertight and so constructed that the concrete can be mixed to insure the uniform distribution of materials throughout the mass. Each truck mixer shall be equipped with an accurate device for measuring the amount of water added. Truck mixers and agitator shall be operated within the limits of capacity and speed of rotation designated by the manufacturer of the equipment.

13.2 Mixing Time

Neither the speed nor the volume capacity of the mixer shall exceed those recommended by the manufacturer. Excessive overmixing, requiring additions of water to preserve the required consistency, will not be permitted. The mixing time for each batch after all solid materials are in the mixer drum, provided that all the mixing water shall be introduced before one-fourth (1/4) of the mixing time has elapsed, shall be not less than two (2) minutes for mixers having capacities up to two (2) cubic yards. For mixers of larger capacities, this minimum shall be increased fifteen (15) seconds for each cubic yard of fraction thereof of additional capacity.

When a truck mixer is used, each batch of concrete shall be mixed not less than fifty (5) nor more than three hundred (300) revolutions, at a mixing speed of not less than four (4) rpm. after all materials are in the mixer drum. In all such cases, however, the concrete shall be delivered to the job site and discharged within 1-1/4 hours or before the drum has revolved 300 times, whichever comes first, after the mixing water has been added.

14. CONVEYING

Concrete shall be conveyed from mixer to forms as rapidly as practicable, by methods which will prevent segregation or loss of ingredients. There shall be no vertical drop greater than five (5) feet, except where suitable equipment is provided, to prevent segregation and where specifically authorized by the ENGINEER. Chuting from towers or elevated positions of the mixer will be permitted, but the water content will be subject to the ENGINEER's control and excess water will not be allowed, in order to force the concrete to flow clean from the chutes, unless all flushing of chutes is discharged outside the forms.

Belt conveyers, chutes or other similar equipment in which the concrete is delivered to the structure in a thin, continuously exposed flow, will not be permitted, except for very limited or isolated sections of the work and only then if approved in writing by the ENGINEER. Such equipment shall be arranged to prevent objectionable segregation.

Where wall forms exceed five (5) feet in height, suitable measures, such as the use of tremie tubes, where practicable, or portholes, shall be provided in the forms to limit the vertical drop of the concrete to a maximum of five (5) feet. Openings shall be spaced around the perimeter of five (5) feet. Openings shall be spaced around the perimeter of the formed area so that lateral flow of fresh concrete will be limited to three (3) feet. Drop chutes which may be provided to convey the concrete through wall ports shall have an outside pocket under each form opening to stop the concrete and allow it to flow easily over into the form without separation.

No concrete shall be placed until the ENGINEER has given his approval of the subgrade, forms and reinforcing steel in place. If the reinforcing steel is not placed in accord with the drawings, the ENGINEER shall stop the CONTRACTOR from placing any concrete until the error is corrected. Under no circumstances will an attempt be made to correct errors by inserting additional unscheduled bars. No concrete shall be placed except in the presence of the ENGINEER or his representative and the CONTRACTOR shall give reasonable notice of his intention to pour.

Before any concrete is placed, the forms and subgrade shall be free of chips, dirt, sawdust, or other extraneous materials.

15. PLACING

15.1 General

Concrete shall be placed within one and one-quarter (1-1/4) hours after the introduction of the water to the cement and aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, or where the temperature of the concrete is 85°F or above, the time shall be reduced to 45 minutes. The ENGINEER may allow a longer time, providing the setting time of the concrete is increased a corresponding amount by the addition of an approved set-retarding mixture. Concrete shall be deposited as closely as possible to its final position in the forms so that flow within the mass and consequent segregation are reduced to minimum. Vibrators may be used to aid in the placement of the concrete provided they are used under experience supervision and the forms designed to withstand their action. The duration of vibration shall be limited to that necessary to produce satisfactory consolidation without causing objectionable segregation. Vibration shall not be applied directly to the reinforcement steel or the forms nor to concrete which has hardened to the degree that it does not become plastic when vibrated.

When a vibrator is used, the CONTRACTOR shall also spade the concrete along form surfaces a sufficient amount to prevent excessive size or numbers of air-void pockets in the concrete surface, except where an approved absorptive form lining is used; in which case the spading specified above will not be permitted.

15.2 Lifts in Concrete

The permissible depth of concrete placed in each lift shall be as shown on the drawings or specified herein. All concrete shall be deposited in horizontal layers not exceeding twenty (20) inches in thickness, unless otherwise authorized directed. The placement shall be carried on at such a rate that the formation of cold joints will be prevented. If a delay occurs in excess of a thirty (30) minute interval between any two (2) consecutive batches or loads, or in case of any delay between placing batches that allows previously placed concrete to take initial set, the CONTRACTOR shall discontinue the placing of concrete and make, at his own expense, a construction joint satisfactory to the ENGINEER before proceeding with the placing operations. He shall remove any portion of the previously placed concrete that is deemed necessary for the proper formation of the construction joint and no payment shall be made to the CONTRACTOR for the concrete removed. The thirty (30) minute limitation, cited immediately above, may be extended in those cases where an approved type retarder is added to the concrete mixture to delay the set of the concrete. Use of a retarder in the mix shall be subject to approval of the ENGINEER.

Hoppers, chutes and pipes shall be used as necessary to prevent splashing of mortar on forms and reinforcing above the layer being placed.

15.3 Placing Temperature

Concrete shall be mixed and placed only when the temperature is at least forty (40) degrees F and rising, unless permission to pour is obtained from the ENGINEER, in which event all material shall be heated and otherwise properly prepared so that batching and mixing can proceed in full accord with the provisions of this specification. The methods proposed for heating the materials and protecting the concrete shall be approved by the ENGINEER. Salt, chemicals, or other materials shall not be mixed with the concrete for the purpose of preventing freezing. Accelerating agents shall not be used.

Concrete placement will not be permitted when, in the opinion of the ENGINEER, the sun, heat, wind, or humidity prevents proper placement and consolidation.

When the atmospheric temperature may be expected to drop below 40°F at the time concrete is delivered to the work site, during placement or any time during the curing period, the following provisions also shall apply:

(1) The temperature of the concrete at the time of placing shall not be less than 50°F nor more than 90°F. The temperature of neither aggregates nor mixing water shall be more than 100°F just prior to mixing with the cement.

(2)When the daily minimum temperature is less than 40°F, concrete structures shall be insulated or housed and heated after placement. The temperature of the concrete and air adjacent to the concrete shall be maintained at not less than 50°F nor more than 90°F for the duration of the curing period.

(3) Methods of insulating, housing and heating the structure shall conform to "Recommended Practice for Cold Weather Concreting," ACI Standard 306.

(4) When dry heat is used to protect concrete, means of maintaining an ambient humidity of at least 40 percent shall be provided unless the concrete has been coated with curing compound as specified in Section 21 or is covered tightly with an approved impervious material.

For obtaining the proper curing conditions for the concrete poured, steam heating equipment, oil-fired blowers (airplane heaters) located outside the enclosure and blowing hot air into the enclosure, or other similar equipment of a capacity sufficient to maintain the required minimum temperature all over, will be required. In conjunction with forced air heaters, means of supplying moisture to the area being cured will also be required. Oil or coke burning salamanders and other fuel-burning heaters produce carbon dioxide which combines with calcium hydroxide in fresh concrete to form a weak layer of calcium carbonate. When this occurs, the surface of the concrete floor will dust under traffic. For this reason, carbon dioxide producing heaters shall not be used while placing concrete and for the first 24 to 36 hours of the curing period unless they are properly vented. The CONTRACTOR must have a sufficient steam retaining canvas or other protective covering at the site to cover all sides and tops of forms to be poured and concrete to be cured, before pouring of concrete will be allowed. This covering must be placed over and around forms and concrete being cured in such a manner that circulation of curing air will prove effective to the tops of floors and to the outside, top and corners of concrete structures, as well as to their interiors. Concrete shall be moist cured in accordance with paragraph 18 of this section. The CONTRACTOR may strip forms during curing period with covering removed, provided atmospheric temperatures are above specified curing temperatures, concrete surfaces are kept moist, and time and labor are available for recovering for lower night temperatures.

When climatic or other conditions are such that the temperature of the concrete may reasonably be expected to exceed 85°F at the time of delivery at the work site, during placement, or during the first 24 hours after placement, the following provisions also shall apply:

(1)The CONTRACTOR shall maintain the temperature of the concrete below 85°F during mixing, conveying, and placing. Methods used shall conform to "Recommended Practice for Hot Weather Concreting," ACI Standard 605.

(2) The concrete shall be placed in the work immediately after mixing. Truck mixing shall be delayed until only time enough remains to accomplish it before the concrete is placed.

(3)Exposed concrete surfaces which tend to dry or set too rapidly shall be continuously

moistened by means of fog sprays or otherwise protected from drying during the time between placement and finishing, and after finishing.

(4) Finishing of slabs and other exposed surfaces shall be started as soon as the condition of the concrete allows and shall be completed without delay.

(5) Concrete surfaces exposed to the air shall be covered as soon as the concrete has hardened sufficiently and shall be kept continuously wet for at least the first 24 hours of the curing period and for the entire curing period unless curing compound is applied as specified in subsection 7, below.

(6)Formed surfaces shall be kept completely and continuously wet for the duration of curing period (prior to, during and after form removal) or until curing compound is applied as specified in subsection 7, below.

(7) If moist curing is discontinued before the end of the curing period, white pigmented curing compound shall be applied immediately.

15.4 Concrete on Rock Foundations

Rock surfaces upon which concrete is to be placed shall be clean, free from oil, standing or running water, mud, objectionable coatings, debris loose semidetached, or unsound fragments. Faults or seams shall be cleaned to a depth satisfactory to the ENGINEER and to firm rock on the sides. Immediately before concrete is placed, all such rock surfaces shall be cleaned thoroughly by use of high velocity air-water jets, wet sandblasting, or other means satisfactory to the ENGINEER. All rock surfaces shall be kept continuously wet for forty-eight (48) hours and all approximately horizontal surfaces shall be covered, immediately before the concrete is placed, with a layer of mortar of the same sand-cement ratio as used in the concrete.

15.5 Concrete on Earth Foundations

Unless otherwise authorized all concrete shall be placed upon clean, damp surfaces free from frost, ice, or deleterious materials and standing or running water. Concrete shall not be placed in mud, dried porous earth or upon fill that has not been subject to approved rolling or tamping until optimum compaction has been obtained. The CONTRACTOR shall take all measures to accomplish the results specified in this paragraph.

15.6 Vertical Joint Spacing

The layout of all monoliths shall be as shown on the drawings or as directed and approved by the ENGINEER before construction is started.

15.7 Placing Concrete through Reinforcement

In dropping concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs.

16. CONSTRUCTION JOINTS

The CONTRACTOR shall furnish and install vinyl or plastic water-stops as manufactured by W.R. Meadows, Inc., Waterstops, Inc., or B.F. Goodrich, Inc., or approved equal quality. Waterstops shall be center bulb type 6 inches wide unless shown otherwise in the plans. Care

and diligence shall be exercised in securing proper embedment in the concrete mix. The waterstop shall be extruded from elastomeric polyvinylchloride material and joints shall be cemented as recommended by the manufacturer. The CONTRACTOR may use other waterstop materials subject to the ENGINEER's approval.

Construction joints shall be located as indicated on the contract drawings, or as approved by the ENGINEER. The surfaces of construction joints shall be clean when covered with fresh concrete. Cleaning shall consist of the removal of all laitance, loose or defective concrete and foreign material. Cleaning of the surface of construction joints shall be accomplished by the use of high velocity air-water jets, wet sandblasting, or other effective means satisfactory to the ENGINEER. Surfaces of construction joints that have been permitted to dry by reason of the succeeding lift or adjoining concrete not being placed within the specified post-curing period shall be moistened and kept continuously moist for at least forty-eight (48) hours immediately prior to the placing of the succeeding lift of adjoining concrete. All pools of water shall be removed from the surfaces of construction joints before the new concrete is placed.

17. FINISHING

17.1 Defective Concrete

Defective concrete, honeycombed areas, voids left by the removal of tie rods, ridges on all concrete surfaces permanently exposed to view or exposed to water on the finished structure, shall be repaired immediately after the removal of forms unless otherwise authorized or directed. Voids left by removal of tie rods shall be reamed and completely filled with dry-patching mortar.

Defective concrete shall be repaired by cutting out the unsatisfactory material and placing new concrete which shall be secured with keys, dovetails, or anchors. Defective areas shall be chipped away to a depth of not less than 1 inch with the edges perpendicular to the surface. The area to be patched and a space at least 6 inches wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar. A grout of equal parts Portland cement and sand with sufficient water to produce a brushing consistency, shall then be well rushed into the surface, followed immediately by the patching mortar. The patch shall be made of the same material and of approximately the same proportions as used for the concrete except that the coarse aggregate shall be omitted. The mortar shall not be richer than 1 part cement to 3 parts sand. On exposed surfaces, white Portland cement shall be substituted for a part of the gray Portland cement to match the color of the surrounding concrete. The proportion of white and gray cements shall be determined by making a trial patch.

The amount of mixing water shall be as little as consistent with the requirements of handling and placing. The mortar shall be retempered without the addition of water by allowing it to stand for a period of 1 hour during which time it shall be mixed occasionally with a trowel to prevent setting.

The mortar shall be thoroughly compacted into place and screeded off so as to leave the patch slightly higher than the surrounding surface. It shall then be left undisturbed for a period of 1 to 2 hours to permit initial shrinkage before being finally finished. The patch shall be finished in such a manner as to match the adjoining surface.

Excessive rubbing of formed surfaces will not be permitted. All uniformed surfaces of concrete, exposed in the completed work, shall have a wood float finish without additional mortar.

17.2 Repair of Defects

When concrete is honeycombed, damaged or otherwise defective, the CONTRACTOR shall remove and replace the structure or structural member containing the defective concrete, or correct or repair the defective parts. The ENGINEER will determine the required extent of removal, replacement or repair.

Prior to starting repair work, the CONTRACTOR shall obtain the ENGINEER's approval of his plan for making the repair. Such approval shall not be considered a waiver of the Contracting Officer's right to require complete removal of defective work if the completed repair does not produce concrete of the required quality and appearance. Repair work shall be performed only when the ENGINEER is present. Repair of formed surfaces shall be started within 24 hours after removal of the forms.

Joints and edges of unformed surfaces that will be exposed to view shall be chamfered or finished with molding tools.

17.3 Removal of Forms

In order that the rubbing required by these specifications shall be effective,nonsupporting forms may be stripped with 24 hours after concrete pouring is completed and initial rubbing required completed within 48 hours. If possible, patching and rubbing shall be done at the same time. This requirement regarding form removal is secondary to heating requirements and the specifications heretofore included regarding heating of concrete shall take precedence.

After the required curing time has elapsed, support forms may be removed to allow finishing. Finish shall be Type I, II, or III as required by the "Concrete Finishes" section. In general, surfaces that will show in the finished work will be rubbed down with a coarse carborundum stone. Floors and slabs shall be float finished as soon as possible after pouring unless otherwise specified. Cement or mortar coating will not be permitted. The CONTRACTOR should refer to the section on "Concrete Finishes" for complete finish requirements for all concrete units.

Rubbing is not required lower than 6 inches below water levels in basins, but all fins must be removed and holes patched. Exposed inside surfaces to be painted must be rubbed smooth.

The surfaces of exposed concrete roofs, walks and copings shall be finished with a wooden float and left with a gritty surface similar to that in general use for sidewalks. This finish and floating must be done at the proper period in the setting of the concrete. These outside exposed surfaces of floors and roofs must be finished as one piece of work without a separate top coat.

Basin and channel floors shall be struck off smooth and finished with a steel float to produce a surface easily cleaned. The inside exposed floors must be finished with a steel float to even surfaces and present a neat, smooth and satisfactory appearance. Finish with bevel around all curbings and other openings. Floors must be finished drain to floor traps and sump with slopes as shown on the plans. Floors at the walls must be level except where shown otherwise on the plans.

Surfaces of precast concrete members that are to be painted shall have all air holes and other imperfections filled and dressed to present surfaces comparable in smoothness and appearance to rubbed concrete as set forth above.

17.4 Watertightness

All concrete when finished must be watertight. Exposed concrete surfaces shall shown no dampness when the interior of basins or exterior of pits have been filled with water for seven days. to obtain this result, the forgoing specifications must be rigidly followed. In case any leakage or dampness shows on the surface of any such walls after testing the time stated, then such defects must be remedied by the CONTRACTOR and work will not be accepted until this is done.

17.5 Openings for Pipes and Joints to Pipes

Pipes shall not be fixed in concrete wall or interior floor pours. Holes of a diameter 1 inch greater than the outside pipe diameter shall be formed accurately to pipe layout dimensions or shall be cored (10 inch diameter and under) in existing concrete slabs or walls.

When piping is placed, the annular ring around it shall be caulked from both sides with dry braided hemp (or unbraided where pipes do not center on grout closure is not necessary), to within 1 inch of wall surface or 2 inches if grout closure is necessary. Where exposed to view, inside basins, or where watertightness, airtightness, support or prevention of vibration is necessary, the remaining annular ring at the surface shall be troweled full with a nonshrink grout. Then the joint shall be raked back 1/2 inch from the surface and filled with a one to two mix grout of Portland Cement and sand. such joints shall be water and seepage tight.

Where malleable pipe (steel, wrought iron, or copper), a brittle pipe (hard rubber), rubber hose, or any pipe cut to fit on the job, passes through any concrete slab, floor or wall, a wrought or cast iron pipe nipple with about 1/2 inch greater diameter than the outside of the pipe shall be used as a sleeve and cast into the slab. In case of floors above ceilings, these sleeves shall extend 1/2 inch to 1 inch above floor surface, to prevent scouring water from running into them. If joint about pipe is required for watertightness or pipe support, the annular ring shall be caulked with dry, unbraided oakum to within 2 inches of surface. The ring at surface shall be filled with nonshrink grout, raked back 1/2 inch, and filled with 1/2 inch can of Portland Cement grout as previously mentioned.

Where holes greater than 10 inch diameter have to be cut for pipe in existing concrete slabs or walls, the space about the pipe shall be formed to original surfaces and the pipe wrapped with 1/2 inch braided hemp. In grouting this space, use a nonshrink grout, such as Sonneborn "Ferrolith G" or Masters Builders "Embeco". Where walls and space give sufficient room for safely using large aggregate, this may be added in a quantity equal to the sand specified. After removal of forms, the yarn shall be removed for a depth of 2 inches from water side and/or exposed surfaces and the space refilled to surface with a nonshrink grout. Then the joint shall be raked back 1/2 inch from the surface and filled with a one to two mix grout of Portland Cement and sand.

18. CURING AND PROTECTION

18.1 General

All concrete shall be cured for a period of not less than seven (7) consecutive days by an approved method, or combination of methods. The curing process shall be done so as to prevent loss of moisture from the concrete for the duration of the entire curing period. Unhardened

concrete shall be protected from heavy rains and flowing water. All concrete shall be adequately protected from damage.

18.2 Moist Curing

Concrete shall be moist cured by maintaining all surfaces continuously (not periodically) wet for the duration of the entire curing period. Water for curing shall be clean and free from any elements which will cause staining or discoloration of the concrete. Where forms of wood are used and left in place during curing, the wood shall be kept wet at all time.

18.3 Membrane Curing

At the option of the CONTRACTOR and when approved by the ENGINEER, the concrete may be cured with an approved curing compound of the surface membrane type in lieu of moist curing with water provided a permanent stain is not produced and provided the concrete surface is not to receive rubbed finish, terrazzo, tile, paint, chemical hardening, grout, cement patch, or concrete topping. The curing compound shall be applied to formed surfaces immediately after the forms have been removed and the surfaces cleaned of any loose sand, mortar and debris. The surface to receive the compound shall be moistened thoroughly with water and the compound applied as soon as the moisture film has disappeared but when the surface is still damp. On unformed surfaces, the compound shall be applied immediately after the surface loses its free water and has a dull appearance.

The curing compound shall be applied in a two coat continuous operation by approved spraying equipment and at a coverage of not more than two hundred (200) square feet per gallon for both coats. The second coat shall be applied to overlap the first coat in a direction at approximately right angels to the direction of the first application. Concrete surfaces which are subjected to heavy rainfall within three (3) hours after the curing compound has been applied shall be resprayed by the method and at the coverage herein specified. All concrete surfaces on which curing compound has been applied shall be adequately protected for the duration of the entire curing period from any damage that would disrupt the continuity of the curing membrane.

The curing compound shall conform to Type 2 or Type 3 of ASTM Designation: C-309.

All curing compound shall be delivered to the site of the work in the original sealed container bearing the name of the manufacturer, the brand name and the manufacturer's batch number. The compound shall be approved prior to use. The compound shall be stored so as to prevent damage to the containers and water-emulsion types shall be protected from freezing.

18.4 Cold Weather

The air and forms in contact with the concrete shall be maintained at temperatures above forty (40) degrees for at least seven (7) days and at a temperature above freezing for at least 21 days. Concrete, permitted to be cured with curing compounds, shall be provided the same protection against freezing and low temperatures as provided herein. No fire or excessive heat shall be permitted near or in direct contact with concrete at any time.

19. FORMS

19.1 Material

Forms shall be wood, steel, or other approved material. Wood forms shall be tongue-and-groove lumber of uniform width and thickness, or plywood having a minimum of five (5) plies, a minimum thickness of 9/16 inch and a type made especially for concrete forms. Steel forms shall be of a type acceptable to, and commonly used in the construction field. The type, shape, size, quality and strength of all material of which the forms are made shall be subject to the approval of the ENGINEER.

19.2 Construction

Forms shall be true to line and grade, mortar tight and sufficiently rigid to prevent objectionable deformation under load. Where forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the complete surface so as to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall be constructed such that keyways, waterstops, and dowels can be placed as shown in the plans.

Responsibility for their adequacy shall rest with the CONTRACTOR. The form surfaces shall be smooth, free from irregularities, depressions, sags, or holes when used for permanently exposed faces. Bolts and rods used for internal ties shall be so arranged that, when all forms are removed, all metal will not be less than one (1) from any concrete surface. Wire ties will not be permitted. All forms shall be so constructed so that they can be removed without hammering or prying against the concrete. All exposed joints shall be chamfered and suitable molding shall be placed to bevel or round exposed edges or corners, unless otherwise directed by the ENGINEER.

Temporary openings shall be provided in the inside form of all wall forms and column forms to facilitate cleaning and inspection immediately before depositing concrete. When wood sheeting is used for the inside form, the bottom board shall be fitted and removed to provide a continuous clean out space and if plywood is used, the forms shall be started with a 6 inch wide piece for the same purpose. Washing out of all forms and other concrete before pouring new materials must be done with water or air from hose under pressure. The hose must be provided with a suitable nozzle for this work. The intent of these specifications is to produce a perfectly watertight structure in all cases, without any subsequent repair work. Forms shall be so assembled that their removal will not damage the concrete.

Contact surfaces of forms shall be divided into two categories: forms for exposed concrete and forms for unexposed concrete. Exposed concrete shall mean concrete normally exposed to view and shall be considered extending 6 inches below planned regrade or water level. Exposed concrete shall exclude interior surfaces of covered water holding basins and unpainted, unfinished, interior surfaces of manholes and vaults. Unexposed concrete shall be concrete not normally exposed to view and shall include all concrete not included by exposed concrete, unless otherwise noted on the plan or in the specifications. Either unlined forms or lined forms (as hereinafter specified) shall be used for exposed concrete. A combination of lined forms for exposed concrete and unlined forms for unexposed concrete may be used in a structure where only a part of the structure is exposed. When this combination occurs, the ENGINEER will determine, upon request of the CONTRACTOR, if that portion of the structure which requires lined forms can be reduced in section to accommodate the liner without offsetting the liner backing from the sheathing used for the unexposed portion of the structure.

(1) Forms for Exposed Concrete

(a) Unlined - The contact surface of forms shall be constructed from 5/8 inch or 3/4 inch 5 ply structural plywood of concrete form grade. All concrete form plywood shall be designated

by grade marking each panel. Full sized sheets of plywood must be used except where smaller pieces will cover an entire area. The edges of all plywood sheets shall be straightened on the bench to insure close fitting, tight joints. All vertical joints shall be backed solidly and the edges of abutting sheet shall be nailed to the same stud.

When the one form is erected and reinforcement is in place and before the other form is erected, the ENGINEER shall be notified and the other form shall not be placed until work already done is approved. Open joints which would permit leakage of grout shall be sufficient cause for rejection of forms. If, in the opinion of the ENGINEER, pointing of slightly open joints will prevent leakage, then such pointing shall be done with an approved mixture. Pointing shall be carefully done and there shall be no trace of the pointing mixture on the surface of the sheathing.

Contact surfaces of forms shall be in good condition. The ENGINEER has the right to reject forms which will not produce a smooth, uniform, concrete surface.

(b) Lined - the backing for form lining shall be constructed of a good grade of form lumber that is solid, straight and free from defects that might impair its strength but need not be of the quality used for contact forms. Square-edged, sized lumber may be used for form boarding in place of shiplap or tongue-and-groove.

The boarding for lined forms may be horizontal or vertical, depending upon convenience. Form sheathing shall be securely nailed to the studs and the edges of the boards shall be in contact to prevent any bulging of the lining.

Plywood faced panel or patented forms in good condition, with tight fitting joints, such as steel-ply forms, can be substituted for lined forms if a smooth wall surface, as required by these specifications, can be obtained. Minor variations in concrete texture at form joints will be permitted.

Lining material shall be 1/4 inch structural plywood securely nailed to the form sheathing. All lining material shall be used in as wide pieces as possible Areas less than 4 feet in width shall be lined with a single width of plywood.

Joints in lining and backing shall not occur at the same place and butting edges of adjacent sheets shall be nailed to the same board. The lining material shall be nailed to the backing beginning at center of the board and working toward the edges to prevent buckling. Lining material may be reused, if it is in satisfactory condition and is approved by the ENGINEER. Open joints which would permit leakage of grout shall be sufficient cause for rejection of forms. If, in the opinion of the ENGINEER, pointing of slightly open joints will prevent leakage, then such pointing shall be allowed.

In the case of line circular forms where the backing for form lining is constructed in chords of a circle, the form lining shall be adequately supported by variable thickness shim strips on at least 6 inch centers so that the liner forms a circular surface within tolerances specified herein.

(2) Forms for Unexposed Concrete

Forms shall be constructed of a good grade of form lumber that is solid, straight and free from defects which might impair its strength, but need not be of the quality required for contact surfaces of forms for exposed concrete. Forms shall be of shiplap or T 7 G No. 2 wood

sheathing, 3/4 inch plywood, 5/8 inch plywood or approved equal. Panel or patented forms may be used when approval of the ENGINEER.

(3) Form Ties

Form ties shall be as follows:

(a) "Water-Seal" type of ties shall be used for water holding structures or structures subject to flooding.

(b) Non-water holding structures, which are not subject to flooding, shall have ties approved by the ENGINEER.

Form ties shall have a minimum working strength when fully assembled of at least 3,000 pounds. Ties shall be so adjustable in length as to permit tightening of forms and of such type as to leave no metal closer than 1 inch from the surface and they shall not be fitted with any lugs, cones, washers, or other device to act as a spreader within the form or for any other purpose which will leave a hole larger than 7/8 inch in diameter of a depression back of the exposed surface of the concrete. Wire ties shall not be permitted.

19.3 Construction Tolerance

The forms shall be constructed and rigidly braced in place within the following tolerances:

(1) Variation from true alignment as shown on the drawings in the lines and surfaces of walls:

In 10 feet	1/4 inch
In 20 feet maximum	3/8 inch
In 40 feet or more	3/4 inch

(2) Variation from the level or from the grades indicated on the drawings in floors or slabs:

In 10 feet	1/4 inch
In 20 feet maximum	3/8 inch
In 40 feet or more	3/4 inch

(3) Variation in sizes and/or locations of floor and/or wall openings: 1/3 inch

(4) Variation in thickness of slabs and walls and in cross-sectional dimensions of columns and beams:

Minus	¼ inch
Plus	½ inch

(5) Variation in plan dimension of footings:

Minus	½inch
Plus	2 inches

19.4 Wetting and Oiling Forms

The inside surface of wood board forms shall be soaked with clean water and kept

continuously wet for 12 hours before any concrete is placed. In case forms have been erected for some time and have become dry so that joints have opened, then the forms shall be thoroughly soaked at least twice each day for at least 3 days prior to placing concrete. If the forms cannot be tightened to the satisfaction of the ENGINEER, they shall be torn down and rebuilt. Plywood forms may be treated with a non staining form oil, mineral oil or lacquer. If oil is used, all excess oil shall be wiped off with rags to leave the surface of the forms just oily to the touch. In freezing weather, oil shall be used.

Coatings of dust shall be removed from contact surfaces of forms before placing concrete. Concrete shall not be placed in any form until inspected by the ENGINEER and permission is given to start placing.

19.5 Removal

Forms shall not be removed without approval of the ENGINEER. All form removal shall be accomplished in such a manner as to prevent injury to the concrete.

Forms shall not be removed sooner than the following minimum times after the concrete is placed. These periods represent cumulative number of days and fractions of days, not necessarily consecutive, during which the temperature of the air adjacent to the concrete is above 50°F.:

Element	Time
Beams, arches - supporting forms and shoring	14 days
Conduits, deck slabs - supporting (inside) forms and shoring	7 days
Conduits (outside forms), sides of beams, small structures	24 hours
Columns, walls, spillway risers - with side or vertical load	7 days
Columns, walls, spillway risers - with no side or vertical load	4 days
Concreting supporting more than 30 feet of wall in place above it.	7 days
Concrete supporting 20 to 30 feet of wall in place above it.*	4 days

* Age of stripped concrete shall be at least 7 days before any load other than the weight of the column or wall itself is applied.

When conditions on the job are such as to justify the requirements, forms will be required to remain in place for longer periods. Forms for beams, girders, and floor slab shall remain in place for at least seven (7) days and shall only be removed when test cylinders used under the same condition as the members break with a compressive strength as required in these specifications.

19.6 Design, Inspection and Approval of Form Work

The design and engineering of the form work, as well as the construction, shall be the responsibility of the CONTRACTOR. The ENGINEER's approval of form work design and/or

drawings, as submitted or as corrected in no way shall relieve the CONTRACTOR of his responsibility for adequately construction and maintaining the forms so that they will function properly.

Forms, form joints, and reinforcing steel placement shall be checked by the ENGINEER before closing up the forms. Concrete shall not be place in any form until the placing of steel and erection of form work have been completed and approved in the completed state by the ENGINEER. Immediately after completion of pouring, tops of all forms shall be adjusted to line and approved by the ENGINEER as to conformity with the tolerances specified herein.

20. EXPANSION OF CONTRACTION JOINTS

20.1 General

Where required, joints shall be provided at the location indicated on the drawings and according to the details shown, or as otherwise approved. The methods and materials used shall be subject to approval and the materials shall conform to the specification applicable. In no case shall any fixed metal, embedded in concrete be continuous through an expansion or contraction joint, except as specifically detailed in the drawings.

20.2 Expansion Joint Filler

At all expansion joints shown on the drawings, a premolded joint filler of the thickness specified, shall be provided to prevent bond between and allow for the expansion and contraction of adjacent parts. The filler material shall be of sufficient length and width, and shall be accurately cut, matched and placed to prevent contact of the concrete in the parts of the structure to be separated.

Preformed expansion joint filler shall conform to the requirements of ASTM Specifications D 1752, Type I, Type II or Type III, unless bituminous type is specified. Bituminous type preformed expansion joint filler shall conform to the requirements of ASTM Specification D-994.

20.3 Asphalt-Treated Roofing Felt

Two layers of heavy, smooth surface asphalt-treated roofing felt, approximate weight 55 pounds per 100 square feet, shall be place at expansion joints, as shown on the drawings.

20.4 Waterstops

Where required, waterstops shall be installed in joints as shown on the drawings or as otherwise directed to provide a continuous watertight diaphragm in the joint. All joints in metal waterstops shall be brazed or welded. Joints in rubber and plastic waterstops shall be cemented, fused, or vulcanized as recommended by the manufacturer. Adequate provisions shall be made to support and completely protect the waterstops during progress of the work. The CONTRACTOR shall replace or repair, at this own expense, any waterstops punctured, ruptured, or otherwise damaged before final acceptance of the work.

Copper used for waterstops shall conform to ASTM Designation: B-248.

Steel used for waterstops shall conform to ASTM Designation: A-366 or ASTM Designation: A-93

Wrought iron used for waterstops shall conform to ASTM Designation: A-162 or ASTM Designation: A-163.

Plastic material used for waterstops shall conform to ASTM Designation: D-742

The rubber waterstop material shall meet the following physical requirements when and if tested, in accordance with the appropriate sections of Federal Test Method Standard No. 601, ASTM Designation: D-395, and ASTM Designation: D-1432.

Hardness - The Shore A durometer hardness shall be 60 to 70.

Elongation - The elongation shall be a minimum of 400 percent.

Tensile Strength - The tensile strength shall be a minimum of 2,500 pounds per square inch.

Water Absorption - The water absorption shall be a maximum of 5 percent by weight after immersion in water for two (2) days at 158°F.

Tensile Strength After Aging - The tensile strength after accelerated aging for five (5) days at 158°F, shall not be less than 80 percent of the original tensile strength.

Compression Set - The compression set after 22 hours at 158°F., shall not be more than 30 percent.

Specific Gravity - The specific gravity shall be 1.20 plus or minus .05.

20.5 Dowel Bar Assembly

When required, dowel bar assembly shall be installed at the expansion joints as shown on the drawings. The dowel bars shall be plain, smooth steel bars of the size specified on the drawings and shall conform to ASTM Designation: A-15. An expansion sleeve shall be provided on one end of each dowel bar. The sleeve shall be metal of an approved type, crimped or capped on one end and provided a minimum of three (3) inch length of covering of the dowel bar with a minimum of three-quarters (3/4) of an inch expansion chamber beyond the end of the dowel bar. The portion of the dowel bar on the expansion sleeve side of the joint shall be coated with a heavy grease to prevent bond between the bar and the concrete. The dowel bar assembly shall be securely held in place by use of metal dowel chairs at each intersection of a dowel bar and spacer bar. The dowel bars shall be installed on proper horizontal and longitudinal alignment to assure a workable expansion device. The premolded joint filler at these expansion joints shall be held in a true vertical plane by means of a header board. The header board shall remain in place for a minimum of thirty (30) minutes after the concrete has been placed on one side or until the concrete has set sufficiently to prevent sloughing, before the header is removed and the work of placing concrete continued.

21. FURNISHING AND PLACING STEEL REINFORCEMENT

The furnishing and placing of reinforcing steel, when specified, is covered in a separate technical specification.

22. EMBEDDED ITEMS

22.1 General

Before placing concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings or required by the ENGINEER. All embedded items shall be thoroughly clean and free of oil and other foreign matter such as loose coatings of rust, paint and scale. The embedding of wood or other perishable materials in concrete shall be prohibited unless specifically directed or authorized by the ENGINEER. Any air lines, water lines, wall sleeves, or other materials embedded in structures, as construction expedients authorized by the ENGINEER, shall conform to the above requirements and, upon completion of their use, shall be backfilled with concrete or grout as directed by the ENGINEER.

22.2 Pipe Embedded in Concrete

Where pipe is partially or wholly encased in concrete, care shall be taken that the pipe is firmly and securely held in place so that the alignment and grade of the pipe is not disturbed while the concrete is placed around the pipe.

23. CONCRETE ANTISEEP COLLARS

23.1 General

Where required, concrete antiseep collars shall be constructed as shown on the drawings and as specified herein.

23.2 Construction

Concrete work shall be performed in accordance with these specifications on concrete. The vertical surfaces of the antiseep collars shall be formed throughout, except for that portion of the antiseep collar which is below the bottom of the lower conduit slab or the collar which is below the bottom of the lower barrel slab or the bottom of the pipe cradle may use the natural ground as forms when approved by the ENGINEER. The antiseep collars shall be poured from their bottom to the elevation of the bottom of the lower conduit slab or the bottom of the pipe cradle (first pour). If forms are used in the first pour, they may be removed after forty-eight (48) hours and the excavation for the antiseep collar below the elevation of the conduit subgrade shall be backfilled with the most impervious earth fill material available at the dam site. This backfill shall be placed in layers not more than four (4) inches thick and each layer thoroughly tamped to secure a dense, well-compacted fill. Care shall be exercised to use material of near optimum moisture content so as to secure a good density of the backfill. The remainder of the antiseep collar (second pour) shall be poured monolithically, or in one pour, only after the adjacent conduit section, or pipe and cradle section has been completed. Three-fourths (3/4) inch premolded joint filler shall be placed between the sides and top of the conduit and the antiseep collar and two (2) layers of heavy asphalt-treated roofing felt shall be place between the bottom of the conduit and antiseep collar as indicated on the drawings. The joint filler and the roofing felt shall extend for the full thickness of the collar (measured along the conduit.)

24. CONCRETE CRADLES AND/OR BEDDING

24.1 General

Concrete cradles, expansion and contractor joints for pipe shall be constructed as shown on the drawings, or herein specified and as directed by ENGINEER.

24.2 Construction

Concrete work shall be performed in accordance with these specifications on concrete. The vertical surfaces of the cradle, expansion and contraction joints shall be formed. The cradle shall be poured with the pipe in place and to line and grade. Construction joints that are used shall conform with the requirements of paragraph 16. Expansion and contraction joints shall conform with requirements of paragraph 20.

25. SEALING JOINTS IN CONCRETE AND CONCRETE PIPE

25.1 General

This specification covers the requirements for sealing or filling joints in concrete pipe and concrete structures where expansion joint material is not used.

25.2 Type

The sealing compound shall be a cold-application mastic, single component or multiple component type.

The single component type shall be a ready-mixed nondrying compound furnished in troweling consistency or in preformed rope or strip form.

The multiple component type shall be composed of two or more substances that are to be mixed prior to application.

25.3 Quality

Sealing compound shall conform to the requirements of one of the following specifications:

ASTM Specification D 1850; Concrete Joint Sealer, Cold-Application Type. Penetration, determined as specified in ASTM D 1850, shall be not greater than 120.

Federal Specification SS-S-99210; Sealing Compound, preformed Plastic, for Expansion Joints and Pipe Joints.

Federal Specification TT-S-227; Sealing Compound; Rubber base, Two Component (For Caulking, Sealing and Glazing in Building Construction), Type II.

25.4 Application

The compound will be applied using manufacturer's instructions to joints identified in the plans or as otherwise required in accordance with good construction practices.

The compound shall be capable of being applied at a temperature of 70ºF and shall be of such nature that it will adhere to dry, dust free concrete when applied either directly or over a material that forms an airtight seal and is capable of filling joints to prevent the entry of subsequently placed concrete or earth during the construction operations.

26. GROUT

Grout under equipment bases, for wall sleeves, and anchorage requirements shall be an approved nonshrink sand-cement mortar.

27. PAYMENT

Payment for all concrete work shall be included in the applicable unit price bid.

PART IX
Special Provisions

PART IX

SPECIAL PROVISIONS

1.0 GENERAL

This section describes the work to be done as it relates to the other sections of these specifications. The method of bidding for the various contract items is also indicated. As described in the advertisement, the project consists of one contract.

1.1 WORK LIMITS

CONTRACTOR shall confine all of his construction activities within the property owned or easements obtained by the owner, unless written permission is obtained from adjacent owners. The CONTRACTOR shall provide all facilities necessary to meet his own requirements as to field office (including telephone and answering machine), toilet facilities, storage facilities, work shop, etc.

Attention is directed to the fact that several contracts may be may be awarded simultaneously. The CONTRACTOR shall consult the specifications for all the other contracts, if applicable, and the relation of those contracts to his work. The CONTRACTOR shall cooperate with the ENGINEER and the other contractors to the fullest extent, to ensure progress on the project and to avoid unnecessary delays to, or interference with, work under the other contracts.

Each CONTRACTOR shall schedule his work and construct the different parts of the system in accordance with the instructions and requirements of the ENGINEER.

1.2 USE OF EXPLOSIVES

The transportation, handling, storage and use of dynamite and other explosives shall be directed and supervised by a person of proven experience and ability in blasting operation. All blasting operations shallbe in accordance with applicable local, state, and federal laws. Before any explosives are brought on the job, permission to do so shall be obtained from the ENGINEER. All blasts shall be fired electrically with an electric blasting machine.Where detonating cord is used as a detonating agent, the detonation cord shall be fired with an electric blasting cap. Delay electric detonators shall be used for all delayed blasts. Blasting machines used for firing shall be known to be in good condition and of sufficient capacity to fire all charges. Rubber covered or other adequately insulated copper wires in good condition shall be used for firing lines and shall have solid cores of appropriate gage.

Sufficient firing lines shall be provided to permit the blaster to be located at a safe distance from the blasts. Single conductor lead lines shall be used. All operations involving the handling or use of explosives shall be discontinued during approach of a thunderstorm or while it is in progress. Blasting operations in the proximity of overhead power lines, communications lines, or other structures shall not be carried on until the operator and/or owner of such lines has been notified and precautionary measures deemed necessary have been taken. All holes located on a shift shall be fired on the same shift. The use of black powder is prohibited.

2.0 DESCRIPTION OF BID ITEMS:

A. The following items are included in the water main portion of Contract 9:

Item 1 - This item includes the cost of all material and all the work necessary to lay and install waterline. All incidental work for a complete and workable installation shall be performed including trenching, any rock excavation, standard pipe bedding, provisions of required fittings, tracer wire, thrustblocking, backfilling, taping (including sleeve and taping valve), seeding, sodding, crop damage, flumes, standard stream crossings, fencing, line testing, line sterilization, tie-ins to existing lines, and all other work required, but not specifically covered by another bid item. Pipe will be measured along the centerline of the pipe from the center of the connecting fitting to the end of the pipe with no deductions for valves and fittings. Carrier pipe installations in special crossings will be included in this item. Where alternate pipe materials are shown, only the amount determined by the lowest unit price shall be forwarded to the total column. All pipe bids will be classed in accordance to the PVC and DIP ratings listing in the Bid Schedule. Pipe shall be JM / Eagle or approved equal. All fittings (tees, elbows, etc.) shall be mechanical joint, Union Tyler, American Cast Iron or equal.

Item 2 - This item includes the cost of open cutting highways and the cost of new 0.25 inch steel casing pipe for a future road installation. The size of the carrier pipe for which casing will be required is listed. Because casing sizes vary for pipe materials of the same diameter, the CONTRACTOR should refer to the Standard Details to determine the sizes required for the pipe he intends to use. The carrier pipe will be paid for under the units bids for furnishing and laying pipe and not under this item. Payment will be based in the required open sitting length.

Item 3 - Payment for gate valve assemblies furnished, delivered and installed on the distribution lines, shall be made at the unit price bid and shall include pipe connections, tracer wire, thrust blocking, valve boxes, covers, extensions, and 2 valve wrenches for the project. Valves shall be American Flow or approved equal.

Item 4 - This item includes furnishing, delivery and installing fire hydrant assemblies as shown in the standard details and shall include all fittings, gate valves, thrust-blocking, excavation, stone bedding and backfilling as specified. Payment will be based on the cost for each assembly. Hydrants shall be American Flow 84B with 5-1/4" valve or equal.

Item 5- This item includes the cost of furnishing the materials, labor and equipment necessary to construct miscellaneous concrete structures as may be deemed necessary through the progress of the job. To be paid per cubic yard of concrete required to construct as per any detailed drawings
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Item 6 - This item includes the complete installation of special creek crossings as detailed in the drawings. The crossings include casing pipe and are to extend 10 feet into each bank. The Type "A" crossing is paid per anchor bag on four foot center required. The Type "B" crossing is paid per linear foot of concrete and encasement pipe required. The carrier pipe is paid separately under Item 1.

Item 7 - This item includes the complete installation of a gravity sewer main crossing. It includes the cost for steel casing pipe with casing spacers and end seals. The carrier pipe will be paid for under the units bids for furnishing and laying pipe and not under this item. Payment will be based in the required open sitting length

Item 8 - This item is to pay for connecting the new main to the existing main by way of taping valves and sleeves. It includes all materials, excavation, taping the existing main and restoration of the connection site. Contractor may at his option make the connection by cutting in a tee which requires installation of 3 gate valve assemblies around the tee to be paid by this bid item and not separately as gate valve assemblies.