discovered following the pressure test shall be repaired or replaced with new material, and the test shall be repeated until satisfactory to the Owner.

3.4.5 LEAKAGE DEFINED

a. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi (35 MPa or 0.35 bars) of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

3.4.6 ALLOWABLE LEAKAGE

a. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

Where:

L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge)

b. This formula is based on an allowable leakage of 11.65 gpd/mi/in of nominal diameter at a pressure of 150 psi.

c. Allowable leakage at various pressures is shown in Table I.

d. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gph/in. (0.0012 L/h/mm) of nominal valve size shall be allowed.

e. When hydrants are in the test section, the test shall be made against closed hydrant valves.

3.4.7 ACCEPTANCE OF INSTALLATION

a. Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified in Section 3.4.6, the Contractor shall, at his own expense, locate and make approved repairs as necessary until the leakage is within the specified allowance.

b. All visible leaks are to be repaired, regardless of the amount of leakage.

TABLE I Allowable Leakage per 1000 ft (305 m) of Ductile Iron Pipeline*--gph†

Average Pressure psi (bar)		Nominal Pipe Diameter--*in.*															
		3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	50
450	(31)	0.48	0.64	0.95	1.27	1.59	1.91	2.23	2.55	2.87	3.18	3.82	4.78	5.73	6.69	7.64	8.60
400	(28)	0.45	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.60	4.50	5.41	6.31	7.21	8.11
350	(24)	0.42	0.56	0.84	1.12	1.40	1.69	1.97	2.25	2.53	2.81	3.37	4.21	5.06	5.90	6.74	7.58
300	(21)	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60	3.12	3.90	4.68	5.46	6.24	7.02
275	(19)	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49	2.99	3.73	4.48	5.23	5.98	6.72
250	(17)	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41
225	(16)	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25	2.70	3.38	4.05	4.73	5.41	6.03
200	(14)	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12	2.55	3.19	3.82	4.46	5.09	5.73
175	(12)	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59	1.79	1.98	2.38	2.98	3.58	4.17	4.77	5.36
150	(10)	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84	2.21	2.76	3.31	3.86	4.41	4.97
125	(9)	0.25	0.34	0.50	0.67	0.84	1.01	1.18	1.34	1.51	1.68	2.01	2.52	3.02	3.53	4.03	4.53
100	(7)	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.80	2.25	2.70	3.15	3.60	4.05

* If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

† To obtain leakage in liters/hour, multiply the values in the table by 3.785.

4.0 RESPONSIBILITY FOR MATERIAL

4.1 Responsibility for material shall be as follows:

4.2 Responsibility When Furnished by Contractor

4.2.1 The Contractor shall be responsible for all materials furnished by him and shall replace at his own expense all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all material and labor required for the replacement of installed materials discovered defective prior to the final acceptance of the work.

4.3 Responsibility When Furnished by Owner

4.3.1 The Contractor's responsibility for material furnished by the Owner shall begin at the point of delivery thereof to said Contractor. Materials located at the site shall become the Contractor's responsibility on the day of the awarding of the Contract. The Contractor shall examine all material furnished by the Owner at the time and place of delivery to him and shall reject all defective material. Any material furnished by the Owner and installed by the Contractor without discovery of such defects will, if found defective prior to final acceptance of the work, replaced defective material. The Contractor shall at his own expense furnish all supplies, labor and facilities necessary to remove said defective material and install the sound material in a manner satisfactory to the Engineer.

4.4 Responsibility for Safe Storage

4.4.1 The Contractor shall be responsible for the safe storage of material furnished by or to him and accepted by him, and intended for the work, until it has been incorporated in the completed project. The interior of all pipe, fittings and other accessories shall be kept in a manner that will protect them from damage by freezing.

4.5 Replacement of Damaged Material

4.5.1 Any material furnished by the Owner that becomes damaged after acceptance by the Contractor shall be replaced at his own expense.

5.0 HANDLING OF MATERIAL

5.1 All materials shall be handled as outlined herein.

5.2 Hauling

5.2.1 All materials furnished by the Contractor shall be delivered and distributed at the site by the Contractor. Materials furnished by the Owner shall be picked up by the Contractor at points designated and hauled to and distributed at the site.

5.2.2 Pipe, fittings, valves, hydrants and accessories shall be loaded and unloaded by lifting with hoists or skids so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against

pipe already on the ground. In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench.

5.3 Care of Pipe Coating and Lining

5.3.1 Pipe shall be so handled that the coating and lining will not be damaged. If any part of the coating or lining is damaged, the repair shall be made by the Contractor at his own expense in a manner satisfactory to the Engineer.

6.0 ALIGNMENT AND GRADE

6.1 Water mains shall be located as shown on the drawings, or as directed by the Engineer or his representative. The water mains shall be laid and maintained to the required lines and grades with fittings, valves and hydrants at the required locations. All spigots shall be centered in bells and all valves and hydrant stems shall be plumb.

6.2 DEVIATIONS CAUSED BY OTHER STRUCTURES

6.2.1 Whenever obstructions not shown on the plans are encountered during construction and interfere to such an extent that an alteration in the plans is required, the Engineer or his representative shall have the authority to change the plans and order a deviation from the line as shown on the plans.

6.2.2 The Engineer may arrange with the Owners of the structure(s) for the removal, relocation or reconstruction of the obstructions. If a deviation in the plans results in a change in the amount of work to be performed by the Contractor, the altered work shall be done on the basis of payment to the Contractor for extra work or credit to the Owner for less work.

6.3 EXCAVATION CAUTION

6.3.1 The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of any underground structures, both known and unknown, may be determined. The Contractor shall be responsible for the repair of such structures or utilities when broken or otherwise damaged because of carelessness on his part or his representative's part.

6.4 DEPTH OF PIPE

6.4.1 All pipe shall be installed according to the depth shown on the contract drawings or as required in the Detailed Specifications. Any deviation therefrom shall be made only at the order of the Engineer or his representative. Greater depths will be required for smooth transitions at points of abrupt changes in the ground surface, or under railroads, streams, county roads and highways.

6.4.2 Unless otherwise noted, polyvinyl chloride (PVC) pipe shall be acceptable water line material for use under roads that are not under the jurisdiction of an agency requiring higher pipe standards. The pipe cover on the State highway, county and private road crossings shall be a minimum of forty-two (42) inches over the entire right-of-way.

7.0 EXCAVATION AND PREPARATION OF THE TRENCH

7.1 The trench shall be dug so that the pipe can be laid to the alignment and depth required, and it shall be excavated only so far in advance of pipe laying as specified or permitted by the Engineer or his representative. The trench shall be so braced and drained that the workmen may work therein safely and efficiently. The sides of the trenches shall be as nearly vertical as possible, or as shown on the plans. The discharge of the trench dewatering pumps shall flow to natural drainage channels, drains or storm sewers.

7.2 Hand methods for excavation shall be used in locations shown on the drawings. In other locations, the Contractor may use trench digging machinery or employ hand methods.

7.3 WIDTH of TRENCH

7.3.1 The width of the trench shall be sufficient to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted as specified. Trenches shall be of extra width, when required, to permit the convenient placing of supports, sheeting and bracing and handling of specials.

7.4 PIPE CLEARANCE in ROCK

7.4.1 A minimum clearance to rock of six (6) inches shall be provided below and on each side of all pipe, valves, hydrants and fittings for pipe less than twenty-four (24) inches in diameter. All rock, boulders, ledge rock and other large stones shall be removed to provide this minimum of six (6) inches clearance. These clearances shall increase to a minimum of nine (9) inches for pipe twenty-four (24) inches in diameter and larger. This minimum specified clearance is a minimum clear distance which will be permitted between any part of the pipe or pipe appurtenances being laid to a point of projection such as a rock, boulder or stone.

7.4.2 All irregularities of the rock shall be filled with earth or sand that has been well rammed into place and the bottom of the trench brought to the proper grade and shape before the pipe is laid. The subgrade shall be made in backfilling with an approved material in three (3) inch compacted layers. The preparation of the subgrade shall be in accordance with the provisions outlined in following.

7.5 TRENCH PREPARATION

7.5.1 The trench shall be excavated to a minimum of three (3) inches and not more than six (6) inches below the specified grade. Before the pipe is laid, the subgrade shall be made by backfilling with an approved material in three (3) inch uncompacted layers. The layers shall be thoroughly tamped as directed by the Engineer to provide a continuous and uniform bearing and support for the pipe at every point between bell holes. The only exception is that it will be permissible to disturb and otherwise damage the finished surface over a maximum length of eighteen (18) inches near the middle of each length of pipe for the withdrawal of pipe slings or other lifting tackle. The finished subgrade shall be prepared accurately by means of hand tools. Excavations carried below the grade specified on the plans, by the Engineer or his representative shall be backfilled at the Contractor's expense with earth, sand, gravel, or concrete as directed by the Engineer or his representative and thoroughly compacted.

7.5.2 The subgrade beneath the centerline of the pipe shall be finished to within 0.03 feet of a straight line between pipe joints and all tolerances shall be above the specified grade. If, in the opinion of the Engineer, soil conditions are encountered at subgrade which require all or part of the work to be done in accordance with Section 7.7, the Engineer shall have the authority to order the work to be done and the Contractor will be allowed extra compensation for the additional work.

7.6 EXCAVATION in POOR SOIL and REFILLING to GRADE

7.6.1 Where the bottom of the trench at subgrade is found to be unstable or to include ashes, cinders, all types of refuse, vegetation or other organic materials, or large pieces or fragments of inorganic material which in the judgment of the Engineer or his representative should be removed, the Contractor shall excavate and remove such unsuitable material to the width and depth ordered by the Engineer. Before the pipe is placed, the subgrade shall be made by backfilling with an approved material in three (3) inch compacted layers. The remainder of the installation of the pipe and preparation of the subgrade shall be in accordance with the specifications outlined in Section 7.5 above.

7.7 SPECIAL FOUNDATION IN POOR SOIL

7.7.1 Where the bottom of the trench at subgrade is found to consist of material which is unstable to such a degree that, in the opinion of the Engineer, it cannot be removed and replaced with an approved material thoroughly compacted in place to support the pipe properly, the Contractor shall construct a foundation to support the pipe, consisting of piling or other materials, in accordance with plans prepared by the Engineer. Extra compensation will be allowed for the additional work.

7.8 SUBGRADE IN ROCK TRENCHES

7.8.1 Where excavation is made in rock or boulders and the clearance specified in Section 7.4 is provided, the subgrade shall be made in backfilling with an approved material in three (3) inch uncompacted layers. The preparation of the subgrade and the installation of the pipe shall be in accordance with the provisions outlined in Section 7.5 above.

7.9 ROCK EXCAVATION

7.9.1 Trench excavation will be unclassified unless the Detailed Specifications and proposal make a provision for payment for rock excavation. Otherwise, it is not a separate pay item and its cost shall be included in the unit prices bid for the various items of construction listed.

7.9.2 The word "rock", wherever used as the name of an excavated material, shall be defined as boulders and pieces of concrete or masonry exceeding 250 pounds in weight or solid ledge rock which, in the opinion of the Engineer, requires for its removal, drilling and blasting, wedging, sledging or barring, or disintegrating with a power-operated hand tool.

7.9.3 No soft or disintegrated rock which can be removed with a hand pick or a 5/8 cubic yard backhoe, under reasonable operating procedures; no loose, shaked or previously blasted rock or broken stone in rock filling or elsewhere shall be considered "rock." Also, no rock

exterior to the minimum limits of measurement allowed which may fall into the excavation will be measured or allowed.

7.10 BLASTING

7.10.1 The use of dynamite or other blasting materials will be permitted upon approval of the Engineer. This approval will be contingent upon the Contractor having taken all adequate safety precautions to protect persons and property. The hours of blasting shall be fixed by the Engineer. Any damage resulting from any necessary blasting shall be paid by the Contractor at his own expense. The Contractor's methods and procedures shall conform to all local and State laws and ordinances.

7.11 OCCUPATIONAL SAFETY and HEALTH ACT of 1970

7.11.1 Requirement for protective systems. Contractor shall be comply with the Standard for Excavation and Trenches Safety Systems, 29 CFR, Part 1926, Subpart P, of the Occupational Safety and Health Administration.

7.12 SURFACE MATERIAL REUSE

7.12.1 All surface materials which, in the opinion of the Engineer or his representative, are suitable for reuse in restoring the surface shall be kept separate from the general excavation material as directed.

7.13 PILING EXCAVATED MATERIAL

7.13.1 All excavated material shall be stockpiled in a manner that will not endanger the work and will avoid obstructing sidewalks and driveways. Hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, fire and police call boxes, or other utility controls shall be left unobstructed and accessible while work is being completed.

7.13.2 Gutters shall be kept clear or other satisfactory provisions made for street drainage. Natural water courses shall not be obstructed. In the event that it is necessary to place the excavated materials on any sidewalk, the Contractor shall keep the excavated materials a minimum of four (4) feet from the front of all buildings and from the inner portion of the sidewalk.

7.14 BARRICADES, GUARDS and SAFETY PROVISIONS

7.14.1 To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, red lanterns and guards, as required, shall be placed and maintained during the progress of the construction and until it is safe for traffic to use the roadway. All material piles, equipment and pipe which may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lighting when visibility is poor. The rules and regulations of the local authorities respecting safety provisions shall be observed and the contractor shall be in compliance with the Manual on "Uniform Traffic Control Devices."

7.15 TRAFFIC MAINTENANCE AND CLOSING OF STREETS

7.15.1 The Contractor shall perform the work which will cause the least interruption to traffic and may close to through travel not more than two (2) consecutive blocks, including the cross-street intersected. The Contractor shall post, where directed by the Engineer or his representative, suitable signs indicating that a street is closed and necessary detour signs for the proper maintenance of traffic.

7.15.2 Where traffic must cross open trenches, the Contractor shall provide suitable bridges or bypasses, as required, for the proper handling of traffic on streets and driveways. Barricades and other warning devices shall be provided at such locations as required by the Engineer to provide safety for the general public.

7.16 STRUCTURE PROTECTION

7.16.1 Temporary support, adequate protection and maintenance of all underground and surface structures, drains, sewers and other obstructions encountered in the progress of the work shall be furnished by the Contractor at his expense and under the direction of the Engineer. All structures which may have been disturbed shall be restored upon completion of the work.

7.17 PROTECTION OF PROPERTY AND SURFACE STRUCTURES

7.17.1 Trees, shrubbery, fences, poles and all other property and surfaces structures shall be protected unless their removal is shown on the plans or is authorized by the Engineer. When it is necessary to cut roots and tree branches, the cutting shall be done under the supervision and direction of the Engineer or his representative. No excavated material shall be placed that could injure trees or shrubs.

7.17.2 All broken branches shall be neatly cut off with a saw or approved method and stumps shall be treated, if the tree's health is threatened.

7.17.3 Trees or shrubs damaged or destroyed by the Contractor shall be replaced by him with new stock of a similar size and age and at the proper season. They shall be replaced at the sole expense of the Contractor.

7.18 LICENSES AND PERMITS

7.18.1 Unless otherwise stated in the Detailed Specifications, the Owner shall obtain the necessary permits for Street, Highway, County Road and Railroad Crossings required by the respective agencies and local ordinances. The Owner will pay any deposits required by the respective entities to insure satisfactory restoration of the properties involved. The Owner shall deduct that amount from the first payment due the Contractor until final approval and acceptance of the work by the Engineer at which time the deposit shall be refunded. In the event the Contractor posts the necessary bonds, no deposit will be withheld. Under no circumstances shall the Contractor proceed with any street, road, highway or railroad crossing until the required permit for such crossing has been obtained and the necessary bond posted.

7.18.2 The Contractor shall comply with all applicable laws, ordinances, rules and regulations relating to the work.

8.0 WATER MAIN INSTALLATION

8.1 LAYING PIPE

8.1.1 Every precaution shall be used to protect pipe against the entrance of foreign material before the pipe is placed in the new trench. At the close of the day's work, or whenever the workmen are absent from the job site, the end of the last laid section of pipe shall be plugged, capped or otherwise tightly closed to prevent the entry of any foreign material.

8.1.2 If the Contractor's pipe laying crew cannot put the pipe in place in the trench without getting soil into the pipe, the Engineer or his representative may require that before lowering the pipe into the trench, a canvas or plastic bag shall be placed over each end and left there until the connection is to be made to the adjacent pipe.

8.2 PREVENTION of TRENCH WATER from ENTERING PIPE

8.2.1 At times when pipe laying is not in progress, the open end of the pipe shall be closed by a watertight plug or other means approved by the Engineer or his representative. If water is in the trench, the seal shall remain in place until the trench is dewatered.

8.3 TRACER WIRE

8.3.1 Tracer wire shall be installed with all water mains and service lines. The tracer wire shall extend into and to the top of all valve boxes, underground vaults and any other water appurtenances where the tracer wire would be accessible to connecting an electronic locator device.

8.3.2 Tracer wire shall consist of a #14 AWG solid, single conductor, insulated copper wire and shall lay along the side of all piping and service lines and shall be within 6 inches on every side of the pipe installed as directed by the Engineer's Construction Observer.

8.3.3 All tracer wire connections are to be made by stripping the insulation from the wire and using Burndy crimp connections. All connections shall be waterproofed and protected using an epoxy filled, heat shrink wrap. Any other connection types shall be approved by the Engineer.

8.3.4 All tracer wire shall be tested using an Ohm meter once a section of water main has been installed and end points developed. This test shall be done in the presence of the Engineer's Representative. Also if a portion of the water main is uncovered (i.e. leak detection) the Contractor shall retest the tracer wire for continuity after all repairs are completed.

9.0 INSTALLING VALVES AND FITTINGS

9.1 Valves, fittings, plugs and caps shall be installed and jointed to pipe in the following manner specified for cleaning, laying and jointing pipe.

9.2 LOCATION OF VALVES

9.2.1 Valves in water mains shall, where possible, be located as shown on the plans, or as directed by the Engineer or his representative.

9.3 VALVE BOXES AND VALVE PITS

9.3.1 A valve box or a masonry pit shall be provided for each valve.

9.3.2 The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve to provide easy access with a valve wrench and operate with a non-binding operation. The box cover shall be flush with the surface of the finished pavement or other level as may be directed. A two (2) feet square by six (6) inch thick concrete collar shall be constructed around all valve boxes as shown on the plans.

9.3.3 A masonry valve pit shall be provided for every valve which has exposed gearing or operating mechanisms. The valve nut shall be readily accessible for operation through the opening of a manhole, which shall be set flush with the surface of the finished pavement or other such level as may be specified. Pits shall be so constructed as to permit minor valve repairs and afford protection to the valve and pipe from impact where they pass through the pit walls.

9.4 DRAINAGE OF MAINS

9.4.1 Drainage branches, blow-offs, air vents and appurtenances shall be provided with gate valves and shall be located and installed as shown on the plans. Drainage branches or blow-offs shall not be connected to any sewer, submerged in any stream or be installed in any other manner that will permit back-siphon into the water distribution system.

9.5 DEAD ENDS

9.5.1 All dead ends on new mains shall be closed with cast iron plugs or caps and a flush hydrant, or as shown on the drawings.

10.0 INSTALLING HYDRANTS

10.1 LOCATION

10.1.1 Hydrants and flush hydrants shall be located as shown on the plans or as directed by the Engineer, and in a manner to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians. When placed beyond the curb, the hydrant barrel shall be set so that no portion of the pumper or hose nozzle cap will be less than six (6) inches nor more than twelve (12) inches from the back of the curb, unless otherwise approved. When set in the parkway between the sidewalk and the property line, no portion of the hydrant or hose nozzle cap shall be within six (6) inches of the sidewalk.

10.2 POSITION

10.2.1 All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb or roadway. Hydrants with a pumper nozzle shall face the curb or roadway.

Hydrants having two hose nozzles 90° apart shall be set with each nozzle facing the curb or roadway at an angle of 45°. Hydrants shall be set to the established grade, with the nozzles at least twelve (12) inches above the ground, as shown or as directed by the Engineer or his representative.

10.3 CONNECTION TO THE MAIN

10.3.1 Each hydrant shall be connected to the main with a six (6) inch ductile iron branch controlled by an independent six (6) inch gate valve, unless otherwise specified.

10.4 HYDRANT DRAINAGE IN IMPERVIOUS SOIL

10.4.1 Wherever a hydrant is set in clay or other impervious soil, a drainage pit two (2) feet in diameter and three (3) feet deep shall be excavated below each hydrant and filled with a compacted coarse gravel or crushed stone mixed with coarse sand, under and around the elbow of the hydrant and to a level of six (6) inches above the waste opening. No drainage pit shall be connected to a sewer.

10.5 HYDRANT USAGE

10.5.1 Hydrants shall remain covered with visqueen plastic until the water main has been approved for usage.

11.0 ANCHORAGE

11.1 ANCHORAGE FOR HYDRANTS

11.1.1 The bowl of each hydrant shall be well braced against unexcavated earth at the end of the trench with concrete backing and shall be tied to the pipe with suitable restraining glands, metal tie rods or clamps, as shown or as directed by the Engineer.

11.2 ANCHORAGE FOR PLUGS, CAPS, TEES AND BENDS

11.2.1 All plugs, caps, tees and bends deflecting 22½° or more on mains eight (8) inches in diameter or larger shall be provided with a reaction backing and shall use suitable restraining gland, metal rods or clamps as shown or specified. All plugs, caps, tees and bends deflecting 22½° or more on mains less than eight (8) inches in diameter shall be backed as shown on the Typical Details sheet of the plans.

11.2.2 Backing shall be of concrete, as specified, and shall be placed between the solid wall of the trench and the fittings to be anchored. The reaction block on the unused branch of a fitting shall be poured separately from the block across the back of the fitting.

11.3 REACTION BACKING CONCRETE

11.3.1 Reaction backing shall be concrete of a mix not leaner than one part cement, two and one-half parts sand, and five parts stone, and having a compressive strength of not less than 3,000 psi at 28 days. Backing shall be placed between the solid ground and the fitting to be anchored. The area of bearing on the pipe and on the ground, in each instance, shall be that shown or directed by the Engineer or his representative. The backing shall, unless

otherwise shown or directed, be placed so the pipe, fitting joints and bolts will be accessible for repair. All fittings shall be enclosed in plastic before backing is placed so concrete will not attach to the fitting, glands and bolts.

11.4 METAL HARNESS

11.4.1 Metal harness of tie rods or clamps of adequate strength to prevent movement may be used instead of concrete backing, as directed by the Engineer. Steel rods or clamps shall be rustproof treated or shall be painted as directed by the Engineer.

11.5 RESTRAINING GLANDS

11.5.1 Restraining glands can be used to prevent movement instead of concrete backing or metal harnesses. The restraining glands shall be manufactured by EBAA Iron, Inc. or equivalent.

12.0 BACKFILLING

12.1 GENERAL

12.1.1 Backfilling shall follow close behind completed installation of water mains.

12.1.2 All backfill material shall be free from cinders, ashes, refuse, vegetation or organic material, boulders, rock or stone, or other material which in the opinion of the Engineer or his representative, is unsuitable. However, from one (1) foot above the top of the pipe to the subgrade of the pavement, material containing stones up to eight (8) inches in their greatest dimension may be used, unless specified otherwise herein.

12.2 USE of EXCAVATED MATERIAL as BACKFILL

12.2.1 When the type of backfill material is not indicated on the drawings or specified, the Contractor may backfill with the excavated material. This material shall consist of loam, clay, sand, gravel or other materials which, in the opinion of the Engineer or his representative, are suitable for backfilling. Where excavated material is indicated on the drawings or specified for backfill and there is a deficiency due to a rejection of part thereof by the Engineer or his representative, the Contractor shall furnish the required amount of sand, gravel or other approved material. The trench shall be backfilled with select materials by hand or by approved mechanical methods.

12.3 BEDDING MATERIAL

12.3.1 Where bedding material is indicated on the drawings or specified herein and in the opinion of the Engineer or his representative should be used in any part of the work, the Contractor shall furnish and backfill with bedding material as directed, as an extra. The bedding material shall be as a No. 6 (ASTM C33, latest revision) and shall have a maximum particle size of ¾ inch and have at least 30% passing the ⅜ inch sieve.

12.4 BACKFILLING UNDER the PIPE

12.4.1 All trenches, whether the pipe, fittings and appurtenances are laid on a flat bottom at subgrade, laid on a fill or laid on blocking, shall be backfilled **"by hand"** from the bottom

of the trench to the centerline of the pipe with an approved material placed in layers of three (3) inches, and compacted by tamping. Backfilling material shall be deposited in the trench for its full width on each side of the pipe, fittings and appurtenances simultaneously.

12.5 BACKFILLING OVER the PIPE

12.5.1 From the centerline of the pipe, fittings and appurtenances to a depth of six (6) inches above the top of the pipe, the trench shall be backfilled with select materials by hand or by approved mechanical methods. The Contractor shall use special care in placing this portion of the backfill so as to avoid injury or moving of the pipe. The select material used for bedding over the pipe shall meet the criteria stated in Section 12.3.

12.6 BACKFILLING to GRADE

12.6.1 From a minimum of six (6) inches above the pipe to the grade shown on the drawings or specified herein, the trench shall be backfilled by hand or approved mechanical methods.

12.7 BACKFILLING UNDER PERMANENT PAVEMENT

12.7.1 Where the excavation is made through permanent pavement, curbs, driveways or sidewalks, or where such structures are undercut by the excavation, the entire backfill to the subgrade of the structures shall be made with select materials. The top twelve (12") inches of material shall be SB-2 baserock under these structures. Such material shall be thoroughly compacted with mechanical tamps to the base of the surface to be replaced. Walks and driveways consisting of broken stone, gravel, slag or cinders shall not be considered as being of permanent construction.

12.8 BACKFILLING WHERE SETTLEMENT is UNIMPORTANT

12.8.1 Unless otherwise specified, the Contractor may backfill the trench from one (1) foot above the pipe to the top of the trench with the excavated material, and the backfill shall be neatly rounded over the trench to a sufficient height to allow for settlement or grade after consolidation.

12.9 BACKFILLING in FREEZING WEATHER

12.9.1 Backfilling shall not be done in freezing weather except by permission of the Engineer, and shall not be made with frozen material. No fill shall be made where the material already in the trench is frozen.

13.0 REMOVAL, RESTORATION AND MAINTENANCE OF SURFACE

13.1 PAVEMENT REMOVAL

13.1.1 The Contractor shall remove pavement and road surfaces as part of the trench excavation. The amount removed shall depend upon the width of trench specified for the installation of the pipe and the width and length of the pavement area required to be removed for the installation of gate valves, specials, or other structures. The width of pavement removed along the normal trench for the installation of the pipe shall not exceed the width of the trench specified by more than six (6) inches on each side of the trench. The width and

lengths of the pavement removed for the installation of gate valves, specials, or other structures shall not exceed the maximum linear dimensions of such structures by more than six (6) inches each side.

13.1.2 Wherever, in the opinion of the Engineer, existing conditions make it necessary or advisable to remove additional pavement, the Contractor shall remove it as directed and shall receive extra compensation, provided such additional work is not shown on the drawings or specified.

13.1.3 The Contractor shall use such methods, either saw cut, drilling or chipping, as will assure the breaking of the pavement along straight lines. The cut surface of the remaining pavement shall be approximately vertical.

13.1.4 If the Contractor removes or damages pavement or surfaces beyond the limits specified above, such pavement and surfaces shall be replaced or repaired at the expense of the Contractor.

13.2 RESTORATION of DAMAGED PROPERTY and SURFACES

13.2.1 Where any pavement, trees, shrubbery, fences, poles or other property and surface structures have been damaged, removed or disturbed by the Contractor, whether deliberately or through failure to carry out the requirements of the contract documents, State laws, municipal ordinances or the specified direction of the Engineer; or through failure to employ usual and reasonable safeguards, such property and surface structures shall be replaced or repaired at the expense of the Contractor.

13.3 REPLACEMENT of STRUCTURES and PAVEMENT by the CONTRACTOR

13.3.1 The Contractor shall restore, unless otherwise stipulated, all pavement, sidewalks, curbing, gutters, shrubbery, fences, poles or other property and surface structures removed or disturbed as a part of the work to an equal to or better condition than before the work began, furnishing all labor and materials incidental thereto. In restoring pavement, the condition of the backfill shall be such as to properly support the pavement.

13.4 CLEAN UP

13.4.1 All surplus water main materials furnished by the Contractor and all tools and temporary structures shall be removed from the site by the Contractor. All dirt, rubbish and excess earth from the excavation site shall be hauled to a dump provided by the Contractor and disposed in accordance with State and local Solid Waste laws and ordinances. The work site shall be left clean to the satisfaction of the Engineer and Owner. All surplus water main materials furnished by the Owner and delivered to the site by the Contractor shall be removed and delivered by the Contractor to a location designated by the Owner.

13.4.2 The trenches shall be maintained for a period of one (1) year in such a manner that no standing water will occur over the trenches.

14.0 OTHER INSTALLATION REQUIREMENTS

14.1 HORIZONTAL & VERTICAL SEPARATION of WATER MAINS and SEWERS

14.1.1 Wherever water mains parallel existing or proposed sewer mains, there shall be ten (10) feet, horizontally, between the mains.

14.1.2 Whenever water mains must cross house sewers, storm or sanitary sewers, the water main shall be laid twenty-four (24) inches above the top of the drain or sewer. The vertical separation shall be maintained for that portion of the water main located within ten (10) feet horizontally of any sewer or drain the water main crosses. Said ten (10) feet to be measured as the normal distance from the water main to the storm or sanitary sewer.

14.1.3 No water main shall pass through or contact any part of a sewer or storm manhole.

14.2 CONNECTION TO EXISTING LINES

14.2.1 Where connections to existing lines are to be made, the fittings shown on the plans shall be installed. If fittings are not specified, then the fittings necessary to make the proper connections shall be installed. Wherever crosses or tees are installed for future connections, the section of the fitting not being used shall be plugged with a standard cast iron plug or cap and properly backed with concrete.

14.2.2 Whenever it is necessary to connect existing lines, the Contractor shall notify the Water and Sewer Superintendents of the Owner at least 24 hours prior to the time he is prepared to make the connection. Upon agreement with the Engineer and Owner, an agreed time shall be set for the connection to be installed. If water service is to be interrupted, the time for connection installation shall be at the discretion of the Water Superintendent and Engineer. Then the Contractor shall make the connection at the specified time.

14.2.3 When making connections to existing water lines, it is extremely important that the Contractor shall make the connections as quickly as possible. The water service shall not be interrupted until the Contractor is completely prepared to the satisfaction of the Engineer and/or Owner. No valves or hydrants in service shall be opened or closed by anyone other than persons authorized by the Owner.

14.2.4 Where connections, other than service taps, are to be made to water lines in service, standard cutting-in sleeves and valves shall be used. The sleeves shall be installed according to the recommendation of the manufacturer with all necessary equipment. The cut shall be performed in the presence of the Engineer and the Water Superintendent of the Owner to quickly assist if trouble arises.

14.2.5 Cutting-in sleeves and valves shall be Mueller or approved equivalent.

14.2.6 Where tees, valves, crosses or other fittings are to be installed in existing lines, a section of sufficient length of the existing line shall be removed to allow for the installation of the fittings, a short section of pipe and a connection sleeve. The use of so-called cutting-in valves, tees or crosses will not be permitted. In all cases, sufficient room for joints as herein specified shall be provided.

14.3 HIGHWAY & COUNTY CROSSINGS

14.3.1 Where water mains are to be constructed along and/or cross Townships, County, State of Federal highways, the Contractor shall have a permit from the governing highway department before commencing any work within the limits of the rights-of-way.

14.3.2 The Owner will obtain the necessary permits for the Contractor (unless stated otherwise in the Special Conditions). But it shall be the Contractor's responsibility to give the Engineer adequate notice of his need for the permit. The costs shall be as outlined in Section 7.18.

14.3.3 Unless special permission is given otherwise by the governing highway authority, the Contractor shall install all water mains crossing highways by boring and jacking methods to the lines and grades established in the plans. Casing pipe will be of the size and type as shown on the plans and/or specified by the Engineer. Casing vents shall be added to each end as required by the permit.

14.3.4 The methods of jacking shall be subject to the Engineer's approval. The casing shall be jacked into the fill as the boring auger drills out the fill. Once boring and jacking operations commence, they shall be continued in successive shifts until the boring and jacking operations have been completed.

14.4 RAILROAD CROSSINGS

14.4.1 Where water lines are to be constructed along and/or cross railroad right-of-way, the Contractor shall have a permit from the railroad to construct the proposed water mains.

14.4.2 The Owner will obtain the necessary permits for the Contractor (unless stated otherwise in the Special Conditions). But it shall be the Contractor's responsibility to give the Engineer adequate notice of his need for the permit. The costs shall be as outlined in Section 7.18.

14.4.3 The water main crossing railways shall be installed like highway crossings unless special permission is given otherwise by the railroad authority.

14.5 PIPELINE CROSSINGS

14.5.1 Where water lines are to be constructed along and/or cross pipeline right-of-way, the Contractor shall have a permit from the pipeline to construct the proposed water mains.

14.5.2 The Owner will obtain the necessary permits for the Contractor (unless stated otherwise in the Special Conditions). But it shall be the Contractor's responsibility to give the Engineer adequate notice of his need for the permit. The costs shall be as outlined in Section 7.18.

14.5.3 The locations and method of crossing shall be given by the Engineer and the pipeline company. The Contractor shall give proper notice (48 hours) of his intent to construct the crossing to the Engineer and the pipeline company so that the required representatives can be present during construction of the crossing.

14.6 RIVER CROSSINGS

14.6.1 The Contractor shall make special provisions for the river crossings shown on the plans. The water main shall be installed with the minimum of thirty (30) inches of cover below the river bed and shall be placed through a casing as shown on the plans.

14.6.2 The ends of the casing shall extend five (5) feet beyond the normal river bed limits or to a point where the ground elevation is three (3) feet higher than the normal water level.

14.6.3 A concrete anchor of at least three (3) cubic feet shall be placed over the casing at each end.

15.0 PROTECTION and PAINTING

15.1 All flanges shall be protected during shipment by wooden covers.

15.2 All ferrous parts of valves and appurtenances installed on piping shall have an epoxy coating of at least 10 mils of thickness to protect all surfaces. The interior coating shall comply with AWWA C550, latest revision, and be certified to NSF 61. The exterior coating must be suitable for field coats on the outside, applied in accordance with the instructions of the manufacturer and also comply with AWWA C550, latest revision.

15.3 Valve boxes shall be given two (2) shop coats of asphaltum varnish or coaltar coating.

15.4 All unfinished parts shall be coated with grease to prevent corrosion during shipment and installation.

16.0 DISINFECTION OF PIPE

16.1 Disinfection of water mains shall be in accordance with AWWA C651, latest revision and should be limited to sections less than 1,000 feet in length.

16.2 All pipe shall be disinfected after installation is complete by sustaining a chlorine solution of at least 50 ppm strength in the pipe for 24 hours. At the end of the 24-hour period, the treated water shall contain a minimum of 25 ppm chlorine through the length of the main.

16.3 Sterilization may be conducted in conjunction with the leak test, as outlined in Section 3.0.

16.4 After the water lines are sterilized, they shall be thoroughly flushed, filled with water from the system. Samples then shall be taken by the Contractor from each of the respective sections of the lines and tested by an approved laboratory. The lines shall not be accepted and placed in operation until two consecutive samples, a minimum of 24 hours apart, showing negative reports are received for each respective section.

16.5 During and after disinfection of the mains, the Engineer will give the Contractor reasonable notice to enable the Contractor to have a competent representative present whenever valves must be operated that will affect the pressure in any part of the work for which the Contractor is responsible.

17.0 PAYMENT

17.1 Unless otherwise spelled out in the proposal or the Detailed Specifications, payment for pipe shall be according to the actual measurements of lineal feet of pipe, completed in place. No deduction shall be made for valves, fittings, hydrants or other specials included in the length of the line. Measurements shall be made from centerline of connections to end of line or centerline of hydrant, valve or other fitting placed at the end of any main or branch line. If pipe is joined to fittings in place, then measurements shall be taken from the end of the first piece of pipe laid.

17.3 In special structures such as creek crossings or other items in which lump sum or other methods of payment include payment for pipe and fittings, these pipe and fittings shall not be included in the unit measured for payment for pipe in place.

GENERAL SPECIFICATIONS

CAST-IN-PLACE CONCRETE

1.0 GENERAL

1.1 Cast-in-place concrete in structures, tanks, bridges, culverts and miscellaneous work, including the concrete portions of steel, timber, stone masonry and composite structures, shall be prepared and constructed in accordance with these specifications and conform to the lines, grades, dimensions and designs shown on the plans.

1.2 This Section specifies all labor, materials, equipment and supervision necessary for cast-in-place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes, plus requirements for submittals and testing included in the Contract. All materials making the composition of the concrete shall satisfy the requirements specified in this Section.

2.0 SUBMITTALS

2.1 GENERAL: Submit the following in accordance with General Conditions.

2.2 PRODUCT DATA: Submit product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, finishing materials and others as requested by Engineer.

2.3 REINFORCEMENT SHOP DRAWINGS: Submit shop drawings for reinforcement, prepared by registered Professional Engineer, for fabrication, bending, and placement of concrete reinforcement. Comply with ACI SP-66 (latest revision), "ACI Detailing Manual," showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures. Contractor shall submit a certification as to the grade of all reinforcing.

2.4 SAMPLES: Submit samples of materials, including names, sources, and descriptions, as follows:

Normal weight aggregates	Lightweight aggregates
Fibrous reinforcement	Reglets
Waterstops	Vapor retarder

2.4.1 Any other products included in the Work related to concrete construction.

2.5 LABORATORY TEST REPORTS: Submit laboratory test reports for concrete materials and mix design test.

2.6 MATERIALS CERTIFICATES: Submit materials certificates instead of materials laboratory test reports when permitted by Engineer. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride complies with specification requirements.

3.0 QUALITY ASSURANCE

3.1 CODES AND STANDARDS: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

ACI 318, "Building Code Requirements for Reinforced Concrete."

Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".

4.0 CONCRETE TESTING SERVICE

4.1 Engage a testing laboratory acceptable to Engineer to perform material evaluation tests and design concrete mixes.

4.2 Materials and installed work may require testing and retesting at any time during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

5.0 QUALITY CONTROL TESTING DURING CONSTRUCTION

5.0.1 The Contractor will employ a testing laboratory to perform tests and to submit test reports.

5.0.2 Sampling and testing for quality control during placement of concrete may include the following, as directed by Engineer.

5.1 SAMPLING FRESH CONCRETE: ASTM C172 (latest revision) except modified for slump to comply with ASTM C94 (latest revision).

5.2 SLUMP: ASTM C143 (latest revision); one test at point of discharge for each twelve (12) cubic yards of concrete poured of each type of concrete; additional tests when concrete consistency seems to have changed.

5.3 AIR CONTENT: ASTM C173 (latest revision); volumetric method for lightweight or normal weight concrete; ASTM C231 (latest revision) pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.

5.4 CONCRETE TEMPERATURE: Test hourly when air temperature is 40°F(4°C) and below or when above 80°F (27°C) and each time compression test specimens are made.

5.5 COMPRESSION TEST SPECIMEN: ASTM C31 (latest revision); one set of four (4) standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cure test specimens are required.

5.6 COMPRESSIVE STRENGTH TESTS: ASTM C39 (latest revision); one (1) set for each day's pour exceeding five (5) cubic yards plus additional sets for each fifty (50) cubic yards more than the first twenty-five (25) cubic yards of each concrete class placed in any one (1) day. A set shall consist of one (1) specimen tested at seven (7) days, two specimens tested at twenty-eight (28) days, and one (1) specimen retained for later testing, if required.

5.6.1 When frequency of testing will provide fewer than five (5) strength tests for a given class of concrete, conduct testing from at least five (5) randomly selected batches or from each batch, if fewer than five (5) are used.

5.6.2 Test results will be reported in writing to Engineer, Ready-Mix Producer, and Contractor within 72 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix

proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

5.7 NONDESTRUCTIVE TESTING: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

5.8 ADDITIONAL TESTS: The testing service will make additional tests of in-place concrete when compression strength test results indicate specified concrete strengths or other characteristics have not been attained in the structure, as directed by Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 (latest revision) or by other methods as directed. Contractor shall pay for all such tests under this Section 5.8.

PRODUCTS

1.0 FORM MATERIALS

1.1 FORMS FOR EXPOSED FINISH CONCRETE: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaced. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

1.2 FORMS FOR UNEXPOSED FINISH CONCRETE: Plywood, metal, lumber, metal, or other acceptable material. Provide lumber dressed on at least two (2) edges and one (1) side for tight fit.

1.3 FORM COATINGS: Provide commercial formulation form-coating compounds with a maximum VOC of 350 mg/l that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1.4 FORM TIES: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spilling concrete upon removal. Provide units that will leave no metal closer than 1½ inches to exposed surface.

1.4.1 Provide ties that, when removed, will leave holes less than one (1) inch diameter in concrete surface.

2.0 REINFORCING MATERIALS

2.1 REINFORCING BARS: ASTM A615 (latest revision) Grade 60, deformed.

2.2 STEEL WIRE: ASTM A82 (latest revision) plain, cold-drawn steel.

2.3 WELDED WIRE FABRIC: ASTM A185 (latest revision) welded steel wire fabric; 55,000 psi minimum tensile strength.

2.4 WELDED DEFORMED STEEL WIRE FABRIC: ASTM A497 (latest revision).

2.5 SUPPORTS FOR REINFORCEMENTS: Bolsters, chairs, spacers, and other devices shall be used for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire-bar-type supports complying with CRSI specifications.

2.5.1 For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2.5.2 For exposed-to-view concrete surfaces, where support legs are in contact with forms, provide supports legs that are plastic coated (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

3.0 CONCRETE MATERIALS

3.1 PORTLAND CEMENT: ASTM C150 (latest revision) Type II. Use only one brand of cement throughout project unless otherwise acceptable to Engineer.

3.2 FLY ASH: ASTM C618 (latest revision) Type C.

3.3 NORMAL WEIGHT AGGREGATES: ASTM C33 (latest revision) and as herein specified. Provide aggregates from a single source for exposed concrete. For exterior exposed surfaces, do not use fine or coarse aggregates containing deleterious substances.

3.3.1 FINE AGGREGATES: Fine aggregate shall consist of sand having clean, hard, durable uncoated grains, free from deleterious substances, including lignite. Fine aggregate shall range in size from fine to coarse within the following percentage by weight:

Passing ⅜" Sieve	Not less than 100%
Passing #4 Sieve	95 to 100%
Passing #16 Sieve	50 to 85%
Passing #50 Sieve	10 to 30%
Passing #100 Sieve	2 to 10%

3.3.2 COARSE AGGREGATE: Coarse aggregate shall consist of a clean, well-graded, hard, durable crushed stone or washed gravel. It shall be free from soft, thin, elongated, or other deleterious matter. Coarse aggregate shall contain no lumps of frozen or partially cemented materials. Coarse aggregate shall be well-graded from coarse to fine within the following percentages by weight:

Passing 1½" Sieve	Not less than 100%
Passing 1" Sieve	90 to 100%
Passing ¾" Sieve	20 to 55%
Passing ½" Sieve	0 to 10%
Passing ⅜" Sieve	0 to 5%

3.4 LIGHTWEIGHT AGGREGATES: ASTM C330 (latest revision), lightweight aggregates prepared by processing natural materials such as pumice, scoria, or tuff shall be used.

3.5 WATER: Potable

3.6 GENERAL ADMIXTURES: No admixtures for concrete shall contain more than 0.1% chloride ions.

3.7 AIR-ENTRAINING ADMIXTURE: ASTM C260 (latest revision) certified by manufacturer to be compatible with other required admixtures. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"Darex AEA" or "Daravair," W.R. Grace & Co.
"MB-VR" or "Micro-Air," Master Builders, Inc.

3.8 WATER REDUCING ADMIXTURE: ASTM C494 (latest revision) Type A. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"WRDA," W.R. Grace & Co.
"Pozzolith Normal" or "Polyheed," Master Builders, Inc.

3.9 HIGH-RANGE WATER-REDUCING ADMIXTURE (Super Plasticizer): ASTM C494 (latest revision) Type F or G. Available Products: Subject to compliance requirements, products that may be incorporated in the work include, but are not limited to, the following:

"Rheobuild," Master Builders, Inc.
"WRDA 19" or "Daracem," W.R. Grace & Co.

3.10 WATER-REDUCING, ACCELERATING ADMIXTURE: ASTM C494 (latest revision) Type E. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"Daraset," W.R. Grace & Co.
"Pozzutec 20," Master Builders, Inc.

3.11 WATER-REDUCING, RETARDING ADMIXTURE: ASTM C494 (latest revision) Type D. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"Dartard-17," W.R. Grace & Co.
"Pozzulith R," Master Builders, Inc.

3.12 RELATED MATERIALS

3.12.1 Reglets: Where resilient or elastomeric sheet flashing or bituminous membranes are terminated in reglets, provided reglets of not less than 0.0217" thick (26-gage) galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

3.12.2 Waterstops: Provide flat, center bulb-type waterstops at all construction joints and other joints where as indicated. Vertical waterstops shall be split to allow mounting to vertical form. Size to suit joints. The minimum water stop size shall be six (6) inch.

a. Under conditions where waterstops need to be attached to reinforcement, the waterstops shall be as manufactured by Murphy Plastics or equivalent.

3.12.3 Granule Base: Evenly graded mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface below slabs on grade.

3.12.4 Vapor Barrier: 6 mil polyethylene sheeting in widest practical widths.

3.12.5 Expansion Joint Filler: Rigid closed cell plastic foam insulation board.

3.12.6 Curing Compound: ASTM C309 (latest revision) Type I certified compatible with adhesive or bonding for scheduled floor surfaces and finishes.

CLASSIFICATION OF CONCRETE

1.0 Seven (7) classes of concrete are noted in these specifications, four classes of non-air-entrained concrete and three classes of air-entrained concrete. Each class shall be used in the part of the structure where stated on the plans or where designated by the Engineer. The classes are as follows:

Non-air-entrained Concrete	Air-entrained Concrete
Class AA	Class AA (AE)
Class A	Class A (AE)
Class A (F)	Class A (F) (AE)
Class B	

2.0 When the class of concrete required is not expressly indicated on the plans, or provided for in the Proposal or Detailed Specifications, the following requirements shall govern:

2.1 Class AA - Slabs and girders without wearing surface, concrete piles, handrails, and bridge floors.

2.2 Class A - Slabs and girders with wearing surface, arch rings, spandrel walls, piers, abutments, retaining walls, culverts, building, floors, tanks and all reinforced concrete not requiring Class AA concrete.

2.3 Class B - Mass concrete in abutments, wingwalls, and pier concrete placed in the dry, when so indicated on the Plans. For mass concrete placed under water, use Class B with twenty-five percent (25%) additional cement.

2.4 Class A(F) - Will be used for thin sections, or in areas where heavy reinforcement makes it impractical to use Class A size aggregate.

2.5 The air-entrained classes will be used when specifically set out in the Detailed Specifications or shown on the Plans.

CLASSIFICATION AND PROPORTIONING

1.0 GENERAL

1.1 Concrete mixtures shall be proportioned so as to secure a workable and durable concrete for the various classes, as hereinafter specified. The Contractor shall submit a mix design to the Engineer for approval.

Class of Concrete	Designated Nominal Opening Size of Coarse Aggregate	Min. Cement Factor Bags per Cu. Yd.	Max. Net Water Content per Bag of Cement Gallons	Consistency Range in Slump Inches	Air Content (Range) Percent
AA	3/4" to No. 4	7	6-1/2	2-4	
AA (AE)	3/4" to No. 4	7	6-1/2	2-4	3-6
A	1-1/4" to No. 4	6	5-1/2	2-4	
A (AE)	1-1/4" to No. 4	6	5-1/2	2-4	3-6
A (F)	3/4" to No. 4	6	6	2-4	
A (F)(AE)	3/4" to No. 4	6	6	2-4	6-9
B	1-1/2" to No. 4	5	6-1/2	2-4	

1.2 The concrete material shall be proportioned using the Absolute Volume Method in accordance with the requirements for each class specified above. It is the intent of the above limits to produce a concrete for each class with a minimum strength as follows:

Class of Concrete	Minimum Compressive Strength (28 days)
AA or AA (AE)	4,500 psi
A or A (AE)	4,000 psi
A (F) or A (F) (AE)	3,000 psi
B	2,100 psi

1.3 When the Contractor proposes to use a new source of material, which has not been proved by past experience, he shall submit samples sufficiently in advance so that trial mixes can be prepared and the concrete tested as provided above.

1.4 When air-entrained concrete is specified, the air-entrainment shall be accomplished by adding to the mixing water the proper amount of air-entraining agent in solution.

2.0 PROPORTIONING AND DESIGN OF MIXES

2.1 Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Engineer for preparing and reporting proposed mix designs. The testing facility can be the same as used for field quality control testing.

2.2 Limit use of fly ash to not exceed 25% of cement content by weight.

2.3 Submit written reports to Engineer of each proposed mix for each class of concrete at least fifteen (15) days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed by Engineer.

2.4 Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

2.5 Provide 4000 psi, air-entrained for all concrete unless otherwise noted: All lightweight aggregates shall have a continuous sprinkler installed at the top of storage pile at the batch plant at least 48 hours prior to any pour. All lightweight concrete shall be 105 pcf and 28 day compressive strength shall meet or exceed 2500 psi.

	Class A/A(AE)
28 Day compressive strength	4000 PSI Minimum
Maximum water per sack cement	5½ gallons
Maximum aggregate size	1¼"
Maximum slump (2" prior to plasticizer)	4" *
Admixtures	6% air entrained
Admixtures	Plasticizer (when needed)
Minimum Cement Content	6 Bags

* The use of plasticizer will allow concrete maximum slump to be eight (8) inches.

2.6 When necessary to increase cement ratio to gain required strength, such adjustments shall be made and Contractor shall pay all costs for such increase.

2.7 ADJUSTMENT TO CONCRETE MIXES: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted and accepted by Engineer before using in work.

2.8 ADMIXTURES

2.8.1 Use water-reducing admixture or high-range water-reducing admixture (Superplasticizer) in concrete as required for placement and workability.

2.8.2 Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50°F (10°C).

2.8.3 Use high-range water-reducing admixture (HRWR) in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water/cement ratios below 0.30.

2.8.4 Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1½% within following limits:

Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or hydraulic pressure:

4.5% (moderate exposure); 5.5% (severe exposure) 1½ inch max. aggregate.

4.5% (moderate exposure); 6.0% (severe exposure) 1 inch max. aggregate.

5.0% (moderate exposure); 6.0% (severe exposure) ¾ inch max. aggregate.

5.5% (moderate exposure); 7.0% (severe exposure) ½ inch max. aggregate.

Other concrete (not exposed to freezing, thawing, or hydraulic pressure) or to receive a surface hardener: 2% to 4% air.

2.8.5 Use admixtures for water reduction and set control in strict compliance with manufacturer's directions.

2.9 WATER-CEMENT RATIO: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:

Subjected to freezing and thawing; W/C 0.35.
Subjected to deicers/watertight; W/C 0.30.

2.10 SLUMP LIMITS: Proportion and design mixes to result in concrete slump at point of placement as follows:

2.10.1 Ramps, slabs, and sloping surfaces: Not more than three (3) inches.

2.10.2 Reinforced foundation systems: Not less than one (1) inch and not more than three (3) inches.

2.10.3 Concrete containing HRWR admixture (Superplasticizer): Not more than eight (8) inches after addition of HRWR to site-verified two (2) inch to three (3) inch slump concrete.

2.10.4 Other concrete: Not more than four (4) inches.

2.11 CONCRETE MIXING

2.11.1 Ready-Mix Concrete: Comply with requirements of ASTM C94 (latest revision) and as specified. When air temperature is between 85°F (30°C) and 90°F (32°C), reduce mixing and delivery time from 1½ hours to 75 minutes, and when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes.

2.11.2 Batching, Mixing, Transporting: Plant batch mix and transport in compliance with above. Provide project superintendent with delivery tickets for each load showing Class, Batch No., maximum aggregate size, air content, time of loading, sacks of cement per yard, and slump. Obtain Engineer approval before any mixing on-site.

EXECUTION

1.0 GENERAL

1.1 Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

2.0 FORMS

2.1 Design, erect, support, brace and maintain formwork to support vertical and lateral, static and dynamic loads that could be applied until concrete can support such loads. Construct formwork so concrete structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.

2.2 Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chambers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

2.3 Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

2.4 Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary opening and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

2.5 Chamfer exposed corners and edges unless indicated otherwise, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

2.6 PROVISIONS FOR OTHER TRADES

2.6.1 Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

2.7 CLEANING AND TIGHTENING

2.7.1 Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Re-tighten forms and bracing before concrete placement as required to prevent mortar leaks and maintain proper alignment.

3.0 PLACING REINFORCEMENT

3.1 Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and support and as herein specified.

3.2 Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.

3.3 Clean reinforcements of loose rust and mill scale, earth, ice and other materials that reduce or destroy bond with concrete.

3.4 Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, so as reinforcing is not displaced during the concrete placement.

3.5 Reinforcement shall be placed at the minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

3.6 The metal reinforcement shall be protected by the thickness of concrete indicated in the plans. Where not otherwise shown, the thickness of concrete over the reinforcement shall be as follows:

3.6.1 Where concrete is deposited against the ground without the use of forms, not less than three (3) inches. Where concrete is exposed to the weather, or exposed to the ground but placed in forms, not less than two (2) inches for bars more than ⅝ inches in diameter and 1½ inches for bars ⅝ inches or less in diameter.

3.6.2 In slabs and walls not exposed to the ground or to the weather, not less than ¾ inch.

3.6.3 In beams, girders and columns not exposed to the ground or to the weather, not less than 1½ inch.

3.6.4 Exposed reinforcement bars intended for bonding with future extensions shall be protected from corrosion by concrete or other adequate covering.

3.7 Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one (1) full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.8 CLEANING AND PLACING REINFORCING

3.8.1 All reinforcement shall be free from rust, scale or other coatings that will destroy or reduce the bond of the concrete to the steel. Where there may be a delay in depositing concrete, the reinforcement shall be reinspected and when necessary, cleaned to the satisfaction of the Engineer. All reinforcing bars shall be tied at alternating intersections both ways. Continuous bars shall be lapped not less than thirty-six (36) bar diameters unless noted otherwise on the drawings.

4.0 ANCHOR BOLTS, DOWELS AND CORNER BARS

4.1 Anchor bolts for all equipment shall be provided and placed in the concrete in accordance with the manufacturer's directions. Unless otherwise noted, dowels or continuous reinforcements, shall be provided at all construction joints. The dowels shall be of the same size as the largest reinforcing bar and shall provide a minimum lap of thirty-six (36) bar diameters. Corner bars shall be used at the outside of all corners. Corner bars shall be lapped a minimum of thirty-six (36) bar diameters. All dowels and anchor bolts must be positioned before concrete is placed. Pushing dowels and anchor bolts into fresh concrete is prohibited.

5.0 JOINTS

5.1 CONSTRUCTION JOINTS

5.1.1 Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Engineer.

5.1.2 Provide keyways at least 1½ inches deep in construction joints in walls and slabs, and between walls and footings. Accepted bulkheads designed for this purpose may be used for slabs.

5.2.3 Place construction joints perpendicular to main reinforcement. Continue full reinforcement across construction joints except as otherwise indicated. Do not continue reinforcement through sides of strip placements.

5.2.4 Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

5.3 WATERSTOPS

5.3.1 Provide waterstops in all construction joints which are below grade and all water containing structures. Install waterstops to form continuous diaphragm in each joint. make provisions to support and protect exposed waterstops during progress of work. Field-fabricate joints in waterstops in accordance with manufacturer's printed instructions. Waterstops shall have a minimum lap of eighteen (18) inches.

5.4 ISOLATION JOINTS IN SLABS-ON-GRADE

5.4.1 Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surface, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated. See Section 5.5.5 of these specifications for joint filler and sealant materials.

5.5 CONTRACTION (CONTROL) JOINTS IN SLABS-ON-GROUND

5.5.1 Construction contraction joins in slabs-on-ground to form panels of patterns as shown. Use saw cuts ⅛ inch wide by ¼ slab depth or inserts ¼ inch wide by ¼ of slab depth, unless otherwise indicated.

5.5.2 Form contraction joints by inserting premolded plastic or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.

5.5.3 Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.

5.5.4 If joint pattern not shown, provide joints not exceeding fifteen (15) feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).

5.5.5 Joint sealant material shall be Vulkem 921 sealant or approved equal. All construction and saw-cut joints shall have foam backer rod used before sealant.

5.5.6 Poured Joint Filler

a. If approved by the Engineer, a poured joint filler which shall consist of a prepared mixture of asphalt and mineral filler can be used as a joint filler. The mineral filler shall be diatomaceous earth. The mixture shall be free from water and shall not foam when heated to the proper temperature range for application, 400 to 485 degrees F. It shall also comply with the following requirements:

Specific Gravity at 77°F	1.02 Min.
Softening Point	183° to 200°F.
Pen. at 77°F., 100 gm., 5 Sec	68 to 88
Pen. at 32°F., 200 gm., l Min	38 Min.
Pen. at 115°F., 50 gm., 5 Sec.	160 Max.
Flash Point	550°F. Min.
Ash	8% Min.
Settlement Ration	1.02 Max.
Ductility at 77°F.	5 Min.
Flow at 140°F.	0.5 cm. Max.

6.0 INSTALLATION OF EMBEDDED ITEMS

6.1 Set and build into work, anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

6.2 Install reglets to receive top edge of foundation sheet waterproofing and to receive thru-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.

6.3 Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to obtain required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

7.0 PREPARATION OF FORM SURFACES

7.1 Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before reinforcement is placed.

7.2 Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

7.3 Coat steel forms with a nonstaining, rust-preventative materials. Rust stained steel formwork is not acceptable.

8.0 CONCRETE PLACEMENT

8.1 INSPECTION

8.1.1 Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work.

8.2 Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.

8.2.1 Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams of planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete to avoid segregation at its final location. Concrete shall not be allowed to free fall more than six (6) feet without the use of an approved concrete tremie or concrete pump and hose.

8.3 PLACING CONCRETE IN FORMS

8.3.1 Deposit concrete in forms in horizontal layers not deeper than twenty-four (24) inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

8.3.2 Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

8.3.3 Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least six (6) inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other items without causing segregation of mix.

8.4 RETEMPERING

8.4.1 The concrete shall be mixed only in such quantities as are required for immediate use and any which has developed initial set shall not be used. Concrete which has partially hardened shall not be retempered or remixed.

8.5 VAPOR BARRIER/RETARDER INSTALLATION

8.5.1 Following leveling and tamping of granular base for slabs on grade, place vapor barrier/retarder sheeting with longest dimension parallel with direction of pour.

8.5.2 Lap joints six (6) inches and seal vapor barrier joints with manufacturer's recommended mastic and pressure-sensitive tape.

8.6 PLACING CONCRETE SLABS

8.6.1 Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

8.6.2 Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

8.6.3 Bring slab surfaces to correct level with straight edge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

8.6.4 Maintain slab reinforcing in proper position during concrete placement. If welded wire fabric is used, fabric wall be supported above subgrade by steel chairs or supports.

8.7 COLD-WEATHER PLACING

8.7.1 Comply with provisions of ACI 306 and as follows: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

8.7.2 When air temperature has fallen to or is expected to fall below 40°F (4°C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F (10°C) and not more than 80°F (27°C) at point of placement.

8.7.3 Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

8.7.4 Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

8.8 HOT WEATHER PLACING

8.8.1 When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

8.8.2 Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F (32°C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.

8.8.3 Cover reinforcing steel with water soaked burlap if it becomes hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

8.8.4 Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.

8.8.5 Use water reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, when acceptable to Engineer.

8.9 DEPOSITING CONCRETE UNDER WATER

8.9.1 Concrete shall not be deposited in water except with the approval of the Engineer, and under his immediate supervision, and in this case the method of placing shall be as hereinafter designated.

8.9.2 Concrete deposited in water shall be seal concrete. To prevent segregation, it shall be carefully placed in a compact mass, in its final position, by means of a tremie, a bottom dump bucket or other approved method, and shall not be disturbed after being deposited. Still water shall be maintained at the point of deposit and the forms under water shall be watertight.

8.9.3 For parts of structures under water, when possible, concrete seals shall be placed continuously from start to finish. The surface of the concrete shall be kept as nearly horizontal as practical at all times. To ensure thorough handling, each succeeding layer of seal shall be placed before the preceding layer has taken initial set.

8.9.4 Tremie shall consist of a tube having a diameter of not less than 10 inches, constructed in sections having flanged couplings fitted with gaskets. The tremies shall be supported so as to permit free movement of the discharge end over the entire top surface of the work and so as to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end shall be closed at the start of work so as to prevent water entering the tube and shall be entirely sealed at all times. The tremie tube shall be kept full to the bottom of the hopper. When a batch is dumped into the hopper, the flow of concrete shall be induced by slightly raising the discharge end, always keeping it in the deposited concrete. The flow shall be continuous until the work is completed.

8.9.5 Depositing of concrete by the drop-bottom bucket method shall conform to the following specifications: The top of the bucket shall be open. The bottom door shall open freely and

outward when tripped. The bucket shall be completely filled and slowly lowered to avoid backwash. It shall not be dumped until it rests on the surface upon which the concrete is to be deposited and when discharged shall be withdrawn slowly until well above the concrete. The slump of concrete shall be maintained between 4 and 8 inches.

8.9.6 Unwatering may proceed when the concrete seal is sufficiently hard and strong. All laitance or other unsatisfactory materials shall be removed from the exposed surface by scraping, chipping or other means which will not injure the surface of the concrete.

9.0 FINISH OF FORMED SURFACES

9.1 ROUGH FORM FINISH

9.1.1 For formed concrete surfaces not exposed to view in the finish work or concealed by other construction. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding ¼ inch in height rubbed down or chipped off.

9.2 SMOOTH FORM FINISH

9.2.1 For formed concrete surfaces exposed to view or covered with a coating material or covering material applied directly to concrete; such as waterproofing, damp-proofing, veneer plaster, painting or other similar system. This is a concrete surface obtained with selected form facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed. All exposed concrete surfaces shall be finished by wetting, thoroughly rubbing with a carborundum brick and rinsing with water.

9.3 RELATED UNFORMED SURFACES

9.3.1 At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

10.0 MONOLITHIC SLAB FINISHES

10.1 TROWEL FINISH

10.1.1 Apply trowel finish to monolithic slab surfaces to be exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.

10.1.2 After floating, begin first trowel finish operation using a power driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of Ff 20-F1 17. Grind smooth surface defects that would telegraph through applied floor covering system.

10.2 NONSLIP BROOM FINISH

10.2.1 Apply nonslip broom finish to exterior concrete platforms, steps, ramps and walks elsewhere as indicated.

10.2.2 Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristly broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

11.0 CONCRETE CURING AND PROTECTION

11.0.1 Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation control material. Apply in accordance with manufacturer's instruction after screening and bull floating, but before power floating and troweling.

11.0.2 Curing during temperatures below 32°F (0°C), the Contractor must maintain a 40°F (4°C) temperature above the concrete surface for a period of 72 hours. This shall be done using curing blankets or curing blankets and artificial heat.

11.0.3 Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than seven (7) days.

11.1 CURING METHODS

11.1.1 Perform curing of concrete by curing and sealing compound, by moist curing, by moisture retaining cover curing, or by any combinations thereof, as herein specified. Wet curing conditions must be maintained for seven (7) days for lightweight concrete.

11.1.2 Provide moisture curing by following methods.

a. Keep concrete surface continuously wet by covering with water.

b. Use continuous water fog spray.

c. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with four (4) inch lap over adjacent absorptive covers.

11.1.3 Provide moisture cover curing as follows:

a. Cover concrete surfaces with moisture retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least three (3) inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

11.1.4 Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walks, and curbs as follows:

a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within two (2) hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions. Recoat areas subject to heavy rainfalls within three (3) hours after initial application. Maintain continuity of coating and repair damage during the curing period.

b. Use membrane curing compounds that will not affect surfaces to be covered with finished materials applied directly to concrete.

11.2 CURING FORMED SURFACES

11.2.1 Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

11.3 CURING UNFORMED SURFACES

11.3.1 Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces, by application of appropriate curing method.

11.3.2 Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture retaining cover, unless otherwise directed.

12.0 REMOVAL OF FORMS

12.1 Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after curing at not less than 50°F (10°C) for cumulative of twenty-four (24) hours after placing concrete, provided concrete is sufficiently hard to be damaged by form removal operations, and provided curing and protection operations are maintained.

12.2 Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than fourteen (14) days and until concrete has attained at least 75% of design minimum compressive strength at twenty-eight (28) days. Determine potential compressive strength of in-place concrete by testing field cured specimens representative of concrete location or members.

12.3 Form facing material may be removed four (4) days after placement only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

13.0 REUSE OF FORMS

13.1 Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

13.2 When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces except as acceptable to Engineer.

14.0 MISCELLANEOUS CONCRETE ITEMS

14.1 FILLING IN

14.1.1 Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

14.2 CURBS

14.2.1 Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

14.3 EQUIPMENT BASES AND FOUNDATIONS

14.3.1 Provide machine and equipment bases and foundation, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

14.4 REINFORCED MASONRY

14.4.1 Provide concrete grout for reinforcement of masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

15.0 CONCRETE SURFACE REPAIRS

15.1 PATCHING DEFECTIVE AREAS

15.1.1 Repairs and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Engineer.

15.1.2 Cut our honeycomb, rock pockets, voids over ¼ inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than one (1) inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar before bonding compound has dried.

15.1.3 For exposed to view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

15.2 REPAIR OF FORMED SURFACES

15.2.1 Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and

other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry-pack mortar, or precast cement cone plugs secured in place with bonding agent.

15.2.2 Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

15.3 REPAIR UNFORMED SURFACES

15.3.1 Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having required slope.

15.3.2 Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.

15.3.3 Correct high areas in unformed surfaces by grinding after concrete has cured at least fourteen (14) days.

15.3.4 Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Engineer.

15.3.5 Repair defective areas, except random cracks and single holes not over one (1) inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and exposed reinforcing steel with at least ¾ inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

15.3.6 Repair isolated random cracks and single holes not over one (1) inch in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2½ parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack before bonding compound had dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

15.3.7 Perform structural repairs with prior approval of Engineer method ad procedure, using specified epoxy adhesive and mortar.

15.3.8 Repair methods not specified above may be used, subject to acceptance of Engineer.

16.0 MEASUREMENT

16.1 All concrete shall be classified as shown on the plans and shall be measured in accordance with the dimensions shown on the plans unless changes are ordered in writing by the Engineer during construction. All columns shall be computed by the average end area method. No deduction shall be made for paneling less than six inches (6") in width.

17.0 PAYMENT

17.1 The various classes of concrete measured as provided for above will be paid for at the unit price bid per cubic yard. This unit price bid shall be full compensation for the furnishing, forming, placing and finishing of concrete, complete in place and this unit price shall include all material, falsework, expansion joints, equipment, labor, tools and all incidental work pertaining thereto, the construction of weep holes, placing of pipes, conduits, anchors, bolts, grillages and all other similar equipment and methods.

GENERAL SPECIFICATIONS

CRUSHED STONE BASE COURSE

1.0 GENERAL

1.1 This item shall consist of a foundation course for surface courses or pavements. The base course shall be constructed on a prepared subgrade or other completed base course in accordance with these specifications and in substantial conformity with the lines, grades, compacted thicknesses and typical cross-sections shown on the plans.

2.0 MATERIAL SPECIFICATIONS

2.1 This material shall consist of crushed stone or a mixture of crushed stone and natural fines uniformly mixed and so proportioned as to meet all the requirements hereinafter specified. The mixture of crushed stone and natural fines shall contain a minimum of 90 percent crusher produced material. The stone shall be hard and durable with a percent wear determined by the Los Angeles Abrasion Test (AASHTO T96) not to exceed 45. Soft shale and slate are not considered to be stone under this specification. The material furnished shall not contain more than 5% by weight of shale, slate or other deleterious matter.

2.2 The class or classes of crushed stone base course material that can be used on any particular work-site will be those stated in the Proposal.

2.3 GRADING REQUIREMENTS

Total Retained Percent by Weight

Sieve	Class SB-2	Class SB-3
1½"	0	---
1"	---	0
¾"	10-50	0-35
No. 4	50-75	50-75
No. 40	70-90	70-90
No. 200	90-97	90-97

2.4 The fraction passing the No. 200 sieve shall not exceed ⅔ the fraction passing the No. 40 sieve. The fraction passing the No. 40 sieve shall have a Liquid Limit not greater than 25 and a Plasticity Index not greater than 6.

2.5 When necessary to blend multiple materials, each material shall be proportioned separately through mechanical feeders to insure uniform proportioning. Premixing or blending in a pit to avoid separate feeding will not be permitted. The blending of materials on the roadway to obtain a mixture that will comply with the above requirements will not be permitted.

3.0 CONSTRUCTION EXECUTION

3.1 The base course material shall be placed on a completed and approved subgrade or existing base that has been graded to substantially the required grades and cross-sections shown on the plans. Base course material shall not be placed on a frozen subgrade or subbase.

3.2 The subgrade shall be prepared in accordance with the 1978 Arkansas State Highway Commission Standard Specifications for Highway Construction, Section 212, and shall be free from an excess or deficiency of moisture at the time of placing the base course. The subgrade shall also comply,

where applicable, with the requirements of other items that may be contained in the contract that provide for the construction, reconstruction or shaping of the subgrade or the reconstruction of the existing base course.

3.3 The crushed stone shall be placed on the subgrade or other base course material and spread uniformly to such depth and lines so that when compacted it will have the thickness, width and cross section shown on the plans.

3.5 The maximum compacted thickness of any one layer shall not exceed six (6) inches. If the required compacted depth of the base course exceeds six (6") inches, the base course shall be constructed in two or more layers of approximate equal thickness. When approved compacting equipment is used, the compacted depth of a single layer of the base course may be increased to eight (8) inches upon approval.

3.6 The spreading shall be done the same day that the material is hauled. The spreading shall be performed in such manner that no segregation of coarse and fine particles nor nests or hard areas caused by dumping on the subgrade will exist. To insure proper mixing, the crushed stone shall be bladed across the entire roadbed before being spread. Care shall be taken to prevent mixing of subgrade or shoulder material with the base course material in the blading and spreading operation.

3.7 Each course shall be compacted by any satisfactory method that will produce the density hereinafter specified. The crushed stone shall be substantially maintained at optimum moisture during the mixing, spreading, and compacting operations, water added or material aerated as necessary. The specified grade and section shall be maintained by blading throughout the compaction operation. The material in each course shall be compacted to a density, as determined by ASTM D 6938, of 95 percent of the maximum density as obtained in the laboratory test ASTM D-1557 (modified proctor). The crushed stone shall be compacted across the full width of application.

3.8 The oven dry weight per cubic foot of the material at optimum moisture content is termed maximum density by the above procedure.

3.9 The Contractor shall arrange for the testing of the materials used under this item and a copy of the testing report shall be submitted to the Engineer for approval prior to installation of the material at the work site.

3.10 The compacted base course shall be tested for depth. Any deficiencies shall be corrected by scarifying, placing additional material, mixing, reshaping and recompacting to the specified density as directed.

3.11 When neither prime coat, surfacing, nor pavement are provided in the same contract with the base course, the density requirement for the base course will be waived. No compaction will be required beyond that obtained by systematic maintenance under traffic.

3.12 The Contractor shall maintain the base course in a satisfactory condition until accepted.

4.0 MEASUREMENT

4.1 Work performed and material accepted under this item will be measured either by the cubic yard in place or by the ton.

5.0 PAYMENT

5.1 Work performed under this item and measured as stated above, will be paid for at the contract unit price bid per ton or per cubic yard as stated in the Proposal for "Crushed Stone Base Course" of the particular class stated and furnished. The price shall be full compensation for preparing the subgrade; for furnishing and loading material; hauling and delivering on the site; spreading, finishing, watering, manipulating, and compacting; and for all labor, equipment, tools, and incidentals necessary to complete the work.

GENERAL SPECIFICATIONS

GRAVEL BASE COURSE

1.0 GENERAL

1.1 This item shall consist of a foundation course for surface courses, for other base courses or for pavements. It shall be constructed on the prepared subgrade or other completed base course in accordance with these specifications and in substantial conformity with the lines, grades, compacted thicknesses and typical cross sections shown on the plans.

2.0 MATERIAL SPECIFICATIONS

2.1 The material shall consist of a natural or artificial mixture of gravel and soil, uniformly well-graded from coarse to fine and proportioned to meet all the requirements hereinafter specified. The gravel shall consist of crushed or uncrushed hard pebbles, crushed boulders, crushed stone or crushed ledge rock with a percent of wear loss determined by the L.A. Abrasion Test (AASHTO T-96) not to exceed 45. The gravel shall have no objectionable, deleterious or other injurious matter.

2.2 The class or classes of gravel base course material that may be used on any particular job will be those stated in the Proposal.

2.3 Crushed stone meeting the requirements of Section 306 of the 1978 Arkansas State Highway Commission Standard Specifications for Highway Construction for Class SB-2, may be furnished instead of any class of gravel base course at the choice of the Contractor.

2.4 GRADING REQUIREMENTS

Sieve	Total Retained Percent by Weight Class GB-2	Class GB-3	Class GB-4
2"	0-5	---	---
1 ½"	0-15	0	---
1"	---	---	0-5
¾"	0-40	0-40	0-30
⅜"	20-60	20-60	15-50
No. 4	40-70	40-70	40-70
No. 10	55-80	55-80	55-80
No. 40	65-90	65-90	65-90
No. 200	88-97	88-97	88-97

2.5 In order to insure that the gravel is uniformly graded, the percent passing and retained on the various sieves shall be as follows:

Sieve Sizes	Percent Retained by Weight
¾"	5 minimum
⅜"	5 minimum
No. 4	5 minimum
No. 10	4 minimum

2.6 The fraction passing the No. 200 sieve shall not be greater than the ⅔ the fraction passing the No. 40 sieve shall have a Liquid Limit not greater than 25 and a Plasticity Index not greater than 6.

2.7 When the source of gravel contains aggregate larger than allowed for the class stated in the Proposal, it must be removed by screening or by screening and crushing. The removal of large size aggregate by hand methods such as raking or forking will not be permitted.

2.8 When it is necessary to blend two or more materials, each material shall be proportioned separately through mechanical feeders to insure uniform production. Blending materials on the roadway to obtain a mixture that will comply with the above requirements will not be permitted, except for minor corrections allowed by written permission of the Engineer.

2.9 That portion of Class GB-3 retained on the No. 4 sieve shall contain a minimum of 15 percent crushed particles.

3.0 CONSTRUCTION EXECUTION

3.1 The base course material shall be placed on a completed and approved subgrade or existing base that has been graded to the required grades and cross-sections shown on the plans. Base course material shall not be placed on a frozen subgrade or subbase.

3.2 The subgrade shall be prepared as specified in Section 212 of the Arkansas State Highway Commission Standard Specifications for Highway Construction, 1978. It shall be free from any excess or deficiency of moisture at the time of placing the base course. The subgrade shall also comply, where applicable with the requirements of other items contained in the contract that provide for the construction, with reconstruction or shaping of the subgrade or the reconstruction of the existing base course.

3.3 Gravel shall be placed on the subgrade or other base course material and spread uniformly to such depth and lines so that when compacted it will have the thickness, width and cross-section as shown on the plans.

3.4 The maximum compacted thickness of any one layer shall not exceed six (6) inches. If the required compacted depth of the base course exceeds six (6) inches, the base course shall be constructed in two or more layers of approximate equal thickness. When approved types of compacting equipment are used, the compacted depth of a single layer of the base course may be increased to eight (8) inches upon approval of the Engineer.

3.5 The spreading shall be done the same day that the material is hauled. The spreading shall be performed in such a manner that no segregation of coarse and fine particles nor nests or hard areas caused by dumping on the subgrade will exist. To insure proper mixing, the gravel shall be bladed across the entire roadbed before being spread. Care must be taken to prevent mixing of subgrade or shoulder material with the base course material in the blading and spreading operation.

3.6 Each course shall be compacted by any satisfactory method that will produce the density hereinafter specified. The gravel shall be substantially maintained at optimum moisture during the mixing, spreading, and compacting operations. Water shall be added or the material aerated, as necessary, to achieve optimum moisture during the mixing, spreading, and compacting operations. The specified grade and section shall be maintained by blading throughout the compaction operation. The material in each course shall be compacted to a density, as determined by AASHTO T- 191, of 100% of the maximum density obtained in the laboratory. The gravel shall be compacted across the entire width of application.

3.7 The laboratory density shall be obtained as follows:

3.7.1 The sample is prepared by removing the aggregate retained on the ¾ inch sieve and adding aggregate passing the ⅜ inch sieve and retained on the No. 4 sieve in an amount equal to that removed.

3.7.2 The prepared sample is compacted in five (5) equal layers in a cylindrical mold 6 inches in diameter and 7 inches high. Each layer is compacted by 55 blows with a 10 pound hammer 2 inches in diameter dropped a height of 18 inches.

3.7.3 Trial sample specimens shall be molded at various water contents to determine the maximum density and optimum water content.

3.7.4 The oven dry weight per cubic foot of the material at optimum moisture content is expressed as the maximum density by this procedure.

3.8 The Contractor shall arrange for the testing of the materials used under this item and a copy of the testing report shall be submitted to the Engineer for approval prior to installation of the material at the work site.

3.9 The compacted base course shall be tested for depth. Any deficiencies shall be corrected by scarifying, placing additional material, mixing, reshaping and recompacting to specified density as directed.

3.10 When neither prime coat, surfacing, nor pavement are provided in the same contract with the base course, the density requirement for the base course will be waived. No compaction will be required beyond that obtained by systematic maintenance under traffic.

3.11 The Contractor shall maintain the base course in a satisfactory condition until accepted.

4.0 METHOD OF MEASUREMENT

4.1 Work performed and material accepted under this item will be measured either by the cubic yard compacted in place or by the ton.

5.0 PAYMENT

5.1 Work performed under this item and measured as stated above, will be paid for at the contract unit price bid per ton or per cubic yard as stated in the Proposal for "Gravel Base Course" of the particular class stated and furnished. The price shall be full compensation for preparing the subgrade; for furnishing and loading material; hauling and delivering on the site; spreading, finishing, watering, manipulating, and compacting; and for all labor, equipment, tools, and incidentals necessary to complete the work.

DS

DETAILED SPECIFICATIONS

Vaughn Engineering, LLC
4100 Silver Creek Road
Fort Worth, Texas

DETAILED SPECIFICATIONS
for
SWINGING BRIDGE WATER MAIN RELOCATION
to serve the users of
SARDIS LAKE WATER AUTHORITY
for the
PITTSBURG COUNTY DISTRICT #2
PITTSBURG COUNTY, OKLAHOMA

GENERAL INFORMATION

GENERAL

The work to be performed to complete this project shall include the furnishing of all materials, tools, equipment, supplies, labor and related items necessary for the satisfactory installation of water mains and associated items of work, all in accordance with the Plans, General and Supplementary Conditions, General Specifications and these Detailed Specifications.

QUALITY OF PLANS

The Construction Plans compiled for this project have been prepared with care. However, these plans cannot be expected to be correct in every detail. The Owner or Engineer may make minor changes in locations, lengths, grades, etc. To improve construction or preserve existing features and/or reduce construction costs.

GENERAL SPECIFICATIONS

The preceding General Specifications cover the various phases of work stated in these Detailed Specifications shall govern and control all work which, in the opinion of the Engineer, they may apply. Since the General Specifications are general in nature, they could refer to work and conditions not found in this project. In these cases such non-applicable stipulations will have no meaning. In case of conflict between the General and Detailed Specifications, the Detailed Specifications shall govern.

MEASUREMENT AND PAYMENT

Methods of measurement provided in the General Specifications are in cases superseded by the specific conditions stated in these Detailed Specifications. In such cases, the provisions stated in the Detailed Specifications shall apply.

Payment for each bid item shall be a the unit price bid or at the lump sum price each as identified in the Schedule of Bids and shall be compensation for all materials, tools, equipment, labor and incidentals necessary to complete the work.

SCHEDULE OF BIDS

A detailed description of each construction item, as stated in the Schedule of Bids is following.

SWINGING BRIDGE WATER MAIN RELOCATION

SCHEDULE OF BID ITEMS

GENERAL

1.0 The work to be performed shall consist of furnishing all materials, tools equipment and labor for constructing water mains and other appurtenances as described later in these Detailed Specifications and as shown on the plans and approved by the Engineer to fit special requirements for the conditions encountered. These specifications following will be applicable to the installation of water mains and appurtenances constructed under this contract.

2.0 These specifications are intended to include all work and materials necessary for completion of the work. Any incidental item of material, labor or detail required for the proper execution and completion of the work and omitted from the specifications, but obviously required by governing codes, local regulations, trade practices, operational functions and good workmanship shall be provided as a part of the Contract work without extra charge even though not specifically detailed or mentioned.

3.0 The Engineer will conduct meetings monthly to discuss the progress of construction and handle paperwork. The Contractor's Superintendent knowledgeable about the progress of construction and any problems encountered shall attend the meeting.

4.0 The Contractor shall attend the pre-construction meeting, progress meetings, final inspection and warranty inspection.

SWINGING BRIDGE WATER MAIN RELOCATION
SCHEDULE OF BID ITEMS

ITEM 1

BONDING, MOBILIZATION and STORMWATER POLLUTION PREVENTION PLAN IMPLEMENTATION

1.0 GENERAL

1.1 This item shall cover the bonding, insurance and mobilization of the Contractor's personnel to the construction site. This item shall be payable a maximum of 30 days following the issuance of the Notice to Proceed.

1.2 This item shall also cover the cost of a lay-down yard, reception of materials, portable toilet, etc.

2.0 STORMWATER POLLUTION PREVENTION PLAN

2.1 The Contractor shall obtain a stormwater permit for this project from the Oklahoma Department of Environmental Quality (ODEQ), if required.

2.2 The permit requires that a Stormwater Pollution Prevention Plan (SWPPP) be developed and implemented for this water main relocation project. This plan shall be kept on-site and be available at all times for inspection. One copy shall be given to the construction observer.

2.3 Two (2) copies of the plan shall submitted to the Engineer for review. Final approval will come from ODEQ.

2.4 The Contractor will be required to follow the requirements of the Sate approved stormwater permit.

4.0 PAYMENT

4.1 Payment for the work under this item shall be by the lump sum amount stated in the Schedule of Bids under Item 1 for an accepted BONDING, MOBILIZATION and STORMWATER POLLUTION PREVENTION PLAN. Contractor shall break down these costs for submittal and approval by the Engineer. Bonding and Mobilization can be paid within 45 days of the Notice to Proceed, after approval by the Engineer. The remainder of the cost shall be spread over the project time to comply with the SWPPP implementation.

4.2 Payment shall also include the implementation of a SWPPP, all materials, labor, tools, equipment and incidentals necessary to follow the requirements of the plan and permit.

4.3 This item shall not exceed 10% of the overall cost of the entire contract. If a larger number is plugged into this item, the Engineer will lower this item to the 10% level at the expense of the Contractor.

3" and 2" WATER MAINS

1.0 SCOPE

1.1 Under these items the Contractor shall furnish all materials, labor, equipment and supplies necessary to install in a workmanlike and satisfactory manner the water mains shown on the plans and as directed by the Engineer. Pipe shall be laid in accordance with the applicable portions of the preceding General Specifications, "Pipe and Pipe Laying".

1.2 Under these items shall be included all excavation and trenching; the furnishing and installing of the water mains, backfilling, repairing settlement, maintaining trenches in good condition until final dressing, the smoothing and dressing of the trenches after final settlement; and disposal of debris and excess excavation.

1.3 Also, under these items the Contractor shall flush, sterilize, take water samples and place in service all water mains which are constructed under this contract. **The cost of all water used by the Contractor for flushing, testing and sterilization shall be the responsibility of the Contractor at $3.00 per 1000 gallons** and no separate pay item shall be authorized.

1.4 Safety barricades, night lighting, warning lights or signs and all other items of work in connection with the installation of these water mains shall be included.

1.5 All water mains shall be laid to line and grade by the Contractor in accordance with the plans and as directed by the Engineer.

2.0 PIPE

2.1 High Density Polyethylene (HDPE) Water transmission and distribution pipe shall meet the specifications and requirements of AWWA C906 latest revision, in size 3 inch and be joined by means of a zero-leak rate, butt fusion and approved mechanical joints. The polyethylene pipe and fittings shall be made from prime virgin resins exhibiting a cell classification of PE 345434C as defined in ASTM D3350 with an established hydrostatic design basis of 1600 psi for water at 73° F. The resin shall be listed by the PPI in its pipe grade registry "TR-4". Pipe O.D. sizes shall be in the same as ductile iron pipe.

2.1.1 **The net pressure capability shall be the working pressure rating as follows:**

DR 11 = Class 200/Class 250 DR 9 = Class 350

2.1.2 The wall thickness shall follow the DR system prescribed in AWWA C906. The pipe is to be joined by heat fusion or mechanical joints systems proven for HDPE pipe. Both pipe and fittings must be NSF approved, be listed and marked. All pipe is to be welded using the manufacturer's recommended procedures.

2.1.3 All pipe and fittings shall be marked as prescribed by AWWA C906 latest revision, which includes the nominal size, O.D. base, DR, pressure class, WPR, manufacturer's name, manufacturer's production code including month and year extruded. All pipe and fittings shall have a date stamp less than six (6) months old.

2.1.4 Trench depth shall be such to maintain a minimum of thirty-six (36) inches cover from the top of the pipe to finish grade. The bedding around the pipe shall have a maximum particle size of ¾ inch for manufactured and one inch for natural rock. Embedment shall be hand placed. Special care shall be exercised in the bedding and backfilling of polyethylene pipe.

2.1.5 The contractor shall install the 3" water line under the creek by directional bore. The line shall be installed a minimum of three (3) feet below the solid creek bottom. The boring installed pipe shall extend a minimum of 100-feet beyond the top of bank on each side of the stream.

2.2 PVC Pipe shall conform to ASTM D1784, latest revision, Class 12454 resins and shall have a minimum Standard Dimension Ration (SDR) of 17. The thickness class shall be either Class 250 (SDR 17) or Class 315 (SDR 13.5) as specified on the plans. All fittings two (2) inches and larger shall be ductile iron and shall conform to AWWA C153. Trench depth shall be such to maintain a minimum of thirty-six (36) inches cover from the top of the pipe to finish grade. The bedding around the pipe shall have a maximum particle size of ¾ inch for manufactured and one inch for natural rock. Embedment shall be hand placed. Special care shall be exercised in the bedding and backfilling of PVC pipe.

2.3 In all cases the following construction procedures shall be strictly adhered to and enforced;

2.3.1 At the end of each day's work and when for any reason the laying of pipe is discontinued for any period, open ends of pipe shall be closed with a watertight plug or cap firmly secured in place.

2.3.2 All pipe and fittings shall be lowered carefully into the trench in such a manner as to prevent damage to pipe, fittings or linings. Neither pipe nor fittings shall be dropped or dumped into the trench.

2.3.3 Pipe shall be laid with bell ends facing in the direction of laying.

2.4 Safety barricades, night lighting, warning lights or signs, and all other items of work in connection with the installation of these water mains which are not included for payments under any other item shall be included in the price per foot bid on these items.

2.5 The pipe shall be of the size, type and pressure rating shown on the plans or in the Schedule of Bids. All pipe shall comply with the appropriate sections of the General Specifications.

2.6 The Contractor's attention is called to the need for special bedding and embedment considerations when PVC pipe is used. The bedding detail on the Typical Detail Sheet of the plans shall be strictly complied with. If rock is excavated or uncovered, the Contractor shall install clean graded rock for bedding. Bedding shall be a minimum of six (6) inches between the pipe and rock protrusions.

2.7 The granular bedding six (6) inches deep under the pipe and the embedment from the bottom of the pipe to six (6) inches above the top of the pipe shall be hand placed. Material excavated from the trench and obtained along the route shall be used for bedding and embedment insofar as is practical. No separate pay item is authorized under these conditions.

2.8 When required by the Engineer, bedding or embedment material shall be hauled in and used. Under this condition, separate payment shall be made a specified under "Bedding Material".

3.0 TRACER WIRE

3.1 Tracer wire shall be installed with all water mains and service lines. The tracer wire shall extend into and to the top of all air release boxes, underground vaults, access boxes and any other water appurtenance where the tracer wire would be accessible to connecting an electronic locator device. The tracer wire shall extend along the outside and to the top of all valve boxes.

3.2 Tracer wire shall consist of a #12 AWG solid, single conductor, insulated copper wire or copper jacketed wire and shall parallel within six (6) inches of the side of all piping and service lines.

3.3 **No tracer wire connections will be allowed on this project unless connections are wire nutted together and sealed up in underground wire gel packs.** All tracer wire ends shall be located in the valve/line markers, if not located at another structure. The maximum distance of the locator markers shall not exceed 1000 feet. The valve/line markers shall be as those specified in the gate valves specifications.

3.4 All tracer wire shall be tested using an Ohm meter once a section of water main has been installed and end points developed. This test shall be done in the presence of the Engineer's Representative. Also, if a portion of the water main is uncovered (i.e. leak detection) the Contractor shall retest the tracer wire for continuity after all repairs are completed.

3.5 All tracer wire end connections shall be located in the locator markers, if not located at another structure. No additional compensation shall be given for these locator markers

4.0 STERILIZATION

4.1 Sterilization shall be in accordance with the latest addition of AWWA C-651, Section 5.2 "Disinfecting Water Mains, (Continuous Feed Method)". Adequate steps shall be taken by the Contractor to prevent erosion from the flush water during the sterilization procedure.

5.0 EASEMENTS

5.1 No additional compensation will be made to the Contractor in the event that the Contractor is required to skip a section of pipe laying and then come back to it at a later time due to easement problems or other problems beyond the control of the Owner or the Engineer.

6.0 INITIAL CLEAN-UP

6.1 Initial clean-up shall be made concurrently with the laying of the pipe and shall include the disposal of all trees, rocks, excess soil, and miscellaneous construction debris. Initial clean-up shall also include restoration of property and driveways. The only items remaining after initial clean-up is complete should be the repair of trench settlement and the permanent repair of fences and paved drives. Should the initial clean-up not progress orderly and with the laying of pipe, the Owner may reduce payment on subsequent pay estimates by the value of

the initial clean-up not completed. The value of the initial clean-up can be computed at **thirty (30) percent** of the unit price bid for this bid item.

6.2 This thirty (30) percent value shall be kept in a separate line item (1A, 2A, etc.) until such time that Contractor completes the clean-up of that line.

7.0 PAVED AND UNPAVED DRIVEWAYS AND SIDEWALKS

7.1 The Contractor shall restore and replace driveways, sidewalks and pavements disturbed or damaged by the process of the construction. The cost to remove and replace these items shall be considered incidental to the cost per foot of water main and no additional payment shall be made therefore. Replacement shall be in like kind, to the extent of which shall be as directed by the Engineer.

8.0 PAVED AND UNPAVED ROADS

8.1 All open-cut County Road crossings shall be fitted with Class 7 (SB-2) base rock above the required bedding for the pipe. The Class 7 (SB-2) base rock shall be compacted to 95% of modified proctor. All County Road crossings shall utilize a PVC encasement pipe that is a maximum of five (5) inches larger than the carrier pipe. The cost of this encasement pipe is incidental to the cost of the carrier pipe.

8.2 All paved County Road crossings shall utilize a steel encasement pipe and be bored under the roadway, unless otherwise specified. The cost of this encasement shall be paid for as bid under an Encased Paved County Road Crossing.

9.0 TESTING

9.1 Testing of the water mains shall be completed according to the information in the General Specifications. An accurate **(new)** water meter shall be provided for testing and shall be located in the downstream line of the testing pump. The Contractor shall also have an easy operating shut-off valve downstream of the pump. It is preferred that the Contractor have one individual responsible for pipe filling and testing. Chlorination of water mains will only be allowed after the testing section has passed the pressure and leakage test. Contractors testing taps and extra expended equipment shall be incidental to installation of the pipe. Refer to the General Specifications for more information.

10.0 MEASUREMENT AND PAYMENT

10.1 Measurement shall be from center to center of fittings or valves. No pipe length deduction will be made for fittings or valves. Payment for 3" and 2" Polyethylene Pipe and PVC pipe shall be made at the unit price bid in the Schedule of Bids under the appropriate bid item.

10.2 Payments for fittings larger than 2" shall be made under a separate item. Payments for valves and fire hydrants will be made under separate items. Separate payment for Bedding shall be made if required by the Engineer / Construction Observer.

GATE VALVES - 2"

1.0 GATE VALVES

1.1 Under these items the Contractor shall furnish and install 2" gate valves and boxes at the locations shown on the plans or as directed by the Engineer.

1.2 All valves shall be AVK Series 25 valves with stainless steel stems and EPDM rubber encapsulated wedges as manufactured by American AVK Company, or the approved equivalent. Valves shall have a 2" square wrench nut. The design failure point shall not be the valve stem. The design failure point shall be the retainer gland on the top of the stuffing box.

1.3 Refer to General Specifications section "Water Pipe, Force Main, and Pipe Laying" for additional requirements.

2.0 VALVE BOX

2.1 All valves shall be equipped and installed with a three (3) piece, plus lid, screw type valve box as manufactured by Tyler/Union 6855 Series, or the approved equivalent.

2.2 A precast concrete protective collar is also required for valve box not in the street.

3.0 VALVE/LINE MARKERS

3.1 A valve/line marker shall be installed at each set of valves not located in the pavement. The marker shall be the Rhino TriView's highly visible triangular design ensures that excavators, mower operators and others will be able to see your warning message from any direction, protecting your pipeline as well as providing easy access to terminals by your technicians or contract locators. The Rhino TriView is durable and flexible reducing the likelihood of damage in the event that the marker is impacted by a vehicle.

3.2 The markers shall be installed during the installation of the water line so tracer wire can be installed. The standard marker colors shall be blue with a standard cap color of black. The size shall be 60" long and be a Tracer Wire Terminal Post with two Internal Terminals and two External Terminals. The 1/4" Brass Terminal includes a bolt, nut, washers and ring terminal.

3.3 The markers will also serve as pipeline markers that carry a warning message which may prevent an excavator from digging without calling for a locate. The standard color fast decals shall use sharply contrasting colors and incorporate the international No-Dig symbol and the 811 logo.

3.4 The water line markers shall be as manufactured by Rhino Marking and Protection Systems, A Division of REP*NET*, Inc., www.RhinoMarkers.com, Phone: 1-800-522-4343, Fax: 1-888-522-4343 or an approved equivalent.

4.0 PAYMENT

4.1 The Contractor shall be paid for each valve, valve box, concrete ring and valve/line marker actually installed at the unit price bid in the Schedule of Bids for the appropriate bid item and such payment shall include all work incidental to installation including the precast concrete collar and valve/line marker.

2" BLOW-OFF VALVES

1.0 Under this item the Contractor shall furnish and install at the locations shown on the plans a blow-off hydrant in accordance with the detail shown on the Typical Details sheet in the plans. These hydrants shall be non-freezing, self-draining with a 3 foot bury. This hydrant will be furnished with a 2" inlet, a non-turning operating rod, and shall open counterclockwise. All working parts shall be bronze to bronze design and serviceable without digging and comply with the latest NSF requirements for brass. All piping shall be either cast or ductile-iron. The outlet shall also be bronze and be 2½" NST. Hydrants shall be lockable to prevent unauthorized use. Hydrant shall be a No. 77 Post Hydrant as manufactured by the Kupferle Foundry Co., St. Louis, Mo. or approved equivalent.

2.0 The blow-off valve shall utilize a two (2") inch MJ connection. The blow-off valve shall be restrained to the PVC through the use of a MIDCO gland. All blow-off hydrants shall use the minimum sized thrust blocking as stated in the "Ductile Iron Fittings" requirements.

3.0 PAYMENT

3.1 The Contractor shall be paid for each blow-off actually installed at the unit price bid in the Schedule of Bids for "2" Blow-off Valve Assembly" and such payment shall include all work incidental to completing the installation.

DUCTILE IRON FITTINGS

1.0 FITTINGS

1.1 Under this item the Contractor shall furnish and install Ductile Iron Fittings at locations as shown on the plans, or as directed by the Engineer. No plastic fittings will be allowed on the smaller lines.

1.2 These fittings shall be pressure rated for 250 (350 psi where Class 350/Class 315 pipe is shown on the plans) in accordance with AWWA C153 and shall utilize restrained joints.

1.3 The restraint joints shall be as manufactured by Smith-Blair, Inc., EBAA IRON, Inc., MIDCO or an approved equivalent. The two inch joints and HDPE pipe shall use MIDCO restraint glands.

1.4 The fittings shall be coated with 6 - 8 mils thickness of fusion bonded epoxy conforming to the requirements of AWWA Specification C-550 and C116/A21.116, latest revision. All fittings shall be furnished with gaskets.

1.5 Also included under this item shall be the providing of necessary and required blocking of fittings as shown on the plans. Plastic shall be wrapped around each fitting prior to placement of backing (see "Typical Details" sheet).

1.6 **The minimum size of blocking shall be a 24" x 18" x 12" cube of concrete. This concrete shall be placed. No bags of Quickcrete will be accepted unless mixed.**

2.0 PAYMENT

2.1 Payment for these fittings will include the concrete, bolts, restraining glands, and accessories of a properly installed Ductile Iron Fitting. Also included is the labor, tools, equipment and any incidental items necessary for a properly installed Ductile Iron Fitting.

2.2 Payment for these fittings will be by the pound (lb.) at the unit price bid in the Schedule of Bids, for this item. **The weight paid for each installed fitting (including accessories, concrete, equipment, labor and incidentals) will be derived from the minimum weight (excluding accessories) shown in the AWWA Standard C153 for compact fittings.**

6"x 3" TAPPING SLEEVE, 3" GAVE VALVES, AND VALVE BOXES

1.0 GENERAL

1.1 Under this item, the Contractor shall furnish all labor, materials, and equipment required to connect the Tapping Sleeve and Valve to the existing mains at the locations shown on the plans.

2.0 SLEEVES

2.1 Sleeves shall be designed for a working pressure of at least 200 psi. A test plug shall be furnished through the body for hydrostatic pressure testing on all sleeves. Full body stainless steel, mechanical-type sleeves are required. The sleeve shall be covered with a bituminous coating upon completion of the installation for all non-stainless steel parts.

2.2 The outlet shall conform to a mechanical joint connection designed to accept a regular MJ valve. All bolts shall be corrosion resistant alloy.

2.3 The sleeve shall have been tested to a minimum of 300 psi on pipe to verify proper fit and be welded to a "Zero Leakage" standard.

2.4 These sleeves shall be Model 3490MJ as manufactured by PowerSeal Corporation (800-800-0932), Smith-Blair, or an approved equivalent.

3.0 VALVES

3.1 All tapping valves shall be AVK Series 25 valves with EPDM rubber encapsulated wedges as manufactured by American AVK Company, or an approved equivalent. Valves shall have a 2" square wrench nut. Refer to General Specifications section "Water Pipe, Force Main, and Pipe Laying" for additional requirements.

4.0 VALVE BOX

4.1 All valves shall be equipped and installed with a three piece, plus lid, screw type valve box as manufactured by Tyler/Union 6855 Series, or the approved equivalent. A valve marker shall be installed at each set of valves not located in the pavement, like the valve bid item.

4.2 A concrete protective collar is also required for valve box and a valve marker for the valve location.

5.0 PAYMENT

5.1 Payment for this item shall be at the unit price bid in the Schedule of Bids, based on each "Tapping Sleeve, Valve and Valve Box properly installed and shall include the cost of all equipment, labor, and materials necessary to complete the installation.

ITEM 9

ENCASED 3" COUNTY ROAD CROSSING

1.0 GENERAL

1.1 Under this item, the Contractor shall furnish all materials and labor to install encased county road crossing of water mains as shown on the plans in accordance with the Plans and Spccifications.

1.2 The encasement shall be installed under the paved road pavement by dry-boring or tunneling. Traffic and safety controls shall be maintained with signs, flagmen, or otherwise as needed or directed by the Pittsburg County Road Departments.

1.3 Included in this item shall be a smooth steel encasement pipe with welded joints. The inside diameter of the encasement pipe shall not less than four inches (4") greater in diameter than the outside diameter of the bell or flange of the carrier pipe to be encased.

1.4 Also included under this item will be approved casing spacers to center the carrier pipe inside the encasement pipe. The spacers shall be spaced according to the manufacturers recommendations for a full pipe of the type of carrier pipe used.

1.5 The steel casing shall extend five (5') feet past the road ditches and be installed with 2-inch steel vent pipes on each end.

2.0 PERMIT

2.1 **The Contractor shall obtain the County's permit, if required, to insure satisfactory restoration of Pittsburg County Road Department property.** Contractor shall be responsible for the acceptance of the county road crossing by the Pittsburg County Road Department at which time permit shall be released.

2.2 **Proper alignment and grade must be maintained through the crossing.**

3.0 PAYMENT

3.1 Payment for "Encased County Road Crossing shall be by the linear foot installed for the size of the carrier. Payment shall be at the unit price bid in the Schedule of Bids, which shall include all compensation for extra labor involved including rock excavation or pavement replacement, if necessary, exclusive of the price per foot of pipe. Carrier pipe will be paid for separately.

CONNECTION TO EXISTING MAINS

1.0 GENERAL

1.1 This item shall include locating existing piping and connecting new piping to existing piping and shall be installed at the locations shown on the plans.

1.2 This item shall also include all fittings and brass less than two (2) inches in size.

2.0 PAYMENT

2.1 Payment shall be made for each connection made to existing piping.

2.2 This shall not be paid in conjunction with Items 8, "6"x3" Tapping Sleeve and 3" Gate Valve".

2" CUT AND CAP EXISTING MAIN

1.0 GENERAL

1.1 This item shall include locating existing piping, cut and cap the existing line to abandon a section of the main as shown on the plans and according to the detail.

1.2 This item shall also include all fittings, caps and accessories.

1.3 This item shall also include the steel tubing installed between the two caps on the piping.

1.4 The concrete installed shall also be included.

1.5 This item cannot be completed until the new piping has obtained safe water samples and passed pressure testing.

2.0 PAYMENT

2.1 Payment shall be made for each cut and cap completed made to existing piping. This item shall include all concrete, steel tubing, caps and hardware, labor and incidentals necessary to complete the item.

GRAVEL BEDDING AND BACKFILL MATERIAL

1.0 GENERAL

1.1 Under this item of work the Contractor shall place bedding and embedment material when so directed by the Engineer or his Representative. This bedding and embedment shall be placed in accordance with the details shown on the plans when the excavated material is not satisfactory and the availability of other suitable material is absent. Materials required due to over excavation will be at the expense of the Contractor.

1.2 Where required by the Engineer or his Representative, bedding material shall be hauled in and used. Obtaining bedding material along the ditch shall not be paid as bedding. Bedding shall cause the Contractor to go at least 400 feet to obtain suitable material.

2.0 BEDDING MATERIAL

2.1 This material shall consist of fine river sand, silt loam or a No. 6 gradation (ASTM C33, latest revision) of a quality approved by the Engineer or his Representative. The maximum particle size shall not exceed ¾ inch. At least 30% of the material shall pass the ½ inch sieve.

2.2 Embedment shall be hand placed. Special care shall be exercised in the bedding and backfilling of PVC pipe.

3.0 MEASUREMENT AND PAYMENT

3.1 The bedding shall be measured on the basis of the actual measurement of the lineal feet of pipe that bedding is used. The minimum required bedding used when required shall be as shown on the plans. Over excavation of the trench will be at the Contractor's expense.

3.2 The **exact** length of pipe bedding required shall be determined by the Engineer or his Representative. The **actual** length of the pipe bedding shall be so noted in the construction observer's diary, and initialed by the Contractor or his representative, which shall constitute full agreement by all parties to the quantity in question.

3.3 Payment shall be made at the unit price bid per linear feet in the Schedule of Bids for this item, "Bedding Material" and such price shall include all related items of work connected with furnishing and placing bedding or backfill material.

ROCK EXCAVATION

1.0 GENERAL

1.1 Under this item the Contractor shall remove and dispose of solid rock encountered in the pipe trench as specified herein.

2.0 DEFINITION

2.1 Solid rock excavation shall be defined as any boulder or ledge rock requiring blasting or mechanical hammering prior to removal. Also included shall be any solidified material, which in the opinion of the Engineer or his Representative, **could not be excavated by a 325 Caterpillar trackhoe with a 24 inch bucket and being used under reasonable operating procedures shall be termed solid rock excavation.**

2.2 **Included in this item shall be the removal and disposal from the site of excess solid rock so excavated.**

3.0 ADDITIONAL REQUIREMENTS

3.1 It should be noted that no boulder exceeding eight (8) inches in any dimension shall be placed in the trench backfill above the bedding.

3.2 All Contractors or subcontractors performing blasting shall conform to all requirements for insurance, the protection of private property, the State of Arkansas Safety Requirements, and any other applicable standards.

4.0 MEASUREMENT AND PAYMENT

4.1 The rock shall be measured on the basis of the actual thickness in the trench at the required depth and a width equal to **eighteen (18) inches plus the diameter of the carrier pipe** being laid according to the detail on the plans. Over excavation of rock will be at the Contractor's expense.

4.2 Payment will be at the price bid per cubic yard in the Schedule of Bids for this item "Rock Excavation" in Trench, and such price shall include all related items of work connected with the removal and disposal of said solid rock material.

2" TEMPORARY WATER LINE

1.0 GENERAL

1.1 Under this bid item, the Contractor shall furnish all material, equipment, and labor for a 2-inch temporary DR-11 polyethylene water line that will allow the construction to begin for the new bridge structure. The line shall be installed above ground across the existing walk bridge crossing the stream as shown on the plans and described herein. This installation shall include all piping, fittings, sterilization, above ground restraints, connections, existing pipe locating and related accessories.

2.0 PIPE

2.1 High Density Polyethylene (HDPE) Water transmission and distribution pipe shall meet the specifications and requirements of AWWA C906 latest revision, in size 3 inch and be joined by means of a zero-leak rate, butt fusion and approved mechanical joints. The polyethylene pipe and fittings shall be made from prime virgin resins exhibiting a cell classification of PE 345434C as defined in ASTM D3350 with an established hydrostatic design basis of 1600 psi for water at 73° F. The resin shall be listed by the PPI in its pipe grade registry "TR-4". Pipe O.D. sizes shall be in the same as ductile iron pipe.

2.1.1 **The net pressure capability shall be the working pressure rating as follows:**

DR 11 = Class 200/Class 250

2.1.2 The wall thickness shall follow the DR system prescribed in AWWA C906. The pipe is to be joined by heat fusion or mechanical joints systems proven for HDPE pipe. Both pipe and fittings must be NSF approved, be listed and marked. All pipe is to be welded using the manufacturer's recommended procedures.

2.1.3 All pipe and fittings shall be marked as prescribed by AWWA C906 latest revision, which includes the nominal size, O.D. base, DR, pressure class, WPR, manufacturer's name, manufacturer's production code including month and year extruded. All pipe and fittings shall have a date stamp less than six (6) months old.

2.2 Contractor shall sterilize water line before connection to the existing system. An alternative would be a pre-sterilized water line with capped ends.

2.3 500-foot water line shall be centered over creek and connected on both ends to the existing 2-inch PVC water line. Contractor shall install piles of soil over the above ground line at 50-foot intervals on both sides of the bridge to keep the water line in place.

3.0 SALVAGE

3.1 After the new water main is installed and safe samples have been obtained, the Contractor shall connect the south end of the existing line to the new water main. Then the temporary water line shall be given to the Sardis Lake Water Authority. The contractor shall roll up the water line on the original spool for delivery to the District. Contractor shall deliver

water line to the District's main office / water treatment plant on Highway 2 north of Clayton, Oklahoma.

4.0 PAYMENT

4.1 Payment shall be at the lump sum price bid for the "2" temporary water line" in the Schedule of Bids for acceptably furnished, installed and salvaged; and shall be full compensation for all materials, equipment, and labor necessary to complete the work and shall be full compensation including incidentals.

APPENDIX

Release of Claimants

RELEASE OF CLAIMANTS

Date:_____

Project:_____

_____

Dear Sir:

I hereby acknowledge receipt of _____

Dollars ($_____) in full payment of my

contracted dated _____, for improvement

work which I did for you and which is described in my contract.

I, Certify that I have paid in full for all material's purchased and all labor employed in the performance of this contract and that there are no claims against me as an employer under this contract on account of injuries sustained by workmen employed by me thereunder.

I, hereby release you from any claims arising by virtue of this contract.

_____

WARNING

The making of any false statement or misrepresentation herein may be a crime punishable under Title 18 U.S.C. Section 1001 which provides in part: "Whoever, in any matter within the jurisdiction of any department or agency of the United States knowingly and willfully.... makes false representation, or makes or uses any false writing or document knowing the same to contain any false fictitious or fraudulent statement or entry, shall be fined not more than $10,000.00 or imprisoned not more than five years, or both."

_____

Sincerely,

By:_____
(Signature)

Title:_____
(Print or Type)

PLANS
FOR

SWINGING BRIDGE WATER LINE RELOCATION

TO SERVE

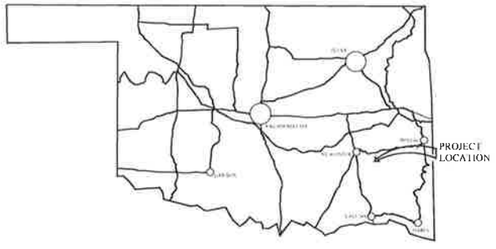
SARDIS LAKE WATER AUTHORITY WATER USERS

PREPARED FOR

PITTSBURG COUNTY - DISTRICT #2
PITTSBURG COUNTY, OKLAHOMA

MAY 2021

CONTENTS



VICINITY MAP
N.T.S.

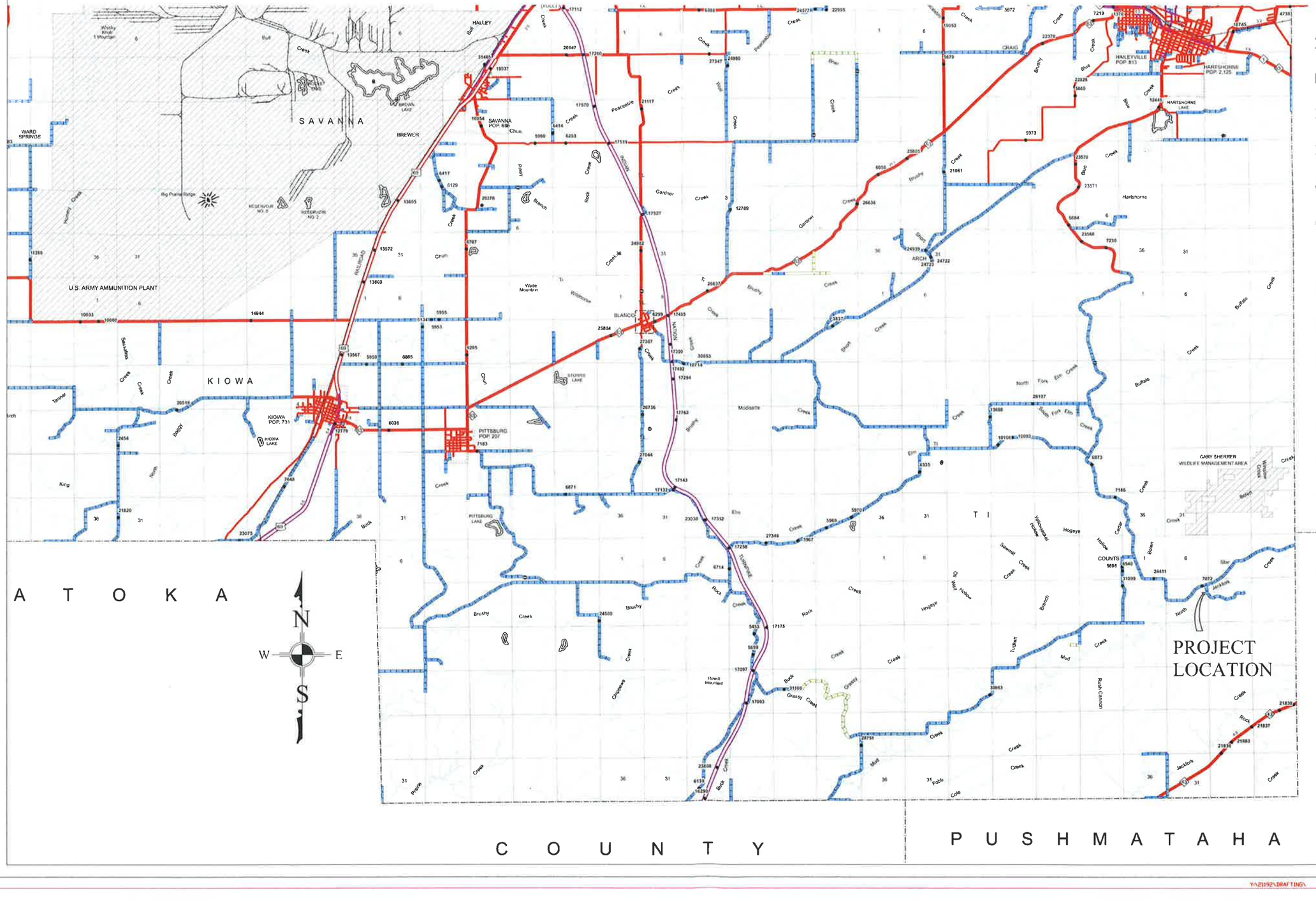
PREPARED BY:
VAUGHN ENGINEERING, LLC
CONSULTING ENGINEERS
4100 SILVER CREEK ROAD
FORT WORTH, TEXAS 76108
TELEPHONE 817-975-1367

STACY COLE
CHAIRMAN OF THE BOARD

CERTIFICATE OF AUTHORIZATION VAUGHN ENGINEERING INC. #3150 OKLAHOMA - ENGINEER

GREG A. VAUGHN, OK P.E. 18370
VAUGHN ENGINEERING, LLC

REGISTERED PROFESSIONAL ENGINEER GREG A VAUGHN 18370 OKLAHOMA 05/18/2021



REV.	DATE:	DESCRIPTION

WATER LINE RELOCATION
FOR
SARDIS LAKE WATER AUTHORITY
PITTSBURG COUNTY, OKLAHOMA

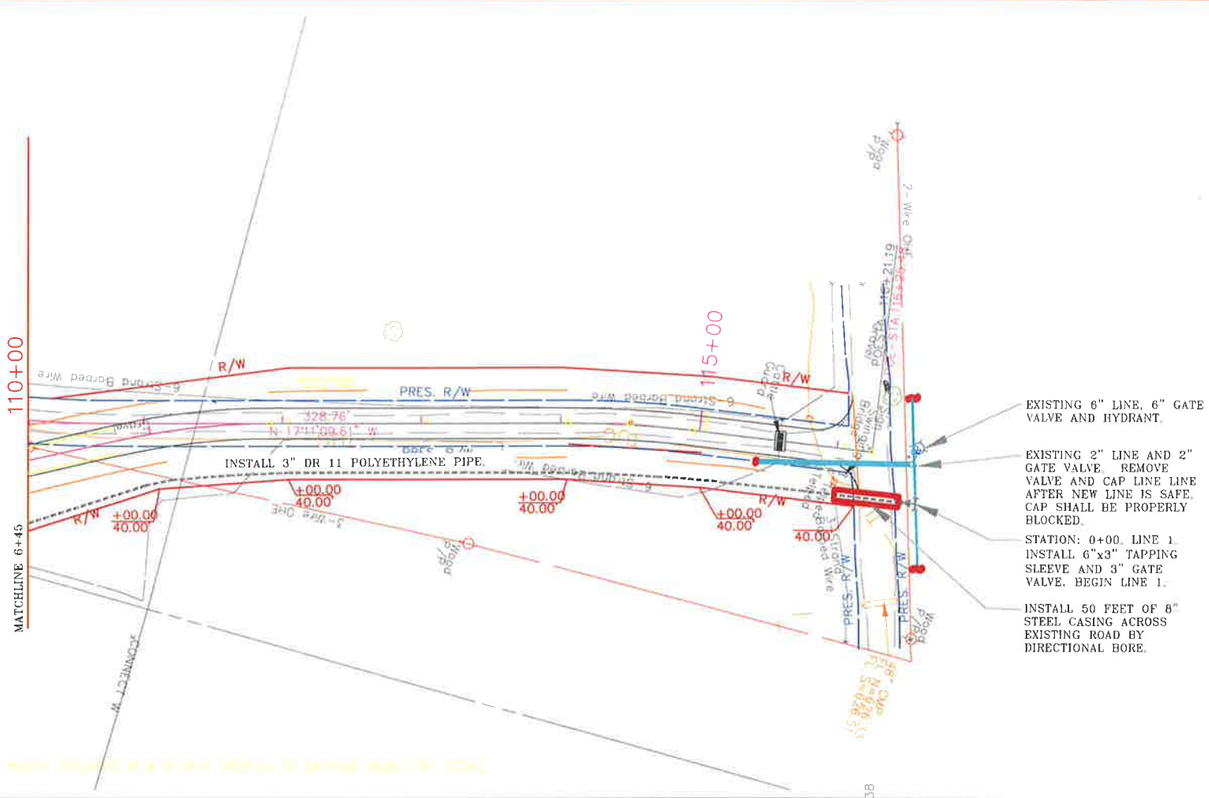
VAUGHN ENGINEERING LLC
CONSULTING ENGINEERS
4100 SILVER CREEK ROAD
FORT WORTH, TEXAS 76108
(817) 975-1367
DESIGNING TOMORROW TODAY

REGISTERED PROFESSIONAL ENGINEER
GREG VAUGHN
18370
OKLAHOMA
05/18/2021

DRAWN BY:	TJV
DATE:	5/21
JOB #	21192
CHECKED BY:	GAV

2

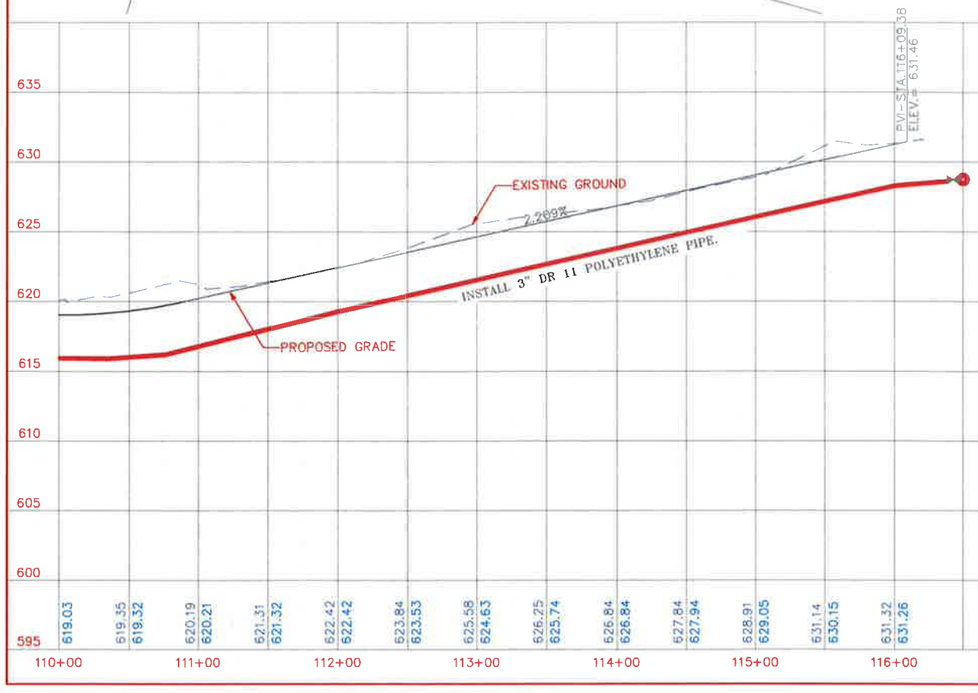
Y:\21192\DRAFTING\



GENERAL NOTES

1. THE DISTRICT SHALL OBTAIN EASEMENTS WHERE WATER MAINS CROSS PRIVATE PROPERTY.
2. WATER MAINS SHALL HAVE A MINIMUM COVER OF THIRTY-SIX (36) INCHES OVER THE TOP OF THE PIPE.
3. ALL WATER MAINS MUST BE SEPARATED FROM ANY EXISTING SEWER LINES BY A MINIMUM OF TEN (10) FEET.
4. WHERE WATER MAINS MUST CROSS SEWER MAINS, THE WATER MAIN MUST PASS OVER THE SEWER MAIN WITH A MINIMUM VERTICAL SEPARATION OF TWENTY-FOUR (24) INCHES.
5. CONTRACTOR SHALL LOCATE EXISTING UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.
6. EXISTING WATER MAINS SHOWN ARE APPROXIMATE. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND MAKE APPROPRIATE FIELD ADJUSTMENTS.
7. CONTRACTOR SHALL INSTALL A 600-FOOT TEMPORARY 2" PE WATER MAIN OVER THE SWINGING WALK BRIDGE AND CONNECT TO THE EXISTING MAIN ON EACH SIDE. THIS WILL ALLOW THE ROAD CONTRACTOR TO BEGIN HIS WORK AND SHALL BE PROTECTED FROM CONSTRUCTION ACTIVITIES. THIS MAIN SHALL BE STERILIZED PRIOR TO CONNECTION. AFTER NEW MAIN IS INSTALLED AND SAFE, TEMPORARY WATER MAIN SHALL BE GIVEN TO THE DISTRICT.

50' 0 25' 50'



SWINGING BRIDGE RD. OVER JACKFORK CREEK — PITTSBURG COUNTY
State Job No. 32927(04) — Sheet No. R004

Y:\21192\DRAFTING\LAYOUT 1.dwg

REV.	DATE:	DESCRIPTION

WATER LINE RELOCATION FOR SARDIS LAKE WATER AUTHORITY

PITTSBURG COUNTY, OKLAHOMA

VAUGHN ENGINEERING LLC
CONSULTING ENGINEERS
4100 SILVER CREEK ROAD
FORT WORTH, TEXAS 76108
(817) 975-1367
DESIGNING TOMORROW TODAY

REGISTERED PROFESSIONAL ENGINEER
GREG A. VAUGHN
18378
OKLAHOMA

DRAWN BY: TJV
DATE: 5/21
JOB # 21192
CHECKED BY: GAV

3

SURVEY DATA

1. HORIZONTAL CONTROL

A. HORIZONTAL CONTROL WAS ESTABLISHED THROUGH OPUS DATA COLLECTION. COORDINATE SYSTEM USED IS NGS OKLAHOMA STATE PLANE, NAD 83 (SOUTH ZONE).

2. VERTICAL CONTROL

B. VERTICAL CONTROL WAS ESTABLISHED THROUGH OPUS DATA COLLECTION. DATUM USED IS NAVD 88.

X=2705585.2497
Y=491790.0408

STATION: 17+00, LINE 1, INSTALL 3"x2" TEE, 2" BLOW-OFF VALVE, 3"X2" REDUCER, 2" GATE VALVE AND 2" LONG SLEEVE. CONNECT TO EXISTING 2" PVC WATER LINE AFTER OBTAINING SAFE SAMPLES. END LINE 1.

INSTALL 3" DR 11 POLYETHYLENE PIPE.

CRL NS.4200 RD

TEMPORARY 2-INCH PE WATER SERVICE. STERILIZE AND CONNECT TO EXISTING 2-INCH PVC WATER LINE ON BOTH ENDS. LOCATION OF EXISTING LINE IS APPROXIMATE.

MATCHLINE 6+45

50' 0 25' 50'

GENERAL NOTES

1. THE DISTRICT SHALL OBTAIN EASEMENTS WHERE WATER MAINS CROSS PRIVATE PROPERTY.
2. WATER MAINS SHALL HAVE A MINIMUM COVER OF THIRTY-SIX (36) INCHES OVER THE TOP OF THE PIPE.
3. ALL WATER MAINS MUST BE SEPARATED FROM ANY EXISTING SEWER LINES BY A MINIMUM OF TEN (10) FEET.
4. WHERE WATER MAINS MUST CROSS SEWER MAINS, THE WATER MAIN MUST PASS OVER THE SEWER MAIN WITH A MINIMUM VERTICAL SEPARATION OF TWENTY-FOUR (24) INCHES.
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6. EXISTING WATER MAINS SHOWN ARE APPROXIMATE. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND MAKE APPROPRIATE FIELD ADJUSTMENTS.
7. CONTRACTOR SHALL INSTALL A 600-FOOT TEMPORARY 2" PE WATER MAIN OVER THE SWINGING WALK BRIDGE AND CONNECT TO THE EXISTING MAIN ON EACH SIDE. THIS WILL ALLOW THE ROAD CONTRACTOR TO BEGIN HIS WORK AND SHALL BE PROTECTED FROM CONSTRUCTION ACTIVITIES. THIS MAIN SHALL BE STERILIZED PRIOR TO CONNECTION. AFTER NEW MAIN IS INSTALLED AND SAFE, TEMPORARY WATER MAIN SHALL BE GIVEN TO THE DISTRICT.

BM 11038 ELEV = 632.14
N= 491750.30 E= 2705591.29

BM 11357 623' RT. OF EXISTING ROAD
STA. 102+32.86 ELEV. = 622.37

BM 11387 619.67' RT. OF EXISTING ROAD
STA. 106+01.94 ELEV. = 619.22

PVI-STA.100+00.00 ELEV.= 630.19
PVC-STA.100+50.00 ELEV.= 631.82
PVI-STA.101+25.00 ELEV.= 634.27
PVI-STA.102+00.00 ELEV.= 634.27
BEGIN BRIDGE STA. 102+57.25
END BRIDGE STA. 104+87.25
PVC-STA.105+00.00 ELEV.= 634.27
PVI-STA.106+00.00 ELEV.= 634.27
PVI-STA.107+00.00 ELEV.= 629.13
HI STA.106+00.00 ELEV.= 634.27

3.266%
0.000%
-5.144%
230'-0"
300' V.C. K = 41
200' V.C. K = 39
PROPOSED GRADE
EXISTING GROUND
INSTALL 3" DR 11 POLYETHYLENE PIPE.

CONTRACTOR SHALL INSTALL THE NEW DR-11 POLYETHYLENE PIPE A MINIMUM OF 3-FEET BELOW THE BOTTOM OF THE CREEK BY DIRECTIONAL BORING EQUIPMENT. OPEN-CUT INSTALLATION CAN OCCUR A MINIMUM OF 100 FEET FROM THE TOP OF BANK ON EACH SIDE OF THE CREEK.

100+00	101+00	102+00	103+00	104+00	105+00	106+00	107+00	108+00	109+00	110+00
630.19	628.79	627.82	627.33	627.27	627.27	627.22	627.27	627.27	627.27	627.27	627.01	626.23	624.93	623.10	621.29	620.00	619.25	619.03
630.19	631.82	633.18	634.00	634.27	634.27	634.27	634.27	633.27	634.27	634.27	633.95	632.98	631.38	629.13	623.99	621.83	620.28	619.35

640 635 630 625 620 615 610 605 600

TITLE
SCALE: 1"=1000'-0"

SWINGING BRIDGE RD. OVER JACKFORK CREEK — PITTSBURG COUNTY
State Job No. 32927(04) Sheet No. R003

REV.	DATE:	DESCRIPTION

WATER LINE RELOCATION
FOR
SARDIS LAKE WATER AUTHORITY
PITTSBURG COUNTY, OKLAHOMA

VAUGHN ENGINEERING LLC
CONSULTING ENGINEERS
4100 SILVER CREEK ROAD
FORT WORTH, TEXAS 76108
(817) 975-1367
DESIGNING TOMORROW TODAY

REGISTERED PROFESSIONAL ENGINEER
GREG A. VAUGHN
18370
OKLAHOMA
6-30-2021

DRAWN BY: TJV
DATE: 5/21
JOB # 21192
CHECKED BY: GAV

4

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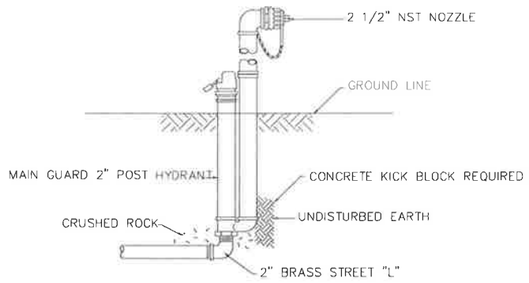
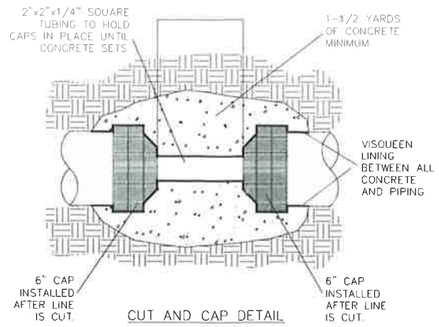
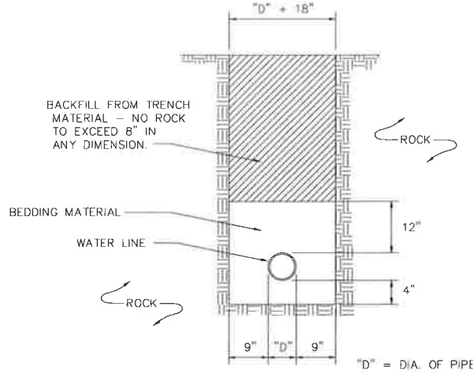


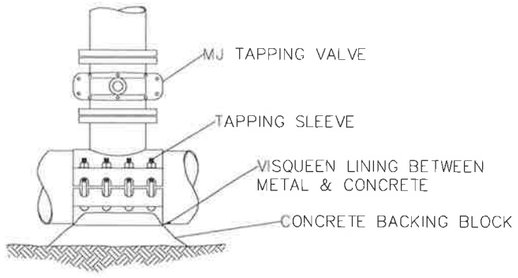
TYPICAL BLOW-OFF VALVE DETAIL



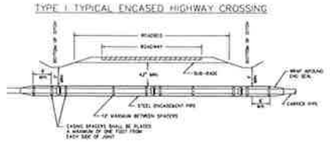
CUT AND CAP DETAIL

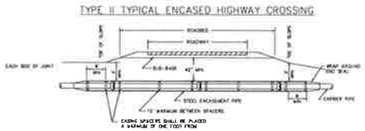


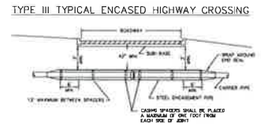
TYPICAL BEDDING FOR WATER MAIN IN A ROCK EXCAVATION

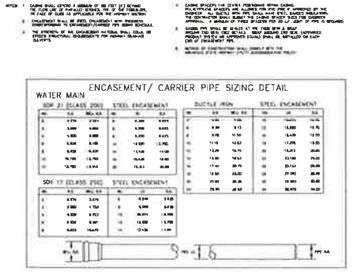


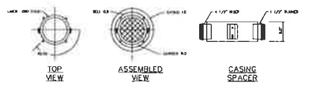
TYPICAL DETAIL OF TAPPING VALVE AND SLEEVE

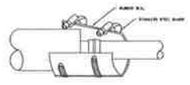




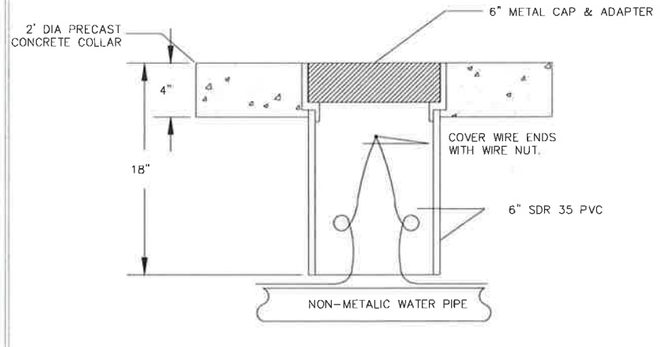




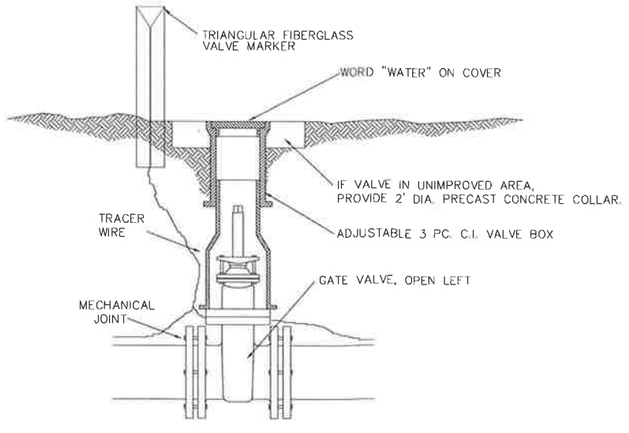




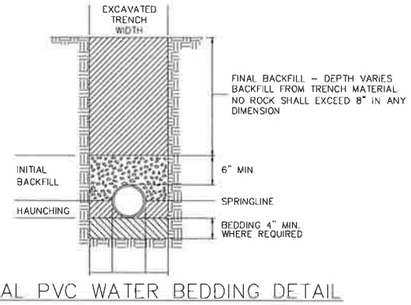
NOTE:
1. WIRE SPLICES SHALL BE WIRE NUTTED TOGETHER
2. TERMINAL BOXES SHALL BE LOCATED AT APPROXIMATE INTERVALS OF 1000' OF PIPE LENGTH OR AT THE LOCATIONS OF WIRE SPLICES.
3. THE CONTRACTOR SHALL PROVIDE AN INSTRUMENT AND DEMONSTRATE THE ELECTRICAL CONTINUITY OF ALL TRACER WIRES PRIOR TO FINAL ACCEPTANCE OF OWNER.
4. TRACER WIRE SHALL BE INSTALLED IN THE LOCATION DIRECTED BY THE ENGINEER BUT SHALL GENERALLY BE LOCATED IMMEDIATELY ADJACENT TO THE PIPE AND AT THE SAME DEPTH.
5. BOX SHALL IDENTIFY BOX USE



TRACER WIRE LOCATOR BOX



TYPICAL VALVE BOX INSTALLATION



TYPICAL PVC WATER BEDDING DETAIL

BEDDING NOTES:

1. PVC PIPE EMBEDMENT SHALL HAVE NO PARTICLE SIZE IN EXCESS OF 3/4".
2. BEDDING WILL BE REQUIRED WHERE NATIVE MATERIAL EXCEEDS THE REQUIREMENTS FOR EMBEDMENT AS DESCRIBED.
3. FINAL BACKFILL SHALL HAVE NO PARTICLE SIZE IN EXCESS OF 8" IN ANY DIMENSION.
4. THE MINIMUM TRENCH WIDTH SHALL BE THE PIPE DIAMETER PLUS 12" AS MEASURED AT THE SPRINGLINE. THE MINIMUM TRENCH WIDTH WILL ALLOW THE PROPER HAUNCHING OF THE PIPE WHEN BACKFILLING. THE MINIMUM TRENCH SHALL BE 18" WIDE.

REV.	DATE:	DESCRIPTION

STANDARD DETAILS
FOR
SARDIS LAKE WATER AUTHORITY
PITTSBURG COUNTY, OKLAHOMA

VAUGHN ENGINEERING LLC
CONSULTING ENGINEERS
4100 SILVER CREEK ROAD
FORT WORTH, TEXAS 76108
(817) 975-1367
DESIGNING TOMORROW TODAY

REGISTERED PROFESSIONAL ENGINEER
GREG A. VAUGHN
18370
OKLAHOMA
2021

DRAWN BY: TJV
DATE: 5/21
JOB # 21192
CHECKED BY: GAV

5

Y:\21191\DRAFTING\SWING BRIDGE

PERMIT# 22.004

STATE OF OKLAHOMA
COUNTY OF PITTSBURG
APPLICATION FOR PERMIT
PUBLIC SERVICE/PIPELINE CROSSING

We, the undersigned, hereby petition the Board of County Commissioners, Pittsburg County, to grant a permit for a public service, pipeline crossing, ingress and egress, or line installation as described below and in accordance with the provisions as listed.

PLEASE PRINT
PUBLIC SERVICE/PIPELINE OWNER NAME: Shannon Webster

CONTACT: Shannon Webster EMAIL: Sheila.norman2@gmail.com

ADDRESS: 462 Gaines Creek Rd PHONE: 918-421-0202

CITY: Canadian STATE: OK ZIP CODE: 74425

CONSTRUCTION COMPANY NAME: G M Contractors

CONTACT: Joe Oley EMAIL:

ADDRESS: 2561 Hereford LN PHONE: 918-470-7416

CITY: McAlester STATE: OK ZIP CODE: 74501

TYPE OF INSTALLATION (Please mark all boxes that apply)				
☐ Electric ☐ Gas ☐ Oil ☒ Water ☐ Telephone ☐ Sewer ☐ Other _____	☒ Permanent Line ☐ Temporary Line	☐ Salt Water ☒ Fresh Water ☐ Other _____	☒ Residential ☐ Commercial ☐ Agricultural ☐ Oil/Gas Service Road ☐ Other _____	☒ Boring ☐ Trenching ☐ In/Through existing culvert ☐ Temporary Road Cross Bridge ☐ Other: _____

This permit is to erect, construct and maintain a New home along, upon and across the hereinafter said county highway/road for the purpose of transporting, selling, and using _____.

LOCATION

Beginning at 35.188388, -95.623700 (GPS Location (in decimals)) and Cross (Cross or Parallel) freeway route Gaines Creek Rd (County Road Name)

Approximately 4 miles EAST (North, South, East, West) of Canadian Access Rd (Name of Closest Intersecting Road or Highway) and ending at _____ (GPS Location (in decimals)). Embraced in Section 9 Township 8N Range 16E.

PIPELINES	ELECTRIC
SIZE 2 ALLOY/MATERIAL poly pipe WALL THICKNESS CONTENTS rural water/Residential MFG. TEST PRESSURE MAX. OPERATING PRESSURE WORKING PRESSURE	VOLTAGE CONDUCTOR SIZE TYPE OF STRUCTURE RULING SPAN
COMMUNICATIONS	**SERVICE ENTRANCE**
WIRES/PAIRS/STRANDS GUAGE CABLE TYPE	DIAMETER OF CULVERT PIPE LENGTH OF CULVERT PIPE

CASING
SIZE 2½" ALLOY/MATER ESS

35.188388, -95.623700

FLOODPLA

Upon review, I, Holly Sweetin rg County, have determined that the above-referenced public se

_____ Does

fall within any floodplain.

Administrator

(Administrator: Please attach a copy of the floodplain p permit was paid if road crossing is within a

If granted, this permit is subject to the following conditions, requirements and covenants, to-wit, please initial that you have read each condition, requirement or covenant:

1. Applicant/contractor is aware that all road crossing permits for PITTSBURG COUNTY shall require approval from the Pittsburg County Floodplain Administrator's Office and that all permits and fees owed to the Floodplain Administrator's Office will be paid in full before approval is given by the Board of County Commissioners.

   Initial: SW

2. Application for road crossing must be submitted ***no later than 5 days before a meeting*** of the Board of County Commissioners with a check for the amount of permit made payable to the Pittsburg County Commissioners. The petitioner/contractor shall contact the County Commissioners Office at the completion of crossing for an onsite inspection.

   Initial: SW

3. The applicant must agree to hold Pittsburg County harmless for any damage or injury to persons or property caused by or resulting from the construction, maintenance, operation, or repair of the facilities on, under, or over the County right-of-way. The petitioner/contractor will be responsible for any damage resulting from deviation of the plat.

Initial: SW

4. All crossings shall be bored on blacktop/asphalt roads. Cutting may be permitted on dirt roads, ditches, or other surfaces with approval from the Board of County Commissioners. Blasting is not permiteed.

Initial: SW

5. In construction pipelines or utility routes that cross county highways or roads, NO DITCH, TRENCH, OR BORING, shall be done by the applicant/contractor until approved by the Board of County Commissioners. All ditching and trenching shall be completed to the County Commissioner's specifications. Applicants, contractors or owners shall maintain crossing. (Signs, grass, brush control, etc.)

Initial: SW

6. The petitioner/contractor shall furnish all flag men, lights, barricades, and warning signs meeting all laws and regulations, including those in the "Manual on Uniform Traffic Control Devices" appropriate for the construction project. The petitioner/contractor agrees to keep the road open to traffic unless approved by the Board of County Commissioners. At the conclusion of such work, the right-of-way must be in a presentable condition.

Initial: SW

7. When notified to do so by the Board of County Commissioners, the petitioner/contractor agrees at their expense to make all changes in the facility on County right-of-way.

Initial: SW

8. Relocation – Applicant, upon 30 days written notice, agrees to relocate utilities at their expense should it interfere with County construction and/or maintenance.

Initial: SW

9. Aerial facilities – Clearance above the traffic lanes of the road at all aerial pole line crossings shall comply with applicable safety codes and will not be less than 20 feet. All poles, posts, stubs, fixtures, down guys, wires, and other appurtenances must be kept in good repair at all times and free from weeds and brush within a 5-foot area of the installation. These facilities, when paralleling the roadway, shall be single pole construction and located within 3 feet of the fence line, if a fence exists. If no fence exists, the right-of-way shall be located by an Oklahoma Registered Land Surveyor at the petitioner's expense and a copy provided to the Board prior to construction. All crossings shall be as nearly perpendicular as possible. Facility shall not interfere with the natural flow of waters or ditch.

Initial: SW

10. Underground facilities – All shall be a minimum of 5 feet below the elevation of the center line of the road, but not less than 4 feet fellow the bottom of the ditch. Crossings shall be encased from right-of-way line to right-of-way line and be vented off the right-of-way lines. Concrete caps of 4' wide and 6" deep may be required from edge of road to fence line. Identification markers shall be installed at each right-of-way line directly above the facility. The markers must identify the owner's name, address and telephone

number, size of facility, and emergency contact number in black with a yellow background. Marker must be at least 130 sq. inches in area and erected at a height plainly visible from the road right-of-way.

All underground electric cable crossings must be placed in a conduit and be a minimum of 4 feet below the ditch flow lines. Conduit placed beneath a roadway must be steel, HDPE, heavy-duty PVC, or fiberglass if it is designed to withstand roadway loading and is properly protected.

Steel pipelines crossing the right-of-way may be, upon approve of the Commissioner, installed without encasement if the carrier pipe material within the right-of-way is superior to the carrier pipe material outside the right-of-way by being of steel at least one grade better and of the same wall thickness, or a minimum of one wall thickness greater and of the same alloy. Pipe must be properly protected from corrosion.

Facilities such as water and sanitary sewer lines crossing the county right-of-way shall be encased. Maintenance will be performed by a method that will not disturb the through lanes or interfere with traffic. All conduits shall be sufficient to withstand roadway loadings.

Initial: SW

11. All section corners and ¼ section corners shall be protected. No pipeline or utility line shall cross an intersection diagonally. No liens shall cross within 50 feet of a ¼ section corner or 100' of a bridge.

Initial: SW

12. Owners of all facilities shall be responsible, at their own expense, for decommissioning of sites. Roads and right-of-way shall be restored to the original condition or better.

Initial: SW

13. All road crossings shall comply with all Department of Transportation and/or Oklahoma Corporation Commission pipeline safety standards rules and regulations in effect at the time of the permit.

Initial: SW

14. All pipelines made of non-metallic materials must have a tracer wire installed so the pipeline can be located from above the ground.

Initial: SW

15. Above ground water lines are temporary and shall be placed within three (3) feet of fence line or county right-of-way as not to disrupt road maintenance. All temporary water lines shall be marked or identified with a company contact number or sign at every county road crossing.

The type of temporary road crossing, either above the road surface or trenched, are at the discretion of the individual commissioner. Trenched lines shall be at sufficient depth as to not interfere with normal maintenance and shall be removed at applicant's expense. The owner, firm or company requesting the permit for temporary or permanent line(s) shall be responsible for all damages to county roads or right-of-way caused by such installation. Temporary installation permits are for a period of thirty (30) days. A new permit will be required for each thirty (30) day time period.

Initial: SW

16. Any pipe or tinhorns to be installed shall be a beveled end at a 45° angle with concrete end treatments. The commissioner shall approve proper diameter of pipe.

Initial: SW

FEE SCHEDULE
(Check must accompany permit)

Floodplain Inspection Fee (if necessary)	$50.00 each
Floodplain Oil & Gas Pipeline Burial Permit Fee	$300.00 each
Floodplain Permit extension	1/2 of permit fee each
(all floodplain permits expire 6 months for original permit date)	
Road Bore – Permanent	$1,000.00 each
Domestic or livestock water 3" diameter or less	N/C
Cut or trenched permanent	$1,500.00 each
Temporary lines through culverts/bridges	$1,500.00 each
Temporary buried line, cut or trenched	$1,500.00 each
Temporary Road Crossing Bridge	$1,500.00 each

NOTE: FAILURE TO NOTIFY COMMISSIONERS OF HEAVY LOAD MOVEMENT OR IF A LINE OR SERVICE ENTRANCE IS PLACED IN COUNTY RIGHT-OF-WAY WITHOUT THE PROPER PERMIT(S) MAY RESULT IN A FINE UP TO $5,000 PLUS COURT COSTS

PETITIONER/CONTRACTOR'S ATTESTMENT

I hereby attest to the accuracy of the information contained on this application. I further certify that, in my professional opinion, the facility line is installed; the drawings, plans and specifications therefore comply in all respects with the requirement of said permit.

Shannon Webster
Petitioner/Contractor Signature

8-16-21
Date

owner
Title

918-421-0202
Phone Number

PERMIT APPROVAL

The undersigned Board of County Commissioners, Pittsburg County, do hereby grant the crossing described in the application hereinabove set forth; provided that, the same shall be subject to the terms and conditions of the application incorporated herein by this reference.

Approved on the 23rd day of August, 20 21.

Pittsburg County District # 1

Company Check# _____ Date of Check _____ Amount of Check _____

COMMISSIONERS COMMENTS/CHANGES:

_____

_____

_____

_____

_____

BOARD OF COUNTY COMMISSIONERS
PITTSBURG COUNTY, OKLAHOMA

ATTEST:

HOPE TRAMMELL - CO. CLERK
PITTSBURG COUNTY

_____
District 1 Commissioner

_____
District 2 Commissioner

_____
District 3 Commissioner

_____
County Clerk

PLEASE READ CAREFULLY.

THE APPROVAL PROCESS AND FEE FOR PUBLIC SERVICE & PIPELINE CROSSING PERMITS HAS CHANGED.

1. Once you have picked up or received a Application for Permit from the Board of County Commissioners, Pittsburg County, you should fill in the application has usual. A fillable form of this permit is available under the forms section on Pittsburg County's website at pittsburg.okcounties.org.
2. Once your permit is ready for approval, please deliver to the Pittsburg County Floodplain Administrator's Office. You may want to email them a copy of this permit so that they can make the determination of whether this location is located within a floodplain, the Floodplain Administrator's email address is floodplain.pittsburgco@gmail.com. If this location is located within a floodplain, it will be necessary to acquire a floodplain permit before this permit is presented to the Board of County Commissioners. Please Be Advised, the Board of County Commissioners, Pittsburg County, will not act on this permit until a floodplain determination has been made, and if required, a floodplain permit has been issued. You can find the fee schedule in the body of the permit. You will want to provide this form in duplicate, should you wish to obtain an original copy.
3. Once the determination, and if required, a floodplain permit is issued, this/these permit(s) must be delivered to the Board of County Commissioners Office, 115 E. Carl Albert Parkway, Room 100, McAlester, Oklahoma, 74501 along with payment for the permit, which can be found in the fee schedule located in the body of the permit.

National Flood Hazard Layer FIRMette

FEMA

95°37'44"W 35°11'33"N

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile *Zone*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represe an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/16/2021 at 1:43 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.