ARTICLE V(ALTERNATE)

# SPECIAL SPECIFICATIONS

for

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## V(A).1 WATER MAIN

A. PIPE MATERIALS:

1. Type of Pipe: Water main shall be Polyvinyl Chloride Pipe (PVC) or ductile iron if authorized by the Owner, as an alternate. The Contractor shall furnish inspection certifications from the pipe manufacturer which will state that the pipe meets all of the requirements as specified herein.

2. Polyvinyl Chloride Pipe: All PVC sizes 4" – 12" shall be Class 150, DR18 conforming to the requirements of AWWA 900 with rubber gasketed joints. Smaller diameters shall be ASTM D-2241, SDR 21 pipe with NSF certification and joints of the rubber gasket type, conforming to ASTM Specifications D-3139, D-1784, and F-477 as appropriate.

3. Ductile Iron Pipe: Ductile iron pipe if called for on the plans, shall be Class 52, cement mortar lined and rubber gasketed pipe conforming to AWWA Standards C104, C111, C150, and C151.

4. Fittings: The Contractor shall furnish and install all fittings as shown on the Plans. All fittings and accessories shall be ductile iron with cement mortar lining, meeting the requirements of AWWA C-104, AWWA C-111, and AWWA C-110, or AWWA C-153 and be manufactured in the U.S.A. The country of origin shall be cast into the fitting. Tyler, Auction Cast Iron, Clow, U.S., Union, and Griffin are acceptable manufacturers. Joints shall be of the mechanical joint style conforming to AWWA C-111.

B. INSTALLATION:

1. Inspection: All pipe and fittings shall be carefully examined for cracks and other defects while suspended above the trench immediately before installation and final positioning. Defective pipe shall be laid aside for inspection by the Engineer who will prescribe corrective repairs or reject the pipe.

2. Lowering of Pipe into Trench: All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench piece by piece by means of a derrick, rope, or other suitable equipment in such a manner as to prevent damage to water main material, protective coatings, and linings. Under no circumstances shall water main material be dropped into the trench.

The Contractor shall be responsible for replacement of any pipe, fittings, valves, hydrants, or other accessories damaged by improper handling.

3. Bedding: Bedding of the pipe shall be as stated on the Plans or if not stated on the Plan sheets, shall consist of the native material. The bedding material or native soil shall be fine graded so as to provide complete support of the pipe when laid.

4. Cutting of Pipe: The cutting of pipe for inserting valves, fittings, etc., shall be done in a neat and workmanlike manner without damage to the pipe or the lining, if any, so as to leave the smooth end at right angles to the axis of the pipe. Only qualified and experienced workmen shall be used for this work.

5. Joining Pipe: Before any pipe is joined, the ends of the pipe and/or couplings which may constitute a part of the pipe shall be carefully cleaned and examined.

The joints shall be assembled in keeping with the procedure recommended for the type of joint and/or gasket that is furnished. Lubricants used shall only be those recommended by the manufacturer.

When pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or other means approved by the Engineer. If water is in the trench, the plug shall remain in place until the trench is pumped completely dry.

6. Thrust Blocks: The Contractor shall provide and install formed, cast-in-place concrete thrust blocks in accordance with the schedule and details shown on the Plans. Precast thrust blocks will not be acceptable. The cost of the thrust blocks will be included in the cost of the fittings. The blocking shall be carefully placed so that the pipe or fitting will be accessible for inspection and repair, with all bolts clear of the concrete.

Hydrants or fittings which cannot be adequately blocked or backed shall be tied to the piping system with suitable metal tie-rods or clamps, approved by the Engineer.

7. Joint Restraint Devices: As an alternate, the Contractor may furnish and install joint restraint devices at all fitting locations on the plans.

The Restraint Devices shall incorporate a series of machined serrations (not “as cast”) on the inside diameter to provide positive restraint, exact fit, $360^{o}$ contact and support of the pipe wall. Restraint Devices shall be manufactured of high strength ductile iron, ASTM A526, Grade 25-45-12 in 2” through 24” sizes and ASTM A36 structural steel in sizes 30” through 36”. Bolts and connecting hardware shall be high strength low alloy material in accordance with ANSI/AWWA C111/A21.11.

The Restraint Devises shall have a water working pressure rating equivalent to the full rated pressure of the PVC Pipe on which they are installed, with a minimum 2:1 safety factor in any nominal pipe size. In addition, they shall meet or exceed the requirements of Uni-B-13-94, "Recommended Performance Specification For Joint Restraint Devices For Use With Polyvinyl Chloride (PVC) Pipe."

One full (20') length of main shall extend in all direction(s) from any fitting where joint restraining devices are to be used.

Joint Restraint Devises shall be utilized at joints which need to be pressurized immediately.

8. Pipe Excavation/Coverage: All pipe shall have the minimum cover of 5.5 feet, except for areas of extra depth as noted on the Plans.

9. Trench Width: The minimum and maximum trench width shall conform to the "Recommended Practices for the Installation of PVC Pressure Pipe" of the UNI-BELL PVC. Pipe Association which calls for widths ranging between pipe diameter plus one foot (min.) and two feet (max).

10. Tracer Wire: A tracer wire shall be installed with the new PVC main. It shall be a #12 THHN copper wire installed on the top of the main along the longitudinal centerline.

The wire shall be brought to the surface of the ground at all fire hydrants with a terminal, as shown on the attached detail. The tracer wire shall be continuous without splices from terminal to terminal. Where a water main is to be installed beyond a fire hydrant, the tracer wire shall terminate at the end of the new main, or at a valve box with an appropriate insulated cap over the wire end.

The cost of installation of this tracer wire and connection terminals shall be incorporated into the unit price of the pipe. No separate measurement or payment will be made.

11. Trench Compaction: The Contractor shall place and compact the trench backfill with a sheepsfoot type roller, either self propelled or on an excavator arm, to obtain a minimum compaction of not less than 90% of the maximum dry density as determined by ASTM D-698.

The placement and compactive operation shall be mechanical means (water settlement will not be allowed), and the entire depth and width of the trench or excavated area shall receive the degree of compaction required.

Density tests for the purpose of evaluating backfill compaction may be arranged and paid for by the Owner. The cost of additional tests required for retests of failed areas shall be paid by the Contractor.

12. Distance from Sewer Lines: All water mains shall be kept at least ten feet (10') from any existing sewer. Where this horizontal separation cannot be achieved or where sewer and water mains cross, the top of the sewer line shall be at least 18 inches lower than the lower extreme of the water line. If this vertical clearance is not possible, the water main shall be centered over the sewer with the joints at the maximum distance from the sewer line.

C. TESTING:

1. Pressure Leakage Test: The Contractor is required to pressure test each completed section of water main and determine the leakage of that section. The allowable leakage will be determined in accordance with AWWA Standard C-600, Latest Revision. Should the test indicate leakage in excess of the allowable, the cause must be located, corrected and the line retested. During this testing procedure, a pressure of 100 psi shall be maintained for two hours. The Contractor shall supply the corporation stop which is to be shut off and left in place at the completion of the test. The Contractor shall also supply all necessary equipment for testing, including an accurate meter for measuring the leakage.

Allowable Leakage Formula = $L = \frac{SD\sqrt{P}}{133200}$

"L" is the allowable leakage in gallons per hour; "S" is the length of the pipeline tested in feet; "D" is the nominal diameter of the pipe in inches, and "P" is the average test pressure during the leakage test, in pounds per square inch gauge.

The pressure and leakage test shall be performed in the presence of the Owner or Engineer.

Any sections not meeting the pressure/leakage test shall be immediately repaired and re-tested.

2. Disinfection Test: Prior to placing any newly constructed water main into service, the Contractor shall disinfect the water main in accordance with AWWA C-651 and all revisions thereto. Two consecutive bacteriological samples taken a minimum of 24 hours apart shall be free from contamination. The Contractor shall arrange for and pay for all sampling and required testing by the Nebraska Health and Human Services Laboratory.

Copies of the results of this testing shall be furnished to the Engineer prior to final payment.

3. As built Records: The Contractor shall maintain a set of Plans on the project to record all field changes and measurements recorded as installations progress.

A good quality color photo shall be provided for each fitting installation. It shall be taken close enough to show a clear picture of the fitting(s). More than one photo may be needed in some cases. Each photo shall be well identified on the back with location and type of fitting(s).

The field corrected Plans and installation photos shall be provided to the Engineer prior to approval of final payment of the Contractor.

D. METHOD OF MEASUREMENT: Measurement of water main shall be by the lineal foot of each nominal diameter in place, measured along the centerline of the pipe with no deduction for valves or fittings. Short pieces of pipe, of less than six foot lengths, needed to make side connections to fittings, hydrants, and existing mains shall not be measured for payment but shall be considered incidental to the construction.

Each fitting shall be measured as an individual unit of appropriate type and nominal diameter.

Items such as, but not limited to, disinfection, hydrostatic testing, thrust blocking, excavation, etc., which are not listed specifically on the Bid Proposal shall be considered incidental to the bid items and will not be measured separately.

E. METHOD OF PAYMENT: Payment for water main pipe shall be made at the unit price bid and the number of lineal feet of each nominal diameter installed and measured in place.

Payment for fittings shall be made at the unit price bid and the number of units of each type and nominal diameter installed and measured in place.

## V(A).2 FIRE HYDRANTS

A. FIRE HYDRANTS: Hydrants shall be Mueller Centurion, complying with AWWA C-502. Other hydrants will not be considered. Hydrants shall be 2-way or 3-way hydrants as shown on the plans, with 2 – 2 ½" hose nozzles, and, in the case of 3-way hydrants, 1 – 5" pumper nozzle, National Standard Thread, 5 ¼" valve opening, 6' – 0" bury. Hydrant grade adjustment, if called for on the plans or authorized by Owner, shall use ductile iron offset adjusting fittings as by CLOW or equal.

B. INSTALLATION: Hydrants shall be set at the proper depth and a concrete thrust block of adequate dimensions shall be provided. A foundation consisting of an 18-inch square pad 4-inches thick shall be provided for each hydrant. The hydrant shall be backfilled with coarse gravel or rock to ensure proper drainage of the hydrant when the valve is closed. A minimum of 10 cubic feet of coarse gravel shall be placed around each hydrant. After gravel is placed, it shall be covered with polyethylene and the remainder of the backfill carefully placed.

All hydrants shall be placed so that they stand plumb. They shall be oriented so that their nozzles are at a 45-degree angle to the curb or at a 90-degree angle to the curb, depending upon the style of hydrant.

C. REMOVALS: Any hydrants removed shall be salvaged and delivered to the Owner if not reused.

D. METHOD OF MEASUREMENT: The installation of fire hydrants shall be measured as an individual unit of the type and size installed and shall include the connecting pipe, up to six feet in length, the valve and box and all incidental construction. The main line fitting shall be measured in accordance with Article 3 and connecting pipe over six feet in length shall be measured in accordance with Article I.

Grade adjustment units, when called for or authorized, shall be measured by the unit and size used. Units used at the Contractor's option shall not be measured for payment.

E. METHOD OF PAYMENT: Payment shall be made at the unit price bid and the number of units of each type and nominal size satisfactorily installed and measured in place.

## V(A).3 VALVES

A. GATE VALVES: Gate valves shall be Mueller, "Resilient Wedge" or approved equivalent, iron body non-rising stem gate valves, with "O" ring seals, complying with the Standard Specifications of the AWWA for 200 bounds working pressure. Other valves will not be considered. They shall turn to the left to open and shall be equipped with two-inch operation unit. Hubs and valves shall meet the requirements of AWWA C-500, with mechanical joint ends.

B. VALVE BOXES: The valve boxes shall be of cast iron of the extension type with suitable length for the individual location. The valve boxes shall have an inside diameter of not less than four inches, and shall have a minimum thickness of metal at any point of not less than 3/16 of an inch. They shall be painted inside and out with a good asphalt paint. They shall be equipped with removal cast iron covers, marked "Water".

C. INSTALLATION:

1. Setting Valves: The valves shall be set in the various pipe lines at the points shown on the Plans. Care shall be taken during backfill to ensure that the boxes remain plumb and centered over the valve. After the valves have been installed and adjusted, they shall be tested for operation under maximum working pressure and shall be watertight and operate easily.

2. Location Records: The Contractor shall be required to provide the Engineer with records concerning the location of all valves, tees, and fittings. Ties (accurate distance measured) shall be made from at least three fixed objects above the ground for each fitting prior to the fitting being covered.

3. Concrete Valve Box Collars: The Contractor shall install a 6" thick concrete collar, as shown on standard details, around the top of each valve box. The cost of this work shall be included in the Contractor's bid for the valves.

D. OPERATIONAL TESTING: Before final payment is made on the contract, the Contractor shall test each new valve installed to ensure proper operation The testing shall be done in the presence of the Owner or Engineer. Any valves found to be operating incorrectly shall be repaired at the Contractor's expense.

E. METHOD OF MEASUREMENT: Each valve with box and incidental construction, except those at fire hydrants, shall be measured as an individual unit of the appropriate nominal diameter.

F. METHOD OF PAYMENT: Payment shall be made at the unit price bid and the number of units each type and nominal diameter installed and measured in place.

## V(A).4 SERVICE LINES

A. MATERIALS:

1. Corporation Stops: Corporation stops shall be of brass or bronze alloy construction with AWWA inlet threads and shall have an outlet connection for the service line material shown on the Plans, with an eighth bend service fitting as shown on the standard detail. Manufacturer shall be Mueller or Ford.

2. Service Saddles: Service saddles, when called for on the Plans and details, shall be a wide brass band saddle specifically made for the type of water main installed, with service outlet with AWWA tapered thread. Manufacturers may be either Ford or Mueller.

3. Service Lines: Service lines shall be of the material and size shown on the Plans and/or as called for on the Bid Proposal.

Copper lines shall be Type "K" soft temper material meeting requirements of ASTM Designation B-88.

Polyethylene lines shall be high-density polyethylene SDR 7 PE 3406 material meetings ASTM Designation D-2239 requirements.

Connections shall be made with brass compression couplings.

4. Curb Valves & Boxes: Curb valves shall be of cast bronze construction with rubber O-ring seals and/or seats to provide for watertight, nonbinding operation. Manufacturer shall be Mueller or Ford.

Curb boxes shall be cast iron extension type with cast iron Pentagon plug style lid. Boxes shall be "Minneapolis" pattern, coated with asphalt based paint, and shall contain a stationary rod. Boxes shall be manufactured by Ford, Mueller or McDonald.

B. METHOD OF MEASUREMENT: Corporation stops with saddles, curb valves, etc., shall be measured as individual units of various sizes installed. Service lines shall be measured by the lineal foot from the main to the curb valve or to the point of connection to the existing service. Connection to the existing service line shall be measured as a unit including any couplings required.

C. METHOD OF PAYMENT: Payment for service lines items shall be made at the unit price bid for the various items and sizes shown on the Bid Proposal and measured as above.

## V(A).5 CONNECTIONS, DISCONNECTIONS AND ABANDONMENT

A. CONNECTION TO EXISTING WATER MAINS: The Contractor's bid prices shall include all labor, equipment, etc. necessary to connect the proposed water liens to the existing. Fittings such as bolted flex couplings, plugs, reducers, etc., will be paid for under the appropriate fittings item in the proposal. After installation and testing of the new water main, the Contractor shall disconnect and abandon the existing mains as shown on the plans. The cost of these disconnections shall be merged into the Contractor's other prices and will not be paid separately, except that the plugging of lines to be abandoned shall be done as shown on the standard details and paid at the unit price bid.

## V(A).6 UNDERCROSSINGS

A. MATERIALS AND INSTALLATION: Materials and Installation for cased or directionally bored undercrossings shall be as stated on the project plans.

B. METHOD OF MEASUREMENT: Cased undercrossings shall be measured from end to end of the required casing pipe approved for installation. Length in excess of that called for or approved will not be included in the final measurement. Carrier pipe shall be measured as provided for in Article 1 above.

Uncased undercrossings shall be measured from the edge of the structure or obstruction, on either end of the undercrossing.

Directionally bored undercrossings shall be measured by the lineal foot of pipe of each nominal diameter in place, measured in place, with no deduction for valves or fittings.

C. METHOD OF PAYMENT: Payment for cased undercrossing shall be made at the unit price bid for each size of casing and the number of feet measured in place to include the casing pipe and all associate work. The carrier pipe shall be paid at the unit price bid for the type and size of pipe used and the number of feet measured in place.

Payment for uncased undercrossings shall be made at the unit price bid and the number of feet measured as provided in Section B. This payment shall cover all boring, pushing or pulling, pit excavation, and associated work.

Payment for directionally bored undercrossings shall be made at the unit price bid and the number of feet measured as provided in Section B. This payment shall cover all materials, boring, pulling, labor and equipment.

## V(A).7 DEWATERING

A. METHOD OF MEASUREMENT: Measurement of dewatering, if required on the project shall be by the lineal foot of trench dewatered, measured along the centerline of the pipe line. If not included in the bid proposal, it shall not be measured as a separate item and will be considered as

incidental construction with not separate payment.

B. METHOD OF PAYMENT: If included in the Bid Proposal, dewatering shall be paid at the unit price bid and the units measured as prescribed above. If not included in the Bid Proposal, it is considered to be incidental and included in the water main price.

## V(A).8 SEEDING

A. MATERIALS:

1. The seed shall be a turfgrass mixture suited for this area along with quick germinating annual grass to establish a ground cover. The seed shall be a mixture of the following improved varieties, or approved equal:

55% - Mixture of Classic, Nassau, and Common Bluegrass
28% - Creeping Red Fescue
17% - Manhattan II Perennial Ryegrass

The seed mixture and application rate shall be submitted by the Contractor for approval by the Engineer prior to seeding operation.

A. APPLICATION:

1. Following smoothing and restoration of grades, fertilizer shall be applied to all areas to be seeded or sodded at the rate of one (1) pound each of available nitrogen, phosphorous and potassium per 1,000 square feet. Following fertilizer application, the areas shall be compacted to provide a firm seedbed.

2. Seed may be drilled, broadcast, or hydraulically applied at the Contractor's option. The specified seed mixture shall be applied at the rate of 2 to 3 pounds per thousand square feet.

Seeding or sodding shall be done between April 1 and June 30 or between September 1 and October 15.

C. MAINTENANCE: Seeded areas shall be protected and kept moist to facilitate germination. The Contractor shall maintain the seeded areas by watering as needed for a period of 45 calendar days following seeding.

At the end of the maintenance period, any areas which do not have a satisfactory stand of seeded grass shall be overseeded and maintained at the direction of the Engineer. This overseeding and additional maintenance shall be done by the Contractor at no cost to the Owner.

D. METHOD OF MEASUREMENT: Seeding, including preparation, fertilizer and maintenance, will be measured as square foot of seeding and will be an established width, five (5) feet each side of

new water mains. Areas beyond this established area shall be seeded where disturbed, but will be considered as subsidiary and will not be measured for payment.

E. METHOD OF PAYMENT: Payment will be made for the square feet of seeding satisfactorily completed and accepted and at the unit price bid.