



CITY OF CRETE

INFRASTRUCTURE MATERIAL SPECIFICATIONS CONSTRUCTION TESTING SUBMITTAL REQUIREMENTS

MARCH 2024

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MATERIAL SPECIFICATIONS

A. Concrete

1. **Concrete** for streets, sidewalks, drainage structures and other structures shall be NDOT 47B (Traditional Mix, 30% Type E Aggregate) – 3500 psi, as per latest NDOT specifications. Class C Fly Ash is not allowed. Type IP cement will be used for all concrete.
2. Full width slip form paving is the preferred method of construction for street paving. A waiver on this requirement may be granted by the City, if requested by the Subdivider/Developer.

B. Storm Sewer

1. **Storm Sewer Pipe** shall be Class III reinforced concrete pipe (RCP).
2. **Inlets** shall be NDOT type curb inlets. Inlets shall be cast in place concrete.
3. **Drainage Structures** shall be NDOT type manholes, junction boxes, collars, pipe taps, etc.

C. Water

1. **Water Main Pipe** shall be Polyvinyl Chloride (PVC) Class 150 DR18 meeting all of the requirements of AWWA C-900 (latest revision) with push-on gasketed bell ends, minimum size 6-inch, color to be blue. Minimum cover of 5'-6".
2. **Fittings** shall meet the requirements of ANSI/AWWA C153/111 or C110/153 mechanical joint and cement lined. All fittings shall be polywrapped and shall have poured in place thrust blocks.
3. **Couplings** will be Ductile Iron with stainless steel bolts and nuts. The working pressure shall be 150 psi.
4. **Valves** shall be Mueller Co., American Flow Control, or Kennedy Valve, and shall conform to ANSI/AWWA C509. Values shall be resilient – wedge type valves with non-rising stems. Direction of opening: Counterclockwise
5. **Valve Boxes** shall have a screw type extension sleeve. The cover shall have the word "WATER" cast thereon.
6. **Fire Hydrants** shall be American Flow Control B-84-B, Mueller Super Centurion 250, or Kenney Guardian K81-D, and shall conform to ANSI/AWWA C502. The fire hydrant shall have a 6" inlet connection, 5-1/4" main valve opening, one 4-1/2-inch pumper nozzle and two 2-1/2" hose nozzles with a minimum 6'-0" bury. Direction of opening: Counterclockwise. Color to be red.
7. **Tracer Wire** shall be installed with all water main. The tracer wire shall be No. 12 AWG Solid Copper or Solid Copper Clad Steel (CCS), 350-pound minimum break load with type THHN insulation. Connectors (splice) shall be Copperhead SnakeBite connector, 3M DBR connector or approved equal rated for direct bury. Valvco tracer wire access boxes will be installed at approximately one block intervals along the route of the water main which includes fire hydrant locations.
8. **Water Service Line Pipe** shall be polyethylene (PE) plastic pipe (SIDR-PR) conforming to ASTM D2239 and AWWA C901, SIDR7. Minimum size 3/4" and minimum cover of 5'-6".
9. The water service line will be connected to the water main with a saddle (Smith Blair Model 317) and a corporation with a swivel 1/8 bend. The working pressure

shall be 150 psi. The water service line will terminate with a curb stop with a 42-inch stationary rod and an arch pattern extendable type curb stop box with a minimum inside diameter of 1-1/2 inches and a pentagon bolt plug style lid. The curb stop box will be located on the street right of way line/property line.

D. Sanitary Sewer

1. **Sewer Main Pipe** shall be Polyvinyl Chloride (PVC) solid wall pipe conforming to ASTM D3034, SDR35 with bell and spigot type joint with a rubber gasket, minimum size 8 inch.
2. **Manholes** shall be precast concrete in accordance with ASTM C478 with resilient connectors complying with ASTM C923. The base shall be precast or cast in place. Joints will be sealed with a flexible butyl rubber joint sealant. Exterior bituminous dampproofing of the manhole sections is required. Manhole steps shall be ½ inch grade 60 reinforcing steel encapsulated in molded copolymer polypropylene. The manhole cover will be a Deeter Foundry 1030 Ring and Cover.
3. **Sanitary Sewer Service Line Pipe** shall be Polyvinyl Chloride (PVC) solid wall pipe SDR 26 with bell and spigot type joint with a rubber gasket minimum size 4 inch. The sanitary sewer service line will terminate with a plug at the street right of way line/property line.
4. **Sanitary Sewer Service Wye** will be compatible with the main line sewer material.

E. Detectable Warning Panels

1. If sidewalk is constructed as part of the project at all curb ramps, detectable warning panels will be installed. The panels shall be Armor Tile Cast in Place System, Color Black.

F. Street Lighting

1. The City shall approve all street lighting.

G. Subgrade, Trench and Grading

1. All subgrade, trench and grading compaction shall meet the requirements of the Geotechnical Report.

H. All sanitary sewer and water improvements will meet the requirements of the Recommended Standards for Water Works, latest edition (aka 10 States Standards) by Great Lakes. Upper Mississippi River Board of State Public Health and Environmental Managers.

CONSTRUCTION TESTING

- A. Grading/Fill Testing:
 - 1. Frequency of Tests:
 - a. 1 test for each lift of 0 to 1 foot in depth per 100' x 100' area.
- B. Trench Testing:
 - 1. Water Piping: Frequency of Tests:
 - a. Under Paving, Slabs-on-Grade and Similar Construction:
 - 1. 1 test per 150 linear feet of main line. Test at random depths.
 - 2. 1 test of each service line. Test at random depths.
 - b. Nonpaved Area:
 - 1. 1 test per 300 linear feet of main line. Test at random depths.
 - 2. 1 test of each service line. Test at random depths.
 - 2. Sanitary Sewer Piping: Frequency of Tests:
 - a. Under Paving, Slabs-on-Grade and Similar Construction:
 - 1. 2 tests per 150 linear feet of main line, test lower portion and test upper portion of trench.
 - 2. 1 test of each service line. Test at random depths.
 - b. Nonpaved Area:
 - 1. 2 tests per 300 linear feet of main line, test lower portion and test upper portion of trench.
 - 2. 1 test of each service line. Test at random depths.
 - 3. 1 test at each manhole location. Test at random depths.
 - 4. Storm Drainage Piping: Frequency of Tests:
 - a. Under Paving, Slabs-on-Grade and Similar Construction:
 - 1. 1 test per 150 linear feet of main line. Test at random depths.
 - b. Nonpaved Area:
 - 1. 1 test per 300 linear feet of main line. Test at random depths.
- C. Subgrade Testing:
 - 1. Frequency of Tests: 1 test per 100 to 150 linear feet of subgrade.
- D. Concrete Testing:
 - 1. Compressive Strength Test Samples: ASTM C 39. For each test, mold and cure 3 concrete test cylinders. A set of 3 test cylinders shall be collected for every 100 cubic yard or fractional part thereof for each class of concrete placed in a day. At least one set of cylinders is required for each day concrete placement takes place for paving, sidewalk and cast in place structures.
 - a. One additional cylinder may be required for a break prior to 7 days.
 - b. Take 1 additional test cylinder during cold weather concreting, as defined by the Nebraska Department of Transportation Standard Specifications Latest Edition and cured on the job site under the same conditions as the concrete it represents.

- c. If the compressive strength is less than specified, the concrete paving will be subject to a pay deduction or rejection as defined by the Nebraska Department of Transportation Standard Specifications Latest Edition.
 - 2. Slump Test - Perform 1 slump test for each set of test cylinders taken.
 - a. If the concrete mixture is excessively wet causing segregation, excessive bleeding, or any other undesirable condition, the concrete shall be rejected.
 - b. If the slump is outside the allowable limits as defined by the Nebraska Department of Roads Standard Specifications Latest Edition, the load of concrete shall be rejected.
 - 3. Air Test - Perform 1 air content test for each set of test cylinders taken.
 - a. If the air content is less than the minimum specified, only one addition of air-entraining admixtures is allowed.
 - b. If the air content is outside the allowable limits as defined by the Nebraska Department of Roads Standard Specifications Latest Edition, the load of concrete shall be rejected.
 - 4. Pavement Thickness Test:
 - a. Obtain a core sample of concrete paving at 150-foot intervals of the entire length of paving.
 - b. If the pavement thickness is less than specified, the pavement will be subject to a pay deduction or rejection as defined by the Nebraska Department of Transportation Standard Specifications Latest Edition.
- E. Flushing:
 - 1. Water Main:
 - a. Procedure:
 - 1. Obtain approval of City to flush new water main and to discharge chlorinated water into storm sewer or natural water way.
 - 2. Use flushing methods which prevent damage to private and public property.
 - 3. Hydrants may be used for flushing.
 - 4. Minimum Flushing Velocity: 2.5 feet per second (fps).
 - 5. Flush 5 times the volume of the line or as directed by City.
 - 6. Ascertain that heavily chlorinated water has been removed from the water line.
 - 7. Chlorine concentration should be no higher than that generally maintained in the system or less than 1 mg/L.
 - b. Chlorinated Water Discharge:
 - a. Discharge/dispose of the chlorinated water resulting from the disinfection of the water improvements in an appropriate manner and in strict compliance with local, state and federal requirements for discharges to any storm drain, surface water, ditch or other waterway.
 - b. Do not discharge 'super-chlorinated' (concentration of 4 mg/L or higher) water directly to any storm sewer drain system, surface water or other waterway without permission of the City.

1. Super-chlorinated water may only be discharged after dechlorination by aeration, retention, dissipation, or chemical treatment using a portable dechlorinator to “no measurable chlorine” content.
2. Removal of any residual chlorine must be completed before any discharge into an environmentally sensitive area or surface water.
- c. If the discharge is to a ditch, at a minimum, all regulatory requirements and the following stipulations shall be complied with.
 1. The water in the ditch(es) shall not have measurable residual chlorine within 1,000 feet of the point of discharge or at the point of entry into an environmentally sensitive area, surface water or other waterway, whichever distance is less.

F. Bacteriological Testing:

1. Water Samples:

A. Procedure:

1. After final flushing and before new waterline is placed in service, fill line with potable water.
2. Install corporation stop on waterline with copper tube gooseneck assembly.
3. Bacteriological samples shall be analyzed for the presence of coliform bacteria. Samples shall be tested in accordance with Standard Methods for the Examination of Water and Wastewater. A passing sample is defined as results showing absence (zero presence) of coliform bacteria.
4. Contractor shall conduct bacteriological sample collection and testing in conformance with one of the following options:
 1. Collect 2 consecutive sets of samples at least 16 hours apart.
 2. At the conclusion of flushing, allow the main to sit without water use for a minimum of 16 hours. After the minimum of 16 hours, two sets of samples shall be collected a minimum of 15 minutes apart while the sample taps are left running.
5. Location of Samples:
 - a. 1 set at end of each test section.
 - b. 1 set for every 1,200 feet.
 - c. 1 set from each branch.
6. Collect samples in sterile bottles treated with sodium thiosulfate.
7. Do not take samples from hose or fire hydrant.
2. Submit water samples to the state regulatory agency laboratory or certified testing laboratory for bacteriological analysis.
3. Bacteriological Test Failure:
 - a. Repeat flushing and disinfection procedures.
 - b. Use continuous-feed method for disinfection.

- c. Repeat bacteriological sampling and testing.
- d. Contractor may be invoiced for the water used to flush if more than 2 sets of samples fail (at the discretion of the City).

G. Pressure Testing:

1. Water Main:

- 1. Perform a Hydrostatic Test of all water main piping.
- 2. Pressure test piping and appurtenances in accordance with AWWA C600 or C605.
- 3. Test individual sections between valves.
- 4. Test Pressure: 150 psi
- 5. Minimum Test Period: 2 hours

2. Allowable Leakage:

- 1. No pipe installation will be accepted if the quantity of makeup water is greater than that determined by the following formula.

$Q = LD \times \sqrt{P}$ divided by 148,000 where

Q = Quantity of makeup water, in gallons per hour

L = Length of pipe section being tested, in feet

D = Nominal diameter of pipe in inches

P = Average test pressure during the hydrostatic test, in pounds per square inch (gauge)

$\sqrt{P}$ means the square root of P

H. Sewer Main:

- 1. Perform a Low-Pressure Air Test of all sanitary sewer main piping.
 - a. Test in accordance with ASTM F1417.
 - b. Test individual section(s) between pneumatic plugs.
 - c. Test pressure of 3.5 psi at start of test.
 - d. More than 1.0 psi pressure drop during test time indicates failed test.
- 2. Perform an alignment and deflection test of all sanitary sewer main piping.
 - a. Provide alignment and deflection test 30 days after backfilling trench.
 - b. Use rigid ball or mandrel having not less than 95 percent of base inside diameter or average inside diameter of pipe depending on which is specified in ASTM to which the pipe is manufactured.
- 3. Perform a TV Inspection of all of the sanitary sewer main piping, which includes:
 - a. DVD Video Tape/Flash Drive.
 - b. Written log of location of:
 - 1. Service wyes or tees as measured from manhole.
 - 2. Location of defects in pipe or joints.
 - 3. Location of debris in pipe.
 - 4. Location of any sags.
 - 5. Other notable items in pipe.

I. Sewer Force Main:

- 1. Pressure test piping and appurtenances in accordance with AWWA C600.
- 2. Test individual section(s) between valves.
- 3. Test Pressure: 150 psi
- 4. Minimum Test Period: 2 hours

5. Allowable Leakage:
No pipe installation will be accepted if the quantity of makeup water is greater than that determined by the following formula.

$Q = LD \times \sqrt{P}$ divided by 148,000 where

Q = Quantity of makeup water, in gallons per hour

L = Length of pipe section being tested, in feet

D = Nominal diameter of pipe in inches

P = Average test pressure during the hydrostatic test, in pounds
Per square inch (gauge)

$\sqrt{P}$ means the square root of P

J. Testing Documentation and Failed Tests:

1. The independent testing laboratory shall document the location, date and test results of all testing on the project. Tests and test locations that fail will be retested until the test result meets the specifications. A copy of all test results will be furnished to the City Administrator.
2. The independent testing laboratory shall document placed concrete items. Documentation shall include concrete item tested, type of test sample taken, test results (slump, air content, air temperature, etc.), date, test cylinder number and location of sample collected.
3. Additional Tests: The testing laboratory shall make additional tests of concrete, when test results indicate that slump, air entrainment, compressive strength, pavement thickness or other requirements have not been met.

SUBMITTAL REQUIREMENTS

- A. Subdivider/Developer shall submit to the City Administrator three (3) paper copies and an electronic copy (PDF of each item) combined on one (1) DVD/Flash Drive of the following for review and approval by the City:
1. Final Plans and Specifications of Improvements, prepared by an Engineer licensed in the State of Nebraska
 2. Final Drainage Report, prepared by an Engineer licensed in the State of Nebraska
 3. Traffic Study (if required) prepared by an Engineer licensed in the State of Nebraska
 4. Landscape/Tree Plan (If required)
 5. Storm Water Pollution Prevention Plan (SWPPP) prepared by an Engineer licensed in the State of Nebraska
 6. Geotechnical Report, prepared by a Geotechnical Engineer licensed in the State of Nebraska
 7. Unit Price Cost Opinion of Improvements, prepared by an Engineer licensed in the State of Nebraska
 8. Subdivision Agreement
- B. Prior to the start of construction activities, the Subdivider/Developer shall submit to the City Administrator three (3) paper copies and an electronic copy (PDF of each item) combined on one (1) DVD/Flash Drive of the following for review and approval by the City:
1. Shop Drawings of Materials and Equipment to be incorporated into Project.
 2. Executed Contract with Construction Company.
 3. Approval Letter of Improvements from:
 - a. Nebraska Department of Environment and Energy
 - b. Nebraska Department of Environment and Energy
 4. Permits
 - a. NPDES Permit for Storm Water Discharges from Construction Sites
 - b. NDOT (If Applicable)
 - c. Other Permits (If Applicable)
- C. The Subdivider/Developer shall retain the services of a certified testing laboratory to provide the following testing services during construction. The Subdivider/Developer shall pay for all testing and retesting costs.
1. Grading/Fill Testing
 2. Trench Testing
 3. Subgrade Testing
 4. Concrete Testing
 - a. Air
 - b. Slump
 - c. Compressive Strength
 5. Pavement Thickness Testing
 6. Sanitary Sewer Main Testing
 - a. Low Pressure Air Test

- b. Alignment and Deflection Test
 - c. TV Inspection
 - 7. Water Main Testing
 - a. Bacteriological Samples
 - b. Hydrostatic Pressure Test
 - 8. Storm Water Pollution Prevention Plan (SWPPP) Monitoring
 - a. Storm Water Construction Site Inspection Report by a certified erosion and sediment control inspector
 - b. Erosion and Sediment Control Maintenance Report by a certified erosion and sediment control inspector
 - 9. Testing Data shall be submitted to the City Administrator as each element of the project is completed.
- D. Post Construction Review:
 - 1. Subdivider/Developer shall submit to the City Administrator three (3) paper copies and an electronic copy (PDF) on a CD the following:
 - a. As Built drawings of the improvements by the Engineer who prepared the plans and specifications.
 - b. Final statement of costs prepared by the Engineer who prepared the plans and specifications.
 - c. Request in writing by the Subdivider/Developer for the City to accept the improvements.