CHAPTER 15
WATER METERS

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GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water Services
2. Electronic Radio Transmitter (ERT)
3. Displacement Meters
4. Compound Meters
5. Combined Fire and Domestic Meters (FMCT)
6. Time Transit Ultrasonic Meters
7. Turbine Meters
8. Separate Irrigation Meters
9. Meter Boxes and Lids
10. Meter Vault Access Doors
11. Brickwork for Vaults

B. Utility furnished products include water meters that will be furnished to the site, ready for installation.

1.2 RELATED DOCUMENTS

A. CHARLOTTE WATER Water and Sewer Design and Construction Standards and Standard Details.

1.3 DEFINITIONS AND ABBREVIATIONS

A. See Sections iii and iv of the CHARLOTTE WATER Water and Sewer Design and Construction Standards for common abbreviations and definitions.

1.4 SUBMITTALS

A. Required submittals for product approval include, but are not limited to, the following:

1. Product brochures
2. Catalog cut sheets
3. Shop drawings including dimensions and part/material lists
4. Certification of compliance with applicable reference standards

B. Shop Drawings:

1. Details of standard pipe, joints, specials, and fittings.

C. Product Certificates:

1. Required for all products furnished.
2. Comply with NSF 61 Annex G for materials for water service piping and specialties for domestic water.

1.5 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for the safe storage of materials furnished by or to them, and accepted by them and intended for the work, until they have been incorporated in the completed project. Handling and storage of all project materials are to be in compliance with the manufacturer's recommendations for handling and storage. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign materials at all times.

B. Transportation of Materials and Equipment: The Contractor and their Suppliers are directed to contact the North Carolina Department of Transportation to verify axle load limits on State maintained roads (and bridges) which would be used for hauling of equipment and materials for this project. The Contractor and their Suppliers shall do all that is necessary to satisfy the Department of Transportation requirements and will be responsible for any damage to said roads which may be attributed to this project. Unless otherwise specified, all materials required to construct this project shall be furnished by the Contractor and shall be delivered and distributed at the site by the Contractor or their material supplier.

1.6 FIELD CONDITIONS

A. Interruption of Existing Water Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted and then only after arranging to provide temporary service according to written requirements by CHARLOTTE WATER.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All water meters installed under this contract must conform to the most recent American Water Works Association standards as specified herein.

B. The manufacturer's serial number must be clearly imprinted on the outer case of the meter and on the register box lid. The serial number must be a minimum of eight digits in length, with the two leftmost digits representing the year of manufacture. For example, 97123456.

C. Registers for the various types and sizes of meters specified in this contract must all be magnetic drive, straight reading, recording in cubic feet, and having a center-sweep test hand. A complete revolution of the test hand must represent no more than one hundred cubic feet. Registers must be dehumidified, airtight, and permanently hermetically sealed. All register numerals must read zero. Register dials or fixed zeroes representing one cubic foot and ten cubic feet must have a black background with white numbers, while the 100 cubic foot and higher dials must have a white background with black numbers. Each digit on the rightmost movable dial must represent no more than one hundred cubic feet. Thousand cubic foot registers are not acceptable. The month & year of manufacture, meter size, and meter model must be imprinted on the register face. All 5/8" and 1" meter registers must include a low flow (leak) detector. Leak detectors on 1 ½" thru 4" meters are preferred. In place of a leak detector, the register can display flowrate.

D. All meters where the register is separate or removable from the main case and held in place by screws must have the head of each screw drilled two ways and sealed with a

copper wire and lead seal before delivery. The security of such registers must be guaranteed non-removable except by destruction of seal wire, or seal.

E. The manufacturer must furnish with each meter a certificate of accuracy which references the particular meter serial number. The certificate of accuracy must be furnished to the Engineer before the meter is activated. The certificate must reference the job name or number. The number can be added by the supplier or Contractor.

F. The manufacturer shall guarantee that all meters furnished under this specification will meet the required new meter accuracy standards in accordance with AWWA standards.

2.2 NO LEAD PIPE MATERIALS

A. All water meter assemblies shall conform to the requirements of Safe Drinking Water Act and the Reduction in Lead in Drinking Water Act – USA Public Law 111-380.

B. No Lead Compliance: All meter assemblies/brass components of proposed water services shall comply with the requirements of USA Public Law 111-380. All meter assemblies/brass components used in the CHARLOTTE WATER potable water system shall conform to the requirements of the Safe Drinking Water Act and the Reduction in Lead in Drinking Water Act – USA Public Law 111-380. Lead Free Brass components in contact with potable water shall be of Lead Free Alloy (UNS/CDA No C89833 or C89520). Components that do not come in contact with potable water may be UNS/CDA No C83600 - 85-5-5-5 or Lead Free Alloy (UNS/CDA No C89833 or C89520) and shall conform to AWWA Standard C800 (ASTM B-62 and ASTM B-584).

1. Ford Meter Box Company No-Lead products shall be identified by “NL” cast on the major body component.

2. A. Y. McDonald Company No-Lead products shall be identified by “NL” cast on the major body component.

3. Mueller Water Products No-Lead products shall be identified by “EB II” (Alloy C89520), or “FD” (Alloy 89833) cast on the major body component.

4. All brass components and fittings shall be stamped or embossed with a mark indicating that the product is manufactured from a lead free alloy indicated above.

2.3 WATER SERVICES

A. ¾ – 1-Inch Water Services

1. Meter Yoke Assembly: Meter yokes shall be the angle ball type, with vertical inlet and horizontal outlet, with compression connections for water service tubing. Yokes shall be equipped with brass angle ball stop cutoff valve and coupling. The angle ball stop for 5/8" meters (3/4" services) shall be 5/8"x3/4" (5/8” diameter ball valve port, with 5/8” meter connection and ¾” copper tubing connection) with a 5/8"x3/4" (5/8” diameter meter connection and ¾” copper tubing connection) 90 degree outlet coupling for the tailpiece connection. The angle ball stop shall have lock wings that allow the valve to be locked in the closed position. The yoke bar shall be of Cast or Ductile Iron. Horizontal type meter yokes may be used for special situations, as approved by the Engineer. Meter yoke assemblies shall be provided for all 5/8" and 1" meters and on fire line detection meters up to 1-inch. Expansion wheel connection between meter and yoke shall be 3 piece units by Ford, AY McDonald, or Mueller.

2. The following meter yoke bars are approved:

Meter Yoke Assemblies		
Manufacturer	**5/8" Meter**	**1" Meter**
Ford	Y501	Y504
AY McDonald	14-1	14-4
Mueller	H-5010	H-5040
Jones Water Products	J-5010	J-5040

3. The following angle ball valves are approved:

Ball Angle Valves		
Manufacturer	**5/8" Meter**	**1" Meter**
Ford	BA94-313WGNL	BA94-444WGNL
McDonald	34580174642BYT NL	174701BT NL
Mueller	G24273 N	G24273 N

B. 1 1/2-Inch and Larger Water Services

1. All meters 1-1/2-inch and larger shall be installed in precast concrete vaults conforming to the Standard Details. Vaults shall be approved by and for use within North Carolina Department of Transportation (NCDOT) right-of-way and shall be designed for H-20 loading. Vaults may be adjusted as shown on the Standard Details using standard/jumbo size concrete brick conforming to NCDOT specifications, or precast concrete curbing sections. Vaults shall have single or double leaf steel covers conforming to the Standard Details. Service numbers supplied by CHARLOTTE WATER shall be bead welded on the cover. All meters shall conform to American Water Works Association (AWWA) standards as specified below. The manufacturers meter serial number shall be imprinted on the outer case of the meter and on the register lid.

C. Brass Meter Setter Assembly – No solder Joints Permitted – Sizes 1-1/2” and 2”

The following manufacturers and models are currently approved:

Manufacturer	**1-1/2”" Model**	**2" Model**
Ford	VB76-95311-005-NL	VB77-95311-002-NL
Mueller	098B 242343N	106B 2423----43N
Cambridge	6020-NL-618F6F6-UUBS	6020-NL-718F7F7-UUBS
McDonald	720B618WTFF 665.3x416	720B718WTFF 775.3x416

D. Pipe and Tubing

1. All services shall be constructed using a single continuous pipe or tubing from the corporation to the meter assembly. Couplings shall not be permitted.

2. Copper tubing shall be installed in a single segment between the corporation stop on the water main pipe and the water meter. No fittings shall be used on the tubing. Couplings may not be installed between the corporation stop and the meter box.

3. PE tubing shall be installed in a single segment between the corporation stop on the water main pipe and the water meter. No fittings shall be used on the tubing.

4. High Density Polyethylene (HDPE) pipe and tubing shall be required on long services where copper is not available in sufficient lengths to complete the service between the corporation and the meter assembly without a splice coupling. HDPE pipe shall be 200 PSI pressure class, OD based Iron Pipe Size (IPS) pipe and much meet the dimension ratio (DR) specified.

   a. ¾-inch and 1-inch HDPE tubing shall be blue SDR 9 (CTS). Stainless steel inserts shall be used with compression fittings. Inserts shall be as required by the HDPE manufacturer and the brass fitting manufacturer. Compression couplings or mechanical couplings of any type are prohibited.

   b. 1.5-inch and 2-inch diameter pipe shall be blue/black HDPE DR 9 pipe (IPS). The HDPE pipe shall be provided with stainless steel threaded end adaptors, as specified, to connect to the brass corporation stop and meter assembly. Adaptors shall be connected to the HDPE pipe by butt fusion splice or electrofusion couplings. The electrofusion controller shall be computer controlled. Compression couplings or mechanical couplings of any type are prohibited. Should bends be required, HDPE butt fused or electro-fusion bends will be required.

   c. 3-inch through 12-inch diameter pipe shall be HDPE DR 11 pipe (IPS). The HDPE pipe shall be provided with HDPE MJ adaptors, as specified, to connect to the tapping sleeve and valve and meter assembly. Adaptors shall be connected to the HDPE pipe by butt fusion splice or electrofusion couplings. The electrofusion controller shall be computer controlled. Compression couplings or mechanical couplings of any type are prohibited. Should bends be required, HDPE butt fused, or electro-fusion bends will be required.

5. See Chapter 10, Water Distribution Piping Specifications, of the CHARLOTTE WATER Water and Sewer Design and Construction Standards for all additional requirements.

2.4 ERT (ELECTRONIC RADIO TRANSMITTER)

A. CHARLOTTE WATER requires that readings on all new meters in sizes 5/8” through 12” be obtained quickly and accurately without opening meter vault lids or entering the vaults. All new meters in these sizes must have submersible Encoded / Absolute Encoded registers and preprogrammed with the CHARLOTTE WATER Roll Call already installed. All new meters in these sizes must include the meter equipped with submersible Encoded / Absolute Encoded registers, End cap with at least 6 feet of wire and Itron Automated Meter Reading ERT completely assembled and programmed at the factory and shipped as a complete unit. (Encoder – Electronic register that continently

accumulates/ counts electrical pulse. Absolute Encoded - Electronic register that reads the exact position of the hands at the moment of interrogation).

B. In the interest of standardization, meters will have an Absolute Encoded register that is interfaceable with the Itron Automated Meter Reading ERT (Electronic Radio Transmitter) 100W series with an applicable hanger clip to properly mount the ERT. The following meter companies will be used: Badger, Hersey and Neptune. CHARLOTTE WATER will provide and install the ERT for 5/8" and 1" meters.

C. All meters must be sealed so that removal of the register impacts the seal. Tamperproof seal screws or pins are preferred. Screws that are not tamperproof must have the head drilled two ways and sealed with a copper wire and non-lead seal before delivery.

D. The Manufacturer must guarantee that all meters furnished under this specification will meet the required AWWA new meter accuracy standards for a period of at least one year from the date first placed in service and repaired meter accuracy standards for at least 14 additional years. Certified wet bench test results must be furnished for each meter.

E. The Manufacturer must guarantee that all ultrasonic meters furnished under this specification will meet the required AWWA new meter accuracy standards for a period of at least 10 years from the date first placed in service. Certified wet bench test results must be furnished for each meter.

F. The warranty period for Absolute Encoded register, wiring, and End cap must be at least 15 years.

G. The categories of meters that may be used for various sizes are as follows:

1.	5/8", 1", 1 ½", 2"	Displacement
2.	3", 4", 6", 8"	Compound
3.	3" – 12"	Ultrasonic
4.	4", 6", 8", 10", 12"	Fire and Domestic

H. All fogged registers must be replaced at no cost to CHARLOTTE WATER for the full warranty period. CHARLOTTE WATER will not accept any meter, piping, valves, parts, or any other component, which allows water to come into contact with lead or allows lead to leak into the water over any period of time.

2.5 DISPLACEMENT METERS

A. Sizes 5/8" and 1":

1. Meters in these sizes must be positive displacement type conforming to AWWA C700, latest revision.
2. All meters must be furnished without end connections.
3. Meters shall use a nutating disc for flow measurement.
4. Main casings and bottom plates shall be of a copper alloy containing not less than 75% copper.
5. Measuring chambers shall be of a copper alloy containing not less than 85% copper or a suitable synthetic polymer.
6. All meters are to have internal strainers.

7. All meters must have submersible Absolute Encoded register with neutral trial gear combinations. The Contractor must furnish CHARLOTTE WATER a certificate from the manufacturer which unconditionally guarantees the registers for a minimum period of 20 years against defects in material or workmanship. All registers must have low flow (leak) detector.

8. Currently, only the following models shall be provided:

    a. Badger Meter Recordall® Model 25 (5/8”), Model 70 (1”)

    b. Hersey-Mueller Model 420 Bronze (5/8”), Model 452 Bronze (1”)

    c. Neptune Technology Group Model T-10® (5/8” and 1”)

B. Sizes 1 1/2" and 2":

1. Meters in these sizes must be positive displacement type conforming to AWWA C700, latest revision.

2. All meters in these sizes shall be furnished with a 2-bolt flange and must be of standard laying length.

3. Meters shall use a nutating disc for flow measurement.

4. Main casings and bottom plates shall be of a copper alloy containing not less than 75% copper, or of lead-free bronze alloy.

5. Measuring chambers shall be of a copper alloy containing not less than 85% copper, or of lead-free bronze alloy.

6. All meters are to have strainers.

7. All meters must have submersible Absolute Encoded register with neutral trial gear combinations. The Contractor must furnish CHARLOTTE WATER a certificate from the manufacturer which unconditionally guarantees the registers for a minimum period of 20 years against defects in material or workmanship.

8. All meters must have bolted top or bottom plates.

9. Only the following models are acceptable:

    a. Badger Meter Recordall® Model 120 (1 ½”), Model 170 (2”)

    b. Hersey-Mueller Model 562 (1 ½”), Model 572 (2”)

    c. Neptune Technology Group Model T-10® (1 ½” and 2”)

2.6 COMPOUND METERS

A. Sizes 3”, 4”, 6”, and 8”:

1. Meters in these sizes shall be single body compound type conforming to AWWA C702, latest revision.

2. Main casings shall be of a copper alloy containing not less than 75% copper, or lead-free bronze alloy.

3. Measuring cages or chambers shall be made of a copper alloy containing not less than 85% copper or lead free bronze-alloy.

4. Meters are to have strainers.

5. All 3”, 4”, 6”, and 8” meters shall be furnished with flanged ends. Laying length shall be as follows for Badger Meter and Neptune Technology Group meters (meter size = laying length):

   a. 3’’ = 17’’

   b. 4’’ = 20’’

   c. 6” = 24”

   d. 8” = 41 7/8” (Badger)

   e. 6” x 8” = 55 3/8” (Neptune)

6. Meters in 3”, 4” ,6”, and 8” sizes shall test 100% ± 1.5% at the following flows in gallons per minute (GPM):

   a. Badger Meter:

      1) 3” = 0.50 to 450 GPM

      2) 4” = 0.75 to 1000 GPM

      3) 6” = 0.75 to 2000 GPM

      4) 8” = 2.50 to 4500 GPM

   b. Neptune Technology Group:

      1) 3” = 0.50 to 450 GPM

      2) 4” = 1.00 to 1000 GPM

      3) 6” = 1.50 to 2000 GPM

      4) 8” = 1.50 to 2000 GPM

7. Only compound meters manufactured by Badger Meter and Neptune Technology Group are acceptable.

8. All meters must have submersible Absolute Encoded register with neutral trial gear combinations. The Contractor must furnish CHARLOTTE WATER a certificate, which unconditionally guarantees the registers for a minimum of 20 years against defects in material or workmanship.

9. Placement of the bypass piping must be quickly and easily changeable by CHARLOTTE WATER employees when needed at the time of meter installation.

10. Only the following models are acceptable:

    a. Badger Meter Recordall® Compound Series (3”, 4”, 6”, 8”)

    b. Neptune Technology Group, TRU/FLO® Compound Meter (3”, 4”, 6”, 6”x8”)

2.7 COMBINED FIRE AND DOMESTIC SERVICE METERS (FMCT)

A. Sizes 4”, 6”, 8”, 10", and 12":

1. Meters shall comply with AWWA C703, latest revision.

2. Meters must be approved for fireline service by Underwriters Laboratories or National Fire Protection Association.

3. Meters are to have stop and check valves on the by-pass meter.

4. Measuring cages, chambers, or turbines shall be made of a copper alloy containing not less than 85% copper, or lead-free bronze alloy or stainless steel.

5. Main casing for by-pass meters shall be of a copper alloy containing not less than 75% copper, or lead-free bronze alloy.

6. Casing for main line meters shall be of either copper alloy containing not less than 75% copper, cast iron protected by a corrosion-resistant coating or other anti-corrosion treatment, or epoxy coated steel or stainless steel.

7. Small bypass meters shall be positive displacement meters as specified.

8. Laying length of meters shall be as follows (meter size = laying length):

   a. 4" = 33"

   b. 6" = 45"

   c. 8" = 53"

   d. 10" = 68"

   e. 12" = 68"

9. Meters are to have strainers.

10. All meters must have submersible automated registers with neutral trial gear combinations. The Contractor must furnish CHARLOTTE WATER with a certificate from the manufacturer which unconditionally guarantees the registers for a minimum period of 15 years against defects in material or workmanship.

11. Six-inch meters must have a bypass meter no larger than 2".

12. Only the following models will be acceptable:

   a. Badger Meter Recordall® Fire Series Assemblies (FSAA):

      1) 4" – 10": With Disc Bypass Meter

      2) 12": With Turbo Bypass Meter

   b. Neptune Technology Group High Performance (HP) PROTECTUS® III Stainless Steel (S) Fire Service Meter (4", 6", 8", 10")

2.8 TIME TRANSIT ULTRASONIC METER (Sizes 3", 4", 6", 8", 10", and 12")

A. Meters shall comply with AWWA C-750.

B. Companion flanges, gaskets, bolts, and nuts shall not be provided.

C. Casing shall be of stainless steel or copper alloy containing not less than 75% copper or galvanized zinc treated cast iron.

D. The Contractor must furnish CHARLOTTE WATER with a certificate from the manufacturer which guarantees a minimum warranty period of 10 years against defects in material or workmanship. The warranty must also provide full replacement within a 10-year period.

E. Only the following makes and models are acceptable:

1. Badger Meter:

   a. 3" – 8": E-Series®

2. Master Meter:

a. 3” – 12”: Octave®

3. Neptune Technology Group:

a. 3” – 12”: Mach 10®

2.9 TURBINE WATER METERS: 3-INCH AND 4-INCH (ONLY WHEN SPECIFIED)

A. Meters shall conform to AWWA C701, latest revision.

B. Meters shall only be used when approved by CHARLOTTE WATER on a project-specific basis.

C. Main casings shall be of a copper alloy containing not less than 75% copper.

D. Measuring cages or chambers shall be made of a copper alloy containing not less than 85% copper or a suitable synthetic polymer.

E. Meters are to have strainers.

F. Meters in 3” and 4” sizes shall test 100% ± 1.5% at the following flows in gallons per minute (GPM):

1. 3” = 3 to 350 GPM

2. 4” = 4 to 650 GPM

G. All meters must have submersible Absolute Encoded register with neutral trial gear combinations. The Contractor must furnish CHARLOTTE WATER a certificate that unconditionally guarantees the registers for a minimum period of 20 years against defects in material or workmanship.

H. Placement of the bypass piping must be quickly and easily changeable by CHARLOTTE WATER employees when needed at the time of meter installation.

I. Only the following models are acceptable:

1. Badger Meter Recordall® Turbo Series Model 450 (3”), Model 1000 (4”)

2. Hersey-Mueller Model MVR 350 (3”), Model MVR 650 (4”)

3. Neptune Technology Group High Performance (HP) Turbine Meter (3” and 4”)

2.10 SEPARATE IRRIGATION METERS

A. Effective July 1, 2009, a new state law requires a separate irrigation meter for all new in-ground irrigation systems connected to the public water supply. The intent of this legislation, House Bill 2499, is to reduce water systems’ vulnerability to drought and allow CHARLOTTE WATER a quicker response to water shortages.

B. CHARLOTTE WATER has approved two methods for installing a separate irrigation meter:

1. Single Split Service: an irrigation service line and meter are tied on an existing domestic service by installing a tee just before the domestic meter on the domestic line.

2. Dedicated Irrigation Service: a separate tap and a separate line run to each meter box.

C. ¾-inch and 1-inch irrigation service tubing shall be Type K copper (ONLY).

D. ¾-inch single split irrigation services shall match the existing ¾-inch service tubing materials – copper split off copper or HDPE (SDR-9 tubing) split off HDPE.

1. Occasionally, IPS diameter HDPE service tube may be encountered on existing services. The Contractor shall furnish an IPS x IPS x CTS brass tee to complete the split irrigation service.

2.11 METER BOXES AND LIDS

A. General

1. Service boxes and lids for ¾-inch and 1-inch water services shall be plastic, unless otherwise approved or directed by the Engineer.

2. Mouse holes shall not be present in meter boxes.

3. All lids shall have a recess suitable for installation of automatic meter reading electronic radio transmitter (ERT). “CHARLOTTE WATER” shall be imprinted/cast into the lid. The solid HD lid shall have 2 rebars or may have a rare earth magnet cast in the plastic. Lids with magnets shall be identified on the underside of the lid with bold letter “M”.

B. Domestic Service

1. ¾” domestic water meter boxes and lids shall be as manufactured by:

a. Southeastern Distributors

1) Box: Model MB 16-HD
2) Lid: Solid lid per Charlotte specification

b. DFW Plastics

1) Box: DFW36FNP4-12-4MA CLTW
2) Lid: DFW36-RSGSM-LID per Charlotte specification

2. 1-inch domestic water meter boxes and lids shall be as manufactured by:

a. DFW Plastics

1) Box: Model DFW65CNP4-14-4MA CLTW
2) Lid: DFW65-RSGSM-LID per Charlotte specification

3. Color shall be “Charlotte Gray” unless otherwise stated.

C. Irrigation Service

1. ¾” irrigation water meter boxes and lids shall be as manufactured by:

a. Southeastern Distributors

1) Box: MB17
2) Lid: Solid lid per Charlotte specification

b. DFW Plastics

1) Box: DFW47FNP2-12-2MA CLTW
2) Lid: Solid lid per Charlotte specification

2. 1-inch irrigation water meter boxes and lids shall be as manufactured by:

a. DFW Plastics

1) Box: DFW65CNP2-14-2MA IRR CLTW

2) Lid: Solid lid per Charlotte specification

3. Color shall be “Charlotte Green” (Color-Pantone#355C) unless otherwise stated. “Irrigation” shall be imprinted/cast into the lid for irrigation services.

D. Concrete Meter Boxes (For meter installation in sidewalk only)

1. The Contractor shall use the approved 1-inch standard concrete box with plastic lid when directed by the Engineer.

2. Concrete meter boxes shall conform to the Standard Details and be made of concrete mix, 1-2-1, one part cement, two parts granite screenings, and one part 3/8" granite stone. The meter boxes shall be concrete machine made and tamped with pneumatic tamps to insure the proper density. All concrete items shall be steam cured 24 hours and yard cured for two weeks. Cracked or broken boxes will be rejected at final inspection and must be replaced.

3. Concrete boxes for 5/8-inch (3/4-inch services) shall be as manufactured by:

a. Southern Meter Box Company

b. Approved equal

4. Concrete boxes for 1-inch meters shall be as manufactured by:

a. Southern Meter Box Company

1) Series 65H

b. Approved equal

2.12 METER VAULT ACCESS DOORS

A. 1.5-inch and 2-inch Services

1. 2 ft. x 3 ft. access doors shall be steel single leaf cast in place or recessed steel single leaf cast in place per the design requirements of the CHARLOTTE WATER Water and Sewer Design and Construction Standards. Meter vault access doors shall be H-20 traffic rated where required. H-20 traffic rated meter vault access doors shall not be used with brick vaults.

2. “CHARLOTTE WATER” shall be imprinted/cut into cover.

3. Steel access doors shall be as manufactured by U.S.F. Fabrication or East Jordan, Inc. only.

B. Large Water Services

1. 3 ft. x 3 ft., 3 ft. x 4 ft., 3 ft. x 5 ft., 3 ft. x 6 ft. single leaf manifold vault access doors, 4 ft. x 5 ft., 5 ft. x 5 ft., and 4 ft. x 6 ft. aluminum double leaf access doors shall meet the general requirements of the CHARLOTTE WATER Water and Sewer Design and Construction Standards. Steel double leaf H-20 traffic rated meter vault access doors shall be used where required. H-20 traffic rated meter vault access doors shall not be used with brick vaults.

2. All 900 PSF double leaf access doors shall be aluminum and all double leaf H-20 traffic rated access doors shall be steel that complies with the requirements of the CHARLOTTE WATER Water and Sewer Design and Construction Standards.

3. Steel access doors shall be as manufactured by U.S.F. Fabrication or East Jordan, Inc. only.

C. Identification

1. Lid: Premise numbers shall be clearly indicated on lid via an adhesive tag. See the CHARLOTTE WATER Water and Sewer Design and Construction Standards for requirements.

2. Manifolds: Premise numbers shall be engraved inside the door, on the support rib adjacent to the handle in line with transmitter. Lettering shall be laid out using a 1 ¼-inch stencil and engraving shall be with a high speed rotary tool with a ¼-inch oval or ball bit.

2.13 BRICKWORK FOR VAULTS

A. When brickwork (curbing) is required by the Standard Details, the interior and exterior faces of all brickwork shall be surfaced with a minimum of ½-inch cement mortar plaster. Mortar mix shall be (1) one part Portland cement and (2) parts clean sand. Mortar joints shall be a minimum of 3/8-inch. The brick shall be NCDOT pink solid concrete cap block for the brick curbing, creating an 8-inch minimum width brick.

B. In lieu of brickwork, reinforced precast concrete with finished mortar joints inside and out or reinforced cast in place concrete curbing may be used. The minimum width shall be 6-inches and the minimum height shall be 8-inches.

C. Submit curbing details for review and approval.

D. All brickwork installed inside vaults shall be NCDOT pink solid concrete cap block.

E. H-20 traffic rated meter vault access doors shall not be used with brick vaults.

2.14 PIPE SUPPORTS FOR VAULT PIPING

A. Pipe supports shall conform to MSS (Manufactures Standardization Society of the Valve and Fittings Industry) SP-58 – Pipe Hangers and Supports – Materials, Design, Manufacturer, Selection, Application, and Installation.

B. Supports shall provide means of vertical adjustment after erection.

C. Pipe sizes 1/2 to 1-1/2 in (13 to 38 mm): ASTM A240 (A240M), Type 316 Stainless Steel, adjustable swivel, split ring.

D. Pipe Sizes 2-inch (50 mm) and larger: ASTM A240 (A240M), Type 316 Stainless Steel, adjustable, clevis.

E. Vertical support shall be riser clamp.

F. Floor supports shall be adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or stainless steel support.

PART 3 - EXECUTION

3.1 TEMPORARY UTILITIES

A. Contractor shall provide and pay for all electrical, gas, and water required for construction and maintenance activities until Acceptance.

3.2 CONSTRUCTION LAYOUT

A. Construction Staking: Contractor is responsible for staking water main alignments, water main appurtenance structures, easements, rights-of-way, limits of disturbance, tree protection fence line, wetland boundaries, buffers, Project Control Points and other horizontal control reference points and benchmarks for the work shown on the Drawings. CHARLOTTE WATER will provide a drawing and/or staking plan files in electronic format to Contractor. Contractor shall confirm all drawing dimensions and elevations and establish elevations, lines, and levels from reference points, utilizing recognized engineering survey practices. During construction, Contractor shall provide competent helpers for checking elevations, lines, and levels deemed necessary by CHARLOTTE WATER. Contractor to establish horizontal and vertical control benchmarks and reference points on the site located in prominent and protected places as agreed upon by Contractor and CHARLOTTE WATER.

B. See Chapter 10, Water Distribution Piping Specifications, of the CHARLOTTE WATER Water and Sewer Design and Construction Standards for all additional requirements.

3.3 INSTALLATION AND ASSEMBLY, GENERAL

A. Proper implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, fittings, valves and hydrants shall be carefully lowered into the trench piece by piece by means of a backhoe or other suitable means, in such a manner as to prevent damage to protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench. A tracer wire system shall be installed for all piping based on the Standard Details and Specifications.

1. Inspection of Material: The pipe and fittings shall be inspected for defects.

2. Cleaning Pipe and Fittings: All lumps, blisters and excess coatings shall be removed from the bell and spigot ends of each pipe, and the outside of the spigot and the inside of the bell shall be wire- brushed and wiped clean and dry and free from oil and grease before the pipe is laid.

B. See Chapter 10, Water Distribution Piping Specifications, of the CHARLOTTE WATER Water and Sewer Design and Construction Standards for all additional requirements.

3.4 PIPING INSTALLATION GENERAL

A. General Locations and Arrangements: Drawing plans and details to indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. In all instances pipe shall be laid in a workmanlike manner, true to line and grade, with bell ends facing up-grade in the direction of laying. The various pipes referred to herein shall be handled, belled up and laid in accordance with the manufacturer's requirements and good engineering practices as defined in the various publications referenced in this document. The following requirements and/or standards of the CHARLOTTE WATER shall govern this construction unless exceeded by other regulatory bodies.

C. Install proper size increasers, reducers, wyes, bushings, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. When installing pipe under streets or other obstructions that cannot be disturbed, use dry bore with encasement, auger without encasement, dry punch/mole or horizontal directional drilling, as shown on the plans or as approved by the Engineer.

E. See Chapter 10, Water Distribution Piping Specifications, of the CHARLOTTE WATER Water and Sewer Design and Construction Standards for all additional requirements.

3.5 WATER SERVICES

A. Services shall be installed prior to testing the proposed main. Services shall be installed in a location determined by CHARLOTTE WATER after consultation with the Contractor (with Inspector present) and applicants. The water meter (only) will be furnished by the CHARLOTTE WATER and will be installed by the Contractor at the time of activation. All other materials required for water services will be furnished and installed by the Contractor.

B. Where single split irrigation services are to be installed, the Contractor shall freeze the existing water service to allow the existing service tubing to be cut for the installation of the brass tee. The Contractor may also choose to excavate to the corporation stop on existing services that are not under hardscape. The corporation stop may then be used to allow the existing service tubing to be cut for the installation of the brass tee. Under no circumstances shall the existing service tubing (copper or HDPE) be crimped to allow the existing service tubing to be cut for the installation of the brass tee.

C. Backflow Prevention devices shall be installed in accordance with Article V of Chapter 23 in the Charlotte City Code.

3.6 CHARLOTTE DEPARTMENT OF TRANSPORTATION (CDOT) REQUIREMENTS

A. Pull boxes, hand holes, manholes, and vaults, if permitted to be in pedestrian/non-motorized areas, shall have lids identifying the utility owner with a skid resistant surface. Lids shall have a minimum vertical load capacity of 20,000 lbs. in accordance with ANSI/SCTE 77 and ANSI Tier 15 test provisions.

3.7 PROTECTION OF ADVANCED METERING INFRASTRUCTURE (AMI)

A. While working in or around meter boxes, the Contractor shall protect in place all Advanced Metering Infrastructure (AMI) devices attached to the water meter or located in or near water meter boxes, coffins, or vaults in accordance with the Contract Documents. This includes any antenna installed through the meter box lid.

B. Contractor shall avoid damaging the antenna, cable, and endpoints when removing the meter box lid and when disconnecting AMI endpoints from the register on top of the water meter.

C. If meters or AMI devices need to be removed or relocated, the AMI endpoints shall be reinstalled with the Encoder/Receiver/Transmitter (ERT) pointing upwards.

D. Because the AMI equipment is uniquely matched to each service location and to specific meter serial numbers, any AMI devices that are removed or disconnected shall be

reinstalled on the same service lateral as well as to the same meter serial number it was attached to originally.

E. Do not change or modify the lid if the lid has an antenna drilled through it.

F. If damaged, disconnected, buried, or broken AMI endpoints, cables between the registers, antennae, lids, or ERTs are encountered, notify the Engineer within 24 hours.

G. Any AMI equipment damaged by the Contractor shall be repaired or replaced by CHARLOTTE WATER at Contractor's expense.

3.8 REPAIRS

A. The Contractor shall make any needed repairs to newly installed unactivated mains and shall notify the Owner and Engineer of the repairs. A representative of the Owner shall be on site during repairs. Repairs to existing and/or activated mains will be made by CHARLOTTE WATER unless the Contractor is otherwise directed by the Engineer.

1. Repairs to New mains: Repairs shall be made by cutting out and removing the damaged/defective section and replacing those with new pipe using long pattern solid sleeves to connect plain ends. Bell clamps will not be allowed to repair newly installed.

2. Repairs to Existing Mains: The Contractor will not be required to repair existing mains unless specifically directed by the Engineer or specified elsewhere in these specifications. Repair methods will be considered on a case-by-case basis.

B. See Chapter 10, Water Distribution Piping Specifications, of the CHARLOTTE WATER Water and Sewer Design and Construction Standards for all additional requirements.

3.9 FINAL INSPECTION

A. See Chapter 10, Water Distribution Piping Specifications, of the CHARLOTTE WATER Water and Sewer Design and Construction Standards for final inspection requirements.

List of Approved Water Meter Manufacturers and Models

Approved Water Meters			
Meter Type	**Size**	**Manufacturer**	**Model**
Displacement			
	5/8”	Badger Meter	Recordall® Model 25
	5/8”	Hersey-Mueller	420 Series Model 420 Bronze
	5/8”	Neptune Technology Group	Model T-10®
	1”	Badger Meter	Recordall® Model 70
	1”	Hersey-Mueller	452 Series Model 452 Bronze
	1”	Neptune Technology Group	Model T-10®
	1 ½”	Badger Meter	Recordall® Model 120
	1 ½”	Hersey-Mueller	500 Series Model 562
	1 ½”	Neptune Technology Group	Model T-10®
	2”	Badger Meter	Recordall® Model 170
	2”	Hersey-Mueller	500 Series Model 572
	2”	Neptune Technology Group	Model T-10®
Compound			
	3” – 6” x 8”	Badger Meter	Recordall® Compound Series
	3” – 8”	Neptune Technology Group	TRU/FLO® Compound Meter Series
FMCT			
	4” – 10”	Badger Meter	Recordall® Fire Series Assemblies (FSAA) with Disc Bypass Meter
	4” – 10”	Neptune Technology Group	HP PROTECTUS® III S Fire Service
	12”	Badger Meter	Recordall® Fire Series Assemblies (FSAA) with Turbo Bypass Meter
	12”	Neptune Technology Group	N/A
Ultrasonic			
	3” – 4”	Badger Meter	E-Series®
	3” – 12”	Master Meter	Octave®
Turbine			
	3”	Badger Meter	Recordall® Turbo Series Model 450
	3”	Hersey-Mueller	Model MVR 350
	3”	Neptune Technology Group	HP Turbine Meter
	4”	Badger Meter	Recordall® Turbo Series Model 1000
	4”	Hersey-Mueller	Model MVR 650
	4”	Neptune Technology Group	HP Turbine Meter

END OF SECTION

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