

NOTICE

THE SPECIFICATION PROVIDED IN THIS DOCUMENT IS THE MAY 2005 STANDARD SPECIFICATIONS.

SPECIAL SPECIFICATIONS AND SPECIAL PROVISIONS THAT SUPERSEDE THESE STANDARD SPECIFICATIONS MAY BE ADDED FOR EACH PARTICULAR PROJECT

SEE PROJECT SPECIFIC CONSTRUCTION DOCUMENTS FOR DETAILS

DIVISION V

WATER METER SPECIFICATIONS

APPROVED METER AND BACK FLOW PREVENTER MANUFACTURERS

Size	Type	Manufacturer	Application
5/8" x 3/4"	Displacement	Neptune Invensys	All
3/4"	Displacement	Neptune Invensys	All
1"	Displacement	Neptune Invensys	All
1-1/2"	Displacement	Neptune Invensys	All
2" & 3"	Compound	Neptune Invensys	All All (May be used for irrigation or for domestic and irrigations where properly sized.)
2" & 3"	Turbine	Neptune Invensys	Irrigation
4", 6", & 8"	Compound	Neptune Invensys	Domestic water, combo domestic/irrigation/limited area fire sprinkler.
4", 6", 8", & 10"	Fire Flow	Neptune Invensys	Combo domestic/fire protection (and irrigation).
4", 6", 8", & 10"	Fire Service Turbine	Neptune Invensys	Combo domestic/fire protection (and irrigation) where particularly approved by Connection Control.
4", 6", 8", & 10"	Turbine	Neptune Invensys	Domestic/irrigation where particularly approved by Connections Control.

SIZE	BACKFLOW PREVENTERS	MANUFACTURERS	REQUIREMENTS
All Sizes	Double Check Assembly	Ames, Conbraco, Febco, Hersey, Watts, Wilkins	USE ONLY APPROVED WATER METER IN ASSEMBLY
All Sizes	Double Check Detector	Ames, Conbraco, Febco, Hersey, Watts, Wilkins	USE ONLY APPROVED WATER METER IN ASSEMBLY
All Sizes	Reducer Pressure	Ames, Conbraco, Febco, Hersey, Watts, Wilkins	USE ONLY APPROVED WATER METER IN ASSEMBLY
All Sizes	Reducer Pressure Detector	Ames, Conbraco, Febco, Hersey, Watts, Wilkins	USE ONLY APPROVED WATER METER IN ASSEMBLY

PART 500 - DEFINITIONS

- 500.1.1 Absolute True Encoder Register – A meter register designed either to electronically determine the position of the odometer wheels or otherwise electronically capture the register reading. The register must be designed to reliably provide an accurate reading, or an error signal in the event of a malfunction, with no manual adjustment when it is connected to an interrogation device. The register must be capable of internally storing or sensing the reading so that it can be accurately read with a remote interrogator without relying on an external device to count periodic signals.
- 500.1.2 Enhanced Absolute True Encoder – Electronic Absolute Encoder Register providing 8-digit remote meter reading, and value added features including leak detection, tamper detection, and backflow indication. Leak detection provided by monitoring a 24-hr period in fifteen minute intervals. Tamper detection provided by reverse flow indication and number of days of zero flow over the previous 35 days. Enhanced Absolute True Encoder shall carry 10 year warranty, and shall be battery less. Enhanced Absolute True Encoder shall be Neptune E-Coder, or equal.
- 500.1.3 Radio Frequency Meter Interface Unit (MIU) – MIU unit shall interrogate the Enhanced Absolute True Encoder register(s) thru a cable lead and transmit the meter reading and other information to a data collection device via an RF interface. The MIU shall be attached to the underside of the cast iron meter can lid thru the industry standard 1-3/4” hole in the pit lid with no degradation of transmission range. Range shall not be effected by flooded pit. Antenna shall be metallic and polymer material to withstand traffic and shall have dual seal connection to MIU housing. MIU shall be protected from static discharge without loss of date per IEC 801-2, issue 2. MIU shall be waterproof. MIU shall be configured to accommodate a minimum of two (2) Enhanced Absolute True Encoders. MIU shall be Neptune R900 Pit Radio MIU or equal.

- 500.1.4 Meter Register Assembly – The system component that converts a meter reading into an electronic signal. This component consists of a meter register and true encoder assembly, assembled as either a single unit or as separate units, to be mounted on the meter.
- 500.1.5 Signal Transmission Assembly – System component consisting of electronic wires (or cable) and connectors, which transmit the electronic signal from a meter-register assembly to a remote receptacle.
- 500.1.6 Remote Pit Receptacle – The system component at a remote location from the meter, which receives the probe or a portable visual-display unit or a portable data-acquisition unit.
- 500.1.7 Probe – The system component that connects a remote receptacle with a portable data-acquisition unit or portable visual-display unit.
- 500.1.8 Portable data-acquisition unit (PDAU) - The system component that semi-automatically obtains and records on electronic data-storage unit, the significant meter registration and the customer identification number when its probe is connected to a remote receptacle.
- 500.1.9 Portable visual-display unit (PVDU) – The system component that provides a visual display of the significant meter registration when its probe is connected to a remote receptacle.

PART 501 - DISPLACEMENT WATER METERS – 5/8” x 3/4”, 1”, & 1-1/2”

501.1 WATER DISPLACEMENT METERS

501.2 GENERAL

- 501.2.1 Displacement water meters shall conform to current standard specifications of the AWWA C700, latest edition, “Cold Water Meters – Displacement Type.”
- 501.2.2 All meters and components shall be manufactured in the territorial boundaries of the United States.
- 501.2.3 The overall length of the 1-1/2” meters shall be 13”. Overall length of 5/8”x3/4” and 3/4” meters shall be 7 -1/2” in length. Overall length of 1” meters shall be 10- 3/4” in length.
- 501.2.4 The meter size and pressure shall conform to Table 1, “Characteristics of Displacement Type Meters”, of AWWA C700.
- 501.2.5 All meters must be guaranteed to operate under a working pressure of 150 psi without leakage or damage to any part.

501.3 CASE

- 501.3.1 The main case of the meter shall be cast waterworks bronze, with a cast iron bottom to allow breakage in the event of freezing so as not to distort the main housing. The “frost proof” cast iron bottom shall be attached to the bronze housing by four (300 Series) stainless steel bolts or cast bronze bolts and the internal water separated from the cast iron bottom by means of suitable polymer or rubber liner.
- 501.3.2 The serial number of the meter shall be imprinted permanently on the raised portion of the main case over the outlet spud or on the raised portion of the main case over the outlet flange. Non-encoder registers of 1-½” and smaller meters shall have covers.
- 501.3.3 Castings shall not be repaired in any manner.

501.4 MEASURING CHAMBER

- 501.4.1 The measuring chamber shall be cast bronze or suitable synthetic polymer and be guaranteed to measure accurately for 15 years. Nutating disc or oscillating piston type will be acceptable. Disc or piston shall be made of the highest grade vulcanized hard rubber or synthetic polymer and fitted accurately into the measuring chamber. Discs shall be equipped with a thrust bearing. The disc shall be flat and one-piece construction. The number of disc nutations shall comply with the AWWA C700 latest edition.
- 501.4.2 Measuring chambers shall be field repairable/replaceable without recalibration using change gears.

501.5 REGISTER

- 501.5.1 Registers will be magnetic driven straight reading in U.S. gallons and hermetically sealed with heat-treated glass on non-encoder registers. Encoder registers may be hermetically sealed with clear plastic.
- 501.5.2 All gearing shall be enclosed in the sealed register unit. All 1-½” meters shall have identical change gears.
- 501.5.3 The sealed register unit shall be warranted for 25 years to be free from defects and fogging.
- 501.5.4 The registration indicated on the meter dial shall not be less than 98.5% nor more than 101.5% while being tested within normal test flow limits as specified in Table 1 “Characteristics of Displacement Type Meters”, of AWWA C700. Meters shall register not less than 95% and not more than 101% at the minimum test rate flow as specified in Table 1 “Characteristics of Displacement Type Meters” of AWWA C700.

501.6 SCREEN

- 501.6.1 A rigid screen of non-corrosive material shall be installed inside the meter case. The screen shall fit snugly, shall be easily removable, and shall have an effective straining area at least double that of the main case outlet.

501.7 LOCAL REMOTE READOUT

- 501.7.1 Each meter shall be capable of accepting an absolute true encoder register operable with no outside electrical power.
- 501.7.2 Manufacturers must demonstrate that they have at least 5 consecutive years of successful experience in the manufacture and sale of a reliable absolute true encoder register.
- 501.7.3 Remote pit receptacles shall automatically query the encoder register to obtain a numeric reading. Manufacturers shall demonstrate that a reading obtained from a remote pit receptacle or AMR device will match the reading on the encoder register.
- 501.7.4 When available from an approved meter manufacturer, remote pit receptacles or AMR devices shall read in 1,000-gallon increments.

501.8 WARRANTY AND CERTIFICATES OF TESTING

- 501.8.1 The company guarantees that all meters will perform to AWWA new meter accuracy standards for a period of one (1) year from date of installation and to meet AWWA repaired meter standards for 10 years, and the meter register shall be guaranteed for 25 years to perform accurately and free from fogging. The manufacturer shall replace at his own expense all meters rejected for failure to comply with this standard. Each meter shall be furnished with certificates of testing indicating conformance with AWWA meter accuracy for new meters.

501.9 CONNECTIONS

- 501.9.1 The connections for 1-1/2" meter shall be bronze, flanged, oval type, faced and drilled, conforming to Class 125, ANSI B16.24.
- 501.9.2 5/8"x 3/4", 3/4", and 1" meters shall have threaded connections.

501.10 EXCHANGE PROGRAM

- 501.10.1 Each bidder will indicate the unit price for the new meters including an allowance per unit for an equal number of meters from the City of Tulsa for a trade-in. Successful bidders shall furnish shipping crates and shall pick up trade-in meters.
- 501.10.2 Each bidder shall furnish a bid for testing up to 25% of the trade-in meters.

501.11 REPAIR PARTS

501.11.1 Successful bidders shall furnish a complete repair parts list and price list for each type meter including prices for future register exchange and chamber exchange. Price shall be net prices of parts Free on Board (FOB) destination for the duration of the contract.

501.12 METER LITERATURE AND HEAD LOSS DELIVERY CURVES

501.12.1 Each bidder shall include with his proposal, two complete copies of descriptive material, loss of head and delivery curves for each item for which a bid is placed. No bids shall be considered unless the above information is furnished with bids.

501.13 COMPANION FLANGES (OPTIONAL)

501.13.1 Where specified, the meters shall be furnished with waterworks bronze companion flanges, gaskets, bolts, and nuts.

501.14 CONFLICTS

501.14.1 Where conflicts arise, the City interpretation shall prevail.

PART 502 - COMPOUND TYPE WATER METERS – 2”, 3”, 4”, 6”, & 8”

502.1 COMPOUND WATER METERS

502.2 GENERAL

502.2.1 Where 2” through 8” compound water meters are specified or required, they shall conform to AWWA C702, “Cold Water Meters – Compound Type”, Latest Edition. Meters shall be designed to operate at a minimum working pressure of 150 psig without leakage or damage to any part.

502.2.2 The compound meter shall contain two measuring chambers, one for low flow and one for high flow, with flow through the chambers controlled by a swing, lifting action, or spring loaded valve.

502.3 SIZE, CAPACITY, AND DIMENSIONS

502.3.1 The compound meter size and pressure shall conform to Table 1, “Operating Characteristics”, of AWWA C702. The overall dimensions from flange to flange of the meter shall not exceed those shown in Table 2, “Meter Dimensions”, of AWWA C702.

502.4 CASE

502.4.1 All meters shall have an outer case with separate, removable measuring chambers. Castings shall not be repaired in any manner. The case shall be bronze.

- 502.4.2 The size, model, and flow direction shall be cast on the outer case.
- 502.4.3 All interior parts shall be removable for repair without disturbing the pipeline connections.
- 502.4.4 The serial number of the meter shall be imprinted permanently on the top of the outlet flange.

502.5 FLANGED CONNECTIONS

- 502.5.1 All 2" compound meters shall be bronze flanged, oval type, faced and drilled, conforming to Class 125, ANSI B16.24.
- 502.5.2 The 3" through 6" compound meters shall be bronze flanged, round type, faced and drilled, conforming to Class 125, ANSI B16.24.

502.6 REGISTER

- 502.6.1 Registers shall be magnetically driven, hermetically sealed, and straight reading in U.S. gallons with heat treated glass on non-encoder registers. Encoder registers may be hermetically sealed with plastic. The register(s) furnished shall be the same register(s) that was on the meter when it was tested for accuracy.
- 502.6.2 Register capacity and indication shall meet the requirements of Table 5 "Maximum Indication on Test Circle and Minimum Register Capacity" of the AWWA C702. A large center sweep test hand register shall be provided.
- 502.6.3 The accuracy of the meter shall not be less than 97% nor more than 103% of the water actually passed through the meter at any rate of flow specified in Table 1, "Operating Characteristics" of the AWWA C702. The test water shall be at a temperature less than 80 degrees F. The accuracy at changeover flow, due to operation of the automatic valve mechanism, shall not be less than 90% and not more than 103%, and shall meet the requirements of Table 3 "Changeover Flow Rates" of AWWA C702.
- 502.6.4 Copper or stainless steel seal wires with lead seal shall be furnished and installed by manufacturer (supplier) to seal the register.

502.7 MEASURING CHAMBER, TURBINE BEARINGS

- 502.7.1 The measuring chamber shall be bronze or synthetic polymer, and shall be easily removable from the main case.
- 502.7.2 The turbine bearings or bushings shall be made of vulcanized, hard rubber, or synthetic polymer material, and shall be replaceable.
- 502.7.3 The high flow metering mechanism shall be driven by a rotor or propeller mounted on a horizontal shaft. No vertical shaft mounted rotor or torrent wheel measuring chambers shall be allowed.

502.8 MAGNETIC OR DIRECT COUPLINGS

502.8.1 Magnetic or direct drive register couplings with stuffing boxes may be used when the intermediate gear trains are located in the water compartment. Only magnetic register couplings shall be used when the intermediate gear trains are located in the register compartments.

502.9 STRAINER

502.9.1 The strainer shall be flanged, and shall have an effective straining area at least double the meter case inlet area. The body shall be ductile or cast iron or bronze, and the strainer screen shall be bronze or stainless steel. The strainer shall be designed for a minimum working pressure of 150 psig.

502.9.2 The total laying length of the meter and strainer shall be as follows:

	Meter and Strainer
Meter Size, Inches	Max. Laying Length, Inches
2	24
3	24
4	33
6	33

502.10 LOCAL REMOTE READOUT

502.10.1 2-inch meters shall be capable of accepting an absolute true encoder register operable with no outside electrical power.

502.10.2 3-inch and larger meters shall be furnished with an absolute true encoder register operable with no outside electrical power.

502.10.3 Manufacturers must demonstrate that they have at least 5 consecutive years of successful experience in the manufacture and sale of a reliable absolute true encoder register.

502.10.4 Remote pit receptacles shall automatically query the encoder register to obtain a numeric reading. Manufacturers shall demonstrate that a reading obtained from a remote pit receptacle or AMR device will match the reading on the encoder register.

502.10.5 When available from an approved meter manufacturer, remote pit receptacles or AMR devices shall read in 1,000-gallon increments.

502.11 AFFIDAVIT OF COMPLIANCE

502.11.1 An Affidavit of Compliance and Certificate of Testing shall be furnished to the City of Tulsa with each meter to insure that the meter conforms to these specifications.

502.12 COMPANION FLANGES (OPTIONAL)

502.12.1 Where specified, the meter shall be furnished with waterworks bronze companion flanges, gaskets, bolts, and nuts.

502.13 REPAIR PARTS

502.13.1 Successful bidders shall furnish a complete repair parts list and price list for each type meter including prices for future register exchange and chamber exchange. Price shall be net prices of parts FOB destination for the duration of the contract.

502.14 WARRANTY

502.14.1 The manufacturer guarantees that all meters will perform to AWWA new meter accuracy standards for a period of one (1) year from date of installation. The manufacturer shall replace at its own expense all meters rejected for failure to comply with this standard. Each meter shall be furnished with certificate of testing indicating conformance with AWWA meter accuracy for new meters.

502.15 EXCHANGE PROGRAM

502.15.1 Each bidder shall indicate the unit price for the new meters. Successful bidders shall furnish shipping crates and shall pick up trade-in meters.

502.15.2 Each bidder shall furnish a bid for testing up to 25% of the trade-in meters.

502.16 METER LITERATURE AND HEAD LOSS DELIVERY CURVES

502.16.1 Each bidder shall include with his proposal, two complete copies of descriptive material, loss of head, and delivery curves for each item for which a bid is placed. No bids shall be considered unless the above information is furnished with bids.

502.17 CONFLICTS

502.17.1 Where conflicts arise, the City interpretation shall prevail.

PART 503 - TURBINE WATER METERS – IRRIGATION AND SPECIAL SERVICES – 2” & 3”

503.1 TURBINE WATER METERS

503.2 GENERAL

503.2.1 Where 2” and 3” turbine meters are specified or required, they shall conform to AWWA C701, “Cold Water Meters, Turbine Type, for Customer Service”, Latest Edition. They shall be designed to operate at a minimum working pressure of 150 psig without leakage or damage to any part.

503.3 SIZE CAPACITY AND DIMENSIONS

503.3.1 The meter size, nominal capacity ratings, and pressure loss shall conform to Table 1, "Operating Characteristics", of AWWA C701. The overall dimensions from flange to flange of the meter shall not exceed those shown in Table 2, "Meter Dimensions for Class 1 and Class II Turbine-Type Meters", of the AWWA C701.

503.4 CASE

503.4.1 All meters shall have a bronze outer case with a separate, removable measuring chamber, in which the turbine operates. Castings shall not be repaired in any manner.

503.4.2 All interior parts shall be removable for repair without disturbing the pipeline connections.

503.4.3 The size, model, and flow direction shall be cast on the outer case.

503.4.4 The serial number of the meter shall be imprinted permanently on the top of the outlet flange.

503.4.5 An adjustment vane for positive and negative calibration of meter accuracy shall be incorporated into the meter main case or measuring chamber cover.

503.5 FLANGED CONNECTIONS

503.5.1 All 3" turbine meters shall be bronze flanged, round type, faced and drilled, conforming to Class 125, ANSI B16.24.

503.5.2 All 2" turbine meters shall be bronze flanged, oval type, faced and drilled, conforming to Class 125, ANSI B16.24.

503.6 REGISTER

503.6.1 The register shall be magnetically driven, hermetically sealed, and straight reading in U.S. gallons with heat-treated glass on non-encoder registers. Encoder registers may be hermetically sealed with plastic. The register(s) furnished shall be the same register(s) that was on the meter when it was tested for accuracy.

503.6.2 The register capacity and indication shall meet the requirements of Table 4 "Maximum Indication on Initial Dial and Maximum Register Capacity" of AWWA C701. A large center sweep test hand register shall be provided.

503.6.3 The accuracy of the meter shall not be less than 98% nor more than 102% of the water actually passed through the meter at any rate of flow specified in Table 1 "Operating Characteristics" of the AWWA C701. The test water shall be at a temperature less than 80°F.

503.6.4 Register cover shall be made of bronze with the name of the manufacturer cast on the lid in raised letters. The serial number shall be imprinted permanently on the cover. Register cover not required for encoder registers.

503.6.5 Copper or stainless steel seal wires with lead seal shall be furnished and installed by manufacturer (supplier) to secure the register.

503.7 MEASURING CHAMBER, TURBINE BEARING

503.7.1 The measuring chamber shall be bronze or synthetic polymer, and shall be easily removable from the main case.

503.7.2 The turbine bearings or bushings shall be made of vulcanized, hard rubber, synthetic polymer, or ceramic material, and shall be replaceable.

503.8 STRAINER

503.8.1 The strainer shall be flanged and shall have effective straining area at least double the meter case inlet area. The body shall be ductile or cast iron or bronze, and the strainer screen shall be bronze or stainless steel. The strainer shall be designed to operate at a minimum working pressure of 150 psi.

503.8.2 The total laying length of the meter and strainer shall be as follows:

	Meter and Strainer
Meter Size, Inches	Max. Laying Length, Inches
2	20
3	19

503.9 LOCAL REMOTE READOUT

503.9.1 Each 2" meter shall be capable of accepting an absolute true encoder register operable with no outside electrical power.

503.9.2 Each 3" meter shall have an absolute true encoder register operable with no outside electrical power.

503.9.3 Manufacturers must demonstrate that they have at least 5 consecutive years of successful experience in the manufacture and sale of a reliable absolute true encoder register.

503.9.4 Remote pit receptacles and AMR devices shall automatically query the encoder register to obtain a numeric reading. Manufacturers shall demonstrate that a reading obtained from a remote pit receptacle or AMR device will match the reading on the encoder register.

503.9.5 When available from an approved meter manufacturer, remote receptacles or AMR devices shall read in 1,000-gallon increments.

503.10 AFFIDAVIT OF COMPLIANCE

503.10.1 An Affidavit of Compliance and Certificate of Testing shall be furnished to the City of Tulsa with each meter to insure that the meter conforms to these specifications.

503.11 COMPANION FLANGES (OPTIONAL)

503.11.1 Where specified, the meter shall be furnished with waterworks bronze companion flanges, gaskets, bolts, and nuts.

503.12 REPAIR PARTS

503.12.1 Successful bidders shall furnish a complete repair parts list and price list for each type meter including prices for future register exchange and chamber exchange. Price shall be net price of parts FOB destination for the duration of the contract.

503.13 WARRANTY

503.13.1 The company guarantees that all meters will perform to AWWA new meter accuracy standards for a period of one (1) year from date of installation. The manufacturer shall replace at its own expense all meters rejected for failure to comply with this standard. Each meter shall be furnished with certificates of testing indicating conformance with AWWA meter accuracy for new meters.

503.14 METER LITERATURE AND HEAD LOSS DELIVERY CURVES

503.14.1 Each bidder shall include with his proposal, two complete copies of descriptive material, loss of head and delivery curves for each item for which a bid is placed. No bids shall be considered unless the above information is furnished with bids.

503.15 CONFLICTS

503.15.1 Where conflicts arise, the City interpretation shall prevail.

PART 504 - TURBINE METERS – FIRE SERVICE – 4”, 6”, 8”, & 10”

504.1 FIRE SERVICE TURBINE METERS

504.2 GENERAL

504.2.1 Where fire service meters are specified or required, they shall conform to AWWA C703, “Cold Water Meters, Fire Service Type”, Latest Edition. They shall be designed to operate at a minimum working pressure of 150 psig without leakage or damage to any part.

504.2.2 The meter shall be a high velocity turbine type with strainer and shall conform to the National Fire Protection Association (NFPA) requirements, and shall be approved by the Underwriters Laboratory (UL) for fire service.

504.3 SIZE, CAPACITY, AND DIMENSIONS

- 504.3.1 The meter size and nominal capacity ratings and pressure loss shall conform to Table 1 "Operating Characteristics" of AWWA C703. The overall dimensions from flange to flange of the meter shall not exceed those shown in Table 2 "Meter Dimensions" of AWWA C703.

504.4 CASE

- 504.4.1 All meters shall have an outer case with a separate, removable measuring chamber, in which the turbine operates. Castings shall not be repaired in any manner. The case shall be bronze or cast iron.
- 504.4.2 The size, model, and flow direction shall be cast on the outer case.
- 504.4.3 All interior parts shall be removable for repair without disturbing the pipeline connections.
- 504.4.4 The serial number of the meter shall be imprinted permanently on the top of the outlet flange.

504.5 FLANGED CONNECTIONS

- 504.5.1 The fire service turbine meter shall be bronze flanged, round type, faced and drilled, conforming to Class 125, ANSI B16.24.

504.6 REGISTER

- 504.6.1 The registers shall be magnetically driven, hermetically sealed and straight reading the U.S. gallons. The register furnished shall be the same register that was on the meter when it was tested for accuracy.
- 504.6.2 The register capacity and indication shall meet the requirements of Table 4 "Register Characteristics" of the AWWA C703. A large center sweep test hand register shall be provided, if available.
- 504.6.3 The accuracy of the meter shall not be less than 98% nor more than 102% of the water actually passed through the meter at any rate of flow specified in Table 1 "Operating Characteristics" of AWWA C703. The test water shall be at a temperature less than 80°F.
- 504.6.4 Register cover shall be made of bronze with the name of the manufacturer cast on the lid in raised letters. The serial number shall be imprinted permanently on the cover. Register covers not required on encoder equipped registers.
- 504.6.5 Copper or stainless steel seal wires with lead seal shall be furnished and installed by manufacturer (supplier) to seal the register.

504.7 MEASURING CHAMBER, TURBINE BEARING

- 504.7.1 The measuring chamber shall be bronze or synthetic polymer, and shall be easily removable from the main case.
- 504.7.2 The turbine bearings or bushings shall be made of vulcanized, hard rubber, synthetic polymer, or ceramic material, and shall be replaceable.
- 504.7.3 An adjustment vane for positive and negative calibration of meter accuracy shall be incorporated into the meter main case or measuring chamber cover.

504.8 STRAINER

- 504.8.1 The strainer shall be flanged and shall have effective straining area at least quadruple the meter case inlet area. The body shall be ductile or cast iron or bronze, and the strainer screen shall be bronze or stainless steel. The strainer shall be designed to operate at a minimum working pressure of 150 psi.
- 504.8.2 The total laying length of the meter and strainer shall be as follows:

	Meter and Strainer
Meter Size, Inches	Max. Laying Length, Inches
4	35 ¹ / ₁₆ "
6	44 ⁷ / ₈ "
8	51 ⁵ / ₁₆ "
10	59 ³ / ₄ " to 61 ³ / ₄ "

504.9 LOCAL REMOTE READOUT

- 504.9.1 Each meter shall be furnished with an absolute true encoder register operable with no outside electrical power.
- 504.9.2 Manufacturers must demonstrate that they have at least 5 consecutive years of successful experience in the manufacture and sale of a reliable absolute true encoder register.
- 504.9.3 Remote pit receptacles and AMR devices shall automatically query the encoder register to obtain a numeric reading. Manufacturers shall demonstrate that a reading obtained from a remote pit receptacle or AMR device will match the reading on the encoder register.
- 504.9.4 When available from an approved meter manufacturer, remote pit receptacles or AMR devices shall read in 1,000-gallon increments.

504.10 AFFIDAVIT OF COMPLIANCE

- 504.10.1 An Affidavit of Compliance and Certificate of Testing shall be furnished to the City of Tulsa with each meter to insure that the meter conforms to these specifications.

504.11 COMPANION FLANGES (OPTIONAL)

504.11.1 Where specified, the meter shall be furnished with waterworks bronze companion flanges, gaskets, bolts, and nuts.

504.12 REPAIR PARTS

504.12.1 Successful bidders shall furnish a complete repair parts list and price list for each type meter including prices for future register exchange and chamber exchange. Price shall be net price of parts FOB destination for the duration of the contract.

504.13 WARRANTY

504.13.1 The company guarantees that all meters will perform to AWWA new meter accuracy standards for a period of one (1) year from date of installation. The manufacturer shall replace at its own expense all meters rejected for failure to comply with this standard. Each meter shall be furnished with certificates of testing indicating conformance with AWWA meter accuracy for new meters.

504.14 METER LITERATURE AND HEAD LOSS DELIVERY CURVES

504.14.1 Each bidder shall include with his proposal, two complete copies of descriptive material, loss of head and delivery curves for each item for which a bid is placed. No bids shall be considered unless the above information is furnished with bids.

504.15 CONFLICTS

504.15.1 Where conflicts arise, the City interpretation shall prevail.

PART 505 - FIRE FLOW METERS – 4”, 6”, 8”, & 10”

505.1 FIRE FLOW METERS

505.2 GENERAL

505.2.1 Fire flow meters shall have a compound meter bypass, or they shall be a Neptune Protectus II Turbine meter with a displacement meter bypass, or an Invensys Fireline Turbine meter with a displacement meter bypass. The high flow metering mechanism for compound bypass meters shall be driven by a rotor or propeller mounted on a horizontal shaft. No vertical shaft mounted rotor or torrent wheel measuring chambers shall be allowed. The meter shall conform to AWWA C703 “Cold Water Meters, Fire Service Type”; AWWA C702, “Cold Water Meters Compound Type”; or AWWA C701, “Cold Water Meters, Turbine Type.”

505.2.2 Meters shall be designed to operate at a minimum working pressure of 150 psig without leakage or damage to any part.

505.2.3 The meter shall conform to the National Fire Protection Association (NFPA) requirements, and shall be approved by the Underwriters Laboratory (UL) for fire service.

505.3 SIZE, CAPACITY, AND DIMENSIONS

505.3.1 The meter size, nominal capacity ratings and pressure loss shall conform to Table 1 "Operating Characteristics" of AWWA C702.

505.4 CASE

505.4.1 The main line meter and automatic valve case shall be made of galvanized cast iron or bronze. The bypass type of meter shall have a bronze case.

505.4.2 The flow direction shall be cast on the outer case.

505.4.3 All interior parts shall be removable for repair without disturbing the pipeline connections.

505.5 FLANGED CONNECTIONS

505.5.1 The meter flanges shall be integral with the case, round type, faced and drilled, and conform to Class 125, ANSI B16.1.

505.6 REGISTERS

505.6.1 Registers shall be magnetically driven, straight reading, hermetically sealed, and shall read in U.S. gallons. The register furnished shall be the same register that was on the meter when it was tested for accuracy.

505.6.2 The register capacity and indication shall meet the requirements of Table 1 "Operating Characteristics" of the AWWA C703.

505.6.3 The accuracy of the meter shall not be less than 97% or more than 103% of the water actually passed through the meter at any rate of flow specified in Table 1 "Operating Characteristics" of the AWWA C703. The test water shall be at a temperature less than 80°F.

505.6.4 Register cover shall be made of bronze with the name of the manufacturer cast on the lid in raised letters. The serial number shall be imprinted permanently on the cover. Register cover not required on encoder-equipped registers.

505.6.5 Copper or stainless steel wires with lead seal shall be furnished and installed by manufacturer (supplier) to seal the register.

505.7 MEASURING CHAMBER, TURBINE BEARINGS

505.7.1 The measuring chamber shall be bronze or synthetic polymer, and shall be easily removable from the main case.

505.7.2 The turbine bearings or bushings shall be made of vulcanized, hard rubber, synthetic polymer, or ceramic material, and shall be replaceable.

505.7.3 100% of the flow through the meter must pass through the metering chambers. No proportional metering chambers shall be allowed.

505.8 STRAINER

- 505.8.1 The strainer shall be flanged and shall have effective straining area at least quadruple the meter case inlet area. The body shall be ductile or cast iron or bronze, and the strainer screen shall be bronze or stainless steel. The strainer shall be designed to operate at a minimum working pressure of 150 psi.

505.9 LOCAL REMOTE READOUT

- 505.9.1 Each meter shall be furnished with an absolute true encoder register operable with no outside electrical power.
- 505.9.2 Manufacturers must demonstrate that they have at least 5 consecutive years of successful experience in the manufacture and sale of a reliable absolute true encoder register.
- 505.9.3 Remote pit receptacles and AMR devices shall automatically query the encoder register to obtain a numeric reading. Manufacturers shall demonstrate that a reading obtained from a remote pit receptacle or AMR device will match the reading on the encoder register.
- 505.9.4 When available from an approved meter manufacturer, remote pit receptacles or AMR devices shall read in 1,000-gallon increments.

505.10 AFFIDAVIT OF COMPLIANCE

- 505.10.1 An Affidavit of Compliance and Certificate of Testing shall be furnished to the City of Tulsa with each meter to insure that the meter conforms to these specifications.

505.11 COMPANION FLANGES (OPTIONAL)

- 505.11.1 Where specified, the meter shall be furnished with waterworks bronze companion flanges, gaskets, bolts, and nuts.

505.12 REPAIR PARTS

- 505.12.1 Successful bidders shall furnish a complete repair parts list and price list for each type meter including prices for future register exchange and chamber exchange. Price shall be net price of parts FOB destination for the duration of the contract.

505.13 WARRANTY

- 505.13.1 The company guarantees that all meters will perform to AWWA new meter accuracy standards for a period of one (1) year from date of installation. The manufacturer shall replace at its own expense all meters rejected for failure to comply with this standard. Each meter shall be furnished with certificates of testing indicating conformance with AWWA meter accuracy for new meters.

505.14 METER LITERATURE AND HEAD LOSS DELIVERY CURVES

505.14.1 Each bidder shall include with his proposal, two complete copies of descriptive material, loss of head and delivery curves for each item for which a bid is placed. No bids shall be considered unless the above information is furnished with bids.

505.15 CONFLICTS

505.15.1 Where conflicts arise, the City interpretation shall prevail.

PART 506 - DOUBLE CHECK DETECTOR ASSEMBLY – 4”, 6”, 8”, & 10”

506.1 DOUBLE CHECK DETECTOR ASSEMBLY

506.2 GENERAL

506.2.1 Where specified or required for fire service lines, a Double Check Detector Assembly Backflow Preventor shall be installed in accordance with the City of Tulsa Plumbing Code.

506.2.2 The assembly shall consist of a double check valve, resilient seated gate valves, and a parallel bypass meter assembly. Design working pressure shall be a minimum of 150 psi.

506.2.3 The assembly shall be tested by a City of Tulsa, approved Back Flow Assembly Tester before it will be accepted.

506.2.4 The check valves in the main line and bypass shall remain closed until there is a demand for water. Flow rates up to approximately three (3) gallons per minute shall be directed through the metered bypass. Higher flow rates shall open the mainline check valves causing flow to occur through the mainline and the bypass.

506.3 REFERENCE STANDARDS AND APPROVALS

506.3.1 The double check detector assembly shall meet or exceed the following standards:

506.3.2 Manual of Cross-Connection Control, Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California (USC-FCCC & HR).

506.3.3 American Society of Sanitary Engineering (ASSE Standard Number 1048).

506.3.4 American Water Works Association (AWWA) Standard Number C510, Double Check Valve Backflow Prevention Assembly (mainline assembly only).

506.3.5 The double check detector assembly shall be tested and approved as follows:

1) USC-FCCC & HR Approved

- 2) Factory Mutual (FM) Approved
- 3) Underwriters Laboratories (UL) Classified

506.4 MAIN LINE DOUBLE CHECK ASSEMBLY

- 506.4.1 The main line unit shall consist of two independently acting spring loaded check valves, located between two resilient seated gate valves, and four properly placed resilient seated test cocks.
- 506.4.2 The main line body and cover shall be constructed of cast iron, ductile iron, or stainless steel. All iron bodies and parts shall be coated with a polymerized coating conforming to AWWA C550.
- 506.4.3 All internal metal parts of the check valves shall be bronze or stainless steel. Check valves shall be serviceable in-line.
- 506.4.4 The shutoff valves shall be resilient seated gate valves conforming to AWWA C509, outside screw and yoke (OS&Y). Main line end connections shall be flanged, 125 lb. ANSI B16.1.

506.5 BYPASS METER ASSEMBLY

- 506.5.1 The bypass assembly shall consist of two independently acting spring loaded check valves, two shutoff valves, displacement water meter, and four properly placed resilient seated test cocks.
- 506.5.2 The bypass assembly piping and valve bodies shall be constructed of bronze. All internal metal parts shall be bronze or stainless steel.
- 506.5.3 The bypass meter shall be a City of Tulsa approved displacement meter furnished with an absolute true encoder register operable with no outside electrical power. The meter shall be furnished with a certificate of testing indicating conformance with AWWA meter accuracy for new meters.
- 506.5.4 Remote pit receptacles and AMR devices shall automatically query the encoder register to obtain a numeric reading. Manufacturers shall demonstrate that a reading obtained from a remote pit receptacle or AMR device will match the reading on the encoder register.
- 506.5.5 When available from an approved meter manufacturer, remote interrogators or AMR devices shall read in 1,000-gallon increments.

506.6 AFFIDAVIT OF COMPLIANCE

- 506.6.1 An affidavit of Compliance and Certificate of Testing shall be furnished to the City of Tulsa with each double check detector assembly to insure that it conforms to these specifications.

506.7 SHIPPING

506.7.1 Each double check detector assembly shall be fully assembled, placed on pallets, and crated for shipping.

506.7.2 Meters shall be FOB destination.

SECTION END