GUIDELINES AND POLICIES

- MATERIAL SPECIFICATIONS -

Version 1, April 1, 2008
Revised: June 18, 2008

Springfield Water and Sewer Commission

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Springfield Water and Sewer Commission

Material Specifications

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CHAPTER 1 REVISIONS

1. Version 1 of these Material Specifications was written April 1, 2008.

2. Revisions of these Material Specifications as of June 18, 2008

   - Chapter 1 Revisions was added (note all other Chapter and Section numbers increased by1, such as; Section 2.9 Couplings is now Section 3.9 Couplings)
   - Section 3.9 – All Couplings required to meet the General Section added, trackhead/teehead bolt to be Cor-Ten added,
   - 3.10.3 – changed minimum bolt length for 4-inch thru 8-inch socket clamps
   - 3.10.6 – clarified minimum bent eye bolt length
   - 3.10.7 – clarified washers for threaded rods may be plated or unplated
   - 3.12.1 – added torque limiting twist off bolt to be Cor-Ten steel, changed working pressure requirements, and clarified all bolts, nuts, and washers to be Cor-Ten steel
   - 3.16.8 – added Dense Grade Crushed Stone

Springfield Water and Sewer Commission

Material Specifications

CHAPTER 2 GENERAL PROVISIONS

2.1.1 Reference to Specifications

These specifications may be referred to as the Commission's Specifications.

2.1.2 Severability

The provisions of these Specifications are severable. If any provision of these Specifications or any specific application to any person or circumstance is held invalid, such invalidity shall not affect other provisions or applications which can be given effect in the absence of the invalid provision or application.

2.1.3 Applicable Regulations

Every user of the public water system, private water mains, public sewer system, or private sewer mains shall be subject to regulations of the Commission, as they apply, and to any charges, rates, fees and assessments which are or may be established by the Commission. Any user of the public water system, private water mains, public sewer system, or private sewer mains shall also be subject to applicable Local, State, and Federal regulations.

2.1.4 Reference Standards

Where reference is made to one of the below standards, the revision in effect at the time of bid opening shall apply.

1. American Concrete Institute (ACI)
2. American Iron and Steel Institute (AISI)
3. American National Standards Institute (ANSI)
4. American Society of Testing and Materials (ASTM)
5. American Water Works Association (AWWA)
6. American Welding Society (AWS)
7. Ductile iron Pipe Research Association (DIPRA)
8. Manufacturing Standardization Society of the Valve and Fittings (MSS)

9. National Fire Protection Association (NFTA)
10. NSF International (NSF)

CHAPTER 3 WATER MAINS AND APPURTANANCES,

Section 3.1 WATER PIPE

3.1.1 Ductile Iron Push-on Joint Water Pipe

1. Ductile Iron Pipe provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Design and Manufacture

   (a) Ductile Iron Pipe shall be designed and manufactured in accordance with the most current ANSI A21.50/AWWA C-150 and ANSI A21.51/AWWA C-151

   (b) Ductile Iron Pipe shall have rated water working pressure as indicated in Paragraph 10 of these Specifications based on AWWA C-151 standard laying condition: Type #2.

3. Cement Lining

   (a) All pipe shall be double cement lined with an approved mortar lining and sealed with an approved asphaltic material seal coat in accordance with ANSI A21.4/AWWA C-104 of the latest revision.

   (b) Provisions of AWWA C-104, Section 4.11 relating to characteristics of asphaltic seal coat as to deleterious effect upon the quality, color, taste or odor imparted to potable water shall be strictly observed.

4. Exterior Coating

   All pipe shall be coated with an approved petroleum asphaltic seal coat in accordance with ANSI A21/AWWA C-110, Section 4.3 of latest the revision.

5. Markings

   The pressure rating, metal thickness class, net weight of pipe without lining, length of pipe, date of manufacture and the name of the manufacturer shall be clearly marked on each length of pipe.

6. Length

   The maximum length shall be twenty (20) feet.

7. Joints

   (a) Pipe to have push-on type joints conforming to ANSI A21.11/AWWA C-111. Rubber gasket joints to be complete with gasket and lubricant.

   (b) Gaskets and lubricant shall be standard for the pipe used and approved by Springfield Water and Sewer Commission. Rubber gaskets and lubricant for the joints shall be shipped in bags.

   (c) The Springfield Water and Sewer Commission may require, under certain terrain conditions that restrained joints be used. The method of restraining may either, be of an locking gasket type joint, interlocking type joint, or mechanical joint restraint, as specified in Section 2.8 of these Specifications and as required by the Springfield Water and Sewer Commission.

8. Wedges

   Three (3) bronze wedges shall be provided for each length of pipe ordered.

9. Inspection

   The Commission reserves the right to retain an outside inspection laboratory to inspect pipe at manufacturer's foundry, inspection costs to be paid by the Commission.

10. Metal Thickness and Pressure Class

    Metal thickness and pressure Class shall be as shown in following table:

Size	Class	Metal Thickness
4"	350	0.25
6"	350	0.25
8"	350	0.25
10"	350	0.26
12"	350	0.28
16"	350	0.34
20"	300	0.36
24"	300	0.40
30"	250	0.42
36"	200	0.42
42”	200	0.47
48”	200	0.52

11. Delivery

Delivery shall be made by truck in minimum truckload quantity to locations designated in the Commission's service area in and near Springfield, Massachusetts. The low bidder shall notify the Commission of the quantity comprising a minimum truckload. The Commission reserves the right to mix size of pipe (diameters) to reach a full truckload.

12. Care and Handling

The manufacturer/vendor/shipper must use care in preparing pipes for shipment and in handling during shipment and delivery, to insure that the pipes are delivered without damage. Particular attention must be directed at protecting the protective coatings from damage. Damaged pipes will not be accepted.

13. Affidavit

The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the pipe and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

14. References

The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

(a) Name of Municipality/Utility

(b) Total amount of product bid on and amount delivered

(c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and a desk top phone number whom the Commission has authorization to contact regarding the product

3.1.2 Flanged Ductile Iron Pipe

1. Flanged Ductile Iron-Pipe shall, as a minimum, shall meet all specifications in Paragraph 2.1.1 and the following:

2. Flanged Ductile Iron Pipe and Fittings provided to the Commission or installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

3. Flanged Ductile Iron-Pipe, as a minimum, shall conform to the most current ANSI A21.l5/AWWA C-115 and all addenda thereto.

4. Flanged Ductile Iron-Pipe shall have the bolt circle and bolt holes conform to dimensions and drilling of ANSI B16.1, Class 125 or ANSI A21.15/AWWA C-115

5. Flanges shall be ductile iron.

Section 3.2 GATE VALVES

3.2.1 Class 150B - Resilient Seated 4" - 16" Gate Valves and Resilient Seated 4" – 16" Tapping Valves

1. Class 150B - Resilient – Seated Gate Valves and Tapping Valves provided to the Commission or installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Class 150B - Resilient – Seated Gate Valves and Tapping Valves shall conform to AWWA C-509 (most current revision) for Resilient – Seated Gate Valves for Water Service or AWWA C-515, (most current revision) for Reduced – Wall, Resilient – Seated Gates Valves for Water Service.

3. Class 150B - Resilient – Seated Gate Valves and Tapping Valves shall be of high strength cast iron ASTM A-126 Class B or of high strength ductile iron ASTM A-536 GR 65-45-12.

4. Class 150B - Resilient – Seated Gate Valves and Tapping Valves maximum working pressure shall be 150-PSI static pressure. Valves provided under Class 150B shall be shell tested at 300-PSI minimum with the gate in the open position. Valves provided under Class 150B shall be seat tested at 150-PSI minimum with the gate in the closed position on each side of the seat.

5. Class 150B - Resilient – Seated Gate Valves and Tapping Valves shall be as provided by American Flow Control – Model 2500, Clow – Model F6100, Kennedy – Model 8571, M&H – Model 4067, Mueller – Model A2360 or A2361, US Pipe – Metropolitan, or the equal product of another manufacturer.

6. Valves that meet the Class 250B specifications also meet or exceed the Class 150B specifications.

7. The valve body and bonnet shall be coated on all exterior and interior surfaces with fusion bonded epoxy conforming to the requirements of AWWA C-550 (most current revision) for Protective Epoxy Interior Coatings for Valves and Hydrants.

8. The valve body markings shall include the manufacturers name or mark, pressure rating, material (C.I. or D.I.), and year of manufacture and be cast into the body.

9. Valves ordered under this specification will be within the following size schedules 4-inch, 6-inch, 8-inch, 10-inch, 12-inch, and 16-inch.

10. Valves to be provided with a minimum of two (2) O-ring stem seals.

11. Valves shall be of the non-rising stem (NRS) design.

12. Valves shall be wrench-nut operated with a 2-inch square-operating nut made of ductile iron and **right hand** to open.

13. Valves ordered under this Specification shall be provided with valve ends selected from the following:

    (a) Mechanical joint both ends

    - Mechanical joint bell dimensions shall conform to ANSI A21.11/AWWA C-111.

    (b) Flanged both ends

    - The end flanges of flanged valves shall conform to dimensions and drilling of ANSI B16.1, Class 125 or ANSI A21.10/AWWA C-110.

    (c) Mechanical joint X flanged

    - Mechanical joint bell dimensions shall conform to ANSI A21.11/AWWA C-111.
    - The end flanges of flanged valves shall conform to dimensions and drilling of ANSI B16.1, Class 125 or ANSI A21.10/AWWA C-110.

    (d) Mechanical joint X tapping valve flange

    - Mechanical joint bell dimensions shall conform to ANSI A21.11/AWWA C-111.
    - Tapping valve flanges that form the joint with the tapping sleeve shall conform to the dimensions MSS SP-60 in sizes 4" through 12". The connecting MJ bell of the tapping valve mating with the tapping machine must be parallel and concentric with the opposite flange and concentric with the waterway to provide proper alignment for the tapping operation. This flange shall conform to the dimensions of MSS SP-113. Tapping valves provided must be manufactured to be used with the Mueller CL-12 Drilling

Machine with the following shell cutter diameters 3 ½", 5 ½", 7 ½", 9 ½", and 11 ½".

14. The resilient-seat wedge shall be constructed of cast iron or ductile iron and fully encapsulated in a rubber compound for water service, constructed of STYRENE BUTADIENE RUBBER (SBR) rubber, and must meet or exceed ASTM D-2000 3 BA 715. No bare metal shall be left exposed. Wedge rubber shall be molded in place and banded tightly to the cast iron or ductile iron core and shall not be mechanically attached with screws, rivets, or similar fasteners. The wedge shall be symmetrical and seat equally well with flow in either direction.

15. The resilient-seat shall be made of an elastomer compound that complies with Section 4.2.2.9 of AWWA Standard C-509, (most current revision), or Section 4.2.2.7 of AWWA Standard C-515, (most current revision).

16. All fasteners, excluding joint accessories, shall be made of Grade 304 stainless steel.

17. To prevent galling nuts shall be coated, inside and out, with an anti-seizing material such as provided by Henkel Technologies, Rocky Hill, Connecticut - product name: Loctite Nickel Anti-Seize Lubricant; Chesterton Technical Products, Stoneham, Massachusetts – product name: Chesterton 772 Premium Nickel Anti-Seize Compound; Permatex Inc. Hartford, Connecticut – product name: Permatex Nickel Anti-Seize Lubricant or equal product of another manufacturer.

18. Valve stems and stem nuts shall be made of a copper alloy or stainless steel that have a minimum yield strength of 40,000-PSI.

19. Valves shall be bid without accessories (glands, gland gaskets and bolts).

20. Accessories shall be as specified in Section 3.12 of these Material Specifications.

21. The manufacturer/vendor/shipper must use care in preparing valves for shipment and in handling during shipment and delivery, to insure that the above products are delivered without damage. Particular attention must be directed at protecting the protective coatings from damage. Damaged valves will not be accepted.

22. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above products and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

23. References

The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

(a) Name of Municipality/Utility

(b) Total amount of product bid on and amount delivered.

(c) Date the bid was accepted and date the product was delivered.

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product.

3.2.2 Class 250B - Resilient Seated 4" - 16" Gate Valves and Resilient Seated 4" – 16" Tapping Valves

1. Class 250B - Resilient – Seated Gate Valves and Tapping Valves provided to the Commission or installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Class 250B - Resilient Seated Gate Valves and Tapping Valves shall conform to AWWA C-515, (most current revision) for Reduced – Wall, Resilient – Seated Gates Valves for Water Service.

3. Class 250B - Resilient Seated Gate Valves and Tapping Valves bodies shall be of high strength ductile iron ASTM A-536 GR 65-45-12.

4. Class 250B - Resilient Seated Gate Valves and Tapping Valves maximum working pressure shall be 250-PSI static pressure. Valves provided under Class 250B shall be shell tested at 500-PSI minimum with the gate in the open position. Valves provided under Class 250B shall be seat tested at 250-PSI minimum with the gate in the closed position on each side of the seat.

5. Class 250B - Resilient Seated Gate Valves and Tapping Valves shall be as provided by American Flow Control – Series 2500, Kennedy – Model 7571, M & H Series 7000, Mueller – Model A2360 or A2361, US Pipe – Model Metropolitan, or the equal product of another manufacturer.

6. The valve body and bonnet shall be coated on all exterior and interior surfaces with fusion bonded epoxy conforming to the requirements of AWWA C-550 (most current revision) for Protective Epoxy Interior Coatings for Valves and Hydrants.

7. The valve body markings shall include the manufacturers name or mark, pressure rating, material (D.I.), and year of manufacture and be cast into the body.

8. Valves ordered under this specification will be within the following size schedules 4-inch, 6-inch, 8-inch, 10-inch, 12-inch, and 16-inch.

9. Valves to be provided with a minimum of two (2) O-ring stem seals.

10. Valves shall be of the non-rising stem (NRS) design.

11. Valves shall be wrench-nut operated with a 2-inch square-operating nut made of ductile iron and **right hand** to open.

12. Valves ordered under this Specification shall be provided with valve ends selected from the following:

    (a) Mechanical joint both ends

    - Mechanical joint bell dimensions shall conform to ANSI A21.11/AWWA C-111.

    (b) Flanged both ends

    - The end flanges of flanged valves shall conform to dimensions and drilling of ANSI B16.1, Class 125 or ANSI A21.10/AWWA C-110.

    (c) Mechanical joint X flanged

    - Mechanical joint bell dimensions shall conform to ANSI A21.11/AWWA C-111.
    - The end flanges of flanged valves shall conform to dimensions and drilling of ANSI B16.1, Class 125 or ANSI A21.10/AWWA C-110.

    (d) Mechanical joint X tapping valve flange

    - Mechanical joint bell dimensions shall conform to ANSI A21.11/AWWA C-111.
    - Tapping valve flanges that form the joint with the tapping sleeve shall conform to the dimensions MSS SP-60 in sizes 4" through 12". The connecting MJ bell of the tapping valve mating with the tapping machine must be parallel and concentric with the opposite flange and concentric with the waterway to provide proper alignment for the tapping operation. This flange shall conform to the dimensions of MSS SP-113. Tapping valves provided must be manufactured to be used with the Mueller CL-12 Drilling Machine with the following shell cutter diameters 3 ½", 5 ½", 7 ½", 9 ½", and 11 ½".

13. The resilient-seat wedge shall be constructed of cast iron or ductile iron and fully encapsulated in a rubber compound for water service, constructed of STYRENE BUTADIENE RUBBER (SBR) rubber, and must meet or exceed ASTM D-2000 3 BA 715. No bare metal shall be left exposed. Wedge rubber shall be molded in place and banded tightly to the cast iron or ductile iron core and shall not be mechanically attached with screws, rivets, or similar fasteners. The wedge shall be symmetrical and seat equally well with flow in either direction.

14. The resilient-seat shall be made of an elastomer compound that complies with Section 4.2.2.9 of AWWA Standard C-509, (most current revision), or Section 4.2.2.7 of AWWA Standard C-515, (most current revision).

15. All fasteners, excluding joint accessories, shall be made of Grade 304 stainless steel.

16. To prevent galling nuts shall be coated, inside and out, with an anti-seizing material such as provided by Henkel Technologies, Rocky Hill, Connecticut - product name: Loctite Nickel Anti-Seize Lubricant; Chesterton Technical Products, Stoneham, Massachusetts – product name: Chesterton 772 Premium Nickel Anti-Seize Compound; Permatex Inc. Hartford, Connecticut – product name: Permatex Nickel Anti-Seize Lubricant or equal product of another manufacturer.

17. Valve stems and stem nuts shall be made of a copper alloy or stainless steel that have a minimum yield strength of 40,000-PSI.

18. Valves shall be bid without accessories (glands, gland gaskets and bolts).

19. Accessories shall be as specified in Section 3.12 of these Material Specifications.

20. The manufacturer/vendor/shipper must use care in preparing valves for shipment and in handling during shipment and delivery, to insure that the above products are delivered without damage. Particular attention must be directed at protecting the protective coatings from damage. Damaged valves will not be accepted.

21. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above products and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

22. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered.

(c) Date the bid was accepted and date the product was delivered.

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product.

Section 3.3 OUTSIDE SCREW and YOKE VALVES

3.3.1 Class 150B - Outside-Screw-And-Yoke (OS & Y) Rising Stem for Water Supply Service

1. Class 150B - Outside-Screw-And-Yoke (OS&Y), Rising Stem, Resilient-Seated Gate Valves provided to the Springfield Water and Sewer Commission (SWSC) or its Contractors or the Springfield Department of Public Works shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. In addition to the Material Specifications for Class 150B - Resilient Seated 4" - 16" Gate Valves and Resilient Seated 4" – 16" Tapping Valves, Outside-Screw-And-Yoke (OS&Y), Rising Stem, Resilient-Seated Gate Valves shall meet the following requirements:

3. Valves ordered under this specification will be within the following size schedules: 3-inch, 4-inch, 6-inch, 8-inch, 10-inch and 12-inch.

4. OS&Y gate valves shall be **LEFT HAND TO OPEN**.

5. Valves shall be of the outside screw-and-yoke (OS&Y) rising stem design. Design shall be such that the stuffing box can be packed when the valve is in the fully open position and under pressure.

6. OS&Y valves shall be operated by hand wheels sized in accordance with Table 5, C-509. Hand wheel shall be of the spoke-type only. An arrow showing the direction to turn the head wheel to open the valve, with the word "OPEN" in ½" or larger letters in a break in the arrow shaft shall be cast on the rim of the hand wheel so as to be readily readable.

7. Valves ordered under this Specification shall be provided with flange valve ends on both ends. The end flanges of flanged valves shall conform to dimension and drilling in accordance with ANSI B16.1, Class 125 or ANSI A21.10/AWWA C-110.

8. All fasteners, excluding joint accessories, shall be made of Grade 304 stainless steel.

9. To prevent galling nuts shall be coated, inside and out, with an anti-seizing material such as provided by Henkel Technologies, Rocky Hill, Connecticut -

product name: Loctite Nickel Anti-Seize Lubricant; Chesterton Technical Products, Stoneham, Massachusetts – product name: Chesterton 772 Premium Nickel Anti-Seize Compound; Permatex Inc. Hartford, Connecticut – product name: Permatex Nickel Anti-Seize Lubricant or equal product of another manufacturer.

10. Valves shall be bid without accessories (companion flanges, glands, gland gaskets and bolts).

11. Accessories shall be as specified in Section 3.12 of these Material Specifications.

12. Valve stems and stem nuts shall be made of a copper alloy or stainless steel and have a minimum yield strength of 40,000 PSI.

13. The manufacturer/vendor/shipper must use care in preparing valves for shipment and in handling during shipment and delivery, to insure that the valves are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged valves will not be accepted.

14. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the valve and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

15. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.3.2 Class 250B - Outside-Screw-And-Yoke (OS & Y) Rising Stem for Water Supply Service

1. Class 250B - Outside-Screw-And-Yoke (OS&Y), Rising Stem, Resilient-Seated Gate Valves provided to the Springfield Water and Sewer Commission (SWSC) or its Contractors or the Springfield Department of Public Works shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. In addition to the Material Specifications for Class 250B - Resilient Seated 4" - 16" Gate Valves and Resilient Seated 4" – 16" Tapping Valves, Outside-Screw-And-Yoke (OS&Y), Rising Stem, Resilient-Seated Gate Valves shall meet the following requirements:

3. Valves ordered under this specification will be within the following size schedules: 3-inch, 4-inch, 6-inch, 8-inch, 10-inch and 12-inch.

4. OS&Y gate valves shall be **LEFT HAND TO OPEN**.

5. Valves shall be of the outside screw-and-yoke (OS&Y) rising stem design. Design shall be such that the stuffing box can be packed when the valve is in the fully open position and under pressure.

6. OS&Y valves shall be operated by hand wheels sized in accordance with Table 5, C-509. Hand wheel shall be of the spoke-type only. An arrow showing the direction to turn the head wheel to open the valve, with the word "OPEN" in ½" or larger letters in a break in the arrow shaft shall be cast on the rim of the hand wheel so as to be readily readable.

7. Valves ordered under this Specification shall be provided with flange valve ends on both ends. The end flanges of flanged valves shall conform to dimension and drilling in accordance with ANSI B16.1, Class 125 or ANSI A21.10/AWWA C-110.

8. All fasteners, excluding joint accessories, shall be made of Grade 304 stainless steel.

9. To prevent galling nuts shall be coated, inside and out, with an anti-seizing material such as provided by Henkel Technologies, Rocky Hill, Connecticut - product name: Loctite Nickel Anti-Seize Lubricant; Chesterton Technical Products, Stoneham, Massachusetts – product name: Chesterton 772 Premium Nickel Anti-Seize Compound; Permatex Inc. Hartford, Connecticut – product

name: Permatex Nickel Anti-Seize Lubricant or equal product of another manufacturer.

10. Valves shall be bid without accessories (companion flanges, glands, gland gaskets and bolts).

11. Accessories shall be as specified in Section 3.12 of these Material Specifications.

12. Valve stems and stem nuts shall be made of a copper alloy or stainless steel and have a minimum yield strength of 40,000 PSI.

13. The manufacturer/vendor/shipper must use care in preparing valves for shipment and in handling during shipment and delivery, to insure that the valves are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged valves will not be accepted.

14. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the valve and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

15. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

Section 3.4 BUTTERFLY VALVES

3.4.1 Class 150B - Butterfly Valves

1. Class 150B - Butterfly Valves (BV) provided to the Springfield Water and Sewer Commission (SWSC) or its Contractors or the Springfield Department of Public Works shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. All BV shall conform to AWWA Standard for Rubber-seated Butterfly Valves C-504, latest revision.

3. All BV shall be rubber-seated, tight closing against stainless steel. BV shall be designed for direct bury service.

4. All BV bodies shall be of high strength cast iron ASTM A-126 Class B or of high strength ductile iron ASTM A-536 GR 65-45-12.

5. All BV body ends shall be mechanical joint conforming to ANSI A21.11/AWWA C-111, unless otherwise specified.

6. All BV shall be provided with manual actuators. All manual actuators shall be provided with a 2-inch square operating nut made of ductile iron. Manual valve actuators shall be capable of holding the disc in any position without creeping or fluttering. Manual actuators shall be serviceable without removal from the valve. A shaft seal shall be incorporated between the manual actuator and the valve.

7. All BV actuators shall be equipped with adjustable mechanical stop limiting devices to prevent over travel of the valve disc in the open and closed positions. Flow stops in the valve flow stream will not be allowed.

8. All BV manual actuators shall be of the traveling nut design rated for 450 foot-pounds of input torque against the open and closed stops. Such actuators shall be totally enclosed for buried service in a gearbox. Gears must operate in a lubricant and be totally sealed to prevent entry of dirt or liquids into the actuator.

9. Unless otherwise specified, all BV shall be right hand to open (clockwise). The operating nut shall be painted red.

10. All BV shall be bid without accessories (glands, gland gaskets and bolts).

11. Accessories shall be as specified in Section 3.12 of these Material Specifications.

12. All BV shall have an epoxy coating on the interior, exterior, and the vane. The coating shall meet all requirements of AWWA C-550 of latest revision. All bodies and vanes shall be factory coated prior to assembly and testing. All ferrous surfaces of the valve body, waterway, and vane shall receive an epoxy coating with a minimum dry film thickness of 8 mils. All exterior surfaces shall be coated with an epoxy with a minimum of 6 mils dry film thickness. Fusion Bonded is acceptable.

13. All BV seats shall be of synthetic Buna-N compound, unless otherwise specified.

14. All BV seats shall be recessed into the body and held in place with epoxy injection or attached to the disk with type 304, 316, or ASTM A564 stainless steel hardware to restrain the seats from any movement at the maximum rated flow in either direction. When the seat is attached to the disc the bolts shall pass through the seat, retainer, and disc.

15. All BV shafts shall be turned, ground, and polished and shall be constructed of Type 304, 316, and/or ASTM A564 stainless steel and shall be sized per AWWA Standard for Rubber-seated Butterfly Valves C-504, latest revision.

16. Valve bearings shall be sleeve type, corrosion resistant, and self-lubricating. Bearing load shall not exceed 20-percent of the compressible strength of the bearing or shaft materials, and shall be secured in the trunion by a machined edge. Ferrous bearings in the flow stream shall not be allowed.

17. Shaft seals shall be of the chevron or O-ring type.

18. All fasteners, excluding joint accessories, shall be made of Grade 304 stainless steel.

19. To prevent galling nuts shall be coated, inside and out, with an anti-seizing material such as provided by Henkel Technologies, Rocky Hill, Connecticut - product name: Loctite Nickel Anti-Seize Lubricant; Chesterton Technical Products, Stoneham, Massachusetts – product name: Chesterton 772 Premium Nickel Anti-Seize Compound; Permatex Inc. Hartford, Connecticut – product name: Permatex Nickel Anti-Seize Lubricant or equal product of another manufacturer.

20. After each BV is completely assembled, including the actuator, it shall be operated several times in the factory to ensure it is in working condition. Each

Class 150 valve shall be shop tested and certified for leakage with the disc in the horizontal plane, in accordance with AWWA C504.

21. Butterfly Valves Class 150B shall be as currently manufactured by Henry Pratt Company, Mueller Valve Company, DeZurik, M & H, Val-Matic, or equal provided the BV are provided as per these specifications.

22. The manufacturer/vendor/shipper must use care in preparing valves for shipment and in handling during shipment and delivery, to insure that the above products are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged products will not be accepted.

23. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above product and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

24. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.4.2 Class 250B - Butterfly Valves

1. Class 250B - Butterfly Valves (BV) provided to the Springfield Water and Sewer Commission (SWSC) or its Contractors or the Springfield Department of Public Works shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. All BV shall conform to AWWA Standard for Rubber-seated Butterfly Valves C-504, latest revision.

3. All BV shall be rubber-seated, tight closing against stainless steel. BV shall be designed for direct bury service.

4. All BV bodies shall be of high strength ductile iron ASTM A-536 GR 65-45-12.

5. All BV body ends shall be mechanical joint conforming to ANSI A21.11/AWWA C-111, unless otherwise specified.

6. All BV shall be provided with manual actuators. All manual actuators shall be provided with a 2-inch square operating nut made of ductile iron. Manual valve actuators shall be capable of holding the disc in any position without creeping or fluttering. Manual actuators shall be serviceable without removal from the valve. A shaft seal shall be incorporated between the manual actuator and the valve.

7. All BV actuators shall be equipped with adjustable mechanical stop limiting devices to prevent over travel of the valve disc in the open and closed positions. Flow stops in the valve flow stream will not be allowed.

8. All BV manual actuators shall be of the traveling nut design rated for 450 foot-pounds of input torque against the open and closed stops. Such actuators shall be totally enclosed for buried service in a gearbox. Gears must operate in a lubricant and be totally sealed to prevent entry of dirt or liquids into the actuator.

9. Unless otherwise specified, all BV shall be right hand to open (clockwise). The operating nut shall be painted red.

10. All BV shall be bid without accessories (glands, gland gaskets and bolts).

11. Accessories shall be as specified in Section 3.12 of these Material Specifications.

12. All BV shall have an epoxy coating on the interior, exterior, and the vane. The coating shall meet all requirements of AWWA C-550 of latest revision. All

bodies and vanes shall be factory coated prior to assembly and testing. All ferrous surfaces of the valve body, waterway, and vane shall receive an epoxy coating with a minimum dry film thickness of 8-mils. All exterior surfaces shall be coated with an epoxy with a minimum of 6-mils dry film thickness. Fusion Bonded is acceptable.

13. All BV seats shall be of synthetic Buna-N compound, unless otherwise specified.

14. All BV seats shall be recessed into the body and held in place with epoxy injection or attached to the disk with type 304, 316, or ASTM A564 stainless steel hardware to restrain the seats from any movement at the maximum rated flow in either direction. When the seat is attached to the disc the bolts shall pass through the seat, retainer, and disc.

15. All BV shafts shall be turned, ground, and polished and shall be constructed of Type 304, 316, and/or ASTM A564 stainless steel and shall be sized per AWWA Standard for Rubber-seated Butterfly Valves C-504, latest revision.

16. All BV disc shall be secured to the shafts with pins. These pins shall be of the same material as the shaft and pass completely through the disc and shaft. Pins shall be tightly secured with lock-washers and nuts to ensure line vibrations cannot loosen the connection.

17. Shaft seals shall be of the chevron or O-ring type.

18. Valve bearings shall be sleeve type, corrosion resistant, and self-lubricating. Bearing load shall not exceed 20-percent of the compressible strength of the bearing or shaft materials, and shall be secured in the trunion by a machined edge. Ferrous bearings in the flow stream shall not be allowed.

19. All fasteners, excluding joint accessories, shall be made of Grade 304 stainless steel.

20. To prevent galling nuts shall be coated, inside and out, with an anti-seizing material such as provided by Henkel Technologies, Rocky Hill, Connecticut - product name: Loctite Nickel Anti-Seize Lubricant; Chesterton Technical Products, Stoneham, Massachusetts – product name: Chesterton 772 Premium Nickel Anti-Seize Compound; Permatex Inc. Hartford, Connecticut – product name: Permatex Nickel Anti-Seize Lubricant or equal product of another manufacturer.

21. After each BV is completely assembled, including the actuator, it shall be operated several times in the factory to ensure it is in working condition. Each Class 250B valve shall be shop tested and certified for leakage with the disc in the horizontal plane, in accordance with AWWA C504.

22. Butterfly Valves Class 250B BV shall be as currently manufactured by Henry Pratt Company, Mueller Valve Company, DeZurik, M & H, Val-Matic, or equal provided the BV are provided as per these specifications.

23. The manufacturer/vendor/shipper must use care in preparing valves for shipment and in handling during shipment and delivery, to insure that the above products are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged products will not be accepted.

24. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above product and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

25. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

Section 3.5 AIR VALVE ASSEMBLIES

3.5.1 General

1. Air Valve Assemblies provided to the Commission or installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Brass components of the Air Valve Assemblies shall be made from copper alloy No. 83600, in accordance with ASTM B30, ASTM B62, or ASTM B584 and AWWA C-800 latest version containing 85% copper, 5% tin, 5% lead, and 5% (brass 85-5-5-5).

3. Copper tube components of the Air Valve Assemblies shall be type "L", manufactured in America.

4. Delivery shall be specified in terms of number of days from receipt of order.

5. The manufacturer/vendor/shipper must use care in preparing air valve assemblies for shipment and in handling during shipment and delivery, to insure that the couplings are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged air valve assemblies will not be accepted.

6. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the air valve assemblies and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

7. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.5.2 Standard Air Valve Assembly

1. One–inch or Two-inch corporations: shall be brass 85-5-5-5, tapered inlet ball corporation with One-inch or Two-inch CC thread on the inlet side and One-inch or Two-inch female IP thread on the outlet side. One is required for each assembly.

2. One-inch or Two-inch 90-degree elbows: shall be brass 85-5-5-5, female on both ends with One-inch or Two-inch IP thread. Three are required for each assembly.

3. One-inch or Two-inch Ball Valve Curb Stop and Waste: shall be brass 85-5-5-5, ball valve type with female, One-inch or Two-inch IP thread on both ends. The stop & waste hole shall be on the downstream side (away from water main). One is required for each assembly.

4. One-inch and/or Two-inch Nip: shall be brass 85-5-5-5, male on both ends with One-inch or Two-inch IP thread. Minimum length shall be six-inches, maximum length shall be twelve-inches, unless otherwise approved by the Commission. Three are required for each assembly.

5. One-inch or Two-inch Riser pipe: shall be brass 85-5-5-5, male on both ends with One-inch or Two-inch IP thread. The length shall be from the last 90-degree elbow to four-to-six-inches below finished roadway. One is required for each assembly.

6. One-inch or Two-inch cap: shall be brass 85-5-5-5, One-inch or Two-inch female IP thread. One is required for each assembly.

3.5.3 One-Piece Air Valve Assembly

1. The One-Piece Air Valve shall be of a type equal to Wedge Manufacturing, L.L.C., catalog numbers 10060 for 1-inch and 20060 for 2-inch, or an approved equal.

2. One-inch or two-inch corporations: shall be brass 85-5-5-5, tapered inlet ball corporation with One-inch or Two-inch CC thread on the inlet side and One-inch or Two-inch male IP thread on the outlet side. One is required for each assembly.

3. One-Piece Air Valves shall be provided with a lower operating lever made of cast or stamped brass that is secured to the brass ball valve with a marine type brass cotter pin.

4. One-Piece Air Valves shall be provided with a brass ball valve with female iron pipe threads at both ends. The ball valves shall be drilled on the riser side for drainage.

5. One-Piece Air Valves shall be provided with an adapter at both ends made of copper. The adapters shall have male threads on one end and plain on the other for crimp fitting.

6. One-Piece Air Valves shall be provided with a copper riser pipe. The Riser pipe shall be crimp fit to the copper adapters at both ends.

7. One-Piece Air Valves shall be provided with a tee handle made of cast brass. The tee handle shall be secured to the operating rod with stainless steel roll pin.

8. One-Piece Air Valves shall be provided with an operating rod made of 3/8-inch diameter brass CDA 360, ASTM B-16.

9. One-Piece Air Valves shall be provided with a split ring connector that shall secure the operating rod to the riser. The fasteners shall be stainless steel.

10. One-Piece Air Valves shall be provided with a lower mechanism that connects the operating rod to the lower operating lever. The lower mechanism shall be secured to the operating rod with a stainless steel roll pin. The lower mechanism shall be secured to the lower operating lever with a 3/8-inch X ½-inch stainless steel bolt with a Nylock safety nut.

Section 3.6 VALVE BOXES

3.6.1 General

1. Valve Boxes provided to the Commission or installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Valve boxes shall be telescopic in design, Cast Iron, heavy pattern, adjustable type top section, bottom section, and cover.

3. The total weight of the valve box assembly (top, cover and bottom sections) shall be 105 pounds minimum.

4. Valve boxes shall be of lengths adapted to five-feet of pipe cover or more and have a minimum of six-inches of overlap in the most extended position

5. All valve box tops, bottoms, and covers shall be coated with an approved petroleum asphaltic seal coat in accordance with ANSI A21/AWWA C-110, Section 4.3 of latest the revision.

6. The manufacturer/vendor/shipper must use care in preparing valves boxes for shipment and in handling during shipment and delivery, to insure that the valves boxes are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged valves boxes will not be accepted.

7. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the valve and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

8. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

(c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.6.2 Two Piece Valve Boxes and Covers

1. In addition to the General Section above the following shall be provided:
2. The top section shall have:
   (a) A top flange to increase the stability of the box to remain at the present height
   (b) A smooth cast seat to accept the lid and insure a non-rocking installation.
3. The bottom section shall have:
   (a) A belled base and have an inside diameter of 5-¼"
   (b) The belled base shall enclose the valve, the valve stuffing box / seal plate, and operating nut.
   (c) A bottom flange of sufficient bearing area to prevent settling.
4. The valve box cover shall have:
   (a) A 5-¼" diameter by 2" deep drop lid.
   (b) The valve box cover shall weigh no less than 13 pounds
   (c) The valve box cover shall have the word "Water" cast in the top.
   (d) The valve box cover shall be designed to remain seated when subjected to mobile traffic conditions.
   (e) The valve box cover shall be close fitting and substantially dirt tight and flush with the top of the box rim.

3.6.3 Three Piece Valve Boxes and Covers

1. In addition to the General Section above the following shall be provided:
2. The top section shall have:

(a) A top flange to increase the stability of the box to remain at the present height.

(b) A smooth cast seat to accept the lid and insure a non-rocking installation.

3. The bottom section shall have:

(a) A belled base and have an inside diameter of 5-¼".

(b) A bottom flange of sufficient bearing that will fit onto a number six base.

4. The number six base section shall have:

(a) At the top opening a minimum inside diameter of 5-¼".

(b) The belled base shall enclose the air valve assembly and allow the lever to operate freely.

(c) A bottom flange of sufficient bearing area to prevent settling.

5. The valve box cover shall have:

(a) A 5-¼" diameter by 2" deep drop lid.

(b) The valve box cover shall weigh no less than 13 pounds

(c) The valve box cover shall have the word "Water" cast in the top.

(d) The valve box cover shall be designed to remain seated when subjected to mobile traffic conditions.

(e) The valve box cover shall be close fitting and substantially dirt tight and flush with the top of the box rim.

3.6.4 Valve Box Extension

1. In addition to the General Section above the following shall be provided:

2. The valve box extension shall be;

(a) 12 inches to 15 inches in length and,

(b) Cast Iron, heavy pattern, and shall fit on the top of the bottom section of the gate box.

Section 3.7 HYDRANTS

3.7.1 Dry Barrel Fire Hydrants

1. Hydrants provided to the Springfield Water and Sewer Commission (SWSC) or its Contractors or the Springfield Department of Public Works shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Hydrants as a minimum shall conform to the most current American Water Works Association Standard C-502 and all addenda thereto.

3. Working pressure 150 PSI. All iron parts shall be made of ductile iron, except for the traffic safety flange and coupling.

4. Hydrant valve opening 5-1/4" minimum as sized by seat ring internal opening.

5. Hydrant nozzle details shall be “three (3) way” and as follows:

   (a) Hydrant shall be equipped with two each 2-1/2" hose nozzles 180 degrees apart; NFPA No. 194 National (American) Standard Fire Hose Coupling Screw Threads.

   (b) Hydrant shall be equipped with one each 4-1/2" pumper nozzle on the same plane and in between the 2-1/2" hose nozzles; 4-1/2" National Standard Pumper Hose Thread.

   (c) Nozzle caps shall be provided with 1-1/8" (point to flat) pentagon and shall be not less than 1" high.

   (d) All nozzle caps shall be provided with chains and washers.

6. Operating Nut: Open Right. (clockwise)

   (a) 1-1/8" (point to flat) pentagon and shall be not less than 1" high.

   (b) Operating nut shall function as both an operating nut and weather shield.

   (c) Operating nut shall be made of ductile iron.

   (d) The direction to open (right/clockwise) shall be cast with an indicating arrow into the operating nut and weather shield or into the bonnet.

7. Hydrant shall open RIGHT (clockwise).

8. Inlet connection shall be a 6" mechanical joint. The hydrant inlet inside surface and valve bottom plate shall be fully epoxy coated by a fusion or thermal bonding process per AWWA C-550. Bronze valve bottom plates do not have to be epoxy coated.

9. Hydrants shall be bid without accessories (glands, gland gaskets and bolts).

10. Accessories shall be as specified in Section 3.12 of these Material Specifications.

11. Hydrant shall be for 6'-0" bury, unless otherwise specified by the Commission.

12. Hydrant shall be of the full compression design, opening against and closing with the water pressure.

13. All internal parts shall be designed for rapid and simple removal employing a compact lightweight wrench that will withdraw all working parts from the base of the hydrant as a unit.

14. Main Valve Assembly.

    (a) The main valve assembly shall have a bronze sub-seat and a bronze seat ring.

    (b) The threaded sub-seat of the hydrant shall be constructed of bronze, and be an integral part of the boot or elbow.

    (c) The seat ring shall also be of bronze and shall be a working component of the main valve assembly.

    (d) Seal between seating and sub-seat shall consist of “o” rings located in machined grooves, above and below the drainage channel.

    (e) There shall be a minimum of two drain ports one hundred and eighty degrees apart.

    (f) All "O" rings shall seal against bronze.

15. Traffic Safety Flange.

    (a) The hydrant ground line construction design (traffic safety flange) shall be of the split flange or split coupling type, designed to permit rotary movement of

the upper barrel without shutting down service or removing the flange bolts and nuts.

(b) Break-away bolts, break-away barrel, lugs or individual metal keeper devices are not acceptable.

16. Upper Operating Assembly.

(a) Hydrant operating assembly shall be housed in a compact seal plate with integral lubrication chamber.

(b) "O"-rings (two) shall be used to seal the chamber from water in the hydrant barrel.

(c) An additional "O"-ring shall be used in the hold down nut to prevent dirt, condensation or atmospheric contamination entering the lubrication chamber from outside.

(d) The design and construction of the hydrant operating mechanism located at the top of the hydrant shall be such that no part of the operating threads will be in contact with water in the standpipe when the hydrant is in service, and "O"-ring seals (two) shall be used to prevent water under pressure from entering the lubricating chamber.

(e) The moving surface against which these two "O"-rings bear upon to create the seal must be of bronze.

(f) A travel stop nut or similar device shall be used to limit main valve travel and to prevent putting main stem into over compression.

(g) The upper operating assembly shall be compatible with the "Custodian" vandal proof device as manufactured by Hydra-Shield Manufacturing, Inc. The "Custodian" device must be able to be installed without further machining or modification to the hydrant.

17. Details and materials for the frangible connections and the dry-top construction shall be subject to the approval of the Commission.

18. The exterior design of the bonnet and upper barrel must meet and be subject to the approval of the Commission’s aesthetic judgment.

19. Inspection

(a) All hydrants furnished shall be subject to inspection by the Commission at the place of manufacture and shall be subject to inspection after delivery to the Commission.

(b) Cost of re-inspection of materials or fabricated hydrants caused by the non-compliance of the manufacturer with the provisions of the specifications, shall be paid for by the manufacturer, and shall be deductible from the price paid for the hydrants.

20. Hydrant Paint and Colors shall be as specified in Section 3.7.2 of these Material Specifications.

21. The manufacturer shall furnish a certified statement that the required tests on the various materials and on the completed hydrant have been made, and the results of all tests conform to the requirements of the American Water Works Association Standard Specification C-502. The records of the tests shall be furnished for the individual parts with respect to physical and chemical properties.

22. One complete catalogue or manual for parts, repair and maintenance shall be furnished by the manufacturer with the bid. Six sets furnished with first delivery.

23. The manufacturer shall, provide at no additional cost four (4) complete sets of assembly/disassembly tools with the first delivery of hydrants.

24. Hydrants shall be as currently manufactured by Clow – Model Medallion and U.S. Pipe – Model M-94, or equal provided the Hydrants are manufactured as per these specifications.

25. Delivery shall be made by truck in minimum truckload quantity to locations designated in the Commission's service area in and near Springfield, Massachusetts. The low bidder shall notify the Commission of the quantity comprising a minimum truckload. The Commission reserves the right to mix depth of bury to reach a full truckload.

26. The manufacturer/vendor/shipper must use care in preparing hydrants for shipment and in handling during shipment and delivery, to insure that the hydrants are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged hydrants will not be accepted.

27. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the hydrant and all

materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

28. References

The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

(a) Name of Municipality/Utility

(b) Total amount of product bid on and amount delivered

(c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.7.2 Hydrant Paint and Colors

1. Public Hydrants

   (a) New Hydrant: the barrels of the hydrants above the ground line shall be painted **Federal Yellow**, Sher-Acryl, High Performance Acrylic, B66-300 Series (water base) as manufactured by Sherwin Williams Company or equal. The prime coat shall be equal to DuPont's Preparakote primer surfacer #65-3010.

   (b) Already installed hydrants the barrels of the hydrants above the ground line shall be painted **Federal Yellow**, Kem-Acryl, High Performance Acrylic, HS-100 Series (oil base) as manufactured by Sherwin Williams Company or equal.

   (c) New Hydrant: the bonnets, hose caps, and chains shall be painted **Bond Plex Silver**, Sher-Acryl, High Performance Acrylic, B66-300 Series (water base) as manufactured by Sherwin Williams Company or equal. The prime coat shall be equal to DuPont's Preparakote primer surfacer #65-3010.

   (d) Already installed hydrants the bonnets, hose caps, and chains shall be painted **Bond Plex Silver**, Kem-Acryl, High Performance Acrylic, HS-100 Series (oil base) as manufactured by Sherwin Williams Company or equal.

2. Private Hydrants

   (a) New Hydrant: the barrels of the hydrants above the ground line shall be painted **Container Red**, Sher-Acryl, High Performance Acrylic, B66-300 Series (water base) as manufactured by Sherwin Williams Company or equal. The prime coat shall be equal to DuPont's Preparakote primer surfacer #65-3010.

   (b) Already installed hydrants the barrels of the hydrants above the ground line shall be painted **Container Red**, Kem-Acryl, High Performance Acrylic, HS-100 Series (oil base) as manufactured by Sherwin Williams Company or equal.

   (c) New Hydrant: the bonnets, hose caps, and chains shall be painted **Bond Plex Silver**, Sher-Acryl, High Performance Acrylic, B66-300 Series (water base) as manufactured by Sherwin Williams Company or equal. The prime coat shall be equal to DuPont's Preparakote primer surfacer #65-3010.

(d) Already installed hydrants the bonnets, hose caps, and chains shall be painted **Bond Plex Silver**, Kem-Acryl, High Performance Acrylic, HS-100 Series (oil base) as manufactured by Sherwin Williams Company or equal.

3.7.3 Vandal Proof Device for Operating Fire Hydrants

1. Vandal Proof Device for Operating Fire Hydrants provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Device Description

   (a) A vandal proof device (Trade Name "Custodian") to prevent unauthorized use of fire hydrants. The device shall readily attach to the existing fire hydrant housing or opening mechanism. Materials shall be strong enough to withstand acts of vandalism and weather extremes and still provide smooth fire hydrant operation. The device shall be unique in that only a special magnetic wrench can open or close the fire hydrant.

   (b) The vandal proof device shall be made to be installed on any hydrant in the Springfield Water and Sewer Commission's Service Area..

   (c) The vandal proof device shall be made to order, for specific makes and models of hydrants.

3. Device Construction

   An inner barrel constructed of high tensile manganese bronze shall be designed to fit over the existing fire hydrant operating nuts. An outer housing constructed of stainless steel shall be installed over the inner barrel so as to swivel freely until a special key wrench is used. Attachment of the outer housing shall be a special snap ring groove designed to withstand repeated blows by a sledge hammer without shearing.

4. Device Mating Collar

   A mating collar shall be installed between the outer housing fire hydrant top for a weather seal and to prevent removal of the swivel housing by pry bars or other tools available to vandals. The mating collar shall extend up the sides of the swivel housing and to a height sufficient to provide added protection of the hydrant operating nut and to withstand repeated blows by sledge without failing.

5. Device Operating Wrench

   A special magnetic operating wrench shall be constructed of an aluminum-magnesium alloy with handles extending from both sides for easy operation. The

wrench shall incorporate a unique permanent magnet which will engage an activator located inside the outer housing. The magnet's inductive magnet can engage the activator. Performance must not be affected by local environment temperature ranges or weather conditions. The special key wrench shall be the only means of opening or closing the hydrant. As an added convenience, the opposite side of the wrench shall contain a conventional 1-1/8" pentagon recess that will work on standard hydrant nuts.

6. The manufacturer/vendor/shipper must use care in preparing the vandal proof device for shipment and in handling during shipment and delivery, to insure that the vandal proof devices are delivered without damage. Damaged vandal proof devices will not be accepted.

7. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the vandal proof device and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

8. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.7.4 Diffusers for Fire Hydrants

1. Fire Hydrant Diffusers shall be provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Fire Hydrant Diffusers shall be for use with chemically treated (4 ppm or less chlorine/chloramine) potable water.

3. Fire Hydrant Diffusers shall be provided with 2-1/2-inch NPT Coupling that accepts any 2-1/2" NPT Male Iron Pipe Adapter.

4. Fire Hydrant Diffusers shall be 18-inches in length x 8-inches x 8-inches at the discharge

5. Fire Hydrant Diffusers shall weight 33-pounds.

6. Fire Hydrant Diffusers shall be used with 81% Sodium Sulfite tablets

7. Fire Hydrant Diffusers shall have an eleven (11) Tablet Capacity and use approximately one (1) Tablet per 2,500-gallons.

8. Fire Hydrant Diffusers shall be as currently manufactured by Pollardwater – Model LPD-250, or equal provided the Fire Hydrant Diffusers are manufactured as per these specifications.

9. The manufacturer/vendor/shipper must use care in preparing the above product for shipment and in handling during shipment and delivery, to insure that the products are delivered without damage. Damaged vandal proof devices will not be accepted.

10. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above product and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

11. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

Springfield Water and Sewer Commission

Material Specifications

(a) Name of Municipality/Utility

(b) Total amount of product bid on and amount delivered

(c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

Section 3.8 FITTINGS

3.8.1 Ductile Iron Fittings - Compact (or Short) Body

1. All Ductile Iron fittings provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. The Ductile Iron Fittings shall conform to ANSI 21.53/AWWA C-153 (most current revision).

3. Fittings shall be bid without accessories (glands, gland gaskets and bolts).

4. Accessories shall be as specified in Section 3.12 of these Material Specifications.

5. Body of Fittings

   (a) Push-on (Tyton), type joints are not acceptable.

   (b) Mechanical joint fittings in sizes 4-inch through 24-inch shall be ductile iron compact fittings and rated for 350 PSI working pressure conforming to ANSI 21.53/AWWA C-153.

   (c) All fittings shall be compact body Ductile Iron class 350 mechanical joint, conforming to ANSI 21.53/AWWA C-153.

6. Joints of Fittings

   (a) Fittings are required to be equipped with mechanical joint restraint as specified in Section 3.12 of these Material Specifications, unless otherwise specified by the Springfield Water and Sewer Commission.

   (b) Ductile Iron fittings shall be mechanical joint, flange, plain end, or combination thereof in accordance with ANSI 21.53/AWWA C-153, as specified by the Springfield Water and Sewer Commission.

7. Ductile Iron Fittings shall be cement lined

   (a) All fittings shall be lined with an approved mortar lining and sealed (over the mortar lining) and with an approved asphaltic material seal coat in accordance with ANSI A21.4/AWWA C-104 of the latest revision.

(b) Provisions of ANSI A21.4/AWWA C-104, Section 4.11 relating to characteristics of asphaltic seal coat as to deleterious effect upon the quality, color, taste or odor imparted to potable water shall be strictly observed.

8. Exterior Coating

   (a) The preferred coating for fittings is Fusion-bonded epoxy coating in accordance with ANSI A21.16 / AWWA C116 and shall be applied to the interior and exterior of the fitting.

   (b) All fittings shall be coated with an approved petroleum asphaltic seal coat in accordance with ANSI 21.53/AWWA C-153, Section 4.3 of the latest revision.

9. Markings

   (a) Fittings shall be marked with the weight.

   (b) Fittings shall have distinctly cast upon them the pressure rating, the manufacturer's identification, nominal diameter of the openings, and the number of degree or fraction of the circle on all bends.

10. Testing

    All tests shall be made in accordance with the methods prescribed by the above mentioned AWWA standards

11. Delivery shall be specified in terms of number of days from receipt of order.

12. The manufacturer/vendor/shipper must use care in preparing fittings for shipment and in handling during shipment and delivery, to insure that the fittings are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged fittings will not be accepted.

13. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the fitting and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

14. References

Springfield Water and Sewer Commission

Material Specifications

The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

(a) Name of Municipality/Utility

(b) Total amount of product bid on and amount delivered

(c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.8.2 Ductile Iron Fittings – Standard (or Long) Body

1. All Ductile Iron fittings provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. The Ductile Iron Fittings shall conform to ANSI A21.10/AWWA C-110 (most current revision).

3. Fittings shall be bid without accessories (glands, gland gaskets and bolts).

4. Accessories shall be as specified in Section 3.12 of these Material Specifications.

5. Body of Fittings

   (a) Push-on (Tyton), type joints are not acceptable.

   (b) Mechanical joint fittings in sizes 4-inch through 24-inch shall be ductile iron compact fittings and rated for 350 PSI working pressure conforming to ANSI 21.10/AWWA C-110.

   (c) All fittings shall be standard body Ductile Iron class 350 mechanical joint, conforming to ANSI 21.10/AWWA C-110.

6. Joints of Fittings

   (a) Fittings are required to be equipped with mechanical joint restraint as specified in Section 3.12 of these Material Specifications, unless otherwise specified by the Springfield Water and Sewer Commission.

   (b) Ductile Iron fittings shall be mechanical joint, flange, plain end, or combination thereof in accordance with ANSI A21.10/AWWA C-110, as specified by the Springfield Water and Sewer Commission.

7. Ductile Iron Fittings shall be cement lined

   (a) All fittings shall be lined with an approved mortar lining and sealed (over the mortar lining) and with an approved asphaltic material seal coat in accordance with ANSI A21.4/AWWA C-104 of the latest revision.

(b) Provisions of ANSI A21.4/AWWA C-104, Section 4.11 relating to characteristics of asphaltic seal coat as to deleterious effect upon the quality, color, taste or odor imparted to potable water shall be strictly observed.

8. Exterior Coating

(c) The preferred coating for fittings is Fusion-bonded epoxy coating in accordance with ANSI A21.16 / AWWA C116 and shall be applied to the interior and exterior of the fitting.

(d) All fittings shall be coated with an approved petroleum asphaltic seal coat in accordance with ANSI A21.10/AWWA C-110, Section 4.3 of the latest revision.

9. Markings

(e) Fittings shall be marked with the weight.

(f) Fittings shall have distinctly cast upon them the pressure rating, the manufacturer's identification, nominal diameter of the openings, and the number of degree or fraction of the circle on all bends.

10. Testing

All tests shall be made in accordance with the methods prescribed by the above mentioned AWWA standards

11. Delivery shall be specified in terms of number of days from receipt of order.

12. The manufacturer/vendor/shipper must use care in preparing fittings for shipment and in handling during shipment and delivery, to insure that the fittings are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged fittings will not be accepted.

13. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the fitting and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

14. References

Springfield Water and Sewer Commission

Material Specifications

The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

(a) Name of Municipality/Utility

(b) Total amount of product bid on and amount delivered

(c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.8.3 Hydrant Anchoring Tees

1. Hydrant Anchoring Tees provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. The Hydrant Anchoring Tees shall conform to ANSI A21/AWWA C-110 (most current revision).

3. Hydrant Anchoring Tees shall be bid without accessories (glands, gland gaskets and bolts).

4. Accessories shall be as specified in Section 3.12 of these Material Specifications.

5. Hydrant Anchoring Tees are required to be equipped with mechanical joint restraint as specified in Section 3.12 of these Material Specifications, unless otherwise specified by the Springfield Water and Sewer Commission.

6. Hydrant Anchoring Tees shall have mechanical joints and be provided in sizes 4-inch through 12-inch.

7. Hydrant Anchoring Tees shall be ductile iron, and conform to Section 3.8.2 of these Material Specifications.

8. The branch shall have a plain end with an integral gland and rotating mechanical joint gland and mechanical joint restraints to provide a restrained connection.

9. The manufacturer/vendor/shipper must use care in preparing fittings for shipment and in handling during shipment and delivery, to insure that the fittings are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged fittings will not be accepted.

10. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the fitting and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

11. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

Springfield Water and Sewer Commission

Material Specifications

(a) Name of Municipality/Utility

(b) Total amount of product bid on and amount delivered

(c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

Section 3.9 COUPLINGS

3.9.1 General Requirements

1. Couplings provided to the Springfield Water and Sewer Commission or its Contractors shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Couplings shall be provided with gaskets constructed of Styrene butadiene rubber (SBR) or Buna-N compounds for water service, molded, not split and glued, and must meet or exceed ASTM D-2000 3 BA 715 and ANSI A21.11/AWWA C-111, latest revision..

3. Exterior Coating:

   (a) The preferred coating for couplings is Fusion-bonded epoxy coating in accordance with ANSI A21.16 / AWWA C116 and shall be applied to the interior and exterior of the fitting.

   (b) All couplings shall be coated with an approved petroleum asphaltic seal coat in accordance with ANSI A21.10/AWWA G-219, Section 4.3 of the latest revision.

4. All fasteners shall be made of Grade 304 stainless steel. Bolts and nuts shall be Unified National Coarse (UNC) rolled thread and heavy-duty hex nuts. Bolts, washers, nuts and steel shall meet ANSI A21.11, latest revision. Tee-head bolts/track-head bolts, washers, and nuts of high strength, low alloy, and corrosion resistant Cor-Ten steel conforming to ASTM A588, with Unified National Coarse (UNC) rolled thread may be substituted at the Commission's discretion.

5. To prevent galling nuts shall be coated, inside and out, with an anti-seizing material such as provided by Henkel Technologies, Rocky Hill, Connecticut - product name: Loctite Nickel Anti-Seize Lubricant; Chesterton Technical Products, Stoneham, Massachusetts – product name: Chesterton 772 Premium Nickel Anti-Seize Compound; Permatex Inc. Hartford, Connecticut – product name: Permatex Nickel Anti-Seize Lubricant or equal product of another manufacturer.

6. Delivery shall be specified in terms of number of days from receipt of order.

7. The manufacturer/vendor/shipper must use care in preparing couplings for shipment and in handling during shipment and delivery, to insure that the couplings are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged couplings will not be accepted.

8. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the couplings and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

9. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.9.2 Standard Range Couplings 4" – 24"

1. Standard Range Couplings 4" – 24" shall, as a minimum, shall meet all specifications as in Paragraph 3.9.1 and the following:

2. Standard Range Couplings 4" – 24" shall be Dresser – Style 253, Ford – Style FC1, Romac - Style 501 couplings, or the equal product of another manufacturer.

3. Standard Range Couplings 4" – 24" shall have both center and end rings made of ductile iron and shall meet or exceed ASTM-A-538, latest revision.

4. Standard Range Couplings 4" – 24" shall have the center rings, end rings, and gaskets clearly labeled to show the diameter range it will cover.

3.9.3 Wide Range Couplings 4" – 24"

1. Wide Range Couplings 4" – 24" shall, as a minimum, shall meet all specifications as in Paragraph 3.9.1 and the following:

2. Wide Range Couplings 4" – 24" may be Dresser – Style 253, Ford – Style FC2W, Romac - Style XR501 couplings, or the equal product of another manufacturer.

3. Wide Range Couplings 4" – 24" shall have both center and end rings made of ductile iron and shall meet or exceed ASTM-A-536, latest revision.

4. Wide Range Couplings 4" – 24" shall have the center rings, end rings, and gaskets clearly labeled to show the diameter range it will cover.

3.9.4 Large Diameter Wide Range Couplings 16" and larger

1. Large Diameter Wide Range Couplings 16" and larger shall, as a minimum, shall meet all specifications as in Paragraph 3.9.1 and the following:

2. Large Diameter Wide Range Couplings 16" and larger coupling may be Total Pipe Solutions Large Diameter Hymax Coupling – 2000 Series, or the equal product of another manufacturer.

3. Large Diameter Wide Range Couplings 16" and larger coupling shall have both center and end rings made of ductile iron and shall meet or exceed ASTM-A-538, latest revision.

4. Large Diameter Wide Range Couplings 16" and larger coupling shall have the center rings, end rings, and gaskets clearly labeled to show the diameter range it will cover.

3.9.5 Couplings 30" – 48"

1. Couplings 30" – 48" shall, as a minimum, shall meet all specifications as in Paragraph 3.9.1 and the following:

2. Couplings 30" – 48" shall be Dresser – Style 38 or 138, Ford – Style FC4, Romac style 400, or equal product of another manufacturer.

3. Couplings 30" – 48" shall have the center rings that are either beveled or flared and made of formed carbon steel with minimum yield of 30,000 PSI.

4. Couplings 30" – 48" shall have end rings that are contoured rolled mill section carbon steel. End ring thickness shall be determined by pipe O.D. and pressure rating.

3.9.6 Coupling with End Caps and Threaded Outlets

1. Couplings with end caps and threaded outlets shall, as a minimum, shall meet all specifications as in Paragraph 3.9.1 and the following:

2. Coupling with end cap and/or threaded outlet shall be Romac Style EC501 or equal product of another manufacturer, and meet previous specifications 2.6.1 and 2.6.2 with the following additions:

3. End caps shall be made of ductile iron and meet or exceed ASTM-A-536, latest revision.

4. End caps to be furnished with a 2" threaded NPT female outlet with plug.

5. Vendor shall provide complete diameter range information on the couplings being bid.

Section 3.10 CLAMPS

3.10.1 Repair Clamps and Clamps With Outlets

1. Repair Clamps and Clamps with Outlets provided to the Springfield Water and Sewer Commission (SWSC) or its Contractors or the Springfield Department of Public Works shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Repair clamps shall be Romac SS1 (4" - 12" one section) or Romac SS3 (16" - 24" three section) or equal product of another manufacturer.

3. Shells shall be constructed of Grade 18-8, Type 304 stainless steel with stainless steel lugs and side bars welded to the shell.

4. Lugs and side bars shall be constructed of Grade 18-8, Type 304 stainless steel with stainless steel fasteners welded to the lugs and side bars.

5. All fasteners shall be made of Grade 304 stainless steel.

6. To prevent galling nuts shall be coated, inside and out, with an anti-seizing material such as provided by Henkel Technologies, Rocky Hill, Connecticut - product name: Loctite Nickel Anti-Seize Lubricant; Chesterton Technical Products, Stoneham, Massachusetts – product name: Chesterton 772 Premium Nickel Anti-Seize Compound; Permatex Inc. Hartford, Connecticut – product name: Permatex Nickel Anti-Seize Lubricant or equal product of another manufacturer.

7. All welds used in the construction of the repair clamps shall conform to all American Welding Society (AWS) codes. All welds shall be fully passivated in order to restore the stainless steel to its original corrosive resistant characteristics.

8. Repair clamps shall be provided with gaskets constructed of Styrene butadiene rubber (SBR) compound for water service and must meet or exceed ASTM-D-2000-AA-415.

9. Ranges must be clearly labeled on the package as well as on each clamp.

10. Clamps with outlets shall have Mueller CC thread.

11. Range diameter information must be provided from vendor on the clamps bid.

12. Delivery shall be specified in terms of number of days from receipt of order.

13. The manufacturer/vendor/shipper must use care in preparing repair clamp for shipment and in handling during shipment and delivery, to insure that the repair clamp are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged repair clamps will not be accepted.

14. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the repair clamp and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

15. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.10.2 Bell Joint Clamps

1. Bell Joint Clamps provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Bell joint clamps shall fit rubber ring joint (Tyton), caulked joint (poured), or both for all classes of cast iron and ductile iron pipe and shall be provided as follows:

   (a) Bell joint clamps to fit rubber ring joint (Tyton) shall be as manufactured by Romac - Style 416 (12" – 24"), Dresser – Style 605, Mueller – Style H-771, or equal product of another manufacturer.

   (b) Bell joint clamps to fit caulked joint (poured) shall be as manufactured by Romac - Style 418 (12" – 24"), Dresser – Style 60/160, Mueller – Style H-770 class A & B (4" – 36"), Mueller – Style H-772 class C & D (4" – 36"), or equal product of another manufacturer.

   (c) Bell joint clamps to fit caulked joint (poured) with stab joint bells (long tapered bell with no shoulder for anchoring a bell ring) shall be as manufactured by Romac - Style 418 (12" – 24"), Dresser – Style 60S, Mueller – Style H-770 class A & B (4" – 36), Mueller – Style H-772 class C & D (4" – 36), or equal product of another manufacturer.

   (d) Bell joint clamps to fit both rubber ring joint (Tyton) and caulked joint (poured) shall be as manufactured by Romac - Style 516 (12" – 14"), Smith-Blair 274 (4" – 12") and (16" – 24"), Ford – Style FBC (4" – 12"), or equal product of another manufacturer.

3. Bell joint clamps shall be provided with gaskets constructed of Styrene butadiene rubber (SBR) compound for water service and must meet or exceed ASTM-D-2000-MBA 710.

4. Bell joint clamps shall be provided with track-head bolts, washers, and nuts of high strength, low alloy, and corrosion resistant Cor-Ten steel conforming to ASTM A588, with Unified National Coarse (UNC) rolled thread. Bolts, washers, nuts and steel shall meet ANSI A21.11/AWWA C-111, latest revision.

5. Delivery shall be specified in terms of number of days from receipt of order.

6. The manufacturer/vendor/shipper must use care in preparing the above product for shipment and in handling, to insure that the products are delivered without

damage. Particular attention must be directed at protecting the products from damage. Damaged products will not be accepted.

7. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above product and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

8. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.10.3 Socket Clamps

1. 4-bolt Socket Clamps provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. 4-bolt Socket clamps shall meet all the requirements of National Fire Protection Association (NFPA) 24 (Installation of Private Fire Service Mains and Their Appurtenances).

3. 4-bolt Socket clamps shall be constructed of carbon steel per ASTM A36 with minimum yield strength of 36000-PSI or material of equal or greater minimum yield strength.

4. 4-bolt Socket Clamps shall be two (2) half bands with four (4) bolts (two (2) on each side).

5. Socket Clamps shall have the minimum following dimensions:

   (a) 4-inch to 6-inch pipe: ½-inch by 2-inch

   (b) 8-inch to 10-inch pipe: 5/8-inch by 2-1/2-inch

   (c) 12-inch pipe: 5/8-inch by 3-inch

   (d) 16-inch pipe: ¾-inch by 4-inch

6. Socket Clamp bolthole diameters shall be a 1/16-inch larger than the bolt diameter.

7. Socket Clamp bolts shall have the minimum following dimensions:

   (a) 4-inch to 6-inch pipe: 5/8-inch-11 by 3-1/2-inch

   (b) 8-inch pipe: 5/8-inch-11 by 4-inch

   (c) 10-inch pipe: 3/4-inch-10 by 4-inch

   (d) 12-inch pipe: 7/8-inch-9 by 4-inch

   (e) 16-inch: 1-inch by 4-1/2-inch

8. Socket Clamps shall be provided plain with out a coating.

9. All fasteners provided with the Socket Clamps shall be made of chrome moly steel, grade B7 bolts with Unified National Coarse (UNC) rolled thread, and heavy hex nuts made of medium carbon steel, ASTM A194, grade 2H.

10. Socket Clamps shall be as provided by PHD Manufacturing, Inc. Figure 590, Anvil Company, Figure 595, Cooper B-Line, Figure B3134, Carpenter and Patterson, Figure 158DB, or the equal product of another manufacturer.

11. Delivery shall be specified in terms of number of days from receipt of order.

12. The manufacturer/vendor/shipper must use care in preparing the above product for shipment and in handling, to insure that the products are delivered without damage. Particular attention must be directed at protecting the products from damage. Damaged products will not be accepted.

13. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above product and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

14. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.10.4 Fabricated Steel Harness Assembly

1. Fabricated Steel Harness Assembly provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Fabricated Steel Harness Assembly shall be constructed of carbon steel per ASTM A36 with minimum yield strength of 36000-PSI.

3. Fabricated Steel Harness Assembly shall be provided plain without coating.

4. Fabricated Steel Harness Assembly shall be as manufactured by Ford – Style FR1, Dresser – Style 443, or equal product of another manufacturer.

5. Delivery shall be specified in terms of number of days from receipt of order.

6. The manufacturer/vendor/shipper must use care in preparing above product for shipment and in handling during shipment and delivery, to insure that the products are delivered without damage. Particular attention must be directed at protecting the product from damage. Damaged products will not be accepted.

7. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above product and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

8. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.10.5 Socket Clamp Washer

1. Socket clamp washers provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Socket clamp washers shall meet all the requirements of National Fire Protection Association (NFPA) 24 (Installation of Private Fire Service Mains and Their Appurtenances).

3. Socket Clamp Washer shall be cast iron, ductile iron, or low carbon steel and square or round.

4. Cast iron and ductile iron Socket Clamp Washers shall have the minimum following dimensions:

   (a) 4-inch, 6-inch, 8-inch, and 10-inch pipe:

   - Square: 5/8-inch by 3-inch by 3-inch
   - Round: 5/8-inch by 3-inch diameter

   (b) 12-inch pipe:

   - Square: 3/4-inch by 3-1/2-inch by 3-1/2-inch
   - Round: 3/4-inch by 3-1/2-inch diameter

   (c) 16-inch pipe:

   - Square: 1-inch by 4-inch by 4-inch
   - Round: 1-inch by 4-inch diameter

5. Steel Socket Clamp Washers shall have the minimum following dimensions:

   (a) 4-inch, 6-inch, 8-inch, and 10-inch pipe:

   - Square: 1/2-inch by 3-inch by 3-inch with 7/8-inch hole size
   - Round: 1/2-inch by 3-inch diameter with 7/8-inch hole size

   (b) 12-inch and 16-inch pipe:

   - Square: 1/2-inch by 3-1/2-inch by 3-1/2-inch with 1-1/16-inch hole size

- Round: 1/2-inch by 3-1/2-inch diameter with 1-1/16-inch hole size

6. Socket Clamp Washers shall be provided plain, with out a coating.

7. Socket Clamps Washers shall be as provided by PHD Manufacturing, Inc. Figure 595, Anvil Company, Figure 594, Cooper B-Line, Figure B3134W, Carpenter and Patterson, Figure 258, or the equal product of another manufacturer.

8. Delivery shall be specified in terms of number of days from receipt of order.

9. The manufacturer/vendor/shipper must use care in preparing socket clamp washers for shipment and in handling during shipment and delivery, to insure that the socket clamp washers are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged bell joint clamps will not be accepted.

10. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the socket clamp washers and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

11. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.10.6 Bent Eye Bolts

1. Bent Eye Bolts provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Bent Eye Bolts shall meet all the requirements of National Fire Protection Association (NFPA) 24 (Installation of Private Fire Service Mains and Their Appurtenances).

3. Bent Eye Bolts diameters shall be:

   (a) For ¾-inch threaded rod: ¾-inch diameter shank with a ¾-inch nominal inside diameter bolthole.

   (b) For 1-inch threaded rod: ¾-inch diameter shank with a 1-inch nominal inside diameter bolthole.

4. Bent Eye Bolts shall be provided in the following minimum lengths:

   (a) 4-inch thru 10-inch clamps shall be 4-inch minimum

   (b) 12-inch and larger clamps shall be 5-inch minimum

5. Bent Eye Bolts shall be constructed of high strength low alloy steel, per ASTM A588, grade B, Unified National Coarse (UNC) rolled thread.

6. Bent Eye Bolts shall be provided with heavy hex nuts made of medium carbon steel, ASTM A194, grade 2H, and Unified National Coarse (UNC) thread.

7. Bent Eye Bolts shall have a minimum tensile strength of 50,000 PSI.

8. Bent Eye Bolts shall be as provided by PHD Manufacturing, Inc. - Figure 598B, Star National Products - Figures ¾"SST747 or ¾"SST757, Dresser Piping Specialties, Inc. – Style 442, or the equal product of another manufacturer.

9. Delivery shall be specified in terms of number of days from receipt of order.

10. The manufacturer/vendor/shipper must use care in preparing above product for shipment and in handling during shipment and delivery, to insure that the products are delivered without damage. Particular attention must be directed at protecting the products from damage. Damaged products will not be accepted.

11. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the products and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

12. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.10.7 Threaded Rods

1. Threaded rods provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Threaded rods shall meet all the requirements of National Fire Protection Association (NFPA) 24 (Installation of Private Fire Service Mains and Their Appurtenances).

3. Threaded Rod diameters shall be:

   (a) For 4-inch through 10-inch pipe: ¾-inch diameter.

   (b) For 12-inch through 16-inch pipe: 1-inch diameter.

4. Threaded Rods shall be provided in either 3-foot, 6-foot, or 12-foot lengths.

5. Threaded Rods shall be constructed of 4140-alloy steel, per ASTM A193, grade B7, Unified National Coarse (UNC) rolled thread.

6. Threaded Rods shall have a minimum tensile strength of 62,500 PSI.

7. Threaded Rods shall be provided with heavy hex nuts made of medium carbon steel, ASTM A194, grade 2H, and Unified National Coarse (UNC) thread.

8. Threaded Rods shall be provided with case hardened steel washers made of C1006 steel, grade 2, Rockwell hardness B55, with the following dimensions:

	Nominal Inside Diameter (In Inches)	Nominal Outside Diameter (In Inches)	Thickness (In Inches)
¾” Threaded Rod	13/16	2	.122 - .177
1” Threaded Rod	1	2-1/2	.136 - .192

   - Washers may be provided with cadmium plating, another plating, or unplated.

9. Delivery shall be specified in terms of number of days from receipt of order.

10. The manufacturer/vendor/shipper must use care in preparing above product for shipment and in handling during shipment and delivery, to insure that the products are delivered without damage. Particular attention must be at protecting the products from damage. Damaged products will not be accepted.

11. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the threaded rods and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

12. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

Section 3.11 TAPPING SLEEVES

3.11.1 General

1. All Tapping Sleeves provided to the Springfield Water and Sewer Commission (SWSC) or its Contractors shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. All tapping sleeves shall be NSF 61 certified.

3. All fasteners shall be made of Grade 304 stainless steel.

4. To prevent galling nuts shall be coated, inside and out, with an anti-seizing material such as provided by Henkel Technologies, Rocky Hill, Connecticut - product name: Loctite Nickel Anti-Seize Lubricant; Chesterton Technical Products, Stoneham, Massachusetts – product name: Chesterton 772 Premium Nickel Anti-Seize Compound; Permatex Inc. Hartford, Connecticut – product name: Permatex Nickel Anti-Seize Lubricant or equal product of another manufacturer.

5. The manufacturer/vendor/shipper must use care in preparing tapping sleeve for shipment and in handling during shipment and delivery, to insure that the tapping sleeve are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged tapping sleeve will not be accepted.

6. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the tapping sleeve and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

7. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

(c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.11.2 Stainless Steel Tapping Sleeves

1. In addition to the General Section above the following shall be adhered to:

2. Tapping Sleeves shall be the style 630 as manufactured by Dresser Industries, Inc., the style FTSS as manufactured by the Ford Meter Box Company, the style SSTIII as manufactured by Romac Industries, Inc., or the approved equal product of another manufacturer.

3. Tapping sleeves shall be constructed of Grade 18-8, Type 304 stainless steel with removable stainless steel fasteners.

4. Tapping sleeves shall be provided with a ¾" NPT test port with a lead free brass lug () with standard square head. Proper use of this feature assures positive seal before tapping.

5. Bolt Lugs shall be 3/16" minimum thickness.

6. Tapping sleeves shall be provided with gaskets made of gridded styrene butadiene rubber (SBR) or Buna-N compounded for water service and shall meet ASTM D2000-80M 4AA607. The sleeve gasket shall provide 360 degree full circumferential support over the full length of the sleeve. The sleeve gasket shall have heavy gauge stainless steel armors, a minimum of 2-1/4" wide, bonded in place to span the gap between the tapping sleeve sections. The outlet gasket shall be made of Buna-N.

7. The flange shall be made of Grade 18-8, Type 304 Stainless Steel. The flange shall conform to AWWA C207 Class D ANSI 150 lb. The flange shall be recessed to accept standard AWWA tapping valves. The bolt holes shall straddle the pipe center line. Iron flanges shall not be accepted.

8. Tapping sleeves shall be rated 150 PSI working pressure and 225 PSI minimum test pressure.

9. All welds used in the construction of the tapping sleeve shall conform to all American Welding Society (AWS) codes. All welds shall be fully passivated in order to restore the stainless steel to its original corrosive resistant characteristics.

10. Tapping sleeves shall be provided with a Grade 18-8, Type 304 Stainless Steel outlet. The outlet shall be double welded, at two places, the flange and the sleeve to provide maximum strength.

3.11.3 Ductile Iron Tapping sleeves

1. In addition to the General Section above the following shall be adhered to:

2. Tapping Sleeves shall be made by Clow – Model F-5205, Mueller – Models H-615 & H-616, U.S. Pipe – Models H-615 & H-616, or the approved equal product of another manufacturer.

3. Tapping sleeves shall be constructed of high strength ductile iron conforming to ASTM A-536 GR 65-45-12. The bolt holes shall straddle the pipe center line.

4. Tapping sleeves shall be mechanical joint conforming to ANSI A21.11/AWWA C-111, unless otherwise specified.

5. Tapping sleeves shall be provided with a ¾" NPT test port with a lead free brass lug () with standard square head. Proper use of this feature assures positive seal before tapping.

6. Tapping sleeves shall be provided with gland and body components made of grade 60-42-10 ductile iron conforming to ASTM A536-84.

7. Tapping sleeve outlet gasket shall be made of Buna-N.

8. The tapping sleeve outlet flange dimensions shall comply with ANSI B16.1 class 125 and with MSS SP-60. The flange shall be recessed to accept standard AWWA tapping valves.

9. Tapping sleeves shall be rated 150 PSI working pressure and 225 PSI minimum test pressure.

10. Exterior Coating

    (a) The preferred coating for fittings is Fusion-bonded epoxy coating in accordance with ANSI A21.16 / AWWA C116 and shall be applied to the interior and exterior of the fitting.

(b) All fittings shall be coated with an approved petroleum asphaltic seal coat in accordance with ANSI A21.10/AWWA C-110, Section 4.3 of the latest revision.

11. Markings

(a) Fittings shall be marked with the weight.

(b) Fittings shall have distinctly cast upon them the pressure rating, the manufacturer's identification, nominal diameter of the openings, and the number of degree or fraction of the circle on all bends.

12. Testing

All tests shall be made in accordance with the methods prescribed by the above mentioned AWWA standards

Section 3.12 JOINT RESTAINT

3.12.1 Mechanical Joint Restraint for Ductile Iron Fittings

1. Mechanical Joint Restraint for Ductile Iron Fittings provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Mechanical Joint Restraint for Ductile Iron Fittings shall be the Series 1100 as manufactured by EBAA Iron, Inc or the approved equal product of another manufacturer.

3. Mechanical Joint Restraint for Ductile Iron Fittings shall be provided with gland and body components made of grade 60-42-10 ductile iron conforming to ASTM A536-84. The casting shall be flat, with no protrusions, where the torque limiting twist-off nuts actuates the restraining wedges.

4. Mechanical Joint Restraint for Ductile Iron Fittings shall be incorporated into the design of the follower gland. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull out as pressure or external forces increase.

5. Mechanical Joint Restraint for Ductile Iron Fittings shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial.

6. The joint restraint ring and its wedging components shall be made of grade 60-42-10 ductile iron conforming to ASTM A536-84. The wedge shall be ductile iron, heat-treated to a minimum hardness of 370 B H N. The joint restraint ring shall be provided with torque limiting twist-off nuts of high strength, low alloy, and corrosion resistant Cor-Ten steel conforming to ASTM A588.

7. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell conforming to ANSI/AWWA C-111/AZ1.11 and ANSI/AWWA G-153/A21.53 of the latest revision. Torque limiting twist-off nuts shall be used to insure proper actuation of the restraining wedge.

8. Mechanical Joint Restraint for Ductile Iron Fittings shall be available in the four through forty-eight inch sizes.

9. Mechanical Joint Restraint for Ductile Iron Fittings shall have a rated working pressure as follows:

   (a) 4-inch – 8-inch = 350 PSI

   (b) 10-inch – 16-inch = 300 PSI

   (c) 20-inch – 36-inch = 200PSI

   (d) 42-inch – 48-inch = 175 PSI

10. Mechanical Joint Restraint for Ductile Iron Fittings shall be listed by Underwriters Laboratories up through the twenty-four-inch size and approved by Factory Mutual up through the twelve-inch size.

11. Mechanical Joint Restraint for Ductile Iron Fittings shall be provided with tee-head bolts, washers, and nuts of high strength, low alloy, and corrosion resistant Cor-Ten steel conforming to ASTM A588. Bolts and nuts shall be Unified National Coarse (UNC) rolled thread and heavy-duty hex nuts. Bolts, washers, nuts and steel shall meet ANSI A21.11/AWWA C-111, latest revision.

12. Mechanical Joint Restraint for Ductile Iron Fittings shall be individually packaged and contain proper size rubber gasket and bolts.

13. The manufacturer/vendor/shipper must use care in preparing Mechanical Joint Restraint for Ductile Iron Fittings for shipment and in handling during shipment and delivery, to insure that the Mechanical Joint Restraint for Ductile Iron Fittings are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged Mechanical Joint Restraint for Ductile Iron Fittings will not be accepted.

14. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the Mechanical Joint Restraint for Ductile Iron Fittings and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

15. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

(a) Name of Municipality/Utility

(b) Total amount of product bid on and amount delivered

(c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.12.2 Gasket Joint Restraint for Ductile Iron Pipe

1. Gasket Joint Restraint for Ductile Iron Pipe provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Gasket Joint Restraint for rubber ring joint (Tyton) shall be as manufactured by United States Pipe and foundry Company – Field Lok 350 Gasket (4" – 24") or equal product of another manufacturer.

3. The Gasket Joint Restraint for Ductile Iron Pipe shall conform to AWWA C-111 (most current revision) for Rubber-Gaskets Joints for Ductile Iron Pressure Pipe and Fittings.

4. The restraint provided shall be a boltless, integral retaining system, and shall be rated for 350 PSI.

5. Delivery shall be specified in terms of number of days from receipt of order.

6. The manufacturer/vendor/shipper must use care in preparing Gasket Joint Restraint for shipment and in handling during shipment and delivery, to insure that the Gasket Joint Restraint are delivered without damage. Damaged Gasket Joint Restraint will not be accepted.

7. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the Gasket Joint Restraint and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

8. References

Springfield Water and Sewer Commission

Material Specifications

The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

(a) Name of Municipality/Utility

(b) Total amount of product bid on and amount delivered

(c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

Section 3.13 ADAPTERS

3.13.1 Bolt-thru Mechanical Joint Restraint (Foster Adapter)

1. The bolt-thru mechanical joint restraint shall be made of ductile iron conforming to ASTM A536, 80-55-06.

2. The bolt-thru mechanical joint restraint shall connect valves and/or fittings at a linear distance not to exceed one and one-half (1-1/2) inches and without attachment to pipe.

3. The bolt-thru mechanical joint restraint shall be provided with an NSF 61 asphaltic seal coat in accordance with ANSI A21/AWWA C-110, Section 4.3 of latest the revision.

4. The bolt-thru mechanical joint restraint shall be provided with mechanical joint gaskets made of styrene butadiene rubber (SBR) compounded for water service and shall conform to the latest revision of AWWA C111/ ASTM f-477.

5. The bolt-thru mechanical joint restraint shall be provided with tee-head bolts/track-head bolts, washers, and nuts of high strength, low alloy, and corrosion resistant Cor-Ten steel conforming to ASTM A588, with Unified National Coarse (UNC) rolled thread. Bolts, washers, nuts and steel shall meet ANSI A21.11/AWWA C-111, latest revision.

6. The bolt-thru mechanical joint restraint may be ordered with longer bolt packs to restrain full bodied fittings and certain butterfly valves, etc. with thicker flanges.

7. Delivery shall be specified in terms of number of days from receipt of order.

8. The manufacturer/vendor/shipper must use care in preparing above product for shipment and in handling during shipment and delivery, to insure that the couplings are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged couplings will not be accepted.

9. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above product and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

10. References

The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

(a) Name of Municipality/Utility

(b) Total amount of product bid on and amount delivered

(c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

Section 3.14 ANTI SEIZE LUBRICANTS

3.14.1 Anti Seize Lubricants

1. Anti seize lubricants provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Anti seize lubricants shall be a nickel anti-seize compound capable of achieving the required bolt torque and sealing stress, and future disassembly with minimal manual input.

3. Anti-seize compound shall be as provided by Henkel Technologies, Rocky Hill, Connecticut - product name: Loctite Nickel Anti-Seize Lubricant; Chesterton Technical Products, Stoneham, Massachusetts – product name: Chesterton 772 Premium Nickel Anti-Seize Compound; Permatex Inc. Hartford, Connecticut – product name: Permatex Nickel Anti-Seize Lubricant or equal product of another manufacturer.

4. Delivery shall be specified in terms of number of days from receipt of order.

5. The manufacturer/vendor/shipper must use care in preparing above products for shipment and in handling during shipment and delivery, to insure that the above product are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged products will not be accepted.

6. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above product and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

7. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

(c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

Section 3.15 PROTECTIVE COATINGS

3.15.1 General

1. Protective primer, protective coating tape, and/or protective outer wrap shall be provided in accordance with of ANSI/AWWA C-217 the latest the revision.

2. Delivery shall be specified in terms of number of days from receipt of order.

3. The manufacturer/vendor/shipper must use care in preparing Protective primer, protective coating tape, and/or protective outer wrap for shipment and in handling during shipment and delivery, to insure that the couplings are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged couplings will not be accepted.

4. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the Protective primer, protective coating tape, and/or protective outer wrap and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

5. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

3.15.2 Protective Primer

1. Protective Primer shall be a petrolatum based primer that exhibits preferential wetting capabilities to readily coat wet or dry surfaces and cavities prior to the application of protective wrap.

2. Protective Primer shall be provided in accordance with of ANSI/AWWA C-217 the latest the revision.

3. The Specific Gravity of the Protective Primer shall be 0.8 - 0.9.

4. Protective Primer shall be packed in cartons of 2 or 4 one gallon cans, 12 one quart cans or in 5 gallon pails.

5. Protective Primer shall be Trenton Wax-Tape primer (Brown), TC Enviroprime, Denso Paste, or the equal product of another manufacturer.

3.15.3 Protective Coating Tape

1. Protective Coating Tape shall be a prefabricated petrolatum coating in tape form designed to protect wet or dry irregularly shaped metal surfaces.

2. Protective Coating Tape shall be provided in accordance with of ANSI/AWWA C-217 the latest the revision.

3. Protective Coating Tape shall be impervious to continuous moisture levels.

4. Protective Coating Tape shall be for use with: bare metal, wood and concrete.

5. Protective Coating Tape shall be compatible with asphalt, coal tar, polyethylene, polypropylene, FBE and urethanes

6. Protective Coating Tape shall have a minimum thickness of 45-mils.

7. Protective Coating Tape shall be resistant to bacteria.

8. Protective Coating Tape shall be provided with a minimum shelf life of one (1) year.

9. Protective Coating Tape shall be packaged in cartons containing widths of 2-inch, 4-inch or 6-inch.

10. Protective Coating Tape shall be Trenton # 1 Wax-Tape, TC Envirotape, Densyl Tape, or the equal product of another manufacturer.

3.15.4 Protective Coating Outer Wrap

1. Protective Coating Outer Wrap shall be a clear flexible plastic film designed to provide extra mechanical protection for surfaces coated with protective coating tape.

2. Protective Coating Outer Wrap shall be provided in accordance with of ANSI/AWWA C-217 the latest the revision.

3. Protective Coating Outer Wrap shall have a minimum thickness of 1-mil.

4. Protective Coating Outer Wrap shall be packaged in cartons containing widths of 4-inch, 6-inch, or 12-inch.

5. Protective Coating Outer Wrap shall be Trenton Poly Ply, TC Envirostretchwrap, Denso Poly-Wrap, or the equal product of another manufacturer.

Section 3.16 FILL MATERIAL

3.16.1 Bank-run Gravel Aggregate

1. Bank run gravel shall be a granular material, well graded from fine to coarse with a maximum size of 3-inch and shall meet or exceed the Massachusetts Highway Department (MHD) specifications for Gravel Aggregate.

2. Bank-run gravel shall be obtained from approved natural deposits and unprocessed except for the removal of unacceptable material and stones larger than the maximum size permitted.

3. Bank-run gravel shall not contain vegetation, masses or roots, or individual roots more than 18" long or more than 1/2" in diameter.

4. Bank-run gravel shall be substantially free from loam and other organic matter, clay, frost, frozen lumps, clay, and other fine or harmful substances.

5. The gradation shall meet the grading requirements of the following table:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
3/8 inch	70 maximum
No. 10	50 maximum
No. 200	5 maximum

3.16.2 Screened Gravel Aggregate

1. Screened gravel shall be a granular material, well graded with hard, durable, particles of proper size and gradation.

2. Screened gravel shall not contain vegetation, masses or roots, or individual roots.

3. Screened gravel shall be free from sand, loam and other organic matter, clay, excess fines and deleterious materials, frost, and frozen lumps.

4. The gradation shall meet the grading requirements of the following table:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
1/2 inch	95 minimum
3/8 inch	40 - 70
No. 4	5 maximum

3.16.3 Structural Gravel Aggregate

1. Structural gravel shall be gravel, sandy gravel, or gravely sand of proper size and gradation.

2. Structural gravel shall not contain vegetation, masses or roots, or individual roots.

3. Structural gravel shall be free from organic material, loam, wood, clay, trash, snow, ice, frost, frozen lumps, and other objectionable material.

4. The gradation shall meet the grading requirements of the following table:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
6-inch	100
No. 4	20 - 95
No. 40	0 - 60
No. 4	8 maximum

3.16.4 Common Borrow/Fill

1. Common borrow/fill shall be inorganic natural soils and/or rock, not having more than 5% by weight passing the No. 200 sieve.

2. Common borrow/fill shall have maximum stone size not greater than 6-inch and material shall be well graded throughout entire size range.

3. Common borrow/fill shall be free from clay, organic material, roots, leaves, trash, snow, ice, frozen soil, and other objectionable material that may be compressible or which cannot be compacted properly.

4. Common borrow/fill shall not contain broken concrete, masonry, rubble, asphalt pavement, ceramic tiles, or other similar materials.

5. Common borrow/fill shall be free of ice or frost and no aggregations of soil particles frozen.

6. Common borrow/fill shall have a moisture content within plus or minus 4% optimum moisture content at the borrow/fill source.

7. Common borrow/fill shall have physical properties, as approved by the Commission, such that it can be readily spread and compacted

3.16.5 Select Common Borrow/Fill

1. Select common borrow/fill shall be as specified for Common Borrow/Fill except the material shall contain no stones larger than 2-inch in its largest dimension.

3.16.6 Crushed Stone ¾-Inch

1. Crushed stone shall consist of sound, durable crushed rock or durable crushed gravel stone, angular in shape and free from structural defects, comparatively free of chemical decay, and free of any foreign material including, but not limited to ice, snow, sand, clay, loam, or other deleterious or organic material.

2. Crushed stone shall be maximum size passing a ¾-inch sieve and retained on a 3/8-inch sieve.

3.16.7 Crushed Stone 2-Inch

1. Crushed stone shall consist of sound, durable crushed rock or durable crushed gravel stone, angular in shape and free from structural defects, comparatively free of chemical decay, and free of any foreign material including, but not limited to ice, snow, sand, clay, loam, or other deleterious or organic material.

2. Crushed stone shall be maximum size passing a 2-inch sieve and retained on a 1-inch sieve.

3.16.8 Dense Grade Crushed Stone

1. Dense Grade Crushed Stone shall be crusher run coarse aggregates of crushed stone combined with fine aggregates uniformly premix with a predetermined quantity of water.

2. The crusher run coarse aggregates shall consist of hard, durable particles of stone. Materials that break up when alternately frozen and thawed or wetted and dried shall not be used.

3. The crusher run coarse aggregates shall have a percentage of wear, by the Los Angeles test of not more than 45.

4. Fine aggregates shall consist of natural or crushed sand.

5. The composite material shall be free from clay, loam or other plastic material, and shall meet the grading requirements of the following table:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
2 inch	100
1-1/2 inch	70 - 100
¾ inch	50 - 85
No. 4	30 - 55
No. 50	8 - 24
No. 200	3 - 10

3.16.9 Sand

1. Aggregate for sand shall consist of clean, inert, hard, durable grains of quartz or other hard durable rocks and free from vegetable matter, lumps or balls of clay and other deleterious substances.

2. Sand shall confirm to ASTM C33 for fine aggregate.

3. The gradation shall meet the grading requirements of the following table:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
1/2 inch	100
3/8 inch	85 - 100
No. 4	60 - 100
No. 16	35 - 80
No. 50	10 - 55
No. 200	2 - 10

3.16.10Excavatable Flowable Fill

1. Excavatable flowable fill shall be 100 PSI maximum.

2. Excavatable flowable shall consist of Portland cement conforming to ASTM C-150, Type II.

3. Excavatable flowable may have coarse and fine aggregate consisting of well graded crushed stone.

4. Excavatable flowable shall have **NO** fly ashe.

5. Excavatable flowable shall have clean water free from oils, acid, and organic matter.

3.16.11Non-Excavatable Flowable Fill

1. Non-excavatable flowable fill shall be 150 PSI minimum.

2. Non-excavatable flowable fill shall consist of Portland cement conforming to ASTM C-150, Type II.

3. Non-excavatable flowable fill may have coarse and fine aggregate consisting of well graded crushed stone.

4. Non-excavatable flowable fill shall have **NO** fly ash.

5. Non-excavatable flowable fill shall have clean water free from oils, acid, and organic matter.

3.16.12Concrete for Fill

1. Concrete shall be 2500 PSI
2. Concrete shall be of Portland cement conforming to ASTM C-150, Type II,
3. Concrete shall have coarse aggregate consisting of well graded crushed stone with a maximum size of 2-inch
4. Concrete shall have clean water free from oils, acid, and organic matter.

3.16.13Concrete for Thrust Blocks

1. Concrete shall be 4000 PSI
2. Concrete shall be of Portland cement conforming to ASTM C-150, Type II,
3. Concrete shall have coarse aggregate consisting of well graded crushed stone with a maximum size of ¾-inch
4. Concrete shall have clean water free from oils, acid, and organic matter.

Springfield Water and Sewer Commission

Material Specifications

CHAPTER 4 WATER SERVICES, AND APPURTANANCES,

Section 4.1 DUCTILE IRON PUSH-ON JOINT WATER SERVICE PIPE

1. Ductile Iron water service pipe shall be at least 6-inches in diameter.

2. Ductile Iron water service pipe, ductile iron valves, and ductile iron appurtenances shall be as specified in Section 3.1 of these Specifications.

Section 4.2 COPPER TUBE WATER SERVICE PIPE

1. Copper tube water service pipe shall be American manufactured.

2. Copper tube water service pipe shall be type "K".

3. Copper tube water service pipe shall be minimum 1-inch diameter.

4. Delivery shall be specified in terms of number of days from receipt of order.

5. The manufacturer/vendor/shipper must use care in preparing the above product for shipment and in handling during shipment and delivery, to insure that the tapping saddle are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged products will not be accepted.

6. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above products and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

7. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

Springfield Water and Sewer Commission

Material Specifications

Section 4.3 TAPPING SADDLES

1. Tapping saddles provided to the Commission or Installer shall be manufactured, tested, inspected, and delivered in full compliance with this Specification.

2. Tapping saddles shall be Ford FC202, Mueller DR2S, Romac 202N or, equal product of another manufacturer.

3. Bodies shall be constructed of high strength ductile iron per ASTM A536.

4. Tapping saddle outlets shall have Mueller CC thread.

5. Bands shall be constructed of Grade 18-8, Type 304 stainless steel with stainless steel lugs and sidebars welded to the band(s). Single bands shall be 3-1/4-inch minimum width and double bands shall be 2-inches minimum width each.

6. Lugs and sidebars shall be constructed of Grade 18-8, Type 304 stainless steel with stainless steel fasteners welded to the lugs and sidebars. A minimum of two (2) lugs per single side bar or one (1) lug per side bar, when tapping saddles are provided with two (2) side bars, shall be provided.

7. All fasteners shall be made of Grade 304 stainless steel.

8. To prevent galling nuts shall be coated, inside and out, with an anti-seizing material such as provided by Henkel Technologies, Rocky Hill, Connecticut - product name: Loctite Nickel Anti-Seize Lubricant; Chesterton Technical Products, Stoneham, Massachusetts – product name: Chesterton 772 Premium Nickel Anti-Seize Compound; Permatex Inc. Hartford, Connecticut – product name: Permatex Nickel Anti-Seize Lubricant or equal product of another manufacturer.

9. All welds used in the construction of the tapping saddles shall conform to all American Welding Society (AWS) codes. All welds shall be fully passivated in order to restore the stainless steel to its original corrosive resistant characteristics.

10. Tapping saddles shall be provided with gaskets constructed of Virgin STYRENE BUTADIENE RUBBER (SBR) compound for water service and must meet or exceed ASTM-D-2000-AA-415.

11. Ranges must be clearly labeled on the package as well as on each tapping saddle.

12. Range diameter information must be provided from vendor on the tapping saddle bid.

13. Coatings shall be fusion bonded epoxy (10 – 12 mils), nylon 11 (10 – 12 mils)

14. Delivery shall be specified in terms of number of days from receipt of order.

15. The manufacturer/vendor/shipper must use care in preparing tapping saddle for shipment and in handling during shipment and delivery, to insure that the tapping saddle are delivered without damage. Particular attention must be directed at protecting the protective coating from damage. Damaged tapping saddle will not be accepted.

16. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the tapping saddle and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

17. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (e) Name of Municipality/Utility

    (f) Total amount of product bid on and amount delivered

    (g) Date the bid was accepted and date the product was delivered

    (h) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

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Section 4.4 WATER SERVICE APPURTENANCES

4.4.1 General

1. Water service appurtenances i.e. valves and fittings, shall conform to AWWA Standard C800 latest version.

2. All valves and fittings, which come in contact with water, shall be made from Lead Free brass.

   (a) This brass alloy is commercially called “Enviro Brass II”, “Federalloy”, “Selenium Free”, or “Red-Hed Lead Free Brass”

   - Enviro Brass II is a Lead Free copper alloy, UNS Copper Alloy C89520.
   - Federalloy is a Lead Free copper alloy, UNS Copper Alloy C89833.
   - Selenium Free Brass is a Lead Free copper alloy, UNS Copper Alloy C89836.
   - Red-Hed Lead Free Brass is a Lead Free copper alloy, UNS Copper Alloy (Proprietary number at this time until patent approval).

   (b) Brass other than the above may be approved by the Springfield Water and Sewer Commission as an acceptable equal.

(c) Lead Free brass is defined as having the following content:

PRIMARY ELEMENTS	COMPOSITION % BY WEIGHT
Copper (Cu)	85.0-91.0
Tin (Sn)	4.0-7.0
Lead (Max) (Pb)	0-0.25
Zinc (Zn)	2.0-6.0
Bismuth (Bi)	1.6-3.5.2
Selenium (Se)	0.0-1.1
Nickel (Ni) (Including Cobalt)	0.9-1.0

3. All castings shall be clearly identified as being cast from Lead Free Brass.

   (a) "EB", "EBII", "NL", or "LF" are acceptable identifiers, and must be cast in high relief or deeply engraved.

   (b) Lead Free identifiers other than "EB", "EBII", "NL", or "LF" are subject to Commission review and approval.

4. Brass parts not in contact with water may be made from copper alloy No. 83600, in accordance with ASTM B30, ASTM B62, or ASTM B584 and AWWA C-800 latest version containing 85% copper, 5% tin, 5% lead, and 5%.

5. All water service valves and fittings shall be certified, by a third party, as suitable for contact with drinking water by an accredited certification organization in accordance with ANSI/NSF 61-8, Drinking Water System Components – Health Effects.

6. Valves and fittings shall be designed to withstand working pressure of a minimum of 150 PSI. The manufacturer shall factory test all valves and fittings (100%) to a minimum of 150 PSI.

7. Corporation Stop Valves may rotate 360 degrees in either direction or rotate ¼ turn only and **OPEN LEFT,** counter-clockwise.

8. Curb Stop Valves shall rotate ¼ turn only and **OPEN LEFT,** counter-clockwise.

9. Valves, fittings, and other service line materials shall be as manufactured by the manufacturers of equivalent products are specified in Section 3.2.10 Table of Equivalencies and Item Number Details or the approved equal of another manufacturer.

10. The manufacturer and/or vendor must use care in preparing materials for shipment and in handling during shipment and delivery, to insure receipt without damage. Damaged materials will not be accepted.

4.4.2 Ball Type Corporation Stops for New Installations (Items # 1, 2, 3, & 4)

1. Corporations shall include a Tee Head Adapter.

2. Corporations shall have AWWA/CC (corporation cock) Taper Thread Inlet x Mueller 110 Compression Outlet.

3. The outlet thread (male) of compression joint must be capable of installation using a Mueller B-101 Drilling and Tapping Machine using an inserting tool for corporation stop, inside thread CTS Mueller 110 Conductive Compression Connection according to the following table:

INSERTING TOOL SIZE	MUELLER PART NUMBER
¾"	680600
1"	680601
1¼"	
1½"	680421
2"	680422

4. Equality of the outlet joint to the "Mueller 110 Compression" is mandatory. The "Quick Joint" (Ford), "McQuick Compression" (McDonald), and "CB Compression" (Cambridge) have been determined to be equal.

5. ALL corporations shall be subject to a sustained hydraulic pressure of 200 PSI and tested in both the open and closed positions for leakage and ease of turning.

4.4.3 Ball Type Curb Stops used at Property Line (Items # 5, 6, 7, & 8)

1. Curb stops shall have Mueller 110 Compression – both ends

2. Equality of the outlet joint to the "Mueller 110 Compression" is mandatory. The "Quick Joint" (Ford), "McQuick Compression" (McDonald), and "CB Compression" (Cambridge) have been determined to be equal.

4.4.4 Ball Type Curb Stops for Service Replacements (Items # 9, 10, 11, & 12)

1. Curb stops shall have Female Iron Pipe Thread (FIP) Inlet x Mueller 110 Compression Outlet.

2. Equality of the outlet joint to the "Mueller 110 Compression" is mandatory. The "Quick Joint" (Ford), "McQuick Compression" (McDonald), and "CB Compression" (Cambridge) have been determined to be equal. (changed 08/11/03)

4.4.5 Straight Ball Meter Valves (Items # 13, 14, 15, & 16)

1. Straight ball meter valves shall have Mueller 110 Compression Inlet x Elliptical Meter Flange Outlet (Items 15 & 16) or Meter Swivel Nut (Items 13 & 14).

2. Equality of the outlet joint to the "Mueller 110 Compression" is mandatory. The "Quick Joint" (Ford), "McQuick Compression" (McDonald), and "CB Compression" (Cambridge) have been determined to be equal.

3. Straight ball meter valves shall be provided with factory installed handles made of water works brass 85-5-5-5.

4.4.6 Angled Ball Meter Valves (Items # 17, 18, 19, & 20)

1. Angled ball meter valves shall have Mueller 110 Compression Inlet x Meter Swivel Nut (Items 17 & 18) or Elliptical Meter Flange (Items 19 & 20).

2. Equality of the outlet joint to the "Mueller 110 Compression" is mandatory. The "Quick Joint" (Ford), "McQuick Compression" (McDonald), and "CB Compression" (Cambridge) have been determined to be equal.

3. Angled ball meter valves shall be provided with factory installed handles (85-5-5-5 brass).

4.4.7 Quick Joint Couplings (Items # 21, 22, 23, & 24)

1. Quick joint couplings shall have Mueller 110 Compression end – both ends

2. Equality of the outlet joint to the "Mueller 110 Compression" is mandatory. The "Quick Joint" (Ford), "McQuick Compression" (McDonald), and "CB Compression" (Cambridge) have been determined to be equal.

4.4.8 Buffalo Style Service Box (Items # 25, 26, 27, & 27a) for New and Existing Services

1. The Buffalo Style Service Box shall be heavy cast iron extension (adjustable) type, slide style, with arch pattern base and a recessed cover.

   (a) For installations in the street the service box shall be 3-1/2-feet tall, with a 24-inch top and an approximate 36-inch bottom

   (b) For installations in the treebelt the service box shall be 5-feet tall, with a 24-inch top and an approximate 48-inch bottom

2. The arch pattern base shall accommodate ¾ to 2-inch ball type corporations and ball type curb stops.

(a) For 1-inch inch ball type corporations and ball type curb stops the arch shall be at least 5-inches tall with a 3-inch by 3-inch arch.

(b) For 1-1/2-inch to 2-inch ball type corporations and ball type curb stops the arch shall be at least 7-inches tall with a 4-inch by 4-inch arch.

3. The inside diameter of the upper section shall be at least 3-inches. The inside diameter of the bottom section shall be at least 2-1/2-inches.

4. The Buffalo Style Service Box shall be provided with a cast iron cover that has a brass pentagon head nut, and the word "WATER" cast into the cover.

5. The Buffalo Style Service Box shall have a heavy coat of Asphalt-base paint.

4.4.9 Handles for Meter Ball Valves (Items # 28, 29, 30 & 31)

1. Handles shall be water works brass 85-5-5-5.

2. Handle shall be provided with brass nut and bolt.

3. For ¾" and 1" Ball Valves the handle shall be a straight lever and a minimum of 4-1/4" long.

4. For 1¼", 1½", and 2" Ball Valves the handle shall be an offset high and a minimum of 9-1/2" long.

4.4.10 Service Line Materials Table of Equivalencies

1. For lead free brass goods add the following to the listed Catalog Numbers below.

(a) Ford add "NL" as a suffix to the catalog number

(b) Red Hed supplies lead free only brass goods

(c) Mueler add "EB" as a suffix to the catalog number.

(d) McDonald add "7" as a prefix to the catalog number.

(e) Cambridge add "NL" as a prefix to the catalog number.

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SECTION NUMBER	ITEM NUMBER	SIZE IN & OUT	CATALOG NUMBER					NOTES
			FORD	RED HED	MUELLER	MCDONALD	CAMBRIDGE	
3.2.2	1	1"	FB1000-4-Q-TA	RHSB43821	B25008	4104BQ 1"	311-A4H4	COMB CORP & CURB STOP CC x Q
	2		FB1000-5-Q-TA	NA	NA	NA	NA	CC x Q
	3	1½"	FB1000-6-Q-TA	RHSB43824	B25008	4104BQ 1½"	311-A6H6	CC x Q
	4	2"	FB1000-7-Q-TA	RHSB43825	B25008	4104BQ 2"	311-A7H7	CC x Q
3.2.3	5	1"	B44-444-Q	RHSB41512	B25209	6100Q 1"	202-H4H4	CURB STOP Q x Q
	6	1¼"	B44-555-Q	RHSB41513	NA	6100Q 1¼" x 1"	202-H5H5	Q x Q
	7	1½"	B44-666-Q	RHSB41514	B25209	6100Q 1½"	202-H6H6	Q x Q
	8	2"	B44-777-Q	RHSB41515	B25209	6100Q 2"	202-H7H7	Q x Q
3.2.4	9	1"	B41-444-Q	RHSB40812	B25172	6102Q 1"	202-H4F4	CURB STOP FIP x Q
	10	1¼"	B41-555-Q	RHB40813	NA	NA	202-H5F5	FIP x Q
	11	1½"	B41-666-Q	RHB40814	B25172	6102Q 1½"	202-H6F6	FIP x Q
	12	2"	B41-777-Q	RHB40815	B25172	6102Q 2"	202-H7F7	FIP x Q

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SECTION NUMBER	ITEM NUMBER	SIZE IN & OUT	CATALOG NUMBER					NOTES
			FORD	RED HED	MUELLER	MCDONALD	CAMBRIDGE	
3.2.5	13	1 x ¾"	B43-342-Q	NA	B24350	6102MQ 1"	NA	METER VALVE Q x SWIVEL
	14	1¼ x 1"	B43-454-Q	NA	B24350	NA	NA	Q x SWIVEL
	15	1½"	BF43-666-Q	NA	B24335	6100MQ 1½"	212-H6MF6H	Q x MTR FLGE
	16	2"	BF43-777-Q	NA	B24335	NA	212-H7MF7H	Q x MTR FLGE
3.2.6	17	1 x ¾"	BA43-342-Q	NA	B24258	4602BQ 1 x ¾"	210-H4T3H	ANGLE METER VALVE Q x SWIVEL
	18	1 x 1"	BA43-444-Q	NA	B24258	4602BQ 1"	210-H4T4H	Q x SWIVEL
	19	1½"	BFA43-666-Q	NA	B24276	4602BQ 1½"	210-H6MF6H	Q x MTR FLGE
	20	2"	BFA43-777-Q	NA	B24276	4602BQ 2"	210-H7MF7H	Q x MTR FLGE
3.2.7	21	1"	C44-44-Q	RH41212	H15403	4758Q 1"	119-H4H4	COUPLING Q x Q
	22	1¼"	C44-55-Q	RH41213	H15403	4758Q 1¼"	119-H5H5	Q x Q
	23	1½"	C44-66-Q	RH41214	H15403	4758Q 1½"	119-H6H6	Q x Q
	24	2"	C44-77-Q	RH41215	H15403	4758Q 2"	119-H7H7	Q x Q
3.2.8	25	3 ½’	NA	NA	NA	NA	NA	Buffalo style curb box in street for 1-inch valves
	26	6’	NA	NA	NA	NA	NA	Buffalo style curb box @ property for 1-incn valves
	27	3 ½’	NA	NA	NA	NA	NA	Buffalo style curb box in street for 1-1/2 to 2-inch valves
	27a	6’	NA	NA	NA	NA	NA	Buffalo style curb box @ property for 1-1/2 to 2-incn valves
3.2.11	28	¾" & 1”	HB34	NA	B-20298	6102MQ 1"	NA	Brass Handle
	29	1¼"	HH67	NA	NA	NA	NA	Brass Handle
	30	1½"	HH67	NA	NA	6100MQ 1½"	212-H6MF6H	Brass Handle
	31	2"	HH67	NA	NA	NA	212-H7MF7H	Brass Handle

Section 4.5 CONCRETE METER VAULTS

4.5.1 General

1. Concrete Meter Vaults provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. All vaults interior dimensions must allow a clear working space around the meters of at least 2 feet.

3. All vaults must be adequately reinforced to bear traffic and have an H-20 load rating.

4. All vaults shall be constructed with shiplap joints.

5. All vaults shall be watertight and sealed with butyl rubber gaskets as follows:

   (a) Seal bell and spigot joints of vault sections with butyl rubber flexible rope-like gasket material.

   (b) Butyl rubber flexible rope-like gasket material shall conform to ASTM C990.

   (c) Butyl rubber flexible rope-like gasket material shall be produced from blends of butyl rubber, refined hydro carbons, resins, and plasticized compounds reinforced with inert mineral filler and be solvent free.

   (d) Each gasket shall have a self-adhesive nature.

   (e) Each gasket shall be 1-inch diameter.

   (f) Each gasket shall be furnished in coils.

6. All vaults shall have two (2) removable tops with lift rings made with ¾-inch galvanized rebar and have a 3-inch loop. The lift rings shall be located at the four (4) corners of each top piece.

7. All vaults shall have manhole rungs made of reinforced steel, copolymer polypropylene, 14-in wide. Copolymer polypropylene shall conform to ASTM D4101 Classification PP0344 B33534 Z02. Steel reinforcing shall be 1/2-in

diameter, conforming to ASTM A615, Grade 60 and shall be continuous throughout rung. Manhole rungs shall meet all OSHA requirements.

8. All vaults shall have manhole rungs installed 12-inches apart, so that the top foothold is within 12-inches of the manhole cover, the bottom foothold is within 12-inches of the vault floor, and the footholds are 7-inches from the vault wall.

9. All vaults shall have an adequate floor sump beneath one of the manhole openings. The sump shall be 12 though 14-inches diameter by 3-inches deep.

10. The sump/drain shall not be connected to a sewer.

11. All vault floors shall be pitched to the drain.

12. Delivery shall be specified in terms of number of days from receipt of order.

13. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

14. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

15. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

4.5.2 Concrete Meter Vault for 4-inch Service Pipe

1. Concrete Meter Vaults for 4-inch water service pipes shall be provided in accordance with **Meter Pit for 4-inch Water Service Pipe Detail (W-13.2)**, of these Material Specifications.

2. Concrete Meter Vaults for 4-inch service pipe shall be provided with inside dimensions of 8-feet long, 6-feet wide, and 6.5-feet tall.

    - 4-inch or less meter may be installed with Commission approval

3. Knockouts for the pipe shall be provided on each end with the center at least 2-feet above the floor and 2-feet from the same wall.

4. The knockout diameter shall be at least 8-inches.

5. Two (2) 30-inch manhole openings shall be provided and each shall be located on the same side of the top at each end across from the knockouts.

6. The walls, top, and bottom shall be 6-inches thick.

7. The Concrete Meter Vaults for 4-inch service pipe shall be delivered in four (4) sections

    (a) Bottom riser with monolithic floor; 3-feet-9-inches high.

    (b) Upper riser (without a top); 3-feet-3-inches high.

    (c) Two-piece top; 6-inches high.

4.5.3 Concrete Meter Vault for 6-inch Service Pipe

1. Concrete Meter Vaults for 6-inch water service pipes shall be provided in accordance with **Meter Pit for 6-inch Water Service Pipe Detail (W-13.3)**, of these Material Specifications.

2. Concrete Meter Vaults for 6-inch service pipe shall be provided with inside dimensions of 10-feet long, 6-feet wide, and 6.5-feet tall.

    - 6-inch or less meter may be installed with Commission approval

3. Knockouts for the pipe shall be provided on each end with the center at least 2-feet above the floor and 2-feet from the same wall.

4. The knockout diameter shall be at least 10-inches.

5. Two (2) 30-inch manhole openings shall be provided and each shall be located on the same side of the top at each end across from the knockouts.

6. The walls, top, and bottom shall be 6-inches thick.

7. The Concrete Meter Vaults for 6-inch service pipe shall be delivered in four (4) sections

    (a) Bottom riser with monolithic floor; 3-feet-9-inches high.

    (b) Upper riser (without a top); 3-feet-3-inches high.

    (c) Two-piece top; 6-inches high.

4.5.4 Concrete Meter Vault for 8-inch Service Pipe

1. Concrete Meter Vaults for 8-inch water service pipes shall be provided in accordance with **Meter Pit for 8-inch Water Service Pipe Detail (W-13.4)**, of these Material Specifications.

2. Concrete Meter Vaults for 8-inch service pipe shall be provided with inside dimensions of 10-feet long, 6-feet wide, and 6.5-feet tall.

    - 8-inch or less meter may be installed with Commission approval

3. Knockouts for the pipe shall be provided on each end with the center at least 2-feet above the floor and 2-feet from the same wall.

4. The knockout diameter shall be at least 12-inches.

5. Two (2) 30-inch manhole openings shall be provided and each shall be located on the same side of the top at each end across from the knockouts.

6. The walls, top, and bottom shall be 6-inches thick.

7. The Concrete Meter Vaults for 8-inch service pipe shall be delivered in four (4) sections

    (a) Bottom riser with monolithic floor; 3-feet-9-inches high.

    (b) Upper riser (without a top); 3-feet-3-inches high.

    (c) Two-piece top; 6-inches high.

4.5.5 Concrete Meter Vault for 10-inch Service Pipe

1. Concrete Meter Vaults for 10-inch water service pipes shall be provided in accordance with **Meter Pit for 10-inch and 12-inch Water Service Pipe Detail (W-13.5)**, of these Material Specifications.

2. Concrete Meter Vaults for 10-inch service pipe shall be provided with inside dimensions of 11-feet, 2-inches long, 8-feet wide, and 6.5-feet tall.

    - Two (2) 8-inch or less meters may be installed with Commission approval

3. Two (2) knockouts for the pipes shall be provided on each end with the centers at least 2-feet above the floor and 2-feet from the centerline of the pit.

4. The knockout diameter shall be at least 12-inches.

5. Two (2) 30-inch manhole openings shall be provided and each shall be located on the same side of the top at each end across from the knockouts.

6. The walls and bottom shall be 6-inches thick. The top shall be 8-inches thick.

7. The Concrete Meter Vaults for 10-inch service pipe shall be delivered in four (4) sections

    (a) Bottom riser with monolithic floor; 3-feet-9-inches high.

    (b) Upper riser (without a top); 3-feet-3-inches high.

    (c) Two-piece top; 8-inches high.

4.5.6 Concrete Meter Vault for 12-inch Service Pipe

1. Concrete Meter Vaults for 12-inch water service pipes shall be provided in accordance with **Meter Pit for 10-inch and 12-inch Water Service Pipe Detail (W-13.5)**, of these Material Specifications.

2. Concrete Meter Vaults for 12-inch service pipe shall be provided with inside dimensions of 11-feet, 2-inches long, 8-feet wide, and 6.5-feet tall.

    - Two (2) 8-inch or less meters may be installed with Commission approval

3. Two (2) knockouts for the pipes shall be provided on each end with the centers at least 2-feet above the floor and 2-feet from the centerline of the pit.

4. The knockout diameter shall be at least 12-inches.

5. Two (2) 30-inch manhole openings shall be provided and each shall be located on the same side of the top at each end across from the knockouts.

6. The walls and bottom shall be 6-inches thick. The top shall be 8-inches thick.

7. The Concrete Meter Vaults for 12-inch service pipe shall be delivered in four (4) sections

    (a) Bottom riser with monolithic floor; 3-feet-9-inches high.

    (b) Upper riser (without a top); 3-feet-3-inches high.

    (c) Two-piece top; 8-inches high.

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Section 4.6 MAN HOLE FRAME AND COVER FOR CONCRETE METER VAULTS

1. Manhole frame and covers provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Manhole frames and covers shall be strong, durable, even grained cast iron, smooth, free from scale, lumps, blisters, sand holes and defects of any kind. Manhole covers and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection.

3. The manhole frame and cover shall be certified to meet AASHTO 35 strength of materials requirements. Cast iron shall conform to ASTM A48, Class 30.

4. Manhole covers shall cast iron, have a diamond pattern, pick holes and the words "SPRINGFIELD WATER & SEWER COMMISSION", "WATER", and the Commission Logo in raised relief in accordance with **32" X 8" Water Frame and Cover Detail (W-13.6)**.

5. All manholes frame and covers shall meet the following dimension requirements:

   (a) New manhole frame and covers shall have a 30-inch diameter access opening and a 32-inch diameter cover in accordance with **32" X 8" Water Frame and Cover Detail (W-13.6)**.

   (b) The dimensions of the frame and cover must match existing frames and covers such that parts are interchangeable with both the new and existing manhole frame and covers.

6. Pick holes shall include two blind non-penetrating pick holes on the side, and one pocket lift handle with integral stainless steel center rod in the location shown on the standard detail. The strength of the center rod must be such that the manhole cover may be lifted by this rod using a pick or cover lifter without breakage.

7. The manhole shall also include a continuous, self-sealing gasket cemented in a machine groove on the underside of the cover or as otherwise approved by the Commission.

8. Manhole frame and covers shall be manufactured by LeBaron Foundry or approved equal of another manufacture.

9. Delivery shall be specified in terms of number of days from receipt of order.

10. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

11. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

12. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product.

Section 4.7 PLASTIC PIT METER SETTER FOR COLD CLIMATES

1. Plastic Pit Meter Setters provided to the Commission or Installer shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Plastic Pit Meter Setters shall be constructed of 20-inch or 36-inch diameter high quality, high-density polyethylene pipe. Unless otherwise approved by the Commission, pit dimensions for the following meter sizes shall be:

   (a) 5/8-inch meter; shall be 20-inch diameter by 48-inches deep.

   (b) 5/8-inch by 3/4-inch meter; shall be 20-inch diameter by 48-inches deep.

   (c) 3/4-inch meter; shall be 20-inch diameter by 48-inches deep.

   (d) 3/4-inch by 1-inch meter; shall be 20-inch diameter by 48-inches deep.

   (e) 1-1/2-inch meter; shall be 36-inch diameter by 48-inches deep.

   (f) 2-inch meter; shall be 36-inch diameter by 48-inches deep.

3. Plastic Pit Meter Setters inlet valve shall be a lead free meter angle valve.

   (a) 5/8-inch to 1-inch meters require a quick connection on the outlet side of the meter valve.

   (b) 1-1/4-inch to 2-inch require a flange connection on the outlet side of the meter valve.

4. Plastic Pit Meter Setters outlet valve shall be a lead free angle cartridge dual check valve.

   (a) 5/8-inch to 1-inch meters require a quick connection on the inlet side of the check valve.

   (b) 1-1/4-inch to 2-inch require a flange connection on the inlet side of the check valve.

5. Plastic Pit Meter Setters shall include copper tube, K type risers.

6. Plastic Pit Meter Setters shall include a male iron pipe connection on both the inlet and outlet connection of the risers.

7. Delivery shall be specified in terms of number of days from receipt of order.

8. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

9. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

10. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

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    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

Section 4.8 FRAME AND LIDS FOR PLASTIC METER PIT SETTER

1. Frame

   (a) Frames shall be made of cast iron or ductile iron and have a 25,000 PSI tensile strength.

   (b) Frames for plastic meter setters for 5/8-inch through 1-inch shall have tile size of 20-inches and a lid size of 12-inches.

   (c) Frames for plastic meter setters for 1-1/2-inch through 2-inch shall have tile diameter of 36-inches and a lid diameter of approximately 12-1/2-inches.

   (d) Frames shall be provided with double lids.

   (e) Frames shall provide a recessed lip to allow the top lid to remain flush with the top of the frame.

2. Lids

   (a) Inner lids shall be plastic.

   (b) Inner lids shall be approximately11-1/2-inches in diameter.

   (c) Top lids shall be plastic.

   (d) Top lids shall be approximately12-1/2-inches in diameter.

   (e) Top lids shall be provided with a worm type locking device.

   (f) Top lids shall be provided with a standard 27/32-inch brass pentagon nut.

   (g) Top lids shall have "WATER METER" printed clearly on them. The printings shall be permanently made on to the lids.

3. Delivery shall be specified in terms of number of days from receipt of order.

4. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

5. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

6. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

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   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

CHAPTER 5 CROSS CONNECTION DEVICES,

Section 5.1 BACKFLOW PREVENTERS

5.1.1 General

1. Cross Connection Devices provided to the Springfield Water and Sewer Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with the Commission's Specifications.

2. The Cross Connection Devices shall conform to AWWA G-110 (most current revision) Standard for Double Check Valve Backflow Prevention Assembly and/or AWWA C-511 (most current revision) Standard for Reduced Pressure Principle Backflow Preventer.

3. Cross Connection Devices shall be delivered with proof of testing by the University of California (USC) and/or the American Society of Sanitary Engineering (ASSE), as set forth in Massachusetts Drinking Water Regulations 310 CMR 22.22.

5.1.2 Fire Systems

1. Fire Systems with out Chemicals Added

   (a) At a minimum, based on the degree of health hazard, a double detector check valve assembly shall be provided on all new systems.

   (b) The double detector check valve assembly shall be provided with a water meter that reads in cubic feet and a double check in the bypass line.

2. Fire Systems with Chemicals Added

   (a) A reduced pressure zone (RPZ) backflow preventer is required and shall be provided with the following:

   (b) The RPZ backflow preventer shall be provided with a water meter that reads in cubic feet and a RPZ in the bypass line.

   (c) The RPZ backflow preventer shall be provided with two independent check valves with an intermediate relief valve.

   (d) The RPZ backflow preventer shall be provided with shut-off valves and ball type test cocks.

   (e) The RPZ backflow preventer shall be provided with a drain that exits the facility and is not connected to sewer.

3. Delivery shall be specified in terms of number of days from receipt of order.

4. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

5. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

6. References

Springfield Water and Sewer Commission

Material Specifications

The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

(a) Name of Municipality/Utility

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5.1.3 Irrigation Systems

1. At a minimum, a pressure vacuum breaker shall be provided with the following:

   (a) The pressure vacuum breaker shall be provided with a spring loaded single float and disc with an independent first check.

   (b) The pressure vacuum breaker shall be provided with shut-off valves and ball type test cocks.

2. A double check valve assembly is also acceptable and shall be provided with the following:

   (a) The double check valve assembly shall be provided two independent check valves.

   (b) The double check valve assembly shall be provided with removable checks.

   (c) The double check valve assembly shall be provided with shut-off valves and ball type test cocks.

3. A reduced pressure zone (RPZ) backflow preventer is also acceptable and shall be provided with the following:

   (a) The RPZ backflow preventer shall be provided with two independent check valves with an intermediate relief valve.

   (b) The RPZ backflow preventer shall be provided with shut-off valves and ball type test cocks.

   (c) The RPZ backflow preventer shall be provided with a drain that exits the facility and is not connected to sewer.

4. Delivery shall be specified in terms of number of days from receipt of order.

5. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

6. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and

all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

7. References

The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

(a) Name of Municipality/Utility

(b) Total amount of product bid on and amount delivered

(c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

5.1.4 Process Systems

1. At a minimum, a reduced pressure zone (RPZ) backflow preventer shall be provided with the following:

   (a) The RPZ backflow preventer shall be provided with two independent check valves with an intermediate relief valve.

   (b) The RPZ backflow preventer shall be provided with shut-off valves and ball type test cocks.

   (c) The RPZ backflow preventer shall be provided with a drain that exits the facility and is not connected to sewer.

2. Delivery shall be specified in terms of number of days from receipt of order.

3. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

4. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

5. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

5.1.5 Threaded Connections

1. All threaded connections shall be provided with a hose connection vacuum breaker.

   (a) The hose connection vacuum breaker shall be provided with a single check valve with an atmospheric vacuum breaker vent.

2. Delivery shall be specified in terms of number of days from receipt of order.

3. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

4. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

5. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

5.1.6 Enclosures

1. Enclosures shall meet all American Society of Sanitary Engineers (A.S.S.E.) 1060 requirements.

2. Enclosures shall be kept in dry shipping containers until installation.

3. Acceptable materials for enclosures shall be aluminum or fiberglass for small enclosures.

4. Insulation thickness for enclosures shall be sufficient to withstand freezing.

5. Adhesive applied stock or material secured by mechanical fasteners may be cause for rejection.

6. Structural members for enclosures shall be aluminum, or fiberglass. Wood or particleboard shall not be allowed.

7. The roof, walls, and access panels for enclosures shall be constructed of specified materials in specified thickness.

8. Delivery shall be specified in terms of number of days from receipt of order.

9. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

10. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable AWWA Standards.

11. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

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CHAPTER 6 SEWER MAINS AND APPURTENANCES

Section 6.1 SEWER PIPE

6.1.1 Polyvinyl Chloride (PVC) Sewer Pipe

1. Pipe provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. All pipe furnished shall be either in 13-foot, 18-foot or 20-foot lengths. Straight pipe shall be furnished in lengths according to ASTM D3034.

3. All pipe and fittings furnished shall be clearly marked on the outside indicating name, manufacturer, nominal diameter, ASTM, schedule, and/or pipe or pressure class designation.

4. PVC pipe provided for depths between 4-feet and 15-feet shall be:

   (a) sizes 4-inch to 15-inch shall conform with ASTM D3034 for solid wall PVC. The PVC pipe shall have an SDR ratio of 35 and a pipe stiffness of 46 psi.

   (b) 18-inch and above shall conform with ASTM F679 for large diameter pipes. The PVC pipe shall have an SDR ratio of 35 and a pipe stiffness of 46 psi.

5. PVC pipe provided for depths between 16-feet and 30-feet shall be:

   (a) sizes 4-inch to 15-inch shall conform with ASTM D3034 for solid wall PVC. The PVC pipe shall have an SDR ratio of 26 and a pipe stiffness of 115 psi.

   (b) 18-inch and above shall conform with ASTM F679 for large diameter pipes. The PVC pipe shall have an SDR ratio of 26 and a pipe stiffness of 115 psi.

6. The pipe manufacturer shall be required to meet all the requirements for PVC Solid Wall Pipe as stated in ASTM D3034 or ASTM F679 whichever is applicable. Specifically, the manufacturer shall perform stiffness, deflection, acid resistances and joint and fitting tightness tests on PVC sanitary sewer pipe and will be required to show certification for such test(s) and at the option of Commission. The pipe manufacturer will be required to perform such test(s) in the presence of the Commission's representative.

7. PVC pipe shall have bell and spigot push-on joints. The bell shall consist of an integral wall section with a solid cross-section elastomeric gasket securely locked in place to prevent displacement during assembly. Installation of elastomeric gasketed joints and performance of the joint shall conform to ASTM F477, ASTM D3139 or ASTM D3212.

8. Sewer lines shall be green in color or as approved by the Commission.

9. Delivery shall be specified in terms of number of days from receipt of order.

10. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

11. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable ASTM Standards.

12. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

6.1.2 Polyvinyl Chloride (PVC) Sewer Fittings

1. Polyvinyl Chloride (PVC) fittings provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. In addition to Section 6.1.1 of these Material Specifications, PVC fittings shall be provided as follows:

3. PVC wyes shall be furnished in lengths of not more than 3-ft. Saddle wyes are not allowed.

4. PVC fittings and accessories for sewers shall have bell and/or spigot configurations compatible with the pipe. The bell shall consist of an integral wall section with a solid cross-section elastomeric gasket securely locked in place to prevent displacement during assembly. Installation of elastomeric gasketed joints and performance of the joint shall conform to ASTM F477, ASTM D3139 or ASTM D3212.

5. Delivery shall be specified in terms of number of days from receipt of order.

6. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

7. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable ASTM Standards.

8. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

(d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

6.1.3 Ductile Iron Push-on Joint for Sewer Pipe

1. Ductile Iron (DI) Pipe provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. In addition to Section 3.1.1 of these Material Specifications, DI Pipe shall be provided as follows:

3. Ductile iron pipe shall conform to AWWA C151 standards and shall be supplied in industry 18-foot and 20-foot lengths.

4. Delivery shall be specified in terms of number of days from receipt of order.

5. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

6. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable ASTM Standards.

7. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product.

6.1.4 Ductile Iron Fittings for Sewer Pipe

1. Ductile Iron (DI) fittings provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. In addition to Section 3.8.1 of these Material Specifications, DI fittings shall be provided as follows:

3. Pipe fittings shall be ductile iron with pressure rating of 350 PSI for 24-in and smaller piping and 250 PSI for 30-in and larger piping.

4. Fittings shall meet the requirements of AWWA C110 or AWWA C153 as applicable.

5. PVC fittings and accessories for sewers shall have bell and/or spigot configurations compatible with the pipe. The bell shall consist of an integral wall section with a solid cross-section elastomeric gasket securely locked in place to prevent displacement during assembly. Installation of elastomeric gasketed joints and performance of the joint shall conform to ASTM F477, ASTM D3139 or ASTM D3212.

6. Delivery shall be specified in terms of number of days from receipt of order.

7. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

8. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable ASTM Standards.

9. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

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Springfield Water and Sewer Commission

Material Specifications

Section 4.1 SANITARY SEWER MANHOLES

4.1.1 General

1. Pre-cast Concrete Manholes provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Materials' quality, manufacturing process and finished sections are subject to inspection and approval by the Commission at either place of manufacture or at work site.

3. Materials will be examined for compliance with ASTM standards, these Materials Specifications, and approved manufacturer's drawings. The Commission will also take note regarding appearance, dimensions, blisters, cracks and other anomalies, if any.

4. The Commission reserves the right to reject any manhole or structure that fails to meet any requirements specified herein. Rejection may occur at place of manufacture, at work site, or following installation and will not cause the Commission to incur any additional costs.

5. Minor repairs to pre-cast concrete sections, if required, are not accepted unless authorized by the Commission.

6. Materials and equipment shall be the end products of one manufacturer in order to provide standardization for appearance, operation, maintenance, spare parts and manufacturer's service.

4.1.4 Pre-cast Concrete Manholes

1. Pre-cast concrete shall be manufactured with concrete that meets the following requirements:

   (a) Minimum compressive strength shall be 5,000 PSI at 28 days.

   - Pre-cast concrete sections shall not be shipped until after concrete has attained a minimum 5,000 PSI compressive strength.

   (b) Maximum water-to-cement ratio shall be 0.40 by weight.

(c) Minimum cement content shall be 600 lbs of cement per cubic yard of concrete.

(d) Shall conform to American Concrete Institute (ACI) 318 and ACI 350R.

(e) When "fy" exceeds 40,000 psi, "z" (ACI 318) shall not exceed 95 kips/in, "fs" shall be completed and shall not exceed 50 percent of "fy".

(f) Products shall be designed to support their own weight, weight of soil at 130-PCF, and a live load equal to AASHTO HS-20 applied to top slab.

2. Lifting lugs or holes in each pre-cast section shall be provided for proper handling. Lifting lugs shall be provided for the top and bottom slab.

3. Pre-cast concrete manholes base sections, riser sections, transition top sections, flat slab tops and grade rings shall conform to ASTM C478.

4. Pre-cast concrete manholes bottom slab thickness, riser wall thickness, shall be as follows:

Diameter (feet)	Wall Thickness (inches)	Base Thickness (inches)	Max Pipe* (RCP) Diameter Allowed (inches)	Max Pipe* (DI/PVC) Diameter Allowed (inches)
4	5	6	18	24
5	6	8	30	36
6	7	8	36	48

* Pipe diameter may vary depending on number of penetrations.

5. Pre-cast concrete manholes top section shall be eccentric cone where cover over pipe exceeds 4-ft. Top section shall be a flat slab where cover over top of pipe is 4-ft or less.

6. Pre-cast concrete manholes base, riser and transition top sections shall have bell and spigot or joints tongue and groove joints.

7. Pre-cast concrete manhole base, riser, transition top, flat slab top and grade ring shall be designed for a minimum H-20 loading plus earth load. Earth load is 130 Pounds per Cubic Foot (PCF).

8. Pre-cast concrete manhole shall be marked on the inside of each pre-cast section with the date of manufacture, name and trademark of manufacturer.

9. Pre-cast concrete manhole sections shall have a formed, tapered circular opening larger than the intended pipe size (outside diameter).

10. Base slab and walls shall be cast together to form a monolithic base section.

11. Structure walls shall be designed for a lateral pressure based on an equivalent fluid unit weight of 90-Pounds per Cubic Foot (PCF). Pressure diagram shall originate at finished ground surface. Lateral pressure from vehicles shall be included in accordance with AASHTO.

12. Discontinuities in structures produced by openings and joints shall be considered in the design. Additional reinforcing around openings shall be provided. Frame openings shall carry full design loads to support walls.

13. Manhole shall be designed against flotation with ground water level at finished ground surface. Floatation prevention shall be achieved by dead weight of manhole and soil load above it. Skin friction, soil friction, or weight of equipment in manhole, if any, cannot be considered in the design against floatation.

14. Manhole shall be designed with a minimum number of joints. Maximum number of structure sections, including top slab, shall be four.

15. Pre-cast concrete manholes shall be constructed with a bell and spigot or tongue and groove joint.

16. Access openings, wall sleeves, and knockouts shall be provided at locations where indicated by the Commission or shown on Design Drawings and as follows:

    (a) Integrally cast knockout panels shall be sized for intended pipe sizes. Knockout panels shall have no steel reinforcing.

    (b) Pre-cast manhole sections shall have a formed, tapered circular opening larger than the intended pipe size (outside diameter).

    (c) Horizontal wall joints shall be located 18-inches minimum from horizontal centerline of wall openings.

17. Manhole rungs shall be reinforced steel, copolymer polypropylene, 14-in wide, M.A. Industries Inc, PF Series or equal. Copolymer polypropylene shall conform to ASTM D4101 Classification PP0344 B33534 Z02. Steel reinforcing shall be 1/2-in diameter, conforming to ASTM A615, Grade 60 and shall be continuous throughout rung. Manhole rungs shall meet all OSHA requirements.

18. Wall sleeves shall be provided by the pre-cast concrete manufacturer.

19. Delivery shall be specified in terms of number of days from receipt of order.

20. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

21. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable ASTM Standards.

22. References

23. The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

Section 6.2 DAMP PROOF COATING

1. Damp proofing provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Damp proofing shall be of bituminous material and shall conform to ASTM D449

3. Damp proofing shall be Hydrocide 648 by Sonneborn Building Products; Dehydratine 4 by W.R. Grace and Company; Meadows Trowel Mastic (Type 3), or equal products of another manufacturer.

4. Delivery shall be specified in terms of number of days from receipt of order.

5. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

6. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable ASTM Standards.

7. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

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Section 6.3 BRICK MASONRY

6.3.1 General

1. Bricks for masonry provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Bricks for masonry shall be sound, hard, uniformly burned, regular and uniform in shape and size. Under burned or salmon brick are not acceptable. Only whole brick shall be used.

3. Bricks for masonry shall be clay, shale, or similarly naturally occurring earthy substance and subjected to a heat treatment process at elevated temperatures.

4. Delivery shall be specified in terms of number of days from receipt of order.

5. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

6. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable ASTM Standards.

7. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

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   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

6.3.2 Bricks for Channels and Shelves

1. Bricks for channels and shelves shall conform to ASTM C32, Grade SS.

2. Bricks for channels and shelves tested so that the mean of five tests for absorption shall not exceed 8 percent and no individual brick exceed 11 percent.

6.3.3 Bricks for Frame and Cover Adjustment

Bricks intended for use in raising manhole frames to finished grade shall conform to ASTM C62.

Springfield Water and Sewer Commission

Material Specifications

Section 6.4 MORTAR

1. Mortar provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Mortar shall be composed of 1 part portland cement, 2 parts sand, and hydrated lime not to exceed 10-lbs to each bag of cement.

3. Portland cement shall be ASTM C150, Type II; hydrated lime shall conform to ASTM C207.

4. Sand shall be washed, cleaned, screened, well graded with all particles passing a No. 4 sieve and conform to ASTM C33.

5. Delivery shall be specified in terms of number of days from receipt of order.

6. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

7. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable ASTM Standards.

8. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

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   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

Springfield Water and Sewer Commission

Material Specifications

Section 6.5 MANHOLE FRAMES AND COVERS FOR SANITARY SEWERS

1. Manhole frame and covers provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Manhole frames and covers shall be strong, durable, even grained cast iron, smooth, free from scale, lumps, blisters, sand holes and defects of any kind. Manhole covers and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection.

3. The manhole frame and cover shall be certified to meet AASHTO 35 strength of materials requirements. Cast iron shall conform to ASTM A48, Class 30.

4. Manhole covers shall cast iron, have a diamond pattern, pick holes and the words "SPRINGFIELD WATER & SEWER COMMISSION", "SEWER", and the Commission Logo in raised relief in accordance with **Sewer Frame and Cover Details (S-02.4 and S-2.05)**.

5. All manholes frame and covers shall meet the following dimension requirements:

   (a) New manhole frame and covers shall have a 30-inch diameter access opening and a 32-inch diameter cover in accordance with **32" X 8" Sewer Frame and Cover Detail (S-02.4)**.

   (b) Existing manhole frame and covers shall have a 22-inch diameter access opening and a 24-inch diameter cover in accordance with **26" X 6" Sewer Frame and Cover Detail (S-02.5)**.

   (c) The dimensions of the frame and cover must match existing frames and covers such that parts are interchangeable with both the new and existing manhole frame and covers.

6. Pick holes shall include two blind non-penetrating pick holes on the side, and one pocket lift handle with integral stainless steel center rod in the location shown on the standard detail. The strength of the center rod must be such that the manhole cover may be lifted by this rod using a pick or cover lifter without breakage.

7. The manhole shall also include a continuous, self-sealing gasket cemented in a machine groove on the underside of the cover or as otherwise approved by the Commission.

8. Manhole frame and covers seats shall be machined to a true surface.

9. Manhole frame and covers shall be manufactured by LeBaron Foundry or approved equal of another manufacturer.

10. Delivery shall be specified in terms of number of days from receipt of order.

11. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

12. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable ASTM Standards.

13. References

    The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

    (a) Name of Municipality/Utility

    (b) Total amount of product bid on and amount delivered

    (c) Date the bid was accepted and date the product was delivered

    (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

Section 6.6 GASKETS FOR PRE-CAST MANHOLES

6.6.1 General

1. Gaskets for Pre-cast Manholes provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. The gaskets shall assure water tightness and permanent seal.

3. Delivery shall be specified in terms of number of days from receipt of order.

4. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

5. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable ASTM Standards.

6. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

6.6.2 Gaskets for Bell and Spigot Joints

1. Seal bell and spigot joints of pre-cast manhole sections with butyl rubber flexible rope-like gasket material.

2. Butyl rubber flexible rope-like gasket material shall conform to ASTM C990.

3. Butyl rubber flexible rope-like gasket material shall be produced from blends of butyl rubber, refined hydro carbons, resins, and plasticized compounds reinforced with inert mineral filler and be solvent free.

4. Each gasket shall have a self-adhesive nature.

5. Each gasket shall be 1-inch diameter.

6. Each gasket shall be furnished in coils.

6.6.3 Gaskets for Tongue and Groove Joints

1. Seal tongue and Groove joints of pre-cast manhole sections with O-ring gaskets.

2. O-ring gaskets shall conform to ASTM C443.

3. Each gasket shall be a continuous ring of round solid cross section having smooth surfaces free from blisters, porosity, and/or other defects.

4. The tensile strength shall be 1200-PSI.

5. The elongation shall such that a 2-inch gauge mark shall not exceed 9-inches.

Section 6.7 FLEXIBLE MANHOLE SLEEVES/SEALS

6.7.1 General

1. Manhole sleeves, gaskets, and sealants for Pre-cast Manholes provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Manhole sleeves, gaskets, and sealants for Pre-cast Manholes shall be furnished complete with lubricants, stainless steel stops, inserts, clamps, etc.

3. Manhole sleeves, gaskets, and sealants for Pre-cast Manholes shall assure water tightness and permanent seal.

4. Delivery shall be specified in terms of number of days from receipt of order.

5. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

6. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable ASTM Standards.

7. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

6.7.2 Flexible Sleeve/Seals from Pre-cast Concrete Manhole Manufacturer

Flexible sleeves/seals from Pre-cast Concrete Manhole Manufacturer shall be New Lok Joint Flexible Sleeve by Interpace, A-Lok Manhole sleeve by L & L Concrete Products, Press Wedge II by Pre-Seal Basket Corporation, or equal products of another manufacturer.

6.7.3 Flexible Sleeve/Seals Field Applied

Flexible sleeves/seals Field Applied shall be K or N Seal boot, or equal products of another manufacturer.

Section 6.8 NON-SHRINK GROUT

1. Non-Shrink Grout provided to the Commission or Installers shall be manufactured, tested, inspected and delivered in full compliance with this Specification.

2. Grout shall be non-shrink and waterproof.

3. Grout shall be Hallemite, Waterplug, Embeco or approved equal. Plastic pipes shall have a water-stop gasket secured to pipe with a stainless steel clamp.

4. Delivery shall be specified in terms of number of days from receipt of order.

5. The manufacturer/vendor/shipper must use care in preparing the above items for shipment and in handling during shipment and delivery, to insure that the above items are delivered without damage. Damaged items will not be accepted.

6. The manufacturer and/or vendor, on request, shall provide the purchaser with an affidavit for each and every delivery of an order, stating that the above items and all materials in its construction exactly conform to the applicable requirements of these specifications to include the applicable ASTM Standards.

7. References

   The Supplier shall provide references, on request, which shall list a minimum of three (3) Municipalities/Utilities that were, supplied this product, in the last two (2) years. The listing is to include:

   (a) Name of Municipality/Utility

   (b) Total amount of product bid on and amount delivered

   (c) Date the bid was accepted and date the product was delivered

   (d) Reference person with address and desk top phone number whom the Commission has authorization to contact regarding the product

CHAPTER 7 SEWER PUMP STATIONS

Section 7.1 SUBMERSIBLE SEWAGE PUMP STATIONS

7.1.1 General

1. The submersible pumping station shall include all materials, equipment and incidentals required to install wastewater pumping stations with all related interior piping and electrical works as specified herein and in accordance with the **Pre-cast Wet Well and Valve Vault Detail (S-06.0)**, unless otherwise approved by the Commission.

2. Pumps shall be designed for use in wastewater non-clog submersible pumping stations.

3. Reference to specific manufacturers is for the purpose of establishing a quality or parameter for specification writing and not to be considered proprietary.

4. One complete spare pump with motor, power and signal cable, attachments to the guide rails, and pipe connection adaptor for the wastewater pumping station is required.

7.1.2 Submersible Sewage Pumps – Quality Criteria

1. The system shall be furnished by a single supplier who shall be responsible for the coordination of the system design and who shall assume complete responsibility for the proper installation and operation of the system. All parts shall be properly stamped for identification and location. Nameplates giving the name of the manufacturer, the rated capacity, head, speed and all other pertinent data shall be attached to each pump and motor.

2. All equipment furnished shall be new and unused, shall be the standard product of manufacturers having a successful record of manufacturing and servicing the equipment and systems specified herein for a minimum of 5 years.

3. All the equipment specified herein is intended to be standard equipment for pumping all material found in domestic wastewater.

7.1.3 Submersible Sewage Pumps and Pumping System

1. The design characteristics of the pump station shall be and in accordance with the **Pre-cast Wet Well and Valve Vault Detail (S-06.0)**, and as specified herein, unless otherwise approved by the Commission.

2. Two non-clog submersible pumps shall be installed in the pumping station wet well. The two pumps shall be programmed to operate in an alternating lead/lag mode.

3. Pumps shall be automatically started from high level switch and automatically stopped from a low level switch. An alternating switch shall be provided in the control panel such that the operation of one pump shall switch the next automatic start to the other pump. The pumps shall also be capable of manual operation from the control panel.

4. Each of the two pumps shall be sized to handle the maximum flows, thus the pumping system shall provide 100% redundancy.

5. At least one pump shall be equipped with a backwash valve or flush valve. The flush valve shall be designed to allow a minimum of 30 seconds circulation of wastewater in the wet well to re-suspend and de-sludge settled solids.

6. The non-clog pumps and motors shall be designed and manufactured so they can operate completely submerged in the sewage and wastewater. Pump motors shall run indefinitely without overheating with motors un-submerged.

7. The centrifugal pump impeller unit shall be attached to a common motor and pump shaft of stainless steel. Pump and motor housings shall be high quality gray iron castings. Impeller shall be single vane cast iron. All fasteners shall be of Type 316 stainless steel.

8. The pump-motor shaft shall be sealed by two mechanical tungsten carbide faced seals within an oil filled chamber to provide clean, constant lubrication. The shaft shall be supported by an upper ball radial and thrust bearing and a two row angular contact lower bearings both grease lubricated. The upper bearing shall be supported by an O-ring sealed, movable cap so that impeller clearance may be adjusted externally for most efficient operation.

9. The motor winding and rotor shall be mounted in a sealed, submersible type housing which is able to transmit heat from motor winding to outer housing. Motor winding shall be Class F insulated and securely held in the housing with

machine screws so that it may be removed in the field without the use of heat or a press.

10. Pump motors shall be air filled and shall have cooling characteristics suitable to permit continuous operation in a totally, partially or non-submerged condition. Jacket water-cooling shall not be required. The pump and motor shall be capable of running without damage for extended periods. Pump and motor shall be explosion-proof, suitable for Class 1, Division 1, Group C or D applications. Motor shall be provided with pilot thermal sensors embedded in the stator windings. Pumps shall have factory installed moisture detectors (seal failure probes) in the seal chamber.

11. The impellers shall be of the semi-open, single vane, non-clog type with the forward ends of the blades generously rounded to avoid catching trash. The blades shall be tapered toward the periphery of the impeller to generate the maximum possible shutoff head, and the outer tips of the blades shall occupy only a negligible portion of the area of the impeller throat or periphery. The impellers shall be accurately balanced before assembling.

7.1.4 Pumps Station Chambers – Wet Well and Valve Vault

1. The Wet Well and Valve Vault of the pump station shall be and in accordance with the **Pre-cast Wet Well and Valve Vault Detail (S-06.0)**, and as specified herein, unless otherwise approved by the Commission.

2. The underground pump station chambers shall of reinforced concrete construction.

3. Pre-cast concrete barrel sections and pre-cast bases shall conform to ASTM C478, and shall meet the following requirements.

4. No pump station chamber shall be less than 72-inches in diameter.

5. The wall thickness shall not be less than:

Diameter (inches)	72	84	96
Wall Thickness (inches)	7	8	9

6. Structure walls shall be designed for an equivalent water pressure of 90 Pounds per Square Foot (PSF). Pressure diagram shall originate at finished ground surface. Lateral pressure from vehicles shall be included in accordance with AASHTO.

7. Barrel sections shall have tongue and groove gasketed joints.

8. All sections shall be cured and shall not be shipped nor subjected to loading until after 5 days after fabrication and/or repair, or when the concrete compressive strength has attained 5,000 PSI, whichever is longer.

9. Pre-cast concrete barrel sections with pre-cast top slabs shall be designed for a minimum of H-20 loading plus the weight of the soil above. Cracked and/or chipped slabs will not be accepted unless manufacturer's proposed repair methods and manufacturer's guarantees are reviewed and approved by the Commission.

10. The date of manufacture and the name and trademark of the manufacturer shall be clearly marked on the inside of each pre-cast section.

11. Pre-cast concrete base shall be constructed and installed as recommended by the manufacturer and/or detailed by the design engineer. However, the thickness of the bottom slab of the pre-cast base shall not be less than the manhole barrel sections or the top slab, whichever is greater. Bolting of the structure to the base slab shall be with Type 304 stainless steel bolts.

12. The pre-cast base shall be firmly anchored to a reinforced concrete slab designed such that the pumping station is able to fully resist flotation when the groundwater elevation is at the finished ground surface level.

13. The design shall resist flotation and shall account for the dead weight of the structure and base in addition to soil load above the structure. Accounting for skin friction, soil friction, or weight of equipment in the structure is not allowed. Flotation safety factor shall be not less than 1.15.

14. Entrance hatches for the concrete chambers (both wet well and valve vault) shall be aluminum single leaf 30-in by 48-in, complete with upper guide holder, chain holder, and cable holder for pumps. Hatches shall be designed with lift assisting springs for easy opening and closing, and with hold-open arm with red vinyl grip handle that automatically locks cover in the open position against weight and wind. Hatches shall be equipped with a locking mechanism that can be unlocked only by the operator.

15. Hatches shall be designed for H-20 loading.

16. Manhole rungs shall be reinforced steel, copolymer polypropylene, 14-in wide, M.A. Industries Inc, PF Series or equal. Copolymer polypropylene shall conform to ASTM D4101 Classification PP0344 B33534 Z02. Steel reinforcing shall be 1/2-in diameter, conforming to ASTM A615, Grade 60 and shall be continuous throughout rung. Manhole rungs shall meet all OSHA requirements.No rungs shall be allowed in the wet well chamber.

17. The wet well chamber shall be supplied with pump mounting plates with upper and lower rail supports attached to the concrete with stainless steel expansion bolts. Two (2) 2-inch stainless steel pipe or fiberglass I-beam rails shall be installed between the mounting plates. The rails shall be used to raise and lower the pumps into the stations. A stainless steel lifting cable shall be attached to the top of each station chamber and to the top of each pump assembly.

18. The valve vault shall be designed with a minimum internal vertical clearance of 7-feet.

7.1.5 Pumps Station Controls and Ancillary Equipment

1. Sealed tilt type switches shall be supplied to control wet well level and alarm signal. The mercury switches shall be sealed in a solid polyurethane float for corrosion and shock resistance. The support wire shall have a heavy Neoprene jacket. A weight shall be attached to each cord above the float to hold each switch in place in the wet well. The weight shall be placed above or inside the float to effectively prevent sharp bends in the cord when the float operates. The float switches shall hang in the wet well supported only by the cord. Four float switches shall be used to control and signal level; one for high level alarm, one for pump turn-on, one for pump turn-off and one for low-level alarm.

2. The Commission may approve an alternate wet well level control set up utilizing an ultrasonic level transducer and one tilt type switch for high level alarm. The Commission may consider this method if the Commission is satisfied that physical and hydraulic conditions in the wet well do not impede the accuracy of the ultrasonic transducer readings. The Commission reserves the right to reject this method at its own discretion.

3. Level settings shall be as designed to ensure a minimum pumping cycle of 15 minutes under maximum flows.

4. Power cables shall be suitable for submersible pump and Class 1, Division 1, Group C or D applications. Cable sizing shall conform to National Electrical Code specifications for pump motors. Cable entry to each pump motor shall be designed for submersible pump applications. The cable entry junction box and motor shall be separated by a stator load sealing gland which shall isolate the motor interior from foreign materials gaining access through the pump top. The electrical power cords shall be sealed by use of a cord grip, with individual conductors additionally sealed into the cord cap assemblies with epoxy sealing compound.

5. The cord grip shall have a male tapered pipe thread, threaded into a female tapered pipe thread in a cord cap. The cord cap shall be sealed into the motor housing with an O-ring. The pumps shall be supplied with a sufficient length of cord to connect to junction boxes inside the station.

6. Level settings shall be as follows:

   (a) On wet well level rise, the "pump OFF" level mercury switch shall be energized. When the level reaches the "pump ON" level switch, it shall be energized and send a signal to the control panel and automatically turn on a pump. One pump shall operate until the wet well level drops down to the "pump off" and the switch automatically turns the pump off. Under normal operation, the duty and standby pumps shall alternate service after each pump cycle is complete and the in-service pump called to stop.

   (b) If wet well level rises to the high water level or falls to the low water level, the alarm level switches shall be energized with an alarm signal that there is a malfunction at the Pumping Station. Upon high water level alarm, the duty pump shall be called to stop and the standby pump shall be started in its place. The high water alarm shall also disable the alternation circuit to prevent re-starting of the faulty pump. A momentary contact pushbutton shall be provided and mounted within the control panel to reset the alternator circuit once both pumps have become operational.

   (c) Should the duty pump fail to start, the standby pump shall be automatically started after a one minute time delay, the failed duty pump shall be locked out, an alarm transmitted and the standby pump shall continue to operate through every cycle. Both pumps shall not be capable of running at the same time when operating in the automatic mode. Each pump shall be capable of being operated manually from the control panel. All level switches shall be adjusted for level setting from the surface.

7. Each float switch shall have a sufficient length of cord, be intended for submersible service and Class 1, Division 1, Group C or D applications, such that the switches can be connected to junction boxes inside the station.

7.1.6 Pumps Station Control Panels

1. The control panels shall be housed in the emergency generator building.

2. Unless approved by the Commission, power supply to the control panels shall be 480 Volts, 3-Phase, 60 Hz. A combination motor circuit protector / disconnect switch and magnetic starter with Class 10 overload protection, and two NO, two NC contacts shall be provided for each pump.

3. The motor circuit protector disconnect switch shall have short circuit rating of 22,000 AIC and shall be interlocked with the door handle of the control panel. An interlock relay shall be provided to automatically re-connect the control circuit in case of circuit breaker trip on one pump. Each pump control circuit shall be supplied with an H-O-A switch, on-off lights LED Type Cluster and running time meter.

4. An automatic alternator shall be provided to alternate the sequence of operation of the pumps on the completion of each pumping cycle. Terminal strips shall be provided for connecting pump and control wires. Additional terminals shall be provided to connect alarms. A transformer shall be supplied to provide 24-volt power to the control circuit. An essentially safe barrier relay shall be provided between each float level switch and the terminal strip in the pump control panel. Relays shall be GEM Safe-Pac Division of Delaval or equal.

5. Lockout-Tag out provision shall be provided. At a minimum, provisions shall be provided to padlock unit disconnect handles in the OFF position with up to three padlocks.

6. The following control panel mounted indicating lights and nameplates shall be included:

   (a) High Level

   (b) Low Level

   (c) Moisture in Motor No. 1

   (d) Moisture in Motor No. 2

(e) Over-heating - Motor No. 1

(f) Over-heating - Motor No. 2

7. All alarms shall be common to an output contact rated 5 amperes at 120 VAC. See SCADA requirements in Section---

7.1.7 Pumps Station Communication System

1. The pump station shall be equipped with radio contact and SCADA system for relay of alarms and monitoring signals to pump station operator.

2. Radio/SCADA systems must be compatible with the Springfield Water and Sewer Commission Operator's system, namely United Water (UW). Contact UW at (413) 732-0293 for coordination of design/procurement of communications equipment.

7.1.8 Pumps Station Piping and Valves

1. Ductile iron (DI) pipe shall be used for sewer pump station piping and shall be in accordance with the **Pre-cast Wet Well and Valve Vault Detail (S-06.0)** and as specified herein, unless otherwise approved by the Commission.

2. DI pipe shall conform to AWWA C151, and shall in accordance with the Commission's Material Specifications for Water Pipe – Flanged Ductile Iron Pipe, unless otherwise approved by the Commission.

3. Gaskets shall be full-face rubber (EPDM) with cloth insertion, 1/8-in thick and shall conform to the dimensions shown in Table A.1 of AWWA C115, unless otherwise approved by the Commission.

4. Flanged joints shall be supplied with bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped. The number and size of bolts shall conform to the same standard as the flange. Low carbon steel bolts and nuts shall conform to ASTM A307, Grade B.

5. Fittings shall be ductile iron, shall have the same pressure rating as the DI pipe, shall be in accordance with the Commission's Material Specifications for Ductile Iron Pipe Fittings and provided in accordance with the **Pre-cast Wet Well and Valve Vault Detail (S-06.0)** and as specified herein, unless otherwise approved by the Commission Fittings.

6. All pipe and fittings shall have a double thick cement mortar lining and bituminous seal coat on the inside, in accordance with AWWA C104.

7. All pipe and fittings shall have a bituminous seal coat on the outside, in accordance with AWWA C104.

8. The valves for isolation shall be flanged gate valves, and shall be in accordance with the Commission's Material Specifications for Gates Valves for pressure class 250, and provided in accordance with the **Pre-cast Wet Well and Valve Vault Detail (S-06.0)** and as specified herein, unless otherwise approved by the Commission

9. The check valves required for prevention of backflow shall be flanged, 250 psi working pressure, bronze-mounted, with bronze seat ring and bronze gate ring. Check valves shall comply with the applicable portions of AWWA Standard for Gate Valves. Valves shall be fitted with an extended hinge arm with outside lever and spring.

10. Sleeve type couplings for exposed ductile iron pipe shall be of steel construction and shall be in accordance with the Commission's Material Specifications for Couplings, and provided in accordance with the **Pre-cast Wet Well and Valve Vault Detail (S-06.0)** and as specified herein, unless otherwise approved by the Commission. Gaskets shall be of a composition resistant to wastewater components.

7.1.9 Pressure Gauges

1. Pump Station Pressure Gauges shall have a 4-1/2-in nominal diameter black case with phosphor bronze Bourdon tubes (beryllium copper bellows), 1/4-in NPT male connections, stainless steel rack and pinion movement micro-adjustment for calibration, white dials and black figures and threaded ring case. All gauges shall be furnished with factory mounted protective diaphragm attachment suitable for wastewater service. Gauges shall read 0 to 50 PSI unless otherwise required by design conditions and as approved by the Commission.

2. Pump Station Pressure Gauges shall be provided with copper nipples complete with "T"-handle cocks. Nipples shall be at least 2-in long and provided with elbows for easy installation and reading of the gauges.

3. Gauges shall be manufactured by U.S. Gauge, Feasterville, PA; Crosby-Ashton, Wrentham, MA; or approved equal.

7.1.10 Vent

1. Vent shall be Steel Schedule 40, ASTM A53, hot-dipped galvanized with threaded, 150 lb, hot-dipped galvanized malleable iron fittings.

2. Vent shall be provided with a stainless steel bug screen.

3. The Commission may consider an alternate, such as Schedule 80 PVC for material depending on Pump Station location, site accessibility and proximity to traffic. Approval of this alternative is at the sole discretion of the Commission.

7.1.11 Emergency Power Generation

1. Pump station shall be equipped with a stand-by emergency power generation source.

2. Power generators shall be provided to supply adequate power required to energize the pumps at full flow capacity, and the pump station electrical and incidental systems.

3. Type of fuel, storage capacity, and storage location shall be approved by the City of Springfield Fire Department.

4. Power generators shall be Cummins, Caterpillar, or approved equal.

7.1.12 Housing for the Emergency Power Generation

1. The housing shall be pre-cast concrete building and sized and configured to adequately house all equipment and incidentals specified herein including, but not limited to, the emergency power generator, pump station control panels, transfer switch, generator controls, heaters, SCADA and communication equipment, and anything else incidental to the pump station design and as required by the design engineer.

2. The building shall meet American Concrete Institute (ACI) 318-02, the Building Code Requirements for Structural Concrete IBC 2003, and City of Springfield Code Enforcement requirements, all the latest versions,

3. Minimum design criteria:

   (a) Floor live load: as required by weight of generator. Minimum 150 psf

(b) Roof live load:60 psf unless otherwise directed by the design engineer

(c) Wind Load: 130 mph

(d) Load factors: Live = 1.7; Dead = 1.4

(e) Concrete minimum compressive strength: 5,000 psi @ 28 days, reinforcing steel shall meet ASTM A615, Grade 60

4. The housing shall be suitable for securing the power generator unit; shall provide weather and sound attenuation; and shall be designed to meet the cooling air flow, heat exchange, exhaust air, sound muffling, space heating and all else required by the emergency generator unit manufacturer.

5. The housing façade shall be brick, wood, vinyl, or other type of siding as approved by the Commission. The Commission shall select the building façade type that is most similar to the pump station area houses/buildings.

6. Roof shall consist of weather proof shingles and UV blockers, shall be resistive to cracking and splitting and shall be non-combustible providing a UL Class A fire rating.

7. Prefabricated housing units may be proposed for the Commission's consideration. The Commission reserves the right to approve or reject this alternative at its sole discretion.

7.1.13 Pump Station Site

Pump station site shall be in accordance with the Commission's Guidelines and Policies.

7.1.14 Submittals

1. Shop drawings detailing all materials, equipment performance information, and design drawings including structural, architectural, mechanical, civil and general. All design drawings shall be stamped by a professional engineer registered in the Commonwealth of Massachusetts.

2. Pumps manufacturer shall include rating curves and details of pump construction. The curves shall indicate head, discharge rate, pump efficiency, and horsepower characteristics throughout the full operating range.

3. Stand-by power generator manufacturer shall include generator unit dimensions, weight, fuel consumption rates, radiator cooling air requirement, combustion air volume, heat radiated to room, noise level, and all else required for completing the pump station design.

4. A pump station testing, startup, and operation plan listing name of qualified pump station operator(s) who is responsible of testing, operating, maintaining, and monitoring the pump station.