REGULAR MEETING – KINGSTON WATER BOARD
TUESDAY DECEMBER 8, 2020
KINGSTON CITY HALL

IN AN EFFORT TO HELP REDUCE THE SPREAD OF COVID-19, THIS MEETING WAS CONDUCTED THROUGH ZOOM AND WAS LIVESTREAMED ON OUR WEBSITE, WWW.KINGSTONTN.GOV AND WAS POSTED TO OUR FACEBOOK PAGE.

The Regular Meeting of the Kingston Water Board was held on Tuesday, December 8, 2020. Chairman Neal called the meeting to order with the following members present upon roll call: Member Brown, Member Childs, Vice-Chair Humphreys, Member Stockton, Member Wright and Chairman Neal.

**PREVIOUS MINUTES**

A motion made by Member Wright, second by Vice-Chair Humphreys to waive the reading and approve the minutes as written the minutes of the regular meeting on November 17, 2020

The motion passed with a unanimous roll call vote. 6 Ayes

**Citizen Comments** – None
**Board Comments** – Member Wright requested the results of the 2020 Census when they are received.
**UTILITY DIRECTOR'S REPORT** – Mr. Bolling gave updates on the following:

- Spring Street Paving Complete after the recent water main break. Thanks to the Roane County Highway Department for the use of equipment to complete this project.
- Upcoming CDBG Grant Cycle.

**New Business**:

1. **Consideration to adopt TDEC mandated water and sewer specifications for the City of Kingston.**

A motion was made by Member Brown, second by Member Wright to adopt TDEC mandated water and sewer specifications for the City of Kingston.

The motion passed with a unanimous roll call vote. 6 Ayes

Chairman Neal adjourned the meeting. 6:23 pm

APPROVED 1-12-2021

Timothy Neal, Chairman

ATTEST:

City Clerk

# STANDARD WATER SPECIFICATIONS
# CITY OF KINGSTON
# ROANE COUNTY, TENNESSEE

SYSTEM APPROVAL

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CITY OF KINGSTON

NOVEMBER 2020

# WATER LINE SPECIFICATIONS

## PART 1 GENERAL

### 1.1 PREFACE

A. The standard specifications have been prepared to complement the standard detail drawings and to provide the qualitative requirements for products, materials and workmanship or construction of additions to and replacements of the water system of the City of Kingston. These Standard Specifications are only to be used for projects with Drawings which have been approved by the Tennessee Department of Environment Conservation, Division of Water Resources as prepared by a developer's engineer whose drawings must first be approved by the City of Kingston. All standard specifications are subject to revision for a special project.

## PART 2 REQUIREMENTS

### 2.1 ENGINEERS REQUIREMENTS

A. The engineer shall field verify all utilities' locations and elevations.

B. The engineer shall provide a proposed site plan drawing to the City of Kingston to be approved before the project starts. If the City of Kingston returns the drawings to the engineer with revisions the drawings shall be revised by the engineer and returned to the City of Kingston.

C. The engineer shall have the drawings accepted by the City of Kingston before sending them to the Tennessee Department of Environment and Conservation.

D. The engineer shall provide the City of Kingston with two sets of paper copy as-built drawings and an electronic copy in dgn format after the job has been completed.

E. The engineer shall provide the items listed below on the As-built drawings:
   1. Location of Waterline
   2. Location of Valves
   3. Location of Fire Hydrants
   4. Location of Water Service Stub Outs
   5. Location of Blow-Offs
   6. Type of Pipe Materials

## 2.2 CONTRACTORS REQUIREMENTS

A. The contractor shall guarantee all materials, equipment and workmanship for a period of one year from the date of final acceptance of the work by the City of Kingston. If during this time period any material, equipment, or item of construction proves defective, the contractor shall make the repairs at their own expense to the City of Kingston specifications.

B. The contractor shall comply with all applicable laws, regulations and requirements which may or may not be included in these technical specifications, including, but not limited to, contractor Licensing Act of 1994, as amended, and the Tennessee State, Health, and Labor Standards.

C. The contractor shall obtain all licenses and permits prior to the start of work. Copies of each permit shall be submitted to the City of Kingston. The contractor shall have their municipality utility license to install water lines in the City of Kingston. The contractor shall be responsible for obtaining permission to work in the right-of-way from the necessary agencies.

D. The contractor is required to contact the City of Kingston inspector three days prior to construction for a pre-construction meeting.

E. The contractor shall submit three (3) copies of the materials they plan to use.

F. The contractor is responsible for getting the most recently revised plans and to be working off those plans.

G. The contractor is responsible for pre-testing all lines before calling the City of Kingston for testing. The contractor is responsible for calling the inspector and setting up testing dates seven days prior to final testing.

## 2.3 DEVELOPER REQUIREMENTS

A. The developer shall read and sign a Developers Agreement and return it to the City of Kingston main office.

B. The developer shall refer to the Developers Agreement for most requirements.

C. The developer is responsible for the engineer and contractor meeting their requirements.

D. The developer is responsible for all costs in providing the City of Kingston with as-built plans.

PART 3 PRODUCTS

3.1 PIPE

A. PVC Pipe: (2"- 4") SDR 17 Class 250 with elastomeric gasketed joints, 20-foot laying length. Integral thickened bell at annular recess designed, sized and shaped so that gasket is locked in place against displacement. The City will insist on approving the manufacturer on all pipe and fittings.

B. PVC Pipe Ultra-Blue: (6"-12") ASTM F1483, Class 200 with elastomeric gasketed joints, 20-foot laying length. Integral thickened bell at annular recess designed, sized and shaped so that the gasket is locked in place against displacement.

C. Ductile Iron Pipe shall be in conformance with AWWA C151/A21.51 Standard, Pressure Rating of 250 PSI, and push on joints lined with cement mortar according to ANSI 21.4/AWWA C-104. Ductile Iron fittings shall meet AWWA C110 standards, Pressure Rating of 250 PSI and made in the United States with no slots. Joints shall be in conformance with AWWA standards C111/A21.11, Rubber gasket joints for Ductile-Iron Pressure Pipe and fittings. **All water pipe over 12" in diameter, Fire Lines, and water lines under paved areas shall be ductile iron pipe.** All pipe, fittings, and jointing compound shall be NSF approved and shall be appropriately marked or labeled.

D. Polyethylene pipe (HDPE) shall have a co-extruded blue cover or stripes designating use for potable water. Pipe shall be SDR 11 PE 3408, manufactured by an approved manufacturer. Pipe with extruded blue stripes shall have a minimum of three equally spaced stripes. Pip shall have a heat indented print line containing the information required in ASTM D 3035.

PART 4 EXECUTION

4.1 GENERAL REQUIREMENTS

A. All ductile iron, HDPE, and PVC shall be installed with a 12-gauge solid copper wire with coating, which shall extend above ground 3 feet in valve boxes and shall run up fire hydrants base and be fixed to the bottom flange with 2" accessible.

B. During pipe installation contractor shall take every precaution to prevent foreign material from entering the pipe. When installing pipe through a bored hole the leading end of the pipe to be inserted shall be closed. After water pipe has been placed in the ditch or inserted through a bored hole it shall be examined for

damage. Damaged pipe shall be replaced, and corrective measures shall be taken to prevent damage to the replacement pipe.

C. All pipes laid at a slope of 20 percent or greater will use an additional restrained joint fitting.

D. Wherever pipe must be deflected from a straight line the pipe shall not break more than 11" in a 20' joint or a 11'1/8" or 22'1/2" bend will be installed at the bend.

E. Minimum cover of 36 inches shall be provided over the top of the pipe, except under streets and driveways where 48 inches of cover shall be provided.

F. Connections to existing lines and connection of service lines shall be coordinated with the City of Kingston.

G. All intersections will be built with ductile iron pipe regardless of line material being used (all hydrants, short nipples between valves, fittings, etc. shall be ductile iron). All intersections will be rodded together or employ a restrained-joint gland (mega-lugs count as a restrained-joint gland), but not a retainer gland, and will be so constructed to allow placement as a unit. Quick connect adapters (Flex T-3) can be used if approved by the City of Kingston. Concrete thrust blocking may be required but does not replace restrained joint construction.

H. Whenever pipe installation is not in progress, the open ends of the pipe shall be closed either with a watertight plug or by other means approved by the City of Kingston.

I. If the water main to be installed parallels a sewer line, there must be at least 10 feet horizontally from any sewer or sewer manhole. In conditions where the 10 feet of horizontal separation cannot be obtained, the water main shall be laid in a separate trench so that the bottom of the water main is at least 18 inches above the sewer pipe.

J. If the water main to be installed crosses under a sewer line, the water main must be Ductile Iron Pipe for a distance of 10 feet on either side of the sewer, with a full pipe section centered under the sewer, along with an 18" minimum separation. The water main, when installed under the sewer, shall be encased in concrete with a minimum 6" concrete depth to the first joint in each direction.

K. For all roadway crossings and stream crossings, water pipe shall be installed in a casing pipe double the size of the water main. The pipe shall be centered with centering spacers at each end of the casing and at each bell of pipe. All pipe inserted through casing must be ductile iron pipe.

L. All water mains installed that come to a dead end must have a flushing device at the end of the line.

4.2 HIGH DENSITY POLYETHYLENE (HDPE)

A. Prior to installing pipe through a bored hole, ensure that the size of the hole is of sufficient diameter to prevent pipe stress during installation. The leading end of the pipe to be inserted shall be closed to prevent the entrance of dirt and debris. After insertion, the leading end of the pipe shall be examined in the exit bell hole to ensure that the pipe has not been damaged during insertion. Damaged pipe shall be replaced after corrective measures have been taken to prevent damage to the replacement pipe.

B. HDPE pipe shall be handled using canvas or nylon slings. If a forklift is to come in direct contact with HDPE pipe, the forks shall be padded. HDPE pipe shall be stored in a manner, which minimizes crushing or bending. HDPE pipe should lay flat and be stacked no higher than 84 inches.

C. HDPE fusion joints shall be allowed to cool for the required time. The contractor shall be qualified to perform HDPE fusion by the product manufacturer and shall provide proof of qualification prior to beginning work.

4.3 HDPE PIPE JOINING

A. HDPE pipe must be joined using a qualified joining procedure and by persons qualified on that procedure.

B. HDPE shall be joined using socket fusion for 2 inch and smaller; butt fusion larger than 2 inches. Fusion shall take place weather conditions acceptable to the City of Kingston.

C. Contractor fusion training shall be completed by a manufacturer or manufacturer representative acceptable to the City of Kingston. Contractor shall provide proof of Training.

D. Mechanical couplings designed for use in HDPE piping systems have qualified installation procedures developed by the manufacturers. These procedures shall be followed for installation.

E. Aqua-grip or other approved City of Kingston fittings shall be used for wet tie-ins.

# PART 5 THRUST BLOCKING

## 5.0 GENERAL REQUIREMENTS

A. Thrust blocking shall be provided at all bends of 11'1/4" or greater and tees and valves. Blocking shall be poured against undisturbed earth and shall be a minimum of 12 inches thick and 3000 psi and Reconstructed so that the pipe and fitting joints will be accessible for repairs. All pipe and fittings in contact with concrete thrust blocks should be wrapped in plastic sheeting. Refer to the chart below for thrust blocking reference: **If pressure exceeds test pressure in chart below contractor shall recalculate thrust blocking volume.**

| THRUST BLOCKING CHART | | | |
|---|---|---|---|
| PIPE SIZE @ TEST P.S.I. | VERTICAL BEND (degrees) | VOLUME OF CONCRETE (ft cubed) | SIDE OF CUBE (FEET) |
| 4" @ 300 psi | 11 1/4 | 8 | 2 |
| | 22 1/2 | 11 | 2.2 |
| | 30 | 17 | 2.6 |
| | 45 | 30 | 3.1 |
| 6" @ 300 psi | 11 1/4 | 11 | 2.2 |
| | 22 1/2 | 25 | 2.9 |
| | 30 | 41 | 3.5 |
| | 45 | 68 | 4.1 |
| 8" @ 300 psi | 11 1/4 | 16 | 2.5 |
| | 22 1/2 | 47 | 3.6 |
| | 30 | 70 | 4.1 |
| | 45 | 123 | 5.0 |
| 12" @ 250 psi | 11 1/4 | 32 | 3.2 |
| | 22 1/2 | 88 | 4.5 |
| | 30 | 132 | 5.1 |
| | 45 | 232 | 6.1 |
| 16" @ 225 psi | 11 1/4 | 70 | 4.1 |
| | 22 ½ | 184 | 5.7 |
| | 30 | 275 | 6.5 |
| | 45 | 478 | 7.8 |
| 20" @ 200 psi | 11 1/4 | 91 | 4.5 |
| | 22 ½ | 225 | 6.1 |
| | 30 | 330 | 6.9 |
| | 45 | 560 | 8.2 |
| 24" @ 200 psi | 11 1/4 | 128 | 5.0 |
| | 22 ½ | 320 | 6.8 |
| | 30 | 480 | 7.9 |
| | 45 | 820 | 9.4 |

# PART 6 SERVICE ASSEMBLIES

## 6.1 PRODUCTS

A. Corporation Stop: The corporation stop shall be made of solid bronze and furnished with AWWA CC threads and compression connections for Type-K Copper.

B. Service Line: All 3/4"- 1" service lines shall be Type K copper or Municipex – Municipal Grade Service Line – 200 psi with another type to receive final approval from the City of Kingston before final usage.

C. Tapping Saddle: Tapping saddle shall be threaded to accept the corporation stop specified above. All tapping saddles shall be a ductile saddle with an epoxy coating with a stainless-steel band.

D. Ball Valve: 3/4" or 1" ball valve with a 5/8" reduced port is required. All ball valves must be female pipe thread or compression.

| ITEM | MODEL # | BRAND | DETAILS |
|---|---|---|---|
| Corporation Stop | B25008 | Mueller | CC Threads |
| | Fb1000 | Ford | CC Threads |
| Tapping Saddle | DR2S | Mueller | CC Threads ¾ &1" |
| | FS202 | Ford | CC Threads ¾"&1" |
| Ball Valve | B25170R | Mueller | |
| | B41 Series with Q nut | Ford | |
| Yoke | 234B2458R2 | Mueller | 5/8 X ¾ X 7 |
| | VBH72-7W-4M-33-Q | Ford | 5/8 X ¾ X 7 |
| Meter Box for ¾" Meter | MS1518B | Old Castle | 13"x 24" x 15" Plastic Box with Cast Iron Reader in Middle |
| Meter Box Lid for ¾" | | Old Castle | 13"x 24" x 15" Plastic Box with Cast Iron Reader in Middle |
| Meter Box for 1-2" | | | Jumbo Box with a Cast Iron Reading Lid |

## 6.2 GENERAL REQUIREMENTS

A. The contractor will be responsible for running all service lines using a tapping saddle, corporation stop, service line and a ball valve at the end of the service line.

B. The service line shall have a ¾" or 1" ball valve at the end of the line. The ball valve shall have a piece of 6" PVC Pipe, painted blue, with a cap extending 3 feet above the ground over the top of it.

C. The service line shall have a minimum of 18 inches of cover.

D. The contractor is responsible for providing temporary services as approved by the City where needed.

E. Services crossing a road or driveway must be in casing a **minimum of three inches in diameter.** This casing pipe maybe PVC or HDPE. If the service is installed 3 feet to 8 feet deep, thin walled PVC may be used.

## PART 7 VALVES

### 7.1 VALVES

| VALVE | MODEL NUMBER | TYPE |
|---|---|---|
| Gate | A2360 | Mueller |
| Butterfly | B5227 | Mueller |
| Gate | 7571-01 | M&H |
| Butterfly | 4500-MJ-Cl250 | M&H |
| Gate | Series 2500 | American |

A. Gate Valves (2" – 12") shall be iron body, bronze trim, resilient wedge design, non-rising stem, turning **counterclockwise to open**. Valves shall meet the requirements of AWWA C509. Internal and external iron surfaces of the valve shall be coated with fusion bonded epoxy meeting the requirements of AWWA C550. All Valves shall be by Mueller, M&H, or American. The City of Kingston must approve the class of the valve being used before installing.

B. Gate Valves (12" & Larger) shall be resilient wedge type rated for 250 p.s.i.g. cold water working pressure. The gate valve stem and wedge nut shall be copper alloy in accordance with Section 4.4.5.1 of AWWA C515 standard.

C. Butterfly Valves (12" & Larger) all butterfly valves shall be of the rubber-seated tight-closing type. They shall meet or exceed performance requirements for AWWA specification C504. A City of Kingston inspector must approve class of valve.

D. Valve boxes shall be standard design cast-iron with cover. Boxes shall be two-piece coal tar coated, screw and adjustable type, consisting of a cover marked water. Valve boxes must be set to be flush with finished grade. **All valves shall have a valve box.**

E. Both valve ends shall be mechanical-joint per AWWA Specification C111. Accessories (Bolts, glands and gaskets) shall be supplied by the valve manufacturer.

F. All internal and external surfaces shall have an epoxy coating. Epoxy coating shall conform to AWWA standard C550.

G. The operating nut and valve box shall be extended if deeper than five feet. The extension must be approved by C.

## PART 8 HYDRANTS

### 8.1 HYDRANTS

| MODEL NUMBER | SIZE | OPEN | TYPE |
|---|---|---|---|
| 421 | 4 ½" | RIGHT | Mueller |
| 129 | 4 ½" | RIGHT | M & H |
| MK73 | 4 ½" | RIGHT | American |

A. Fire hydrants where the system can provide greater than 500 gpm @ 20 psi shall be designed for 150 PSI working pressure. Valve opening shall be 4-1/2 inches. Hydrant shall be equipped with two 2-1/2-inch nozzles, with National Standard threads. Hydrant shall be of the break-flange type. Hydrant shall be furnished with auxiliary gate valve and box.

B. Hydrants shall be by Mueller, M&H, or American (Model MK73). Hydrants shall be open right.

C. There shall be a hydrant or a blow-off valve at the dead end of every main.

# PART 9 BLOW-OFFS AND AIR RELEASE VALVES

## 9.1 BLOWOFFS

A. Blow-offs shall be made of all brass material with a 90-degree bend. A resilient wedge design valve shall be used on blow-off assemblies. Refer to the drawings to see specifications.

## 9.2 AIR RELEASE VALVES

A. Refer to site plans for placements of air release valves. Site plans are subject to change by the request of the City of Kingston.

B. Valves shall be manufactured and tested in accordance with American Water Works Association standard C512.

| VAL-MATIC AIR RELEASE VALVES | | | | | | | |
|---|---|---|---|---|---|---|---|
| MODEL NO. | HEIGHT | WIDTH | INLET SIZE N.P.T | OUTLET SIZE | ORIFICE SIZE | MAX W.P. | WT. LBS. |
| 15A<br>15A.2 | 5 1/4" | 4 3/4" | ½"<br>¾" | ½" NPT | 1/16" | 175 PSI | 6 |
| 22.4<br>22.9 | 6" | 5 1/8" | ½"-¾"<br>½"- 1" | ½" NPT | 3/32"<br>1/16" | 175 PSI<br>300 PSI | 8 |
| 25.5<br>25.6 | 7" | 6 1/8" | ¾"- 1" | ½" NPT | 1/8"<br>5/64" | 150 PSI<br>300PSI | 11 |

| APCO AIR RELEASE VALVES | | | | | | | |
|---|---|---|---|---|---|---|---|
| MODEL NO. | HEIGHT | WIDTH | INLET SIZE N.P.T | OUTLET SIZE | ORIFICE SIZE | MAX W.P. | WT. LBS. |
| 200A | 10" | 7" | 1" | ½" NPT | 5/16" | 50 PSI | 20 |
| 200A | 10" | 7" | 1" | ½" NPT | 3/16" | 150 PSI | 20 |
| 200A | 10" | 7" | 1" | ½" NPT | 5/32" | 300 PSI | 20 |

| A.R.I. COMBINATION AIR VALVE | | | | | | | |
|---|---|---|---|---|---|---|---|
| MODEL NO. | HEIGHT | WIDTH | INLET SIZE N.P.T | OUTLET SIZE | ORIFICE SIZE | MAX W.P. | WT. kg |
| D-040-C | 5.9" | 4.6 | 1" | ¾"-1"-2" | 3/8" BSP | 230 psi | 1.7 |

## PART 10 TESTING & DISINFECTING

### 10.1 FIELD TEST

A. All newly installed water lines shall be tested in the presence of the City of Kingston before being placed into service. Prior to making tests, all air shall be expelled from the pipe. The Contractor is responsible for installing taps at high points of the line for purpose of expelling air if necessary.

B. A two-hour test shall be made in accordance with AWWA testing procedures on the pipeline between valves or temporary plugs at a test pressure of 200 psi, for two hours with no loss of pressure.

C. All newly installed lines shall be pre-tested by the contractor before contacting the City of Kingston for a leakage test. The Contractor will be responsible for costs or lost time incurred by the City of Kingston when attempting to test a faulty line. The contractor will be charged by the City 250 dollars if the first test fails and a second test is needed at a later date.

### 10.2 FLUSHING AND DISINFECTING

A. All new sections of water mains including repaired portions of or extensions to existing systems must be flushed, disinfected and tested for bacteriological quality before being put into service. Disinfection must be by the use of chlorine or chlorine compounds in such amounts as to produce a concentration of at least 25 ppm at the end of 24 hours and followed by flushing.

B. During installation, be certain to use the necessary amount of chlorine (HTH granules) necessary to provide proper disinfection. A chart will be provided to s how much granular HTH must be added to each pipe length according to its diameter. This should produce a chlorine residual of about 25mg/L.

| **Number of 5 gram hypochlorite tablets required for 25 mg/L dosage** | | | | | |
|---|---|---|---|---|---|
| PIPE DIAMETER | 13 or less | 18 | 20 | 30 | 40 |
| 4" | 1 | 1 | 1 | 1 | 1 |
| 6" | 1 | 1 | 1 | 2 | 2 |
| 8" | 1 | 2 | 2 | 3 | 4 |
| 10" | 2 | 3 | 3 | 4 | 5 |
| 12" | 3 | 4 | 4 | 6 | 7 |
| 16" | 4 | 6 | 7 | 10 | 13 |

C. Once the installation is complete, SLOWLY fill the line (approximately 1 ft/sec) to ensure that the calcium hypochlorite granules are not flushed to the end of the line. Also, take action to release trapped air in the line while filling the line at dead ends and/or high points

D. Once the chlorinated water has remained in the line for 24 hours, there should be detectable chlorine residual in the line at any given point. The line can now be flushed to discharge heavily chlorinated water. This can be achieved through a hydrant using a diffuser to reduce the chlorine residual to a minimum. Final chlorine residual should be less than 4 mg/L. Once this is achieved, the main is now ready for bacteriological testing and pressure testing. These two tests can be coordinated through the City inspector.

| Pipe Size (Inches) | Flow Required For 2.5 ft/sec (gpm) | Orifice Size (Inches) | Hydrant Outlet(s) (number) | Hydrant Nozzle Size Inches |
|---|---|---|---|---|
| 4 | 100 | 15/16 | 1 | 2-1/2 |
| 6 | 220 | 1-3/8 | 1 | 2-1/2 |
| 8 | 390 | 1-7/8 | 1 | 2-1/2 |
| 10 | 610 | 2-5/16 | 1 | 2-1/2 |
| 12 | 880 | 2-13/16 | 1 | 2-1/2 |
| 14 | 1200 | 3-1/4 | 2 | 2-1/2 |
| 16 | 1565 | 3-5/8 | 2 | 2-1/2 |
| 18 | 1980 | 4-3/16 | 2 | 2-1/2 |
| 20 | 2440 | 4-3/16 | 2 | 2-1/2 |
| 24 | 3470 | 4-3/16 | 2 | 2-1/2 |

E. Two sets of samples will be taken 24 hours apart and will be collected by City of Kingston. Samples will need to be collected every 2500 feet. Until the sample test results are found to be satisfactory the line is not to be put into service.

F. Following disinfection, all treated water shall be thoroughly flushed from the newly laid pipeline at its extremities until the replacement water throughout its length shall, upon test, be proved comparable to the quality of water served the public from the existing water supply system and approved by the Tennessee Department of Environment and Conservation, Division of Water Resources. This quality of water delivered by the new main should continue for a period of at least two full days as demonstrated by laboratory examination of samples taken from a tap located and installed in such a way as to prevent outside contamination. Samples shall not be taken from an un-sterilized hose.

**END**

# CITY OF KINGSTON

# STANDARD SEWER SPECIFICATIONS

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# TABLE OF CONTENTS

# SANITARY SEWER (GRAVITY)

## PART 1 GENERAL

### 1.1 Preface

A. The standard specifications have been prepared to complement the detail drawings and to provide the qualitative requirements for products, materials and workmanship for construction of additions to and replacements of the wastewater system of the City of Kingston. These Standard Specifications are only to be used for projects with Drawings which have been approved by the Tennessee Department of Environment Conservation, Division of Water Resources as prepared by an engineer whose drawings must first be approved by the City of Kingston. All standard specifications are subject to revision for a special project.

## PART 2 REQUIREMENTS

### 2.1 Engineers Requirements

A. The engineer shall field verify all utilities' locations and elevations.

B. The engineer shall provide a proposed site plan drawing to the City of Kingston to be approved before the project starts. If the City of Kingston returns the drawings to the engineer with revisions the drawings shall be revised by the engineer and returned to the City of Kingston.

C. The engineer shall have the drawings accepted by the City of Kingston before sending them to The Tennessee Department of Environment and Conservation.

D. The engineer shall provide the City of Kingston with two sets of paper copy as-built drawings and an electronic copy in dgn format after the job has been completed.

E. The engineer shall provide the items listed below on the As-built drawings:

1. Site Plan and Profile
2. Manhole Station Numbers
3. Distance of lateral from downstream Manhole
4. Length of lateral (From main to 6" cleanout)
5. Depth of lateral
6. Depth of the manhole invert elevations
7. Invert In and Out elevations
8. Manhole Top Elevation
9. Length, Size of Pipe on Profile
10. Type of Pipe Material

2.2 Contractors Requirements

A. The contractor shall guarantee all materials, equipment and workmanship for a period of one year from the date of final acceptance of the work by the City of Kingston. If during this time period any material, equipment, or item of construction proves defective, the contractor shall make the repairs at their own expense to the City of Kingston specifications.

B. The contractor shall comply with all applicable laws, regulations and requirements which may or may not be included in these technical specifications, including, but not limited to, contractor Licensing Act of 1994, as amended, and the Tennessee State, Health, and Labor Standards.

C. The contractor shall obtain all licenses and permits prior to the start of work. Copies of each permit shall be submitted to the City of Kingston. The contractor shall have their municipality utility license to install sewer in the City of Kingston's district. The contractor shall be responsible for obtaining permission to work in the right-of-way from the necessary agencies.

D. The contractor is required to contact the City of Kingston inspector three days prior to construction for a pre-construction meeting.

E. The contractor is responsible for getting the most recently revised plans and to be working off those plans.

F. The contractor shall submit three (3) copies of the materials they plan to use.

G. The contractor is responsible for pre-testing all lines before calling the City of Kingston for testing. The contractor is responsible for calling the inspector and setting up testing dates seven days prior to final testing.

2.3 Developer Requirements

A. The developer shall read and sign a Developers Agreement and return it to the City of Kingston's main office.

B. The developer shall refer to the Developers Agreement for most requirements.

C. The developer is responsible for the engineer and contractor meeting their requirements.

D. The developer is responsible for all costs in providing the City of Kingston with as-built plans.

PART 3 PRODUCTS

3.1 Pipe

A. Polyvinyl chloride (PVC) pipes and fittings shall meet or exceed the requirements of SDR 26 for pipe from 6 inches to 15 inches in diameter. For sizes from 18 inches to 24 inches in diameter, the pipe shall meet or exceed the requirements of ASTM F679, wall thickness T-1.

B. Ductile Iron Pipe: AWWA C151, thickness class 350 for pipe 4"- 24". Joints: AWWA C111 mechanical joint with gray or ductile iron glands or push on joint; plain gaskets of natural rubber or neoprene. Pipe shall have coal tar epoxy lining.

a. Made of good quality ductile iron in conformance with the latest revision of AWWA C151/A21.51.
b. Push-on joint with a minimum pressure class of 150 psi for pipe sizes 24 inches and larger.
c. Ceramic epoxy lined and coated outside with an asphaltic coating.
d. Ceramic Epoxy Lining:
    1. 40-mils dry film thickness lining, consisting of amine cured novolac epoxy containing at least 20 percent by volume quartz pigment manufactured under the name of Protecto 401.
    2. Line interior of bell and exterior of spigot in joint sealing areas with 6 mils to 10 mils of specified lining.
    3. Surface Preparation: SP10 near-white abrasive blast.
    4. Pinhole Detection: 2,500 volts minimum over 100 percent of lined surfaces.

C. HDPE pipe and fittings shall be a minimum of SDR 11 meeting the requirements of AWWA C906, with an external green stripe light interior color, and heat fusion welded joints. Butt welded or electro-fusion pipe fittings shall be provided.

3.2 Manhole

A. Manholes shall be cast-in-place or pre-cast concrete base, riser and flat top or cone section meeting specification ASTM C-478 (Latest Revision).

B. Manhole steps shall be copolymer polypropylene plastic with ½" grade 60 steel reinforcement.

C. Castings shall be cast iron conforming to the standard specifications of Class 30 ASTM 48. Casting shall have the City of Kingston name on them to be accepted by the City of Kingston. Vented Manhole rings and covers shall be East Jordon Iron Works 2450-A Watertight rings or approved equal and covers shall be East Jordon Iron Works 2450-B or equal, with anchor bolts. All frames and covers

shall match the existing standard of the City of Kingston. All manholes, frames and covers shall have a minimum 26-inch clear opening.

D. Butyl Mastic Sealant shall be used when joining the casting frame to the precast manhole and for all manhole adjustments to provide a watertight structure. The sealing compound shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inner mineral filler and shall contain no solvents, irritating fumes, or obnoxious odors. It shall be supplied in rope form of suitable cross section and in such sizes as to seal the joint space. Use two complete ropes at each joint. The sealant shall be protected by a wrapper to protect the compound before application.

E. Grade rings shall be 2-6" in height for a total of 12" before a step shall be installed.

F. Pipe connections to precast concrete manholes shall be with A-LOK cast-in-place gaskets, Kor-N-Seal, or Dura Seal.

G. Drop Manholes can be pre-cast but only on the outside of the manhole.

PART 4 INSTALLATION

4.1 General Requirements

A Minimum slope for sanitary sewer shall be as follows:

| PIPE SIZE | MIN. % SLOPE |
|---|---|
| 6" | 1.00% |
| 8" | 0.40% |
| 10" | 0.28% |
| 12" | 0.22% |
| 15" | 0.15% |
| 18" | 0.12% |
| 21" | 0.10% |
| 24" | 0.08% |

B. A minimum 12 AWG insulated solid copper wire shall be installed over all sewer lines from Manhole to Manhole and inserted into the manholes between casting and cone or flattop. Tracer wire shall be installed with all laterals and extend to the top of the stand-up pipe on 6" cleanout.

C. Sewer shall be designed with a 10-foot horizontal separation from any existing or proposed water main. If conditions prevent a horizontal separation of 10 feet,

the sewer shall be installed in a separate trench so that the top of the sewer pipe is at least 18 inches below the bottom of the water main.

D. Where the slope of a sewer line is in excess of 15%, the line shall be constructed of mechanical joint ductile iron pipe, with concrete anchors at each joint. The ductile iron pipe shall be installed from one manhole to another.

E. Minimum cover in roadways and other traffic-bearing areas is 48 inches. In non-traffic bearing areas, the minimum cover is 30 inches. In areas where this cover cannot be obtained Ductile Iron Pipe is required.

F. Pipe depths greater than 15 feet shall require ductile Iron pipe and shall be approved by the City of Kingston. The ductile iron pipe shall be installed from one manhole to another.

G. When ductile iron pipe must be used on a portion of a new sewer line segment due to minimum or maximum cover, water line proximity, or waterway crossing, the entire length between manholes shall be installed with ductile iron pipe. No flexible couplings will be permitted on new construction to convert to PVC between manholes.

H. For all roadway crossings and stream crossings, sewer pipe shall be installed in a casing pipe double the size of the water main. The pipe shall be centered with centering spacers at each end of the casing and at each bell of pipe.

I. The maximum spacing for manholes shall be 400 feet.

J. Where the difference in the invert elevations of two sewers intersecting in a manhole is 2 feet or more, a drop manhole shall be provided.

K. Check dams shall be installed in the bedding and backfill of all new or replaced sewer lines to limit the drainage area subject to the French drain effect of gravel bedding. Major rehabilitation projects should also include check dams in the design. Dams shall consist of compacted clay bedding and backfill at least 3' thick at the top of the trench and out into the walls of the trench two feet. Alternately, concrete may be used, keyed into the trench walls. Dams shall be placed no more than 500 feet apart. The preferred location is upstream of each manhole. All stream crossings will include check dams on both sides of the crossing.

L. Erosion control shall be performed on all cut and fill operations, excavation, backfill, check dams or other general construction activities within the limits of the construction site, within any temporary or permanent easements, and within any borrow site used during the period of construction including all construction general permitting. The protection of these sites shall continue throughout the construction period. During flood seasons, protect the sites by sandbagging,

pumping water, and any other means appropriate to restrain flooding of neighboring streets and properties. During dry weather, sprinkle the sites with water and/or other means as necessary to provide dust control.

M. Temporary pollution control provisions shall be coordinated with permanent erosion control features, to ensure economical, effective, and continuous erosion control throughout the construction and post-construction period.

N. According to the size of the project, a written plan shall be required to ensure that PL 100-4, Section 319, TCA 69-3-101, et. Seg., Subsection 69-3-108 and Subsection 69-3-114, and Division of Construction Grants and Loans General Permit for Utility Line Crossings, Chapter 1200-4-7.09 are met. Since the Contractor is responsible for the construction means and methods which in turn are responsible for ensuring that construction does not harm the Waters of Tennessee, the Contractor is solely responsible for ensuring that the above-mentioned laws and regulations are met. **It shall be the CONTRACTOR'S sole responsibility for payment of any fines or penalties the City of Kingston may receive as a result of Tennessee Department of Environment and Conservation (TDEC) enforcement due to a notice of noncompliance.**

4.2 Pipe Installation

A. Lasers shall be used to install sewer lines, and the type and procedure shall be approved by the City of Kingston. Reference points for both line and grade shall be set at each manhole.

B. Do not allow water to run or stand in the trench while pipe installation is in progress or before the trench has been backfilled. Do not at any time open up more trenches than the available pumping facilities are able to dewater.

C. Carefully inspect each piece of pipe and fitting before it is placed in the trench. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells upgrade. When pipe laying is not in progress, keep the ends of the pipe tightly closed with an approved temporary plug.

D. Trench bottoms shall be bedded with no less than 8" of ½" gravel before the sewer line is placed in the trench. Sewer pipe shall have 6" of ½" gravel on top of the pipe before beginning to backfill. If trench has rock bottom, pipe shall be bedded with 1 foot of gravel underneath and 1 foot of gravel above.

E. The flow of existing sewer lines must be maintained throughout any construction. Whenever pipe lying requires the flow to be interrupted, the contractor is responsible for plugging the sewer upstream of the construction and provides bypass pumping to the next manhole. The contractor must submit a plan to be approved by the City of Kingston before bypass pumping begins.

4.3 Service Laterals

A. Sewer laterals shall be of the same material as the main sewer.

B. Install service laterals to the property line with a 6" cleanout at the property line. The lateral shall be a minimum of 6" PVC (SDR 26) at a minimum slope of 1 percent.

C. The 6" cleanout stand up pipe shall extend a minimum of 3 feet above the ground with a cap with a screwed plug on top.

D. The 6" cleanout shall connect to the lateral with a 6X6X6 wye with a 45-degree elbow. The backside of the wye shall have 2 feet of pipe with a cap.

E. All service laterals require at least 18" of Cover.

F. A 12 AWG insulated solid copper wire shall be installed over all laterals and ran up the 6" cleanout to the screw in cap. The copper wire shall be connected to the wire installed over the main.

PART 5 TESTING OF GRAVITY SEWER

5.1 Testing Procedures

A. Prior to acceptance of completed sewer lines, the lines shall be inspected and tested to ensure compliance with the following provisions. The contractor shall remove all debris from lines and manholes before final inspection. After final inspection, a deflection test and air test will be performed by the contractor. All manholes will be required to have a vacuum test as well. The contractor is responsible for providing all materials needed to perform these tests. These tests must be passed and approved by the inspector before lines will be accepted by the City of Kingston.

B. All newly installed lines shall be pre-tested by the contractor before contacting the City of Kingston for these tests. The Contractor will be responsible for costs or lost time incurred by the City of Kingston when attempting to test a faulty line. The contractor will be charged by the District 250 dollars if the first test fails and a second test is needed at a later date.

C. Deflection test of all pipes shall be required. The Test shall be conducted after the backfill has been in place at least 72 hours.

D. No pipe shall exceed a deflection of 5%.

E. The test shall be run with a 9-arm mandrel approved by the City of Kingston. The mandrel shall have a diameter equal to 95% of the inside diameter of the

pipe. The test must be performed by manually pulling the mandrel through the line.

F. A five-minute air test shall be preformed on all sewer lines by the contractor with a City of Kingston inspector present. The sewer lines will be pressurized to 5 psi using plugs. The sewer lines must hold at 5 psi for 5 minutes with no loss of pressure to pass the air test. The contractor is responsible for all necessary repair work on sections not passing or sections damaged during the test.

G. All manholes must be separately tested by a vacuum test. Installation and operation of all testing equipment shall be in accordance with equipment specifications and instructions provided by the manufacturer. The contractor is responsible for providing all testing equipment needed.

H. A vacuum of 10.0 inches of mercury shall be drawn. The vacuum shall not drop below 9.0 inches of mercury in the time allowed below:

| Manhole Depth | Diameter | Time to Drop 1" HG |
|---|---|---|
| 4' to 10' | 4' | 75 seconds |
| 10' to 15' | 4' | 90 seconds |
| 15' to 25' | 4' | 105 seconds |

I. Once the three tests have been completed, then the contractor shall provide the City of Kingston with an as-built before the lines will be accepted by the City of Kingston.

# SANITARY SEWER (FORCE MAIN)

## PART 1 GENERAL

### 1.1 Preface

A. The standard specifications have been prepared to complement the standard detail drawings and to provide the qualitative requirements for products, materials and workmanship for construction of additions to and replacements of the wastewater system of the City of Kingston. These Standard Specifications are only to be used for projects with Drawings which have been approved by the Tennessee Department of Environment Conservation, Division of Water Resources as prepared by a developer's engineer whose drawings must first be approved by the City of Kingston. All standard specifications are subject to revision for a special project.

## PART 2 REQUIREMENTS

### 2.1 Engineers Requirements

A. The engineer shall field verify all utilities' locations and elevations.

B. The engineer shall provide a proposed site plan drawing to the City of Kingston to be approved before the project starts. If the City of Kingston returns the drawings to the engineer with revisions the drawings shall be revised by the engineer and returned to the City of Kingston.

C. The engineer shall have the drawings accepted by the City of Kingston before sending them to The Tennessee Department of Environment and Conservation.

D. The engineer shall provide the City of Kingston with two sets of paper copy as-built drawings and an electronic copy in dgn format after the job has been completed.

E. The engineer shall provide the items listed below on the As-built drawings:

1. Site Plan and Profile
2. Manhole Station Numbers
3. Distance of lateral from downstream Manhole
4. Length of lateral (From main to 6" cleanout)
5. Depth of lateral
6. Depth of the manhole invert elevations
7. Invert In and Invert out Elevations
8. Manhole Top Elevation
9. Length, Size of Pipe on Profile
10. Type of Pipe Material

2.2 Contractors Requirements

A. Contractor shall guarantee all materials, equipment and workmanship for a period of one year from the date of final acceptance of the work by the City of Kingston. If during this time period any material, equipment, or item of construction proves defective, the contractor shall make the repairs at their own expense to the City of Kingston specifications.

B. The Contractor shall comply with all applicable laws, regulations and requirements which may or may not be included in these technical specifications, including, but not limited to, Contractor Licensing Act of 1994, as amended, and the Tennessee State, Health, and Labor Standards.

C. The Contractor shall obtain all licenses and permits prior to the start of work. Copies of each permit shall be submitted to the City of Kingston. The contractor shall have their municipality utility license to install sewer in the City of Kingston's district. Contractor shall be responsible for obtaining permission to work in the right-of-way from the necessary agencies.

D. The Contractor is required to contact the City of Kingston inspector three days prior to construction for a pre-construction meeting.

E. The contractor shall submit three (3) copies of the materials they plan to use.

F. The Contractor is responsible for getting the most recently revised plans and to be working off those plans.

G. The Contractor is responsible for pre-testing all lines before calling the City of Kingston for testing. The contractor is responsible for calling the inspector and setting up testing dates seven days prior to final testing.

2.3 Developer Requirements

A. The Developer shall read and sign a Developers Agreement and return it to the City of Kingston's main office.

B. The Developer shall refer to the Developers Agreement for most requirements.

C. The Developer is responsible for the engineer and Contractor meeting their requirements.

D. The Developer is responsible for all costs in providing the City of Kingston with as-built plans.

PART 3 – PRODUCTS

A. Polyvinyl chloride (PVC) or HDPE pipes and fittings may be used for force mains from 2" to 24" in diameter, in accordance with the requirements of AWWA C900 or AWWA C905. The pressure class shall be approved by the City of Kingston based on the design requirements of the system.

B. Ductile Iron Pipe and fittings may be used for force mains 8" and larger: Made of good quality ductile iron in conformance with latest revision of AWWA/ANSI C151/A21.51. The Pipe shall be push-on joint with a minimum pressure class of 150 psi. Ductile iron pipe and fittings shall conform to the requirements of the materials specifications herein.

1. 40-mil nominal lining consisting of amine cured novolac epoxy Containing a minimum of 20 percent by volume quart pigment manufactured under the name of Protecto 401 by the Vulcan Group.
2. Line interior of bell and exterior of spigot in joint sealing areas with 6 to 10 mils of specified lining.
3. Surface Preparation: SP10 near-white abrasive blast.
4. Pinhole Detection: 2,500 volts minimum over 100 percent of l lined surfaces.

C. HDPE pipe and fittings may be used for force mains: Minimum HDPE SDR 11 for pipe 2" to 24" and SDR 9 for pipe sizes 1" and ¾" meeting the requirements of AWWA C906, ASTM F714 and ASTM D3035. HDPE pipe shall have a co-extruded green cover or extruded green stripes designating use for sanitary sewer. All fittings shall be molded, Butt heat fusion or electro-fusion fittings.

PART 4 – EXECUTION

4.1 INSTALLATION

A. All force main pipe shall be installed with a 12-gauge insulated solid copper wire with coating for tracing purposes.

B. All force mains shall have at least 48" of cover under roadways and driveways and 30" of cover elsewhere. The pipe shall slope continuously between high and low points to eliminate the formation of air pockets.

C. Pipe shall be lowered carefully into the trenches with suitable equipment one piece at a time.

D. Pipes and fittings shall not be lowered into the trench until they have been cleaned and all debris has been removed.

E. Whenever pipe lying is not in progress, the open ends of the pipe shall be closed with a watertight plug or by other means approved by the City of Kingston

F. Wherever pipe must be deflected from a straight line in order to avoid obstructions, or wherever long radius curves are permitted Mechanical Joint Fittings shall be used with Megalug type restraints.

G. No pipe shall be installed in water or when it is the opinion of the City of Kingston that the trench is unsuitable.

H. Thrust blocks shall be installed wherever the force main changes direction (at all Mechanical Joint Fittings), at dead ends or any other place recommended by the City of Kingston.

I. Air valves shall be located at all high points on the pipeline or as directed by the City of Kingston.

K. Install tracing tape saying "Sewer Below" 2 feet above Force Main when backfilling the ditch.

L. If at the end of a Sewer Force Main, a valve and flushing station all made of brass, schedule 80, ductile iron or HDPE shall be installed in a box approved by the City of Kingston. Flushing station shall be supported with thrust blocking. Manhole or Box lid will have the City of Kingston Sewer on top.

L. Each service line off the main will be installed back to the property lot line. At the property line there shall be a check valve and ball valve installed covered with a box approved by the City of Kingston. Box will have sewer marked on top. The end of the box is designated as the end of the public sewer service by the City of Kingston. From the box on to the customer shall be the expense and operation of the property owner.

## PART 5 – AIR RELEASE VALVES

### 5.1 PRODUCTS

A. Air release valve shall be A.R.I. D-025 series or equivalent. These valves shall have standard metal body-baked epoxy coating or plastic body with a vacuum guarding out only attachment. The valve shall be placed in a jumbo meter box or manhole cone section with manhole lid.

### 5.2 INSTALLATION

A. Air valves shall be located at all high points on the pipeline or as directed by the City of Kingston.

PART 6 – PRESSURE TEST

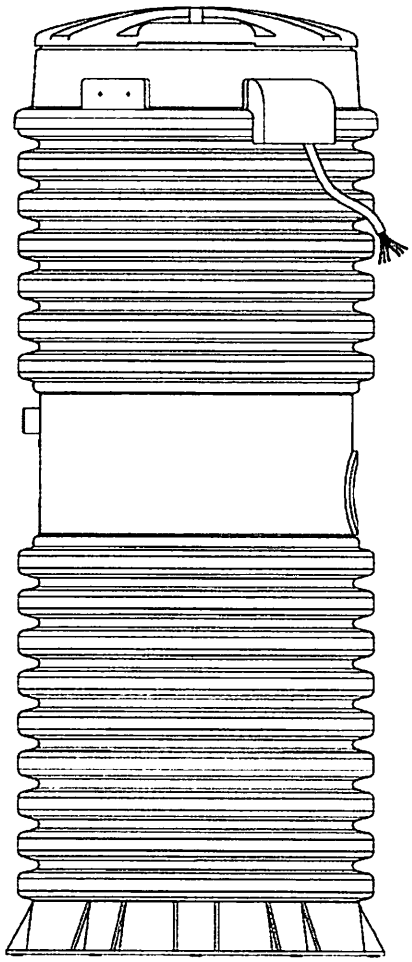
6.1 AIR TEST

A. All newly installed and backfilled pipe shall be subjected to a leakage test, conducted in the presence of the City of Kingston.

B. Test Pressure shall be 150 percent of systems estimated operating pressure estimated by the City of Kingston.

C. The force main shall be filled with water; the specified test pressure shall be applied with a pump connected to the pipe in a manner satisfactory to the City of Kingston. Contractor shall furnish the pump, pipe, connections, gauges, and all necessary apparatus.

D. The leakage test shall be conducted at the specified test pressure for two hours with no loss to pass.



# Grinder Pump Station Specifications

## Semi-Positive Displacement Type

## 1.0 GENERAL

**1.01 GENERAL DESCRIPTION**: The **MANUFACTURER and/or SUPPLIER** shall furnish complete factory-built and tested Wetwell or Wetwell/Drywell Grinder Pump Station(s), each consisting of grinder pump(s) suitably mounted in a basin constructed of polyethylene (HDPE), NEMA 6P electrical quick disconnect (EQD), pump removal system, stainless steel discharge assembly/shut-off valve, anti-siphon valve/check valve, each assembled in the basin, electrical alarm panel and all necessary internal wiring and controls. Component type grinder pump systems that require field assembly will not be acceptable due to the potential problems that can occur during field assembly. All components and materials shall be in accordance with section 2.0 of this Product Specification. For ease of serviceability, all pump, motor/grinder units shall be of like type and horsepower throughout the system. Only grinder pumps will be allowed, and no STEP pump systems will be allowed. The customer shall own, operate, and maintain all sewer facilities from the box that houses the ball valve/check valve to the structure to be served.

**1.02 SUBMITTALS:** The **MANUFACTURER and/or SUPPLIER** shall furnish equipment specifications and detailed drawings of all equipment-products to be furnished including dimensional data and materials of construction.

**1.03 MANUFACTURER and/or SUPPLIER:** Grinder pump stations, complete with all appurtenances, form an integral system. The **CONTRACTOR** shall be responsible for the satisfactory operation. The equipment specified shall be a product of a company experienced in the design and manufacture of grinder pumps for specific use in low pressure sewage systems. The company shall submit detailed installation and user instructions for its product, submit evidence of an established service program including complete parts and service manuals, and be responsible for maintaining a continuing inventory of grinder pump replacement parts. The **MANUFACTURER-SUPPLIER** shall provide, upon request, a reference and contact list from ten of its largest contiguous grinder pump installations of the type of grinder pumps described within this specification.

The **MANUFACTURER** of the grinder pump station shall be Environment One Corporation.

**1.04 OPERATING CONDITIONS**: The pumps shall be capable of delivering 15 GPM against a rated total dynamic head of 0 feet (0 PSIG), 11 GPM against a rated total dynamic head of 92 feet (40 PSIG), and 7.8 GPM against a rated total dynamic head of 185 feet (80 PSIG). The pump(s) must also be capable of operating at negative total dynamic head without overloading the motor(s). Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

**1.05 WARRANTY**: The grinder pump **MANUFACTURER** shall provide a part(s) and labor warranty on the complete station and accessories, including, but not limited to, the panel for a period of 60 months / 63 months after receipt of shipment. Any manufacturing defects found during the warranty period will be reported to the **MANUFACTURER** by the **OWNER** and will be corrected by the **MANUFACTURER** at no cost to the **OWNER**.

## 2.0 PRODUCT

**2.01 PUMP**: The pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the **progressing cavity type** with a single mechanical seal. Double radial O-ring seals are required at all casting joints to minimize corrosion and create a protective barrier. All pump castings shall be cast iron, fully epoxy coated to 8-10 mil Nominal dry thickness, wet applied. The rotor shall be through-hardened, highly polished, precipitation hardened stainless steel. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. This material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance. Buna-N is not acceptable as a stator material because it does not exhibit the properties as outlined above and required for wastewater service.

**2.02 GRINDER**: The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller (cutter wheel) assembly shall be

securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft. Attachment by means of pins or keys will not be acceptable. The grinder impeller shall be a one-piece, 4140 cutter wheel of the rotating type with inductively hardened cutter teeth. The cutter teeth shall be inductively hardened to Rockwell 50 – 60c for abrasion resistance. The shredder ring shall be of the stationary type and the material shall be white cast iron. The teeth shall be ground into the material to achieve effective grinding. The shredder ring shall have a staggered tooth pattern with only one edge engaged at a time, maximizing the cutting torque. These materials have been chosen for their capacity to perform in the intended environment as they are materials with wear and corrosive resistant properties.

This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to minimize clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump:

1. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.

2. The maximum flow rate through the cutting mechanism must not exceed 4 feet per second. This is a critical design element to minimize jamming and as such must be adhered to.

3. The inlet shroud shall have a diameter of no less than 5 inches. Inlet shrouds that are less than 5 inches in diameter will not be accepted due to their inability to maintain the specified 4 feet per second maximum inlet velocity which by design prevents unnecessary jamming of the cutter mechanism and minimizes blinding of the pump by large objects that block the inlet shroud.

4. The impeller mechanism must rotate at a nominal speed of no greater than 1800 rpm.

The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass, wipes, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter stainless steel discharge piping.

**2.03 ELECTRIC MOTOR**: As a maximum, the motor shall be a 1 HP, 1725 RPM, 240 Volt 60 Hertz, 1 Phase, capacitor start, ball bearing, air-cooled induction type with Class F insulation, low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. The motor shall be press-fit into the casting for better heat transfer and longer winding life. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. The motor protector shall be specifically investigated and listed by Underwriters Laboratories Inc. for the application. Non-capacitor start motors or permanent split capacitor motors will not be accepted because of their reduced starting torque and consequent diminished grinding capability. The wet portion of the motor armature must be 300 Series stainless steel. To reduce the potential of environmental concerns, the expense of handling and disposing of oil, and the associated maintenance costs, oil-filled motors will not be accepted. Pump operation during instances of potentially damaging high current or low voltage conditions shall be inhibited by an in-pump electrical monitoring system that has been investigated and listed by Underwriters Laboratories Inc. for the application. Motor start shall be controlled by a DC driven electromechanical relay integrated within the control compartment of the pump. Electrical monitoring shall ensure the relay operates reliably. AC Mechanical contactors for motor start are susceptible to damage from short cycling and will not be accepted.

**2.04 MECHANICAL SEAL**: The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless-steel spring.

2.05 **TANK: High Density Polyethylene Construction.** The tank shall be either a Wetwell or Wetwell/Drywell design made of high-density polyethylene, with a grade selected to provide the necessary environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. The corrugations of the outside wall are to be a minimum amplitude of 1-1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be 0.250" thick (minimum). All seams created during tank construction are to be thermally welded and factory tested for leak tightness. The tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

For **Wetwell/Drywell** configurations the tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe. The tank capacities shall be as shown on drawings.

The Drywell accessway shall be an integral extension of the Wetwell assembly and shall include a lockable cover assembly providing low profile mounting and watertight capability. The accessway design and construction shall enable field adjustment of the station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak free installation no field penetrations will be acceptable.

All discharge piping shall be constructed of 304 stainless steel. The discharge shall terminate outside the accessway bulkhead with a stainless steel, 1-1/4" Female NPT fitting. The discharge piping shall include a stainless-steel ball valve rated for 235 psi WOG; PVC ball valves or brass ball/gate will not be accepted. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

The accessway shall include a single NEMA 6P Electrical Quick Disconnect (EQD) for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. The EQD will be supplied with 32', 25' of useable Electrical Supply Cable (ESC) outside the station, to connect to the alarm panel. The ESC shall be installed in the basin by the manufacturer. Field assembly of the ESC into the basin is not acceptable because of potential workmanship issues. The EQD shall require no tools for connecting, seal against water before the electrical connection is made, and include radial seals to assure a watertight seal regardless of tightening torque. Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts. A junction box shall not be permitted in the accessway due to the large number of potential leak points. The EQD shall be so designed to be conducive to field wiring as required. The accessway shall also include an integral 2-inch vent to prevent sewage gases from accumulating in the tank.

**Wetwell** designed stations will be **High Density Polyethylene Construction** of a grade selected for environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. Corrugations of the outside wall are to be of a minimum amplitude of 1-1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be a minimum .250 inch thick. All seams created during tank construction are to be thermally welded and factory tested for leak tightness. Tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to maximum external soil and hydrostatic pressure.

The tank shall be furnished with a factory installed PVC inlet flange to accept a 4.50" OD (4" DWV or SCH 40) inlet pipe.

The tank shall include a lockable cover assembly providing low profile mounting and watertight capability. The cover shall be high density polyethylene, green in color, with a load rating of 150 lbs per square foot. The cover assembly shall also include an integral 2-inch vent to prevent sewage gases

from accumulating in the tank. The accessway design and construction shall facilitate field adjustment of station height in increments of 3" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

The power and control cable shall connect to the pump by means of the provided NEMA 6P Electrical Quick Disconnect (EQD) and shall enter the tank through a factory installed watertight strain relief connector. An electrical junction box shall not be permitted in the tank.

The station shall have all necessary penetrations factory sealed and tested. No field penetrations shall be acceptable.

**2.06 CHECK VALVE**: The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless-steel discharge piping. The check valve will provide a full-ported passageway when open and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Moving parts will be made of a 300 Series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low backpressure. The valve body shall be an injection molded part made of an engineered thermoplastic resin. The valve shall be rated for continuous operating pressure of 235 psi. Ball-type check valves are unacceptable due to their limited sealing capacity in slurry applications.

**2.07 ANTI-SIPHON VALVE**: The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the stainless-steel discharge piping. Moving parts will be made of 300 Series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from an engineered thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices due to their tendency to clog from the solids in the slurry being pumped. The anti-siphon port diameter shall be no less than 60% of the inside diameter of the pump discharge piping.

**2.08 CORE UNIT**: The grinder pump station shall have a cartridge type, easily removable core assembly (No rail assemblies) consisting of pump, motor, grinder, all motor controls, check valve, anti-siphon valve, level controls, electrical quick disconnect and wiring. The watertight integrity of each core unit shall be established by a 100 percent factory test at a minimum of 5 PSIG.

**2.09 CONTROLS**: All necessary motor starting controls shall be located in the cast iron enclosure of the core unit secured by stainless steel fasteners. Locating the motor starting controls in a plastic enclosure is not acceptable. The wastewater level sensing controls shall be housed in a separate enclosure from motor starting controls. The level sensor housing must be sealed via a radial type seal; solvents or glues are not acceptable. The level sensing control housing must be integrally attached to pump assembly so that it may be removed from the station with the pump and in such a way as to minimize the potential for the accumulation of grease and debris accumulation, etc. The level sensing housing must be a high-impact thermoplastic copolymer over-molded with a thermo plastic elastomer. The use of PVC for the level sensing housing is not acceptable.

Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The air column shall be integrally molded from a thermoplastic elastomer suitable for use in wastewater and with excellent impact resistance. The air column shall have only a single connection between the water level being monitored and the pressure switch. Any connections are to be sealed radially with redundant O-rings. The level detection device shall have no moving parts in direct contact with the wastewater and shall be integral to the pump core assembly in a single, readily-exchanged unit. Depressing the push to run button must operate the pump even with the level sensor housing removed from the pump.

All fasteners throughout the assembly shall be 300 Series stainless steel. High-level sensing will be accomplished in the manner detailed above by a separate air column sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and high-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices and their tendency to malfunction because of incorrect wiring, tangling, grease buildup, and mechanical cord fatigue. To assure reliable operation of the pressure switches, each core shall be equipped with a factory installed equalizer diaphragm that compensates for any atmospheric pressure or temperature changes. Tube or piping runs outside of the station tank or into tank-mounted junction boxes providing pressure switch equalization will not be permitted due to their susceptibility to condensation, kinking, pinching, and insect infestation. The grinder pump will be furnished with a 6 conductor 14-gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a **FACTORY INSTALLED** NEMA 6P EQD half attached to it.

2.10 **STAINLESS STEEL CURB STOP/CHECK VALVE ASSEMBLY (UNI-LATERAL):** The curb stop shall be pressure-tight in both directions. The ball valve actuator shall include position stop features at the fully opened and closed positions. The curb stop/check valve assembly shall be designed to withstand a working pressure of 235 psi.

The stainless-steel check valve shall be integral with the curb stop valve. The check valve will provide a full-ported 1-1/4" passageway and shall introduce minimal friction loss at maximum rated flow. The flapper hinge design shall provide a maximum degree of freedom and ensure seating at low back pressure.

**Curb Boxes (Supplied by others)** – Curb boxes shall be constructed of ABS, conforming to ASTM-D 1788. All components shall be inherently corrosion-resistant to ensure durability in the ground.

**High Density Polyethylene Pipe (Supplied by others)** – Pipe shall have a working pressure of 160 psi minimum and shall be classified SDR per ASTM D 3035.

**Pipe Dimensions** – The SDR (Standard Dimension Ratio) of the pipe supplied shall be as specified by the **SPECIFYING ENGINEER**. SDR 7, 9 and 11 fittings are available from the **MANUFACTURER**.

**Factory Test** – The stainless steel, combination curb stop/check valve component shall be 100 percent hydrostatically tested to 150 psi in the factory.

2.11 **ALARM PANEL:** Each grinder pump station shall include a NEMA 4X, UL-listed alarm panel suitable for wall or pole mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic polyester to ensure corrosion resistance. The enclosure shall include a hinged, lockable cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel. The Simplex enclosures shall not exceed 10.5" W x 14" H x 7" D, or 12.5" W x 16" H x 7.5" D if certain options are included.

The alarm panel shall contain one 15-amp, double-pole circuit breaker for the pump core's power circuit and one 15-amp, single-pole circuit breaker for the alarm circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the alarm panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.

The alarm panel shall include the following features: external audible and visual alarm; push-to-run switch; push-to-silence switch; redundant pump start; and high level alarm capability. The alarm sequence is to be as follows when the pump and alarm breakers are on:

1. When liquid level in the sewage wet-well rises above the alarm level, the contacts on the alarm pressure switch activate, audible and visual alarms are activated, and the redundant pump starting system is energized.

2. The audible alarm may be silenced by means of the externally mounted, push-to-silence button.

3. Visual alarm remains illuminated until the sewage level in the wet-well drops below the "off" setting of the alarm pressure switch.

The visual alarm lamp shall be inside a red, oblong lens at least 3.75" L x 2.38" W x 1.5" H. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 4X rating. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).

The entire alarm panel, as manufactured and including any of the following options shall be listed by Underwriters Laboratories, Inc.

**2.12 SERVICEABILITY**: The grinder pump core, including level sensor assembly, shall have two lifting hooks complete with lift-out harness connected to its top housing to facilitate easy core removal when necessary. Rail assemblies and not allowed due to maintenance and replacement costs. The level sensor assembly must be easily removed from the pump assembly for service or replacement. All mechanical and electrical connections must provide easy disconnect capability for core unit removal and installation. Each EQD half must include a water-tight cover to protect the internal electrical pins while the EQD is unplugged. A pump push-to-run feature will be provided for field trouble shooting. The push-to-run feature must operate the pump even if the level sensor assembly has been removed from the pump assembly. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

**2.13 OSHA CONFINED SPACE**: All maintenance tasks for the grinder pump station must be possible without entry into the grinder pump station (as per **OSHA 1910.146**, permit-required confined spaces). *"Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space."*

**2.14 SAFETY**: The grinder pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired grinder pump station shall be listed by Underwriters Laboratories, Inc. to be safe and appropriate for the intended use. UL listing of components of the station, or third-party testing to UL standard are not acceptable.

The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low pressure sewer system applications. As evidence of compliance with this requirement, the grinder pump shall bear the seal of NSF International. Third-party testing to NSF standard is not acceptable.

## 3.0 EXECUTION

**3.01 FACTORY TEST**: Each grinder pump shall be submerged and operated for 1.5 minutes (minimum). Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge assembly and each unit's dedicated level controls and motor controls. All factory tests shall incorporate each of the above listed items. Actual appurtenances and controls which will be installed in the field shall be particular to the tested pump only. A common set of appurtenances and controls for all pumps is not acceptable. Certified test results shall be available upon request showing the operation of each grinder pump at two different points on its curve. Additional validation tests include: integral level control performance, continuity to ground and acoustic tests of the rotating components.

The **UTILITY** reserves the right to inspect such testing procedures at the **GRINDER PUMP MANUFACTURER'S** facility.

All completed stations shall be factory leak tested to assure the integrity of all joints, seams and penetrations. All necessary penetrations such as inlets, discharge fittings and cable connectors shall be included in this test along with their respective sealing means (grommets, gaskets etc.).

**3.02 CERTIFIED SERVICE PROGRAM:** The grinder pump **MANUFACTURER** shall provide a program implemented by the **MANUFACTURER'S** personnel as described in this specification to certify the service company as an authorized serviced center. As evidence of this, the **MANUFACTURER** shall provide, when requested, sufficient evidence that they have maintained their own service department for a minimum of 30 years and currently employ a minimum of five employees specifically in the service department.

As part of this program, the **MANUFACTURER** shall evaluate the service technicians as well as the service organization annually. The service company will be authorized by the **MANUFACTURER** to make independent warranty judgments. The areas covered by the program shall include, as a minimum:

1. Pump Population Information — The service company will maintain a detailed database for the grinder pumps in the territory that tracks serial numbers by address.

2. Inventory Management — The service company must maintain an appropriate level of inventory (pumps, tanks, panels, service parts, etc.) including regular inventory review and proper inventory labeling. Service technicians will also maintain appropriate parts inventory and spare core(s) on service vehicles.

3. Service Personnel Certification — Service technicians will maintain their level-specific certification annually. The certifications are given in field troubleshooting, repair, and training.

4. Service Documentation and Records — Start up sheets, service call records, and customer feedback will be recorded and available by the service company.

5. Shop Organization — The service company will keep its service shop organized and pumps will be tagged with site information at all times. The shop will have all required equipment, a test tank, and cleaning tools necessary to service pumps properly.

**3.03 DELIVERY:** All grinder pump units will be delivered to the job site 100 percent completely assembled, including testing, ready for installation. Grinder pump stations will be individually mounted on wooden pallets.

**3.04 INSTALLATION:** The tanks, pumps and alarm panels must be installed per **MANUFACTURER** written installation instructions.

The Uni-Lateral assembly per the specifications is required to be installed in the pipe lateral outside the home between the pump discharge and the street main on all installations.

An alarm device per the specifications is required on every installation, there shall be **NO EXCEPTIONS**. It will be the responsibility of the **CONTRACTOR** and the **UTILITY** to coordinate with the individual property owner(s) to determine the optimum location for the Alarm Panel.

The **CONTRACTOR** shall mount the alarm device in a conspicuous location, as per national and local codes. The alarm panel will be connected to the grinder pump station by a length of 6-conductor type TC cable as shown on the contract drawings. The power and alarm circuits must be on separate power circuits. The grinder pump stations will be provided with 32 feet, 25 feet of useable, electrical supply cable to connect the station to the alarm panel. This cable shall be supplied with a **FACTORY INSTALLED** EQD half to connect to the mating EQD half on the core.

All restoration will be the responsibility of the **CONTRACTOR**. The properties shall be restored to their original condition in all respects, including, but not limited to, curb and sidewalk replacement, landscaping, loaming and seeding, and restoration of the traveled ways.

**3.05 START-UP AND FIELD TESTING**: The **MANUFACTURER** shall provide the services of qualified factory trained technician(s) who shall inspect the placement and wiring of each station, perform field tests as specified herein, and instruct the **OWNER'S** personnel in the operation and maintenance of the equipment before the stations are accepted by the **OWNER**.

**4.0 OWNERSHIP**

**4.01 GENERAL:** Kingston ends their responsibility of all grinder pump installations at the box that houses the ball valve and check valve for all grinder pump installations. The grinder pump, controls, and all other components of the installation past the ball valve/check valve box shall be the responsibility of the property owner to operate and maintain.

END OF SECTION