

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

1 OF 14

02.10.2023

### PART 1 - DESCRIPTION

#### 1.1 SUMMARY

- A. Section includes furnishing and installing pipe, appurtenances and accessories for ductile iron water distribution systems including hydrostatic pressure testing, disinfection, bacteriological sampling, underground utility conductivity and continuity, testing and reporting and disposal of chlorinated water and the removal / abandonment of pipe and appurtenances. All work shall conform to the 2020 MDOT Standard Specifications for Construction as modified by the HBPW. Non-itemized work will not be paid for separately.

#### 1.2 MISCELLANEOUS

- A. Record and provide actual locations of mains, valves, fittings, thrust restraints and elevations of pipe. Identify, describe, record and provide unexpected subsoil conditions and uncharted utilities.
- B. Provide a Disinfection Report which includes: Disinfection and testing procedures; Type, form and levels of disinfectant used; Equipment used; Date and time of disinfectant injection start and time of completion; Test locations; Name of person collecting samples; Initial and 24 hour disinfectant residuals (ppm) of treated water for each outlet tested; Date and time of flushing start and completion; Disinfectant residual (ppm) after flushing for each outlet tested.

### PART 2 - MATERIALS

- 2.1 Provide materials and products for permanent incorporation into the work that were produced only in the contiguous United States. Foreign produced materials and products will not be accepted.

#### 2.2 WATER MAIN, DI

- A. Pipe
  1. Class 52, Conforming to ANSI/AWWA C151/A21.51, NSF 61 Certified,
  2. 18' or 20' sections or as indicated,
  3. Double thickness cement lined in accordance with ANSI/AWWA C104/A21.3
  4. Zinc Coated shall be standard, unless a written exception is granted by the HBPW, and shall have the exterior of the pipe coated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200 g/m<sup>2</sup> of pipe surface area. A finishing layer topcoat shall be applied to the zinc. The mean dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum of not less than 2 mils. The coating system shall conform in every respect to ISO 8179-1 "Ductile iron pipes – External zinc-based coating – Part 1: Metallic zinc with finishing layer. Second edition 2004-06-1".

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

2 OF 14

02.10.2023

5. C-909 and C-900 PVC DR 18 235 psi pipe may be used with approval by HBPW staff for sizes 8 inches or smaller. If PVC is used, appropriate Mega-lugs must be used for PVC pipe.

### B. Joints

1. 50 psi rated conforming to ANSI/AWWA C111/A21.11,
2. Nitrile or FKM gaskets shall be used in areas of suspected soil contamination,
3. Push-On Joint Restraint shall consist of stainless steel locking segments vulcanized into the gasket, Push-on Joint Restraint shall only be used on main line linear restraint, **only with prior approval by BPW. Failed Push-On Joint Restraint shall be cut out, not pulled apart.**
4. Mechanical Joint Restraint shall be EBAA Iron, Inc. Series 1100 “MEGALUGS” or HBPW approved equal.
5. PVC main joint restraints shall be bell clamp with a submittal approved by the BPW prior to use.
  - A. EBAA Series 1900 for C-909 and EBAA Series 1600 for C-900 or HBPW approved Equal.
6. Minimum of two (2) bronze wedges per joint for continuity on Ductile Iron Main,
7. Bolts shall be Cor-Blue bolts conforming to ANSI/AWWA C111/A21.11.

### C. Polyethylene Encasement

1. 8-mil polyethylene per ANSI/AWWA C105/A21.5, black in color for water main or purple in color for reuse main,
2. Closed with 2” Poly Ken #900 and Scotchwrap #50
3. No Encasement for PVC Main.

## 2.3 FITTINGS, DI

- A. Ductile iron, push on or mechanical joint, 350 psi rated joints conforming to ANSI/AWWA C153/A21.53.
- B. Transition gaskets (for new construction) shall be used for all fittings up to 8” transitioning from iron pipes sizes (IPS) to ductile iron pipes sizes (DIPS) and meeting the ANSI/AWWA C111/A21.11 standard.

## 2.4 TRACER WIRE & CONNECTIONS

- A. Tracer wire shall be a #10 AWG (0.1019” diameter) fully annealed, high carbon 1055 grade steel, high strength solid copper clad steel conductor (HS-CCS), insulated with a 30 mil, high-density, high molecular weight polyethylene (HDPE) insulation, and rated for direct burial use at 30 volts.
  1. Copperhead High Strength 1030 or approved equal.
- B. Splices shall be made using properly sized, waterproof connectors rated for underground service.
  1. UL listed and NEC approved Underground waterproof wire nuts. DRYCONN waterproof connectors are locally available.

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

3 OF 14

02.10.2023

### 2.5 UTILITY MARKER POSTS

- A. Marker posts shall be blue 72-inch Rhino Tri-View Marker Posts with 2 external terminals, or Rhino HideOut 24-inch flush mount test station color coded in accordance with PA 174 of 2013, as amended. Caps shall be black in color. The BPW will supply decals for the marker posts. When necessary, locations and types of marker posts to be used will be determined by the BPW.

### 2.6 GATE VALVE AND BOX

- A. Resilient Seated Gate Valves: Conforming to AWWA C509 or AWWA C515, NSF 61 Certified, sized as indicated on the drawings, right-hand open (clockwise). The HBPW W/WW Services Department reserves the right to approve or reject any valve for use in the water distribution system.
1. EJ or HBPW approved equal
  2. Valve body, bonnet and seal plate shall be ductile iron.
  3. Valve stem shall be stainless steel.
  4. The rated working pressure of the valve shall be 250 psi.
  5. The interior shall be free of pockets or ledges where debris can collect.
  6. All gaskets shall be pressurized o-rings. Packing glands are not permitted.
  7. The valve body and bonnet shall be coated on all exterior and interior surfaces with a fusion-bonded epoxy in conformance with AWWA C550.
  8. Bolting materials shall be stainless steel and meet ASTM A307, Grade B
  9. Gate valves 20" and larger shall have an enclosed beveled spur gear, lay on the side operation to ensure proper coverage.
  10. The manufacturer's name, valve size, year of manufacture, pressure rating, AWWA Standard, and "DI" shall be cast on the valve.
  11. The valve shall be designed so that during operation or cycling of the valve, there is no friction or abrasion or rubbing together of the gate and body that can wear away any rubber or epoxy and expose bare iron. Gates shall be completely covered with rubber over all interior and exterior ferrous surfaces. The rubber shall be securely bonded to the gate body, including the part that houses the stem nut. The stem nut through the gate shall be fully opening top to bottom and shall be solid ductile iron.
  12. All valves shall be assembled solely of components manufactured within the continental United States to assure timely shipment and access to manufacturing facilities. All valves shall be assembled and tested within the continental United States to assure timely shipment and access to assembly and testing facilities.
  13. All required Drawings, manuals, parts lists and certifications must be furnished. Manufacturer shall certify that the valves furnished meet this Specification and any materials found not conforming to this specification subsequent to acceptance and/or installation shall be rejected and replaced.
  14. Boxes shall be cast iron, 3 sectional, screw-type adjustable to allow top to be set flush with final grade elevation of pavement or ground surface. Cast iron lids shall

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

4 OF 14

02.10.2023

be provided with the word “water” or “reuse”. The box shall be designed for highway loads and shall be Buffalo type.

A. EJ 8560 Series or HBPW approved equal

### 2.7 WATER SERVICE

#### A. Ball-Type Corporation Stops

1. The brass alloy used shall meet the requirements of UNS/CDA C89520 or C89833 as listed in ANSI/AWWA C800. The product shall meet NSF/ANSI Standards 61 Annex G and 372. The corporation shall be packed joint with a lock-down nut for copper tubing as specified in this section. All corps shall conduct electrical current from the pipe it's connected to through the body of the valve to the pipe connected to it without exception. Equivalent flare connection valves may be accepted upon approval by the HBPW.

A. Ford Meter Box FB1000-x-NL, AY McDonald 74701B-22 (no lead), Mueller P-25008-N or HBPW approved equal

#### B. Service Saddles

1. Ductile Iron Main - Service Saddles are required for all 1.5” and 2” Service Connections. The saddle shall consist of brass nuts and a brass body with an EPDM gasketed outlet tapped with an AWWA taper. Straps shall be double, flattened silicon bronze. The brass alloy used shall meet the requirements of UNS/CDA C83600 per ASTM B62, ASTM B584 and ANSI/AWWA C800.

A. Ford 202BS, AY McDonald 3825-4148, Mueller BR2S/W or HBPW approved equal

2. PVC Main - Service Saddles shall be used for all service taps 2 inches in diameter and smaller.

A. Ford S90-80X or HBPW approved equal

#### Pipe

3. Services shall be seamless and manufactured in conformance with ASTM B88, type “K” copper with NSF 61 Certification. Minimum size used shall be 1” standard Copper Tubing Size (CTS).

#### C. Ball-Type Curb Stop and Curb Box

1. The brass alloy used shall meet the requirements of UNS/CDA C89520 or C89833 as listed in ANSI/AWWA C800. The product shall meet NSF/ANSI Standards 61 Annex G and 372. The curb stop shall be packed joint with a lock-down nut for copper tubing as specified in this section. All curb stops shall conduct electrical

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

5 OF 14

02.10.2023

current from the pipe it's connected to through the body of the valve to the pipe connected to it without exception. Equivalent flare connection valves may be accepted upon approval by the HBPW.

- A. Ford Meter Box B44-XXX-NL, AY McDonald 76100-22 (no lead), Mueller P-25209-N or HBPW approved equal
2. Cast iron Buffalo Box with arch pattern screw adjustment, 2¼" minimum shaft ID.
  - A. Tyler / Union 6500 Series Box 95-E or HBPW approved equal.

### 2.8 LIVE TAP

- A. Tapping valves shall conform to the requirements of gate valve and box as specified above, be made with conformance to the shape required to allow a tapping machine to tap directly through the open valve, and have a mechanical joint to connect to the tapping sleeve and a flanged joint to connect to the main, unless otherwise indicated. Flange bolts shall be type 304 stainless steel.
- B. Tapping sleeves shall be stainless steel split sleeves with flanged outlet. All flange nuts and bolts shall be stainless steel and conform to ASTM A307, Grade B.

### 2.9 FIRE HYDRANT

- A. The HBPW W/WW Services Department reserves the right to approve or reject any fire hydrant for use in the water distribution system.
  1. EJ WaterMaster 5BR250 or HBPW approved equal
  2. Manufactured / tested in accordance with UL 246, FM 510 and AWWA C502.
  3. Designed so that one person can replace any or all of the working parts without removing the main valve seat and, in case of accident or breaking of the hydrant barrel, valve will remain closed by mechanical design.
  4. 5¼" valve opening, minimum
  5. Inlet shall be 6" mechanical joint and NSF 61 Certified.
  6. Hydrant shall be of proper length for installation in a trench of 5.5'
  7. Two, 2½" national standard thread hose nozzles
  8. One factory installed 5" Harrington Storz pumper / steamer connection
  9. Square 15/16" operating nut
  10. Shall be right-hand open (clockwise)
  11. Designed for a minimum working pressure of 150-psi and tested at 300-psi
  12. Drain orifice shall be plugged.
  13. The upper barrel of the hydrant shall be "Safety Yellow"
  14. Two coats of asphalt varnish shall be applied to the section below ground.

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

6 OF 14

02.10.2023

15. All nozzles shall be on a removable head, not on the hydrant barrel, so that they may be rotated by changing the position of the top flange, without removing the barrel.

### 2.10 SUBMITTALS

- A. Provide product data on all materials, appurtenances and accessories.
- B. The manufacturer shall furnish certified transcripts of the results of tensile tests, a listing of the length and weight of each piece, a list of the pieces rejected and the reason for the rejection. The manufacturer shall also furnish a sworn statement that the inspection and all of the specified tests have been made and that the results comply with the requirements of the applicable standard.
- C. Manufacturer's certification of compliance to ANSI/AWWA C111/A21.11 shall accompany each shipment of Cor-Blue bolts.

### 2.11 MISCELLANEOUS

- A. Standpipes shall be a minimum of 4-inches in diameter with separate flushing and testing ports.
- B. Pressure Test Gauge shall be liquid filled, have a maximum reading of 200 psi, have hash marks in increments of 5 psi and have certification of calibration within the past 12 calendar months prior to use.
- C. Backflow Prevention Device shall be rented from or approved by the HBPW. The Backflow Prevention Device shall be capable of achieving the required flushing velocity. For pipes 8-inch in diameter or larger, 4-inch Backflow Prevention Devices or larger may be required and are not available for rent from the HBPW.
- D. Disinfection Chemicals shall be Liquid Chlorine or Sodium Hypochlorite (liquid) per AWWA B300

## PART 3 - CONSTRUCTION

### 3.1 STORAGE

- A. Pipe delivered to the site should be pressure washed with a bleach solution, capped with water tight caps and placed appropriately to minimize the entrance of foreign material and other contaminants.
- B. Valves delivered to the site shall be stored in shipping containers with labels in place.

### 3.2 WATER MAIN

- A. The Contractor shall verify the existing main depth, composition, diameter and location at the proposed connections / relocations to permit adjustment prior to construction. Adjustments to unit prices will not be considered.
- B. Water main relocations shall extend to the first undisturbed joint beyond the trench. Solid sleeve couplings shall only be used in reconstruction projects.

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

7 OF 14

02.10.2023

- C. Mains may be relocated over a conflicting utility only when 5' of cover will be maintained over the relocated main and a minimum vertical separation of 18" will be maintained between the two utilities.
- D. Route the pipe in a straight line. Allowable deflection is provided in Tables 3 and 4.
- E. Unless otherwise indicated in a profile, mains shall be installed with a minimum cover of 5' as measured from the permanent centerline elevation (or existing road elevation if the permanent pavement elevation is not known) or existing ground at main, whichever results in a lower elevation. Where the main crosses a ditch a minimum cover of 5' shall be maintained.
- F. A minimum horizontal separation of 10' from water main and all sewers (including reuse main) and a minimum vertical separation of 18" from water main and all utilities shall be maintained. Where pipe deflection is not possible, 22.5 ° vertical bends shall be used to obtain the required separation.
- G. All Ductile Iron mains shall be polyethylene encased. The polyethylene shall be overlapped and secured with tape. Installation Method 'C' as described in ANSI/AWWA C105/A21.5 shall be used. Damaged polyethylene shall be repaired prior to backfilling.
- H. The bell holes shall be excavated to sufficient width and depth to permit proper joining of pipe and thorough examination of joints.
- I. Every precaution shall be taken to prevent any foreign materials from entering the pipe while it is being placed. When pipe installation is not in progress, the open ends of the pipe shall be closed by a cover or a plug. If water is in the trench, the seal shall be a watertight seal and shall remain in place until the trench is completely dry. Pipe shall not be laid in water nor laid when, in the opinion of the Engineer or his representative, trench conditions are unsuitable.
- J. Rubber gaskets for mechanical joints shall be carefully placed and bolts drawn up evenly and progressively.
- K. When joining push on type joint pipes, the gasket will be wiped clean, flexed and then placed in the socket. A thin film of lubricant will be applied to the inside surface of the gasket that will come into contact with the entering pipe. Only manufacturer's recommended lubricant will be allowed. When installing gaskets in freezing weather, the gaskets will be kept warm and pliable prior to their use.
- L. When the pipe has been cut in the field, the cut end will be reconditioned. The outside of the cut end shall be tapered back about 1/8" at an angle of about 30 degrees in order to remove any sharp, rough edges which might damage the gasket.
- M. For pipe 8" or smaller, joint assemblies may be manually done. For pipe larger than 8", a jack-type tool will be used for the joint assemblies.
- N. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- O. Slope water pipe and position drains at low points.
- P. Thrust blocks may not be used in lieu of restrained joints.
- Q. When new pipe is connected to non-restrained pipe using 45 degree (or greater) bends or tees, thrust blocks set against or piling driven into solid bearing shall be constructed as pipe restraint. All such restraint shall be approved by the Engineer prior to backfill operations.
- R. Dead ends shall be closed with ductile iron plugs or caps and equipped with standpipes.
- S. Bore and jack shall follow HBPW current Jacking specifications, unless plans call for meeting specifications of another permitting authority such as CSX.

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

8 OF 14

02.10.2023

- T. Pipe shall be bedded in accordance with AWWA C600. The HBPW standard of practice is complete trench backfill with suitable sand. Native soils shall be reviewed with HBPW staff for reusability prior to pipe placement.
- U. PVC unrestrained pipe joints shall be monitored at each joint before burying, with the reference mark clearly visible.
1. No power equipment shall be used to seat PVC gasketed joints.
  2. If inspection of placed joints reveals over insertion with no reference mark visible, the installer shall install EBAA Mega Stop 5000 bell protection system at all remaining unrestrained joints at no extra cost.
- V. Pipe restraint shall follow EBAA Iron pipe restraint calculator.  
<https://rlc.ebaa.com/calculator.php>
1. Trench Type – Type 4
  2. Soils - SW
  3. Depth of Bury -5 ft. is minimum bury depth, use actual depth of main
  4. Design Pressure – 200 psi
  5. Safety – 1.5-1
  6. Also, to augment the above, in the straight through direction, the minimum length of the first pipe on either side of the tee shall be 10'. In those cases where a valve is placed at the tee, the valve shall be restrained with Mega-Lugs, and the next pipe shall be a minimum length of 10'.

### 3.3 WATER SERVICE

- A. Unconnected services shall be marked with 2"x2"x12' hardwood markers, placed vertically at the end of the pipe, painted a fluorescent color and 2'x3/8" diameter rebar placed 1' below grade.
- B. Unless otherwise approved, the Contractor shall provide at least 36-hours of advance notice to the affected customer before interrupting service.
- C. An existing service shall be relocated in one continuous operation. Couplings for copper water services are not permitted under paved surfaces.
- D. Broken services shall be turned off at the corporation, cut and disconnected. The new service shall be installed and the original water service shall be removed.
- E. All surface structures outside paved areas shall be set to the plan elevation of 0.20' above the adjacent ground.
- F. As encountered, contractor will be billed for damage and removal of sand and debris from customer meters after restoration of water service.
- G. A new service tap on an existing water main shall be a minimum of 2 feet from an existing service tap.
- H. Abandonment of existing services shall be as follows: The corporation stop will be shut off. Water service will be severed by removing a 1 foot section near the corporation stop. Abandoned water service to be marked with a painted blue, 2"x2" hardwood marker to 2' above the main.
- I. Unconnected ends of new service pipe should be protected during work to prevent foreign materials such as dirt from entering active service lines.

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

9 OF 14

02.10.2023

- J. Existing Galvanized Steel water services shall be replaced in compliance with the EGLE Lead Service replacement rules and the HBPW Galvanized Service Replacement specification

### 3.4 TRACER WIRE & CONNECTION POINTS

- A. Tracer wire and marker posts shall be installed directly on top of the respective utility. In no case shall a discrepancy of more than 6-inches exist between the utility and the tracer wire, unless approved by the BPW.
- B. Marker posts shall be installed per the manufacturer's instructions for direct bury installation. The tracer wire shall be connected to the external terminals. The external terminals shall be configured such that only the brass nuts and washers are visible from the outside of the post.
- C. In the event the utility is located entirely under a paved surface the marker post shall be installed in the nearest unpaved right of way/easement a minimum of 12-inches from the edge of pavement.
- D. Marker posts shall be installed plumb with a clear line of sight to all surrounding posts. In no case shall tracer wire be installed on the outside of a marker post.
- E. Tracer wire shall be installed with 10-feet of slack on either side of all connection points.
- F. Tracer wires of parallel utilities shall not remain in contact.
- G. For water main with regularly spaced fire hydrants the tracer wire shall follow the hydrant lead from the main and connect directly to the lower standpipe section immediately below the swivel flange. This shall apply to all hydrants within the construction influence area. Tracer wire shall be run up and connected to the back side of the hydrant barrel. With the approval of BPW personnel the tracer wire can be looped around the north bolt of the stand pipe section and retained with the bolt nut.
- H. At connections to existing main without tracer wire, the wire should be wrapped around the terminating Mega-Lug with 10 feet of slack.
- I. For water main without regularly spaced hydrants the tracer wire shall extend upward from the main and connect directly to the points provided in the marker posts. Locations of the marker posts or HideOut test stations shall be determined by the BPW.

### 3.5 GATE VALVE AND BOX

- A. Set valves on solid bearing,
- B. Valves shall only be installed on sections of mains that are horizontally level,
- C. Center and plumb valve box over valve,
- D. Without exception, service curb valve and box shall be installed on a portion of the water service that is perpendicular to the face of the building it services,
- E. Water service corporation valve shall be inserted directly into the main or HBPW approved clamp, saddle or coupling. Insertion must be at an angle less than 45 degrees from the horizontal and on the same side of the main as the customer being served,
- F. All surface structures outside paved areas shall be set to the plan elevation of 0.20' above the adjacent ground.
- G. Valve box to be set according to Detail WM-2 with concrete backfill at grade.

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

10 OF 14

02.10.2023

### 3.6 FIRE HYDRANTS

- A. Set hydrants plumb; locate Storz connection perpendicular to and facing roadway with the center of the connection 18" above the finished grade at the hydrant. At no cost to the owner, the Contractor may be required to exchange ordered hydrants for shorter hydrants in order to address utility conflicts.
- B. Thrust blocks may not be used in lieu of restrained joints. Restrained joints shall be installed in accordance with Table 2,
- C. As indicated, locate hydrants and control valves on solid bearing to grade,
- D. Breakable portion of the stem coupling shall be placed at or just above finish grade,
- E. Verify that all hydrant drains and weep holes are plugged,
- F. All hydrant barrels shall be encased in polyethylene and taped from the hydrant valve to 3" below grade. The polyethylene encasement under the hydrant flange shall not be exposed once restoration is complete.
- G. All surface structures outside paved areas shall be set to the plan elevation of 0.20' above the adjacent ground.
- H. Hydrants not yet in service, or taken out of service shall be marked "OUT OF SERVICE". In a manner approved by the BPW.
- I. At no cost to the owner, the Contractor shall replace any hydrant damaged beyond repair by the Contractor or his assigns. This shall include hydrants stripped, to any degree, of factory applied primer.
- J. Prior to the owner's final acceptance of construction, it is the Contractor's responsibility to pump all hydrants dry and verify that they remain dry no earlier than 30 days following the initial pumping.

### 3.7 HYDROSTATIC PRESSURE TESTING

- A. After completion of the pipeline installation, including partial backfill, but prior to final connection to the existing system, conduct, in the presence of the BPW, concurrent hydrostatic pressure and leakage tests in accordance with AWWA C600.
- B. Provide all personnel, equipment, corporation stops, gauges, pumps, standpipes, temporary blocking and other necessary apparatus requested by BPW personnel to perform the leakage and hydrostatic pressure tests. Standpipes shall be a minimum of 4" in diameter.
- C. Before applying test pressure, air shall be expelled completely from the section of piping under test. If air cannot be expelled from existing hydrants, corporation cocks shall be installed. After the air has been expelled, the hydrants or corporation cocks shall be closed and test pressure applied. If installed, the corporation cocks shall be removed and plugged after successful completion of the test.
- D. Dead ends, bends at hydrants and other fittings shall be properly restrained before testing.
- E. Tests shall not be made against closed valves.
- F. Slowly bring the piping to test pressure and allow the system to stabilize prior to conducting the leakage test. Valves shall not be operated at pressures above the rated valve pressure.
- G. Pressure test potable water systems at 150 psi for a minimum of 2 hours or longer as needed for the BPW to examine the line. Repair leaks and re-test.

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

11 OF 14

02.10.2023

- H. All exposed piping, fittings, valves, hydrants, and joints shall be examined carefully during the hydrostatic pressure test. Any damaged or defective materials discovered following the pressure test shall be repaired or replaced with sound material at no cost to the Owner, and test shall be repeated to the satisfaction of the BPW.
- I. No pipeline installation will be approved if the pressure varies by more than 5 psi during the duration of the test.
- J. An allowable loss pressure test can only be used at the discretion of the BPW.
- K. One complete hydrostatic pressure test will be witnessed by the BPW and considered normal service. If the first test does not fulfill all requirements of these hydrostatic pressure testing procedures, the BPW reserves the right to recoup any and all expenses for subsequent witnessing of hydrostatic pressure tests from the Contractor.

### 3.8 WATER MAIN DISINFECTION, SAMPLING AND TESTING

- A. When flushing or filling mains under construction from an existing municipal water main a backflow prevention device shall be utilized.
- B. One complete hydrostatic pressure test will be witnessed by the HBPW and considered normal service. If the first test does not fulfill all requirements of these hydrostatic pressure testing procedures, the HBPW reserves the right to recuperate any and all expenses for subsequent witnessing of hydrostatic pressure testing.
- C. At least 1 set of bacteriological samples shall be collected from every 1,200 LF of water main, at least 1 from each end and at least 1 from each branch that is 10 LF in length or longer.
- D. All necessary appurtenances for sampling will be provided by the contractor. These include pipe tapping, standpipe, valves, and spigot sample point.
- E. Disinfection of the installed main shall be in accordance with AWWA C651 continuous-feed method including preliminary flushing of all mains and branches at a velocity of not less than 3.0 ft/sec. The initial free chlorine concentration in all parts of the new system shall be no less than 25 mg/L. The contact time shall be at least 24 hours during which all valves and hydrants shall be operated. After the contact time the residual chlorine concentration shall be 10 mg/L or greater.
- F. The minimum quantity of chlorine required to achieve a 25 ppm concentration can be estimated using Equation 2. Note that the equation predicts the amount of *total* chlorine. Additional chlorine solution may be required to achieve an acceptable *free* chlorine concentration.

(Equation 2)

$$S = \frac{V}{C \cdot 200}$$

Where:

V = Volume of water in the pipeline, in gallons

C = Percentage of chlorine in chlorine solution (use 13 for 13% chlorine solution)

S = Volume of chlorine solution to add to pipeline, in gallons

- G. At the end of the 24 hour period, HBPW personnel will collect the first set of bacteriological test samples.

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

12 OF 14

02.10.2023

- H. Immediately prior to sampling, the Contractor, at no cost to the HBPW, shall apply dust palliative to all exposed aggregate within the project limits.
- I. Samples shall be collected from a spigot located on the vertical portion of a standpipe assembly. Samples shall not be collected from fire hydrants.
- J. HBPW Sampling Procedure:
  - 1. Heat sampling point with propane torch and open the valve completely.
  - 2. Working towards the existing water system, open all necessary valves until the new water system is being fed by the existing water system. Open the valves appropriately to draw a sample of water from the new system. DO NOT sample water from the existing system.
  - 3. Collect a sample of water in a 10 mL vial and check the free chlorine concentration. A sample cannot be taken until the water contains less than 30 ppm free chlorine for at least 24 hours.
  - 4. Once water has run freely from each sampling point for at least 5 minutes, throttle the valve until there is a constant stream about the thickness of a pencil. Allow the water to run for 1 additional minute.
  - 5. Hold the sample bottle near the bottom with one hand and unscrew the cap with the other. DO NOT rinse out the powder in the sample bottle. DO NOT allow the interior of the cap to come into contact with anything other than the sample bottle.
  - 6. Hold the sample bottle under the stream of water and fill it above the 100 mL line to the base of the neck. DO NOT adjust the flow once you have started filling the sample bottle. DO NOT allow the sample bottle to overflow. After the sample bottle is filled to the correct level remove it from the flow, immediately replace the cap and secure it tightly.
  - 7. Throttle down the sampling point valve then reverse the opening order to close the remaining valves.
  - 8. Complete a sample form to include: date issued, project name, time and date of water sample collection, name of person collecting samples, test locations, disinfectant residuals for each outlet tested (ppm), bacteria test results for each outlet tested and certification that water conforms to bacterial standards. Using permanent marker, transcribe the 5-digit number from the sample form to the bottle cap.
  - 9. Deliver the sample(s) to the lab immediately. Samples will be cooled on ice pack in cooler after collection and until delivery to lab. No more than 2 hours may pass between the collection time and the delivery time.
- K. At the discretion of the HBPW Water Treatment Plant, a third set of bacteriological test samples may be required 24 hours after the second set has been collected.
- L. In order to pass bacteriological testing, 2 or 3 consecutive samples, at least 24 hours apart, must display negative bacteriological results. Results from bacteriological testing will be available approximately 36 hours after the sample is taken.
- M. The HBPW reserves the right to recover all costs associated with additional flushing, sampling and testing. In addition to the assessment of liquidated damages for delays in construction resulting from failed bacteriological samples, failed samples will be billed to the Contractor at the rate of \$1,000.00 each failed testing cycle or \$273.00 each sample

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

13 OF 14

02.10.2023

point tested during a failed sample, whichever is greater. At no cost to the owner, the Contractor may be required to perform pipeline pigging operations in the direction from bell to spigot.

### 3.9 UTILITY CONDUCTIVITY TESTING & ACCEPTANCE

- A. Testing and acceptance shall be performed solely by the BPW Water/Wastewater Services group.
- B. Prior to final paving the tracer wire shall be tested to ensure conductivity and continuity. The Contractor shall coordinate testing with the BPW upon completion of new water main installation. Any and all areas in which conductivity and/or continuity are compromised the Contractor, at no cost to the BPW, shall excavate, repair, and retest the tracer wire.
- C. Damage to the tracer wire of any utility shall be treated as damage to the utility itself. The Contractor shall inform the BPW of the damage immediately so that repairs may be witnessed, tested, and accepted.

### 3.10 TYING-IN WATER MAINS

- A. In-Service valves shall be operated only under the supervision of HBPW personnel.
- B. The contractor must schedule all water main tie-ins at least 72 hours in advance with HBPW personnel. As part of that notice, the Contractor shall indicate the amount of shutdown time required.
- C. Daytime shutdowns shall be limited to 0800 - 1500, Monday - Friday, excluding holidays.
- D. The HBPW reserves the right to recover all costs associated with a shutdown that exceeds the allotted time. Also, after the allotted time, the contractor shall reimburse the HBPW for damages at the rate of \$20.00 per minute.
- E. Upon receipt of satisfactory bacteriological results, the contractor shall connect the new water main to the existing water system under the inspection of the HBPW. The interiors of all pipes and fittings shall be swabbed with a 1% - 5% chlorine solution. Before backfilling, the system shall be brought to full pressure, air removed and the joints inspected for leaks.
- F. Mechanical joint restraints are required on all tie-ins.

**TABLE 1: PERMISSIBLE DEFLECTIONS IN PUSH-ON JOINT PIPE**

Pipe Size (in)	Maximum Permissible Deflection per Length of Pipe (in)		Approximate Radius of Curve Produced by Succession of Joints (ft)	
	18'	20'	18'	20'
4	19	21	205	230
6	19	21	205	230
8	19	21	205	230
12	19	21	205	230
16	11	12	340	380
20	11	12	340	380
24	11	12	340	380

# HOLLAND BOARD OF PUBLIC WORKS (HBPW)

## SPECIFICATION FOR WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW: MJG

14 OF 14

02.10.2023

30	11	12	340	380
36	11	12	340	380

**TABLE 2: PERMISSIBLE DEFLECTIONS IN MECHANICAL JOINT PIPE**

Pipe Size (in)	Maximum Permissible Deflection per Length of Pipe (in)		Approximate Radius of Curve Produced by Succession of Joints (ft)	
	18'	20'	18'	20'
4	31	35	125	140
6	27	30	145	160
8	20	22	195	220
12	20	22	195	220
16	13	15	285	320
20	11	12	340	380
24	9	10	450	500

**END OF SECTION**