

THE CITY OF HOLLAND BOARD OF PUBLIC WORKS (HBPW)
SPECIFICATION
FOR
DUCTILE IRON PIPE WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW:ARP

2 OF 12

2.21.2012

1.3 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.
- D. 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.
- E. 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 - PRODUCTS

2.1 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
- B. Joints
 - 1. 350 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 and capable of being disassembled,
 - 4. Mechanical Joint Restraint (**PREFERRED**) shall be EBAA Iron, Inc. Series 1100 "MEGALUGS" or HBPW approved equal,
 - 5. 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

THE CITY OF HOLLAND BOARD OF PUBLIC WORKS (HBPW)
SPECIFICATION
FOR
DUCTILE IRON PIPE WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW:ARP

3 OF 12

2.21.2012

2.2 FITTINGS, DI

- A. Ductile iron, push on or mechanical joint, 350 psi rated joints conforming to ANSI/AWWA C153/A21.53 up to 12" and ANSI/AWWA C110/A21.11 for 16" and larger.
- 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.

2.3 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. The rated working pressure of the valve shall be 250 psi.
 - 4. The interior shall be free of pockets or ledges where debris can collect.
 - 5. All gaskets shall be pressurized o-rings. Packing glands are not permitted.
 - 6. The valve body and bonnet shall be coated on all exterior and interior surfaces with a fusion-bonded epoxy in conformance with AWWA C550.
 - 7. Bolting materials shall be stainless steel and meet ASTM A307, Grade B
 - 8. Gate valves 20" and larger shall have an enclosed spur gear.
 - 9. The manufacturer's name, valve size, year of manufacture, pressure rating, AWWA Standard, and "DI" shall be cast on the valve.
 - 10. 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.
 - 11. 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.
 - 12. 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.

THE CITY OF HOLLAND BOARD OF PUBLIC WORKS (HBPW)
SPECIFICATION
FOR
DUCTILE IRON PIPE WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW:ARP

4 OF 12

2.21.2012

13. 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 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

2.4 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 4701B-22 (no lead), Mueller P-25008-N or HBPW approved equal

B. Service Saddles

1. The brass alloy used shall meet the requirements of UNS/CDA C83600 per ASTM B62, ASTM B584 and ANSI/AWWA C800. 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.

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

C. Pipe

1. 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).

THE CITY OF HOLLAND BOARD OF PUBLIC WORKS (HBPW)
SPECIFICATION
FOR
DUCTILE IRON PIPE WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW:ARP

5 OF 12

2.21.2012

D. 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 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 6100-22 (no lead), Mueller P-25209-N or HBPW approved equal
2. Cast iron Buffalo Box with arch pattern screw adjustment and 2¼" minimum shaft ID.
 - A. Tyler / Union 6500 Series Box 95-E or HBPW approved equal.

2.5 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.

2.6 FIRE HYDRANT

- A. The HBPW W/W 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

THE CITY OF HOLLAND BOARD OF PUBLIC WORKS (HBPW)
SPECIFICATION
FOR
DUCTILE IRON PIPE WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW:ARP

6 OF 12

2.21.2012

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.
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.

2.7 MISCELLANEOUS

- A. Standpipes shall be a minimum of 4-inches in diameter.
- B. Pressure Test Gauge shall be liquid filled, have a maximum reading of 300 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.
- D. Disinfection Chemicals shall be Liquid Chlorine or Sodium Hypochlorite (liquid) per AWWA B300

PART 3 - EXECUTION

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 INSTALLATION – WATER MAIN, DI

- 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.
- 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 2 and 3.
- 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.

THE CITY OF HOLLAND BOARD OF PUBLIC WORKS (HBPW)
SPECIFICATION
FOR
DUCTILE IRON PIPE WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW:ARP

7 OF 12

2.21.2012

- G. All 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. Any 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. Restrained joints shall be installed in accordance with Table 1.
- 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. The contractor shall transport all removed metal pipe and appurtenances to a metal recycler where they shall be weighed and credited to the HBPW. Weight tickets shall be submitted for record.

3.3 INSTALLATION – 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.

THE CITY OF HOLLAND BOARD OF PUBLIC WORKS (HBPW)
SPECIFICATION
FOR
DUCTILE IRON PIPE WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW:ARP

8 OF 12

2.21.2012

- 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.

3.4 INSTALLATION – 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.

3.5 INSTALLATION – 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 1,
- 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 by a hydrant marker ring containing the words "OUT OF SERVICE". The ring shall be red with white block lettering with a height no less than 3".
- 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.

THE CITY OF HOLLAND BOARD OF PUBLIC WORKS (HBPW)
SPECIFICATION
FOR
DUCTILE IRON PIPE WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW:ARP

9 OF 12

2.21.2012

3.6 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. Achieve a free chlorine concentration of 25 – 500 ppm not more than 10 LF downstream from the beginning of the new main and maintain the disinfectant in the system, including all hydrant branches and standpipes, for at least 24 hours. HBPW personnel may test the treated water for conformance to this specification.
- E. Flush and circulate the water in the system, including hydrant branches and standpipes, with a minimum velocity of 2.5 FPS until the required cleanliness is achieved. Maintain the water in the system for at least 24 hours. At the end of the 24 hour period, HBPW personnel will collect the first set of bacteriological test samples.
- F. Immediately prior to sampling, the Contractor, at no cost to the HBPW, shall apply dust palliative to all exposed aggregate within the project limits.
- G. Samples shall be collected from a spigot located on the vertical portion of a standpipe assembly. Samples shall not be collected from fire hydrants.
- H. HBPW Sampling Procedure:
 - 1. Spray bleach onto the sampling point 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 1.30 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 to the shoulder of the 100 mL line. 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.

THE CITY OF HOLLAND BOARD OF PUBLIC WORKS (HBPW)
SPECIFICATION
FOR
DUCTILE IRON PIPE WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW:ARP

10 OF 12

2.21.2012

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. No more than 2 hours may pass between the collection time and the delivery time.
- I. 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.
 - J. 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.
 - K. 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. At no cost to the owner, the Contractor may be required to perform pipeline pigging operations in the direction from bell to spigot.

3.7 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 HBPW 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.

THE CITY OF HOLLAND BOARD OF PUBLIC WORKS (HBPW)
SPECIFICATION
FOR
DUCTILE IRON PIPE WATER DISTRIBUTION SYSTEMS – 33 10 00

HBPW:ARP

11 OF 12

2.21.2012

TABLE 1: PIPE RESTRAINT LENGTH REQUIRED, FEET

Pipe Size (in)	Tees, 90° Bends	45° Bends	22½° Bends	11¼° Bends	Dead Ends	Reducers One Size	**
4	33	13	7	3	82		
6	46	19	9	4	117	61	90
8	59	24	11	6	149	61	79
12	83	34	17	9	213	114	172
16	106	44	21	10	275	117	157
20	127	53	26	13	333	117	149
24	149	61	30	14	389	117	142
30	176	73	36	17	469	164	212
36	202	83	40	20	542	164	200

**If length of pipe on small side of reducer exceeds this value, restrained joints are unnecessary.

Tees: Tees shall be restrained in the branch direction as required in the table above. 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 to the tee as noted below, and the next pipe shall be a minimum length of 10'.

Bends: Bends shall be restrained in both directions as required in the table above.

Valves: All mainline valves shall be restrained.

Plugs/Caps: All dead ends on mains shall be plugged or capped with standard plugs or caps. The main, including the plug or cap shall be restrained back from the plug or cap as required in the table above. In those cases where a plug/cap is located at or adjacent to a tee or cross, the pipe shall be restrained as a dead end, per the table above.

Casing Pipe: Restrain all joints within a casing pipe or within 20' of a casing pipe.

All joints lying within the above minimum distances shall be restrained and shall not be included as a separate pay item. The length of restrained joints is based on trench backfill being compacted to 95% of maximum unit weight in accordance with MDOT procedures. If, at the discretion of the HBPW, the pipe is not encased in polyethylene wrap, a multiplier of 0.70 may be used.

TABLE 2: PERMISSIBLE DEFLECTIONS IN PUSH-ON JOINT PIPE

THE CITY OF HOLLAND BOARD OF PUBLIC WORKS (HBPW)

**SPECIFICATION
FOR
DUCTILE IRON PIPE WATER DISTRIBUTION SYSTEMS – 33 10 00**

HBPW:ARP

12 OF 12

2.21.2012

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
30	11	12	340	380
36	11	12	340	380

TABLE 3: 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