williams&works

engineers surveyors planners

February 26, 2024

City of Lowell Mike Burns City Manager 301 East Main Street Lowell, MI 49331

CONTRACT: WASHINGTON STREET IMPROVEMENTS 2024

ADDENDUM NO. 1

Notice to All Prospective Bidders:

This Addendum is issued in accordance with <u>INSTRUCTIONS TO BIDDERS</u>, and is hereby incorporated into the Contract Documents. The CONTRACTOR is reminded to appropriately-acknowledge receipt of this Addendum in the <u>BID FORM</u>. This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents dated February 12, 2024. This Addendum No. 1 consists of two (2) typed pages and enclosures. The issuance of the Specification Sections, and the issue of Drawings are listed at the end of this document and are attached to this document.

Modifications to Specifications:

- 1. C-111 Advertisement for Bids: (re-issued)
 - After "Project has an expected duration of 160 days." insert "The Project shall be substantially completed and open to traffic by or before November 1, 2024."
- 2. C-410 Bid Form: (re-issued)
 - Addition of item 78 HMA, 4EL
 - Cured In-Place Manhole Lining, 48-inch quantity updated to 35 feet.
- 3. Section 01 35 21 Contractor Conduct and Public Relations: Inserted
- 4. Section 33 11 00 Water Main: (re-issued)
 - 2.03.A.2.: replace "minimum 2 per joint" with "minimum 3 per joint"
 - 3.02.G.2.: Insert

 In the case that an emergency repair is the only solution, the CONTRACTOR must follow EGLE's emergency repair guidelines. The City of Lowell and the ENGINEER will oversee the necessary actions required by EGLE after an emergency repair is completed.
 - 3.02.k.2.a.: remove "copper horn"
 - 3.02.k.2.a.: Replace "3/4 inch minimum" with "1 inch minimum"
- 2. Section 33 31 00 Sanitary Sewerage: (re-issued)
 - 2.01.B.: replace "same classification as mainline pipe" with "classification determined by table 702.2 of the Michigan Plumbing Code."
 - 3.02.F.: Insert

City of Lowell Washington Street Improvements 2024 Addendum No. 1 February 26, 2024 Page 2 of 2

9. A minimum 5-foot horizontal separation of water service and sewer later is required per the Michigan Plumbing code. If a 5-foot separation cannot be maintained, per section 603.2 of the Michigan Plumbing code the sewer lateral must be constructed of materials listed in table 702.2.

Modifications to Drawings:

- 1. Sheet 2.1: (Re-issued) Add Main Street typical section STA 15+65 to STA 16+45
- 2. Sheet 24: (Re-issued) Add two (2) valve and box callouts to the plans.

Please contact the project manager with any questions or comments on this addendum.

Respectfully submitted,

Williams & Works

Brandon Mieras, P.E. Project Manager

- Enclosures: C-111 -- Advertisement for Bids C-410 – Bid Form Section 01 35 21 – Contractor Conduct and Public Relations Section 33 10 00 – Watermain Section 33 31 00 – Sanitary Sewerage Sheet 2.1 – Typical Sections Sheet 24 – WM Plan & Profile: STA. 33+50 to STA. 37+50
- Cc: All Plan Holders Mike Burns, City of Lowell Rich Labombard, City of Lowell Katie Mendez, EIT, Williams & Works File

ADVERTISEMENT FOR BIDS

CITY OF LOWELL 301 E. MAIN STREET LOWELL, MI 49331

General Notice

The City of Lowell is requesting Bids for the construction of the following Project:

Washington Street Improvements 2024

Bids for the construction of the Project will be received at the **City of Lowell** located at **301 E. Main Street, Lowell, MI 49331**, until **Wednesday**, **March 13th at 10:00am** local time. At that time the Bids received will be publicly opened and read.

The Project includes the following Work:

Removal and replacement of existing asphalt pavement, sanitary sewer, watermain and storm sewer and associated structures, upgrades to existing concrete curb, gutters and sidewalk ramps.

Bids will be received on a unit price basis for a single prime Contract.

Owner anticipates that the Project's total bid price will be approximately \$**3,400,000**. The Project has an expected duration of **160** days. The Project shall be substantially completed and open to traffic by or before November 1, 2024.

Obtaining the Bidding Documents

Information and Bidding Documents for the Project can be found at the following designated website:

https://williams-works.com/

Bidding Documents may be downloaded from the designated website. Prospective Bidders are required to register with the designated website as a plan holder, even if Bidding Documents are obtained from a plan room or source other than the designated website in either electronic or paper format. **Builder's Exchanges are authorized to share the contract documents with other exchanges.** The designated website will be updated periodically with addenda, lists of registered plan holders, reports, and other information relevant to submitting a Bid for the Project. All official notifications, addenda, and other Bidding Documents will be offered only through the designated website. Neither Owner nor Engineer will be responsible for Bidding Documents, including addenda, if any, obtained from sources other than the designated website.

The Issuing Office for the Bidding Documents is:

Williams & Works 549 Ottawa Ave NW, Suite 310 Grand Rapids, MI 49503

Bidding Documents also may be examined in person or online*via: Builders Exchange of Lansing 1240 East Saginaw, Lansing, MI 48906* Builders Exchange of Grand Rapids, 678 Front Ave. NW #330, Grand Rapids, MI 49504* Construction Association of Michigan, 43636 Woodward Ave Suite 400, Bloomfield Hills, MI 48302* Williams & Works, 549 Ottawa Ave NW, Grand Rapids MI 49503* Prospective Bidders may obtain or examine the Bidding Documents at the Issuing Office on Monday through Friday between the hours of **8:00 a.m. and 5:00 p.m.**, and may obtain copies of the Bidding Documents from the Issuing Office as described below. Partial sets of Bidding Documents will not be available from the Issuing Office. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents, including addenda, if any, obtained from sources other than the Issuing Office.

Pre-bid Conference

A pre-bid conference for the Project will be held on **Monday, February 26nd** at **10am** at **City Hall, 301 E Main St, Lowell, MI 49331.** Attendance at the pre-bid conference is encouraged but not required.

Instructions to Bidders.

For all further requirements regarding bid submittal, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Bidding Documents.

Domestic Preference

This project is subject to the Build America, Buy America Act (BABAA) requirement under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953. Absent an approved waiver, all iron, steel, manufactured products, and construction materials used in this project must be produced in the United States.

The following waivers apply to this Contract:

BABAA De Minimis, Small Grants and Minor Components

This Advertisement is issued by:

Owner: City of LowellBy:Mike BurnsTitle:City ManagerDate:February 12, 2024

BID FORM FOR CONSTRUCTION CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to:

City of Lowell 301 E. Main Street Lowell, MI 49331

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

- 2.01 The following documents are submitted with and made a condition of this Bid:
 - A. Required Bid security;
 - B. List of Proposed Subcontractors;
 - C. List of Proposed Suppliers;
 - D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;
 - E. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;
 - F. Bidder Qualification Statement submitted within five days of Owner's request.
 - G. If Bid amount exceeds \$10,000, signed Compliance Statement (RD 400-6). Refer to specific equal opportunity requirements set forth in the Supplementary Conditions of the Construction Contract (EJCDC C-800);
 - H. If Bid amount exceeds \$25,000, signed Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion Lower Tier Covered Transactions (AD-1048);
 - I. If Bid amount exceeds \$100,000, signed RD Instruction 1940-Q Exhibit A-1, Certification for Contracts, Grants, and Loans.

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

- 3.01 Unit Price Bids
 - A. Bidder will perform the following Work at the indicated unit prices:

ltem No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Mobilization, Max 10%	LSUM	1	\$	\$
2	Maintaining Traffic	LSUM	1	\$	\$
3	Erosion Control, Inlet Protection, Fabric Drop	Ea	28	\$	\$
4	Erosion Control, Maintenance, Sediment Removal	Cyd	75	\$	\$
5	Erosion Control, Silt Fence	Ft	700	\$	\$
6	Pavt, Rem, Modified	Syd	12593	\$	\$
7	Curb and Gutter, Rem	Ft	5100	\$	\$
8	Concrete Driveway and Sidewalk, Rem	Syd	1683	\$	\$
9	Stump, Rem, 19 inch to 36 inch	Ea	1	\$	\$
10	Maintaining Sanitary Sewer Service	LSUM	1	\$	\$
11	Sanitary Sewer, Rem	Ft	2733	\$	\$
12	Sanitary Sewer Structure, Rem	Ea	19	\$	\$
13	Sanitary Sewer, 8 inch	Ft	374	\$	\$
14	Sanitary Sewer, 12 inch	Ft	1235	\$	\$
15	Sanitary Sewer, 15 inch	Ft	1127	\$	\$
16	Sanitary Sewer, 24 inch	Ft	364	\$	\$
17	Sewer Wye Branch, Sanitary, 8 inch x 6 inch	Ea	8	\$	\$
18	Sewer Wye Branch, Sanitary, 12 inch x 6 inch	Ea	27	\$	\$
19	Sewer Wye Branch, Sanitary, 15 inch x 6 inch	Ea	19	\$	\$
20	Sewer Wye Branch, Sanitary, 24 inch x 6 inch	Ea	2	\$	\$
21	Sanitary Manhole, 48 inch	Ea	10	\$	\$
22	Sanitary Sewer Lateral, 6 inch	Ft	1455	\$	\$
23	Connect to Existing Sanitary Sewer	Ea	10	\$	\$
24	Cured In-Place Pipe Liner, 27 inch	Ft	610	\$	\$
25	Cured In-Place Manhole Lining, 48 inch	Ft	35	\$	\$
26	Fire Hydrant, Rem	Ea	9	\$	\$
27	Water Main, 6 inch	Ft	75	\$	\$
28	Water Main, 8 inch	Ft	4140	\$	\$
29	Water Main, 12 inch	Ft	155	\$	\$
30	Fire Hydrant	Ea	9	\$	\$
31	Bend, 45 degree, 6 inch	Ea	4	\$	\$
32	Bend, 45 degree, 8 inch	Ea	8	\$	\$
33	Bend, 22 Degree, 8 inch	Ea	1	\$	\$
34	Bend, 11 Degree, 8 inch	Ea	3	\$	\$
35	Bend, 90 Degree, 8 inch	Ea	1	\$	\$
36	Valve and Box, 6 inch	Ea	8	\$	\$
37	Valve and Box, 8 inch	Ea	29	\$	\$
38	Valve and Box, 12 inch	Ea	4	\$	\$

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39	Tee, 8 inch x 8 inch x 6 inch	Ea	8	\$	\$	
40	Tee, 8 inch x 8 inch x 8 inch	Ea	13	\$	\$	
41	Tee, 12 inch x 12 inch x 12 inch	Ea	2	\$	\$	
42	Reducer, 8 inch x 6 inch	Ea	3	\$	\$	
43	Reducer, 12 inch x 8 inch	Ea	2	\$	\$	
44	Cap, 8 inch	Ea	8	\$	\$	
45	Connect to Existing Water Main, 6 inch	Ea	3	\$	\$	
46	Connect to Existing Water Main, 8 inch	Ea	6	\$	\$	
47	Connect to Existing Water Main, 12 inch	Ea	2	\$	\$	
48	Water Meter Chamber including Meter Installation	Ea	61	\$	\$	
49	Tap for Water Service including Corporation Stop, 1 inch	Ea	61	\$	\$	
50	Water Service 1 inch, Main to Water Meter Chamber	Ft	1360	\$	\$	
51	Water Service 1 inch, Water Meter Chamber to Building	Ft	600	\$	\$	
52	Reconnect Existing 1 inch Water Service	Ea	61	\$	\$	
53	Maintain Storm Sewer Service	LSUM	1	\$	\$	
54	Storm Structure, Rem	Ea	15	\$	\$	
55	Storm Sewer,C76 CL III, 12 inch	Ft	220	\$	\$	
56	Storm Sewer, 48 inch	Ft	96	\$	\$	
57	Dr Structure, Storm, 48 inch Dia	Ea	2	\$	\$	
58	Dr Structure, Catch Basin, 24 inch Dia	Ea	18	\$	\$	
59	Connect to Existing Storm Sewer, 12 inch	Ea	1	\$	\$	
60	Connect to Existing Storm Sewer, 15 inch	Ea	1	\$	\$	
61	Core and Boot, 12 inch Storm Sewer into Catch Basin or Manhole	Ea	8	\$	\$	
62	Dr Structure Repair	Ea	5	\$	\$	
63	Driveway, Nonreinf Conc, 6 inch	Syd	577	\$	\$	
64	Sidewalk Ramp, Conc, 6 inch	Sft	572	\$	\$	
65	Sidewalk, Conc, 4 inch	Sft	10428	\$	\$	
66	Detectable Warning Surface	Ft	95	\$	\$	
67	Machine Grading	Sta	47	\$	\$	
68	Subbase, CIP	Cyd	1635	\$	\$	
69	Aggregate Base, 8 inch	Syd	13388	\$	\$	
70	Curb and Gutter, Conc, Det F4, Modified	Ft	5100	\$	\$	
71	HMA, 3EL	Ton	1103	\$ 	\$	
72	HMA, 5EL	Ton	1472	\$ 	\$	
73	Dr Structure Cover, Adj, Case 1	Ea	23	\$ 	\$	
74	Slope Restoration, Non-Freeway, Type A	Syd	3110	\$	\$	
75	Lead Water Service Allowance	Lsum	1	\$ 45,000.00	\$	45,000.00
76	Storm Sewer Connection, 48 inch	Ea	2	\$ 	\$	

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77	Connection Rebuild	Ea	7	\$	\$
78	HMA, 4EL	Ton	54	\$	\$
	\$				

- B. Bidder acknowledges that:
 - 1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and
 - 2. estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 4—DELETED

ARTICLE 5—DELETED

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

- 6.01 Bidder's Representations
 - A. In submitting this Bid, Bidder represents the following:
 - 1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
 - 2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - 3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work, including all Domestic Preference requirements.
 - 4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
 - 5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
 - 6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and

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procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.

- 7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
- 8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- 10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- 11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.
- 6.02 Deleted
- 6.03 Deleted

BIDDER hereby submits this Bid as set forth above:

Bidder:

	(typed or printed name of organization)
By:	
	(individual's signature)
Name:	
	(typed or printed)
Title:	
	(typed or printed)
Date:	(tored eventieted)
	(typea or printea)
If Bidder	is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.
Attest:	
	(individual's signature)
Name:	
	(typed or printed)
Title:	
	(typed or printed)
Date:	
	(typed or printed)
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Address for giving notices:

Bidder's Contact:		
Name:		
	(typed or printed)	
Title:		
	(typed or printed)	
Phone:		
Email:		
Address:		

PART 1- GENERAL

1.01 DESCRIPTION

- A. This section includes:
 - 1. CONTRACTOR'S responsibilities for maintaining professional conduct, minimizing disruption to the public, and fostering positive public relations during road construction.

1.02 CONTRACTOR RESPONSIBILITIES

- A. Professional Conduct:
 - 1. The CONTRACTOR shall conduct all operations in a professional and ethical manner, complying with all applicable laws, regulations, and permits.
 - 2. The CONTRACTOR'S personnel shall be courteous and respectful towards the public, property owners, and project stakeholders.
 - 3. The CONTRACTOR shall provide clear and effective communication channels for addressing concerns, receiving feedback, and providing updates to relevant parties throughout the duration of the project.

PART 2 - ENVIRONMENTAL AND COMMUNITY CONSIDERATIONS:

- 2.01 The CONTRACTOR shall ensure proper disposal of construction waste and debris in compliance with environmental regulations and project specifications.
- 2.02 The CONTRACTOR shall designate specific areas for material storage, equipment parking, and worker amenities to minimize disruption to the neighborhood.
- 2.03 The CONTRACTOR shall implement erosion and sediment control measures to prevent soil erosion and runoff from the construction site.

PART 3 – QUALITY ASSURANCE AND COMPLIANCE:

3.01 The CONTRACTOR shall adhere to the project specifications and approved construction drawings, notifying the client of any deviations or discrepancies that may affect the quality or integrity of the work.

PART 4 – CONTRACTOR CONDUCT AND ETHICS:

4.01 The CONTRACTOR and its personnel shall conduct themselves with honesty, integrity, and professionalism at all times, refraining from any behavior that could damage the reputation of the project or the parties involved.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes the work required for water transmission and distribution mains, structures and appurtenant work.
 - 1. The primary intent of the project is to replace existing water main. The existing water main may be brittle and will fail when subjected to loading, impact or excessive vibration.
 - 2. All reference to American Water Works Association (ANSI/AWWA) standards and National Sanitation Foundation (NSF) shall be to the latest revision thereof.
 - 3. All internal plumbing required to reconnect water services shall be in accordance with the current Michigan Plumbing Code.

1.02 SUBMITTALS:

- A. Submit the following:
 - 1. Product data on valves, hydrant and service fittings.
- B. Report witness measurements on valves, fittings and curb boxes.
 - 1. Provide measurements from three permanent fixtures such as building corners, power poles and trees 8-inch diameter and larger.
- C. Provide manufacturer's certifications on pipe and fittings indicating conformance to specifications prior to installation.

1.03 JOB CONDITIONS:

- A. Interrupting Water Service:
 - 1. Scheduling: Obtain OWNER's approval prior to interruption of service.
 - 2. Provide notice of 8 hours to affected occupants and 24 hours to Fire Department of time and duration.
 - 3. Provide stand-by service as required; outage not to exceed 4 hours.
 - 4. Existing valve operation shall be by OWNER'S employees only.
 - 5. Prevent contamination of existing water mains.
- B. Clean up promptly following pipe installation within maximum of 600 feet behind pipe laying operation.
- C. Salvage all existing valve boxes, curb boxes and hydrants removed and deliver to the OWNER's yard at 217 S. Hudson St., Lowell, MI 49331. Hydrants shall be removed carefully without causing damage to the hydrant and fittings.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Cement Lining: ANSI A 21.4 standard thickness for ductile iron pipe and fittings.
- B. Hydrant Leads: Restrained joints, Ductile Iron.
- C. All products that may come in contact with water shall meet American national standards institute/national sanitation foundation standards, specifically ANSI/NSF standard 61.
- D. All plastic materials shall be NSF 14, or NSF –pw rated; for potable water.

2.02 PIPE:

- A. Ductile Iron: ANSI A21.50 and ANSI A21.51; pressure class 350.
- B. PVC: AWWA C909, Class 150 DR 18

- C. HDPE: AWWA C906 DR 11
- D. Service Tubing:
 - 1. Copper: ASTM B88, Type K annealed and soft temper.
 - 2. Plastic: Permitted only after the water meter. Trace wire must be provided; multiple trace wires are required if installed via directional boring.
- 2.03 JOINTS:
 - A. Ductile Iron Pipe and Fittings:
 - 1. Mechanical: ANSI A21.11.- Electrical conductors required: welded cable, wedges (minimum 2 per joint), or conductivity gaskets.
 - 2. Push-on: ANSI A21.11. Electrical conductors required: welded cable, wedges (minimum 3 per joint), or conductivity gaskets.
 - Locking joint restraint glands comparable to Mega Lug by EBAA Iron Works, U.S. Pipe FIELD LOK®, or approved equal provided it meets ANSI A21.11 AWWA C111 for rubber gasketed joints. Nitrile Buna Rubber shall be used where petroleum contamination is present.
 - B. PVC Pipe: Bell and spigot with elastomeric rubber ring gaskets ASTM D3139. Nitrile Buna Rubber shall be used where petroleum contamination is present.

2.04 FITTINGS:

- A. Ductile Iron: ANSI A21.10 (AWWA C110), or ANSI A21.53 (AWWA C153), 350 psi working pressure thru 24 inches and 250 psi above.
- B. Stainless Steel: ASTM F-593 or, ASTM F-594.
- 2.05 VALVES:
 - A. Gate: EAST JORDAN IRON WORKS, AWWA C509 or equal, resilient wedge, non-rising stem, fully bronze mounted with o-ring packing and roller and gear operator over 16 inches. End connections shall match pipe. (OPEN RIGHT, CLOCKWISE). Must meet Build America Buy America Act (BABAA) criteria.
 - B. Boxes: 3 section cast iron with lid marked WATER:
 - 1. Upper section: Screw on adjoining center section and full diameter throughout.
 - 2. Center section: Minimum 5 inch inside diameter.
 - 3. Base section: Fit over valve bonnet and shaped round for valves thru 10 inch and oval for 12 inch and over.
 - 4. EJIW 4906, screw adjustment or equal
 - C. Concrete Support rings
 - 5. Concrete support rings as the base for water main valve boxes.
 - 6. Geotex 4 oz. (heavy duty) fabric

2.06 HYDRANTS:

- A. AWWA C502, mechanical joint with drain outlet, East Jordan 5BR 250, Red. Part No. 54915D or equal.
- B. 5 inch size, 2 2-1/2 inch hose nozzles and 1 5 inch integral hydrant Storz 55903D fitting on the main pumper nozzle, including blind cap and Storz spanner wrench. The cap shall be connected to the adapter or hydrant with a 0.125" vinyl coated aircraft cable. The fittings shall be installed on the hydrant during assembly, not at the job site.
- C. Provide National Standard Fire Hose Thread.
- D. Weep hole shall be open unless, as directed by the ENGINEER. The ENGINEER may direct the closure of the weep hole in areas with poor draining soils, high ground water table, or groundwater/soil contamination.

E. Newly installed hydrants shall be bagged until hydrant is in use.

2.07 VALVE CHAMBERS:

- A. Precast Units: ASTM C478.
 - 1. Joints: Cement mortar, pre-formed bituminous rope or "o"-ring gaskets.
 - 2. Pipe openings: Pipe diameter plus 6 inch maximum.
- B. Concrete radial units: ASTM C139.
- C. Grade Rings: ASTM C478.
- D. Mortar: ASTM C270, 1 part Portland cement, 1 part lime and 3 parts sand by volume.
- E. Chamber Steps shall be one of the following:
 - 1. Cast iron: 10 inch deep by 10 inch wide, 5 inch tread depth, 1 inch x 1 inch tread section, with 2 inch rail height.
 - 2. Plastic: Reinforced with 3/8 inch steel rod and dimensioned as cast iron.
- F. Chamber Castings: East Jordan 1140 A cover or Neenah R-1764 two hole cover; with letter W or equal.
- 2.08 SERVICE FITTINGS: All fittings shall be Compression, and brass water fittings must be in compliance with the "low lead brass" rule that took effect January 4, 2014.
 - A. Corporation Stops: Ford F-1000 (packed joint, size per plan), or equal
 - B. Service Clamps: Ford 202BSD dual band saddle or equivalent with stainless steel parts, AWWA C800 threads.
- 2.09 PLASTIC SEAMLESS ENCASEMENT TUBING: Where indicated on plans.
 - A. Material: ASTM D-1248 Polyethylene, Type I, Class C, 8 mils thick, AWWA C105.
 - C. Closing Tape: 2 inch wide Poly Ken #900 or Scotch wrap #50.
- 2.10 WATER METER CHAMBER: Where indicated on plans.
 - A. Meter Pit: Ford "Wabash" W4-C-REC463-T or equal.
 - B. Cover: Top lid: C3L-C-REC463-T Style C or equal. Inner Lid: W3BPD or equal.
- 2.11 MISCELLANEOUS:
 - A. Insulation: Dow Corning 2 inch blue board with minimum R value of 7.5 or equal.
 - B. Tracer wire and appurtenances.
 - 1. Trace wire AWG and break load shall be as follows:
 - a. Open Trench- Trace wire shall be #12 AWG Copper Clad Steel, High Strength with minimum 450 lb. break load, with minimum 30 mil HDPE installation thickness.
 - b. Directional Drilling/ Boring Trace wire shall be #12 AWG Copper Clad Steel, Estra High Strength with minimum 1,150 lb. break load, with minimum 30 mil HDPE insulation thickness.
 - 2. All trace wire shall have HDPE insulation intended for direct bury, color coated per APWA standard for the specific utility being marked.
 - 3. Wires shall terminate in a vox Valco tracer wire access box, Bingham & Taylor 2 ½" or approved equal. Located adjacent to fire hydrant with excess slack to access wire.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Alignment and Grade:
 - Deviations: Notify ENGINEER and obtain instructions to proceed where there is an obstruction not shown on plans.
 - a. Verify location and depth of existing utilities in advance of construction and provide adjustments in alignment and grade of watermain at no additional cost to OWNER.
 - 2. Depth of pipe: 5 feet, minimum cover.
 - 3. High points in pipe line: Locate at services and hydrants.
- B. Bedding:

1.

1.

- 1. Method: See DETAIL SHEETS
- 2. Bed and backfill entire trench with granular material meeting MDOT CL II granular.
- 3. Provide continuous bearing supporting entire length of pipe barrel evenly.
- C. Cleaning Pipe and Fittings:
 - General: Provide interior free of foreign material and joint surfaces free of lumps and blisters.

3.02 INSTALLATION:

- A. Removal / Abandonment of Existing Watermain
 - 1. Existing watermain is to be removed as shown on the plans.
 - 2. Abandonment of portions of the existing watermain may be allowed, but only be when authorized by the ENGINEER.
 - 3. Removal /Abandonment of the existing watermain is included in the unit price for installation of the new watermain and will not be paid for separately.
- B. Laying Pipe:
 - 1. Prevent entrance of foreign material and plug open ends with a watertight fitting when left unattended.
 - 2. Provide pipe length and bedding as a unit in a frost free, dry trench.
 - 3. Special supports and saddles: See DETAIL SHEETS
 - 4. Joint deflection shall be no more than as specified by pipe manufacturer.
 - 5. Provide minimum vertical and horizontal separation between watermain and sewers or 18 inches and 10 feet, respectively.
 - 6. Ductile Iron pipe installation shall conform to AWWA C600.
 - 7. PVC pipe installation shall conform to AWWA C605.
- C. Cutting Pipe:
 - 1. Saw cut.
- D. Jointing:
 - 1. Mechanical:
 - a. Lubricate as recommended by manufacturer.
 - b. Tighten bolts evenly to 75 to 90 foot-pounds.
 - c. Locking joint restraint glands comparable to Mega Lug by EBAA Iron Works, U.S. Pipe FIELD LOK®, or approved equal provided it meets ANSI A21.11 AWWA C111 for rubber gasketed joints in ductile iron pipe.
 - 2. Push-on:
 - a. Lubricate as recommended by manufacturer.
 - b. Shape beveling as recommended by manufacturer.
 - c. 3 bronze continuity wedges (per joint) must be installed in all bell and spigot connections.
- E. Setting Valves, Valve Chambers, Fittings and Fire Hydrants:
 - 1. General: See Detail Sheets.
 - 2. Valves: Set plumb.
 - 3. Valve boxes:
 - a. Base section: Center and plumb over operating nut and 2 inches above bonnet joint.

- b. Upper section: Set cover flush with finished grade.
- c. Witnesses: Provide 3 measurements to permanent surface features.
 - d. Install concrete support rings as a base for water main valve box
- e. Wrap Geotex 4 oz. (heavy duty) fabric around bottom and top of valve to prevent debris from entering valve box. Fabric should be cut to fit over top section of valve, placed under concrete support ring and pulled up to mid-section of the valve box. Fabric should be restrained using zip tie.
- 4. Hydrants:
 - a. Positioning: Plumb with pumper nozzle facing curb and nozzle centerline 20 inches above finished grade.
 - b. Any hydrant found to have dirt dumped on it during construction will be replaced by CONTRACTOR at their cost.
- 5. All joints shall be restrained.
- F. Chambers:
 - 1. General: SEE DETAIL SHEETS
 - 2. Base Bedding: Provide 4" pea stone with full and even bearing in impervious soils or wet conditions. Otherwise provide on undisturbed frost-free dry subgrade.
 - 3. Precast: Fill joint space completely and trowel.
 - 4. Provide casting setting as follows:
 - a. Existing pavement: Flush.
 - b. Gravel grade: 4 inches below.
 - c. Unpaved areas: Finished grade.
- G. Connections:
 - 1. Existing water mains:
 - a. Provide temporary support during cut-in.
 - b. Disinfect by swabbing pipe, valves and fittings with 4 percent chlorine solution.
 - c. Pressure off: Install mechanical joint solid sleeve.
 - d. Pressure on: Install tapping sleeve, valve and box.
 - Service lines:
 - a. Align at right angles to street or easement line.
 - b. Any abandoned water service lead shall be cut from the private side and provide an approved watertight compression plug on each cut end.
 - b. Minimum depth: Same as pipe, 5 feet minimum.
 - c. Tapping: 45 degrees above center and provide horizontal loop at corporation stop. (1) Plastic Pipe: Tap pipe using a holesaw cutter (new cutter) and double
 - strap saddle per manufacturer's recommendation. No direct tapping allowed. Hole saw size shall be no less than the nominal tap size.
 - d. Maximum tap sizes shall be as follows:

Type of Pipe (Tap)	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
Ductile Iron (direct)	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2"	2"	2"	2"
All Pipe (w/dbl. strap saddle)	1"	1-1/2"	2"	2"	2"	2"	2"	2"	2"	2"

- e. In the case that an emergency repair is the only solution, the CONTRACTOR must follow EGLE's emergency repair guidelines. The City of Lowell and the ENGINEER will oversee the necessary actions required by EGLE after an emergency repair is completed.
- H. Joint Restraint: Provide restrained joints for pipe lengths listed in joint restraint tables below. Note design & field conditions assumed.
 - 1. Restraint Table for Fittings in a Horizontal Plane:

Ap	Appurtenance								
	Pipe Size (in)	90° Bend	45º Bend	22.5º Bend	11.25º Bend				
	4	24'	10'	5'	2'				
	6	35'	14'	7'	3'				
	8	46'	19'	9'	4'				
	10	56'	23'	11'	5'				
ipe	12	66'	27'	13'	7'				
БР	16	86'	36'	17'	9'				
inlir	20 107'		44'	21'	10'				
Mai	24	126'	52'	25'	12'				

2. Restraint Table for Fittings in a Non-horizontal Plane (i.e. angled or vertical position):

Appurtenance

_							
	Pipe Size (in)	90º Bend	45º Bend	22.5º Bend	11.25º Bend	Reducers (One Size)	Dead Ends (Plugs, Valves)
	4	45'	19'	9'	4'	14'	45'
	6	64'	27'	13'	6'	33'	64'
	8	83'	34'	17'	8'	35'	83'
	10	101'	42'	20'	10'	34'	101'
ipe	12	119'	49'	24'	12'	35'	119'
БF	16	154'	64'	31'	15'	65'	154'
inlir	20	187'	77'	37'	18'	66'	187'
Ma	24	219'	91'	44'	22'	66'	219'

3. Restraint Table for Tees:

Note: Restraint Lengths Shown are for Branch Pipe Only

D	Prench Dine										
Br	Branch Pipe										
	Pipe Size										
	(in)	4	6	8	10	12	16	20	24		
	4	18'									
	6	16'	28'								
	8	14'	27'	38'							
	10	12'	25'	37'	48'						
ipe	12	10'	24'	36'	47'	58'					
inline P	16	6'	21'	34'	45'	56'	77'				
	20	2'	18'	32'	43'	55'	76'	97'			
Mai	24	0'	15'	29'	41'	53'	75'	96'	116'		

- 4. Hydrants: Restrain entire assembly.
- 5. Reducers: If the reducer lies in a straight run, and the length of the small side opposite the reducer exceeds this length, no restrained joints are necessary.
- I. Polyethylene Encasement:
 - In corrosive soils: Install over ductile iron pipe and tape seams in accordance with AWWA C-105. Use where directed by engineer or shown on plans.
- J. Trace Wire

1.

- 1. Connectors:
 - a. All mainline trace wires must be interconnected in intersections, at mainline tees and mainline crosses. At tees, the three wires shall be joined using a single 3-way lockable connector. At Crosses, the four wires shall be joined using a 4-way

connector. Use of two 3-way connectors with a short jumper wire between them is an acceptable alternative.

- b. Direct bury wire connectors shall include 3-way lockable connectors and mainline to lateral lug connectors specifically manufactured for use in underground trace wire installation. Connectors shall be dielectric silicon filled to seal out moisture and corrosion, and shall be installed in a manner so as to prevent any uninsulated wire exposure.
- c. Non locking friction fit, twist on or taped connectors are prohibited.
- 2. Termination/ Access: a. All trace wir
 - All trace wire termination points must utilize an approved trace wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose.
 - b. All grade level/in-ground access boxes shall be appropriately identified with "sewer" or "water" cast into the cap and be color coded.
 - c. A minimum of 2 ft. of excess/slack wire is required in all trace wire access boxes after meeting final elevation.
 - d. All trace wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the trace wire connection and the terminal for the grounding anode wire connection.
 - e. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes
 - f. **Service Lines on public property** Trace wire must terminate at an approved grade level/in- ground trace wire access box, located at the edge of the road right-of-way, and out of the roadway.
 - g. Service Lines on private property Trace wire must terminate at an approved above-ground trace wire access box, affixed to the building exterior directly above where the utility enters the building, at an elevation not greater than 5 vertical feet above finished grade, or terminate at an approved grade level/in-ground trace wire access box, located within 2 linear feet of the building being served by the utility.
 - h. **Hydrants** Trace wire must terminate at an approved above-ground trace wire access box, properly affixed to the hydrant grade flange. (affixing with tape or plastic ties shall not be acceptable)
 - i. Long-runs, in excess of 500 linear feet without service laterals or hydrants -Trace wire access must be provided utilizing an approved grade level/in-ground trace wire access box, located at the edge of the road right-of-way, and out of the roadway. The grade level/in-ground trace wire access box shall be delineated using a minimum 48" polyethylene marker post, color coded per APWA standard for the specific utility being marked.
- 3. Grounding:
 - a. Trace wire must be properly grounded at all dead ends/stubs
 - b. Grounding of trace wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20ft of #14 red HDPE insulated copper clad steel wire connected to anode (minimum 0.5 lb.) Specifically manufactured for this purpose, and buried at the same elevation as the utility.
 - c. When grounding the trace wire at dead ends/stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the trace wire, at the maximum possible distance.
 - d. When grounding the trace wire in areas where the trace wire is continuous and neither the mainline trace wire or the grounding anode wire will be terminated at/above grade, install grounding anode directly beneath and in-line with the trace wire. Do not coil excess wire from grounding anode. In this installation method, the grounding anode wire shall be trimmed to an appropriate length before connecting to trace wire with a mainline to lateral lugconnector.
 - e. Where the anode wire will be connected to a trace

wire access box, a minimum of 2 ft. of excess/slack wire is required after meeting final elevation.

- 4. Trace Wire:
 - a. Trace wire installation shall be performed in such a manner that allows proper access for connection of line tracing equipment, proper locating of wire without loss or deterioration of low frequency (512Hz) signal for distances in excess of 1,000 linear feet, and without distortion of signal caused by multiple wires being installed in close proximity to one another.
 - b. Trace wire systems must be installed as a single continuous wire, except where using approved connectors. No looping or coiling of wire is allowed.
 - c. Any damage occurring during installation of the trace wire must be immediately repaired by removing the damaged wire, and installing a new section of wire with approved connectors. Taping and/or spray coating shall not be allowed.
 - d. Trace wire shall be installed at the bottom half of the pipe and secured (taped/tied) at 5' intervals.
 - e. Trace wire must be properly grounded as specified.
 - f. Trace wire on all service laterals/stubs must terminate at an approved trace wire access box located directly above the utility, at the edge of the road right-of-way, but out of the roadway. (See Trace wire Termination/Access)
 - g. At all mainline dead-ends, trace wire shall go to ground using an approved connection to a drive-in magnesium grounding anode rod, buried at the same depth as the trace wire. (See Grounding)
 - h. Mainline trace wire shall not be connected to existing conductive pipes. Treat as a mainline dead- end, ground using an approved waterproof connection to a grounding anode buried at the same depth as the trace wire.
 - i. All service lateral trace wires shall be a single wire, connected to the mainline trace wire using a mainline to lateral lug connector, installed without cutting/splicing the mainline trace wire.
 - j. In occurrences where an existing trace wire is encountered on an existing utility that is being extended or tied into, the new trace wire and existing trace wire shall be connected using approved splice connectors, and shall be properly grounded at the splice location as specified.
- 5. Water system:
 - a. A mainline trace wire must be installed, with all service lateral trace wires properly connected to the mainline trace wire, to ensure full tracing/locating capabilities from a single connection point.
 - b. Lay mainline trace wire continuously, by-passing around the outside of valves and fittings on the North or East side.
 - c. Trace wire on all water service laterals must terminate at an approved trace wire access box color coded blue and located directly above the service lateral at the edge of road right of way.
 - d. Above-ground tracer wire access boxes will be installed on all fire hydrants.
 - e. All conductive and non-conductive service lines shall include tracer wire
- k. Construction of Water Services outside the Right-of-Way.
 - Plumbing permits will be required for work performed inside and outside existing buildings. The CONTRACTOR shall secure all required permits and pay all associated fees. All plumbing work inside and within three feet of a building shall be performed by a licensed plumber in possession of a valid permit.
 - 2. Connection of new service line.
 - a. Connect new shut off valve, and meter within 3 feet of basement wall, or as approve by the ENGINEER.
 - b. Continue copper to existing house plumbing, match existing size, 1 inch minimum.

Connect to maximum pipe size of system. Provide all copper and fittings necessary to make connection.

- c. Flush water systems until water clears, check all new plumbing for leaks.
- d. Restore temporary removals or damages to the lawn, driveway, or building.
- e. Have homeowner sign a letter of acceptance of the Work, in a form approved by ENGINEER.
- f. The CONTRACTOR shall not connect proposed copper water service back to an existing lead service for any reason, temporary or otherwise, unless approved in writing by the ENGINEER.

3.03 FIELD QUALITY CONTROL:

- A. Testing and Inspection:
 - 1. General:
 - a. Supervision: By ENGINEER.
 - b. Completion: Before connecting to existing line.
 - c. Notification: Pretest and arrange with ENGINEER for inspection and test.
 - d. Equipment and assistance: Provide.
 - e. Required water: By OWNER where available from municipal system.
 - 2. Tracing wire continuity: All new trace wire installations shall be located using typical low frequency (512Hz) line tracing equipment by the CONTRACTOR, witnessed by the CONTRACTOR, ENGINEER and OWNER as applicable, prior to acceptance of ownership. This verification shall be performed upon completion of rough grading and again prior to final acceptance of the project. Continuity testing in lieu of actual line tracing shall not be accepted.
 - 3. Pressure:
 - a. Conditions: Hydrostatically tested in accordance with AWWA C600. Air or airwater methods of applying pressure prohibited.
 - b. Range: 140 to 150 psi at highest elevation.
 - c. Duration: 1 hour and until completion of inspection.
 - d. Procedure: Fill system slowly, expel air through corporation stop at high points and apply pressure.
 - e. Inspection: Examine line and appurtenances for leaks and movement.
 - f. Corrections: Repair defects, visible leaks and repeat test until acceptable.
 - 4. Leakage:
 - a. Sequence: Following pressure test.
 - b. Average pressure: Within pressure test range.
 - c. Duration: 2 hours.
 - d. Filling: As in pressure test.
 - e. Make-up water: Supply measured by water meter.
 - f. Leakage: Quantity of water supplied to maintain test pressure.
 - g. Allowable: Less than: <u>L = SD x square root (P)</u> where:
 - 148,000

L = leakage (gallons per hour) D = nominal pipe diameter (inches)

S = length of pipe (feet) P = average test pressure (psi gauge)

- h. Correction: Repair defects and repeat test until acceptable.
- 5. Testing valves only: Maintain pressure on main and check all valves as follows:
 - a. Vent extreme ends of main and briefly check each valve progressively back towards test point.
 - b. Allowable pressure drop shall be less than 10 psi in 5 minutes with test pump off.
 - c. Correction: Repair defects and repeat test until acceptable.
- B. Procedure

- 1. All communication between the City and the Contractor shall be channeled through one individual representing each party, i.e. City Project Inspector and Contractor project foreman. All other communication should be minimized and considered "un-official".
- 2. Prior to any water main construction, a source sample shall be collected using AWWA approved means for sampling water. The source sample may be from an existing hydrant (use a cap with a sampling tap), house spigot, or a direct water main sampling tap. After the source sample is verified as potable water, the water main construction can proceed.
- 3. The Contractor may be required to install a corporation stop and copper gooseneck for sampling and pressure testing. Upon completion of all testing, the Contractor should be required to remove the corporation stop and plug the water main.
- 4. Water main anchoring and restraint shall be adequate for the testing pressures, and provisions for flushing the mains without damage to surrounding property shall be made in advance.
- 5. Before any testing can proceed, a total water main flush is required. Flushing time will depend on length and size of water main (see attached charts). All water mains shall be flushed a minimum of thirty (30) minutes.
- 6. The Contractor shall provide a place for all discharged flushing water. The Contractor shall furnish blow-off plugs, standpipes, hand valves, bends, connecting pieces and fire hose as needed to prevent damage and soil erosion for testing and chlorination of the new water mains. All required sleeves shall be furnished by the City.
- 7. The Contractor shall retain all water main material they furnish. The placement, removal and salvage of all water main material, including the sleeves, shall be included in the water main construction. No special payment will be made for this work.
- 8. The original chlorination test should follow a total water main flush. A chlorine solution of a maximum of twenty five (25 ppm) parts per million should be injected after the water main flush. A high range test kit (AWWA C651) can be used to verify the chlorine content.
- 9. After twenty four (24) hours of chlorine contact, the water main should be flushed entirely of this concentrate. (NOTE: It is the responsibility of the Contractor to furnish dechlorination tablets, hoses and an area of discharge for the chlorinated water.)
- 10. The first sample is taken with the chlorine residuals recorded by the City of Lowell Water Dept. personnel. Twenty-four (24) hours after the first sample, a second sample from the same sampling point will be taken with the chlorine residuals being recorded. All samples will be a representative sample of the water in the new water main.
- 11. All samples will be taken and tested by City of Lowell Water Dept. personnel. The test results are considered final.
- 12. Test results are communicated from the lab to a contact person at the City. The Project Inspector shall promptly relay the notification of test results to the Contractor's liaison. A passing test must be achieved prior to granting approval to connect the new water main into the existing system. A failing test results in re-chlorination at the sole expense of the Contractor, using the following steps:
 - a. Re-flush the water main (doubling the time periods shown on attached chart) and rechlorinate at a maximum of twenty five (25 ppm) parts per million with a contact time of forty eight (48) hours.
 - b. The chlorine residual should be recorded after the first twenty four (24) hours. If the chlorine residual has dropped more than fifteen (15 ppm) parts per million from the original amount, the water main shall be re-chlorinated continuously until the chlorine residual stabilizes in the water main. Upon completion of this, a resample from the water main will be taken as previously outlined in step 8.
 - c. In the case of a third failing test, the Contractor shall, at his expense, clean the water main by approved mechanical means until the water main is clear of any build up or waste. It should be the Contractor's responsibility to notify the Owner when they have completed this process and they are ready for a retest. The Contractor should perform the required cleaning activities within a reasonable period of time. Failure to do this should constitute an inability to clean the water main and it should be removed and reconstructed.
 - d. After the Contractor cleaning, the Owner should again flush the water main (tripling the time period shown on attached charts). A chlorine solution of a maximum twenty five (25 ppm) parts per million should be administered with a phosphate additive for forty eight (48) hours.

- e. Residuals should be taken after twenty four (24) hours and again, chlorine should be added until stabilization is maintained.
- f. Samples should be taken as done previously in step 8. If the test results return as a failure, the Contractor shall be required to remove and relay the water main at their expense
- 13. The Contractor shall NOT add any type of disinfectant or other additive without written permission from the Owner. If permission is granted, the Owner will furnish all materials. The Contractor may witness any or all of testing procedures.
- 14. Subject to prior approval by the Engineer, pipe, fittings or offsets that have not been subjected to the chlorination test must be cleaned of all dust, dirt, or other deposits and then carefully swabbed with a chlorine solution containing fifty (50 ppm) parts per million of chlorine, immediately before installation.
- C. Preventative Measures The AWWA recommends the following preventive measures, which shall be followed during the construction of water mains and fire lines:
 - 1. Precautions shall be taken to protect the interiors of pipes, fittings, and valves against contamination. Pipe delivered for construction shall be stored so as to minimize entrance of foreign material. All openings in the pipeline shall be closed with a water tight plug when laying pipe is stopped at the close of day's work or for other reasons, such as rest breaks or meal periods.
 - 2. Delay in placement of delivered pipe invites contamination. The more closely the rate of delivery is correlated to the rate of pipe laying, the less likelihood of contamination.
 - 3. Contractor should consider capping and plugging the ends of all pipe stored on the construction site.
- D. Testing Costs All costs associated with the pressure testing and chlorination of water mains will be billed to the Contractor.
- E. Defective Water main
 - Any defects, cracks, or leakage that may develop or that may be discovered, either in the pipe or in the body of the castings when the City furnishes the pipe, due to the negligence of the Contractor, or leakage in joints shall be promptly corrected by the Contractor at his own expense and to the satisfaction of the Engineer. Bell leak clamps shall not be used to abate leaking joints on new water mains.
 - 2. If any such defects, cracks, or leakage are not due to the negligence of the Contractor, then the City will furnish whatever pipe or special castings which are necessary to replace the defective parts. The Contractor at his own expense shall remove such defective parts and install the new pipe and special castings furnished by the City for that purpose.
 - 3. "Leakage" is defined as the quantity of water to be supplied into the newly laid pipe necessary to maintain the specified leakage test pressure after the pipe has been filled with water and air expelled.
- F. Cold Weather Testing Requirements The following methods apply during periods of testing and chlorinating water main during cold temperature:
 - 1. All hydrants shall be wrapped and insulated from freezing. If additional heat sources are required, the Contractor shall furnish all necessary materials at the contractor's expense.
 - 2. The Contractor shall provide a heated shelter to accommodate all testing equipment, including but not limited to: test hydrants, jumper hoses, pumps, and any supplies needed to pressure test and chlorinate water mains.
 - 3. During periods of below-average temperatures, the City reserves the right to suspend testing and chlorinating activities until it is determined by the Engineer that said weather conditions will not impact the integrity of the testing and chlorinating process.
- G. Flushing Requirements
 - 1. Watermains

Required Flow at Openings to Flush Water Mains with 40 psi Residual Pressure (AWWA C651-86, Table 3)

Pipe	Flow R	equired	to	Size of Ta Number o Moin	ıp (inches) f Taps on	Number of 2 1/2 inch
(inches)	(gpm)	1 10 10 10 10 10 10 10 10 10 10 10 10 10	lly	1 1/2	2	Outlets
4	120	1		-	-	1
6	270	-		1	-	1
8	470	-		2	1	1
10	740	-		3	2	1
12	1060	-		-	3	2
16	1600	-		-	4	2

With a forty (40) psi pressure in the main with the hydrant flowing to atmosphere, a two and a half (2-1/2") inch hydrant outlet will discharge approximately one thousand (1000 gpm) gallons per minute and a four and a half (4-1/2") inch hydrant outlet will discharge approximately two thousand five hundred (2500 gpm) gallons per minute.

The number of taps on the main is based on discharge through five (5') feet of galvanized iron (GI) pipe with one ninety (90°) degree bend.

2. <u>Firelines</u>

h----

Required Flow at Openings to Flush Fire Lines (1992 NFPA 24, Table 8-8.2)

Pipe Diameter	Flow Required to Produce 10.0 ft/s Velocity
(inches) A	(gpm)
6	900
8	1600
10	2400
12	3500

****END OF SECTION***







PART 1 - GENERAL

- 1.01 DESCRIPTION:
 - A. This section includes the work required for sanitary sewer pipe, structures, and appurtenant work.

1.02 SUBMITTALS:

- A. Submit the following:
 - 1. Proposed equipment and method for leakage testing.
 - 2. Shop drawings on radius pipe and manhole tees.
 - 3. Manufacturer's air or vacuum test results on concrete pipe.
 - 4. Manufacturer's certification of compliance with specified materials.
- B. Contractor shall report witness measurements and "as-built" elevation on end of service lines.
 - Provide measurements from three permanent fixtures such as building corners, power poles and trees 8-inch diameter and larger.
- C. Report and record presence of underground utilities and drains

1.03 JOB CONDITIONS:

1.

- A. Maintain existing sanitary sewer system operational.
- B. Do not bypass wastewater to ground or surface waters.
- C. Install service lines as pipe laying progresses and within maximum of 600 feet of mainline sewer installation.
- D. Cleanup promptly following pipe installation and within maximum of 400 feet behind pipe laying operation.

PART 2 - PRODUCTS

2.01 PIPE:

A. Classification Table:

Туре		Design Depth (feet)	
&	D1	D2	D3
Size	5-10	10-15	over 15
Plastic (PVC)	ASTM	ASTM	ASTM
6" - 18"	D 3034-SDR35	D 3034-SDR35	D 3034-SDR26

- B. Service Pipe (laterals): Provide minimum 6 inch, classification determined by table 702.2 of the Michigan Plumbing Code.
- C. Plastic Pipe: Provide seating marks where couplings are used for jointing. 1. Joints: Provide rubber "o" ring.
- D. Joint Repair or Connecting to Existing Sewer Pipe of Different Material: 1. Provide Manhole.
- E. Provide Joint Materials as Indicated for the Following Pipes:1. Plastic (PVC): Joints shall meet ASTM F477.

2.02 MANHOLES:

A. Manholes shall be precast units with booted pipe connections.

- B. Precast Units: ASTM C478, modified for "o" ring gaskets.
 - 1. Pipe Openings: Provide flexible, watertight rubber boot using mechanically compressed flexible joint re-seal, link-seal, Pressure Wedge II, Kor-N-Seal, or equal. Conform to ASTM C923.
- C. Concrete Brick: ASTM C55, Grade N-1
- D. Grade Rings: ASTM C478. Note: Ladtech HDPE adjusting rings are a suitable alternate.
- E. Mortar: ASTM C270: 1 part Portland cement, 1 part lime and 3 parts sand by volume.
- F. Manhole Steps:
 - 1. Plastic with 3/8-inch steel rod reinforcement.
 - 2. Dimensions: 10-inch deep by 10-inch wide, 5-inch tread depth.
- G. Manhole Castings: Shall have 24 inch opening with solid covers, watertight frame gasket. Standard Manhole Castings: East Jordan 1045Z Frame, 1040A (City of Lowell) cover.
- H. Bituminous Waterproofing: ASTM D449.
- I. Joint Waterproofing: CRETEX, Infi-Shield exterior joint wrap or approved equal. Apply to joints and casting/chimney/adjustment rings.
- 2.03 MISCELLANEOUS:
 - A. Tracer Wire and appurtenances.
 - 1. Trace wire AWG and break load shall be as follows:
 - a. Open Trench- Trace wire shall be #12 AWG Copper Clad Steel, High Strength with minimum 450 lb. break load, with minimum 30 mil HDPE installation thickness.
 - Directional Drilling/ Boring Trace wire shall be #12 AWG Copper Clad Steel, Estra High Strength with minimum 1,150 lb. break load, with minimum 30 mil HDPE insulation thickness.
 - 2. All trace wire shall have HDPE insulation intended for direct bury, color coated per APWA standard for the specific utility being marked.
 - 3. Wires shall terminate in a vox Valco tracer wire access box, Bingham & Taylor 2 ½" or approved equal. Located adjacent to fire hydrant with excess slack to access wire.

PART 3 - CONSTRUCTION

- 3.01 PREPARATION:
 - A. Alignment and Grade:
 - 1. Deviations: Notify ENGINEER and obtain instructions to proceed where there is a grade discrepancy or an obstruction not shown on the plans.
 - 2. Laser Beam Control (Use for all sewer less than 24" in diameter):
 - a. Check grade: at set-up point, 25 feet, 50 feet, 100 feet and 200 foot points thereafter to the next set-up point.
 - b. Projector advancement: Reset at each manhole.
 - B. Bedding:
 - 1. Method: ASTM 2321.
 - 2. Provide bedding area and full trench backfill with MDOT class II granular material.
 - 3. Provide continuous bearing by supporting entire length of pipe barrel evenly.

3.02 INSTALLATION:

- A. General Pipe installation shall be in accordance with ASTM 2321.
- B. Laying Pipe:

- 1. Direction shall be upstream with spigot or tongue end downstream and bell end upstream.
- 2. Joints shall be smooth and clean.
- 3. Place pipe length and bedding as a unit in a frost free, dry trench.
- C. Jointing:
 - 1. Provide solvents, adhesives and lubricants as furnished by Manufacturer.
 - 2. Gasket position: Confirm that the gasket is in place and that the joint is properly made.
- D. Manholes:
 - 1. General: ASTM C478
 - 2. Base bedding: Provide 4" pea stone with full and even bearing in impervious soils or wet conditions. Otherwise provide on undisturbed frost-free dry subgrade.
 - 3. Fill joint space completely and trowel between sections of precast units.
 - 4. Grout annular space between manhole wall and flow channel and pipe.
 - 5. Provide casting grade setting as follows:
 - a. Existing pavement: Finished grade.
 - b. Gravel or lawn grade: 4 inches below.
 - c. Unpaved areas: Finished grade.
 - 6. Provide waterproofing on ASTM C478 manholes:
 - a. Bituminous: Apply 1 gallon per 100 s.f. to outside free of holidays and open pin holes.
 - 7. Provide flexible seal on all joints including: chimney, casting, adjustment rings, and each barrel section joint for entire manhole. Surface preparation required to install seal material shall be in accordance with the manufacturer's instructions.
- E. Connections:
 - 1. Connect to existing sanitary manhole by core drilling a flexible manhole connection meeting ASTM C923 to receive an opening adequate to insert pipe and secure circumference of pipe with non-shrink cement mortar.
 - a. Relay and repoint loose blocks and bricks on existing block and brick structures. Re-channel flowlines and benches with concrete.
 - b. System carrying wastewater: by-pass pumping as necessary to complete work.
 - 2. Future Sanitary Sewer: Provide the following:
 - a. Plug: Pipe 4 inch through 21 inch with standard disc.
 - b. Bulkhead: Pipe 24 inch and larger with brick and mortar and 1/2 inch plaster coat outside.
 - (1) 24 inch 36 inch: 4 inch thick.
 - (2) 42 inch 60 inch: 8 inch thick.
- F. Service Lines (laterals):
 - 1. Align at right angles to street or easement line.
 - 2. Grade: Provide at uniform rate from connection or main riser to the property or easement line, minimum 1/8 inch per foot. (1%)
 - 3. Provide minimum depth at street right-of-way line, property line, or easement line as follows:
 - a. Standard house with basement: 12 feet below first floor elevation.
 - b. Tri-level house: 4 feet below basement floor elevation.
 - c. House with walkout basement: 5 feet below basement floor elevation.
 - d. Commercial and industrial buildings, schools, churches: As determined in field by ENGINEER.
 - e. The above depths govern, except that the minimum depth at the right-of-way line or property line shall be 10 feet below street or easement centerline grade unless otherwise permitted by ENGINEER. Property line riser excluded from this requirement.
 - 4. Connection fitting:
 - a. Locate as directed by ENGINEER in field.
 - b. 45 degrees or 60 degrees Wyes: Provide on all pipe except concrete pipe.
 - c. Tees: Allowed only on reinforced concrete pipe.
 - 5. Main riser will be allowed where cover exceeds 13 feet at mainline, and meets R.O.W. requirements.
 - 6. Plugging: Provide standard plugs or caps securely blocked.

- 7. Markers: Provide 1/2" steel rod, extended from lateral invert to 4 inches below grade.
- 8. Witnesses: Report the following to the ENGINEER:
 - a. Wyes and Tee: Measurement to nearest downstream manhole.
 - b. Markers: 3 measurements to permanent surface features.
- 9. A minimum 5 foot horizontal separation of water service and sewer later is required per the Michigan Plumbing code. If a 5 foot separation cannot be maintained, per section 603.2 of the Michigan Plumbing code the sewer lateral must be constructed of materials listed in table 702.2.
- G. Trace Wire
 - 1. Connectors:
 - a. All mainline trace wires must be interconnected in intersections, at mainline tees and mainline crosses. At tees, the three wires shall be joined using a single 3-way lockable connector. At Crosses, the four wires shall be joined using a 4-way connector. Use of two 3-way connectors with a short jumper wire between them is an acceptable alternative.
 - b. Direct bury wire connectors shall include 3-way lockable connectors and mainline to lateral lug connectors specifically manufactured for use in underground trace wire installation. Connectors shall be dielectric silicon filled to seal out moisture and corrosion, and shall be installed in a manner so as to prevent any uninsulated wire exposure.
 - c. Non locking friction fit, twist on or taped connectors are prohibited.
 - 2. Termination/ Access:
 - a. All trace wire termination points must utilize an approved trace wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose.
 - b. All grade level/in-ground access boxes shall be appropriately identified with "sewer" or "water" cast into the cap and be color coded.
 - c. A minimum of 2 ft. of excess/slack wire is required in all trace wire access boxes after meeting final elevation.
 - d. All trace wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the trace wire connection and the terminal for the grounding anode wire connection.
 - e. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes
 - f. **Service Laterals on public property** Trace wire must terminate at an approved grade level/in- ground trace wire access box, located at the edge of the road right-of-way, and out of the roadway.
 - g. **Service Laterals on private property** Trace wire must terminate at an approved above-ground trace wire access box, affixed to the building exterior directly above where the utility enters the building, at an elevation not greater than 5 vertical feet above finished grade, or terminate at an approved grade level/in-ground trace wire access box, located within 2 linear feet of the building being served by the utility.
 - h. **Long-runs, in excess of 500 linear feet without service laterals or hydrants** -Trace wire access must be provided utilizing an approved grade level/in-ground trace wire access box, located at the edge of the road right-of-way, and out of the roadway. The grade level/in-ground trace wire access box shall be delineated using a minimum 48" polyethylene marker post, color coded per APWA standard for the specific utility being marked.
 - 3. Grounding:
 - a. Trace wire must be properly grounded at all dead ends/stubs
 - b. Grounding of trace wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20ft of #14 red HDPE insulated copper clad steel wire connected to anode (minimum 0.5 lb.) Specifically manufactured for this purpose, and buried at the same elevation as the utility.

- c. When grounding the trace wire at dead ends/stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the trace wire, at the maximum possible distance.
- d. When grounding the trace wire in areas where the trace wire is continuous and neither the mainline trace wire or the grounding anode wire will be terminated at/above grade, install grounding anode directly beneath and in-line with the trace wire. Do not coil excess wire from grounding anode. In this installation method, the grounding anode wire shall be trimmed to an appropriate length before connecting to trace wire with a mainline to lateral lug connector.
- e. Where the anode wire will be connected to a trace wire access box, a minimum of 2 ft. of excess/slack wire is required after meeting final elevation.
- 4. Trace Wire:
 - a. Trace wire installation shall be performed in such a manner that allows proper access for connection of line tracing equipment, proper locating of wire without loss or deterioration of low frequency (512Hz) signal for distances in excess of 1,000 linear feet, and without distortion of signal caused by multiple wires being installed in close proximity to one another.
 - b. Trace wire systems must be installed as a single continuous wire, except where using approved connectors. No looping or coiling of wire is allowed.
 - c. Any damage occurring during installation of the trace wire must be immediately repaired by removing the damaged wire, and installing a new section of wire with approved connectors. Taping and/or spray coating shall not be allowed.
 - d. Trace wire shall be installed at the bottom half of the pipe and secured (taped/tied) at 5' intervals.
 - e. Trace wire must be properly grounded as specified.
 - f. Trace wire on all service laterals/stubs must terminate at an approved trace wire access box located directly above the utility, at the edge of the road right-of-way, but out of the roadway. (See Trace wire Termination/Access)
 - g. At all mainline dead-ends, trace wire shall go to ground using an approved connection to a drive-in magnesium grounding anode rod, buried at the same depth as the trace wire. (See Grounding)
 - h. Mainline trace wire shall not be connected to existing conductive pipes. Treat as a mainline dead- end, ground using an approved waterproof connection to a grounding anode buried at the same depth as the trace wire.
 - i. All service lateral trace wires shall be a single wire, connected to the mainline trace wire using a mainline to lateral lug connector, installed without cutting/splicing the mainline trace wire.
 - j. In occurrences where an existing trace wire is encountered on an existing utility that is being extended or tied into, the new trace wire and existing trace wire shall be connected using approved splice connectors, and shall be properly grounded at the splice location as specified.

3.03 TESTING AND INSPECTION:

- A. General:
 - 1. Supervision: By ENGINEER.
 - 2. Testing: Perform upon completion and before connecting to active system.
 - 3. Leakage tests: Provide promptly following installation of sewer pipe including services, and keep within maximum 1200 feet behind pipe laying operation.
 - 4. Notification: Clean, pretest and arrange with ENGINEER for final inspection and test.
 - 5. Provide necessary equipment, manpower and assistance.





- Β. Line and grade: Allowable drift between structures from proposed alignment will be as follows. 1
 - Line:
 - a. Thru 36 inch: 0.20 foot. Over 36 inch: 0.40 foot.
 - b. 2. Grade:
 - Thru 36 inch: 0.02 foot. a.
 - Over 36 inch: 0.05 foot. b.
- C. Plastic pipe deformation:
 - Pipe deflection will be limited to 5 percent of diameter. 1.
 - 2. Pull GO, NO-GO type gauge through pipe.
 - Schedule: Conduct after final backfill has been in place a minimum of thirty (30) days, and 3. after shutdown of dewatering operation.
- D. Leakage Testing:

1.

2.

- Acceptable leakage will be as follows:
 - Water: Less than 100 gallons per inch of pipe diameter per mile of pipe per 24 a. hours. (test permitted only when service laterals are not present, and approved by ENGINEER)
 - Air: Holding time not less than that listed in table. b.
 - Correction: Repair defects and repeat test until acceptable.
 - Method of repairing defects shall be approved by ENGINEER. a.
- Ε. Infiltration test (water):
 - Conditions: Minimum groundwater depth 2 feet above high point of system under test. 1.
 - 2. Procedure:
 - Install and maintain "V" notch weir at low end of system under test. a.
 - b. Leakage: Quantity of water measured by "V" notch weir.
- F. Exfiltration test (water):
 - Conditions: Determine groundwater elevation. 1.
 - Procedure: 2.
 - Fill System minimum 2 feet above high point of system or 2 feet above a. groundwater, whichever is higher.
 - b. Leakage: Quantity of water required to maintain constant level.
- G. Exfiltration (air):
 - Condition: Determine groundwater elevation. 1.
 - Procedure: Fill system to a minimum of 4psig plus the additional pressure created by the 2. presence of groundwater, eg. 4 feet average depth of groundwater requires the addition of 1.73 psig to 5.73 psig. Hold test for required time with pressure dropping to no less that 3.5 psig.
 - 3. Air Exfiltration Tests shall be done in accordance with ASTM F1417
 - 4 See Attached Exfiltration Air Test Table
- Tracing wire continuity: H.

All new trace wire installations shall be located using typical low frequency (512Hz) line tracing equipment, witnessed by the contractor, engineer and facility owner as applicable, prior to acceptance of ownership. This verification shall be performed upon completion of rough grading and again prior to final acceptance of the project. Continuity testing in lieu of actual line tracing shall not be accepted.

3.04 ADJUST AND CLEAN:

- Α. General: Keep pipe and structures clean as work progresses.
- Β. Exfiltration Air Test Table.

SECTION 33 31 00

EXFILTRATION AIR TEST

TIME REQUIRED FOR LOSS OF PRESSURE FROM 3.5 PSIG TO 2.5 PSIG FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015 (CU. FT./MIN./SQ. FT. OF INTERNAL SURFACE AREA)

Pipe Diam-	Mini- mum	Length for	Time for								
eter	time	Mini-	Longer	Sp	pecificatio	n Time for	Length (L) Shown (ı	min:sec)		
(in.)	(min: mum length										
	sec.)	Time	(sec.)								
		(ft.)		100ft	150ft	200ft	250ft	300ft	350ft	400ft	450ft
4	3:46	597	0.380L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17.48
12	11:20	199	3.418L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

Notes:

1. When 2 or more sizes of pipe are involved, the time shall be computed by using the lengths involved.

2. Air Exfiltration Tests shall be done in accordance with ASTM F1417





ID No.	ITE
(5EL-T)	нм
(4EL-L)	нν
(JEL-B)	нм
	BC

				Williams@works Williams@works engineers surveyors planners 616.224.1500 phone http://williams-works.com 649 Ottawa Ave NW Grand Rapids, MI 49503
				BY DATE BM 06/15/22 BM 06/15/22 BM 12/29/23 BM 01/02/24 BM 01/04/24 BM 02/12/24 BM 02/22/24
-T) -L) -B) 2%				NO. ISSUED FOR 1. PRE-ADVERTISING REVIEW 2. USDA REVIEW 3. ACT 399 PERMIT 4. PART 41 PERMIT 5. CONTRACTOR BID 6. ADDENDUM NO. 1
SAND WASH	SUBBASE, CIP, 12 II	NCH	CURB DET F4, D	CITY OF LOWELL KENT COUNTY, MICHIGAN WASHINGTON ST IMPROVEMENTS 2024 TYPICAL SECTIONS
1 A, 5EL A, 4EL A, 3EL	HMA APPLIC RATE PER SYD 165 # 220 #	ASPHALT PENETRA PG 58–28 PG 58–28	E TION REMARKS TOP COURSE (AWI = 220) LEVELING COURSE	LIFE 01/2023 BMIERAS 01/2023 BMIERAS 01/2023 DH/KM 10/2023 DH/KM 10/2023 DH/KM 10/2023 DH/KM 10/2023



