

TECHNICAL SPECIFICATIONS

The Colorado Department of Transportation (CDOT) 2023 Standard Specifications for Road and Bridge Construction controls construction of this Project. The following special provisions supplement or modify the Standard Specifications and take precedence over the Standard Specifications and plan.

Index Pages

- Division 100 – General Provisions
- Section 202 – Removal of Structures and Obstructions
- Section 206 – Excavation and Backfill for Structures
- Section 208 – Erosion Control
- Section 209 – Watering and Dust Palliatives
- Section 304 – Aggregate Base Course
- Section 403 – Hot Mix Asphalt
- Section 509 – Steel Structures
- Section 601 – Structural Concrete
- Section 602 - Reinforcing Steel
- Section 604 – Manholes, Inlets and Meter Vaults
- Section 609 – Curb and Gutter
- Section 619 – Water Lines
- Section 620 – Field Facilities
- Section 626 – Mobilization

**REVISION OF DIVISION 100
GENERAL PROVISIONS**

Division 100 of the Standard Specifications is hereby revised for this project as follows:

Division 100 – General Provisions is replaced in its entirety with applicable sections of the City of Thornton Special Conditions and General Conditions of the Contract included herein.

**REVISION OF SECTION 202
REMOVAL OF STRUCTURES AND OBSTRUCTIONS**

Section 202 of the Standard Specifications is hereby revised for this project as follows:

Subsection 202.02 – General shall include the following:

Where it is required to cut existing paving or concrete, the cutting shall be done to a true line with a vertical face with a saw or other method as approved by the Engineer.

Delete: Removed concrete and asphalt material may be used to construct embankments in accordance with subsection 203.07.

Replace with: Removed concrete and asphalt material shall not be used to construct embankments.

Subsection 202.03 – Salvable Material shall include the following:

The salvaged gate valve shall be delivered to the City of Thornton IMC Facility at 12450 Washington Street, Thornton CO 80241.

Subsection 202.03 – Salvable Material shall include the following:

Salvaged gate valve removal and delivery to the City shall not be paid for separately but shall be included in the cost of the 8" PVC water main.

Subsection 202.12 – Basis of Payment shall include the following:

Payment for removal items, shall be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Removal of Asphalt	Square Yard
Remove Curb and Gutter	Linear Feet
Removal of Existing Manhole	Each

Payment shall be full compensation for all items and work necessary to complete removals.

**REVISION OF SECTION 206
EXCAVATION AND BACKFILL FOR STRUCTURES**

Section 206 of the Standard Specifications is hereby revised for this project as follows:

Subsection 206.06 – Method of Measurement shall include the following:

Delete “Structure Excavation, structure backfill, and bed course material will not be measured but will be the quantities designated in the Contract.”

Replace with “Structure excavation, structure backfill, and bed course material will not be measured separately but shall be incidental to the pipe and structure installation. Dewatering will be incidental for the installation of the structures.”

Subsection 206.07 – Basis of Payment shall include the following:

Structure excavation and structure backfill required for all pipe and structure installation will not be measured and paid for separately but shall be included in the work and incidental to the pipe and structure installation.

**REVISION OF SECTION 208
EROSION CONTROL**

Refer also to City of Thornton Special Conditions of the Contract Article 30 – “Storm Water Management”

Section 208 of the Standard Specifications is hereby revised for this project as follows:

Subsection 208.01 Description shall include the following:

The Contractor shall keep the work area dry of standing water and shall keep the excavations areas free from storm run-off.

Subsection 208.12 – Basis of Payment shall be replaced with the following:

Payment for erosion control items, shall be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Erosion Control	Lump Sum

Payment shall be full compensation for all items and work necessary to comply with applicable permits and Erosion Control Manual requirements (project requirements).

Temporary erosion or pollution control measures required due to the Contractor’s negligence, carelessness, or failure to install permanent controls as a part of the work scheduled or ordered by the Engineer for the Contractor’s convenience, shall be performed at no additional cost to the project.

Repair, including removal, replacement, or reconditioning of work damaged by standing water or from storm run-off shall be performed at no additional cost to the project.

**REVISION OF SECTION 209
WATERING AND DUST PALLIATIVES**

Section 209 of the Standard Specifications is hereby revised for this project as follows:

Subsection 209.02 shall include the following:

The Contractor is responsible for obtaining a legal source for water to complete the work as specified in the Contract Documents, including any necessary permits or fees.

Subsection 209.07 – Method of Measurement shall be replaced with the following:

Measurement of water use is defined in Special Conditions Section 34 – Water Use.

Subsection 209.08 – Basis of Payment shall be replaced with the following:

Water and/or Dust Palliative will not be measured and paid for separately but shall be included in the cost of the work.

**REVISION OF SECTION 304
AGGREGATE BASE COURSE**

Section 304 of the Standard Specifications is hereby revised for this project as follows:

Subsection 304.08 – Basis of Payment shall be replaced with the following:

Aggregate Base Course (ABC) will not be measured or paid for separate but shall be included in the cost of the work.

**REVISION OF SECTION 403
HOT MIX ASPHALT**

Section 403 of the Standard Specifications is hereby revised for this project as follows:

Subsection 403.03 – Construction Requirements shall include:

At locations where new Hot Mix Asphalt is to abut existing asphalt, saw cut the existing pavement a minimum of 1 foot back from the existing edge with a neat line and remove pavement.

Subsection 403.05 – Basis of Payment shall include the following:

Payment will be made under:

Pay Item	Pay Unit
Hot Mix Asphalt (5-inch)(Grading S75)	SY

Asphalt section shall have an 8-inch layer of Class 6 Aggregate Base Course (ABC) underlay. ABC will not be measured or paid for separate but shall be included in the cost of the work.

**REVISION OF SECTION 509
STEEL STRUCTURES**

Section 509 of the Standard Specifications is hereby revised for this project to include the following:

Method of Measurement - Subsection 509.32 shall be replaced with the following:

The Catwalk assembly shall not be measured in the field but shall be paid for as a lump sum.

Basis of Payment - Subsection 509.33 shall including the following:

The Catwalk Assembly shall include, but is not limited to, bar grate, pipe railing, angle iron, I-beams, embedded angles, embedded threaded connections, and all other work required.

Payment will be made under:

Pay Item	Pay Unit
Catwalk Assembly	Lump Sum

Payment will be full compensation for all labor, materials, equipment, and other items necessary and incidental to the completion of the work.

**REVISION OF SECTION 601
STRUCTURAL CONCRETE**

Section 601 of the Standard Specifications is hereby revised for this project to include the following:

Basis of Payment - Subsection 601.20 shall including the following:

Class 5 Aggregate Base Course (ABC) underlay will not be measured or paid for separate but shall be included in the cost of the work.

**REVISION OF SECTION 602
REINFORCING STEEL**

Section 602 of the Standard Specifications is hereby revised for this project to include the following:

Subsection 601.07 – Method of Measurement shall be revised as follows:

Reinforcing steel will not be paid for separately but shall be incidental to the Work containing the reinforcement.

**REVISION OF SECTION 604
MANHOLES, INLETS AND METER VAULTS**

Section 604 of the Standard Specifications is hereby revised for this project as follows:

Subsection 604.07 – Basis of Payment shall include the following:

Manholes shall include, but is not limited to, existing pipe removal, new pipe connections, manhole steps, rim and lid assembly, and all other work necessary. Dewatering will not be measured and paid for separately but shall be included in the work.

Payment will be made under:

Pay Item	Pay Unit
Manhole (4' Dia.) (10 Feet) (With Grate Inlet)	Each
Manhole (4' Dia.) (10 Feet)	Each

**REVISION OF SECTION 609
CURB AND GUTTER**

Section 609 of the Standard Specifications is hereby revised for this project as follows:

Subsection 609.02 – Materials shall be revised as follows:

Fibrous concrete reinforcement shall consist of:

1. 100% virgin polypropylene fibrillated fibers specifically manufactured for use as concrete reinforcement, containing no reprocessed olefin materials. Fibrous concrete reinforcement shall be as manufactured by Fibermesh Company, Buckeye Ultra Fiber 500, or approved equal.
2. Physical characteristics:
 - a. Specific gravity = 0.905 grams per cubic centimeter.
 - b. Tensile strength: 70 to 110 psi.
 - c. Fibrous concrete reinforcement materials provided by this subsection shall produce concrete conforming to the requirements for each type and class of concrete required as indicated.
 - d. Construction methods:
 - i. Add fibrous concrete reinforcement to concrete materials at the time concrete is batched in amounts in accord with approved submittals for each type of concrete required.
 - ii. Mix batched concrete in strict accord with fibrous concrete reinforcement manufacturer's instructions and recommendations for uniform and complete dispersion.

Concrete for curb and gutter shall be 4500PSI CDOT Class D and contain fibrous concrete reinforcement materials at the rate of one and one-half (1 ½) pounds per cubic yard of concrete.

Subsection 609.03 (c) – Mixing and Placing shall include the following:

Fibrous concrete reinforcement materials shall be incorporated into each batch of concrete at the plant prior to delivery to the project site. Each batch delivery ticket shall indicate the amount of fibrous concrete reinforcement material added to each batch of concrete.

Subsection 609.06 – Method of Measurement shall be revised to include the following:

Curb and gutter will be measured along the back of curb.

Subsection 609.07 – Basis of Payment shall be revised as follows:

Pay Item	Pay Unit
1-Inch Type 2 Curb and Gutter (Section IIB - Modified)	LF

Bed course material will not be measured and paid for separately but shall be included in the work.

Fibrous concrete reinforcement material will not be measured and paid for separately but shall be included in the work.

REVISION OF SECTION 619 WATER LINES

Section 619 – Water Lines shall be replaced in its entirety with the following specifications derived from the City of Thornton Standards and Specifications for the Design and Construction of Public and Private Utilities (October 2012)

204 WATER DISTRIBUTION SYSTEM CONSTRUCTION SPECIFICATIONS

204.1 Materials

Materials furnished shall be new and undamaged. Everything necessary to complete all installations shall be furnished and installed whether shown on approved drawings or not, and all installations shall be completed as fully operational.

Acceptance of materials or the waiving of inspection thereof shall in no way relieve the Responsible Party of the obligation to furnish materials meeting the requirements of these Standards and Specifications.

The City reserves the right to direct or deny use of certain types of materials in specific circumstances. Materials delivered to the job site shall be adequately housed and protected so as to ensure the preservation of their quality and fitness for the work.

A. Ductile Iron Pipe (DIP)

DIP shall be manufactured in accordance with AWWA Standard C-150 and C-151, "Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-lined Molds for Water or Other Liquids", with the following additional requirements or exceptions:

1. "Push-on single gasket" type conforming with applicable requirements of AWWA Standard C-111, "Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings".
2. The grade of iron shall be 60-42-10 having a minimum tensile strength of 60,000 psi, minimum yield strength of 42,000 psi, and a minimum % of elongation of 10%.
3. Pipe furnished under this specification shall conform to AWWA C-150 and C-151, and have nominal laying lengths of either 18 or 20 feet. Random lengths are not acceptable.
4. Pipe furnished shall have standard thickness cement mortar linings in accordance with AWWA Standard C-104, "Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water", and the exterior coating shall be the standard outside bituminous coating as specified in AWWA C-151.
5. The Contractor shall furnish a manufacturer's certified statement that the inspection and specified tests have been made and the results thereof comply with the requirements of the applicable standard(s) herein specified. A copy of the certification shall be sent to the Engineer upon request.

6. Ductile iron water pipe shall be installed per AWWA C-600.
7. Provide corrosion protection per City of Thornton Corrosion Protection Detail, Drawing No. 200-15.

B. Polyvinyl Chloride Pressure Pipe (PVC)

1. All polyvinyl pipe for water mains 12 inches and less, except that 10 inch diameter is not permitted, shall be manufactured in accordance with AWWA Standard C-900-07, "Polyvinyl Chloride (PVC) Pressure Pipe.", and shall meet the requirements for DR-25 for all distribution mains, and shall meet the requirements of DR-18 for hydrant leads. All PVC pipe larger than 12 inches shall meet C-905-97, and shall be DR-21 or DR-18 as determined by the Development Engineering Manager.
2. Solvent cement joints are strictly prohibited.
3. Each length of pipe shall be a standard laying length of 20 or 12 feet. Random lengths shall only be acceptable at fittings and hydrant branch lines. PVC pipe must be laid with tracer wire (16-gauge wire only).
4. PVC must conform to cast iron outside diameters. Pipe stored outside which may be exposed to sunlight for more than 30 days, shall be covered with an opaque material such as canvas. Clear plastic sheets shall not be used to cover the pipe. Air circulation shall be provided under the covering. Sunburned pipe shall not be permitted for installation and shall be removed from the job site immediately. Pipe must be UL approved.
5. The Contractor shall furnish a manufacturer's certified statement that the inspection and specified tests have been made and the results thereof comply with the requirements of the applicable standard(s) herein specified. A copy of the certification shall be sent to the Engineer upon request.
6. Provide corrosion protection per City of Thornton Corrosion Protection Detail, Drawing No. 200-15.

C. Fittings

Cast iron fittings shall be manufactured in accordance with the following AWWA standards: C-104, "Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water," C-110, "Ductile Iron Fittings" and C-111, "Rubber Gasket Joints for Ductile Iron Pressure for Pipe and Fittings," with the following additional requirements or exceptions:

1. Fittings shall be furnished with a cement mortar lining of standard thickness as defined in referenced specifications and given a seal coat of bituminous material.
2. Fittings shall be furnished with mechanical joint, ring tite or flanged ends conforming to referenced specifications and, in addition, the tee-head mechanical joint bolts and hexagon nuts shall be fabricated from a high strength, stainless steel or approved equal. Swivel fittings as approved by the Development

Engineering Manager may also be utilized. Under no circumstances shall repair clamps be permitted on new installations.

3. Fittings shall be of the 250 psi pressure rating and shall conform to the dimensions and weights shown in the tables of referenced specifications.
 4. The Contractor shall furnish a manufacturer's certified statement that the inspection and specified tests have been made and the results thereof comply with the requirements of the applicable standard(s) herein specified. A copy of the certification shall be sent to the Engineer upon request.
 5. Provide corrosion protection per City of Thornton Corrosion Protection Detail, Drawing No. 200-15.
- D. Gate Valves – Detail 200-6A & 200-6B

Refer to Detail 200-6 for gate valve requirements, and Detail 200-15 for corrosion protection.

E. Valve Boxes – Detail 200-6B

Refer to Detail 200-6B for valve box requirements, and Detail 200-15 for corrosion protection.

F. Butterfly Valves – Detail 200-8

Refer to Detail 200-8 for butterfly valve requirements.

G. Pressure Reducing and Regulating Valves (PRV) – Detail 200-12

1. PRV's shall be Cla-Val 90-01 series or an approved equivalent. The valve shall be designed to reduce a high upstream pressure to a constant downstream pressure by way of a pilot control system. The pilot system shall control the main valve which shall be of the single seated, hydraulically operated, diaphragm, globe valve type. The valve seats shall be stainless steel.
2. Material shall be cast iron for valve body. Flanges and covers shall conform to ASTM Standard Designation A-48. Bronze castings or parts for internal trim shall conform to ASTM Standard B-61.
3. Valves shall be furnished with flanged ends and drilled in accordance with ANSI B-16.1 Class 125 specifications. Flanges shall be machined to a flat face or machined to a flat surface with a serrated finish in accordance with AWWA Standard C-207.
4. The pilot valve for controlling operation of the main valve shall be a single seated, diaphragm operated, spring loaded type. The pilot valve shall be attached to the main valve with piping and isolation valves so arranged for easy access in making adjustments and also for its removal from the main valve while the main valve is under pressure. Pilot control system shall be stainless steel with 316 stainless steel trim.

5. The needle valve shall be bronze and included with the main valve to control the speed of piston travel.
6. The operating pressure shall be 150 psi.
7. The body of the PRV shall be given a hydrostatic test of 50% more than the operating pressure specified herein. A second test to check seating of the cylinder shall be made at the operating pressure.
8. Pressure reducing and regulating valves shall be installed in factory built steel vaults as specified in Detail 200-12. There shall be no dissimilar metals allowed in the piping in the PRV vaults without proper insulation.
9. The manufacturer shall furnish a certified statement that the inspection and specified tests have been made and the results thereof comply with the requirements of the applicable standard(s) herein specified. A copy of the certification shall be sent to the Development Engineering Manager upon request.
10. After approved factory assembly, each valve shall be given the operation and hydrostatic tests in accordance with the referenced specifications.
11. The manufacturer shall furnish a certified statement that the inspection and specified tests have been made and the results thereof comply with the requirements of the applicable standard(s) herein specified. A copy of the certification shall be sent to the Development Engineering Manager upon request.

H. Air Valves – Details 200-13A & 13B

Refer to Details 200-13A and 13B for air valve requirements.

I. Blowoff Assemblies – Detail 200-9

Refer to Detail 200-9 for blowoff assembly requirements.

J. Vaults – Refer to Detail 200-12

1. Vaults shall be fabricated steel and shall be factory built for underground use as manufactured by Engineered Fluid, Inc., or approved equal. Field welding to complete the structure shall not be allowed.
2. The vault shall have a protective coating for corrosion protection and shall be equipped with packaged magnesium anodes for cathodic protection. The anodes shall be buried equally spaced around the vault and connected by heavy copper wire to bags on the vault provided for that purpose.
3. Vaults shall be designed with wall sleeves and link seal and be capable of handling thrusts caused by operating valves.

4. The designing engineer shall submit shop drawings along with design calculations including the electric layout to the Development Engineering Manager for approval prior to the installation.

K. Thrust Blocks – Detail 200-11

Refer to Detail 200-11 for thrust block requirements.

L. Concrete

Refer to Section 600 of these Standards and Specifications for all concrete work requirements.

M. Mechanically Restrained Joints

Megalugs, Cam-Lok or approved equal shall be used. Tie rods may be used as approved by the Development Engineering Manager. If tie rods are used, they shall be mild steel, ASTM Standard Designation A-36. Hex nuts shall be ASTM Standard Designation A-307, grade A or B, Hexagon Heavy series. Tie rods shall be used at bends and fittings where thrust blocks cannot be used due to existing field conditions or where harness rods are specifically required by the Development Engineering Manager. Harness rods shall have a bituminous coating for corrosion protection.

N. Fire Hydrants – Detail 200-10

Refer to Detail 200-10 for fire hydrant requirements.

M. Steel Casing Pipe

Pipe casing shall be smooth wall welded steel cylinder fabricated in accordance with AWWA C200. It shall be round, straight, and free from defects or damage due to improper manufacturing or handling with a minimum yield strength of 35,000 psi.

204.2 Corrosion Protection – Detail 200-15

DIP, steel pipe, steel casing pipe, harness rods, fittings, valves, and valve boxes shall be protected as specified in Detail 200-15.

204.3 Installation of Pipe

- A. Refer to Section 100 for excavation, dewatering, pipe bedding, testing, backfill, and compaction requirements.
- B. Pipe shall be installed in accordance with AWWA C-900 along with the following provisions:
 1. Pipe and fittings shall be loaded and unloaded by lifting so as to avoid shock or damage. Under no circumstances shall such material be dropped. Before the placing of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of foreign material, kept clean, and examined for cracks or defects before installation.

No pipe shall be installed that is damaged by prolonged exposure to the sun or adverse weather conditions.

2. Joint lubricant shall be as supplied by the pipe manufacturer.
3. When laying pipe on curves, the pipe shall be kept in alignment by deflecting joints or using short lengths of pipe. If using deflecting joints, recommended practices and allowances as stipulated by the manufacturer must be adhered to. Pipe shall be laid with the bell ends facing in the direction of laying unless directed otherwise by the Development Engineering Manager.
4. Whenever the pipe is left unattended, temporary plugs shall be installed at openings. Temporary plugs shall be watertight, standard cast iron, and of such design as to prevent children and animals from entering the pipe. Temporary plugs shall be subject to approval by the Development Engineering Manager.
5. Pipe and appurtenant structures shall not be installed upon a foundation into which frost has penetrated or at any time when the Inspector deems there is a danger of ice formation or frost penetration at the bottom of the excavation. Pipe and appurtenant structures shall not be installed unless backfilling can be completed before the formation of ice and frost.
6. Immediately before joining two (2) lengths of pipe, the inside of the bell and the outside of the spigot end and the gasket shall be thoroughly cleaned. Caution shall be exercised to ensure that the correct type of gasket is used. A thin film of gasket lubricant shall be applied according to the manufacturer's recommended practices to either the inside face of the gasket or the spigot end of the pipe or both.
7. The spigot end of the pipe shall be placed in the socket with care to prevent the joint from contacting the ground. The joint shall be completed by pushing the pipe home with a slow steady pressure, without jerky or jolting movements. Stabbing shall not be permitted. Pipe furnished without a depth mark shall be marked before assembly to ensure insertion to the full depth of the joint.
8. Extra care should be used in handling PVC pipe during cold weather due to the reduced flexibility and impact resistance as temperatures approach and drop below freezing.
9. Non-disinfected mains which cannot be isolated shall not be connected to an existing, disinfected main. The Responsible Party shall assume any and all responsibility for damage done by heavily chlorinated water entering existing facilities due to negligence on his part. Water mains shall adhere to the following sequence of tests: (1) chlorine, (2) pressure tests, and (3) clearwater test.

204.4 Installation of Valves and Valve Boxes – Detail 200-6A & 200-6B

Refer to Detail 200-6A & 200-6B for installation requirements for valves and valve boxes.

204.5 Testing

Refer to Subsection 206 of these Standards and Specifications.

205 WATER SERVICES AND APPURTENANCES CONSTRUCTION SPECIFICATIONS

205.1 General

Water services construction connecting to the City water system shall be done in accordance with these Standards and Specifications, which shall cover new water services construction from the water main to the meter pit or vault. Refer to Sections 100, 204, and 206 for installation and testing procedures for water services and appurtenances.

205.2 Materials

- A. Materials furnished shall be new and undamaged. Everything necessary to complete installations shall be furnished and installed whether shown on the approved drawings or not and installations shall be completed as fully operational.
- B. Acceptance of materials or the waiving of inspection thereof shall in no way relieve the Responsible Party of the obligation to furnish materials meeting the requirements of these Standards and Specifications.
- C. The City reserves the right to direct or deny use of certain types of materials in specific circumstances.
- D. Materials delivered to the job site shall be adequately housed and protected so as to ensure the preservation of their quality and fitness for the work.
- E. The minimum size allowable for a water service shall be three-fourths (3/4) inch diameter.
 1. Copper Service Pipe - Type "K" only

Type "K" copper shall be used for service lines three-fourths (3/4) inch through three (3) inch diameter.
 2. Ductile Iron Service Pipe

DIP shall be used for services larger than three (3) inches,
 3. Corporation and Curb Stops
 - a. A curb stop or valve of the same size as the service pipe and conforming to the following standards shall be installed on every commercial service larger than one (1) inch between the water main and the meter which is at a point at or near the property line.
 - b. Water service saddles shall be cast bronze with double silicone bronze straps, Type 325 or 327 by Smith-Blair Inc., or an approved equal.

- c. Corporation stops shall be AWWA taper thread to copper connection of pack joint and shall be a Ford Type F600 or an approved equal.
- d. Curb stops shall be compression to compression connections and shall be Ford Ball Valves, B44-666M (one and one-half (1-1/2) inches) or B44-777M (two (2) inches) or approved equal.
- e. Curb stops are set in the service on the inlet side, a minimum of two (2) feet upstream of the vault and provide a means to shut off the service for repairs inside the meter vault.
- f. Curb stop service boxes shall be a cast iron box, Minneapolis pattern, extension type. The curb stop box shall be centered over the curb stop valve and in a vertical position. The top lid of the curb stop box shall be installed a maximum of one (1) inch above the final grade.

205.3 Location - Detail 200-2

Refer to Detail 200-2 for service location requirements.

205.4 Depth – Detail 200-14

Refer to Detail 200-14 for service depth requirements.

205.5 Connections – Detail 200-14

Refer to Detail 200-14 for service connection requirements.

205.6 Abandonment

Only one (1) domestic tap is allocated per single family residence. If it is required by the Development Engineering manager to abandon an existing water tap, it shall be turned off and disconnected at the main. City shall inspect disconnection prior to backfilling. If the City does not inspect prior to backfilling the contractor will be required to re-excavate affected area for inspection. A compression fitting shall be utilized if necessary to relocate a meter pit from a driveway area, only if the installation of a new service line would require the cutting and patching of asphaltic concrete surfacing.

206 WATER MAIN ACCEPTANCE PROCEDURE

206.1 Scope

This procedure is to be followed when releasing a newly installed water main or releasing a repaired pre-existing water main. It covers disinfection, bacteriological sampling, and reporting of results.

206.2 New Mains

Installation shall be in accordance with established AWWA standards (AWWA C-600 or C-603) with particular attention paid to the provision for cleanliness within the pipe itself. Flushing and disinfection shall be performed by the Responsible Party in accordance with

AWWA Standard C-601 (more detailed instructions shall be found below). Sampling (bacteriological and chlorine residual) shall be performed by personnel from the Thornton Water Quality Control Laboratory. Chlorine residual analysis shall be performed using accepted test procedures in Standard Methods for the Examination of Water and Wastewater's most recent edition. Bacteriological testing shall be performed by personnel from the Thornton Water Quality Control Laboratory. The release form shall be initiated by personnel from the Thornton Water Quality Control Laboratory with copies to Tri-County Health Department and the Colorado Department of Health (with the Water Quality Control Laboratory being responsible for forwarding copies to the health departments and being responsible for notifying the Responsible Party).

206.3 Repaired Mains

After a main has been repaired and flushed, personnel from the Thornton Water Quality Control Laboratory or Operations Department shall inspect the water for color, turbidity, and chlorine residual, prior to restoring the repaired main into service.

206.4 Disinfection

Disinfection shall be accomplished using tablet form Hypochlorite. These shall be affixed to the inside (top) with an approved food grade adhesive such as Permatex Form-A-Gasket No. 2 and Permatex Clear RTV silicone adhesive sealant, or approved equivalent. Dosage shall be calculated for a 100 mg/liter chlorine concentration for volume of installed pipe (this is to allow for the refilling of pre-existing pipe attached to the installed sections). For calculating the weight of chlorine required, see Table 200-2. The chlorine solution shall remain in contact with the piping for a minimum of 24 hours.

TABLE 200-2

MINIMUM NUMBER OF HYPOCHLORITE TABLETS OF 7 GRAM STRENGTH (5 GRAMS AVAILABLE CHLORINE) FOR A DOSE OF 100 MG/L

Length of Section (feet)	Diameter of Pipe (inches)									
	4	6	8	12	16	18	20	24	30	36
13	1	2	3	6	11	13	16	24	36	52
18	1	2	3	8	15	18	23	32	50	72
20	1	3	4	9	16	20	25	36	56	80
30	2	2	6	14	24	30	37	54	83	120
40	2	5	8	18	32	40	50	71	111	160

206.5 Flushing

After chlorination or disinfection of the pipeline, flushing shall commence to remove the chlorine solution. Flushing shall continue for a minimum of five (5) minutes beyond the time when chlorine residual is present at the same levels as normal distribution system residuals.

206.6 Fire Sprinkler Main Testing

Fire sprinkler system water mains (from the water supply to the system riser) and lead-in connections to sprinkler system risers shall be completely flushed before connection is made to sprinkler piping. The flushing operation shall be continued for a sufficient time to ensure thorough cleaning. The minimum rate of flow shall be not less than one of the following:

- A. The hydraulically calculated water demand rate of the system including any hose requirements;
- B. That flow necessary to provide a velocity of 10 ft/sec (see Table 200-3);
- C. The maximum flow rate available to the system under fire conditions.

TABLE 200-3

FLOW REQUIRED TO PRODUCE A VELOCITY OF 10 FT/S (3 M/S) IN PIPES

Pipe Size Inches	Flow Rate Gpm
4	390
6	880
8	1560
10	2440
12	3520

206.7 Hydrostatic Testing

- A. No hydrostatic tests shall be made on any portion of the pipeline until field placed concrete has had adequate curing time as defined for thrust blocks in Detail 200-11 and compaction test results have been submitted to and approved by the Development Engineering Manager. Only potable water may be used in testing procedures.
- B. The pipeline shall be tested in accordance with AWWA C-600 or C-900 except as follows:
- C. The pipeline shall be tested with water at a pressure of 150 psi or 50 psi above working pressure, whichever is greater.
- D. The Development Engineering Manager shall be notified 24 hours in advance of testing. Acceptance testing shall be made in the presence of the Development Engineering Manager only after the pipeline is in a state of readiness for testing.
- E. Air in the line shall be properly purged. Where blowoffs or hydrants are not available or effective in purging air from the line, the Development Engineering Manager may require a tap to purge the line. The location and size of the tap shall be at the Development Engineering Manager's discretion. The cost for such a tap shall be borne by the Responsible Party.

- F. No leakage is allowed through the bonnet of the line valve. Any valve leaking through the bonnet shall be removed and replaced.
- G. The pressure test shall be a two (2) hour test taken at the high point in the line. Every time the water line pressure drops five (5) psi, the pump shall be started to bring the line pressure back to the initial pressure.
- H. PVC or DIP shall be considered to have passed the pressure test when the total leakage in (24) hours is less than 11.5 gallons per inch of inside diameter per mile of pipeline. The Development Engineering Manager shall direct the Responsible Party to repair specific leaks regardless of test results, if in his opinion they are serious enough to endanger the future service of the pipeline. Pipelines shall be tested in sections as rapidly as such section may be isolated. Should any leakage of the pipeline become apparent during the one (1) year warranty period, the City shall perform the necessary repairs. The Responsible Party shall be invoiced for all work performed during the one (1) year warranty period. Blowoffs, pressurizing pump, corporation stops, and water measuring apparatus shall be provided by the Responsible Party, or at his expense. At the Development Engineering Manager's discretion, measuring apparatus may be required to be calibrated by Thornton personnel at the Responsible Party expense.
- I. The City shall not be held responsible for water tightness of its valves on existing facilities. If existing valves leak, the City shall assist in reducing the influx of water, but the Responsible Party must use methods at his own disposal to work with the resulting leakage.

TABLE 200-4

MAXIMUM PERMISSIBLE LEAKAGE LOSS
FROM WATER MAINS

(Adapted from AWWA C-601 – Formula – Permissible Leakage Loss = 11.5 gal/Inch Dia/Mile/24 hrs)

Pipe Size	6 inch				
Length (feet)	Time (hours)				
	1/2	1	1 1/2	2	24
50	0.01	0.03	0.04	0.05	0.65
100	0.03	0.05	0.08	0.11	1.31
200	0.05	0.11	0.16	0.22	2.61
300	0.08	0.16	0.25	0.33	3.92
400	0.11	0.22	0.33	0.44	5.23
500	0.14	0.27	0.41	0.54	6.53
600	0.16	0.33	0.49	0.65	7.84
700	0.19	0.38	0.57	0.76	9.15
800	0.22	0.44	0.65	0.87	10.45
900	0.25	0.49	0.74	0.98	11.76
1000	0.27	0.54	0.82	1.09	13.07

Pipe Size	8 inch				
Length (feet)	Time (hours)				
	1/2	1	1 1/2	2	24
50	0.02	0.04	0.05	0.07	0.87
100	0.04	0.07	0.11	0.15	1.74
200	0.07	0.15	0.22	0.29	3.48
300	0.11	0.22	0.33	0.44	5.23
400	0.15	0.29	0.44	0.58	6.97
500	0.18	0.36	0.54	0.73	8.71
600	0.22	0.44	0.65	0.87	10.45
700	0.25	0.51	0.76	1.02	12.20
800	0.29	0.58	0.87	1.16	13.94
900	0.33	0.65	0.98	1.31	15.68
1000	0.36	0.73	1.09	1.45	17.42

Pipe Size	12 inch				
Length (feet)	Time (hours)				
	1/2	1	1 1/2	2	24
50	0.03	0.05	0.08	0.11	1.31
100	0.05	0.11	0.16	0.22	2.61
200	0.11	0.22	0.33	0.44	5.23
300	0.16	0.33	0.49	0.65	7.84
400	0.22	0.44	0.65	0.87	10.45
500	0.27	0.54	0.82	1.09	13.07
600	0.33	0.65	0.98	1.31	15.68
700	0.38	0.76	1.14	1.52	18.30
800	0.44	0.87	1.31	1.74	20.91
900	0.49	0.98	1.47	1.96	23.52
1000	0.54	1.09	1.63	2.18	26.14

Pipe Size	16 inch				
Length (feet)	Time (hours)				
	1/2	1	1 1/2	2	24
50	0.04	0.07	0.11	0.15	1.74
100	0.07	0.15	0.22	0.29	3.48
200	0.15	0.29	0.44	0.58	6.97
300	0.22	0.44	0.65	0.87	10.45
400	0.29	0.58	0.87	1.16	13.94
500	0.36	0.73	1.09	1.45	17.42
600	0.44	0.87	1.31	1.74	20.91
700	0.51	1.02	1.52	2.03	24.39
800	0.58	1.16	1.74	2.32	27.88
900	0.65	1.31	1.96	2.61	31.36
1000	0.73	1.45	2.18	2.90	34.85

206.8 Bacteriological Sampling

24 hours after flushing, personnel from the City shall sample hydrants for bacteriological contamination. A minimum of two (2) samples shall be analyzed. Samples shall be collected in duplicate, that is, two (2) samples from each hydrant tested. Bacteriological samples may be required at blowoffs at the direction of the Development Engineering Manager. If the samples show no bacteriological growth and are free from excessive turbidity, the Thornton Water Quality Control Laboratory shall release the main for service and shall initiate the required forms. If samples do not warrant approval for main release from the Thornton Water Quality Control Laboratory, lines must be re-flushed. If again, samples do not warrant approval for main release after flushing, re-chlorination shall be required.

206.8 Method of Measurement and Basis of Payment

Water main includes all work associated with the water line installation including tracer wire, polywrap, megalugs, fittings, thrustblocks, disinfection and testing, and removal of existing water line as necessary.

The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Pay Item	Pay Unit
8-Inch PVC Water Main	Linear Foot
Fire Hydrant Assembly	Each

**REVISION OF SECTION 620
FIELD FACILITIES**

Section 620 of the Standard Specifications is hereby revised for this project to include the following:

Subsection 620.08 Method of Measurement and Basis of Payment shall be replaced with the following:

The various facilities complete with utilities will not be measured or paid for separately but will be included in the Mobilization pay item.

**REVISION OF SECTION 626
MOBILIZATION**

Section 626 of the Standard Specifications is hereby revised for this project as follows:

Section 626 - Mobilization shall be replaced in its entirety with applicable sections of the City of Thornton Special Conditions and General Conditions of the Contract included herein.