The enclosed City of Cambridge Construction and Operating Procedures are provided to outline the CWD's (Cambridge Water Department) minimum criteria for construction of utilities and infrastructure within city limits. It is the duty of the property owner to verify and obtain all applicable permits. All water works construction projects shall follow these procedures.

The city's authorized representatives must approve the proposed construction; written permits must be obtained from appropriate agencies, and all permit fees paid before construction begins. Contractors working on city roads, right of ways, or city owned utilities must be bonded with the City of Cambridge.

Final definitive plans shall conform in accordance with the latest edition of the rules and regulations of the City of Cambridge and these procedures, and shall receive approval of the appropriate officials before improvements are made.

These practices were prepared with the intent of obtaining the highest quality of construction possible, consistent with accepted industry practices and specifications,

A minimum of 72 hours notice shall be given to the C WD prior to starting construction. Emergency work will be approved by the Distribution Manager or designated representative.

The Contractor shall be responsible for the preparation and submittal of three sets of blue line record drawings to the CWD within 60 days after completion of construction. Record drawings shall be a full set of drawings showing all details of the construction. A registered professional engineer shall celtify record drawings true and correct.

Copies of the Construction and Operating Procedures may be obtained from the Cambridge Water Department, 250 Fresh Pond Parkway, Cambridge, MA 021 38. .Pdf of document is available at www.cambridgema.gov/cwd

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ARTICLE 1. CONSTRUCTION AND MA TERIAL STANDARDS

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ARTICLE 1

SECTION 1. DEFINITIONS

AWWA	American Water Works Association
ANSI	American National Standard Institute
ASTM	American Society for Testing and Materials
ASCE	American Society of Civil Engineers
ABANDONMENT	The condition in which water service to a building has been discontinued at the Owner's request for a period of at least one year and the owner has made no commitment as to possible future use.
APPLICANT replacement	Any person applying for water service or for a water main e.xtension, or relocation.
APPLICATION FOR WATER WORKS CONSTRUCTION PERMIT	The CWD form completed and signed by an owner or by the owner's agent and submitted to the CWD prior to construction of a water service pipe or a fire pipe froln a public water main.
AS BUILTS	CWD requires specific measurements from property lines to water mains, hydrants and service boxes on all valves. These measurements should conform to the square tie measurement practice (i.e. ninety degrees). Also, as-built plans should specify the degree, size and type of any fittings used during water main or service installation, The plans should also reflect any field notes taken by the resident engineer during installation regarding such issues as thrust blocks, insulation, and backfill material used, elevations and grades.
BACKFLOW pressure or	The reversal of the normal flow of water or other liquids caused by back back siphon age.
BACKFLOW PREVENTOR	A device or means to prevent backflow.
BUILDING	Any structure used for human occupancy, employment, and recreational or other purposes.
	City of Cambridge, Massachusetts
COMBmED SERVICE	An existing service pipe that is used to provide both water service and private protection service. New installations of combined service are not permitted.
CONSUMPTION	The amount of water used, as measured by a meter or as estimated by the CWD in accordance with its billing.
CONTRACTOR	A person who performs plumbing, paving, sidewalk, sewer, water or other work.
CROSS-CONNECTION	Any physical or potential connection or arrangement between two separate

systems,	HYDRANT PERMITS
questionable	one of which contains potable water and the other water of unknown or safety or steam, gas or chemicals, allowing flow from one system to the other.
CUSTOMER	The person listed in the C.YVD records as the party responsible for payment of bi\ls for water service to a property.
Control Density Fill sufficient (CDP - Flow fill)	CDP is a flowable mixture of aggregate and cementitious material containing Portland cement to develop a 28-day compressive strength of between 50 to 150 psi, that compacts upon backflll placement.
CTD CFD CWD	Cambridge Traffic Department Cambridge Fire Department Cambridge M/ater Department
DEMOLITION	A partial or full dismantling of a structure. A demolition permit is necessary to demolish or to remove all detached structures as required by 780 CMR s 1 13; Ch. 2.78 Cambridge Municipal Code. A Demolition permit is required by the Building code and by provisions of the Historical Buildings Ordinance for the demolition or moving of all buildings and structures of significant portions.
DESIGN CRITERIA	Standards for design used by the CWD for construction and rehabilitation of Public water mains, water service pipes and fire pipes.
DEP	Department of Environmental Protection
DISCONTINUANCE customer. .	The cessation of water services at the prelnises at the request of an owner or
	Departtnent of Public Works
EASEMENT others.	An acquired legal right for the specific use of land owned and maintained by
FLY ASH	Ply ash shall conforjn to the requirements of ASTM C618, Class F. Fly ash as a percent by weight of total cementitious material, shall not exceed 20 percent, A means for
FIRE PUMP TEST system	contractors to conduct a test to determine whether a fire punip is functioning properly as required by M.G.L. ch. 310: CMR 22.22: 13.08. The private water piping, control valve and appurtenances installed solely to water for extinguishing fires.
FIRE PIPE furnish	The measurement of flow from a hydrant performed by the CWD or by a testing company in accordance with generally accepted engineering practices.
FIRE FLOW TEST licensed	A device connected to a public water main for the purpose of extinguishing fires or other authorized purpose,
HYDRANT	A written pernit granted by the CWD for the temporary use of a hydrant.
	ISD

LET ON	WATER SERVICE PIPE Inspectional Services Department
MASTER METER	The opening of a control valve to initiate or restore water service.
METER	A meter used for billing purposes serving a building or group of buildings.
METER PIT	An instrument for measuring the flow of water.
MWRA	An underground vault enclosing a meter.
OWNER	Massachusetts Water Resources Authority
PERSON	A person who alone, or jointly or severally with others, has the legal title to any premises or has care, charge or control of any premises as agent, executor, administrator, trustee, lessee or guardian of the estate of the holder of legal title.
PLUMBER	Any individual, firm, company, partnership, association, society, corporation, group or any political subdivision of the Commonwealth.
POTABLE	A person licensed as a plunlber by the Commonwealth of Massachusetts.
WATER	'Water fit for human consumption in conformance with the regulations of the Massachusetts Department of Environmental Protection.
PRIVATE FIRE PROTECTION	Private water mains, fire pipes and other appurtenances installed for the purpose of fire protection at particular prenlises.
PUBLIC FIRE PROTECTION	The public water mains, hydrants and appurtenances installed for the purpose of fire protection in a public way, city-owned easement or private way open to public travel.
PUBLIC WATER MAIN	The piping and associated valves, hydrants and appurtenances installed in a public way, CWD/city-owned easement or private way opens to public travel for the purpose of supplying water to one or more customers or for public fire protection.
RESIDENTIAL METER	A Ineter two inches in size or smaller used to measure the flow of water to a predominantly residential property.
SHUT OFF	The closing of a control valve to temporarily stop 'Mater service or to terminate water service.
TERMINATION	The cessation of water service pursuant to the C WD's billing, termination and appeal regulations or for violation of these regulations.
USER	Any person who obtains water from a public water main or a private water main supplied from a public water main.
WATER SERVICES	The readiness to supply or actual supplying of water to premises in which a water service pipe or fire pipe has been installed. Water service may also mean a water service pipe.
	The connection, piping and associated valves and appurtenances that extend from a public water main to a building or property for the purpose of supplying water.

ARTICLE 1 CONSTRUCTION AND MATERIAL STANDARDS

SECTION 2: WATER DISTRIBUTION SYSTEM The piping system shall meet the following minimum requirements and shall be subject to the approval of the Cambridge Water Department (C WD):

A. Pipe shall be cement lined, tar coated, Ductile Iron, Class 52.
B. The CFD and the C WD shall approve hydrant location.
C. Every hydrant. shall be equipped with a 6-inch shut-off valve, bolted or anchored to the hydrant tee,
D. Line valves shall be spaced at not more than 500 feet and as determined by the CWD.
E. In new construction, every intersection shall be valved "(3) three-ways" if a tee is used; and "(4) four-way" if a cross is used.
F. Dead ends shall be avoided by the looping of all water mains whenever practical.
G. All water mains and service pipe shall be laid in a trench separate from any other utility. The horizontal distance between water mains or service pipe and any other utility (gas, electric, telephone, etc.) shall be at a minimum no less than bvvo (2) feet, vertical distance shall be no less than (l) foot and no less than ten (10) feet from a sanitary sewer or surface water drain, DEP regulation #310CMR22.19 distribution system requirements.

Relation to water mains and sewers:

Horizontal Separation: Whenever possible sewers shall be laid at a minimum of at least 10 feet (3.0m), horizontally, from any existing or proposed water main. Should local conditions prevent a lateral separation of 10 feet, a sewer may be laid closer than 10 feet to a water main if:

1. It is laid ili a separate trench, or if;
2. [t is laid in the same trench with the water mains located at one side on a bench of undisturbed earth, and if;
3. In either case the elevation of the top (crown) of the sewer is at least 1 8-inches (46cm) below the bottom (invert) of the water main.

Vertical Separation: Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least 18-inches (46cm) below the bottom of the water main. When the elevation of the sewer cannot be varied to meet the above requirements, the water main shall be relocated to provide this separation or re-constructed with mechanical-joint pipe for a distance of 10 feet (3.0m) on each side of the sewer, One full length of water main should be centered over the sewer so that both joints will be as far from the se',ver as possible.

When it is impossible to obtain horizontal and/or vertical separation as stipulated above, both the water main and sewer shall be constructed of mechanical-joint cement lined ductile iron pipe or other equivalent based on water-tightness and structural soundness. Both pipes shall be pressure tested by an approved method to assure water-tightness.

H. The minimum bury shall be 5 feet for all water lines: Unless approved by C WD.

I. All material shall be in accordance with the "Material Standards" attached hereto.
J. All material shall be new and shall be of the type cun•ently used by the C WD.
K. All construction shall be in accordance with the latest "Commonwealth of Massachusetts, Depaflment of Public Works - Standard Specifications for Highways and Bridges", the "American Water Works Association Standards" and in accordance with the current practice of the CWD.

SECTION 3: SYSTEM CONNECTIONS

Connections to the existing water distribution system must be approved by the C WD. Please refer to Appendix B for Water Works Construction Permit.

SECTION 4: CONTRACTOR RESPONSIBILITIES

The Contractor shall not operate any hydrants, valves, curb stops or corporations, nor shall they draw any water from the system, without specific approval of the C WD. Only CWD personnel will operate valves, hydrants, colporations and curb stops unless otherwise directed by the CWD. Please refer to Appendix B for appropriate permit.

SECTION 5: PIPE

Distribution system pipe shall be at least 8 inches in diameter, shall be class 52 ductile iron pipe, cen1ent lined and tar coated per AWWA specifications. The pipe shall be as manufactured by the U. S. Pipe and Foundry Company, Griffin Pipe Company or an approved equal by the CWD.

Pipe used for hydrant branches shall be at least 6 inches in diameter and shall meet the above specifications and shall be restrained the entire length of the branch.

Pipe used for fire lines shall be sized by the owner's engineer and must meet the above specification.

SECTION 6: PIPE JOINTS

Push-on type joints are recommended on straight runs of pipe. Gaskets must be standard for pipe used and be suitable to the C WD. The C WD may require, under certain conditions, that restrained type joints be used. The method of restraining may be either of an interlocking type or mechanical joints restraint (see Section 20 of this Article) or as specified by the CWD.

SECTION 7: FITTINGS

Ductile iron fittings must be used and shall be cement lined. Fittings are required to be equipped with a mechanical joint restraint as specified in Article 1, Section 20, unless otherwise specified by the CWD. Mechanical joint fittings in sizes 4-inch through 12-inch shall be ductile iron compact fittings and rated for 350 psi working pressure. All Nuts and bolts shall be of a type equal to ductile iron or KOR-IO steel T-bolts and nuts.

SECTION 8: COUPLINGS

Couplings shall be of a type equal to Smith Blair, Style 441; Dress, Style 153; 360 or Romac Style 501 or an approved equal. Couplings shall be provided with plain, Grade 27, rubber gaskets and with black steel, track-head bolts with nuts.

SECTION 9: GATE VALVES

Gate valves shall be resilient seated and shall meet the requirements of A WWA C-509. Valves shall be rated for 200 psi minimum working pressure. Valves shall be iron body, bronze mounted, resilient

seated, non-rising stem type fitted with "O" ring seals. The operating nut shall be 2-inches square. Bolts on the bonnet and stuffing box shall be stainless steel (316 stainless steel). Valves shall have mechanical joint ends and shall be equal to ANSI/AWWA Cl l/A21.l l . Valves shall open right (clockwise).

Extensions shall be provided for all gate valves that the depth exceeds 6 feet to the top of the operating nut.

SECTION 10: BUTTERFLY VALVES

Butterfly valves for buried services shall conform to AWWA C504, except as hereinafter provided. Butterfly valves shall be rated for Class 150b and both valve operators shall be especially designed for services buried in ground and shall be of the totally enclosed type. The unit shall be permanently lubricated with grease or oil. A standard A W WA 2-inch squareoperating nut shall be provided on the input shaft. Valves shall open to the right (clockwise).

SECTION 11: TAPPING SLEEVE AND VALVES

Tapping sleeves shall be mechanical joint type and shall be Mueller H-615, American Darling 1004 or equal. Tapping valves shall meet the requirements of AW WA C500. The valves shall be flanged by mechanical joint outlets with non-rising stem and designed for vertical burial. Tapping valves shall be rated at 200 psi working pressure and shop tested at 300 psi. Bolts on bonnets and stuffing boxes shall be stainless steel (316 stainless steel); stuffing boxes shall be "O" ring type. The operating nut shall be 2-inches square. The valve shall be provided with oversized seat to permit use of full size cutters. Gaskets shall cover the entire flange surface. Valves shall be Mueller H-667 or equal. Valves shall open right. (Clockwise). Multiple taps to be three (3) feet from flange to flange. Pre-inspection is required for all taps.

SECTION 12. GATE BOXES

Valve boxes shall be provided for each gate valve and tapping valve. Valves boxes shall be cast iron and of the telescopic design with two piece construction, a top with a cover and a bottom (5inch inside diameter 6ft length). The top section shall have a top flange to increase the stability of the box to remain at the present height. The lower section of the box shall have a bell shaped bottom designed to enclose the operating nut and stuffing box of the valve without settling. The gate box shall come complete with a cover on which the word "WATER" shall be cast, The cover of the gate box shall be close fitting and substantially dirt tight and flush with the top of the box rim. Gate boxes shall be installed for each buried valve. Cast iron boxes shall be general foundry Buffalo boxes or equal.

SECTION 13. HYDRANTS

Hydrants shall conform to the "standard dry barrel hydrants" ANSI/AWWA C502 85. Hydrants shall be designed for 150-psi service and for installation in a 5 ft. covered trench. They shall OPEN clockwise and must be marked with an arrow and the word OPEN to indicate the direction of turn of the stem to open the hydrant. They shall have one steamer connection, 4-1/2inch diameter and two 2-1/2 inch hose nozzles all with National Standard Thread (NST). Hydrant inlet opening on shoe shall have mechanical joints for accepting 6-inch ductile or cast iron pipe. Hydrants shall have a compression type main valve, opening against and closing with water pressure. The main valve opening at the base of the

Hydrant shall have a minimum area of 39 square inches (5-inch minimum diameter circle). Each hydrant shall have "traffic" type ground line construction (breakaway bolts not acceptable) and permit 360 degree movement of the upper barrel to allow for any alignment without shutting down service and/or removing flange bolts and nuts. Hydrant operating nut shall be 1-1/2 inches, flat to point, pentagonal. Hydrants shall be hydrostatically tested as specified in AW WA C502. The length of the hydrant barrel shall be such that when installed with the proper depth of cover on the branch pipeline, the hydrant will be set with the normal ground line of the barrel ',within 3-inches of the actual finished ground grade surface elevation. For the most part, minimum bury length shall be 5-1/2 feet. Connecting pipes and pipe nipples between the main line tee and hydrant shall be 6-inch ductile iron conforming to the requirements for ductile iron pipe.

SECTION 14. HYDRANT TEES (ANCHORING TEES)

Hydrant tees shatt be anchor type. The branch shall have a plain end with an integral gland and rotating mechanical joint restraints as specified in Article 1, Section 20. Mechanical joint restraint to provide a restrained connection (thrust blocks) required.

SECTION 15. SERVICE PIPING & CONNECTIONS

Service pipe shall be type "K" copper tubing, American manufactured, I-inch minimum. All service fittings shall be extra heavy brass, manufactured by either Water Distribution Products, Cambridge Brass or Ford Meter Box Company, Inc. All services greater than I-inch shall have the valve box installed at the corporation at the main.

SECTION 16. CORPORATIONS

Corporations for I-inch installations shall be heavy pattern, easy turning and of a type equal to Ford FB 1000-4 (no lead brass) series. The inlet shall be an A WWA (CC) thread. The outlet shall be for a compression joint for Type-K copper. The 1-1/2 inch and 2-inch corporations shall be of a ball valve type which incorporates Teflon seats to assure self-centering of a Teflon coated bronze ball similar to a style typified by the Ford FAFB - 1000 (T-head) series or an approved equal by the CWD. The colorations shall be easy turning and non-binding. The inlet shall be an AWWA (CC) thread. The outlet shall be for a compression joint for Type-K copper. ALL corporations shall be subject to a sustained hydraulic pressure of 200 psi and tested in both the open and closed positions for leakage and ease of turning. All taps 1 inch or greater will require the use of a tapping saddle with stainless steel hardware.

SECTION 17. CURB STOPS

For sizes -inch, the curb stops shall be a type equal to the Ford B44-444-Q (no lead brass) series or approved equal. The curb stop shall have a quaner turn stop with check, solid tee head and no waste. No curb stops with plugged solid waste shall be accepted.

SECTION 18. SERVICE BOXES

Service boxes supplied shall be "Buffalo" style, Arnerican manufactured, of a telescopic type with a length from four (4) to five (5) feet. The cover shall be made of extra grade gray iron. The arch shall accommodate up to a I-inch curb stop. The upper section shall be made of cast iron and be equal to a "Buffalo" style 94-E upper section. Inside diameter to be a minimum of 2-1/4,,inches.

SECTION 19. THRUST BLOCKING

Where applicable, thrust blocks shall be furnished at all tees, tapping sleeves and bends as directed or as detailed on drawings with 3,000 psi, 1-1/2, 470 cement concrete masonry. The blocks shall be poured against undisturbed original ground and shall be so placed that pipe joints will be accessible for any

Possible future repairs. The other means of restraint may either be of an interlocking type or mechanical joint restraint as in Article 1, Section 20, as specified by the C WD and shall be installed in addition to thrust blocks as directed by the CWD.

SECTION 20. MECHANICAL JOINT RESTRAINT

Mechanical joint restraint shall be incorporated into the design of the follower gland. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull out as pressure or eternal forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. The joint restraint ring and its wedging components shall be made of grade 60A2-10 ductile iron conforming to ASTM A 536-84. The wedges shall be ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell conforming to ANSI/AWWA Cl I l/A21.1 and ANSI/AWWA C153/A21.3 of the latest revision. Torque limiting twist off nuts shall be used to insure proper actuation of the restraining wedges. The mechanical joint restraint shall be available in the four through f01ty-eight inch sizes. They shall have a rated work pressure of 350 psi in sizes sixteen inch and smaller and 250 psi in sizes eighteen inch through forty-eight inch. The devices shall be listed by Underwriters Laboratories up through the twenty-four inch size and approved by Factory Mutual up through the twelve-inch size. The restraint shall be the Series 1 100 MEG .ALUG restraint as produced by EBAA Iron, Inc. or approved equal.

SECTION 21. ELECTRICAL GROUNDING

No electrical grounds shall be made on water service pipes where a driven ground rod can provide the needed grounding service as determined by the ISD. Electrical grounding must be provided in accordance with the National Electric Code.

SECTION 22. PRESSURE & LEAKAGE TEST

Appendix G contains the AWWA Standards for the Installation of Ductile Iron Water Mains and their Appurtenances (ANSI/AWWA C600-93), including the requirements for pressure and leakage testing. The pressure and leakage tests shall be as specified in ss 301.60.L of the Standard Specifications for Highways and Bridges, AW WA Standard C600-93, ss 4.11 and NFPA standard for underground sprinkler piping. In general, the water pipe shall be given a pressure and leakage test in sections of approved length. For these tests, the CONTRACTOR shall provide a method of determining the exact amount of water being pumped into the test section and a pressure gauge. The CONTRACTOR shall also furnish and install suitable temporary testing plugs or caps for the pipeline; all necessary pressure pumping, pipe connections and other similar equipment; and all labor required; all without additional compensation. Prices for the appropriate pipe items shall include compensation for testing. The test equipment shall be installed by the CONTRACTOR in such a manner that all water entering the section under test will be measured and the pressure in the section indicated and they shall be kept in use during all tests. The scheduling of pressure and leakagc tests shall be approved by the C WD and shall be attended by a CWD representative, Unless it has already been done, the section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe.

If the section fails to pass the pressure and leakage test, the CONTRACTOR shall do everything necessary to locate, uncover, even to the extent of uncovering the entire section and repair or replace the defective pipe, fitting or joint all at his own expense.

A report containing calculations and documentation pertaining to the pressure and leakage testing shall be submitted to the C WD.

SECTION 23. DISINFECTING & FLUSHING

Appendix C contains the AWWA Standards for Disinfecting Water Mains (ANSI/AWWA C651-92). After a section of the main has been pressure tested and found acceptable, it shall be flushed thoroughly by the CONTRACTOR. Flushing the completed main is to be followed by sterilization in accordance with the AWWA Standards for Disinfecting Water Mains (ANSI/AWWA C651-92). Test results for chlorine residuals for times as specified in the method of disinfecting must be submitted to the C WD. If the initial treatment fails to produce the desired result, the chlorinating procedure must be repeated. Discharge of chlorinated water shall comply with all Federal, State and Local Standards. DPW must be contacted prior to flushing. De-chlorinating facilities shall be used as required.

ARTICLE 11 USE OF WATER AND WATER FACILITIES

SECTION 1. PRICING STRUCTURE

Please refer to Appen(lix A for the Special Service Fees as adopted pursuant to Cambridge Municipal Code, 13.08.020.

SECTION 2. JURISDICTION

All property situated within the City of Cambridge shall be eligible to receive water service from the CWD upon compliance with these Practices. The timing and methods for extending or providing service shall be at the CWD's sole discretion. The C WD's jurisdiction is from the city water main to the water meter or in cases of fire line to the street side valve. Thereafter ISD.

SECTION 3. OWNERSHIP

All public water mains, hydrants, valves and associated appurtenances located within public ways, city-owned easements and private ways open to public travel within the city are owned by the CWD. The property owner owns the water service pipe and fire service lines from the water main into the building (including all control valves).

SECTION 4. PUBLIC WATER MAINS

The use of all public water mains in the city, except for transmission mains of the MWRA, shall be controlled by the C WD. No person shall, without prior written authorization from the CWD, uncover, make any connections with or opening into, alter or disturb a public water main.

SECTION 5. PRIVATE WATER MAINS

All private water mains in the City that convey water from public water mains owned by the C WD shall be controlled by the C WD, but shall be operated and maintained by their owners. The C WD may direct the owner to repair or replace a private water main, if in the judgment of the C WD such action will reduce the quantity of water lost through leaks from that main. Repairs to private water mains, including repairs required to comply with these practices, shall be made by and at the expense of the owner.

SECTION 6. APPLICABLE REGULATIONS AND CODES

Any user of public or private water mains shall be subject to whatever rules, regulations, policies, charges, rates. fees and assessments that are from time to time established by the C WD. Any user of public or private water mains shall also be subject to applicable state and federal regulations. In instances where various regulations contain conflicting requirements, the most stringent requirements

shall be met. In addition to these Practices, the most recent edition of the following rules or guidelines shall be adhered to:

A. Commonwealth of Massachusetts, Department of Environmental Protection, Division of Water Supply: Guidelines for Public Water Systems;
B. Commonwealth of Massachusetts, Board of Examiners of Plumbers and Gas Fitters: Uniform State Plumbing Code and Massachusetts Fuel Gas Code (Massachusetts Plumbing Code);
C. Commonwealth of Massachusetts, Department of Public Health: State Sanitary Code, Article I and Alticle Il;
D. Commonwealth of Massachusetts, Department of Environmental Protection: Drinking Water Regulations: 310 CMR Section 22; E.

City of Cambridge: Fire Protection Code;
F. National Fire Protection Association: National Fire Code.

SECTION 7. WATER CONSERVATION AND EMERGENCIES

Conservation by Users

.No user shall knowingly allow water to leak or run to unnecessary waste. Conservation Restrictions

Upon C WD's determination that conditions exist which so limit the water supply that unrestricted water use could endanger the adequacy of supply and the public health, safety and welfare, the Managing Director may adopt conservation restrictions in accordance with the provisions of Massachusetts General Laws Chapter 21 G. Conservation restrictions shall remain in force and effect until the Managing Director determines that the conditions requiring their imposition no longer exist,

Emergency Shut-Off

Upon notification to the owner and in accordance with Massachusetts General Laws, Chapter 40, Section 4 IA, the CWD may shut-off water service to any premises during a drought, hurricane, conflagration or other disaster.

SECTION 8. WATER MAIN EXTENSIONS AND RELOCATION

Procedure for Extensions

An applicant may propose an extension, replacement or relocation of public water mains to serve new or rehabilitated buildings. All proposed extensions, replacements or re-locations, including any tests, studies, investigations and inspections required for design, shall be subject to the approval of the C WD. All expenses, including all engineering, legal permitting, construction and inspection expenses involved in applying for and constructing an extension, replacement or relocation shall be borne by the applicant.

Bonding and Approval of Contractors

Before commencing work on any public water main extension, replacement or relocation, a contractor working for the CWD or for an owner on city-owned property or easement shall (a) file a bond with the DPW in an amount acceptable to the DPW (b) contractor must be approved by the CWD. (A deposit may be required by C. W.D.)

Release Agreement

After approval of a proposed extension, replacement or relocation of a water main and after the intended construction has been approved by the C WD, the applicant shall transfer ownership of the extended,

replaced or relocated water main to the CWD through a Release Agreement in a form prescribed by the C WD. (See Appendix B for Release Agreement.)

CWD Denial or Modification ofProposal

The C WD may deny the request of an applicant to extend, replace or relocate a public water main if in the CWD's opinion; adequate water pressure cannot be achieved. The CWD may condition its approval of a request to extend, replace or relocate. Among other things, the C WD may require that an applicant who proposes to extend, replace or relocate a public water main, install a larger pipe size than required to serve the applicant.

Water Main Replacement

If an applicant requests a new water service pipe or fire pipe which, in the judgment of the CWD will impose a demand in excess of the capacity of the existing main, it may be necessary to replace the existing main with one of appropriate size. The full cost thereof, the applicant shall pay including any tests, studies, investigations and inspections required for design and construction.

Major Development Project Reviews

When the CWD must reasonably secure professional engineering and legal reviews for major development projects, the applicant shall pay for such engineering or reviews up to a reasonable limit.

SECTION 9. HYDRANTS

Ownership

Unless the Managing Director expressly determines otherwise with respect to specific locations, all hydrants located in public ways, city-owned easements or private ways open to public travel shall be owned and maintained by the CWD.

Installation

All hydrants installed by outside contractors shall meet CWD specifications and comply with CWD details for installation. The C WD and the CFD must review plans before a permit will be issued. All hydrants shall be located on City property. Any hydrant installed on property not

owned by the City shall be privately owned and maintained. All newly installed hydrants shall be flow tested by the contractor installing the hydrant and shall be color-coded accordingly:

BLUE/SILVER	Flows 1500 gpm or greater
GREEN/SILVER	Flows 950 gpm or greater
ORANGE/SILVER	Flows 650 gpm or greater
RED/SILVER	Flows 450 gpm or greater
BLACK/SILVER	Flows less than 450 gpm

Hydrant Removal

All requests for a City-owned hydrant to be removed must be accompanied with a written approval from the CFD and subject to CWD approval.

Barrelis

Orange — Sweeper Hydrant

Red — Private Hydrant

White tops — High Pressure Hydrant

Location

Hydrants shall be placed at locations designated by the C WD, with the previous approval of the CFD, to facilitate public fire protection. As a condition of new or extended water service, the CWD may require an owner to pay for the cost of hydrant installation, if the CWD determines that such new or extended water service creates additional fire protection requirements.

Relocation

An owner may request approval to relocate a hydrant. The request shall include a plan of the relocation designed by a registered professional engineer. If the relocation and design is approved by the CWD, CPD, DPW and all abutters have been notified, the owner shall have the work performed at its expense by a contractor bonded and approved in accordance •with Section 8 above.

Permits for Use of a Hydrant

Any use of a fire hydrant by someone other than the C WD or the CFD requires an application for a permit (See Appendix B). Fees for hydrant rental are those set in the CWD fee structure (See Appendix A). Cenain conditions may require the use of a backflow preventer.

Hydrant Flow Tests

Hydrant flow tests shall be performed by the CWD from April I st to November I st at the requesting person's expense. Fees for hydrant flow tests are those set in the CWD's fee structure (48 hour notice is required).

SECTION 10. WATER-COOLED AIR CONDITIONING AND REFRIGERATION An air conditioning or refrigeration unit or units requiring more than 60 cubic feet of water per hour cannot be used without provision for recycling. Larger systems shall include a device enabling the reuse of water supplied in the system and the reuse device shall be in operation whenever such system is in operation. Such shall be subject to the provisions of Article V, Cross-Connections.

SECTION 11. FOUNTAIN AND IRRIGATION SYSTEMS

General Requirements

Free-flowing fountains discharging directly to drains or sewers are prohibited. All fountains shall be equipped with a shut-off mechanism, appropriate cross-connection control and backflow preventer. Drinking water fountains shall be equipped with an automatic shut-off mechanism. Outside decorative fountains shall be turned off from October 1 5 th until March 3 I St of each year.

Irrigation Systems

All irrigation systems shall be equipped with an appropriate cross-connection control device and a meter at the Owner's expense. All outside installations must be protected from freezing and theft in an approved above-ground method (see detail).

Restrictions on Fountain and Irrigation Systems

During a Drought Watch, as identified or declared by the CWD, the Managing Director may require that non-recirculating, decorative fountains be turned off.

ARTICLE 111 WATER SERVICE

SECTION 1. APLICATION FOR WATER SERVICE

Application Procedure

In order to obtain approval to construct or change the size or location of a water service pipe connection to a public water main, the owner shall submit a Water Works Construction Permit (Appendix B). Water Works Construction Pennit forms may be obtained at the CWD's offices. A completed Water Works Construction Permit includes verification by the applicant that the address listed is the correct address for the premises in question. A shall be supplemented by building site plans approved by the CWD and by such other petmits, plans, specifications and information as the C WD may require. Approval of a Water Works Construction Permit shall be subject to the availability of capacity in the public water main as determined by the CWD.

Expense Borne by Owner

All costs and expenses incident to submission of and to the design, construction, connection and inspection of a water service pipe shall be borne by the 0'.vner.

Existing Users

In the absence of a signed General Service Application, the provision of water service by the C WD and its use by the owner shall nonetheless be subject to all provisions of these Procedures.

SECTION 2. RATES AND FEES

Water Rates

All water will be sold as follows:

Residential Rate - Per cubic foot and a customer charge, billed quarterly
Non-Residential Rate - Per cubic foot Minimum
bill of $7.50

SECTION 3. WATER SERVICE PIPES

Design and Construction Standards

Water service pipes within a public way or a private way open to public travel shall be constructed in accordance with the CWD specifications. Water service pipes within private property shall be constructed in accordance with the latest version of the Massachusetts Plumbing Code and all CWD guidelines.

Location of Water Serpice Pipe

No water service pipe shall be laid in the same trench with any other public or private facilities, except a fire pipe, nor within ten feet of a sewer. The minimum bury shall be (5) feet unless approved by the C WD. Any connection of a water service pipe to a public main shall be made in a public way and run 90 degrees of the C WD main. (See Article 1 Sec. 2 line G)

Limitations on Tapping Mains

Where there is more than one public water main in a street, the C WD shall determine which main the owner may tap for a water service pipe connection. Water mains designated as transmission mains shall not be tapped for water service, except when approved by the CWD. All new taps 4" or larger shall not exceed half the diameter of the main to be tapped without prior CWD approval. Otherwise, a solid sleeve three-way branch shall be used to connect to the new main.

Separate Services

In general, the C WD requires a single water service pipe and a master meter for multiple unit premises. Otherwise, a separate service line and meter shall be required for each premises of different address or ownership. The CWD's policy on domestic water services for condominiums is as follows: Before a CWD new water service construction permit can be issued the owner/developer must provide to the C WD's Engineering Division a Massachusetts P.E. stamped sketch (i.e., 8 h" X I l" SK) showing the specific location and piping configuration details of the single, appropriately sized master water meter that will meter all condominium unit water usage. The CWD's requirements are that this location must have proper heating, year round, and provide adequate access to subject master meter for testing and servicing by the CWD's meter technicians. The CWD's policy does not allow individual condominium unit meters controlled by the C WD. The owner/developer has the option to sub-meter all individually owned condominium units downstream of CWD's master meter. This option is per the Massachusetts General Law, MGL Chapter 186-Section 22.

Redundancy Waterfeed/three way valving

For all new construction as a minimum involving Laboratories, Biotech buildings, Hospitals, Schools, and buildings with 50 units or more or any other facility where the water need is considered critical during emergency situations or for performance of routine maintenance the owners will be required to install redundant water services (feeds) .

The City of Cambridge Water Department must approve all plans and reserves the right to require facilities, developments and other projects to use multiple water services (feeds),

In the event that water service redundancy is not obtainable through separate water sources in the street, a 3-way valve setup will be required.

Contbined Service

All provisions within this Alticle for water service pipes shall also apply to existing combined services. New combined services shall not be installed, unless the CWD determines that a combined sewice is in the interest of efficiency.

Installation of Water Service Pipe

The owner or the owner's CWD approved contractor shall be responsible, at its expense, for installing the water service pipe and appurtenances and making connection to the public water main designated by the C WD and cutting and capping any water service pipe to be abandoned. The owner or owner's contractor shall: (l) arrange with at least 24 hours advance notice for an inspection by the CWD before

backfilling the installed water service pipe and appurtenances; and (2) not backfilling the installation until after receipt of a written inspection certificate from the DPW,

SECTION 4. METERS AND METER TESTING

Furnishing ofMeters and Meter Size

In new installations, the C WD shall furnish at its expense meters up to and including 2-inch meters in size. New meter installations greater than 2 inches in size shall be furnished and maintained in good working order by the owner. The size of the meter required shall be determined by the owner and subject to the approval of the C WD. One meter shall be supplied for each service line tapped off of a City main.

Ownership

All meters once installed, become the property of the CWD.

Installation ofMeters

All meters up to 2 inch in size shall be installed by the CWD at its expense. Prior to installation of the meter, the 0'vner shall, at its expense, complete the plumbing so that the premises are ready for meter installation. All meters greater than 2 inches in size shall originally be installed by the owner at its expense and inspected by the C WD. Replacement of such meters will be CWD's approval. Meters 2 inches in size and larger shall be the turbine type and shall be provided with a I-inch tap for meter testing by the CWD. All Ineters large* than 2 inches shall be installed with a strainer.

Location ofMeters

All meters shall be installed within an owner's building in an ample and suitable space free from exposure to freezing, unless otherwise directed by the CWD. This space shall at all times be

unobstructed and accessible to the CWD. The owner shall be responsible for any damages as a result of not adhering to this section. (Pit meters are prohibited.)

Outside Meter-Reading Devices

The CWD may install a device within or on the outside of a building in a conveniently accessible location to enable routine meter readings without internal access to the owner's building. Required on all new installations.

Right to Enter Premises

In accordance with the provisions of Article VI of these Procedures and Massachusetts General Laws, Chapter 165, Section 1, the C WD may enter premises to examine or remove meters, pipes, fittings; and work for supplying or regulating the supply of water and to ascertain the quantity of water consumed or supplied.

Meter Testing

All meters may be subjected to periodic tests by the C WD. An 0',vner rnay request that their meter be tested by the C WD. An approved testing company at the owner's expense will perform all requests for meter tests.

Meter Tampering

No person shall bypass, tamper with, or prevent a meter from registering water consumption and such acts shall be subject to the penalties stated in Massachusetts General Laws, Chapter 165, Section I I and to such other penalties as the CWD may adopt under Article VI of these Procedures.

Master Meters

The C WD, at its sole discretion, may require the master metering of more than one water service. In such cases, the owner of the premises sewed shall be responsible for payment of all water charges and the acceptance of all related notices. This includes but is not limited to, condominiums and townhouses.

Meter Replacement or Repair

The C WD maintains an annual meter installation and maintenance program. If plumbing work is necessary to make the premises meter-ready, the C WD will provide plumbing specifications to enable the owner to prepare the premises for meter installation.

SECTION 5. REPAIRS MAINTENANCE AND THAWING

Repairs and Maintenance

The water service pipe supplying a property shall at all times be kept by the owner in good repair, free of leaks and protected from frost and corrosion. In the case where the portion of the water service pipe is damaged by neglect or carelessness of the owner of the premises served, or any plumber, contractor, occupant or other person acting on behalf of the owner of the premises, all necessary repairs shall be made at the owner's expense.

Leak Up To Owner

If the C WD determines that there is a leak on the property side water service, the CWD shall so notify the owner and the owner shall be responsible for having the leak repaired. A leaking water service pipe may be shut off by the CWD, in accordance with the provisions of Article Ill, Section 5.

Thawing

The owner is responsible and shall bear the expense for hawing a frozen water service pipe.

SECTION 6. SHUT-OFF TERMINATION ABANDONrvm,NT AND LET-ON

Sh ut-off

The C WD may shut off water service without notice in order to perform emergency work on a public water main or a water service pipe or pursuant to Article V, Section 3 hereof. At the owner's request, the CWD may shut off water service to premises in order for the owner to make repairs or tör temporary vacancy.

Termination by the CWD

An owner may discontinue the owner's water service to a vacant building by notifying the CWD in writing at least three working days in advance of the date on which water service is to be discontinued.

Abandonment

When water service has been discontinued for a period of one year or more and no commitment has been provided by the owner as to possible future use, the CWD may, at its sote discretion, consider the water service to be abandoned and may disconnect the water service pipe(s) from the public water main at the owner's expense. The CWD shall send to the owner (as retlected on C WD records) written notice

by certified mail, return receipt requested that such disconnection would occur within one week after the date of the notice.

Let-on

Only the CWD shall let-on water service. After inspection of a newly installed water service pipe and upon request by an owner, the C WD shall let-on water service only if someone is present at the site. If an owner requests the CWD to shut off water service, then the CWD will let-on the water service only after a subsequent request by the owner. The C WD may let-on water service without notice after performing work on a public water main or a water service pipe.

Let-On After Ternzination

When water service to any premises has been terminated for any reason, it will be let-on by the CWD only after the conditions, circumstances or practices that caused the water service termination are corrected.

Let-On After Abandonment or Discontinuance

If a water service pipe has been abandoned for one year or longer or if water service has been discontinued for one year or longer, the service will be let-on only after the owner submits a General Service Application.

Let-On OfLead Service Pipe Prohibited

If a lead water service pipe is discontinued or abandoned, the water service shall not be let-on until a new Water Works Construction pennit is submitted by the owner and the lead water service pipe has been replaced with a new pipe of approved material. .

ARTICLE IV PRIVATE FIRE PROTECTION

SECTION 1. APPLICATION FOR A FIRE SERVICE LINE

Application Procedures

In order to obtain approval to construct or change the size or location of a fire line connecting to a public water main, the owner shall submit a General Service Application. The application shall be supplemented by building site plans approved by ISD. Approval of the application shall be subject to the availability of capacity in the public water main as determined by the C WD.

Expenses Borne by Owner

All costs and expenses pertaining to the completion of a General Service Application, the design, construction, connection and inspection of a fire pipe shall be borne by the owner.

Existing Users

In the absence of a signed General Service Application, the provision of water service by the CWD and its use by the owner shall nonetheless be deemed subject to all provisions of these Procedures.

SECTION 2. FIRE LINES

Design and Construction Standards

Fire protection lines shall be constructed in accordance with C WD specifications and latest versions of the Massachusetts Plumbing Code, City Fire Prevention Code and National Fire code.

Location ofFire Pipe

No fire service line shall be laid in the same trench with any other public or private facilities, except a water service pipe or within ten feet of a sewer. Any connection of a fire service line to a public main shall be made in a public way at 90 degrees of the C WD water main.

Limitations of Tapping Mains

Water mains designated as transmission mains shall not be tapped for a fire pipe, except when approved by the C WD. All new taps shall be a minimum of one pipe size smaller than the main to be tapped; otherwise, a solid sleeve three-way branch shall be used to connect to the new main.

Limitations on Water Use

Where there is more than one public water main in a street, the C WD shall determine which main the owner may tap for a fire service line connection. Water supplied through a fire line shall be for fire protection only, except for annual fire pump tests. A fire line shall not be connected with a water Domestic service line.

Installation of Fire Service Line

The owner or the owner's contractor shall be responsible, at its expense, for installing the fire service line and appurtenances including a- street side valve, tapping and making connection to the public water main designated by the CWD; and cutting and capping any water service line to be abandoned. The owner or owner's contractor shall: l) arrange with at least 24-hour advance notice for an inspection by the C WD betöre backfilling the installed fire line and appurtenances; and 2) not backfill the installation until after receipt of a written inspection certificate from the DPW. The owner shall provide access to the property for the inspection by the CWD and DPW.

SECTION 3. REPAIRS MAINTENANCE AND THAWING

Repairs and Maintenance

The fire pipe shall at all times be kept by the owner of the premises and at its expense in good repair, free of leaks and protected from frost and corrosion.

Repair ofLeaks

The owner shall be responsible for having a leak in a fire line repaired at the owner's expense. Such a leaking fire line shall be shut off by the CWD in accordance with the provisions of Section 6 of this Article.

Thawing

The owner is responsible, at its expense, for thawing a frozen fire pipe.

SECTION 4. SHUT-OFF, TERMINATION, ABANDONWIENT AND LET-ON

Shut-Off

No shut-off of a fire line shall occur except in accordance with Massachusetts General Laws Chapter 148, Section 27A and with the City of Cambridge Fire Prevention Code. After compliance therewith, the CWD may shut of a fire pipe without notice in order to prevent the loss of %xvater, to prevent or stop damage to property or to perform work on a public water main. At the owner's request, the CWD may shut-off water service to a premise in order for the owner to make repairs, providing that the CFD has been notified.

Discontinuance by the Owner

No discontinuance of a fire line shall occur except in accordance with Massachusetts General Laws, Chapter 148, and Section 27A and with the City of Cambridge Fire Prevention Code. After compliance therewith, an owner may discontinue the 0 [1],vner's fire service to specific premises by notifying the CWD in writing at least three working days before the date on which the fire line is to be discontinued.

Abandonment

No abandonment ofa fire pipe shall occur except in accordance with Massachusetts General Laws, Chapter 148, and Section 27A and with the City of Cambridge Fire Prevention Code. After compliance therewith, if a fire pipe has been discontinued for a period of one year or more and no commitment has been provided by the owner as to the possible future use, the CWD may, at its sole discretion, consider the fire pipe to be abandoned and may disconnect the fire pipe(s) from the public water main at the owner's expense. The C WD shall mail to both the owner (as reflected on C WD records), a written notice that such disconnection shall occur unless the owner makes other arrangements with the CWD within one week after the date of the notice.

Let-on

Only the C WD shall let-on a fire line. After inspection of a newly installed fire line and upon written request by the owner, the C WD shall let-on water service only if someone is present at the site. If an owner requests the CWD to shut-off water service, then the C WD will let-on the water service only upon request by the owner. The C WD may let-on water service without notice to the owner after performing work on a public water main.

Let-On After Termination

When water service to the fire pipe of any premises has been terminated for any reason, it will be let-on by the C WD only after the conditions, circumstances or practices that caused the water service termination are corrected.

Let-On After Abandonment or Discontinuance

If a fire pipe has been abandoned for one year or longer, or if water service has been discontinued for one year or longer, the service will be let-on only after the owner submits a General Service Application.

ARTICLE V CROSS-CONNECTIONS

SECTION 1. BACKFLOW PREVENTORS

Backflow Preventers Required

No person shall maintain a cross-connection without an approved backflow preventer. Backflow preventer shall comply with the provisions of the Massachusetts Department of Environmental Protection (DEP) Drinking Water Regulation 310 CNR Section 22: Cross-Connections.

Plan Approval and Initial Inspection

The C WD, as the designee of the DEP, shall approve all plans for the installation of backflow preventors and, after installation, shall perform the initial inspection and test of the backflow preventors

Installation ofBackflow Preventers

The mvner at its expense shall install Backflow preventors and the installation shall be approved by the CWD.

Subsequent Testing

After installation, the CWD shall semi-annually test and inspect all backflow preventors, at the owner's expense, to insure continuous satisfactory operation.

SECTION 2. CROSS-CONNECTION INSPECTION

Right to Enter

The CWD may enter premises sewed by a public or private water main at all reasonable times for the purpose of conducting routine, periodic surveys and investigations of cross-connections and potential cross-connections within the premises. On request by the CWD, the owner shall furnish information on water use practices within the owner's premises. Pretnises having or suspected of having cross-connections in violation of these Procedures may be inspected regularly for backflow hazards.

Notification

Notwithstanding any other provision of these Procedures, investigations and inspections for the purpose of locating possible cross-connections in violation of these Procedures may be performed by the CWD without prior notice to the owner.

SECTION 3. CROSS-CONNECTION ELIWHNATION

Prevention of Cross-Connections

The backflow of non-potable water, other liquids or foreign materials into public water mains is prohibited. Public private water mains shall be protected against cross-connection and backflow from any plumbing fixture or other equipment or appliance capable of affecting the quality of the water supply. All backflow prevention devices shall be approved by the DEP.

Sh ut-Off Of Water Service

The CWD shall have the right to shut-off water service without prior notice to eliminate a crossconnection or backflow condition where contaminants are actually in the process of or suspected of entering the potable water supply, or where there is, in the C WD's judgment, the reasonable possibility that such contamination will occur if the water service is not shut-off, Under such conditions, the water service shall remain shut-off until the cross-connection or backflow connection is eliminated, or the condition is remedied, at the owner's expense and the remedial work has been approved by the CWD.

SECTION 4. OWNER'S LIABILITY

The owner shall be liable to the CWD an(l shall reimburse the CWD for all penalties, fines and monetary judgments levied against or imposed upon the C WD as a result of the owner's violation of any provision of this Article.

ARTICLE VI ENFORCEMENT

SECTION 1. INSPECTION

Right ofAccess

Duly authorized representatives of the C WD may inspect the property or the facilities of any owners or users (including facilities under construction) to ascertain compliance with Procedures. Owners or occupants of premises where water service pipes or fire lines are located shall allow properly identified C WD representative ready access, at all reasonable times during normal business hours and at such other times as the C WD reasonably suspects that a violation of these Procedures may be occurring, to such parts of the premises as would enable C WD personnel to inspect, observe, measure sample and test:

A. Water Use;
B. Buildings;
C. Water quality;
D. Meters;
E, Water service pipes;
F. Fire pipes;
G. Cross-connections and backflow preventors; and
H. Other facilities that the CWD reasonably believes may be contributing to a violation of these Procedures.

Right of Entry

Upon proper identification and at reasonable times during normal business hours and at such other times as the CWD reasonably suspects that a violation of these Procedures may be occurring, duly authorized representatives of the C WD shall be permitted to enter all private property through which the C WD holds an easement fŏr the purpose of inspection, observation, measurement, sampling, testing,

maintenance, repair or reconstruction of any portion of a public water main lying within said easement. All entry and subsequent work, if any, shall be done in full accordance with the terms of said easement.

Security Clearance

Where a user has security measures in force that would require clearance before entry to the premises, the user shall make necessary arrangements to permit C WD personnel to enter without undue delay for the purpose of carrying out their specific responsibilities.

Consequences ofDenial of Entry or Access

Where an owner or user, after having received reasonable notice from the CWD, refuses to permit properly identified CWD personnel to enter or have access to premises or facilities in accordance with the terms of this section, the CWD may forthwith give written notice of its intent to terminate water service to such user or owner. SECTION 2. ENFORCEMENT

Alternative Actions

Where the CWD determines that l) a violation of these Procedures; or 2) any damage to the public water mains is threatened or has occurred, any one or more the following may be taken:

A. The CWD may shut-off water services as authorized elsewhere in these Procedures.
B. The CWD may issue an order to cease and desist any such violation and may direct the violator(s) as follows:

1 . To comply with these Procedures and with the cease and desist order either forthwith or in accordance with a time schedule set forth by the CWD; or
2. To take appropriate remedial preventive action in the event of a threatened violation.

C. The C WD may require the user in question to submit a detailed schematic plan and time schedule or require such other actions within such times as the C WD deems appropriate.
D. The C WD may take direct enforcement action by filing suit in any court of competent jurisdiction.
E. The C WD may issue citations pursuant to M.G.L. Ch. 40, ss 2 ID, non-criminal disposition, to the extent allowed by Ordinance.

SECTION 3. LIABILITY

No Direct or Consequential Damage As A Result Of a Let-On or Shut-Off

The CWD shall not be responsible for any damage resulting from the shut-off or subsequent leton of water, including but not limited to busting or collapse of water heaters or boilers supplied by direct pressure; damage by debris in dirty water; the breaking of any pipes, fixtures or control valves; stoppage or interruption of water supply. The CWD shall also have no responsibility for any consequential damages (including, but not limited to, food or housing costs) incurred by an owner, customer or user as a result of the shut-off or subsequent let-on of water.

Damage As A Result Of Water Use or Leak

No user shall utilize any apparatus or device or use water in such a way that could or does adversely affect a public water main, appurtenance or water service pipe. The user shall be liable for any damage to public water mains, appurtenances or water service pipes or property resulting from a violation of these Procedures.

Damage During Owner Repairs and Installations

The owner shall indemnify the CWD from, and shall reimburse the C WD for any loss or damage directly or indirectly caused to the CWD's water facilities by the installation of any privately owned ponion of water service pipe, fire line or other plumbing.

Indemnification

An owner or user shall indemnify and hold harmless the CWD for any damages or civil liabilities the CWD may sustain or be required to pay in consequence of an injury or property damage resulting from that owner's or user's violation of these Procedures.

Governmental Function

In acting under these Procedures, the CWD shall be deemed to be performing a governmental function for the benefit of the general public. The C WD shall not be liable for any loss or damage as a result of the performance of such governmental function.

Monetary Liability

Any person who violates any provision of these Procedures shall, upon issuance CWD order to that effect, forfeit and pay to the City Treasurer the penalty established by applicable Massachusetts General Laws or by these Procedures for each such violation. For purposes of this section, each day that a violation continues shall be deemed to be a separate violation.

Reimbursementfor Costs to CPVD

Failure to comply with any portion of these Procedures, or with any permit or order issued there under, shall be sufficient cause for the CWD to levy on and collect from each violator any additional cost for any expense, loss or damage incurred by the CWD as a result of such violation.

SECTION 4. PENALTIES

Amounts

Violations of these Procedures shall be subject to civil monetary penalties established 1) by applicable Massachusetts law; 2) by applicable rules and regulations of the DEP; and 3) by such penalty schedules as may from time to time be adopted by the C WD and appended to these Procedures.

Continuing Violations

For purposes of the computation of penalties, each day of a continuing violation of these Procedures shall be deemed to be a separate violation.

No Court Limitation

If the City elects to file an enforcement action in a court of competent jurisdiction, the damages then recoverable by the City shall not be limited to amounts recoverable under these Procedures.

ARTICLE APPELLATE PROCEDURES

SECTION 1. IMMEDIATE RIGHT TO A HEARING FOR SHUT-OFFS OR TERIMINATIONS

The owner shall receive notice to a hearing within 24 hours of a service.shut-off or termination. The C WD has the option to reconnect service temporarily, without waiving the infraction that caused the shut-off or termination, until a formal appeal outline in Section 2 is conducted.

SECTION 2. APPEALS FROM CWD ACTIONS INCLUDING SHUT-OFF OR TERMINATION

A. At the Managing Director's level:

Infornud Conference

Whenever the CWD, acting under these Procedures, denies an application, requires an owner or user to build or install any particular facility or device, issues a cease and desist order, a compliance order or an implementation schedule or assess penalties or other charges for noncompliance, the C WD shall promptly so inform the owner or user to whom such action is addressed. Such notice shall be sent by first-class mail and shall inform the addressee of his right to submit, within 14 days after the date of such notice, a written request for reconsideration of the C WD's action. A request for reconsideration shall be addressed to the Managing Director at the C WD's Administrative Office and shall set forth in detail the facts supporting it. Upon receiving such a timely request for reconsideration, the Managing Director or his/her designee shall schedule an informal conference with the 0',vner or user making the request. Written notice of the conference date, time and place shall be mailed to the owner or user at least ten days (unless waived by the owner) before the date of the conference, which shall be held no later than 21 days (unless waived by the owner) after receipt of the request. The Managing Director or his/her designee shall rule in writing on the request for reconsideration within 14 days (unless waived by the owner) after completion of the conference and shall promptly notify the owner or user of his/her decision.

Hearings by the Managing Director

A copy of the decision on the request for reconsideration shall be mailed to the owner or user who submitted the request. The decision shall be accompanied by a notice that the owner or user has the right to request a hearing before the CWD or its designated representative. The written notice shall infönn the addressee that a hearing on the CWD's action must be requested within 30 days after the date of the written notice by a writing addressed to the Managing Director at the C WD's Administration Office. Within 15 days (unless waived by the owner) after receiving a timely written request for a hearing, the C WD shall schedule a hearing and shall mail to the owner or user which requested the hearing a written notice specifying the date, time, place and subject matter of the hearing. The notice shall also state that the entity requesting a hearing has the right to be represented by legal counsel and to present evidence (in the form of both documents and testimony) at the hearing.

Conduct ofHearings hy the Managing Director

Any hearing scheduled under this section shall be held not sooner than 15 days nor later than 30 days (unless waived by the owner) after the date of the hearing notice. The rules of evidence observed by courts need not be adhered to. The proceedings may be tape-recorded and the recording shall be kept in the C WD's custody. Any person who desires a transcript of the hearing may obtain one from the CWD, upon payment to the C WD of the transcription charge reasonably incurred by the CWD.

Hearing Record and Decision by the Managing Director

At any hearing scheduled under Section 3, above, the documents and other evidence offered shall constitute the hearing record. The hearing decision shall be based solely on the hearing record and shall be made within 30 days (unless waived by the owner) after the conclusion of the hearing. The decision shall be embodied in writing which summarizes the matters considered and the reasons for the determination made on each such matter. The written decision shall be signed and dated by the Managing Director or his/her designated representative and shall be mailed to the owner or user which had requested the hearing.

B. Further review by the City Manager:

Any owner or user aggrieved by the decision of the Director may petition the City Manager to review the written decision and hearing record. A grieved owner or user must cause to be delivered to the City Manager on or before the 1 4 th calendar day after the date of the Director's decision a written petition for review of the decision and record. If the aggrieved owner or user so causes the petition to be delivered, then the City Manager shall review the hearing record and the Director's decision; and shall within 30 calendar days (unless waived by the owner) following the receipt of the petition for review issue in writing either a confirmation or modification of the Director's decision, addressed to the petitioning owner or user and with copies to the Director.

ARTICLE Vill ADOPTION

SECTION 1. SUPERCEDES PRIOR PROCEDURES

These procedures take precedence over any inconsistent or conflicting C WD Procedures.

SECTION 2. SEVERABILITY

The invalidity of any selection, clause, sentence or provision of these Procedures shall not affect the validity of any other part that can be given effect without such invalid part or parts.

SECTION 3. RIGHT TO AMEND

The City Manager reserves the right to amend these Procedures in any manner, at any time and to establish any more stringent requirements as is deemed necessary or appropriate.

APPENDIX A

SPECIAL SERVICE FEES

Cambridge Water Department Fee Schedule

1	Permits Required	NOTES
a.	Water Permit Fee (includes one site inspection. Additional inspections are $125.00 per site visit)	1
	1% inch	$125.00
	2 inch	
	4 inch	
	6 inch	
	8 inch	
	10 inch	
	12 inch	
b.	Fire Pump Test Standard	$750.00
c.	Fire Pump Test Rooftop	$1 1000.00
d.	Fire Pump Test Initial Startup	$1 1000.00
	Fire Pump Test Standard and Rooftop	
	Demolition	
g.	Back Flow	
2	Fire Hydrant Temporary Connection (Up to and including 30 calendar days of use)	$225.00
a.	% inch & 1 inch	$225.00
b.	1 % inch & 2 inch	$300.00
	(More than 30days of use)	$350.00
3	Water Service Taps	$200.00
b.	1 1/2 inch C. 2 inch	$25.00
4	New Water Service Installation/ or Change In Size/ Plus Tap	$100.00
a.		$50.00/day + $2000.OO deposit
b.	1 % inch	$100.00/day + $2000.OO deposit
c.	2 inch ,d Minimum Charge	
5	Inspections	6
a.		$350.00
b.	Back flow Device Test (each) C. Back flow Re-test (each)	$400.00
		$450.00
6	Fire/Hydrant Flow Test	7
a.	Each Report	$1 10.00/ft.
b.	Reverse Flow	$125.00/ft.
		$130.00/ft.
		$1 1000.00
		(In permit fee)
		$100.00
		$100.00
		8
		$175.00
		$225.00
		9 (same as 1.)

	$5000.OO Deposit + $100.00 Backflow Test	
9	Final Bill 1 Reading	
10	Meter I MTU Replacements	10
a.	Meter Transmitter Unit (MT U) installed b, 518 inch	11
C.	% inch	
d.	1 inch	
.	1.5 inch 2 inch	
11	Water Service/Disconnect (i.e., "clip and cut" at water main)	12
a.	% inch	
b.	1 inch	
c.	1 % inch	
d.	2 inch	
	Emergency	13
Response 12	Bacterial Testing	14
13	Fire Service Fee (annual user fee)	15
14	Fines	16
a.	Illegal use of hydrants	
b.	Illegal water service connection	
c.	Failure to obtain permits	

d.	Damaged MTU
.	Meter tampering
	$25.00
	$300.00
	$100.00
	$120.00
	$190.00
	$300.00
	$400.00
	$1 1500.00
	$1 1500.00
	$1 1500.00
	$1 .500.oo
	Cost plus 30% admin fee
	$100.00
	$500.00
	$300.00/occurrence
	$300.00/occurrence
	$300.00/occurrence

*NOTES

L Fees for the C WD Permit include (1) one site inspection, A separate fee of $125.00 per site visit is required, regardless of service size; if additional site work inspections are deemed necessary (additional site inspections may be arranged at time of permit issuance).

2. Other City permits may be required. For testing that takes place on Sundays, holidays and outside regularly scheduled work hours, the fee will be increased from $225.00 to $350.00 to cover overtime rate of pay for CWD personnel.

3. This fee is only for the C WD authorized signature on the ISD issued Demolition Permit. Demolition permits will not be endorsed unless the service is "clipped" at the water main (not the curb stop on the sidewalk) and/or a $1000.00 deposit is received.

4. Fee is for the issuance of the C WD Back Flow Preventer Permit for a new back flow device. Fee includes initial inspection/test by a C WD inspector.

5, This may require a back flow inspection.

6. CWD is responsible for obtaining "street opening permit".
7. This fee is for the tap work at the water main. It DOES NOT include the cost for excavation/paving. The "owner" is responsible for obtaining the CDP W issued "Street Opening Permit".

8. This may require a back flow inspection. All hydrant flow tests to be performed from April 1 5 th to November I st. Dates between November I st and April 14th are weather dependent and at the CWD's discretion.

9, Fire service line installations are by the "owner" and require a CWD Permit issued with the fee schedule/size as in NOTE l , above.

10. This is an administrative fee to cover the cost to verify the final meter reading. This cost will be included on the final water bill for the metered account.

I l . Each resi(lential customer account will be furnished with (1) one meter and (l) one outside remote reader (MTU) receptacle at no additional cost for a new domestic service line (ref. NOTE l . above). If a meter malfunction occurs as a result of negligence on the part of the owner, the owner shall bear the cost for a new meter. The CWD requires one service connection = one account — one meter. Multiple meter lines are the owner's responsibility.

12. This fee covers the cost for C WD to perform the 'vvork for domestic and or fire services up to and including a 2" diameter service feed. Services must be "clipped" at the water main (not the curb stop on the sidewalk). Service lines larger than 2" diameter must have their attaching "Tee's" cut out of the water main and a full sized "spool piece" installed in place of the "Tee". This will require C WD shutting down the lrvater main at a mutually convenient time that must be pre-arranged with the CWD Distribution Division. A $1000.00 deposit is required at the time of C WD Permit issuance and inspection fee(s) are also required (per NOTE l , above).
13. This cost/fee is for work performed during regular scheduled work hours. Any inspections required outside of regularly scheduled hours will include the incremental cost associated with overtime pay of C WD personnel.
14. This fee covers the cost for a CWD lab technician to take (l) one sample of water from the work location for bacteria analysis. Additional sampling will generate a new equivalent fee.
15. This is an annual fee to have a fire service line connected to the Cambridge water system. It is not part of or included in any other C WD Permit fee.

16. The maximum fine by ordinance is $300.00 per occurrence.

Please refer to C WD Water Service Installation and Maintenance Regulations as adopted by the Cambridge Water Board of September 8, 1998.

Water Service Fee

The Water Service Fee covers the actual cost of installing the necessary piping from the Cambridge water distribution system to the applicant's property line. It is the responsibility of the applicant or his contractor to install the water service line to his structure according to C WD specifications (permit required). The applicant or his representative must inform the CWD twenty-

four (24) hours prior to beginning installation procedures. A representative of the CWD must approve the installation prior to back-filling and final connection.

All materials used must meet standards and be approved by the C WD for water work and the Department of Public Works for all other materials.

All service lines and meter locations are at the discretion of the C WD.

APPENDIX B

WATER WORKS CONSTRUCTION PERMITS/ APPLICATION FOR RELEASE AGREEMENT

CITY OF CAMBRIDGE
MASSACHUSETTS

TELEPHONE: 617-349-4770; FAX: 617-349-4796; TTY/TDD: 617-492-0235

"PERMIT APPLICATION FOR WATER WORKS CONSTRUCTION"
(Please print or type, complete entire form)

DATE:PERMIT #

TO THE CAMBRIDGE WATER DEPARTMENT:
Pursuant to the requirements of City Ordinance "Chapter 13.08" M.G.L. Chapter 40, Sections 39E and 39G; in accordance with "N.F.P.A. 25", "248 CMR 2:00", "310CMR 22", CWD Construction and Operating Procedures, and any other regulations and standards incorporated by reference herein, the undersigned hereby acknowledges the receipt of the C WD's;

A Conditions of Approval

B Fire Hydrant Rental, Pump Test and Flow Test Agreement

C Requirements for Backflow Preventor Installation

D Multiple Inspection Form (large projects)

and requests permission to construct, test, improve or install the apparatuses described below at the following location:

Address:_____ C.W.D. Grid Map_____

_____ Permit Completed_____

Part I: Water Works Improvements- provide brief description & circle general waterworks category that best describes the nature of work.

1. Meter/OSR Account #

2. Water Service_____
3. Water main

4. Back flow Prevention

5. Hydrant_____
6. Fire Pump Test

A scale drawing of the property location, showing the plot plan of the building(s), limits of he City right-of-way and the location of the proposed water works improvements must be included as part of the submittal.

Part Il: Connection Information & Customer Usage Data Please Circle

Main: 4 „6 - 8- IO - 12 - 16 - 20 - 24 - 30 inches Service • : I -1 1/2 8 inches

Acct.: Commercial/Industrial/Institutional/ResidentiaI

Part Ill: Owner and Contractor Information

Owner Signature: Contractor Signature:

Name: Name:

Bus. Tele: Emerg. Tele: Bus. Tele: Emerg. Tele: Address: Address:

Contractor/Testor or

Drain Layer Contractor S ignature: Date:

Name: Bus.Tele: Emerg. Tele:

Address:

Part IV: Requirements and Sign Off (Circle all applicable: a, b, c, d, e, f, g,)

a. Dig Safe No.:

Mark-out by CWD (Provide 24-hour notice to C WD): Date b.

Inspection by CWD (Provide 24-hour Notice to C WD): Date

c. Pressure/Pump Test (witnessed by/certification): Date

d. Disaffection (witnessed by/certification): Date

e. Public Works Department (Notification) Date

f. Cambridge Emergency Communications Date

g. Plumbing Permit, Inspectional Services Dept. Date

Part IV: Permit Approval

Estimated Cost of Construction:Refundable Retainer (10% of

Construction Cost W/ $150 Minimum)

Estimated amount of water to be used: hundred cubic feet

Fee: Check No.: Deposit: Check No.: Approved (Cambridge Water Department) _____Date: _____Print Name:

This Permit is not effective until all approvals have been granted by the C WD.
(No Water taps allowed on Fridays)

Start Date: Expiration Date: _____

CONDITIONS OF APPROVAL

1 . All abandoned (e.g. temporary, domestic, fire, irrigation, non-active, etc.) water lines must be cut and capped, at the main, with restrained joints or clipped and then inspected by the Water Department. Trench and surface condition must be inspected by the DPW.

2. All materials used are to meet A W WA Standards as applicable for water work. All other materials must meet specifications of DPW.

3. Ductile iron pipe is to be Class 52 or greater with 1/8-inch cement lining. Copper tubing shall be type K only.

4. Multiple taps must be a minimum of 3 ft. apart and 3 ft. from any joint or bell on the main being tapped.

5. When work is completed, as-built drawings MUST be submitted to the CWD within 60 days in triplicate prior to water turn-on. (Preferably in electronic format such as Auto CAD.)

6. The CWD must be notified 24 hours before water work is to start.

7. All shut-offs/turn-ons to be performed by C WD personnel. To arrange for this service call 617-349-4787.

8. All water work must be inspected prior to trench backfill. Please call to make arrangements 24 hours in advance for inspections.

9. All companies performing water construction must be bonded with DPW.

10. After the CWD permit is approved a street opening permit must be obtained from DPW.

I 1 . If service is to be used for construction purposes, back flow devices may be required. For more information on back now prevention please contact our Cross Connection Department.

12. Fire Department approval is required for fire line installation.

13. A certified check made payable to the City of Cambridge in the amount of 10% of the contract cost or $1,000.00, whichever is lesser, shall be held on deposit by the C WD until satisfactory completion of the water construction. (No deposit required for private property.)
14. A 72-hour notice is required by the C WD to mark out the water utilities before construction can begin.

15. A Dig number must be obtained before construction can begin.

16. All new water mains must be pressure tested and chlorinated before activation in the distribution system. A 24-hour notice is required by the CWD for pressure test and sampling after chlorination. Any questions, contact our Laboratory Supervisor to arrange sample collection.

Permit Number: _____

Name of Company: _____

Name of Representative: _____

(Print)

Signature of Representative: _____

HYDRANT RENTAL	FIRE PUMP TEST	HYDRANT FLOW TEST
617-349-4025	617-349-7754	617-349-4763

Tests can only be scheduled between April I SE - November 1 st (weather permitting).

STANDARD PROCEDURE FOR THE OPERATION OF FIRE HYDRANTS

1. Hydrants shall be operated with a five-sided adjustable hydrant wrench only.

2. When operating a hydrant, open it fully so that the drain ports will be fully closed. If the drain is partially open, water seeping through it could saturate the drainage filed and result in the hydrant boot blowing off the 6-inch branch line.

3. Hose connections on the 2-1/2-inch nozzles can be isolated with gate valves and a backflow preventer. Quick-closure butterfly valves are not pemitted because of the associated water hammer problems.

4. The renter is solely responsible for all damages to the fire hydrant, water distribution system and adjacent private properties (Cambridge Municipal Code 13.08.080).

5. A deposit of One Thousand Dollars ($ 1000.00) is required.

RULES FOR FIRE PUMP TEST

1. A seventy-two (72) hour notice is required for scheduling.

2, At no time during the test is the upstream pressure to go below 20 p.s.i.; if so the test shall be terminated.

D. Systetns that are deemed inoperative or do not meet the required specifications are to be repolted to the CFD immediately.

4. The permit applicant shall obtain a "Discharge Permit" and an "Obstruction Permit", if obstructing the city right of way with a hose, from DPW (617-349-4800) at 147 Hampshire Street. The applicant must submit a site plan showing the location of the catch basin which will receive the flot,v. Prior to the issuance of a permit DPW will approve the catch basin location.

5. It is the responsibility of the permit holder to retain the services of a police detail as required.

Permit Number: _____

Name of Company/Tester: _____

Name of Representative: _____
(Print)

Signature: _____

C

REQUIREMENTS FOR BACKFLOW PREVENTER INSTALLATION

Telephone: 617-349-4025

1. Complete one (l) form BR-P WS 09 cross connection plan approval (design data form) for each device to be installed.

2. Submit an 8-1/2-inch by I I-inch sketch or schematic with each design data form.

3. Forms may be obtained from the secretary of the Inspectional Services Department or from the Cross Connection Department of the C WD.

Massachusetts Regulation Plumbing Code 248 CIVIR 2:14 (6) C (2), "No plumbing permit shall be issued for cross connection installation requiring reduced pressure zone backflow preventor or double check valve assemblies until the application for such permit is accompanied by a letter of approval from the Massachusetts Department of Environmental Protection (D.E.P.) or its designee. As the D.E.P. designee, the C WD will issue a letter of approval upon review and acceptance of the design data sheet.

NOTE: Please call the Cross Connection office when the installation is complete and reacly for testing.

Permit Number: _____

Name of Installer/Contractor: _____

Signature of Installer/Contractor: _____

MULTIPLE INSPECTION FORM

Permit Number: _____

Inspection of	CWD Inspectors:	Date:
Inspection of	CWD Inspectors: _____	Date:
Inspection of	C WD Inspectors: _____	Date:
Inspection of	CWD Inspectors:	Date:
Inspection of	CWD Inspectors:	Date:
inspection of	CWD Inspectors: _____	Date:

Name of Contractor: Address:

Inspection of C WD Inspectors: Date:

Inspection of CWD Inspectors: Date:

Inspection of CWD Inspectors: Date:

Inspection of C WD Inspectors: Date:

CITY OF CAMBRIDGE
MASSACHUSETTS
WATER DEPARTMENT 250
FRESH POND PARKWAY
CAMBRIDGE, MA 02138

Sam Corda
Managing Director

TELEPHONE: 617-349-4025
FAX: 617-349-4796
TTY/TDD: 617-492-0235

HYDRANT FLOW TEST SUMMARY SHEET

The C WD assumes no responsibility for design calculations.

Flow Test Requester: _____

Company Name: _____

Address: _____

City & State: _____

Pressure Hydrant Location: _____ I.D. # _____

Flow Hydrant Location: _____ I.D.# _____

The flow test requester is liable for all damages to the fire hydrant, water distribution system and adjacent private properties (Cambridge Municipal Code Section 13.08.080).

Signature: _____ Date: _____

Flow Test Results

Static Pressure: _____ Psi.

Residual Pressure: _____ Psi.

Flow Rate: _____ GPM

Performed by_____

Amount Paid: _____ Check #: _____

Approved: _____

Cambridge Water Department
City of Cambridge, Massachusetts

APPLICATION FOR A RELEASE AGREEMENT

To the City of Cambridge, Massachusetts

The undersigned, being the _____
(Owner, Owner's Agent)

of the Property located at _____ does
(Number) (Street)

hereby request approval for a Release Agreement to transfer ownership of the _____

extended, replaced or relocated water main to the C WD.

In consideration of the granting of this permit, the undersigned agrees:

l . That all construction has abided by all provisions of the Rules and Regulations for the Installation and Connection of Building Water Main and for the Use of Public Water Main of the City of Cambridge, Massachusetts, and all other pertinent rules and regulations that may be adopted in the future.

2. That all construction fbr water main was developed at no expense to the City,

Date: Signed: _____

_____
(Applicant)

(Address of Applicant)

$ _____ inspection fee paid.

Application approved and permit issued: Number: _____

Date: Signed: _____

Managing Director

APPENDIX C

DISINFECTING WATER MAINS

SUIVhMARY OF "AWWA STANDARD FOR DISINFECTING WATER MAINS"

GENERAL

According to the Standard for Disinfecting Water Mains (e.g. A W WA C651), all new water mains and those water mains taken out of service for inspecting, repairing or other activity that might lead to contamination of water should be disinfected before they are placed in service.

The basic disinfecting procedure consists of:

1. Preventing contamination material from entering the water main during storage, construction or repair.

2. Removing, by flushing or other means, those materials that may enter the water mains.

3. Chlorinating any residual contamination that may remain and flushing the chlorinated water from the main.

4. Determining the bacteriological quality by laboratory test after disinfecting. Re-disinfecting and re-sampling are needed if the initial disinfecting fails to produce satisfactory bacteriological samples.

METHOD

The general application of disinfecting water mains is the continuous-feed method. This method consists of placing calcium hypochlorite granules in the main, preliminary flushing the complete main to remove particles and chlorinating the main.

- Placing calcimn hypochlorite granules: During construction, calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main and at 500-ft. intervals. The quantity of granules is shows in Table l .

Table l : Quantity of calcium hypochlorite granules to be placed at the beginning of main and at each 50-ft. interval.

Pipe Diameter (in.)	Calcium Hypochlorite Granules (oz.)
4	0.5
5	1.0
8	2.0
12	4.0
16 or larger	8.0

- Preliminary flushing: Before being chlorinated, the main shall be filled to eliminate air pockets and shall be flushed to remove particulate. The flushing velocity in the main shall not be less than 2.5 ft./s unless under the conditions which do not permit the required flow to be discharged to waste. Table 2 shows the rates of flow required to produce a velocity of 2.5 ft./s in pipes of various sizes.

Table 2: Required flow and openings to flush pipelines (40 psi residual pressure in water Main*).

	Flow Required to	Size of Tap		Number
	Produce 2.5 ft./s	in		of 2.5-in
Diameter	Velocity in Main	1.5	2	Hydrant Outlet*
in	gpm	Number of Taps on Pipe #		

4	100	1	-	1	1	6
6	200	-	1	-	1	200
8	400	-	2	1	1	8
10	600	-	3	2	1	400
12	900			2	2	2
16	1600			4	2	

*With a 40-psi pressure in the main with the hydrant flowing to atmosphere, a 2.5-in. hydrant outlet will discharge approximately 100 gpm and 4.5-in. hydrant outlet will discharge approximately 2500 gpm. Number of taps on pipe based on discharge through 5-ft. of galvanized iron pipe with one 90 degree elbow.

- Chlorinating the main: Before the main is to be chlorinated, water from the existing distribution systems or other approved source of supply shall be made to flow at a constant, measured rate into the newly laid water main. In absence of a meter, the rate may be approximated by methods such as using a Pitot gauge in the discharge, or measuring the trajectory of the discharge (Figure I in Appendix). Table 3 gives the amount of chemicals required for disinfecting each 100-ft of pipe with various diameters.

Table 3: Chlorine required producing 25 mg/L concentration in 100 ft. of pipe by diameter.

Pipe Diameter	Calcium Hypochlorite (65%)	1% Chlorine Solution*
4	0.03	0.16
6	0.06	0.36
8	0.1 1	0.65
19	0.18	I .02
12	0.25	I .44
16	46	2.60

*1% chlorine solution requires I lb. of calcium hypochlorite (65%) in 8 gal. of water.

During the application of chlorine, water entering the new main shall receive a dose of chlorine fed at a constant rate, such that the water will have not less than 25 mg/L free chlorine at a point not more than 10 ft. downstream from the beginning of the new main. All valves shall be positioned so that strong chlorine solution in the main being treated will not flow into water mains in active service. Chlorination shall not cease until entire main is filled with heavily chlorinated water. The chlorinated water shall be retained in the main for at least 24 h, during which time all valves and hydrants in the treated section shall be operated to ensure disinfecting of the appurtenances. At the end of this 24-h

period, the treated water in all portions of the main shall have a residual of not less than 10-mg/L free chlorine.

FINAL FLUSHING

- Clearing the main of heavily chlorinated water: After the applicable retention period, heavily chlorinated water shall be flushed out from the main until the chlorine residual in the water leaving the main is no higher than the generally prevailing in the system or is acceptable for domestic use.

- Disposing OJ heavily chlorinated water: The environment to which the chlorinated water is to be discharged shall be inspected. A reduce agent (Table Bl in Appendix) shall be applied to neutralize the chlorine residual remaining in the water if there is any question that chlorinated discharge will cause damage to the environment.

BACTERIOLOGICAL TESTS

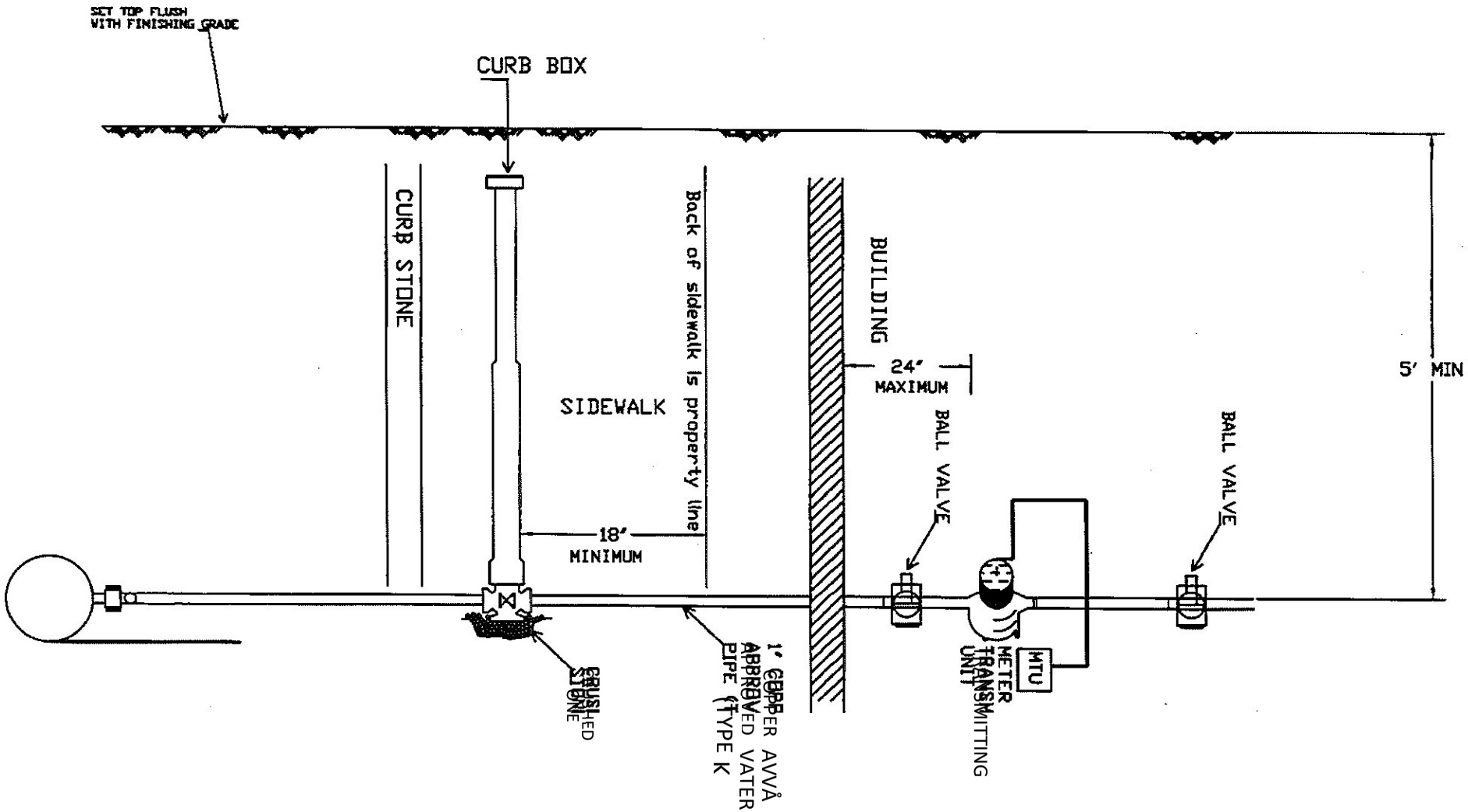
- Sampling conditions: After final flushing and before the water main is to be placed in service, samples shall be collected from the end of new main and each branch if there is any, shall be tested for bacteriological quality in accordance with Standard Methods Tor the Examination of Water and Wastopater, and shall show the absence of coliform organisms. In case of extremely long main, it is desirable that samples be collected along the length of the lines as well as its end.

- Sampling procedure: Samples for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate as required by Standard Methods for the Examination of Water and Wastewater. The chlorine residual in the water shall be measured and the sampling tap shall be cleaned before the sample is collected. No hose or fire hydrant shall be used in collection of samples. A suggested combination blow-off and sampling tap is shown in Figure l . A corporation cock may be installed in the main with a copper tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use.

APPENDIX D

WATER MAIN INSTALLATION DETAIL

CAMBRIDGE WATER DEPARTMENT
WATER WORKS STANDARDS



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NOT TO SCALE

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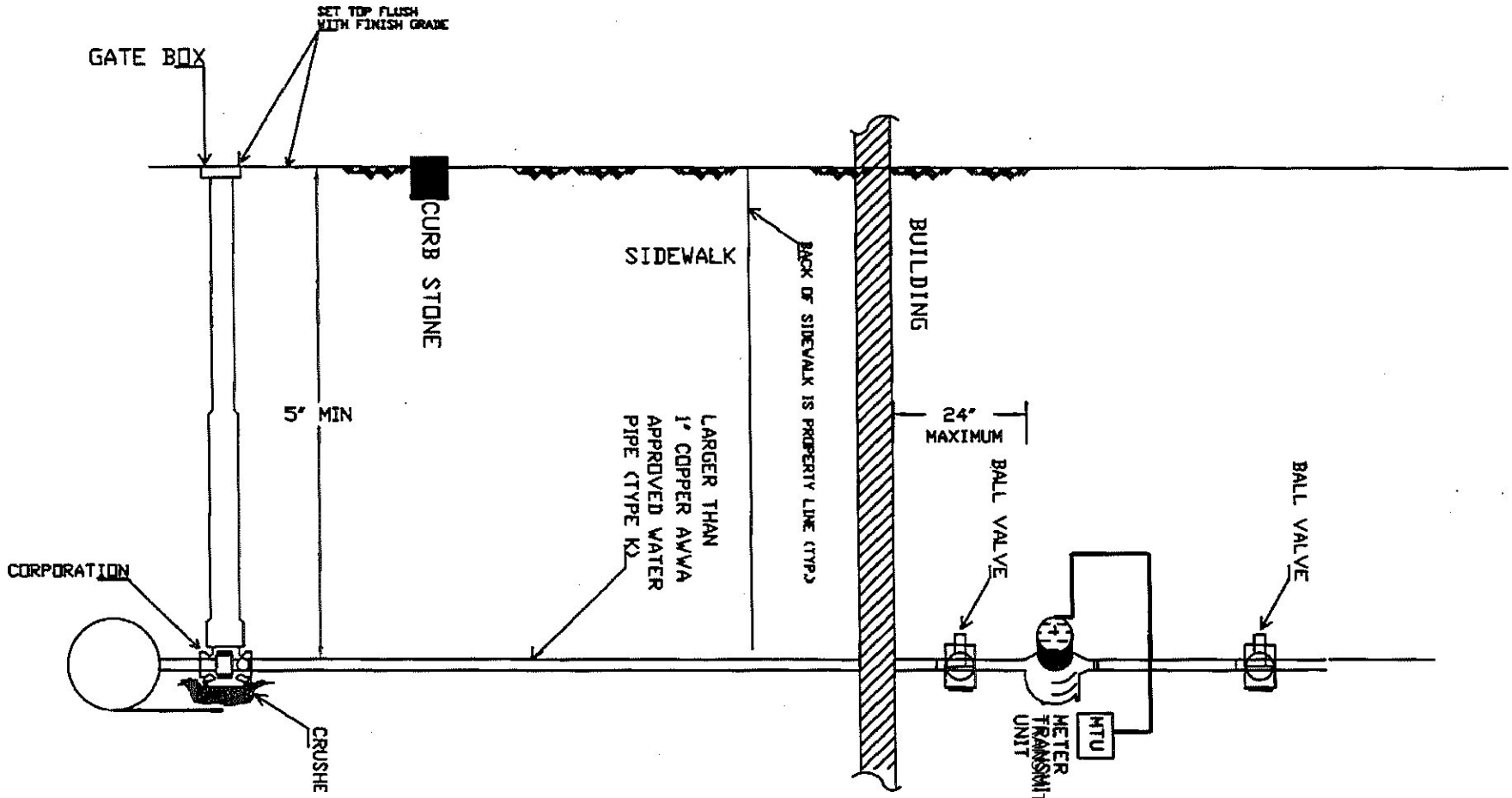
WATER WORKS STANDARDS



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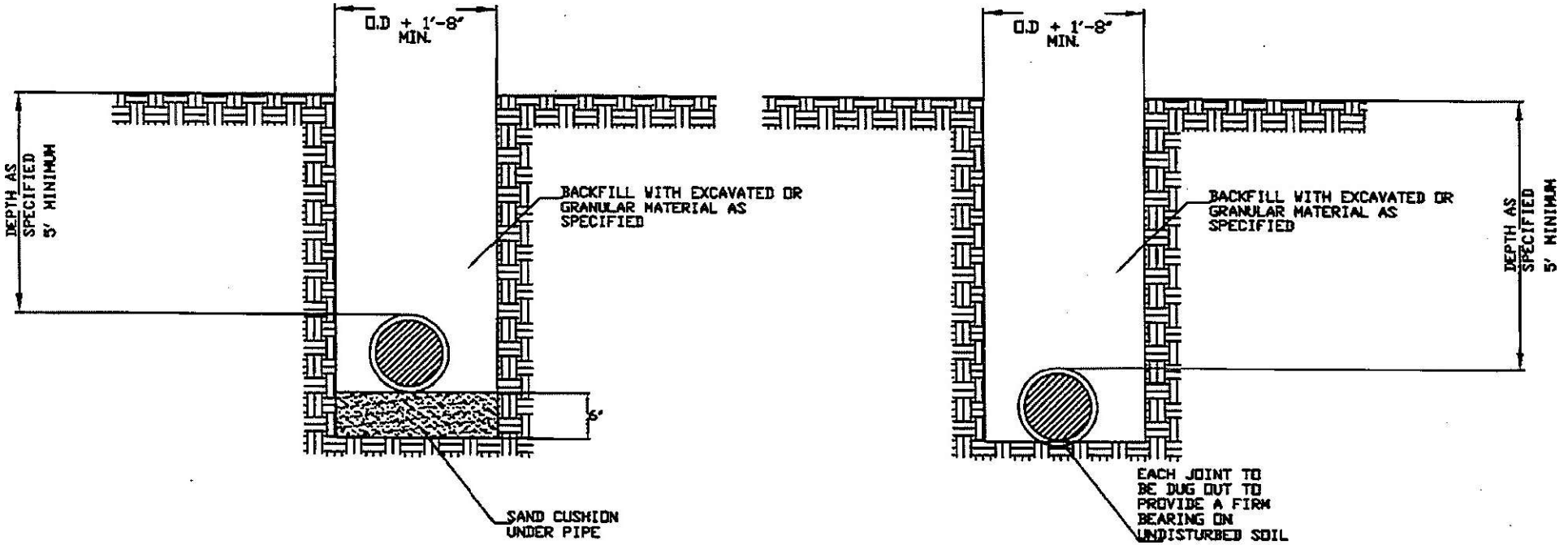

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WATER WORKS STANDARDS

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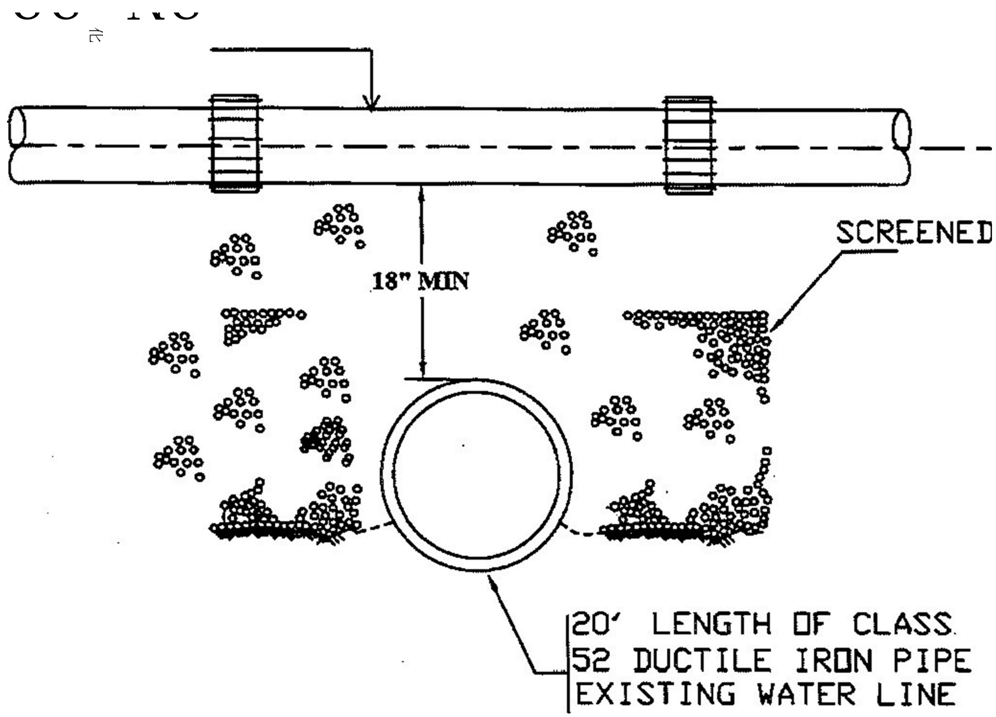

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WATER WORKS STANDARDS

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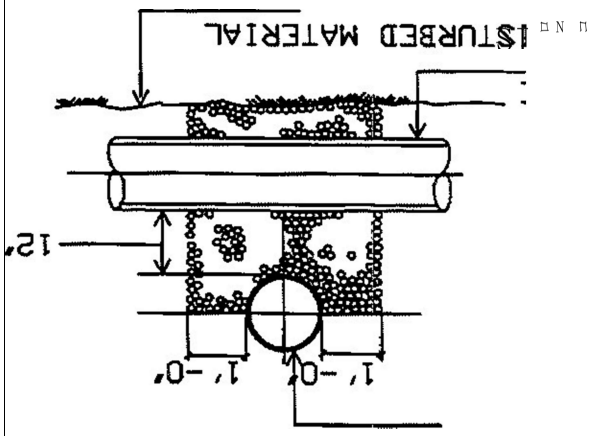

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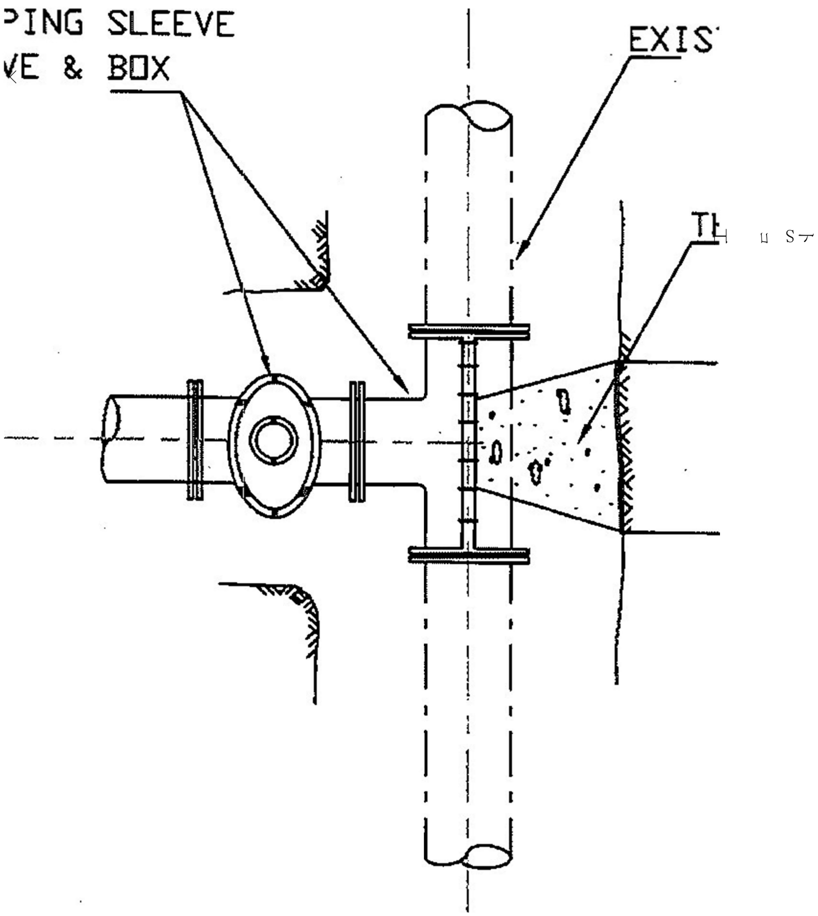

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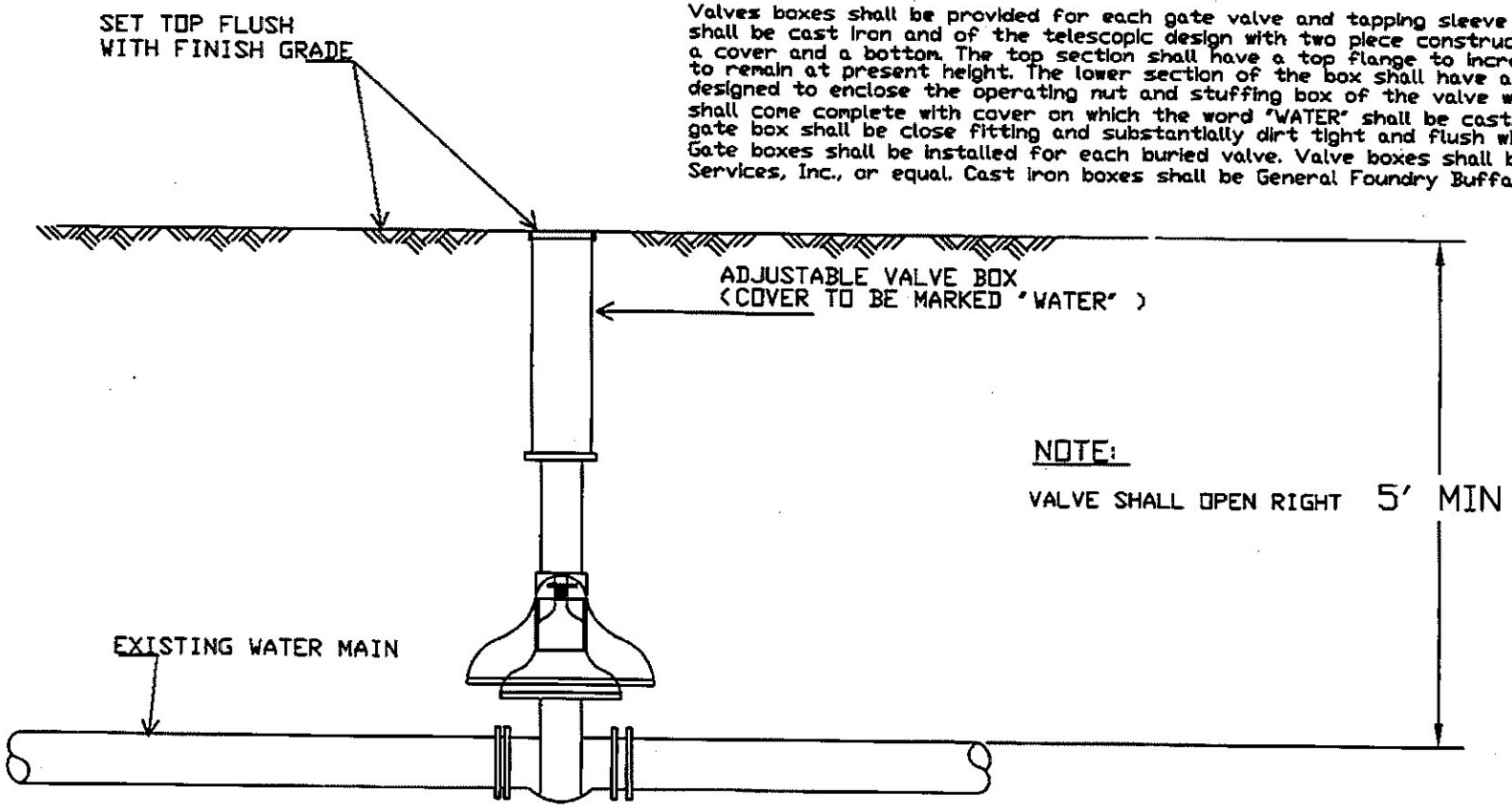
CAMBRIDGE WATER DEPARTMENT
WATER WORKS STANDARDS

SECTION 12. GATE BOXES

Valves boxes shall be provided for each gate valve and tapping sleeve and valve. Valve boxes shall be cast iron and of the telescopic design with two piece construction, top with a cover and a bottom. The top section shall have a top flange to increase the stability of the box to remain at present height. The lower section of the box shall have a bell shaped bottom designed to enclose the operating nut and stuffing box of the valve without settling. The gate box shall come complete with cover on which the word "WATER" shall be cast. The cover of the gate box shall be close fitting and substantially dirt tight and flush with the top of the box rim. Gate boxes shall be installed for each buried valve. Valve boxes shall be C.P. Test Services, Inc., or equal. Cast iron boxes shall be General Foundry Buffallo Boxes or equal.



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SHORT PIECE OF PIPE (3'-0" MIN.)
CAP OR PLUG
B
PLAN - PLUG
#4 REINF. BARS WITH TIE BARS
ELEVATION - VERTICAL BENDS
SECTION A-A
H
12
PLAN - HORIZONTAL BEND
PLAN - REDUCER (OPTIONAL)
6' MIN
ABANDON EXISTING WATERMAIN

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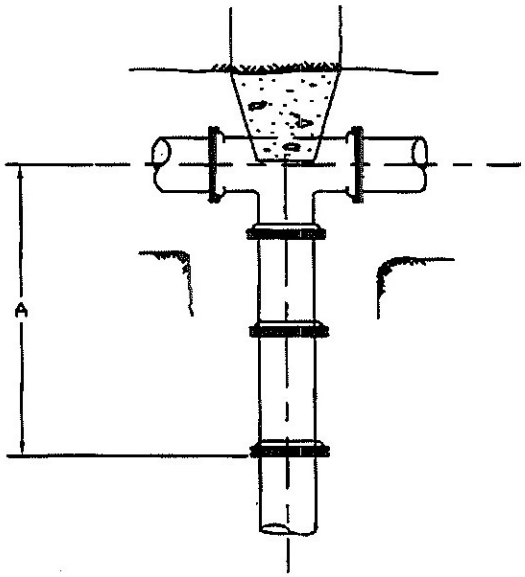
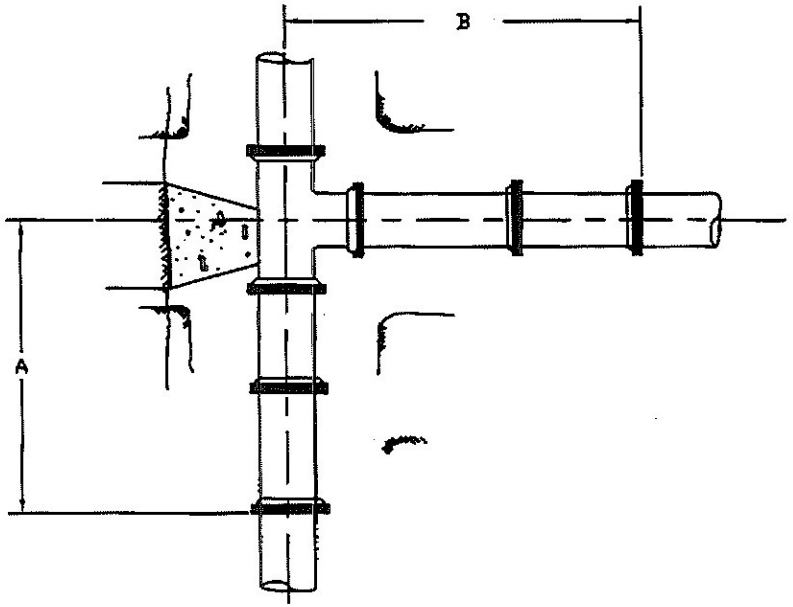
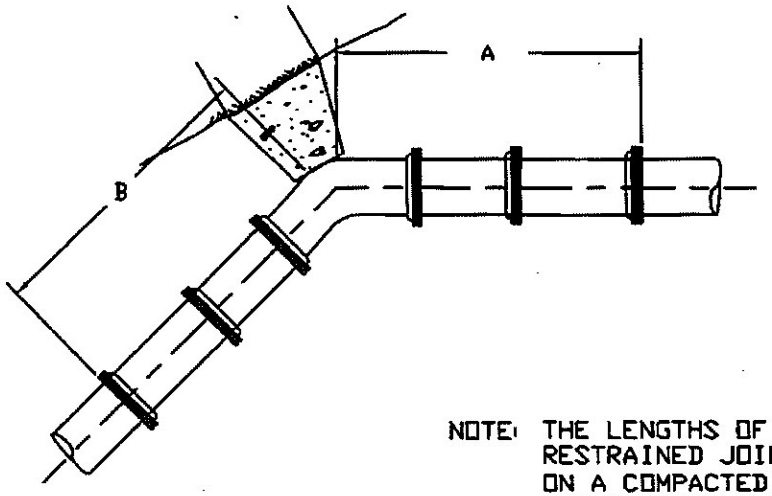
CAMBRIDGE WATER DEPARTMENT
WATER WORKS STANDARDS







NOTE: THE LENGTHS OF PIPE WITH RESTRAINED JOINTS ARE BASED ON A COMPACTED SILTY SOIL SURROUNDING THE PIPE

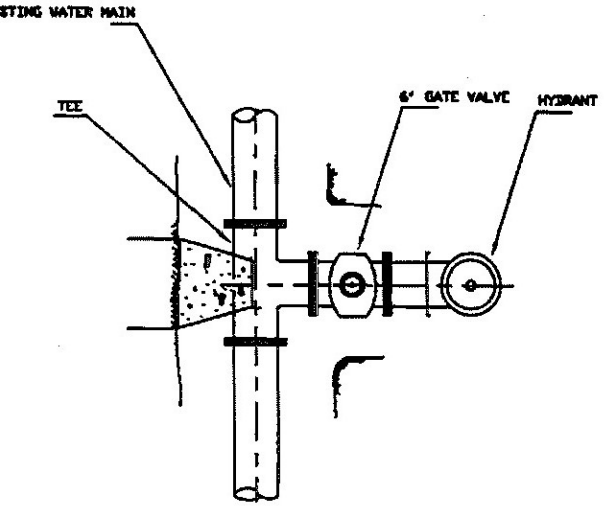
	A		B		
SIZE	TEE & PLUG	90 DEGREE BEND	45 DEGREE BEND	22 - 1/2 DEGREE BEND	11 - 1/4 DEGREE PLUG
6"	12' - 0"	17' - 0"	10' - 0"	5' - 0"	3' - 0"
8"	16' - 0"	22' - 0"	13' - 0"	8' - 0"	4' - 0"
10"	19' - 0"	27' - 0"	16' - 0"	9' - 0"	5' - 0"
12"	23' - 0"	32' - 0"	19' - 0"	11' - 0"	6' - 0"
14"	26' - 0"	36' - 0"	21' - 0"	12' - 0"	7' - 0"
16"	29' - 0"	41' - 0"	24' - 0"	14' - 0"	8' - 0"
18"	32' - 0"	45' - 0"	26' - 0"	15' - 0"	8' - 0"
20"	35' - 0"	50' - 0"	29' - 0"	16' - 0"	9' - 0"
24"	41' - 0"	59' - 0"	34' - 0"	19' - 0"	10' - 0"
30"	50' - 0"	70' - 0"	40' - 0"	22' - 0"	12' - 0"
36"	58' - 0"	82' - 0"	46' - 0"	26' - 0"	14' - 0"
42"	66' - 0"	93' - 0"	52' - 0"	29' - 0"	15' - 0"

CONCRETE ANCHORAGE DETAILS

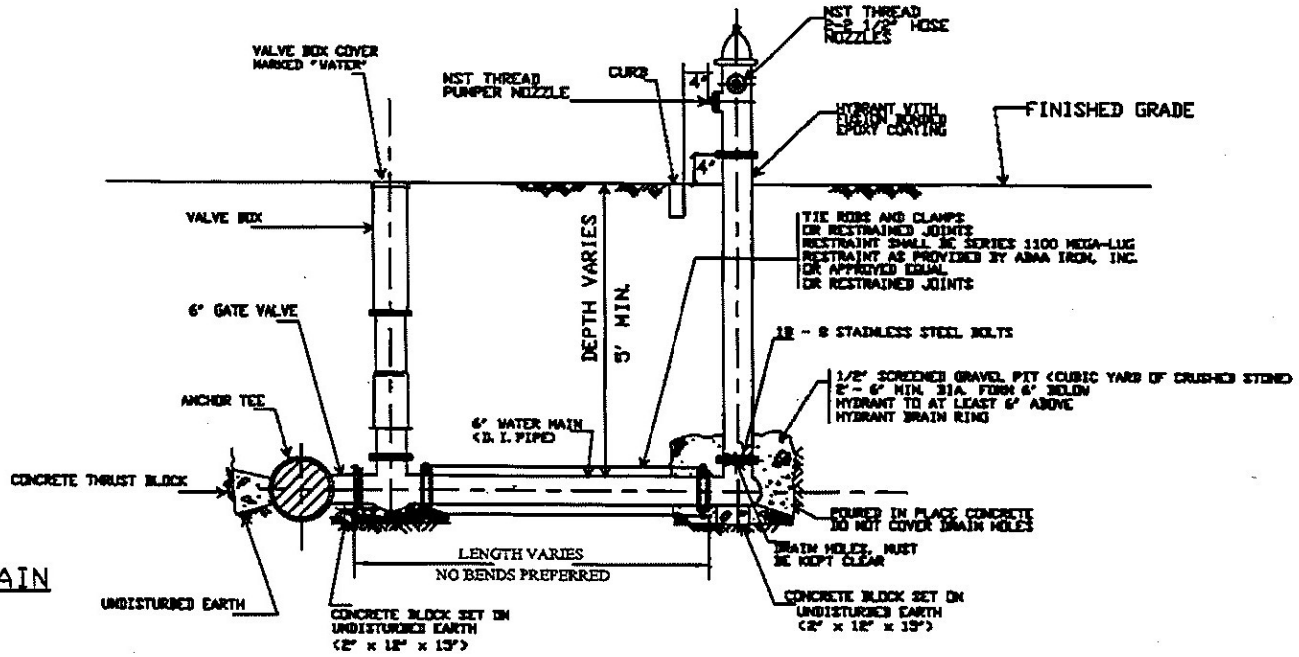
NOT TO SCALE

FILENAME: .....\REST_JOINT.DWG

CAMBRIDGE WATER DEPARTMENT
WATER WORKS STANDARDS



INSTALLATION PERPENDICULAR TO MAIN



ELEVATION
STANDARD CONNECTION

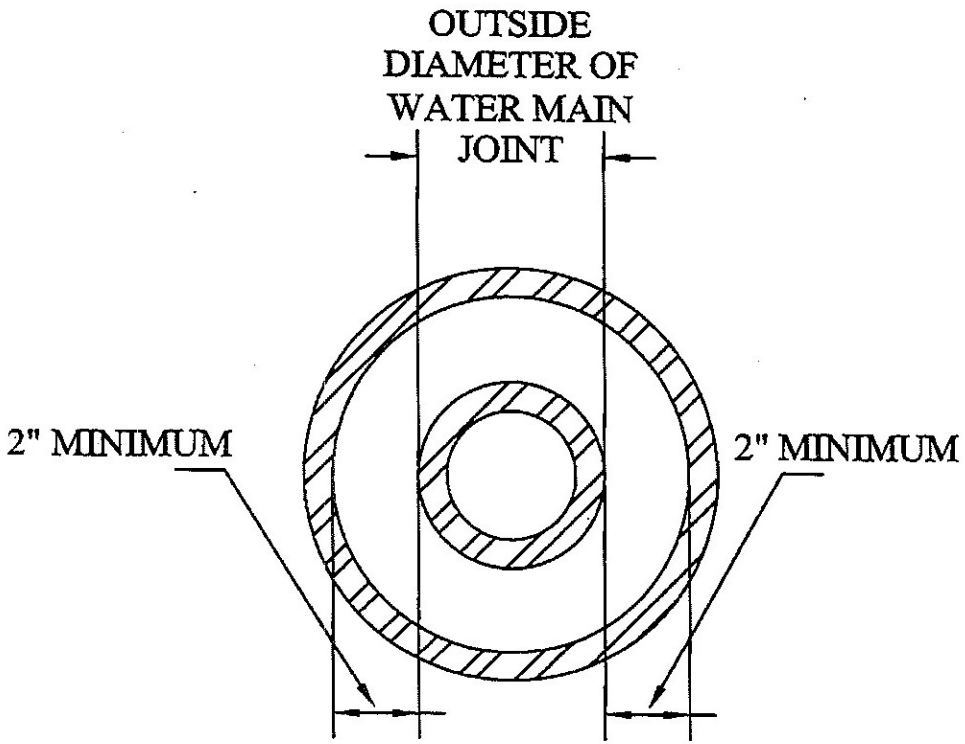
NOTES:
1. TIE RODS AND CLAMPS, RESTRAINED JOINTS, DUCTILE IRON PIPE WITH THRUST BLOCKS OR COMBINATIONS OF THESE MAY BE USED WHERE ADDITIONAL RESTRAINING/ANCHORAGES IS REQUIRED
2. HYDRANTS SHALL BE SAME MODEL CURRENTLY USED BY CAMBRIDGE WATER DEPARTMENT (CWD)

TYPICAL FIRE HYDRANT DETAILS

NOT TO SCALE

FILENAME: "WATER ON SNOOPY"\.....\HY_DET1.DWG

CAMBRIDGE WATER DEPARTMENT
WATER WORKS STANDARDS

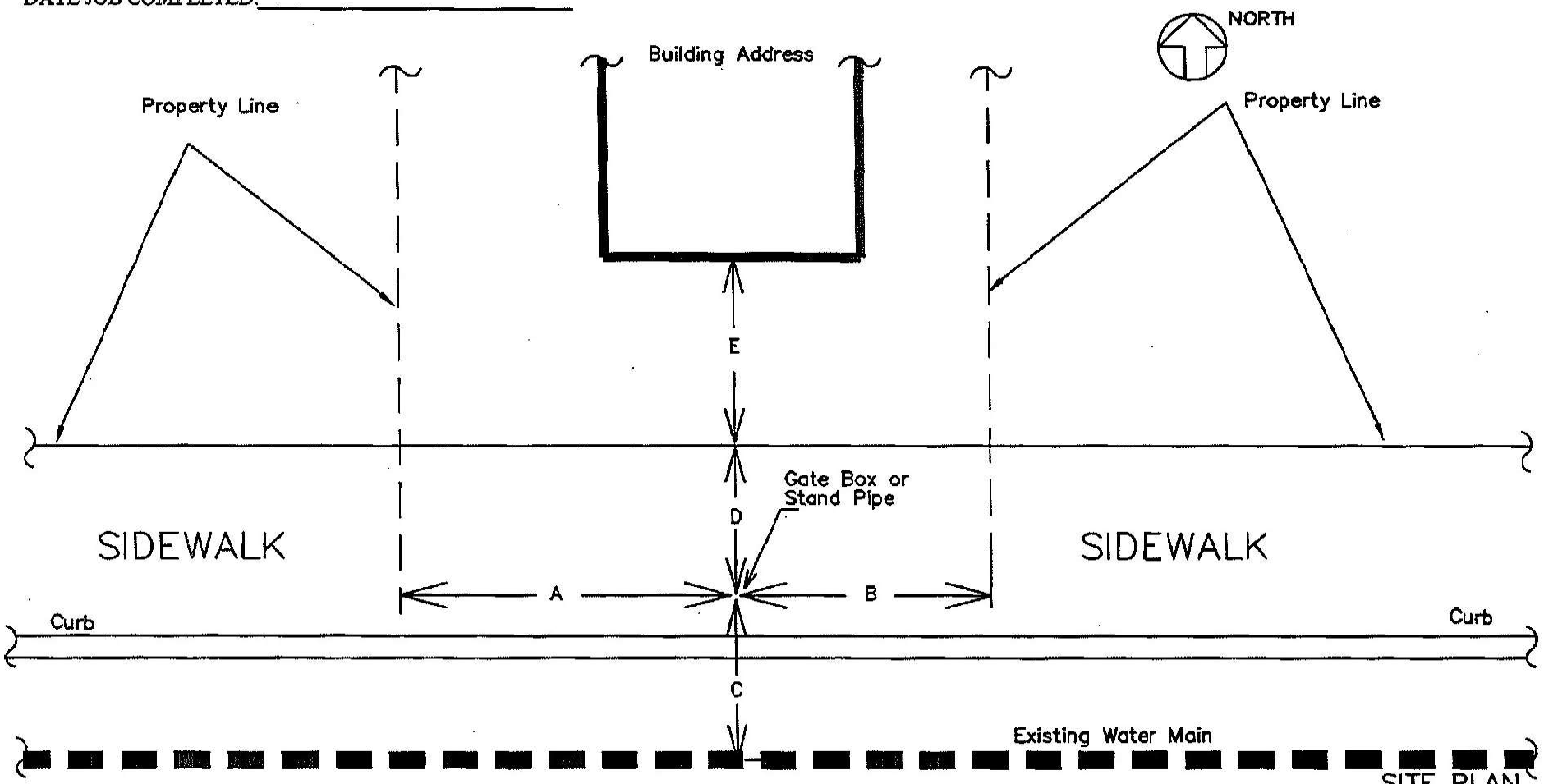


STEEL CASING DETAIL

DIAMETER OF CASING	WALL THICKNESS (INCHES)	
	UNDER HIGHWAY	UNDER RAILROAD
UNDER 14"	0. 250	0. 188
14"	0. 250	0. 219
16"	0. 250	0. 219
18"	0. 250	0. 250
20"	0. 375	0. 281
22"	0. 375	0. 312
24"	0. 375	0. 344
26"	0. 375	0. 375
28"	0. 500	0. 406
30"	0. 500	0. 406
32"	0. 500	0. 438
34"	0. 500	0. 469
36"	0. 500	0. 469
38"	0. 500	0. 500
40"	0. 500	0. 500
42"	0. 500	0. 500

FILENAME: "WATER ON SNOOPY"..... \STEEL_CAS. DWG

DATE JOB COMPLETED:_____



SITE PLAN

NOT TO SCALE

AS BUILT NEED TO SHOW THE FOLLOWING
A & B = Distance from the property line to the gate box or stand pipe
C = Distance from existing main to gate box or stand pipe
D = Distance from property line to gate box or stand pipe
E = Distance from property line to the Building

Also need to show
Size of the service lines, material
Building address

S 831V

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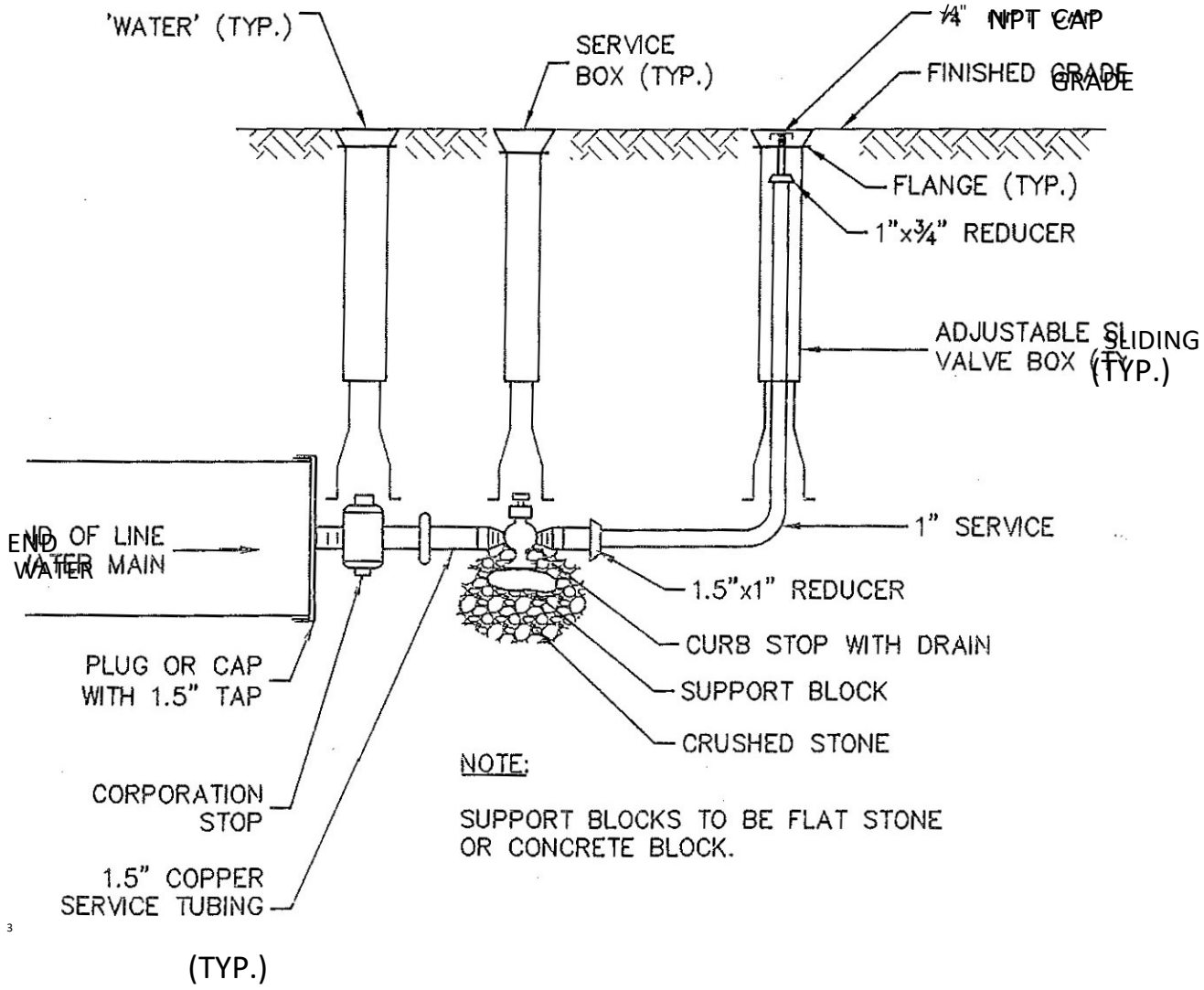
VALVE BOX COVER MARKED



NOTE;

1. CURB STOP WITH DRAIN TO BE USED ONLY FOR NON-POTABLE APPLICATIONS AS APPROVED BY THE CAMBRIDGE WATER DEPARTMENT.

CCD-4

Sheet No.

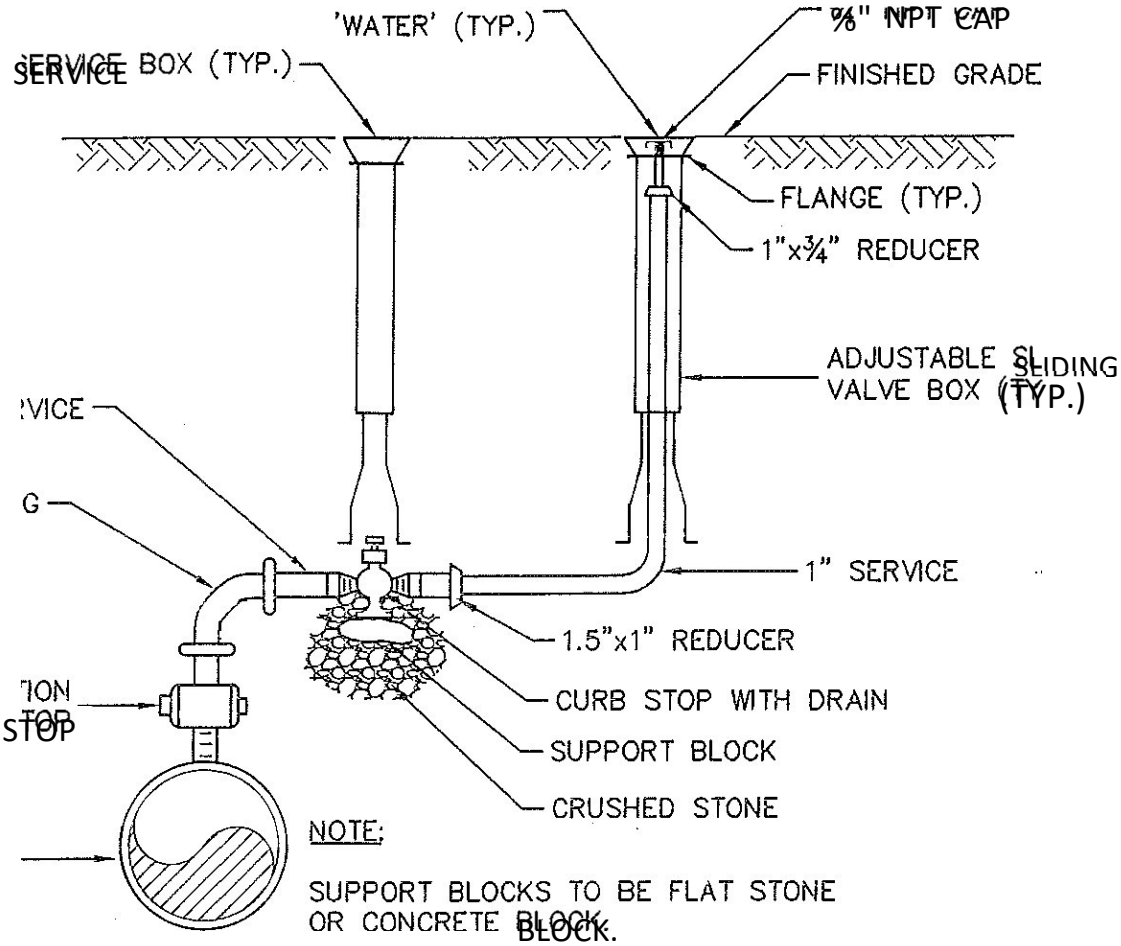
Figure - 1

Scale

END OF LINE BLOWOFF DETAIL N.T.S.

VALVE BOX COVER MARKED

1.5"



SERVICE

go ° FfTTlNC

CORPORATION

WATER MAIN

NOTE:

l . CURB STOP DRAIN TO BE USED ONLY FOR NON-POTABLE APPLICATIONS AS APPROVED BY THE CAMBRIDGE WATER DEPARTMENT.

Sheet No.

CAMBR!DGE WATER DEPT.

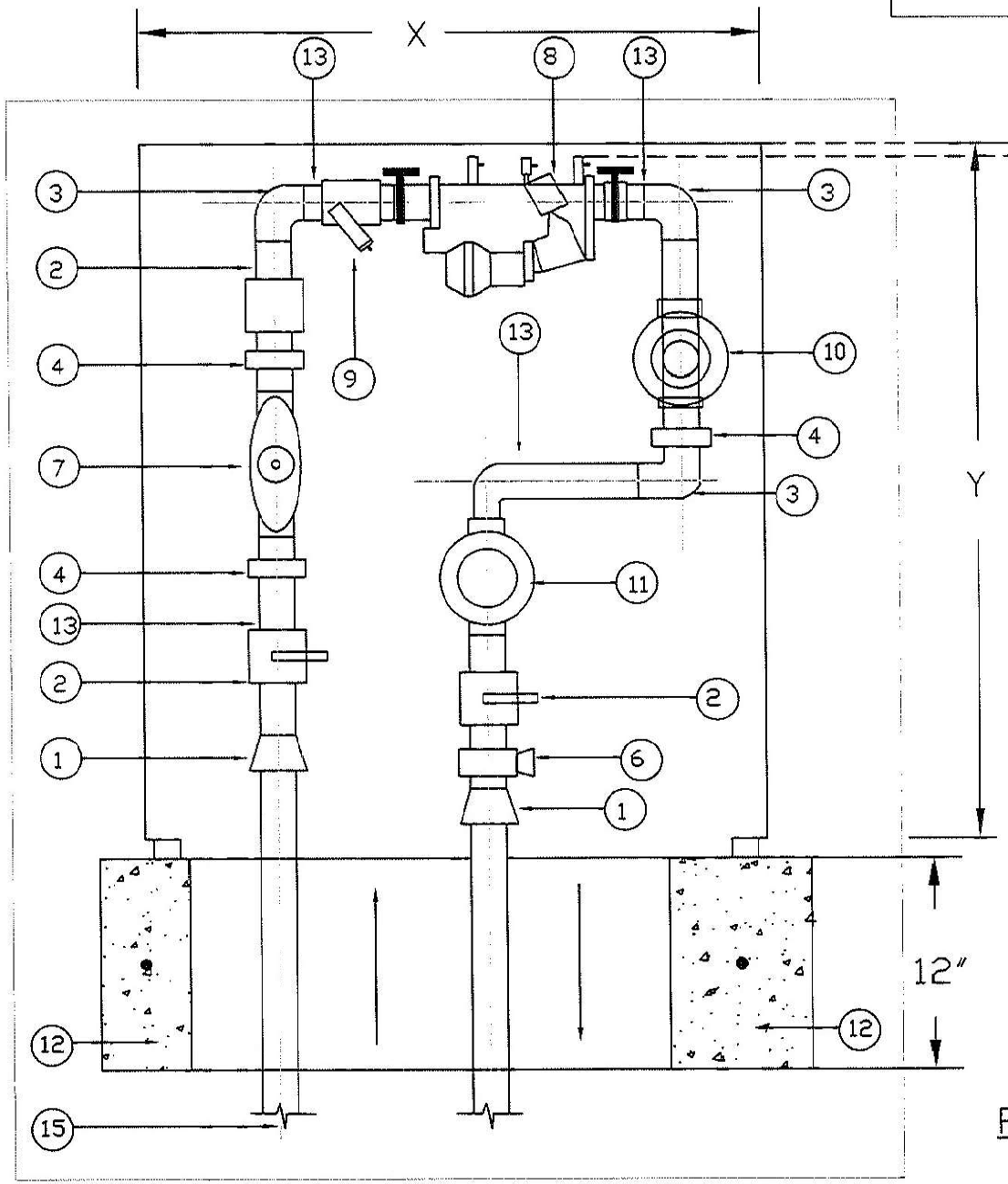
RTA ND,ARD DE T A (t S Figure - 1

Scale

MAINLINE BLOWOFF DETAIL

N.T.S.

CAMBRIDGE WATER DEPARTMENT
WATER WORKS STANDARDS



Min 6 " Clearance Between top of highest test cock and roof panel of control panel

IRRIGATION CONTROL BOX

1. REDUCER, 1" x 3/4"
2. 3/4" BALL VALVE
3. ELBOW
4. UNION (TYP.)
5. PIPE SUPPORT NOT SHOWN
6. BLOW DRAIN 3/4" VALVE
7. WATER METER 3/4"
8. 3/4" BACKFLOW RPZ WITH 2 VALVES
9. "Y" STRAINER 3/4"
10. 3/4" PRESSURE REDUCING VALVE
11. 3/4" REMOTE CONTROL VALVE
12. #4 REBAR
13. NIPPLE
14. X and Y are Linear dimensions (inches), as required
15. Stop and waste valve

FRONT SECTION

(NOT TO SCALE)

FILENAME:.....\IRR_BOX3.DWG

APPENDIX E

СПУ OF CAMBRIDGE
PERMIT CONTACTS CITY OF
CAMBRIDGE PERMIT CONTACTS

Last updated June 10, 2010

ANIMAL COMMISSION, City Hall Annex, 5 1 Inman Street

Phone: 349-4376; Fax: 349-4669; TTY: 492-4621 ARTS

COUNCIL, City Hall Annex, 57 Inman Street

Phone: 349-4380; Fax: 349-4669; TTY: 492-4621 CITY

CLERK, City Hall, 795 Massachusetts Avenue

Phone: 349-4260; Fax: 349-4269; TTY: 349-4242

CITY MANAGER'S OFFICE, City Hall, 795 Massachusetts Avenue

Phone: 349-4300; Fax: 349-4307; TTY: 349-4242

COMMUNITY DEVELOPMENT, 57 Inman street, 3 rd Fl.

Phone: 349-4600; Fax: 349-4669; TTY: 492-4621.

CONSERVATION COMMISSION, 57 Inman Street

Phone: 349-4680; Fax: 349-4669; wry: 492-4621.

DISABILITIES COMMISSION, 51 Inman Street

Phone: 349-4692; Fax: 349-4669; TTY: 492-0235

ELECTRICAL DEPARTMENT, 250 Fresh Pond Parkway
Phone: 349-4925; Fax: 349-491.3; TTY: 492-0235

FIRE DEPARTMENT, 491 Broadway

Phone: 349-4918; Fax: 349-4912/TTY: 499-9924 or 9932

HISTORICAL COIVMISSION, 83 1 Massachusetts Avenue

Phone: 349-4683; Fax: 349-6165; TTY: 349-61 12

INSPECTIONAL SERVICES DEPT., 831 Massachusetts Avenue

Phone: 349-6100; Fax: 349-6132; TTY: 349-61 12
LICENSE COMMISSION. 83 1 Massachusetts Avenue,

Phone: 349-6140; Fax: 349-6184; TTY: 349-61 12

POLICE DEPARTMENT, 125 Sixth St.

Phone: 349-3330; Fax: 349-3335; TTY: 499-9924 or 9932

PUBLIC HEALTH, 1 19 Windsor Street

Phone: 498-1480; Fax: 498-1514; wry: 498-1462

PUBLIC WORKS, 147 Hampshire Street

Phone: 349-4800; Fax: 349-4868; 349-4805

RECREATION, 51 Street

Phone: 349-6238; Fax: 349-4868; TTY: 349-4805

TRAFFIC PARKING & TRANSPORTATION, 57 Inman Street

Phone: 349-4700; Fax: 349-4747; 349-4621

WATER DEPARTMENT, 250 Fresh Pond Parkway

Phone: 349-4770; Fax: 349-4796; TTY: 492-023.5

APPENDIX F

DEMOLITION DEMOLITION

The owner calls C WD to schedule an inspection (617-349-7754).

The inspector will meet the owner or contractor at the site. ff there are no conflicts the inspector will sign-off on the demolition permit. No further action is required by C WD after signing-off.

The inspector will provide the owner with a sketch of his property showing the location, size and age of his sewice.

If the inspector determines there is a conflict with the water service line, and the owner will not be reusing the service, the contractor will be required to cut and cap the service at the main. A water works construction permit from the C WD will be required, as well as a street opening permit from DPW prior to the start of any work. Once the sewice has been cut and capped the contractor shall call C WD at 349-7754 to have the work inspected. If the inspector feels that the work has been done satisfactorily, he will sign-off on the demolition permit at that time,

If the inspector determines there is a conflict with the water service line and the owner will be reusing the existing service, the CWD will require a deposit made out to the City of Cambridge Water Department. This check will be held by the city until construction has been completed. If there is an incident at the site that requires the C WD to dispatch a crew to make repairs during the construction period, the cost of such work will be deducted from the deposit. Any balance will be returned to the owner at the completion of the project.

Any new water lines being installed to the property will also require a water works construction permit.

APPENDIX G

HYDROSTATIC TESTING

SECTION 4: HYDROSTATIC TESTING

Warning: The testing methods described in this section are specific for water-pressure testing. These procedures should not be appliedfor air-pressure testing because of the serious safety hazards involved.

Sec. 4.1 Pressure and Leakage Test

4.1. I Tesl Restrictions: Test pressure shall not be less than 1.50 times the working pressure at the highest point along the test section. Test pressure shall not exceed pipe or thrust-restraint design pressures. The hydrostatic test shall be of at least a 2-h duration. Test pressure shall not vary by more than ± 5 psi (34.5 kPa) for the duration of the test. Valves shall not be operated in either direction at a differential pressure exceeding the rated valve working pressure. Use of a test pressure greater than the rated valve pressure can result in trapped test pressure between the gates of a double-disc gate valve. For tests at these pressures, the test setup should include a provision, independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure or fully opened if desired. The test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient. seated gate valves or butterfly valves.

4.1.2 Pressurization: After the pipe has been laid, all newly laid pipe or any valved section thereof, shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing. Each valved section of pipe shall be slowly filled with water; and the specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge), shall be applied by means of a pump connected to the pipe. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test.

4.1 .3 Air Renaoval: Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. If permanent air vents are not located at all high points, corporation cocks shall be installed at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place as required by the specifications.

4.1 .4 Examination: All exposed pipe, fittings, valves, hydrants and joints shall be examined carefully during the test. Any damage or defective pipe,

4.1.5 fittings, valves, hydrants or joints that are discovered föllowing the pressure test shall e repaired or replaced with sound material; and the test shall be repeated until satisfactory results are obtained.

4.1.6 Leakage defined: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi (34.5 kPa) of the specified test pressure after the pipe has been filled with water and the air has been expelled.

Leakage shall not be measured by a drop in pressure in a test section over a period of time.

4.1.7 Allmpable leakage: No pipe installation will be accepted if the leakage is greater than that determined by the following formula: In inch/pound units,

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

Where:

= allowable leakage, in gallons per hour = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches = average test pressure during the leakage test, in pounds per square inch

(gauge)

APPENDIX H

DIG SAFE

THE COMMONDWEALTH OF MASSACHUSETTS CHAPTER 82, SECTION 40

Effective 12/1 7/98

Section 40. The following words, as used in this section and sections 40A to 40E, inclusive, shall have the following meanings:

"Company", natural gas pipeline company, petroleum or petroleum products pipeline company, public utility company, cable television company, and municipal utility company or department that supply gas, electricity, telephone, communication or cable television services or private water companies within the city or town where such excavation is to be made.

"Description of excavation location", such description shall include the name of the city or town, street, way or route number where appropriate, the name of the streets at the nearest intersection to the excavation, the number of the buildings closest to the excavation or any other description, including landmarks, utility pole numbers or other information which will accurately define the location of the excavation.

"Elnergency", a condition in which the safety of the public is in imminent danger, such as a threat to life or health or where immediate correction is required to maintain or restore essential public utility service.

"Excavation", an operation for the purpose of movement or removal of earth, rock or the materials in the ground including; but not limited to, digging, blasting, augering, back-filling, test boring, drilling, pile driving, grading, plowing, in hammering, pulling in, jacking in, trenching, tunneling and demolition of structures, excluding excavation by tools manipulated only by human power for gardening purposes and use of blasting for quarrying purposes.

"Excavator", any entity including, but not limited to, a person, partnership, joint venture, trust, corporation, association, public utility, company or state or local government body which performs excavation operations.

"Prenvark", to delineate the general scope of the excavation or boring on the paved surface of the ground using white paint or stakes or other suitable white markings on non-paved surfaces. No pre-marking shall be acceptable if such marks can reasonably interfere with traffic or pedestrian control or are misleading to the general public. Pre-marking shall not be required of any continuous excavation that is over 500 feet in length.

"Safety zone", a zone designated on the surface by the use of standard color-coded markings which contains the width of the facilities plus not more than 18-inches or, each side.
"Standard color-coded markings", red — electric power lines, cables, conduit or light cables; yellow — gas, oil, street petroleum, or other gaseous materials; orange — communications cables or conduit, alarm or signal lines; blue — water, irrigation and slurry lines; green — sewer and drain lines; white — pre-mark of proposed excavation.

"System", the underground plant-damage prevention system as defined in Section 76D of' Chapter 164.

Section 40A. No excavator installing a new facility or an addition to an existing facility or the relay or repair of an existing facility shall, except i_n an emergency, make an excavation, in any public or private way, any company right-of-way or easement or any public or privately owned land or way, unless at least 72 hours, exclusive of Saturdays, Sundays and legal holidays; but not more than 30 days before the proposed excavation is to be made, such excavator has pre-marked not more than 500 feet of the proposed excavation and given an initial notice to the system. Such initial notice shall set forth a description of the excavation location in the manner as herein defined. In addition, such initial notice shall indicate whether any such excavation will involve blasting and, if so, the date and the location at which such blasting is to occur.

The notice requirements shall be waived in an emergency as defined herein; provided, however, that before such excavation begins or during a life-threatening emergency, notification shall be given to the system and the initial point of boring or excavation shall be pre-marked. The excavator shall ensure that the underground facilities of the utilities in the area of such excavation shall not be damaged or jeopardized.

In no event shall any excavation by blasting take place unless notice thereof, either in the initial notice or a subsequent notice accurately specifying the date and location of such blasting; shall have been given and received at least 72 hours in advance, except in the case of an unanticipated obstruction requiring blasting when such notice shall be not less than four hours prior to such blasting. If any such notice cannot be given as aforesaid because of an emergency requiring blasting, it shall be given as soon as may be practicable but before any explosives are discharged.

Section 40B, Within 72 hours, exclusive of Saturdays, Sundays and legal holidays, from the time the initial notice is received by the system or at such time as the company and the excavator agree, such company shall respond to the initial notice or subsequent notice by designating the location of the underground facilities within 15 feet in any direction of the pre-marking so that the existing facilities are to be found within a safety zone. Such safety zone shall be so designated by the use of standard color-coded markings. The providing of such designation by the company shall constitute prima facie evidence of an exercise of reasonable precaution by the company as required by this section; provided, however, that in the event that the excavator has given notice as aforesaid at a location at which because of the length of excavation the company cannot reasonable designate the entire location of its facilities within such 72 hour period, then such excavator shall identify for the company that portion of the excavation which is to be first made and the coinpany shall designate the location of its facilities in such portion within 72 hours and
designate the location of its facilities in the remaining portion of the location within a reasonable time thereafter. When an emergency notification has been given to the system, the company shall make every attempt to designate its facilities as promptly as possible.

Section 40C. After a company has designated the location of its facilities at the location in accordance with Section 40B, the excavator shall be responsible for maintaining the designation markings at such locations, unless such excavator requests remarking at the location due to the obliteration, destruction or other removal of such markings. The company shall then remark such location within 4 hours following receipt of such request.

When excavating in close proximity to the underground facilities of any company, when such facilities are to be exposed, non-mechanical means shall be employed, as necessary, to avoid damage in locating such facility; and any further excavation shall be performed employing reasonable precautions to avoid damage to any underground facilities including, but not limited to, any substantial weakening of structural or lateral support of such facilities, penetration or destruction of any pipe, main, wire or conduit or the protective coating thereof, or damage to any pipe, main, wire or conduit.

If any damage to such pipe, main wire or conduit or its protective coating occurs, the company shall be notified immediately by the excavator responsible for causing such damage.

The making of an excavation without providing the notice required by Section 40A with respect to any proposed excavation, which results in any damage to a pipe, main, wire or conduit, or its protective coating, shall be prima facie evidence in any legal or administrative proceeding that such damage was caused by the negligence of such person.

Section 40D. Nothing contained herein shall be construed to affect or impair local ordinances or by-laws requiring permits to be obtained before excavation in a public way; provided, however, that nothwithstanding any contrary provision of local ordinances or by-laws, no permit to excavate in a

public way shall be approved or issued by the officer or board having charge of any such way, except in an emergency as herein defined; until such time as proof of such notices to the system have been filed with such officer or board by the applicant for the permit as required by this section and notice of issuance of a permit to excavate have been served by such officer or board upon the appropriate water and sewer department.

Section 40E. Any person or company found by the department of telecommunications and energy, after a hearing, to have violated any provision of Sections 40A to 40E, inclusive, shall be fined $500 for the first offense and not less than $1,000 nor more than $5,000 tor any subsequent offense within 12 consecutive months as set forth by the rules of said department; provided, however, that nothing herein shall be construed to require forfeiture of any penal sum by a state or local government body for violation of Section
40A or 40C; and provided, further, that nothing herein shall be construed to require the forfeiture of any penal sum by a residential property osvner for the failure to pre-mark for an excavation on such person's residential property.

TRENCHING, BACKFILLING AND COMPACTION

PART l : GENERAL

1.01 SCOPE OF WORK

A Furnish all labor, materials, equipment and incidentals necessary to perform all trenching for pipelines and appurtenances, including drainage, filling, backfilling, disposal of surplus material and restoration of trench surfaces and easements.

B Excavation shall extend to the width and depth as specified by the Cambridge Water Depaflment and shall provide suitable room for installing pipe, structures and appurtenances.

c The Contractor shall furnish and place all sheeting, bracing and supports and shall remove from the excavation all materials which the Cambridge Water Department may deem unsuitable for backfilling. The bottom of the excavation shall be firm, dry and in all respects, acceptable. If conditions warrant, the Contractor may be ordered to deposit gravel for pipe bedding, or gravel refill for excavation below grade, directly on the bottom of the trench immediately after excavation has reached the proper depth and before the bottom of the trench has become softened or disturbed by any cause whatever. The length of open trench shall be related closely to the rate of pipe lying. All excavation shall be Inade in open trenches.

D All excavation, trenching, and related sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650

Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply,

E Wherever the requirement for 95 percent compaction is referred to herein it shall mean "at least 95 percent of maximum density as determined by ASTM DI 557, Method D",

F Prior to the start of work the Contractor is required to submit his proposed method of backfilling and coinpaction to the Cambridge M/aler Department for review.

I .02 RELATED WORK

A granular fill material is included in Section 02230.

I .03 REFERENCE STANDARDS

A American Society for Testing and Materials (ASTM)

1.ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

PART 2: EXECUTION

3.01 TRENCH EXCAVATION

A Trench excavation shall include material of every description and of whatever substance encountered including the cement concrete pavement base, except rock and boulders. Pavement shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating.

B While excavating and backfilling is in progress, traffic shall be maintained, and all utilities and other propeny protected as provided in the General Conditions and General Requirements.

c Trenches shall be excavated to the depth indicated by the Cambridge Water Department and in widths sufficient for laying the pipe, bracing and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry and in all respects acceptable to the Cambridge Water Depaftment. Trench width shall be practical minimum. Pipeline cover shall be not less than 5 ft. unless otherwise indicated.

D Excavation and dewatering shall be accomplished by methods, which preserve the undisturbed state of sub grade soils. The trench may be excavated by machinery to or just below the designated sub grade, provided that material remaining in the bottom of the trench is no more than slightly disturbed. Sub grade soils, which become soft, loose, "quick", or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods shall be reinoved and replaced by screened gravel fill as required by the Cambridge Water Department at the Contractor's expense.

E Clay and organic silt soils are particularly susceptible to disturbance due to construction operations. When excavation is to end in such soils, the

Contractor shall use a smooth edge bucket to excavate the last one-foot ot' depth.

F Where pipe is to be laid directly on the trench bottom, final excavation at the bottom of the trench shall be performed manually, providing a flat bottom true to grade upon undisturbed material. Bell holes shall be made as required.

3.02 DISPOSAL OF MATERIALS

A Excavated material shall be stacked without excessive surcharge on the trench bank or obstiucting free access to hydrants and gate valves. Inconvenience to traffic and abutters shall be avoided as much as possible. Excavated material shall be segregated for use in backfilling as specified below.

B It is expressly understood that no excavated material shall be removed from the site of the work or disposed of by the Contractor prior to approval from the Cambridge Water Department. When removal of surplus materials has been approved by the Owner, the Contractor shall dispose of such surplus material in areas approved by the Owner.

c Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored at a location provided by the Contractor. When required, it shall be re-handled and used in backfilling the trench.

3.03 SHEETING AND BRACING

A The Contractor shall furnish, put in place and maintain sheeting and bracing required by federal, state or local safety requirements to suppol•t the sides of the excavation and prevent loss of ground which could endanger personnel, damage or delay the work or endanger adjacent structures. If the Cambridge Water Department is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports placed at the expense of the Contractor. Compliance with such order shall not relieve the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.

B When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the screened gravel backfill.

1.When installing ductile iron pipe, trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, screened gravel shall be placed to fill any voids created and the screened gravel and backfill shall be re-compacted to provide uniform side support for the pipe.

c The Contractor will be permitted to use steel sheeting in lieu of wood sheeting for the entire job wherever the use of sheeting is necessary. The cost for use of sheeting will be included in the bid items for pipe and shall include full compensation for driving, bracing and later removal of sheeting.

D All sheeting and bracing shall be carefully removed in such manner as not to endanger the construction of other structures, utilities, or property, whether public or private. All voids left after withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, by watering or otherwise as directed.

E The Contractor shall receive no payment, for sheeting, bracing, etc., during the progress of the work. The Contractor shall receive no payment for sheeting, which has actually been left in the trench for the convenience of the Contractor.

F Sheeting driven below mid-diameter of any pipe shall remain in place from the driven elevation to at least one foot above the top of the pipe.

3.04 TEST PITS

The Contractor may be required to excavate test pits for the purpose of locating underground utilities or structures as an aid in establishing the precise location of new work.

B Test pits shall be backfilled as soon as the desired information has been obtained. The backfilled surface shall be maintained in a satisfactory condition for travel until resurfaced as specified.

3.05 EXCAVATION BELOW GRADE AND REFILL

Whatever the nature of unstable material encountered or the groundwater conditions, trench drainage shall be complete and effective.

B If the Contractor excavates below grade through error or for his own convenience, or through failure to properly dewater the trench, or disturbs the sub grade before dewatering is sufficiently complete, he may be directed by the Cambridge Water Department to excavate below grade as set forth in the following paragraph, in which case the work of excavating below grade and furnishing and placing the refill shall be performed at his expense.

c It' the material at the level of trench bottom consists of fine sand, sand and silt or soft earth which may work into the screened gravel notwithstanding effective drainage, the sub grade material shall be removed to the extent directed and the excavation refilled with a 6-in layer of coarse sand, or a mixture graded from coarse sand to the fine pea stone, as approved by the Cambridge Water Department, to form a filter layer preserving the voids in the gravel bed of the pipe. The composition and gradation of gravel shall be approved by the Cambridge Water Department prior to placement. Screened gravel shall then be placed in 6-in. layers thoroughly compacted up to the normal grade of the pipe, If directed by the Cambridge Water Department, bank-run gravel shall be used for refill of excavation below grade.

3.06 BACKFILLING

A As soon as practicable after the pipe has been laid and jointed, and tested (if required), backfilling shall begin and thereafter be prosecuted expeditiously. Selected common fill shall be placed around the pipe and hand tampered in layers 6-in thick after compaction. Backfilling shall proceed in this manner to a depth of one (1) foot over the top of the pipe.

B An impervious dam or bulkhead cutoff of clay or other impervious material shall be constructed in the trench as directed, to interrupt the unnatural flow of groundwater after construction is completed. The dam shall be effectively keyed into the trench bottom and sidewalls. Provide at least one clay or other impervious material dam in the pipe bedding every 300 feet.

c The trench, up to a depth of one (l) foot below the bottom of the specified permanent paving, shall be backfilled with common fill material in layers not to exceed 8-in and thoroughly compacted. The sub base layer for paving shall be of bank-run gravel thoroughly compacted in 6-in layers.

D To prevent longitudinal movement of the pipe, dumping backfill material into the trench and then spreading will not be permitted until selected material has been placed and compacted to a level I-ft over the pipe.

E Backfill shall be brought up evenly on all sides. Each layer of backfill material shall be thoroughly compacted by rolling, tamping, or vibrating with mechanical convacting equipment or hand tamping, to 95 percent compaction. If rolling is employed, it shall be by use of a suitable roller or tractor, being careful to compact the fill throughout the till] width of the trench.

F Bituminous paving shall not be placed in backfilling. Frozen material shall not be used under any circumstances.

IAII road surfaces shall be broomed and hose-cleaned immediately after backfilling. Dust control measures shall be employed at all times.

3.07 SOIL-TESTING FOR COMPACTION

The Cambridge Water Department may select areas within the limits of the fill for testing the degree of compaction to determine conformance to the specifications. Compaction shall be measured as percent density as determined by ASTM DI 557, Method D.

B Payment for testing shall be made by the Cambridge Water Depaflment. If test results are unsatisfactory, all costs involved in correcting deficiencies to the satisfaction of the Cambridge Water Depaflment, shall be borne by the Contractor.

3.08 RESTORING TRENCH SURFACE

A Where the trench occurs adjacent to paved streets, in shoulders, sidewalks, or in cross-country areas, the Contractor shall thoroughly consolidate the backfill and shall maintain the surface as the work progresses. If settlement takes place, he shall immediately deposit additional fill to restore the level of the ground.

B In and adjacent to streets, the top 12-in layer of trench backfill shall consist of compacted bank run gravel. Should the Contractor wish to use material excavated from the trench as gravel sub base for pavement replacement, the Contractor shall at his own expense have samples of the material tested by an independent testing laboratory at intervals not to exceed 500 feet, in order to establish its compliance with the specifications. Only material which has been tested by the Contractor and approved by the Cambridge Water Department shall be allowed to be incorporated into the work.

c The surface of any driveway or any other area which is disturbed by the trench excavation and which is not a part of the paved road shall be restored by the Contractor to a condition at least equal to that existing before work began.

3.09 PROTECTION

A Curbing and fencing in the vicinity of the Contractor's operations shall be adequately protected, and if necessary removed and restored after backfilling. All curbing and fencing, which are damaged during construction, shall be replaced with material fully equal to that e,xisting prior to construction.

GRANULAR FILL MATERIALS

PART l : GENERAL

1.01 DESCRIPTION

A Granular fill materials are specified in this Section, but their use for bedding pipe, replacement of unsuitable material, gravel cushion in ledge excavation, pavement base, foundation support and similar uses are specified in detail elsewhere. The Cambridge Water Department may order the use of fill materials for purposes other than those specified in other Sections if, in his opinion, such use is advisable.

PART 2: PRODUCTS

2.01 MATERIALS

Bank run gravel shall consist of hard, durable stone and coarse sand, essentially free from frost, frozen lumps, loam and clay, uniformly graded and containing no stone having any dimension greater than 3-in. The grading of sizes and material shall be such that the gravel may be thoroughly consolidated. The grading shall conform to the following requirements:

Sieve	Percent Passing
3/8-in	70 maximum
No. 10	50 Inaximum
No. 200	5 maximum

B Screened gravel shall consist of hard, durable, particles of proper size and gradation, free from sand, loam, clay, excess fines and deleterious materials. The size of the particles shall be uniformly graded gravel such that not less than 95 percent of the particles will pass a 1/2-in sieve, 40-70 percent will pass the 3/8-in sieve, and not more than 5 percent will pass a No. 4 sieve.

c Common fill shall consist of mineral soil, substantially free of clay, organic material, loam, wood, trash, snow, ice, frozen soil and other objectionable material which may be compressible, or which cannot be compacted properly. Common fill shall not contain stones larger than 4-in in any dimension, broken concrete, masonry, rubble, asphalt pavement, or other similar materials. It shall have physical properties, as approved by the Cambridge Water Department such that it can be readily spread and compacted.

D Select common fill shall be as specified above for common fill except that the material shall contain no stones larger than 2-in in its largest dimension.

E Sand shall conform to ASTM C33 for fine aggregate.

F Flowable fill shall be supplied by a ready-mix concrete manufacturer experienced in the design and control offlowable fill mixtures. Final compressive strength of flowable fill shall be less than 100 psi to allow for ease of future excavation while still providing an in place load-bearing capacity of 5 tons per square foot. Design

information shall be provided to the Engineer prior to use. Flowable fill shall contain the following:

1. Portland Cement shall meet ASTM C-150.

2. Aggregates shall meet ASTM C-33 and be non-reactive, free of contaminants, and exhibit high flow properties.

3. Mineral admixtures shall be materials used in standard ready-mix concrete production or slag cement and shall meet ASTM specifications. Chemical admixtures shall be liquid or powder materials used in standard ready-mix concrete production or specifically designed admixtures for flowable fill. Flowable fill admixtures shall be high-air generators and shall conform to the specifications of Grace Construction Products, "Darafill" or approved equal. No fly ash is to be used in the mix. END OF SECTION