

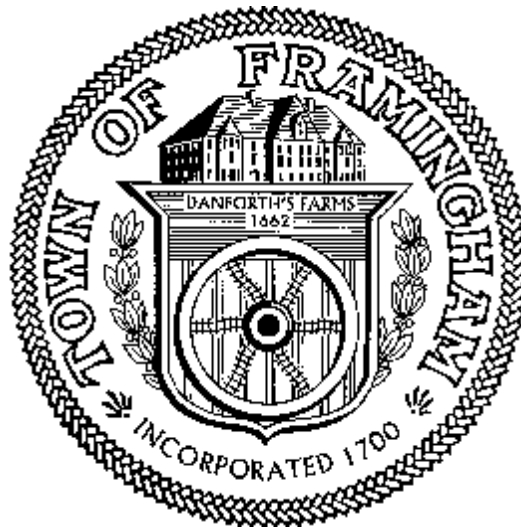
CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

INVITATION FOR BIDS

FOR

EDGELL ROAD WATER PUMPING
STATION REPLACEMENT

BID # PW-428



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS
110 WESTERN AVENUE
FRAMINGHAM, MA 01702



Joseph J. D'Alesio
1/28/20



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Hazardous Materials Survey
Edgell Road Pump Station
Town of Framingham, Massachusetts
April 23, 2019

Site Inspection

On February 9, 2018, BETA Group, Inc. (BETA) and Smith & Wessel Associates, Inc. (SWA) conducted an inspection of the interior and exterior of the pump station building on Edgell Road in Framingham, Massachusetts (the Site). On April 5, 2019, BETA and SWA returned to the Site to inspect the roof and upper wall blocks of the Site building. SWA inspected the building for the presence of asbestos-containing building materials, lead-based paint, polychlorinated biphenyls, and mercury components while BETA inspected the building for the presence of containers of and equipment that may contain hazardous materials. The purpose of these inspections was to identify items which may require special handling and/or disposal during planned work at the Site.

Asbestos-Containing Building Materials (ACBM)

The purpose of SWA's ACBM inspection was to evaluate the types, locations, and extent of suspect ACBM throughout the Site building. SWA's inspection addressed both friable materials (materials that can be easily crushed, crumbled, or pulverized by hand pressure) and non-friable suspect materials. On February 9, 2018, SWA identified and collected samples of several suspect materials at the Site including gray terra cotta tile mortar, gray terra cotta tile grout, white exhaust insulation, white exhaust fitting insulation, gray exterior door caulking, and gray exterior window caulking. On April 5, 2019, SWA identified and collected samples of several suspect materials at the Site including roofing materials and roof wall seam caulking. SWA submitted a total of twenty samples from these materials to EMSL Analytical, Inc. of Woburn, Massachusetts. Of these materials, only the gray exterior door caulking and gray exterior window caulking was found to contain greater than 1% asbestos. The two types of caulking were found to contain 2% asbestos. SWA identified four doors and twelve windows with asbestos-containing caulking. Refer to SWA's Inspection Report in Appendix A for more information regarding their inspection and results.

Lead-Based Paint (LBP)

The purpose of SWA's LBP inspection was to evaluate the types, locations, and extent of suspect LBP throughout the Site building, to evaluate potential hazards associated with LBP, and to provide appropriate recommendations for its handling associated with demolition work. SWA used the United States Department of Housing and Urban Development (HUD)'s 1.0 milligrams per centimeter squared (mg/cm^2), as tested using and X-Ray Fluorescence Analyzer (XRFA), as a suitably analogous standard for identifying LBP at the Site. HUD's standard only applies to housing funded by the federal government; however, it is a useful reference for assessing hazards associated with LBP in other settings.

SWA used an XRFA to scan painted surfaces at the Site building and identified lead concentrations ranging from $<0.1 \text{ mg}/\text{cm}^2$ to $3.7 \text{ mg}/\text{cm}^2$. The only surface that was identified to contain lead above the $1.0 \text{ mg}/\text{cm}^2$ HUD standard was the white glaze on the porcelain water bubbler. Refer to SWA's Inspection Report in Appendix A for more information regarding their inspection and results.

Polychlorinated Biphenyls (PCBs)

SWA conducted a visual inspection for PCB-containing fluorescent light ballasts. SWA observed "No PCB" labels on inspected light fixtures. SWA was not able to access the ballasts in the light fixtures; however, due to their age, it is assumed that they contain PCBs in the capacitor oil.

On February 9, 2018, SWA collected sixteen (16) samples of door and window caulking. On April 5, 2019, SWA collected one sample of the caulking on the upper wall blocks of the building. These samples were submitted to a state-certified laboratory for PCB analysis by EPA Method 8082. The laboratory identified 0.43 part per million (ppm) in the gray door frame caulking sample from around Door #1 on the North side of the building and from 0.37 to 2.30 ppm in samples of gray window frame caulking around the four windows on the east side of the building. The laboratory did not detect PCBs above the laboratory method detection limits in any of the other samples. None of these samples exceed EPA's Toxic Substances Control Act (TSCA) threshold of 50 ppm, and therefore, further testing is not required. Furthermore, the caulking that was identified to contain PCBs also contains asbestos. As such, this material will need to be disposed as ACM material. Refer to SWA's Inspection Report in Appendix A for more information regarding their inspection and results.

Mercury

The purpose of SWA's mercury inspection was to conduct a visual inspection for building components that may contain mercury. SWA did not conduct any testing for mercury. SWA observed thirty (30) 4-foot long fluorescent light bulbs that may contain mercury. SWA did not observe any heat regulating thermostats with associated mercury tubes at the Site.

Hazardous Materials

BETA inspected the building for the presence of containers of and equipment that may contain hazardous materials. BETA only conducted a visual inspection of accessible areas and did not conduct any laboratory analysis or destructive testing at the Site. BETA did not inspect the underground trenches within the Site building or within any operating equipment at the Site. BETA has identified the following items that may contain hazardous materials.

Aboveground Storage Tank/Petroleum

BETA observed an approximately 500-gallon diesel fuel aboveground storage tank in a fenced enclosure north of the Site building. Operations personnel informed BETA that this tank supplies diesel fuel to the pump motor in the Site building.

BETA observed oil staining under the yellow pump motor unit. The source of this staining could not be determined.

Operations personnel informed BETA that an underground storage tank formerly existed northeast of the Site building. BETA observed disconnected underground feed and return lines in the boiler room area of the Site building. We did not review any documentation regarding the removal of this UST.

Batteries/Electrical Equipment

BETA observed the following batteries and/or electrical equipment at the Site.

- Three 12-volt battery for pump motors;
- Computer, monitor, APC battery backup, and network equipment;
- Refrigerator;
- Dry type transformer inside the Site building; and
- Pole-mounted transformer on pole in rear portion of the Site.

These items may contain lead, polychlorinated biphenyls, or other hazardous materials.

Propane

BETA observed two 20-pound portable propane tanks in the Site building.

Containers of Potentially Hazardous Materials

BETA observed miscellaneous containers (one gallon or less) of cleaning and maintenance chemicals in the Site building.

Water Treatment Equipment

BETA observed a Hach CL17 chlorine analyzer in the pump room area that was associated with the monitoring of chloramine residual in the water at the Site. It is possible that this analyzer contain residual chlorine and/or other hazardous substances that would necessitate proper handling and/or disposal practices.

Findings and Conclusions

The following summarizes the findings and conclusions from the HBMI. Please refer to the attached reports for more details.

- Asbestos was identified in exterior window and door caulking.
- Lead was identified in the white glaze on the porcelain of the water bubbler.
- Fluorescent light ballasts are assumed to contain PCBs.
- Samples of window and door caulking did not contain PCBs above the TSCA 50 ppm threshold.
- Batteries, fluorescent light bulbs, electronics, containers of hazardous materials, an oil tank, and propane tanks were observed at the Site.

Recommendations

Based on the findings from the HBMI, the following recommendations are offered.

- Prior to renovation of the building, known or assumed ACBM must be removed by qualified personnel in accordance with applicable regulations.
- If the LBP surfaces are to be impacted by the renovation in a manner that may generate dust or fumes, compliance with Occupational Safety and Health Administration (OSHA) regulations concerning worker exposure may be necessary. Additionally, U.S. Environmental Protection Agency (EPA) regulations relative to waste disposal may apply.
- The fluorescent light ballasts should be removed and properly disposed.
- If the batteries, fluorescent light bulbs, electronics, containers of hazardous materials, oil tank, and propane tanks are going to be removed from the Site or modified during the proposed renovations, proper handling and/or disposal in accordance with all applicable local, state, and federal regulations would be required.

Limitations

Please note that the condition of the building and the nature of the work necessitate the following limitations:

- The inspection was limited to areas that could be safely and physically accessed without demolition. The attached report notes areas that could not be inspected. Future renovation work in the uninspected areas may encounter ACM, lead-based paint, PCBs, and/or other hazardous materials that could not be identified during this work.
- With the exception of sampling of caulking, inspection for PCBs was visual only. Light ballasts and other electrical equipment were not sampled. PCB content was ascertained by labels and/or apparent age of the electrical equipment.
- These inspections included limited intrusive sampling of building systems. Please note that some potentially hazardous building components may not be identified by these inspections due to seemingly homogenous materials that are not homogenous, seemingly representative locations that are not representative, layered materials that are not uniformly present or are isolated, and materials that are present in an isolated and/or limited quantity.

**INSPECTION REPORT FOR
Asbestos-Containing Building Materials, Lead-Based Paint,
Polychlorinated Biphenyls, and Mercury Containing
Components**

**Edgell Road Pump Station
663 Edgell Road
Framingham, MA**

Prepared for:

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Norwood, MA 02062

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Project 19087

April 19, 2019

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INTRODUCTION

Beta Group, Inc. (Beta) retained Smith & Wessel Associates, Inc. (SWA) to conduct inspections for asbestos-containing building materials (ACBM), lead-based paint (LBP), polychlorinated biphenyls (PCBs) and mercury containing components for the pump station located at 663 Edgell Road in Framingham, Massachusetts. SWA inspected the building on February 9, 2018 in anticipation of future renovations. Follow up roof inspection and sampling was conducted on April 5, 2019.

Asbestos

The purposes of the inspection were to evaluate the types, locations, and extent of suspect ACBM and to provide appropriate recommendations for its abatement or management. SWA's inspection addressed both friable (materials that can be easily crumbled, crushed, or pulverized by hand pressure) and non-friable suspect materials. SWA identified several suspect materials at the site that were sampled and analyzed for asbestos content. However, if any suspect materials are identified at later dates that are not addressed in this report, they must be assumed to be ACBM unless appropriate sampling and analysis demonstrate otherwise.

SWA identified only non-friable ACBM at the site in the form of the following materials:

- Interior window caulking
- Exterior window caulking

Lead-Based Paint

The purposes of the lead paint inspection were to evaluate the types, locations, and extent of suspect LBP in the building, to evaluate potential hazards associated with LBP, and to provide appropriate recommendations for its abatement and management.

The United States Department of Housing and Urban Development (HUD) has established a standard for lead-based paint, as tested using an X-ray Fluorescence Analyzer (XRFA), of 1.0 milligram per square centimeter (mg/cm^2). Although this standard only applies to housing funded by the federal government, it is a useful reference concentration for assessing hazards associated with lead in paint in other settings. Thus, when paint contains greater than $1.0 \text{ mg}/\text{cm}^2$, special care should be taken when conducting activities that impact these paints.

The lead content of paints surveyed at the site ranged from less than $0.1 \text{ mg}/\text{cm}^2$ to $3.7 \text{ mg}/\text{cm}^2$ as measured with an X-ray Fluorescence Analyzer (XRFA). If LBP are impacted by demolition in a manner that may generate dust or fumes, compliance with Occupational Safety and Health Administration (OSHA) regulations regarding worker exposure to lead may be necessary. Additionally, United States Environmental Protection Agency (EPA) and Massachusetts Department of Environmental (DEP)

regulations relative to waste disposal may apply.

PCBs

SWA's investigation for PCBs in light fixture ballasts was visual only. Typically, ballasts installed after 1978 do not contain PCBs and are marked as such. Ballasts that do not have the "No PCBs" wording on the label are assumed to contain PCBs. SWA observed the "No PCB" wording on the affixed labels of the representative ballasts at the site. However, all individual ballasts must be inspected for the "No PCB" wording on affixed labels to determine proper disposal/recycling requirements. One transformer was observed in the building in the main pump room.

SWA also collected samples of window caulking, door caulking and roof seam for laboratory analysis to determine their concentration of PCBs. Sample collection occurred at each individual window and door throughout the building. The roof seam was sampled during follow up. A minimum five gram piece of material was taken from the substrate.

Analytical results indicate that the window caulking and door caulking contains less than 50 parts per million (ppm). Therefore, the material is not subject to regulation under the Toxic Substances Control Act (TSCA), but may require special handling and disposal as it pertains to materials containing low levels PCBs.

Mercury Filled Fluorescent Light Fixtures

SWA observed fluorescent light bulbs that if impacted by renovations must be collected and recycled in accordance with the "Universal Waste" regulatory requirements. SWA observed 30 (4') fluorescent bulbs that would require recycling. No heat regulating thermostats with associated mercury tubes were observed in the building.

Exclusions

While SWA endeavored to conduct a thorough, comprehensive inspection, some exclusions are warranted. Because our inspection addressed a limited number of areas, it is possible that the locations that we inspected were not fully representative of materials found in other areas. Our inspection included building areas only; no assessment of soil, debris, or subterranean areas was conducted. Additional limitations may have impacted our ability to inspect all locations such as poor lighting, height constraints, unusual building features, occupancy, and stored materials that block access to suspect materials. Stored goods, debris, and building materials that were removed and were either stored or loose were not inspected, but if observed were assessed and quantified.

While SWA followed industry standards during the inspection, we do not warrant that all suspect hazardous building materials were identified in or on the building and shall not be held liable related to future abatement costs related to hazardous materials that are either not discovered or not appropriately characterized. This is due in part to inherent problems with every building inspection, such as, but not limited to:

- Seemingly homogeneous materials that are not in fact homogeneous;
- Seemingly representative locations that are not in fact representative;
- Layered materials that are not uniformly present or are isolated;
- Materials that are present and accessible but were not considered to be hazardous,
- Materials that are present in an isolated and limited quantity; and
- Material that is present in locations that are unsafe or otherwise difficult to access.

Client acknowledges that SWA's inspection is inherently limited and all hazardous materials may only become apparent during the course of future renovation or demolition. During the course of future renovation/demolition work, it is likely that additional hazardous materials or materials suspected of being hazardous will be identified. Such materials should be assumed to be hazardous unless appropriate evaluation or sampling and analysis demonstrate otherwise. Contracts, specifications and plans should advise contractors to conduct controlled demolition work and stop immediately should any hazardous building materials be encountered during the course of their work.

1.0 ASBESTOS CONTAINING BUILDING MATERIALS

1.1 Scope of Work

SWA's Massachusetts certified Asbestos Inspector, Gary Buda (Cert. # AI-900501), performed the asbestos inspection of readily accessible and observable areas throughout the interior and exterior of the building. SWA's Asbestos Inspector, Ted Sherry (Cert. # AI-032572), conducted the follow up roof sampling SWA inspected for the following types of suspect ACM:

- Thermal system insulation (TSI), such as insulation on pipes, boilers, tanks and related equipment;
- Surfacing material, acoustical and decorative plasters, fireproofing and other sprayed or trowel applications; and
- Miscellaneous materials, such as window caulking, wallboard, floor tile, adhesives, and other building materials that are not TSI or surfacing materials.

To determine the asbestos content of suspect ACM, SWA collected and analyzed representative bulk samples by extracting a small but representative portion of suspect material from the substrate. The samples, typically measuring one cubic centimeter, were collected using a variety of methods. The extracted samples were then placed into labeled, individual sealed plastic bags for transport to the laboratory.

EMSL Analytical, Inc. (EMSL) of Woburn, Massachusetts, a fully accredited asbestos analytical laboratory, analyzed the bulk samples utilizing Polarized Light Microscopy (PLM) in accordance with the requirements of 40 CFR Part 763, Subpart F, Appendix A (see Appendix A of this report).

For each homogeneous sampling group, the laboratory analyzed samples until a positive result was obtained (i.e. greater than one percent asbestos) or until all samples were analyzed. If one sample indicates an asbestos content greater than one percent, the entire homogenous area must be considered to be an ACM even if one or more samples in the group indicates an asbestos content of less than one percent.

1.2 Regulatory Guidance

The EPA, OSHA, Massachusetts Department of Labor Standards (MA DLS) and MA DEP are responsible for regulating the release of asbestos into the environment and protecting workers from exposure to airborne asbestos fibers.

OSHA and MA DLS are responsible for the health and safety of workers who may be exposed in connection with their jobs including custodial activities, renovation work, and asbestos abatement. These agencies specify requirements for the work practices and

engineering controls that must be utilized during asbestos abatement projects. They also require that ACM be repaired, removed, or otherwise appropriately abated before maintenance, renovation, or demolition work disturbs them. Thermal system insulation, surfacing materials, and floor tile installed before 1980 must be presumed to be ACM unless appropriate inspection and sampling analysis prove otherwise.

The EPA and MA DEP are responsible for developing and enforcing regulations necessary to protect the general public from airborne contaminants that are known to be hazardous to human health. They regulate ACM associated with renovation, demolition, and asbestos abatement projects via the National Emissions Standard for Hazardous Air Pollutants (NESHAP) Title 40 CFR Part 61 regulation and MA DEP Chapter 141-E Asbestos Management and Control. These regulations require that buildings be inspected for ACM prior to renovation/demolition projects. They stipulate that all friable ACM as well as non-friable ACM that are in poor condition or will be made friable by renovation or demolition activity be removed or otherwise appropriately abated before they are disturbed.

1.3 Findings

SWA identified the following friable and non-friable *suspect* ACM:

• Terra cotta tile mortar	• Generator exhaust insulation
• Generator exhaust fitting insulation	• Exterior door caulking
• Exterior window caulking	• Terra cotta tile grout
• Roofing materials	• Roof wall seam

SWA collected a total of 14 representative bulk samples of the above materials to determine asbestos content, of which 12 were analyzed via PLM. Two of the samples did not require analysis as the first sample in the homogeneous sampling group tested positive for asbestos (i.e. contain greater than one percent asbestos). Follow up roof sampling included 6 samples of which all were analyzed.

SWA has listed in **Table 1**, the location and estimated quantity, by square foot (sf), linear foot (lf), or other appropriate unit, of each type of ACM identified at the site.

Table 1 • List of Materials Testing Positive for Asbestos			
Type of Material	Location	Quantity	Sample number
Gray exterior door caulking	Front and rear of the building	4 doors	05A
Gray exterior window caulking	Front and sides of the building	12 windows	06A

In **Table 2**, SWA has listed all materials that tested negative for asbestos, including the locations where these materials were observed and the corresponding bulk sample reference number(s).

Table 2 • List of Materials Testing Negative for Asbestos		
Type of Material	Location	Sample No.
Gray terra cotta tile mortar	Throughout main pump room	01A, 01B
Gray terra cotta tile grout	Throughout main pump room	02A, 02B
White exhaust insulation	Main pump room – Generator exhaust	03A, 03B, 03C
White exhaust fitting insulation	Main pump room – Generator exhaust	04A, 04B, 04C
White gypcrete deck	Throughout roof	0405-01A, 0405-01B
Black tar flashing	Roof perimeter and stack	0405-02A, 0405-02B
Gray parapet wall seams	Throughout front and side walls	0405-03A, 0405-03B

Roof Layers: Rubber membrane – 2.5 “ISO on gypcrete deck.

1.4 Conclusions and Recommendations

On the basis of our findings, SWA offers the following conclusions and recommendations:

1. Only non friable ACBM were identified at the site. ACBM that will be impacted by renovation or demolition work must be removed before they are disturbed. SWA recommends that this work be conducted in accordance with a project design as prepared by a licensed Asbestos Abatement Project Designer. ***This report is not intended for use as an abatement design.***
2. During the course of renovation or demolition work, it is possible that additional suspect ACBM will be encountered. Contractors should be apprised to conduct any such work in a controlled manner. If suspect materials that have not been sampled are encountered, they should be assumed to contain asbestos, unless appropriate sampling and analysis indicates otherwise.

1.5 Cost Estimates

In **Table 3**, SWA has provided estimates of abatement costs associated with all identified ACBM in the inspected areas. These estimates are based on current industry standards that may fluctuate rapidly based on a variety of factors: the prevailing economic climate, seasonal differences, union labor considerations, scale of the abatement, occupancy of the building, and so on. SWA recommends that qualified abatement contractors be solicited to determine actual pricing involved. In addition to pricing for abatement, SWA has considered anticipated industrial hygiene costs associated with abatement, including

air monitoring and oversight of the abatement.

Table 3 • Estimated Costs for Removal of ACBM		
Type of Material	Quantity/Unit cost (\$)	Total Cost (\$)
Gray exterior window caulking	12 windows @ 350/ea.	4,200.
Gray exterior door caulking	4 doors @ 350/ea.	1,400.
Total Abatement Cost		5,600.
Total Industrial Hygiene Fee		1,000.
Total Fee		\$ 6,600.

2.0 LEAD-BASED PAINTS

2.1 Scope of Work

SWA's accredited lead paint inspector tested representative painted surfaces throughout the building. SWA analyzed paints for lead content using the NITON XLS-303-A, X-ray fluorescence analyzer (XRFA) following the manufacturer's instructions for initial calibration and operation. The XRFA uses a radioactive source to excite the electrons of lead atoms (if present) in paint. As the lead atom electrons return to their normal state, they emit x-rays that are measured by the XRFA, then processed and the results converted to milligrams of lead per square centimeter of sampled surface area. On most substrates, the XRFA is precise to $+0.1 \text{ mg/cm}^2$.

Surfaces tested included, but were not limited to walls, trim, doors, casings/jambs, pipes, and other miscellaneous surfaces.

2.2 Regulatory Guidance

In all areas where LBP is disturbed by renovation work and where components covered by LBP are disposed of, applicable OSHA and EPA regulations apply.

OSHA

Renovation or demolition activities that disturb surfaces that contain lead must be conducted in accordance with the OSHA regulation 29 CFR 1926.62 "Lead Exposure in Construction: Interim Final Rule." This regulation requires that a site-specific health and safety plan be prepared before conducting activities that create airborne lead emissions. Such a plan should include the identification of lead components, an exposure assessment, and, if applicable, the required work procedures and personnel protection to be used.

An exposure assessment in the form of personal air monitoring must be performed if there is the potential for employees to be exposed to lead due to the renovation or demolition activity. If demolition is being conducted that will disturb lead-based paints, the employer must assume that employee exposure is in excess of the Permissible Exposure Limit (PEL) of 50 micrograms per cubic meter of air ($\mu\text{g/m}^3$) until the exposure assessment is completed. If the PEL is exceeded, employees are required to use half-face mask respirators with HEPA filter cartridges. Furthermore, a written respirator program is required per 29 CFR 1910.134. The lead standard also requires the following protective measures be taken until the exposure assessment is completed:

- Isolation of the work area;
- appropriate personal protective clothing and equipment;
- change areas and hand washing facilities;
- biological monitoring; and
- training

The results of the initial exposure assessment will determine the protective measures that must be followed for the remainder of the project. OSHA may allow air-monitoring data from previous projects conducted under conditions closely resembling the present project to be used for the exposure assessment. If the exposure assessment indicates that exposure levels are below the Action Level of $30 \mu/m^3$, there are no additional requirements under the standard if the conditions remain the same.

EPA

In addition to the worker protection requirements stipulated by OSHA, MA DEP and the EPA regulate the disposal of wastes that are potentially hazardous. Such wastes may include paint chips and residue generated during abatement or repainting work, or whole components, such as wood windows, doors, and trim that are coated with LBP and that are disposed of as the result of renovation or demolition work. Metal components are not regulated if they will be recycled and not disposed of in a landfill.

To determine the required method for disposing of permeable items coated with LBP, the MA DEP and the EPA require representative sampling of the debris to determine the quantity of lead that would be expected to leach into the environment if the debris were disposed of in a landfill. The representative sample(s) must be analyzed by the Toxicity Characteristic Leaching Process (TCLP). If the result of this procedure indicates that the sample leaches a lead concentration below five parts per million (ppm), the debris is not regulated and can be disposed of in a traditional construction landfill. However, the debris must be disposed of as hazardous waste if the TCLP result exceeds 5 ppm. To minimize the total volume of hazardous waste, segregating hazardous from nonhazardous waste is advisable.

HUD

The United States Department of Housing and Urban Development (HUD) has established a standard for lead-based paint, as tested using an XRF analyzer, of 1.0 mg/cm^2 . Although this standard only applies to housing funded by the federal government, it is a useful reference concentration for assessing hazards associated with lead in paint in other settings. Thus, when paint contains greater than 1.0 mg/cm^2 , special care should be taken when conducting activities that impact these paints. When conducting abrasive blasting, torch burning, or similar activities that generate significant dust or fume, hazards can be caused even at concentrations below the HUD standard.

2.3 Findings

Analysis of painted surfaces throughout the site indicate that lead levels range from $<0.1 \text{ mg/cm}^2$ to 3.7 mg/cm^2 . A summary of paints with elevated concentrations of lead (greater than 1.0 mg/cm^2) is presented in **Table 4**, and the results of all testing are presented in Appendix B.

Table 4 • Summary of Surfaces Coated With LBP				
Location	Substrate	Color	Component	Approx. Quantity
Interior – main pump room	Porcelain	White	Water bubbler	1 ea.

2.4 Conclusions and Recommendations

Based on our findings, SWA offers the following conclusions and recommendations:

1. Lead-based paint is present at the site in the glaze of a porcelain water bubbler only. Handling or impacting components that are covered by LBP may require compliance with the OSHA lead standard. To minimize exposure to airborne dust or fumes, torch burning, cutting, grinding, or similar high impact work on components covered by LBP should be avoided. Such work would need to be conducted by properly trained workers using appropriate worker protection and engineering controls.
2. For work activities that may generate airborne lead, the contractor(s) should perform an initial exposure assessment (personal air monitoring) for each individual task (e.g. demolition, abrasive blasting, and painting) that has the potential for causing worker exposure to be at or above the OSHA Action Level. In lieu of monitoring, historical data from similar operations may be used to comply with OSHA requirements.

2.5 Cost Estimates

SWA estimates that costs associated with OSHA and EPA compliance relative to lead paint at less than **\$500** for this site.

3.0 POLYCHLORINATED BIPHENYLS (PCBs)

3.1 Scope of Work

SWA's investigation for PCBs in light fixture ballasts was visual only. Typically, ballasts installed after 1978 do not contain PCBs and are marked as such. Ballasts that do not have the "No PCBs" wording on the label are assumed to contain PCBs.

SWA also collected samples of window caulking, door caulking and roof wall seam for laboratory analysis to determine their concentration of PCBs. Sample collection occurred in locations that appeared to be representative of the materials throughout the building. A minimum five gram piece of material was taken from the substrate, placed into labeled individual sealed containers, and delivered to the laboratory via proper chain-of-custody.

3.2 Background/Regulatory Guidance

According to the EPA, PCBs are toxic and persistent chemicals that were used primarily as insulating fluid in heavy-duty electrical equipment. They were also utilized in a wide variety of products including paints, caulks, light fixture ballast, oils, plastics, adhesives, tapes, carbonless copy paper, floor finishes and related products. Because PCBs are suspected carcinogens and may cause other adverse health effects, the EPA banned their manufacture and installation starting in 1979.

Any materials containing PCBs equal to or greater than 50 parts per million (ppm) are regulated under the Toxic Substance Control Act and the PCB regulation found at 40 CFR Part 761. Further, EPA policy, as described in "Current Best Practices for PCBs in Caulk Fact Sheet" updated in September, 2009, is that PCBs at concentrations greater than 50 ppm are not authorized for use and must be removed and properly disposed of.

Additionally, where <50 ppm caulk or PCB remediation waste is present, it may be regulated for removal and/or cleanup unless the <50 ppm PCB caulk meets the definition of an Excluded PCB Product as defined under 40 CFR Part 761.3. Excluded products would include those legally installed before October 1, 1984 and the resulting PCBs concentration is not the result of dilution or leaks or spills from other products. Thus, if a formerly installed PCB caulk containing greater than 50 ppm had been removed and replaced by a non-PCB caulk, the non-PCB caulk could be contaminated from the residue of the former caulk. In this instance, if the non-PCB caulk tested at a concentration above one ppm, it would be regulated as PCB containing.

Further, because PCBs may have leached into surrounding substrates, such as brick, CMU, and cement, or may have degraded and contaminated adjacent soil, assessment of masonry and soils is necessary on instances where PCBs are present in caulk or other building materials. Where analysis indicates contaminant concentrations above one ppm

in masonry or soils, remedial actions are required.

3.3 Findings

SWA inspected and observed the "No PCB" wording on affixed labels associated with the light fixtures in the building. However, all individual ballasts must be inspected for the "No PCB" wording on affixed labels to determine proper disposal/recycling requirements. SWA did not observe the "No PCB" wording on the wall mounted transformer.

Testing results indicate that the window caulking, door caulking and roof wall seam contains less than 50 parts per million (ppm). Therefore, the material is not subject to regulation under the Toxic Substances Control Act (TSCA).

Table 5 • Results of PCB Sampling		
Material sampled	Location	Result
01 – Gray door frame caulking	Front door	ND
02 – Gray door frame caulking	North side – Door #3	ND
03 – Gray door frame caulking	North side – Door #2	ND
04 – Gray door frame caulking	North side – Door #1	0.43
05 – Gray window frame caulking	East side – Window #4	2.30
06 – Gray window frame caulking	East side – Window #3	1.19
07 – Gray window frame caulking	East side – Window #2	0.37
08 – Gray window frame caulking	East side – Window #1	0.73
09 – Gray window frame caulking	South side – Window #4	ND
10 – Gray window frame caulking	South side – Window #3	ND
11 – Gray window frame caulking	South side – Window #2	ND
12 – Gray window frame caulking	South side – Window #1	ND
13 – Gray window frame caulking	West side – Window #4	ND
14 – Gray window frame caulking	West side – Window #3	ND
15 – Gray window frame caulking	West side – Window #2	ND
16 – Gray window frame caulking	West side – Window #1	ND
0405-01A – Gray roof wall seam	Throughout front and side parapet walls	ND

3.4 Conclusions and Recommendations

Based on our observations, SWA concludes the following:

1. Prior to renovation or demolition all ballasts should be inspected for the “No PCB” wording on the label to determine appropriate segregation and recycling requirements. The ballasts that do not contain the "No PCBs" wording on the affixed label are assumed to contain PCB oils and must be segregated for proper disposal/recycling.
2. Low levels of PCBs were identified in select window and door caulking at the site. It is believed that the caulk is an original application and thereby an “Excluded Product”. The caulks also contain asbestos and therefore must be properly packaged for disposal in a landfill permitted to accept a mix waste.
3. If during the course of demolition work, materials suspected of containing PCBs are uncovered, they must be assumed to contain PCBs until further testing indicates otherwise.

3.5 Cost Estimates

SWA estimates that the cost to inspect and remove individual ballasts and other components at the site should not exceed **\$250**. The cost for disposal of the caulks as a mixed waste is covered in the asbestos section.

4.0 MERCURY COMPONENTS

4.1 Scope of Work

SWA's inspectors observed fluorescent light bulbs suspected of containing mercury in the building. Typically when fluorescent light fixtures, thermostats, or switches will be removed and disposed of, SWA makes a conservative assumption that they contain mercury and should be handled as a regulated waste. These materials are classified as "Universal Wastes" and must be appropriately handled and packaged for disposal or recycling.

4.2 Findings

SWA observed fluorescent light bulbs that if impacted by renovations must be collected and recycled in accordance with the "Universal Waste" regulatory requirements. SWA observed 30 (4') fluorescent bulbs that would require recycling. No heat regulating thermostats with associated mercury tubes were observed in the building.

4.3 Conclusions and Recommendations

Based on our observations, SWA offers the following conclusions and recommendations.

1. Prior to being impacted, all fluorescent light bulbs and heat regulating thermostats with associated mercury tubes must be collected and properly packaged for disposal or recycling in a facility permitted to accept mercury containing waste. Or they may be stored for reuse.

4.4 Cost Estimates

The cost to collect and dispose/recycle the fluorescent light bulbs at this site is not expected to exceed **\$750**.

APPENDIX A

Certificates of Asbestos Bulk Sample Analysis (PLM)



EMSL Analytical, Inc.

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com> / bostonlab@emsl.com

EMSL Order: 131800834

Customer ID: SMIT50B

Customer PO:

Project ID:

Attention: Gary Buda
Smith & Wessel Associates, Inc.
188 Greenville Street
Spencer, MA 01562

Phone: (781) 535-1329

Fax: (978) 346-7265

Received Date: 02/09/2018 12:25 PM

Analysis Date: 02/13/2018

Collected Date: 02/09/2018

Project: 663 Edgell Rd. Framingham, MA

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
01A <small>131800834-0001</small>	1st Floor - Gray Tile Mortar	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
01B <small>131800834-0002</small>	1st Floor - Gray Tile Mortar	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
02A <small>131800834-0003</small>	1st Floor - Gray Tile Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
02B <small>131800834-0004</small>	1st Floor - Gray Tile Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
03A <small>131800834-0005</small>	1st Floor - White Generator Exhaust Insulation	White Fibrous Homogeneous	15% Synthetic	85% Non-fibrous (Other)	None Detected
03B <small>131800834-0006</small>	1st Floor - White Generator Exhaust Insulation	White Fibrous Homogeneous	15% Synthetic	85% Non-fibrous (Other)	None Detected
03C <small>131800834-0007</small>	1st Floor - White Generator Exhaust Insulation	White Fibrous Homogeneous	15% Synthetic	85% Non-fibrous (Other)	None Detected
04A <small>131800834-0008</small>	1st Floor - Gray Generator Exhaust Fitting Insulation	Gray Fibrous Homogeneous	10% Cellulose 5% Min. Wool	85% Non-fibrous (Other)	None Detected
04B <small>131800834-0009</small>	1st Floor - Gray Generator Exhaust Fitting Insulation	Gray Fibrous Homogeneous	10% Cellulose 5% Min. Wool	85% Non-fibrous (Other)	None Detected
04C <small>131800834-0010</small>	1st Floor - Gray Generator Exhaust Fitting Insulation	Gray Fibrous Homogeneous	10% Cellulose 5% Min. Wool	85% Non-fibrous (Other)	None Detected
05A <small>131800834-0011</small>	Exterior North Door 3 - Gray Exterior Door Caulking	Gray Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
05B <small>131800834-0012</small>	Exterior Front Door - Gray Exterior Door Caulking				Positive Stop (Not Analyzed)
06A <small>131800834-0013</small>	Exterior East 4 - Gray Window Caulking	Gray Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
06B <small>131800834-0014</small>	Gray Window Caulking				Not Submitted

Initial report from: 02/13/2018 17:19:54



EMSL Analytical, Inc.

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com> / bostonlab@emsl.com

EMSL Order: 131800834

Customer ID: SMIT50B

Customer PO:

Project ID:

Analyst(s)

Steve Grise (12)

Steve Grise, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Samples received in good condition unless otherwise noted. Estimated accuracy, precision and uncertainty data available upon request. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Reporting limit is 1%

Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-139, VT AL998919, Maine Bulk Asbestos LB-0039

Initial report from: 02/13/2018 17:19:54



EMSL Analytical, Inc.

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com> / bostonlab@emsl.com

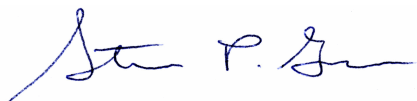
EMSL Order: 131902322
Customer ID: SMIT50B
Customer PO:
Project ID:

Attention: Ted Sherry Smith & Wessel Associates, Inc. 188 Greenville Street Spencer, MA 01562	Phone: (978) 994-3643 Fax: (978) 346-7265 Received Date: 04/08/2019 1:10 PM Analysis Date: 04/10/2019 Collected Date: 04/08/2019
Project: Edgell Pump Statio, 663 Edgell Rd., Framingham, MA P#19087	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
0405-01A <small>131902322-0001</small>	Roof - White Gypsum Deck	White Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
0405-01B <small>131902322-0002</small>	Roof - White Gypsum Deck	White Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
0405-02A <small>131902322-0003</small>	East Wall - Black tar flashing	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
0405-02B <small>131902322-0004</small>	West Wall - Black tar flashing	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
0405-03A <small>131902322-0005</small>	Front - Gray Wall Seams	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
0405-03B <small>131902322-0006</small>	West - Gray Wall Seams	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Analyst(s) _____
Elizabeth Stutts (6)



Steve Grise, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method"), but augmented with procedures outlined in the 1993 ("final") version of the method. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. All samples received in acceptable condition unless otherwise noted. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. EMSL recommends gravimetric reduction for all non-friable organically bound materials prior to analysis. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-139, VT AL998919, Maine Bulk Asbestos LB-0039

Initial report from: 04/10/2019 11:44:56

APPENDIX B

Results of Testing for Lead Based Paint (LBP)

Lead Based Paint Testing Results Edgell Road Pump Station Framingham, MA				
Location	Substrate	Color	Component	Result mg/cm²
Interior	Brick	Beige	Exterior wall	<0.1
	Terra Cotta Tile	Red	Floor	<0.1
	Metal	Blue	Pump unit	0.5
	Metal	Red	Pump unit	<0.1
	Metal	White	Pump unit	<0.1
	Metal	Yellow	Large generator	<0.1
	Metal	Green	Window frame	<0.1
	Metal	Beige	Door system	0.5
	Metal	Green	Small generator	<0.1
	Metal	White	Sink	<0.1
	Metal	Gray	Generator base	<0.1
	Porcelain	White	Bubbler	3.7
	Porcelain	White	Bathroom sink	<0.1
	Metal	Black	Door system	<0.1

Note: All testing was conducted using a NITON XLS-303A. Limit of detection = 0.1 mg/cm².

APPENDIX C

Certificates of Analysis (PCBs)



New England Testing Laboratory, Inc.
(401) 353-3420

REPORT OF ANALYTICAL RESULTS

NETLAB Work Order Number: 8B13004
Client Project: 663 Edgell Rd, Framingham, MA

Report Date: 21-February-2018

Prepared for:

Gary Buda
Smith & Wessel Associates
8808 17th Avenue Circle NW
Bradenton, FL 34209

Richard Warila, Laboratory Director
New England Testing Laboratory, Inc.
59 Greenhill Street
West Warwick, RI 02893
rich.warila@newenglandtesting.com

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Samples in this Report

Lab ID	Sample	Matrix	Date Sampled	Date Received
8B13004-01	01	Solid (Misc)	02/11/2018	02/13/2018
8B13004-02	02	Solid (Misc)	02/11/2018	02/13/2018
8B13004-03	03	Solid (Misc)	02/11/2018	02/13/2018
8B13004-04	04	Solid (Misc)	02/11/2018	02/13/2018
8B13004-05	05	Solid (Misc)	02/11/2018	02/13/2018
8B13004-06	06	Solid (Misc)	02/11/2018	02/13/2018
8B13004-07	07	Solid (Misc)	02/11/2018	02/13/2018
8B13004-08	08	Solid (Misc)	02/11/2018	02/13/2018
8B13004-09	09	Solid (Misc)	02/11/2018	02/13/2018
8B13004-10	10	Solid (Misc)	02/11/2018	02/13/2018
8B13004-11	11	Solid (Misc)	02/11/2018	02/13/2018
8B13004-12	12	Solid (Misc)	02/11/2018	02/13/2018
8B13004-13	13	Solid (Misc)	02/11/2018	02/13/2018
8B13004-14	14	Solid (Misc)	02/11/2018	02/13/2018
8B13004-15	15	Solid (Misc)	02/11/2018	02/13/2018
8B13004-16	16	Solid (Misc)	02/11/2018	02/13/2018

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Request for Analysis

01

Analysis

PCBs

Method

EPA 8082A

02

Analysis

PCBs

Method

EPA 8082A

03

Analysis

PCBs

Method

EPA 8082A

04

Analysis

PCBs

Method

EPA 8082A

05

Analysis

PCBs

Method

EPA 8082A

06

Analysis

PCBs

Method

EPA 8082A

07

Analysis

PCBs

Method

EPA 8082A

08

Analysis

PCBs

Method

EPA 8082A

09

Analysis

PCBs

Method

EPA 8082A

10

Analysis

PCBs

Method

EPA 8082A

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

11

Analysis

PCBs

Method

EPA 8082A

12

Analysis

PCBs

Method

EPA 8082A

13

Analysis

PCBs

Method

EPA 8082A

14

Analysis

PCBs

Method

EPA 8082A

15

Analysis

PCBs

Method

EPA 8082A

16

Analysis

PCBs

Method

EPA 8082A

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Case Narrative

Sample Receipt

The samples were all appropriately cooled and preserved upon receipt. The samples were received in the appropriate containers. The chain of custody was adequately completed and corresponded to the samples submitted.

PCBs

All samples were extracted and analyzed within method specified holding times and according to NETLAB's documented standard operating procedures. The results for the associated calibration, method blank and laboratory control sample (LCS) were within method specified quality control criteria. Samples were extracted via EPA 3540C - Soxhlet.

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 01

8B13004-01 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		180	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		180	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		180	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		180	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		180	ug/kg	02/14/18	02/20/18
Aroclor-1254	ND		180	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		180	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		180	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		180	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	<i>50.8%</i>		<i>30-101</i>		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	<i>99.8%</i>		<i>37-113</i>		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 02

8B13004-02 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		170	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		170	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		170	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		170	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		170	ug/kg	02/14/18	02/20/18
Aroclor-1254	ND		170	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		170	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		170	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		170	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<hr/>						
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	<i>50.2%</i>		<i>30-101</i>		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	<i>80.4%</i>		<i>37-113</i>		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 03

8B13004-03 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1254	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		172	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<hr/>						
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	<i>51.3%</i>		<i>30-101</i>		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	<i>75.1%</i>		<i>37-113</i>		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 04

8B13004-04 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		162	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		162	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		162	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		162	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		162	ug/kg	02/14/18	02/20/18
Aroclor-1254	434		162	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		162	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		162	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		162	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<hr/>						
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	<i>50.1%</i>		<i>30-101</i>		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	<i>92.4%</i>		<i>37-113</i>		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 05

8B13004-05 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1254	2300		172	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		172	ug/kg	02/14/18	02/20/18
<hr/>						
Surrogate(s)	Recovery%		Limits			
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	54.8%		30-101		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	75.7%		37-113		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 06

8B13004-06 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		174	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		174	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		174	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		174	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		174	ug/kg	02/14/18	02/20/18
Aroclor-1254	1190		174	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		174	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		174	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		174	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	52.4%		30-101		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	75.1%		37-113		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 07

8B13004-07 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1254	369		159	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		159	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			

<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	<i>51.8%</i>		<i>30-101</i>		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	<i>63.8%</i>		<i>37-113</i>		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 08

8B13004-08 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		154	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		154	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		154	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		154	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		154	ug/kg	02/14/18	02/20/18
Aroclor-1254	731		154	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		154	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		154	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		154	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	56.6%		30-101		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	71.2%		37-113		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 09

8B13004-09 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		175	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		175	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		175	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		175	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		175	ug/kg	02/14/18	02/20/18
Aroclor-1254	ND		175	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		175	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		175	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		175	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<hr/>						
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	<i>50.9%</i>		<i>30-101</i>		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	<i>68.0%</i>		<i>37-113</i>		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 10

8B13004-10 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		177	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		177	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		177	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		177	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		177	ug/kg	02/14/18	02/20/18
Aroclor-1254	ND		177	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		177	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		177	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		177	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<hr/>						
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	<i>49.6%</i>		<i>30-101</i>		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	<i>64.2%</i>		<i>37-113</i>		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 11

8B13004-11 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1254	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		159	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		159	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<hr/>						
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	<i>57.3%</i>		<i>30-101</i>		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	<i>72.4%</i>		<i>37-113</i>		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 12

8B13004-12 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		168	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		168	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		168	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		168	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		168	ug/kg	02/14/18	02/20/18
Aroclor-1254	ND		168	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		168	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		168	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		168	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	<i>48.4%</i>		<i>30-101</i>		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	<i>64.5%</i>		<i>37-113</i>		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 13

8B13004-13 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1254	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		172	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		172	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<hr/>						
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	<i>55.1%</i>		<i>30-101</i>		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	<i>67.6%</i>		<i>37-113</i>		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 14

8B13004-14 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		171	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		171	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		171	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		171	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		171	ug/kg	02/14/18	02/20/18
Aroclor-1254	ND		171	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		171	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		171	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		171	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<hr/>						
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	<i>50.0%</i>		<i>30-101</i>		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	<i>71.8%</i>		<i>37-113</i>		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 15

8B13004-15 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		153	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		153	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		153	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		153	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		153	ug/kg	02/14/18	02/20/18
Aroclor-1254	ND		153	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		153	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		153	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		153	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<hr/>						
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	<i>56.9%</i>		<i>30-101</i>		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	<i>107%</i>		<i>37-113</i>		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Sample: 16

8B13004-16 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Polychlorinated Biphenyls (PCBs)						
Aroclor-1016	ND		145	ug/kg	02/14/18	02/20/18
Aroclor-1221	ND		145	ug/kg	02/14/18	02/20/18
Aroclor-1232	ND		145	ug/kg	02/14/18	02/20/18
Aroclor-1242	ND		145	ug/kg	02/14/18	02/20/18
Aroclor-1248	ND		145	ug/kg	02/14/18	02/20/18
Aroclor-1254	ND		145	ug/kg	02/14/18	02/20/18
Aroclor-1260	ND		145	ug/kg	02/14/18	02/20/18
Aroclor-1262	ND		145	ug/kg	02/14/18	02/20/18
Aroclor-1268	ND		145	ug/kg	02/14/18	02/20/18
Surrogate(s)	Recovery%		Limits			
<hr/>						
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	<i>56.0%</i>		<i>30-101</i>		02/14/18	02/20/18
<i>Decachlorobiphenyl (DCBP)</i>	<i>83.1%</i>		<i>37-113</i>		02/14/18	02/20/18

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Quality Control

Polychlorinated Biphenyls (PCBs)

Analyte	Result Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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Batch: B8B0480 - EPA 3540C

Blank (B8B0480-BLK1)

Prepared: 02/14/18 Analyzed: 02/20/18

Aroclor-1016	ND	200	ug/kg						
Aroclor-1221	ND	200	ug/kg						
Aroclor-1232	ND	200	ug/kg						
Aroclor-1242	ND	200	ug/kg						
Aroclor-1248	ND	200	ug/kg						
Aroclor-1254	ND	200	ug/kg						
Aroclor-1260	ND	200	ug/kg						
Aroclor-1262	ND	200	ug/kg						
Aroclor-1268	ND	200	ug/kg						
<hr/>									
Surrogate: 2,4,5,6-Tetrachloro-m-xylene (TCMX)		58.0	ug/kg	80.0		72.5	30-101		
Surrogate: Decachlorobiphenyl (DCBP)		69.9	ug/kg	80.0		87.4	37-113		

LCS (B8B0480-BS1)

Prepared: 02/14/18 Analyzed: 02/20/18

Aroclor-1016	778	200	ug/kg	1000		77.8	60-119		
Aroclor-1260	920	200	ug/kg	1000		92.0	53-115		
<hr/>									
Surrogate: 2,4,5,6-Tetrachloro-m-xylene (TCMX)		60.2	ug/kg	80.0		75.3	30-101		
Surrogate: Decachlorobiphenyl (DCBP)		68.9	ug/kg	80.0		86.1	37-113		

LCS Dup (B8B0480-BSD1)

Prepared: 02/14/18 Analyzed: 02/20/18

Aroclor-1016	830	200	ug/kg	1000		83.0	60-119	6.50	20
Aroclor-1260	992	200	ug/kg	1000		99.2	53-115	7.51	20
<hr/>									
Surrogate: 2,4,5,6-Tetrachloro-m-xylene (TCMX)		63.0	ug/kg	80.0		78.7	30-101		
Surrogate: Decachlorobiphenyl (DCBP)		72.8	ug/kg	80.0		91.0	37-113		

Project: 663 Edgell Rd, Framingham, MA

Case Number: 8B13004

Notes and Definitions

Item	Definition
Wet	Sample results reported on a wet weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.

Sample #	Material	Location
01	Gray ^{out} Caulking	Front door
02	Gray ^{out}	North side door #3
03	↓ door	North side door #2
04	↓ Door	North side door #1
05	Gray window caulking	East side window #4
06	↓	window #3
07	↓	window #2
08	↓	window #1
09	↓	South side #4
10	↓	#3
11	↓	#2
12	↓	#1
13	↓	West side #4
14	↓	#3
15	↓	#2
16	↓	#1



Chain-of-custody

Relinquished by [Signature] Date 2/17/18 Time Fedex Analysis requested: _____
 Received by [Signature] Date 2/13 Time Fedex Turnaround time: 5 day
 Total # of samples 16

Analysis for PCBs via EPA's SW-846 Method 3540C/8082 SOXHLET Extraction

MassDEP Analytical Protocol Certification Form

Laboratory Name: New England Testing Laboratory, Inc.

Project #:

Project Location: Framingham, MA

RTN:

This Form provides certifications for the following data set: list Laboratory Sample ID Number(s):
8B13004

Matrices: Groundwater/Surface Water Soil/Sediment Drinking Water Air Other:

CAM Protocol (check all that apply below):

8260 VOC CAM II A <input type="checkbox"/>	7470/7471 Hg CAM III B <input type="checkbox"/>	MassDEP VPH (GC/PID/FID) CAM IV A <input type="checkbox"/>	8082 PCB CAM V A <input checked="" type="checkbox"/>	9014 Total Cyanide/PAC CAM VI A <input type="checkbox"/>	6860 Perchlorate CAM VIII B <input type="checkbox"/>
8270 SVOC CAM II B <input type="checkbox"/>	7010 Metals CAM III C <input type="checkbox"/>	MassDEP VPH (GC/MS) CAM IV C <input type="checkbox"/>	8081 Pesticides CAM V B <input type="checkbox"/>	7196 Hex Cr CAM VI B <input type="checkbox"/>	MassDEP APH CAM IX A <input type="checkbox"/>
6010 Metals CAM III A <input type="checkbox"/>	6020 Metals CAM III D <input type="checkbox"/>	MassDEP EPH CAM IV B <input type="checkbox"/>	8151 Herbicides CAM V C <input type="checkbox"/>	8330 Explosives CAM VIII A <input type="checkbox"/>	TO-15 VOC CAM IX B <input type="checkbox"/>

Affirmative Responses to Questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
E	VPH, EPH, APH, and TO-15 only a. VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications). b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Responses to Questions G, H and I below are required for "Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No ¹
----------	---	--

Data User Note: Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.

H	Were all QC performance standards specified in the CAM protocol(s) achieved?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No ¹
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No ¹

¹All negative responses must be addressed in an attached laboratory narrative.

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, is accurate and complete.

Signature: 

Position: Laboratory Director

Printed Name: Richard Warila

Date: 2/21/2018



New England Testing Laboratory, Inc.
(401) 353-3420

REPORT OF ANALYTICAL RESULTS

NETLAB Work Order Number: 9D09056
Client Project: 19087 - 663 Edgell Rd, Framingham, MA

Report Date: 16-April-2019

Prepared for:

Ted Sherry
Smith & Wessel Associates
8808 17th Avenue Circle NW
Bradenton, FL 34209

Richard Warila, Laboratory Director
New England Testing Laboratory, Inc.
59 Greenhill Street
West Warwick, RI 02893
rich.warila@newenglandtesting.com

Samples Submitted :

The samples listed below were submitted to New England Testing Laboratory on 04/09/19. The group of samples appearing in this report was assigned an internal identification number (case number) for laboratory information management purposes. The client's designations for the individual samples, along with our case numbers, are used to identify the samples in this report. This report of analytical results pertains only to the sample(s) provided to us by the client which are indicated on the custody record. The case number for this sample submission is 9D09056. Custody records are included in this report.

Lab ID	Sample	Matrix	Date Sampled	Date Received
9D09056-01	0405-01 - Gray Roof Wall Seam	Solid (Misc)	04/05/2019	04/09/2019

Request for Analysis

At the client's request, the analyses presented in the following table were performed on the samples submitted.

0405-01 - Gray Roof Wall Seam (Lab Number: 9D09056-01)

<u>Analysis</u>	<u>Method</u>
PCBs	EPA 8082A

Method References

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, USEPA

Case Narrative

Sample Receipt

The samples were all appropriately cooled and preserved upon receipt. The samples were received in the appropriate containers. The chain of custody was adequately completed and corresponded to the samples submitted.

PCBs

All samples were extracted and analyzed within method specified holding times and according to NETLAB's documented standard operating procedures. The results for the associated calibration, method blank and laboratory control sample (LCS) were within method specified quality control criteria. The sample was extracted via EPA 3540C - Soxhlet.

Results: Polychlorinated Biphenyls (PCBs)

Sample: 0405-01 - Gray Roof Wall Seam

Lab Number: 9D09056-01 (Non-soil solid, as received basis)

Analyte	Result	Qual	Reporting Limit	Units	Date Prepared	Date Analyzed
Aroclor-1016	ND		171	ug/kg	04/11/19	04/15/19
Aroclor-1221	ND		171	ug/kg	04/11/19	04/15/19
Aroclor-1232	ND		171	ug/kg	04/11/19	04/15/19
Aroclor-1242	ND		171	ug/kg	04/11/19	04/15/19
Aroclor-1248	ND		171	ug/kg	04/11/19	04/15/19
Aroclor-1254	ND		171	ug/kg	04/11/19	04/15/19
Aroclor-1260	ND		171	ug/kg	04/11/19	04/15/19
Aroclor-1262	ND		171	ug/kg	04/11/19	04/15/19
Aroclor-1268	ND		171	ug/kg	04/11/19	04/15/19
PCBs (Total)	ND		171	ug/kg	04/11/19	04/15/19
Surrogate(s)	Recovery%		Limits			
<i>2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>	63.9%		30-100		04/11/19	04/15/19
<i>Decachlorobiphenyl (DCBP)</i>	57.1%		30-105		04/11/19	04/15/19

Quality Control

Polychlorinated Biphenyls (PCBs)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B9D0501 - EPA 3540C										
Blank (B9D0501-BLK1)										
					Prepared: 04/11/19 Analyzed: 04/15/19					
Aroclor-1016	ND		33	ug/kg						
Aroclor-1221	ND		33	ug/kg						
Aroclor-1232	ND		33	ug/kg						
Aroclor-1242	ND		33	ug/kg						
Aroclor-1248	ND		33	ug/kg						
Aroclor-1254	ND		33	ug/kg						
Aroclor-1260	ND		33	ug/kg						
Aroclor-1262	ND		33	ug/kg						
Aroclor-1268	ND		33	ug/kg						
PCBs (Total)	ND		33	ug/kg						
<hr style="border-top: 1px dashed black;"/>										
<i>Surrogate: 2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>			9.77	ug/kg	13.3		73.3	30-100		
<i>Surrogate: Decachlorobiphenyl (DCBP)</i>			10.5	ug/kg	13.3		78.5	30-105		
<hr style="border-top: 1px dashed black;"/>										
LCS (B9D0501-BS1)										
					Prepared: 04/11/19 Analyzed: 04/15/19					
Aroclor-1016	142		33	ug/kg	167		85.2	64-112		
Aroclor-1260	152		33	ug/kg	167		91.5	59.4-124		
<hr style="border-top: 1px dashed black;"/>										
<i>Surrogate: 2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>			8.80	ug/kg	13.3		66.0	30-100		
<i>Surrogate: Decachlorobiphenyl (DCBP)</i>			11.0	ug/kg	13.3		82.5	30-105		
<hr style="border-top: 1px dashed black;"/>										
LCS Dup (B9D0501-BSD1)										
					Prepared: 04/11/19 Analyzed: 04/15/19					
Aroclor-1016	141		33	ug/kg	167		84.8	64-112	0.456	20
Aroclor-1260	154		33	ug/kg	167		92.3	59.4-124	0.836	20
<hr style="border-top: 1px dashed black;"/>										
<i>Surrogate: 2,4,5,6-Tetrachloro-m-xylene (TCMX)</i>			9.23	ug/kg	13.3		69.2	30-100		
<i>Surrogate: Decachlorobiphenyl (DCBP)</i>			10.9	ug/kg	13.3		81.6	30-105		

Notes and Definitions

Item	Definition
Wet	Sample results reported on a wet weight basis.
ND	Analyte NOT DETECTED at or above the reporting limit.

Sampled on 4-5-19

Sample #	Material	Location
0405-01	Gray roof wall seam (concrete)	Roof - Front Parapet wall



Chain-of-custody

Relinquished by Ted Sherry BS Date 4-8-19 Time 2pm
 Received by [Signature] Date 4/9/19 Time FedEx

Analysis requested: *
 Turnaround time: 5-Day
 Total # of samples: 1

* Analysis for PCBs via EPA's SW-846 Method 3540C/8082 SOXHLET Extraction

MassDEP Analytical Protocol Certification Form

Laboratory Name: New England Testing Laboratory, Inc.

Project #: 19087

Project Location: Framingham, MA

RTN:

This Form provides certifications for the following data set: list Laboratory Sample ID Number(s): 9D09056

Matrices: Groundwater/Surface Water Soil/Sediment Drinking Water Air Other: Solid

CAM Protocol (check all that apply below):

8260 VOC CAM II A <input type="checkbox"/>	7470/7471 Hg CAM III B <input type="checkbox"/>	MassDEP VPH (GC/PID/FID) CAM IV A <input type="checkbox"/>	8082 PCB CAM V A <input checked="" type="checkbox"/>	9014 Total Cyanide/PAC CAM VI A <input type="checkbox"/>	6860 Perchlorate CAM VIII B <input type="checkbox"/>
8270 SVOC CAM II B <input type="checkbox"/>	7010 Metals CAM III C <input type="checkbox"/>	MassDEP VPH (GC/MS) CAM IV C <input type="checkbox"/>	8081 Pesticides CAM V B <input type="checkbox"/>	7196 Hex Cr CAM VI B <input type="checkbox"/>	MassDEP APH CAM IX A <input type="checkbox"/>
6010 Metals CAM III A <input type="checkbox"/>	6020 Metals CAM III D <input type="checkbox"/>	MassDEP EPH CAM IV B <input type="checkbox"/>	8151 Herbicides CAM V C <input type="checkbox"/>	8330 Explosives CAM VIII A <input type="checkbox"/>	TO-15 VOC CAM IX B <input type="checkbox"/>

Affirmative Responses to Questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
E	VPH, EPH, APH, and TO-15 only a. VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications). b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Responses to Questions G, H and I below are required for "Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No ¹
----------	---	--

Data User Note: Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40.1056 (2)(k) and WSC-07-350.

H	Were all QC performance standards specified in the CAM protocol(s) achieved?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No ¹
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No ¹

¹All negative responses must be addressed in an attached laboratory narrative.

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, is accurate and complete.

Signature: 

Position: Laboratory Director

Printed Name: Richard Warila

Date: 4/16/2019

APPENDIX D

Photographs

663 Edgell Road, Framingham, Massachusetts



Exterior asbestos door and window caulk



Interior – Main pump room



Interior – Main pump room



Non-asbestos generator exhaust insulation

Edgell Pump Station – 663 Edgell Road, Framingham MA



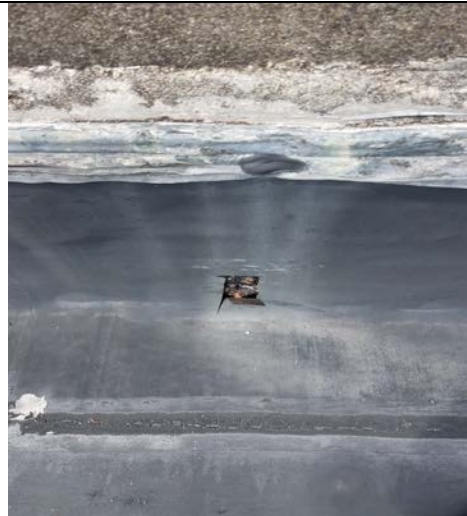
View of roof



Front view of roof wall



Roof field cut



Roof tar flashing cut



Wall seam



View of roof

APPENDIX B
City of Framingham
Department of Public Works
Construction Standards

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City of Framingham
Department of Public Works
Construction Standards

March 2009

Revised
March 2018



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Appendices

Appendix A Plan Content and As Built Plan Requirements

Appendix B Construction Details

Glossary



AAB	Architectural Access Board
AASHTO	American Association of State Highway and Transportation Officials
AC	Asbestos Cement
ACM	Asbestos containing material
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials. Note: ASTM International is originally known as the American Society for Testing and Materials, is an international standards organization that develops and publishes voluntary technical standards for a wide range of materials, products, systems, and services
AWWA	American Water Works Association
ATSSA	American Traffic Safety Services Association
BMP	Best Management Practice
CDF	Controlled Density Fill
CLOMR	Conditional Letter of Map Revisions
CMR	Code of Massachusetts Regulations
DBH	Diameter at Breast Height (the diameter of a tree trunk at 4.5 feet above ground)
DI	Ductile Iron
DPW	Framingham Department of Public Works
Engineer	A member of the Framingham Department of Public Works Engineering & Transportation Division or an authorized representative thereof
FEMA	Federal Emergency Management Agency
HDPE	High Density Polyethylene
HMA	Hot Mix Asphalt
ID	Inner Diameter
LOMR	Letter of Map Revisions



Mandrel Test	The roundness of a pipeline is tested by moving a slightly smaller steel shank, called a mandrel, through the inside of the pipeline. If the pipeline is out of round, the mandrel will be held and kept from moving forward.
MGL30 §39M	Massachusetts General Law “General Provisions Relative to State Departments, Commissions, Officers and Employees: Contracts for Construction and Materials; Manner of Awarding”
mg/l	milligrams per liter
MassDEP	Massachusetts Department of Environmental Protection
Mass DLS	Massachusetts Department Labor and Standards
MassDOT	Massachusetts Department of Transportation (formerly Massachusetts Highway Department)
MUTCD	Manual on Uniform Traffic Control Devices
NPDES	National Pollutant Discharge Elimination System
OD	Outer Diameter
OSHA	Occupational Safety and Health Administration
PE	Polyethylene
PP	Polypropylene
PVC	Polyvinyl Chloride
ppm	Parts per million
psi, psig	Pounds per square inch, pounds per square inch (gauge)
RCP	Reinforced Concrete Pipe
SOP	Street Opening Permit
SDR	Standard Diameter Ratio
US DOT	U.S. Department of Transportation
US EPA	U.S. Environmental Protection Agency

Add PM, Owner, Consultant, and Contractor to this list to define those roles

This list is not complete regarding abbreviations used in the details – should it be?



1 General

1.1 Preamble

- A. These Construction Standards are hereby established by the City of Framingham Department of Public Works (DPW). Their purpose is to provide a consistent policy under which the controlling requirements for construction of physical aspects of infrastructure system improvements within the City limits will be implemented. These aspects include streets, sidewalks, storm drains, water supply and sewer lines.
- B. These Design and Construction Standards and Construction Details are herein after referred to as the Standards. The Design and Construction Standards are provided as specifications in the materials and methods for performing work relative to the City of Framingham's infrastructure systems. The Construction Details are provided to graphically depict and to help illustrate key elements outlined within the written portion of these Standards.
- C. Most of the elements contained in this document are related to public improvements and City of Framingham contract projects; however, it is intended that they apply to both public and private work designated herein. For private work that does not fall within the regulatory jurisdiction of City By-Laws or regulations, DPW strongly recommends that these standards be used as a basis for construction. These Standards address the more typical infrastructure components. Accordingly, these Standards are intended to assist but not to substitute for competent work by design professionals by providing basic information. It is expected that engineers will bring to each project the best of skills from their respective disciplines, and design professionals shall contact the DPW for clarification and direction regarding designs not covered by these Standards.
- D. These Standards are also not intended to unreasonably limit any innovative or creative effort which could result in better quality, cost savings, or both. However, any proposed departure from the Standards will be judged on the likelihood that such variance will produce a long-term compensating or comparable result, in every way adequate for the user and City resident. Any variances from these Standards must be approved by the DPW. Further, these Standards are not intended to restrict the DPW in its effort to obtain the maximum benefits for the City in any construction project.
- E. These Standards are supplemented by regulations and fee structures. Reference to the pertinent regulations and fee structures is provided within each section of this document. In some cases, the regulations, fee structures, and forms are provided as Appendices to these Standards.

1.2 Regulatory Framework

- A. These Standards are provided to outline the DPW minimum criteria for construction of infrastructure within City limits. It is the responsibility of the property owner to verify and obtain all applicable permits.
- B. These standards are supplemental to the standards in the *City of Framingham Zoning By-Law* regulations for erosion and sediment control during and after construction and the *Rules and Regulations Governing Subdivision of Land in the City of Framingham*, which provides general design standards. Please refer to these documents for design requirements. All work shall conform to the current versions of the City of Framingham Water and Sewer regulations.
- C. All construction materials and methods shall conform to the requirements contained in the latest version of the Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges as amended, unless otherwise specified herein or approved by the City of Framingham DPW.



1.2.1 Application/Plan Review

- A. Proposed construction must be approved by the DPW. The approval must be by the City Engineer, or designee. Proposed work shall be submitted as an Engineering Plan stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. The DPW will provide the Applicant with written correspondence indicating approval of the plan, or required changes. See Appendix A for Plan content requirements.
- B. In addition to plan review approval, it is the responsibility of the property owner to verify and obtain all written permits from appropriate agencies and pay all permit fees before construction begins.

1.2.2 Construction

- A. DPW Inspector of Construction and Utilities may approve field changes, or allowances, that differ from submitted plans or City standards. No changes are allowed without prior approval by the Inspector.

1.2.3 As-Built/Record Documents

- A. The Contractor shall be responsible for the preparation and submittal of record drawings to the DPW when construction is complete. Record drawings shall be a full set of drawings showing all details of the construction, along with any specifications or design reports. This plan shall include all drain lines and structures with rim and invert elevations; all water lines, gates and dwelling service shut offs; all sewer lines and structures with rim and invert elevations; all service wyes with distances to the nearest structures and all relevant easements. Record drawings and reports shall be certified (signed and stamped) true and correct by a Professional Engineer registered in the Commonwealth of Massachusetts and/or Professional Land Surveyor registered in the Commonwealth of Massachusetts, as applicable. Drawings shall be submitted in both electronic and hard copy formats. Contact the DPW to determine the current acceptable electronic format. See Appendix A for As-built Plan content requirements
- B. Certificates of Occupancy will not be signed until payments of the required fees are confirmed and a final site inspection is concluded to validate completeness and accuracy of the submitted as-built plan documents. The DPW requires a minimum of five business days following the delivery of as-built documents package (turnaround time subject to document package completeness) to provide Occupancy Certificate Sign-off.

1.3 General Requirements

1.3.1 Brand Name or Equal

- A. If an item in these Standards is identified as “brand name or an approved equal,” the product will reflect the characteristics and level of quality that will satisfy the City’s needs. The City will evaluate “equal” products on the basis of information furnished by the Applicant or Contractor. All “or Equal” submissions must be approved during the Plan review process and will be judged consistent with MGL 30 §39M. All technical information submitted must be as provided by the manufacturer. The City is not responsible for locating or obtaining any information not identified.

1.3.2 FEMA Regulations

- A. The developer or owner is required to meet all Federal Emergency Management Agency (FEMA) regulations and the City’s Zoning By-Law, Section III (H) “Floodplain Districts.” When a submittal to FEMA is required to adjust the FEMA Flood Boundary and Floodway Maps, the



submittal must be submitted to and approved by the City Engineer prior to submitting to FEMA. Conditional Letter of Map Revisions (CLOMRs) and Letter of Map Revisions (LOMRs) are required for any modifications to a floodplain or floodway.

1.3.3 Easements

- A. Easements for Water, Sewer, or Drainage on or across lots or centered on rear lot lines or side lines shall be provided where necessary and shall be at least thirty feet (30 feet) wide. Major easements (i.e., over three hundred feet (300 feet) long) for sewer, water and drainage must be at least forty feet (40 feet) wide. Signed copies of easements and agreements affecting land not within a subdivision, but necessary for provision of utilities shall be submitted to the DPW before a plan can be approved. Where a subdivision is traversed by a water course, drainage way, channel, or stream, the DPW may require a storm water easement or drainage right of way be provided of adequate width to conform substantially to the lines of such water course, drainage way, channel, or stream and the necessary width for access. The DPW may further require the subdivider to provide construction of such improvements as they consider essential for public safety and for the adequate control of a one hundred (100) year storm.

1.3.4 Roadway Bounds and Monumentation

- A. All existing roadway monumentation shall be inventoried and protected. Any and all proposed impacts shall be brought to the attention of the Engineering Division immediately.
- B. The Engineering Division shall be notified immediately if any survey monuments are uncovered, exposed or damaged.
- C. Any damage to roadway or other survey monuments prior to acceptance by the City shall be repaired in a manner satisfactory to the DPW and the full cost of such repair shall be paid by the Contractor. Any material used which does not meet the standards of the DPW shall be replaced by the Contractor at no cost to the City.

1.3.5 Traffic Management Plans

- A. All traffic management plans shall be approved by the Engineering Division before construction may begin.
- B. Traffic management plans shall meet the requirements and guidance set forth in the MassDOT Work Zone Safety Guidelines, the ATSSA Guide to Temporary Traffic Control, and the MUTCD guidelines.
- B. Specific requirements are provided in Section 6 of these Construction Standards.

1.3.6 Construction Site Maintenance

- A. At the completion of each working day, all areas affected by work shall be brought to a reasonably clean, safe, and usable condition as determined by the City or its designee.

1.4 Erosion Control

1.4.1 Stormwater Management During Construction

- A. All construction shall comply with the City's Zoning By-Laws and Subdivision Regulations for land disturbance including clearing, erosion control, and stormwater management. In addition, construction shall comply with any applicable federal and state requirements, including but not



limited to National Pollutant Discharge Elimination System (NPDES) stormwater discharge requirements.

- B. Every person seeking to construct, repair, or modify a property's infrastructure that is either in the right of way or is subject to applicable City requirements (e.g., Planning Board or Conservation Commission) shall be required by the City to prepare and implement an Erosion and Sedimentation Control Plan to prevent the introduction of sediments into the City's drainage system. The person initiating such modification will be held accountable as the "Responsible Party" with the obligation to:
1. Secure the design of any facilities required pursuant to this section;
 2. Submit the design to DPW for review and approval;
 3. Be responsible for the full expense of installation and maintenance of such facilities; and
 4. Notify the DPW prior to the start of any work to arrange and coordinate City Inspection of the installation.
- C. Silt fencing shall be used as one of the primary erosion control measures. Silt fence shall consist of a sheet of synthetic fabric such as polypropylene, nylon, polyester, or polyethylene yarn. Silt fence shall be erected in a continuous fashion from a single roll of fabric. The bottom of the fabric fence shall be buried sufficiently below the ground surface to prevent gaps from forming, usually 4 to 6 inches below ground surface. The fabric shall be installed on the upstream side of the stakes. Stakes shall be strong enough and tall enough to securely anchor the fabric to the ground. Stake spacing shall be no more than 10 feet apart for extra-strength fabric and 6 feet apart for standard strength fabric. Maintenance of the fence is required during construction. Material shall be based on the synthetic fabric requirements as follows:
1. Filtering efficiency: 75% (minimum)
 2. Tensile strength: Standard strength: 30 lb./linear inch (minimum), Extra strength: 50 lb./linear inch (minimum)
 3. Elongation: 20% (maximum)
 4. Ultraviolet radiation: 90% (minimum)
 5. Slurry flow rate: 0.3 gal/ft²/min (minimum)
- D. Fiber rolls or an approved equal shall be used as another primary erosion control measures. Fiber rolls shall be used in conjunction with silt fences except when used for hillside erosion control, where they may be used alone.
1. Fiber rolls shall be trenched between 3 and 5 inches into the ground, depending on the size of the fiber roll.
 2. Fiber rolls shall be staked securely into the ground using wood stakes. A minimum of 3 inches of the stake shall stick out above the roll.
 3. Stakes shall be spaced 3 to 4 feet apart unless otherwise approved by the DPW.
 4. Fiber rolls placed around drain inlets shall be placed a minimum of one (1) foot back from the inlet.
 5. For slope stabilization, fiber rolls shall be placed perpendicular to the expected flow of stormwater runoff, with the following separation:
1:1 slopes = 10 feet apart
2:1 slopes = 20 feet apart



3:1 slopes = 30 feet apart

4:1 slopes = 40 feet apart

- E. Gravel aprons shall be installed at the entrance of construction sites where disturbance is over 4,000 square feet to prevent sediment from the construction site entering the roadway. Aprons shall be a minimum of 15 feet in length, and extend the width of the entrance.
- F. Silt sacks (or equivalent) shall be placed in down gradient catch basins to prevent sediment from entering the drainage system. Silt sacks shall be periodically cleaned while in use and must be cleaned prior to and after precipitation events. Applicants are advised they may be required to respond immediately for repair and maintenance at the request of the City within two hours of notification.
- G. All erosion and sediment controls shall remain in effective operating condition during construction activities. Inspect all erosion and sediment controls regularly and make the necessary repairs or modifications to ensure effectiveness or as directed by the City Inspector.
- H. Initiate soil stabilization measures immediately whenever earth-disturbing activities have permanently or temporarily ceased on any portion of the site. Complete soil stabilization measures as soon as practicable, but no later than 14 calendar days after the initiation of soil stabilization measures.
- I. All soil stockpiles to be in place for more than 14 days shall have erosion controls (e.g., fiber rolls) installed on the downgradient side to prevent migration of soils.

1.4.2 Stormwater Management Post Construction

- A. Every person shall be required to prepare and implement a stormwater management operations and maintenance plan as required by City review requirements (e.g., Planning Board or Conservation Commission).
- B. Such a plan shall include non-structural and structural measures to manage stormwater during and after construction of the new or expanded facility. The design of such facilities shall be subject to the approval of the DPW. The costs for the design, installation and maintenance of the aforementioned stormwater management systems shall be the responsibility of the facility owner. The DPW shall receive advance notice prior to the start of said work to coordinate Inspectional coverage of the installation.
- C. For subdivisions regulated by the City's Subdivision By-Laws, the DPW may require that major components of stormwater management systems be placed on the property rather than within the City right-of-way limits. In such cases, the owner or homeowners' association shall be responsible for the ongoing maintenance of said components, and the approved stormwater management plan shall include management of these components. This management plan shall be recorded with the deed at the Massachusetts Registry of Deeds.

1.5 Tree Planting and Protection

- A. All tree work shall be completed in accordance with the requirements of the Tree Warden and/or planning board as appropriate.
- B. When specifying trees to be planted on or near the roadways in Town, specifications shall identify species and cultivar. The more disease resistant cultivars shall be recommended.



- C. Trees shall be tagged with identification as to location of origin, species, and cultivar. Notification shall be provided to the Tree Warden to provide time for inspection and verification of tree species and cultivar.
- D. When planted, an area around the trees shall be mulched for a minimum of 3 feet from the tree or twice the size of the root ball, whichever is greater. The area immediately around the tree trunk (within 2 inches of the trunk) shall remain un-mulched.
1. The planting hole shall be at least 2 times the width of the rootball, up to 5 times the rootball.
 2. Burlap, twine, and wire baskets shall be entirely removed after planting.
 3. Place the tree in the hole at both the appropriate upright angle and depth.
 4. Replace the soil so that there is no excessive coverage to roots or contact above the root flare at the stem.
 5. Add a two- to three-inch layer of mulch, not contacting the bark of the tree.
 6. Immediately water the tree, with a plan for regular follow-up watering.
 7. Provide a final quality-control check, where depth of the structural roots is verified, with the use of a chaining pin or other measuring implement.
- E. Tree protection shall include the following.
1. Notification shall be provided to Tree Warden during the planning and specification development of projects where tree protection may be required. The Tree Warden may require that a City-approved certified arborist oversee construction activities related to tree protection.
 2. A pre-construction meeting with the Tree Warden shall be conducted at least two weeks prior to construction to review tree protection procedures.
 3. Tree protection shall be provided for each tree within the work area.
 4. The tree protection zone shall extend out from the center of the trunk to a radius of 1.5 feet per inch of DBH (DBH = diameter of trunk at 4.5 feet above ground).
 5. Primary tree protection shall include 2" x 4" boards in 8-foot lengths vertically strapped around the trunk, at a maximum of 8 inches apart, on center. No penetration of the tree trunk shall be allowed except as approved by a certified arborist or the Tree Warden.
 6. Secondary tree protection shall include fencing around the tree protection zone.
 7. No storage of any materials or equipment shall be allowed within the tree protection zone.
 8. No parking shall be allowed within the tree protection zone.
 9. No roots greater than 2 inches shall be cut during construction activities.
 10. Any pruning of tree limbs shall be done under the direction of a certified arborist.
 11. During excavation, major roots as determined by the Tree Warden shall be exposed using an air spade and flagged for protection.
 12. Vertical mulching shall be required if soil compaction levels exceeds 75% or more than 3 passes by heavy equipment are expected.
 13. If travel is required within the tree protection area, a layer of at least 6 inches of wood chips, mulch, or other matting as approved by the Tree Warden shall be laid down to protect the



roots. The matting shall be removed and the area restored to pre-construction conditions upon completion of the work.

14. For construction where trees roots may be damaged, only root pruning methods may be used for removal. The Tree Warden shall be notified and a plan submitted to the Tree Warden for approval.
 15. Curb cuts should not be closer than five (5) feet from the trunk of any adjacent tree.
- F. Trees that, in the judgment of the Engineer or the Tree Warden, have been irreparably damaged by the Contractor shall be replaced in kind and in size, or with a quantity of 2-inch caliper replacement trees (the quantity of which shall be determined by the Engineer) such that the cumulative caliper of the replacement trees will be up to the equivalent diameter of the lost tree at breast height. Cost of removal of a destroyed tree, including roots and stumps, as well as the cost of replacement trees, shall be paid for by the Contractor.
- G. A written guarantee shall be provided to the Town that trees planted in Town as per the contract will thrive for a minimum of two (2) years. The guarantee shall include replacement of trees that the Tree Warden has determined are not thriving. Replacements shall be required to have the same guarantees as the original trees.

1.6 Waste Management

Disposal of removed pavement, concrete, soil, or other construction materials shall comply with the DPW's Waste Management and Soil Management specifications. The disposal location and management plan shall be pre-approved by the DPW, prior to the start of any work.

1.7 Asbestos Cement Pipe Encountered during Construction

- A. If either asbestos cement (AC) pipe or asbestos cement material in soil is encountered, notification shall be immediately provided to the DPW Engineering and Transportation Division.
- B. Handling of any AC Pipe or AC material shall be according to federal and state regulations, specifically but not limited to EPA's *National Emission Standards for Hazardous Air Pollutants* (NESHAP) Title 40, Part 61; EPA's *Guide to Respiratory Protection for the Asbestos Abatement Industry* OSHA 29 CFR part 1926.1101; OSHA 29 CFR 1010.1001; USDOT 49 CFR 100-185; Massachusetts Division of Labor Standards 453 CMR 6; MassDEP 310 CMR 7.00, 7.09, 7.15; and MassDEP *Asbestos Cement Pipe Guidance Document* (June 2011).
- C. Handling, management, storage and disposal of any AC pipe or AC contaminated material shall comply with Framingham's Standard Operating procedures for asbestos containing materials.

1.8 Conditions for Street Acceptance

- A. The following shall be required as applicable as conditions for acceptance of streets. Any listed reports shall be signed and stamped by a registered professional engineer or land surveyor with applicable qualifications.
 1. Conditions & confirmation conditions achieved
 2. Order letter of conditions
 3. Identified condition exceptions
 4. Homeowner association document
 5. As-built subdivision or plot plan
 6. Roadway layout plan



7. Copies of deeded easements
8. Inspection reports of plantings and other items in the right of way
9. Street light inspection report
10. Fire pull box inspection report
11. Highway sign and/or striping inspection report
12. Layout /bound/ easement inspection report
13. Roadway/sidewalk/curbing base & finish inspection report
14. Utilities inspection (water, sewer, drainage) reports, including water quality testing for all water systems
15. CCTV drain/ sewer systems reports
16. Hydrant inspection reports including test data
17. Drainage/retention pond inspection report
18. Easement or proof of ownership and Operations and Maintenance plans for drainage detention/retention basins.

1.9 Items Not Covered in This Document

- A. Items not covered in this document include the following:
1. Complex and specialty items such as bridges, culverts, siphons, pump stations, and backflow prevention. Plans for these items are to be provided for individual review by the DPW.
 2. Drainage that is completely operating within the boundaries of private property, with no discharge to waterways or the City's drainage system.
 3. Street Opening Permit (SOP) requirements for any facility installation that may occur within the Town Right of Way limits. For SOP policy details please refer to Town of Framingham Web site link as follows: http://www.framinghamma.gov/public_works/sop/default.htm.
 4. Trench Opening Permit requirements for any excavation that meets the definition of a trench as per MGL Chapter 82A Unattended Open Trenches Safety Hazards Rules, Regulations and Fines, and regulated under 520 CMR 14.00 Excavation and Trench Safety Regulations.

1.10 References

<u>Standards</u>	<u>Title/Subject</u>
ATSSA	Guide to Temporary Traffic Control in Work Zones
Mass DLS	453 CMR 6. Current Asbestos Regulations
MassDEP	310 CMR 7.00. Air Pollution Control Regulations. Includes Section 7.09 <i>Dust Odor, Construction and Demolitions</i> and 7.15: <i>Asbestos</i>
MassDEP	Asbestos Cement Pipe Guidance Document (June 2011).
MassDOT	Work Zone Safety Guidelines for Massachusetts Municipalities and Contractors
US DOT	Manual on Uniform Traffic Control Devices
OSHA	29 CFR part 1926.1101. Safety and Health Regulations for Construction, Sub Part Z, Toxic and Hazardous Substances: Asbestos



OSHA	29 CFR 1010.1001. Occupational Safety and Health Standards, Subpart Z, Toxic and Hazardous Substances: Asbestos
US DOT	49 CFR 100-185. Hazardous Materials Transportation
US EPA	National Emission Standards for Hazardous Air Pollutants (NESHAPS) Title 40, Part 61
US EPA	Guide to Respiratory Protection for the Asbestos Abatement Industry



2 Water Construction Standards

2.1 General

2.1.1 Description

- A. The work includes furnishing and installing all pipe, fittings, valves, structures and appurtenances required for the proposed system to supply water to users of the City's Water System.
- B. Work and materials shall be performed in accordance with the State Plumbing Code when work is within ten (10) feet of buildings.
- C. Only one domestic water service shall be installed per parcel.
- D. All water connections shall be to City owned distribution mains.

2.1.2 Submittals

- A. Materials List and Shop Drawings
 - 1. Materials list of materials proposed shall be submitted to the City.
 - 2. Approved shop drawings for all materials and structures shall be submitted to the City.
 - 3. Plans for chlorination, dechlorination, pressure test, bypass construction shall be submitted to the City. All pressure testing shall be performed by a qualified third party approved by the City. All pressure testing must be in conformance to a written plan submitted to, and approved by, the City.
- B. As-Built Drawings
 - 1. Submit one (1) copies of As-Built Drawings to the DPW upon completion and acceptance of work as wells as an electronic version of the drawings in both AutoCAD and Acrobat (PDF) format.
 - 2. As-Built Drawings shall be complete and shall indicate the true measurement and location, horizontal and vertical, of all new construction. As-Built Drawings shall include a minimum of three (3) ties to each valve cover and curb stop from fixed permanent objects. Three (3) ties shall also be provided for each bend or other unanticipated field change. As-Built drawings shall also contain any additional information required by the municipality and shall be stamped with the seal of a Professional Land Surveyor or Licensed Professional Engineer. The City may, at its discretion, require that as-built plans be submitted on electronic form (e.g., AutoCAD release 2008 or higher).
 - 3. As-Built Drawings shall be filed or stored on property and available for use by DPW for all commercial, industrial, and institutional properties and large residential properties, such as apartment or condominium complexes and assisted or congregate living facilities.
- C. Temporary Bypass Plans shall be prepared by a registered professional engineer and submitted to DPW for review and approval prior to installation when required by the City. Bypass plans shall include and consider the following:
 - 1. Proposed schedule for installing, testing, disinfecting, operating, and removing the temporary bypass.



2. All components of the bypass shall be for potable water transmission and distribution with a minimum service pressure of 150 psi. Piping and hose shall be galvanized steel, high density polyethylene (HDPE) or polyvinylchloride (PVC) pipe. All plastic pipe or hose shall bear the imprint of the National Sanitary Foundation (NSF) approval for potable water NSF-PW or shall be capable of meeting the standards established by the NSF for this use.
3. Details of the materials, size, and location of temporary facilities including bypass mains, valves, connections, laterals, services, and fire hydrants.
4. Bypass mains shall be supplied by at least two connections to the existing system either via an existing hydrant or a direct connection to an underground main.
5. Bypass mains shall be a minimum of 6-inches in diameter when supplying water for fire protection to temporary hydrants. Temporary hydrants shall be located in the same approximate location as existing hydrants that have been placed out of service and bagged. The number of hydrants on the temporary bypass shall be greater than or equal to the number of existing hydrants that are placed out of service.
6. Minimum size of bypass mains that do not supply water for fire protection is 2-inches. All temporary services shall be greater than or equal to the diameter of the existing service.
7. Bypass mains shall be laid outside of the traveled and access ways whenever possible and trenched when crossing roadways. All services shall be ramped or trenched.
8. Where possible, services shall be connected to the user's sill cock using a wye fitting with valves to accommodate connections of garden hoses by the user.
9. Need to add language about containment – i.e., dentist offices
10. All plans shall include provision of twenty-four/seven contact information for operation and maintenance of the bypass system.
11. Pressure testing shall comply with the requirements of Section 2.3.1.1 and disinfection testing shall comply with the requirements Section 2.3.1.2.
12. All work shall be coordinated with DPW and the Fire Department and no construction activity shall commence without a minimum of 48 hours advance notice to each department.

2.1.3 Inspection

- A. The Applicant is responsible for the provisions and all test requirements specified herein. In addition, all pipe and appurtenances shall be inspected at the plant for compliance with these specifications by an independent testing laboratory.
- B. Inspection of the pipe and appurtenances shall also be made after delivery. The pipe and appurtenances shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though samples may have been accepted as satisfactory at the place of manufacture. Pipe and appurtenances rejected after delivery shall be marked for identification and shall be removed from the site at once.
- C. All bypass plans must be submitted to DPW for review and approval prior to installation.
- D. All work shall be inspected by the City's Inspector of Construction and Utilities or designated representative prior to backfill.

2.1.4 Delivery, Storage and Handling

- A. All materials shall be adequately protected from damage during transit. Pipes shall not be dropped.



- B. All pipe and other appurtenances shall be inspected before placement in the work and any found to be defective from any cause, including damage caused by handling, and determined by the Town to be unrepairable.
- C. Storage and handling of pipes and other appurtenances shall be in accordance with the manufacturer's recommendations, subject to the approval of the Town.

2.2 Materials

- A. The Materials section summarizes the City's standards to be used in public or private components that affect the City's water system. All materials should conform to the applicable AWWA standards unless otherwise noted.

2.2.1 Lead Free

- A. All materials used in public or private water systems within the Town of Framingham's water system must be certified "lead free."

2.2.2 Pipe

- A. All water mains shall be minimum Ductile Iron Class 52, single gasket, double sealing pipe with cement mortar lining. All ductile iron water main pipe shall be rated for a minimum operating pressure of 350 psi. All water mains shall be encased in polyethylene film when the trench is backfilled with control density fill.
- B. All water mains shall be minimum 8-inch diameter. All hydrant branches shall be minimum 6-inch diameter.
- C. Push-on type joints are recommended on straight runs of pipe. Gaskets must be standard for pipe used and be acceptable to the DPW.
- D. Mechanical joint restraints shall consist of individually actuated wedges that increase their resistance to pull out as pressure or external 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. They shall have a rated work pressure of 350 psi in sizes 16-inch and smaller and 250 psi on in sizes greater than 16 inches.
- E. The City has standardized on the Series 1100 MEGA-LUG restraint as produced by EBAA Iron, Inc. or approved equal.
- F. Where petroleum contamination is known or suspected to be in the soil and/or groundwater, nitrile gaskets shall be required.

2.2.2.1 Fittings

- A. Ductile iron fittings shall be used and shall be cement lined. Fittings shall be equipped with a mechanical joint restraint, unless otherwise specified by the DPW. 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-10 steel T-bolts and nuts or an approved equal.

2.2.2.2 Couplings

- A. Couplings shall be provided with AWWA approved plain, Grade 27, rubber gaskets and track-head bolts with nuts. Couplings shall be Smith Blair, Style 441 or Dress, Style 153; 360 or an approved equal. If the outer diameter of the pipe permits, a Dresser coupling is preferred.



- B. Where petroleum contamination is known or suspected to be in the soil and/or groundwater, nitrile gaskets shall be required.

2.2.2.3 Resilient Seat Gate Valves

- A. Resilient seat gate valve bodies shall be manufactured of ductile iron. Gate valves shall be open left (counter clockwise). All valves shall be designed for minimum 250 psi working water pressure.
- B. The City has standardized on American Flow Control and Kennedy.

2.2.2.4 Valve Boxes

- A. Valve boxes shall be heavy duty, adjustable style with the lower part manufactured of cast iron and the upper part of steel or cast iron. All valve boxes shall be designed and constructed to prevent direct transmission of traffic loads to the pipe or valve, and shall have the lower part manufactured of cast iron and the upper part of steel or cast iron. The top of the cover shall be flush with the finish grade. Boxes shall be as manufactured by Bibby Ste-Croix or approved equal.
- B. Box covers shall be round frame and cover manufactured by the Bibby Ste-Croix or approved equal. The boxes shall be labeled to differentiate between division valves ("DIV"), Blow-Off ("B.O.") and generic valves as indicated in the Construction Details. Box covers shall have a minimum height of four (4) inches.

2.2.2.5 Tapping Sleeves and Valves

- A. Tapping sleeves shall be of the mechanical joint type. The valves shall be flanged by mechanical joint outlet 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 bonnet and stuffing box shall be stainless steel (316 stainless steel), stuffing boxes shall be "O" ring type. The operating nut shall be 2 inches square. Gaskets shall cover the entire flange surface. Valves shall open left, (counter clockwise).
- B. The City has standardized on American Darling 1004 or an approved equal.
- C. Tapping sleeves shall be no greater than one-half of the diameter of the main being tapped.

2.2.3 Piping Connections

2.2.3.1 Service Connections

- A. All service pipe shall be type "K" copper tubing.
- B. Plastic services are allowed on a case-by-case basis. In such circumstances, the City will require that the applicant verify that no petroleum constituents are present in subsurface soil in the vicinity of the service. Plastic water services shall be NSW-PW, listed, High Density Polyethylene (HDPE) blue plastic and shall conform to the following:
 1. Copper Tube Size (CTS) – ASTM 2737, 200 psi, PE 3608 or PE 3710, SDR9
 2. Iron Pipe Size (IPS) – ASTM 2239, 200 psi, PE 3608 or PE 3710, SDR7

Plastic pipe shall be as manufactured by Silver Line Plastics or approved equal. Dimensional and performance characteristics shall conform to the requirements of AWWA C901. The use of



HDPE pipe and tubing may be allowed for water service - two (2) inches or under in diameter (4-inch and larger diameter water services shall use cement lined ductile iron water pipe). HDPE pipe shall be installed with enough slack to compensate for settlement and compaction and shall be laid on a bed of fine grained material.

- C. Curb valves shall not include a drain.
- D. The City has standardized on lead-free service connections manufactured by McDonald, Mueller, Ford or an approved equal. Copper tubing shall be of the type commercially known as type "K" soft and conforms to ASTM Specifications B-88-49.
- E. Curb boxes shall be Erie box style for 1-inch services and Buffalo box style (no rod) for 1-1/2-inch and larger services.

2.2.3.2 Corporations

- A. Corporations for 1 inch installations shall be heavy pattern, solid plug, easy turning. The inlet shall be an AWWA (CC) thread. The 1 inch, 1-1/2 inch and 2 inch corporations shall be of a tee head ball valve type which incorporates Teflon seats to assure self-centering of Teflon coated bronze ball. The corporation shall be easy turning and non-binding. The inlet shall be an AWWA (CC) thread. Corporations shall be subject to a sustained hydraulic pressure of 200 psi. All 1½ and 2-inch saddles shall have stainless steel straps.

2.2.4 Hydrants

- A. Hydrants shall have a 5-1/4-inch valve opened by turning the operating unit in the counter clockwise direction. The hydrant shall have one 4-1/2- inch steamer and two 2-1/2- inch hose connections. The hose and steamer connections shall have National Standard Thread. The operating nuts shall be pentagonal in shape, 1-1/2- inch from point to opposite flat and shall open left (counter clockwise). The hydrant shall be the hub or mechanical-joint type having a 6-inch pipe connection to an 8-inch or larger diameter main.
- B. The hydrant valve shall consist of a cast iron valve and valve bottom and hydrant valve rubber. The rod threads shall be permanently sealed from contact with water. The hydrant valve shall seal against the bronze hydrant seat. The upper barrel shall be ductile iron with markings identifying size, model and year of manufacture. The lower barrel shall be ductile iron.
- C. The upper barrel shall connect to the lower barrel with a breakable traffic flange and 8 bolts and nuts. This connection shall allow 360 degree rotation of the upper nozzle section.
- D. The hydrant shall have a bronze drain ring securely held between the barrel and base flange. It shall provide bronze to bronze threaded connection for hydrant seal. The bronze drain ring shall serve as a non-corrosive multi-port drain channel.

Hydrant anchor tees shall be located at the main.

- E. The hydrant shall have a minimum working pressure of 200 psi. Hydrant design shall be of positive automatic drain type to prevent freezing.
- F. All hydrants that will not be City owned shall be painted red. Hydrants that are City owned, or will be City owned, shall be factory painted with Sherman-Williams brand paint to the City's paint scheme:

Hydrant body: hydrant blue b54tz104

Caps: Pure white-b54w2101



- G. The City has standardized on American Darling Model No. B-62B as manufactured by American Flow Control Inc.

2.3 Execution

- A. This section summarizes the City's standardized methods for the installation and maintenance of certain aspects of the water system. All procedures shall be performed consistent with AWWA standards.

2.3.1 Piping

- A. The sizing of water mains shall be based on sound engineering principals. All water mains shall be minimum 8-inch nominal diameter. All hydrant connections shall be minimum 6-inch diameter.
- B. All piping shall be installed with a minimum 5-foot cover. In such cases where 5-foot cover is not possible, the piping shall be appropriately insulated. Water pipe shall be installed with minimum distance from sewer and septic pipe as summarized in Section 3.3.1.2 H.
- C. Pipe shall be laid accurately to line and grade in sand bedding conforming to MassDOT Standard Spec. M1.04.0 Sand Borrow and AWWA guidelines. The depth of the sand bedding shall be one half (1/2) the diameter of the pipe under the main and one half (1/2) the diameter of the pipe over the main or 6 inches both under and over the pipe, whichever is greater. Bedding shall be placed in layers not over six inches thick, and each layer shall be thoroughly compacted by tamping and chinking on each side of pipe to provide uniform support.
- D. Backfill material placed above the bedding material and below the roadway foundation shall conform to W-2.3.0. Roadway foundation and surface restoration shall conform to Section 5, Roadway Construction Standards, and Section 6, Existing Road Openings, as applicable.
- E. Push-on pipe gaskets shall be clean and thoroughly coated with lubricant specified by the manufacturer during installation.

2.3.1.1 Pressure Tests

- A. The pipelines shall be tested (in sections if required by the City) for strength and for leakage at a pressure of 200 pounds per square inch. In certain circumstances, the City may require higher pressure tests. The tests for leakage shall last for two hours although the City may allow a one hour test subject to advanced approval. No more than 1,000 feet of water main shall be tested in a single test.
- B. The additional water needed to maintain the required pressure shall be accurately measured in a manner approved by the City. The container shall be clearly labeled with its capacity in gallons. Allowable leakage amounts will be determined by the AWWA standards for pressure testing Ductile Iron pipe (AWWA C600 latest revision).
- C. Tests shall be made for all newly installed pipe and when required by the City. A 24-hour notice shall be given to the City prior to all tests. The Contractor shall pay for and make all necessary arrangements for securing the water for test purposes. For projects where water is collected straight from an un-metered source, the Contractor shall meter the water. The City will subsequently bill the contractor on a private job for that water usage. For DPW projects, the Contractor will not be billed, but water usage shall be documented.



- D. During this test all hydrant laterals shall be in the open position. Methods of testing and plans showing sections to be tested shall be submitted to the City for approval as requested. The Contractor will not perform a pressure test against existing valves unless authorized by the City.
- E. The Contractor shall submit a written report to the DPW summarizing the results. The Contractor shall repair all leaks discovered under any of the required tests and retest the pipe. The City will not accept any installation where a final test has not been passed.

2.3.1.2 Chlorination of the Pipeline

- A. Prior to disinfection, the Contractor shall submit a detailed disinfection plan to the DPW. The plan shall be prepared consistent with AWWA standards and federal and state regulations, and it shall outline and describe the disinfection procedures. At minimum, the plan shall include the following components:
 - General: All water mains, water services, attached appurtenances and connections shall be disinfected in accordance with AWWA Standard C651.
 - Disinfection of new mains, including all chlorination, chlorine residual measurements, collection of samples, and certification shall be conducted by a third party testing agency approved by the DPW.
 - All pipe, fittings, and appurtenances shall be kept free from dirt and foreign matter at all times. During construction all open pipe ends and fittings shall be fitted with a water tight plug. At the end of the work day the open pipe in the trench shall be plugged in an equally suitable manner.
 - The interior surfaces of new valves, pipe and appurtenances shall be swabbed, as well as the interior surfaces of existing main, both upstream and downstream of the new pipe section, with a minimum five percent concentration of hypochlorite disinfection solution before installation. During the chlorination or chlorinating process, all valves shall be operated, and the chlorine solution shall be drawn through all laterals and appurtenances. Disinfection of mains and appurtenances, hydrostatic testing, and chlorine retention may run concurrently for the required minimum 24- hour period only if prior approval is obtained from DPW.
 - In the event of leakage or where repairs are necessary, added disinfection shall be made only by injecting chlorine into the line whereby adequate mixing is assured. If the test results are not satisfactory, additional disinfection shall be required.
 - Chlorine Dosage and Injection shall be performed in accordance with the continuous feed method as described in AWWA C651. The Disinfection Plan shall summarize the intended chlorine dosage and the method for establishing that dosage. The disinfection may be accomplished by introducing into all the various parts of the new water mains a liquid solution containing one percent available chlorine in such volume that the rate of dosage to the water mains shall be at least 25 parts per million of available chlorine. The Disinfection Plan shall document the locations and methods for applying the chlorine into the pipeline. Disinfection Period and Flushing – The contact period for this disinfection shall be at least twenty-four hours, and a longer period will be required if tests of residual chlorine show it to be less than the required minimum of 10 mg/l. The pipeline shall be adequately flushed with potable water and the Disinfection Plan shall document the method for de-chlorinating and discharging the residual water. All discharges must comply with local, state and federal requirements
 - Water shall be flushed from the line at its extremities and at all outlets until the chlorine residual of the water system being flushed is equal or less than the distribution system level.
 - Sampling – Sampling shall be performed by an independent certified laboratory according to AWWA C651 – Disinfecting Water Mains. B. The Contractor shall not proceed with the



disinfection procedures until the Disinfection Plan has been approved by the DPW. All sampling results shall be submitted to the DPW prior to activation of the water main.

- C. Connections at cuttings shall be swabbed with a 5% solution of chlorine at locations when other methods are not applicable.
- D. All water used to disinfect pipe shall be discharged and managed consistent with the appropriate state and local regulations. These shall include the City of Framingham Conservation Commission permitting and the *Illicit Discharges to Municipal Separate Storm Sewer System* bylaw. Discharge to the sanitary sewer system is not allowed.
- E. Water mains and appurtenances must be completely installed, flushed, disinfected, and satisfactory bacteriological sample results received prior to connections being made to the active distribution system.

2.3.2 Valves

- A. All material shall be inspected for defects prior to installation. Defective materials shall be immediately removed from the site. All foreign matter shall be removed from valve openings and seat faces. All nuts and bolts shall be checked for tightness.
- B. For any T-connections that may be considered a lateral connection, the valve for the lateral line shall be attached with an anchor-T or tapping sleeve if approved by DPW (See Detail W-2.4.1). The valves on the main line shall be installed in line with the curb (see Detail W-2.4.3).

2.3.3 Tapping

- A. Where there is more than one public water main in a street, the City shall determine which main the owner may tap for water service pipe connection. Water mains designated as transmission mains shall not be tapped for water service, except when approved by the City.
- B. Service taps to the distribution main shall be separated by a minimum of 18-inches in all directions.
- C. Temporary taps installed for filling and testing a pipe shall be abandoned prior to City acceptance. Abandonment shall include cut pipe no more than 3" from the corporation stop and corporation stop shall be in the closed position.

2.3.4 Thrust Restraint

2.3.4.1 Thrust Blocks

- A. Thrust blocks may only be used against undisturbed soil. They shall be designed in accordance with the Design Standards using the appropriate concrete and pressures as specified in the Construction Details and the AWWA standards and guidelines.

2.3.4.2 Tie Rods

- A. Tie rod systems may be used where approved by the City. All materials shall be steel and coated with an approved bituminous coating or other approved corrosion resistant coatings. Unless otherwise required or approved by the Engineer, the Contractor shall install tie rods in accordance with the following schedule for all fittings:



Minimum Tie Rod Design		
Pipe Size (inches)	Number of Rods	Tie Rod Diameter (inches)
4"-12"	2	¾"
16"	4	¾"
20" – 24"	4	1 ½"

2.3.4.3 Wedge Action Retaining Joints

- A. Wedge Action Retaining Joints may be used wherever approved by the City and shall be manufactured of ductile iron conforming to ASTM A536. The mechanical joint restraint shall be Megalug Series 1100 or equal approved by DPW.

2.3.5 Electrical Grounding

- A. No electrical grounds shall be made on water service pipes where a driven ground rod can provide the needed grounding service. Electrical grounding shall be provided in accordance with the Massachusetts Electric Code.

2.3.6 Fire Suppression

- A. All new fire suppression (i.e. sprinkler) connections shall be coordinated with and approved by the City's fire department.
- B. Fire suppression connections shall be coordinated with the property owner. Sprinkler valves shall only be operated by a certified sprinkler operator. The certified sprinkler operator shall bleed air from the sprinkler system upon completion of installation.
- C. Single-family detached dwellings (i.e. single-family homes) may tap a single fire suppression service connection from their domestic water line if all of the following conditions are met:
1. The connection is made after the water meter
 2. A testable backflow preventer is installed on the fire service line next to the connection
 3. All pipes used in the fire suppression system be approved to carry potable water
 4. Fire suppression system does not contain anti-freeze or any substance other than potable water
- D. No fire service connection may be tapped off a domestic service (and vice-versa) for all commercial and multi-family properties. Separate domestic and fire services shall be installed from the building serviced to the public water main.

2.3.7 Pipe, Valve and Structure Abandonment / Removal

- A. Pipes left in place that are greater than 6 inches in diameter shall be filled with CDF regardless of material (e.g., DI, PVC).
- B. Pipes left in place that are equal to or less than 6 inches in diameter may be left unfilled.
- C. Structures left in place shall be demolished down to five feet below ground surface, the bottom shall be cracked and compacted, and the remaining structure filled with CDF. Demolition debris shall be removed, and the area regraded and compacted over the filled structure.



- D. When abandoning asbestos cement pipe, care shall be used to follow DPW's Standard Operating Procedures for ACM.

2.4 References

- A. All materials and execution shall conform to the highest applicable standards. If there is a conflict between other standards, or between other standards and these Design standards, then the most stringent criteria shall be used.
- B. The City commonly references AWWA standards as guidance for the materials and execution of work performed on the City's water infrastructure. The following summarizes select AWWA standards applicable to the sections in these Design Standards. This list is not exclusive as other standards may apply. The latest revision of each standard shall be referenced.

Standards	Title/Subject
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM D3350.	Standard Specification for Polyethylene Plastic Pipe and Fittings Materials
AWWA C104/ANSI 21.4.	American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C105/ANSI A21.5.	American Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C110/ANSI A21.10.	American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 Inch Through 48 Inch for Water
AWWA C111/ANSI A21.11.	American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C150/ANSI A21.50.	American National Standard for the Thickness Design of Ductile-Iron Pipe
AWWA C151/ANSI A21.51.	American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
AWWA C153/ANSI A21.53.	American National Standard for Ductile-Iron Compact Fittings, 3 In. Through 64 In.
AWWA C502.	AWWA Standards for Dry-Barrel Fire Hydrants
AWWA C504	AWWA Standard for Rubber-Seated Butterfly Valves
AWWA C509.	AWWA Standard for Resilient-Seated Gate Valves for Water Supply Service
AWWA C515.	AWWA Standard for Reduced-Wall Resilient-Seated Gate Valves for Water Supply Service
AWWA C600.	AWWA Standard for the Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C651.	AWWA Standard for Disinfecting Water Mains



AWWA C901.

Polyethylene (PE) Pressure Pipe and Tubing, ½ Inch – 3 Inch, for Water Service

MassDEP

Guidelines for Public Water Systems (April 2014)

US EPA

In a Guidance Letter dated July 17, 1991, identified as Control # C99 within the Agency Applicability Determination Index, the U.S. EPA determined that “the pumping of grout into buried lines is not a process which, in and of itself, would cause asbestos cement pipe to become regulated asbestos containing material.”





3 Sewer Construction Standards

3.1 General

3.1.1 Description

- A. This Section specifies requirements for a gravity flow sewerage system and pressure sewer system.
- B. The work includes furnishing and installing all pipe, fittings, manholes, structures and appurtenances required for the proposed system to convey sewage by gravity flow conditions. Work when applicable will include furnishing and installing all pipe, fittings, valves and structures for a pressure sewer system.
- C. Work and materials shall be performed in accordance with the State Plumbing Code when work is within ten (10) feet of buildings.

3.1.2 Submittals

- A. Materials List and Shop Drawings
 - 1. The list of materials proposed shall be submitted to the City.
 - 2. Approved shop drawings for all materials (including bricks and mortar) and structures shall be submitted to the City.
- B. As-Built Drawings
 - 1. Submit one (1) copy of As-Built Drawings to the DPW upon completion and acceptance of work.
 - 2. As-Built Drawings shall be complete and shall indicate the true measurement and location, horizontal and vertical, of all new construction. As-Built Drawings shall include a minimum of three (3) ties to each manhole from fixed permanent objects. As-Built drawings shall also contain any additional information required by the municipality and shall be stamped with the seal of a Professional Land Surveyor or Licensed Professional Engineer. The City may, at its discretion, require that as-built plans be submitted on electronic form (e.g., AutoCAD release 2008 or higher).
 - 3. As-Built Drawings shall be filed or stored on property and available for use by DPW for all commercial, industrial, and institutional properties and large residential properties, such as apartment or condominium complexes and assisted or congregate living facilities.
- C. Abandonment Plan
 - 1. Pipes abandoned in place that are greater than 6 inches in diameter shall be abandoned using control density fill and shall be subject to prior DPW approval of an abandonment plan.
 - 2. Pipes abandoned in place that are equal to or less than 6 inches in diameter may be left unfilled.
 - 3. When abandoning asbestos cement pipe care shall be used to prevent pipe material from becoming friable, thereby rendering it as regulated asbestos containing material (US EPA).



- D. Temporary wastewater bypass plans shall be prepared by a registered professional engineer and submitted to DPW for review and approval prior to installation. Bypass plans shall include and consider the following:
1. Proposed schedule for installing, testing, operating, restoring flows to normal conditions, and removing the temporary bypass.
 2. Details of the materials, size, number, and location of temporary facilities including upstream suction manhole and downstream discharge manhole locations, piping layout, bypass pumps, mains, valves, connections, laterals, services, and primary and standby power.
 3. Sewer plugging location(s) and method, type, and quantity of plugs. Spare plugs of the proper size and material shall be stored on site and available at all times of bypass operation.
 4. Primary and backup bypass pump sizes, capacity, and number to be on site, power requirements, and power supply. Pumps shall be either submersible or self-priming type.
 5. All bypass piping and system components shall be watertight and pressure rated for the proposed bypass system operating conditions.
 6. Calculations of flow rate, static head, friction losses, total dynamic head, flow velocity, and pump curves indicating operating range.
 7. Method of noise control for pumps and generators.
 8. Surcharging of upstream flows during bypass shall be minimized at all times. The pumping system may not surcharge the upstream sewer more than 18-inches in the vertical direction as measured from the invert of the existing suction manhole from which bypass pumps are withdrawing wastewater. The suction and discharge manholes shall be frequently monitored by the Contractor to observe flow rate and flow depth conditions in the existing system during bypass operations.
 9. Flow turbulence in the downstream discharge manhole shall be minimized at all times.
 10. All work shall be coordinated with DPW and no construction activity shall commence without a minimum of 48 hours advance notice.
- E. Temporary stone sump systems are not allowed as a temporary wastewater disposal method for service connection flows

3.1.3 Inspection

- A. The Applicant is responsible for the provisions and all test requirements specified in ASTM D3034 for SDR 35 gravity pipe and ASTM D2241 for polyvinyl chloride (PVC) pressure rated sewer pipe. In addition, all PVC pipe may be inspected at the plant for compliance with these specifications by an independent testing laboratory.
- B. Inspection of the pipe may also be made after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though pipe samples may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the site at once.

3.1.4 Delivery, Storage and Handling

- A. All materials shall be adequately protected from damage during transit. Pipes shall not be dropped.



- B. All pipe and other appurtenances shall be inspected before placement in the work and any found to be defective from any cause, including damage caused by handling, and determined by the City to be unrepairable, shall be replaced at no cost to the City.
- C. Storage and handling of pipes, manholes and other sewer system appurtenances shall be in accordance with the manufacturer's recommendations, subject to the approval of the City.

3.2 Materials – Gravity Sewer Systems

- A. The Materials section summarizes the City's standardized components to be used in public and private components that affect the City's sewer system. All materials should conform to the applicable ASTM standards.

3.2.1 Polyvinyl Chloride Pipe (PVC) (Gravity)

- A. Pipe and Fittings: Polyvinyl chloride pipe and fittings (PVC) shall be minimum SDR 35 with full diameter dimensions conforming to the specifications for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, ASTM Designation D-3034, latest revision, for sizes 3 inches to 15 inches. For sizes 18 inches to 48 inches, the pipe shall comply with ASTM F679, latest record.
- B. Pipe color shall be in accordance with Uniform Color Code as established by the American Public Works Association Utility Location and Coordination Council (adopted September 2000).

3.2.2 Couplings

- A. Fittings, couplings, and adaptors for use with the gravity sewer system shall be Romac Industries, Inc. or an approved equal. Saddles for low-pressure sewers shall be bolt-on premier units. They shall have polypropylene bodies, stainless steel fasteners, stainless steel reinforced outlets.
- B. Joints: PVC pipe shall have an integral wall bell and spigot push-on joint with elastomeric gaskets secured in place in the bell of the pipe. The bell shall consist of an integral wall section with a solid cross section elastomeric gasket, factory assembled, securely locked in place to prevent displacement during assembly. Elastomeric gaskets shall conform to ASTM D3212.
- C. Spigot pipe ends shall be supplied with bevels from the manufacturer to ensure proper insertion. Each spigot end shall have an "assembly stripe" imprinted thereon to which the bell end of the mated pipe will extend upon proper joining of the two pipes.
- D. Where petroleum contamination is known or suspected to be in the soil and/or groundwater, nitrile gaskets shall be required.

3.2.3 Ductile Iron Pipe (Gravity) – where required by City

- A. Ductile Iron Pipe: ASTM A746, Extra Heavy type, bell and spigot end, with Inderon Protecto 401 ceramic epoxy lining or equivalent applied per manufacturer's recommendation.
- B. Ductile Iron Pipe Joint: ANSI A21.11, rubber gasket joint.
- C. Where petroleum contamination is known or suspected to be in the soil and/or groundwater, nitrile gaskets shall be required.

3.2.4 Cast Iron Pipe (Gravity) (For Plumbing Code Areas Only)

- A. Cast Iron Soil Pipe: ANSI/ASTM A74, Extra Heavy type, bell and spigot end, inside to be asphalt coated per manufacturer standard.
- B. Cast Iron Pipe Joint: ASTM C564, rubber gasket joint devices.



- C. Transitions between different gravity pipe sizes shall be accomplished by using Femco or approved equal flexible eccentric reducing couplings with stainless steel bands. Completed pipelines shall be free of deviations from grade. Visible leaks, broken pipes, etc., shall be repaired or replaced.
- D. Fittings for pressure sewer pipe shall be of similar style and material to match the force main material (PVC or DI). Bells shall be gasketed joint conforming to ASTM D3139 with gaskets conforming to ASTM F477. Gasket material shall be equal to that specified for pipe.

3.2.5 Cleanouts

- A. The sewer cleanouts shall be minimum 6-inch diameter or sized to match the service pipe, whichever is greater. The cleanouts shall be either stubbed 6 inches above surface grade, or completed at finish grade if contained within a hand hole clearly marked "SEWER" per Standard Detail S-3.2.0. Cleanouts shall include a water-tight cap.

3.2.6 Manholes

- A. All precast concrete manholes shall conform to the ASTM "Specifications for Precast Reinforced Concrete Manhole Sections," Designation D478. The barrel shall be 4-foot or 5-foot diameter at the City's discretion. The precast structures shall be manufactured with 4,000 psi minimum compressive strength concrete, with eccentric cone section tapering to 30-inch diameter, or flat top, and one pour monolithic base section conforming to ASTM C478. All units to be designed for HS-20 loading.
- B. Precast Unit Joint: Butyl rubber section joint conforming to ASTM C443.
- C. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.
- D. Manhole frames and covers shall be minimum Class 25 conforming to ASTM "Standard Specification for Gray Iron Castings," Designation: A48. Manhole frame shall have a clear opening of 24 inches and be a minimum of 6 inches in height. The surface of the covers for manholes that will not become the property of the City of Framingham shall have a diamond pattern with the word "SEWER" cast thereon for sanitary sewers. For sewer systems that will become the property of the City, the sewer manholes shall include the words "FRAMINGHAM SEWER." Watertight manhole covers shall be secured with six (6) stainless steel bolts and have a watertight gasket. The frame and cover shall be watertight up to 15 psig external pressure.
- E. All manholes frames and covers shall be manufactured by East Jordan Iron Works (formerly LeBaron Foundry Co.) or an approved equal.
- F. The top of cone shall be constructed of red brick or reinforced concrete grading rings for adjusting frame to match finished surface. Manhole frame shall be flush with grade using a minimum of two (2) and a maximum of five (5) brick courses. Elevations greater than 6 inches vertical may include riser rings designed for that purpose. Brick shall conform to sewer bricks (made from clay) ASTM designation C32, Grade MS.
- G. Curve side inverts and layout main inverts (where direction changes) shall be constructed with smooth curves of longest possible radius tangent to adjoining pipelines centerline. All inverts shall be constructed with 4,000 psi concrete in void areas and with sewer brick. Brick shall conform to sewer bricks (made from clay) ASTM designation C32, Grade SS.

All sewer inverts are to be constructed once the manhole is installed. Manhole inverts built above ground will not be accepted.



- H. Mortar shall be in conformance with ASTM C270, Type M. The mortar shall be composed of Portland cement hydrated lime, and sand, in the proportions of 1 part cement to ¼ part hydrated lime to 3 ½ parts sand, by volume.
- I. Cement shall be Type I or II Portland cement conforming to ASTM C150, Standard Specification for Portland Cement. Where masonry is exposed to salt water, Type II shall be used.
- J. Hydrated lime shall be Type S conforming to ASTM D207.
- K. Sand for masonry mortar shall conform to the gradation requirements of ASTM C144.
- L. All drop manholes will be of the external type. The drop pipe shall be constructed of minimum SDR 35 PVC. The drop piping and horizontal cleanout sections will be sized the same as the sewer main piping and shall enter the manhole at invert elevation. The drop portion of the piping shall be secured with anchor straps. The drop piping shall be encased with control density fill.
- M. Manhole Pipe Connections: Flexible sleeve or rubber gaskets shall be Lock Joint, Kor-n-Seal, A-Lok, or approved equivalent.
- N. Manhole covers shall be watertight when placed in the 100-year flood plain areas or as determined by DPW, and as specified in federal, state and local regulations.

3.2.7 Manholes & Sewer Structures – Bitumastic Coatings

- A. The entire exterior surface of all masonry and concrete (whether precast or cast-in-place) structures associated with sewerage systems, such as: manholes, grease traps, holding tanks, tight tanks, septic tanks, aeration tanks, pump stations, valve pits, etc., shall receive two coats of waterproofing such as Carboline Bitumastic 300M as manufactured by SOMAY Products, Inc., Miami, FL; Sonnoshield HLM 5000 as manufactured by Sonneborn, Shakopee, MN or approved equal at a minimum thickness of 7 mils per coat and a total thickness of 14 mils; however, in no case shall the thickness per coat be less than that recommended by the manufacturer.

3.2.8 Sewer Piping Connections

3.2.8.1 Service Connections

- A. Gravity service connections shall be minimum 6 inch PVC. All connections into sewers shall be by wyes, T-wyes, or a Romac saddle, and couplings manufactured for use with the same type of pipe. Service connections made using saddles and tapping sleeves shall be allowed only when authorized by the DPW. All service connections shall have a slope between 2 and 6 percent. Service connections that have a vertical drop of 4 feet to 12 feet between the house sewer invert at the street and the main sewer invert shall be by sloped line using 22-degree or 45-degree angle connectors to allow snakes and rods to clean the line between the house and the main sewer.
- B. For grinder pump to gravity sewer connections, the service connections shall be minimum 2-inch DI or SDR 21 PVC. Check valves shall be Y-pattern commercial bronze valves.
- C. On private projects, portions of existing service piping to remain shall be video inspected prior to verify pipe condition, ensure integrity, and limit infiltration. Service piping video shall be provided to DPW for review prior to approval of existing piping reuse.
- D. Use of Inserta Tee service connectors may be allowed upon specific approval by DPW.



3.3 Execution – Gravity Sewer Systems

- A. This section summarizes the DPW's standardized methods for the installation and maintenance of certain aspects of the sewer system. All procedures should be performed consistent with ASTM standards.

3.3.1 Piping

- A. The minimum pipe diameters for gravity building sewers and public sewers shall be six and eight inches, respectively. All pipes shall be designed based on the standards established in the Water Environment Federation/American Society of Civil Engineers *Manual of Practice No. FD-5, Gravity Sanitary Sewer Design and Construction*, latest edition, and New England Interstate Water Pollution Control Commission, *Guides for the Design of Wastewater Treatment Works, Technical Report # 16*, latest edition, and sound engineering principals.
- B. Pipe shall be handled in an approved manner, using slings or other approved devices. No pipe shall be dropped from trucks or into trenches.
- C. Pipe shall be laid accurately to line and grade in three-quarter (3/4") crushed stone. The depth of the crushed stone shall be one half (1/2) the diameter of the pipe under the main and one half (1/2) the diameter of the pipe over the main or 6 inches both under and over the pipe, whichever is greater. Stone shall be placed in layers not over six inches thick, and each layer shall be thoroughly compacted by tamping and chinking on each side of pipe to provide uniform support.
- D. Backfill material placed above the bedding material and below the roadway foundation shall conform to 6.3.1. Roadway foundation and surface restoration shall conform to Section 5, Roadway Construction Standards, and Section 6, Existing Road Openings, as applicable.
- E. Impervious material may be required on service connections for a distance 10 feet from the inside wall of the foundation to where crushed stone can start. Pipe shall be laid with the spigot end pointing in the direction of the flow.
- F. Sewer pipe shall be laid at a minimum of ten feet from the water main. Should local conditions prevent a lateral separation of ten feet, a sewer may be laid closer than ten feet from a water main if:
- Approved by DPW
 - It is laid in a separate trench.
 - The sewer is encased in concrete, unless otherwise approved by DPW.
 - The elevation of the top (crown) of the sewer is at least 18 inches below the bottom (invert) of the water main. The sewer pipe shall be laid such that the pipe joints are equidistant and located as far as possible from the water main crossing. See Section 3.3.1.2.H for additional requirements.
- G. Sewer pipe shall be laid at a minimum of 5 feet horizontally from a drainage main and 18 inches vertically from a drainage main (see 4.3.7)
- H. Sewer pipe shall have a minimum cover of 3 feet unless otherwise approved by DPW.

3.3.1.1 Gravity Main

- A. The connection of the building sewer to the public sewer shall be made at the "Y" branch, if such branch is available at a suitable location. Lateral stubs or stubs for future sewer extensions shall be capped watertight until permanent connections are completed. All lateral stubs shall be approved by the City prior to installation. If no branch is available, a connection may be made by tapping the public sewer by an approved method, then inserting an approved cast iron, ductile iron,



stainless steel or PVC “Y” or “T” saddle with stainless steel mounting bands or other approved connection device. Cutting a hole in the public sewer by hand is prohibited.

- B. All sewer mains shall be laid with a straight alignment between manholes. When tying into an existing manhole, the manhole wall shall be cored and an insert installed for water-tightness.

3.3.1.2 Pipe Installation

- A. All sewer pipes shall be laid accurately to the lines and grades shown in the Drawings and in conformance with pipe manufacturer’s recommended procedures.
- B. Notch under pipe bells and joints, where applicable, to provide for uniform bearing under entire length of pipe.
- C. Laying Pipe: Each length of pipe shall be laid with firm, full and even bearing throughout its entire length, in a prepared trench. Pipe shall be laid with bells upgrade unless otherwise approved by the Engineer. Do not permanently support pipes on bells.

Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. The interior of the pipe and the jointing seal shall be free from sand, dirt and trash. Extreme care shall be taken to keep the bells of the pipe free from dirt and rocks so that joints may be properly lubricated and assembled. No pipe shall be trimmed or chipped to fit.

No length of pipe shall be laid until the proceeding lengths of pipe have been thoroughly embedded in place, to prevent movement or disturbance of the pipe alignment.

All piping shall be laid in the dry with the spigot ends pointing in the direction of flow. Installation shall proceed from the downstream to upstream in all cases.

Refer to pipe installation details?

- D. Pipe Extension: Where an existing pipe is to be extended, the same type of pipe shall be used, unless otherwise approved by the Inspector.
- E. Full Lengths of Pipe: Only full lengths of pipe shall be used in the installation except that partial lengths of pipe may be used at the entrance to structures, and to accommodate the required locations of service connection fittings.
- F. Pipe Entrances to Structures: All pipe entering structures shall be cut flush with the inside face of the structure, and cut ends of the pipe surface within the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges or imperfections that will impede or affect the hydraulic characteristics of the sewage flow. The method of cutting and finishing shall be subject to the approval of the Inspector.
- G. Protection During Construction: The Applicant shall protect the installation at all times during construction, and movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be performed at the Applicant’s risk.

At all times when pipe laying is not in progress, all open ends of pipes shall be closed by approved temporary water-tight plugs. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been dewatered and all danger of water entering the pipe eliminated.

- H. Water Pipe – Sewer Pipe Separation: When a sewer pipe crosses above or below a water pipe, the following procedures shall be utilized. The Applicant shall comply with the following procedures: reference detail S 3.5.0

1. Relation to Water Mains:



- a. *Horizontal Separation:* Whenever possible, sewers shall be laid at a minimum at least 10 feet 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:
 - i. It is laid in a separate trench, or if
 - ii. It is laid in the same trench with the water mains located at one side on a bench of undistributed earth, and if
 - iii. In either case, the elevation of the top (crown) of the sewer is at least 18 inches below the bottom (invert) of the water main.
 - b. *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 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 reconstructed with mechanical-joint pipe for a distance of 10 feet on each side of the sewer. One full length of the water main should be centered over the sewer so that both joints will be as far from the sewer as possible.

When it is impossible to obtain horizontal and/or vertical separation as stipulated above, pipes shall be pressure tested by an approved method as described in Section 3.3.2 to assure watertightness or both pipes shall be encased in control density fill (CDF). Further, any ductile or cast iron shall be double wrapped in 6. mil polyethylene plastic.
- I. Sewer Pipes-Laser Installation: Sewer pipes shall be laid to required grades by use of a laser and target system, unless otherwise specifically approved in writing by engineer.

3.3.1.3 Pipe Joints

- A. All joints shall be made water-tight.
- B. Pipe shall be jointed in strict accordance with the Pipe manufacturer's instruction. Jointing of all pipe shall be done entirely in the trench.
- C.
 1. Lubricant for jointing of PVC pipe shall be applied as specified by the pipe manufacturer. Use only lubricant supplied by the pipe manufacturer.
 2. PVC Pipe shall be pushed home by hand or with the use of bar and block. The use of power equipment, such as a backhoe bucket, shall only be used at the direction of the manufacturer.
 3. Field-cut pipe ends shall be cut square and the pipe surface beveled to the size and shape of a factory-finished beveled end. All sharp edges shall be rounded off.
- D. Jointing of Ductile Iron and Cast Iron Pipe shall be in accordance with Section 2, Water Construction Standards.
- E. Bentonite collars shall be placed every 500 feet on sewer lines placed in the groundwater table that are more than 1200 feet in length. Collars shall extend to the width and height of the stone bed.

3.3.1.4 Manholes

- A. General Requirements: All manholes shall be built in accordance with the Details and in the locations shown on the City of Framingham Details.
- B. Structures shall be constructed of precast concrete.
- C. All masonry shall be installed by personnel experienced and skilled in this work, and any person not deemed to be such by the Engineer shall be removed and replaced by a person so qualified.



- D. Manholes shall be constructed as soon as the pipe laying reaches the location of the manhole. Should the Applicant continue pipe laying without making provision for completion of the manhole, the Engineer shall have the authority to stop the pipe laying operations until the manhole is completed.
- E. The Applicant shall accurately locate each manhole and set accurate templates to conform to the required line and grade. Any manhole which is mislocated or oriented improperly shall be removed and rebuilt in its proper location, alignment and orientation at no additional cost to the Owner.
- F. Foundations: All manholes shall be constructed on a 12-inch layer of compacted bedding material. The excavation shall be dewatered to provide a dry condition while placing bedding material and setting the base.
- G. Inverts: Brick invert channels shall be constructed in all manholes to provide a smooth channel for sewage flow through the structure, and shall correspond in shape to the lower half of the pipe. At changes in directions, the inverts shall be laid out in curves of the longest possible radii tangent to the centerline of the sewer pipes at the manhole side. Brick shelves shall be constructed to the elevation of the highest pipe crown and sloped to drain toward the flow channel. Only red sewer brick shall be used for any invert, brick shelves and manhole frame adjustments. Brick shall comply with ASTM Standard Specification for Sewer Brick (made from clay or shale), Designation C32, for Grade SA, hard brick.

Special care shall be taken in laying brick inverts. Joints shall not exceed three-sixteenth inch in thickness and each brick shall be carefully laid in full cement mortar joints on bottom, side and end in one operation. No grouting or working in of mortar after laying of the brick will be permitted. Bricks forming the shaped inverts in manholes shall be laid on edge.

Invert channels shall be built for future extensions where shown on the Drawings and where directed by the Engineer.

Inverts shall not be built above ground. All inverts shall be built with the manhole in place (i.e. at the design elevation) and with all pipes installed.

- H. Precast Manholes: Precast manholes shall be installed only after Shop Drawings have been approved.
- I. The top grade of the precast concrete cone section shall be set sufficiently below finished grade to permit a maximum of five and a minimum of two courses (laid in the flat position) of eight inch brick to be used as risers to adjust the grade of the manhole frame. Manhole frames shall be set on a grout pad to make a water-tight fit.
- J. Grout fill lifting holes on all manhole sections.

3.3.1.5 Connections to Existing Facilities

- A. General Requirements: The Applicant shall make all required connections of the proposed sewer into existing sewer system, where and as shown on the Drawings and as required by the Engineer.
- B. Applicant to verify the location, size, invert and type of existing pipes at all points of connection prior to ordering new utility materials.
- C. Compliance with Requirements of Owner of Facility: Connections into existing sewer facilities shall be performed in accordance with the requirements of the Owner of the facility. The Applicant shall comply with all such requirements, including securing of all required permits, and paying the costs thereof.



3.3.1.6 Manhole Connections

- A. Manhole pipe connections for precast manhole bases may be accomplished by any method described below. The Applicant shall make sure that the outside diameter of the pipe is compatible with the particular pipe connection used.
1. A tapered hole filled with non-shrink waterproof grout after the pipe is inserted. This connection method will not be allowed when connecting PVC pipe to manholes.
 2. The LOCK JOINT Flexible Manhole Sleeve cast in the wall of the manhole base. The stainless steel strap and exposed sleeve shall be protected from corrosion with a bitumastic coating.
 3. PRESS WEDGE II gasket cast into the wall on the manhole base. The rubber wedge shall only be driven into the V slot from the outside of the manhole.
 4. The RES-SEAL, a cast iron compression ring which compresses a rubber "O" ring gasket into a tapered hole in the wall of the manhole base. Exposed metal shall be protected from corrosion with a bitumastic coating.
 5. KOR-N-SEAL neoprene boot cast into the manhole wall. The stainless steel clamp shall be protected from corrosion with a bitumastic coating.
- B. Sewer manholes shall be constructed with drop connections when the proposed invert of the connection is at least 2 feet above the manhole invert. Drop connections for differences of less than 2 feet shall also be provided if required by the City.

3.3.1.7 Service Connections Refer to detail?

- A. General Requirements: The Applicant shall make all required connections of the building sewer service pipes into the sewer system. Work shall include making the service pipe connections into the sewer system pipes or into the manholes located ten (10) feet outside of the proposed building lines. If stubs are constructed for later connection to the building pipes, the ends shall be sealed with watertight plugs.
- B. Coordination with Building Applicant: The Applicant shall coordinate the work with the work of the Building Applicant to determine the exact location and elevation of the point of entry into the building.
- C. Connection into Sewer System: Sewer service pipe connections to the pipe of the sewer system shall be made with fittings supplied by the pipe manufacturer.
- The Applicant shall install 45 degree wye branch or 90 degree tee fittings in the sewer pipes at all locations where building sewer service pipe connections are shown on the Drawings. Connections of the sewer service pipes shall be made into the wye branches or tees by means of 45 degree bends. The connections shall be made thoroughly watertight and concrete shall be placed under each connection to bear on undisturbed earth and firmly support the connection. Sewer chimneys shall be encased in concrete unless directed otherwise by the City.
- D. Any sewer lateral that contains a 45-degree (45°) bend or greater shall require a manhole. Alternative connections shall be allowed only if reviewed and approved by DPW.

- 3.3.1.8 E. Chimney drop sewer services shall only be allowed where the depth of the mainline sewer crown is more than 12-feet from the ground surface. Installation of chimney when the mainline crown is less than 12-feet deep will not be allowed without the prior review by DPW. Service connections shall preferably be installed utilizing the most direct (shortest) route from building to**



main. Services should be laid out to run perpendicular to the main. Refer to standard installation details for materials and requirements? Rehabilitation of Sewers with Cured-In-Place Pipeliners

- A. Pipeline rehabilitation using cured in place pipeliners (CIPP) may be approved by DPW for existing public sewers 8-inches in diameter and greater. CIPP rehabilitation of public sewers less than 8-inches in diameter is not permitted.
- B. The CIPP shall conform to the provisions and all test requirements specified in ASTM D790 – Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Insulating Materials, ASTM F1216 – Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube, and ASTM F2561-11 Standard Practice for Rehabilitation of a Sewer Service Lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-in-Place Liner.
- C. The CIPP shall be designed based on a fully deteriorated condition of the existing host pipe in which it is assumed that the existing host pipe provides no structural support. The CIPP shall be designed to carry soil, groundwater, and other superimposed loads.
- D. The CIPP shall be designed in accordance with ASTM F1216 under the following conditions:
 - 1. Fully deteriorated host pipe
 - 2. Height of groundwater above pipe invert = Ground surface elevation
 - 3. Height of soil above pipe = Final design ground surface elevation
 - 4. Life Load = AASHTO HS-20
 - 5. Soil density = 120 lbs. / cubic foot
 - 6. Ovality = 2% to 8%
- E. The applicant shall prepare and submit a design submittal prepared and stamped by a registered professional engineer that includes the following:
 - 1. Description of materials and product samples
 - 2. Design parameters
 - 3. Installation process
 - 4. Long term creep data, testing duration 10,000 hours minimum
 - 5. Proposed flexural modulus and flexural strength
 - 6. Proposed wall thickness supported by design calculations
 - 7. Bypass pumping plan
 - 8. Installer’s qualifications and relevant experience
- F. The existing sewer shall be cleaned and closed circuit television inspected prior to the CIPP installation to prepare the host pipe and locate the existing service connections.
- G. Installation, curing, cool down, finish, and sealing at manhole and service connections shall conform to CIPP manufacturer’s requirements. Curing shall be performed using steam unless otherwise approved by DPW and MWRA.
- H. All service connections shall be reinstated after the CIPP is installed to no less than 95% of the existing service connection diameter and ground or brushed as required to form a neat lateral



opening free of any jagged edges, lips, or protuberances. All service connections shall be grouted to prevent infiltration from the edge of lined sewer main to a minimum distance of 3 feet up the service connection.

- I. Post construction acceptance testing of the rehabilitated sewer shall conform to manufacturers requirements, ASTM D5813-04 (2012 or latest edition) - Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems, and the requirements of Section 3.3.2.
- J. For each separate manhole to manhole segment of CIPP installed, at least one sample shall be prepared and tested in accordance with ASTM F1216 and ASTM D790. A “restrained” sample shall be taken for pipes 18-inches or less in diameter. A “flat plate” sample shall be taken for pipes more than 18-inches in diameter. The proposed testing laboratory shall be submitted for approval to DPW. Samples shall be tested to verify that the flexural modulus, flexural strength, and wall thickness of the CIPP are at least equal to the parameters proposed in the approved design submittal.

3.3.2 Testing of Public Sewer

- A. If the visual inspection of the completed sewer or any part thereof shows any pipe, manhole or joint which allows infiltration of water, the defective work or material shall be replaced or repaired as directed. After completing installation and backfill of sewer pipe to the satisfaction of the DPW, the applicant shall conduct a line acceptance test under the following procedures.

3.3.2.1 Gravity Main

- A. All gravity sewers that will become the property of the City of Framingham shall undergo mandrel testing, televised inspection and, as directed by the City, pressure testing. All televised inspections shall be recorded and provided to the City in digital format.
- B. Pressure Testing Gravity Sewers – After a manhole to manhole reach of pipe has been backfilled and cleaned, pneumatic plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches four psig greater than the average back pressure of any groundwater that may be over the pipe. A minimum two minutes shall be allowed for the air pressure to stabilize. After the stabilization period (3.5 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed “Acceptable” if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any groundwater that may be over the pipe), shall not be less than the time shown for the given diameters as indicated in the Uni-Bell PVC Pipe Association’s, Handbook of PVC Pipe, current edition.

If testing is not feasible between manholes due to live sewer service connections the contractor shall conduct low pressure air testing at each pipe joint.



Pipe Diameter (inches)	Minimum Time (min:sec)	Allowable Maximum Length (L = ft) for Minimum Time	Time for Longer Length (sec)
8	3:46	597	0.380L
10	5:40	398	0.854L
12	7:34	298	1.520L
15	14:10	159	5.342L
18	17:00	133	7.692L
24	22:40	99	13.674L
30	28:20	80	21.366L
36	34:00	66	30.768L
42	39:48	57	41.883L
48	45:34	50	54.705L

Vacuum testing of service connections may be required as directed by the City.

- C. Deflection testing shall be performed on all flexible pipes. The tests shall be conducted after the final backfill has been in place for at least 30 days to allow for stabilization. Pipe shall be installed so there is no more than a maximum deflection of five (5.0) percent. Deflection testing shall be performed using a specially designed gauge assembly (mandrel) pulled through the complete section. The gauge assembly shall have a diameter of not less than 95 percent of the base inside diameter or the average inside diameter as specified by ASTM. The pipe shall comply with ASTM D2122, Standard Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings. The deflection test shall be performed without mechanical pulling devices. Other testing methods such as electronic deflectometers, calibrated video cameras, or laser profilers must be submitted for review and approval by DPW prior to use.

3.3.2.2 Manholes

- A. All tests shall be observed by a representative of the DPW and the Applicant on each manhole. Manholes shall be tested by vacuum methods [see below].
- B. Vacuum Testing of Manholes – Leakage tests for four and five foot diameter manholes may be made using vacuum testing equipment. This type of test may be used only immediately after assembly of the manhole and only prior to backfilling. The manhole to pipe connection should only be a flexible connector. All lift holes shall be plugged with a non-shrinking mortar. For this test, each four or five foot diameter manhole shall be tested under 10 inches of Hg vacuum. Manholes shall be vacuum tested per ASTM C1244 – 11. Manholes shall be prepared by plugging all lift holes and pipes entering the manhole. Care shall be taken to securely brace the pipes and plugs to prevent them from being drawn into the manhole. The test head shall be placed at the top of the manhole in accordance with manufacturer's recommendations and a vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 in. of mercury. The manhole shall pass if the time for the vacuum reading to drop from 10 in. of mercury to 9 in. of mercury



meets or exceeds the values indicated in the table below. If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a passing test is obtained.

Depth (feet)	Testing Time (Seconds) for 48 and 60-Inch Diameter Manhole (inches)	
	48-Inch	60-Inch
8 (and less)	20	26
10	25	33
12	30	39
14	35	46
16	40	52
18	45	59
20	50	65
22	55	72
24	59	78
26	64	85
28	69	91
30	74	98

All excess material including dirt, loose concrete, bricks, grit, stones and any other material, shall be removed from all manholes prior to final acceptance by DPW.

3.3.2.3 Pipe and Structure Abandonment

- A Pipes left in place that are greater than 6 inches in diameter shall be filled with CDF regardless of material (e.g., DI, PVC).
- B Pipes left in place that are equal to or less than 6 inches in diameter may be left unfilled.
- C Structures left in place shall be demolished down to five feet below ground surface, the bottom shall be cracked and compacted, and the remaining structure filled with CDF. Demolition debris shall be removed, and the area regraded and compacted over the filled structure.

3.4 General – Pressure Sewers

- A. Whenever possible, the force main will be designed on a continuous slope so that no “high points” exist, which may result in entrapment of gases and so that no “low points” exist which may induce settlement of solids. If unavoidable, all “high points” will have an air/vacuum release valve, and “low points” will have a cleanout. Details for these appurtenances will be provided and they will be accessible for maintenance without the need for excavation. During backfill, a polyethylene warning tape will be buried two feet below the ground surface along the entire length of the force main. Restrained joints on the force main should be used in place of thrust blocks.
- C. The Work of this section includes the installation of a new sewage pump station and pressure sewer as shown on the Drawings and specified herein.
- D. Work under this section shall comply with federal, state, and local requirements for the design, installation, testing, and certification of an operational sewage pump station and pressure sewer



system. The Applicant shall be required to submit Shop Drawings, and Equipment cut sheets for items specified and required in this Section.

- E. Work shall comply with local, state and federal electrical codes to provide watertight and corrosion resistant installations. Electrical junctions of any kind are prohibited within the confines of the wet well.
- F. Work shall comply with the Commonwealth of Massachusetts Plumbing Code.
- G. Pipe color shall be in accordance with Uniform Color Code as established by the American Public Works Association Utility Location and Coordination Council (adopted September 2000).
- H. All pressure sewers and force mains shall be constructed of DI or SRD 21 (pressure rated) PVC. Reference the appropriate AWWA standards latest version for tightness testing. At minimum, all force mains shall be pressure tested with minimum pressure of 150 psi for minimum two hours.

3.5 Materials – Pressure Sewers

3.5.1 Pressure Sewer Pipe and Fittings

- A. Polyvinyl Chloride (PVC) Plastic Pipe and Fittings:
 - 1. Size 2 inch to 12 inch diameter, SDR 21, ASTM D-2241, with material per ASTM D-1784, Grade 1, Type 1.
 - 2. Push on joint, bell and spigot type with pressure rating of 200 psi.
 - 3. Joints to meet ASTM F477 and tested to ASTM D-3139 standard.
 - 4. Install at locations and sizes indicated on drawings.
- B. Ductile Iron Pipe and Fittings:
 - 1. Pipe size 4 to 12 inches diameter, push-on joint, pressure Class 350, ANSI/AWWA C150/A21.50, inside epoxy coating per manufacturer standard.
 - 2. Pipe size 12 to 24 inches diameter, push-on joint, pressure Class 250, ANSI/AWWA C150/A21.50, inside epoxy coating per manufacturer standard.
 - 3. Fittings, size 4 to 12 inches diameter, pressure Class 350, ANSI/AWWA C153/A21.53, push-on joints per ANSI/AWWA C111/A21.11.
 - 4. Gaskets shall conform to ANSI/AWWA C111/A21.11. Restrained joints shall be provided by a field lock gasket supplied by the manufacturer of the pipe for that purpose. (U.S. Pipe – “FIELDLOK”, Clow – “SUPER-LOCK,” or U.S. Pipe – “TRFLEX”).
 - 5. Pipe and fittings to have an outside coating of asphaltic material per ANSI/AWWA C153/A21.53 and ANSI/AWWA C110/A21.10.
 - 6. Valves and fittings to have an inside coating of epoxy lining applied in accordance with AWWA C550.
- C. Flanged Ductile Iron Pipe and Fittings:
 - 1. Pipe and fitting sizes 3 inches to 24 inches, pressure Class 250 psi, per ANSI/AWWA C115 A21.15 with asphaltic coating outside and epoxy coated inside.
 - 2. Flange bolt circle and holes per ANSI/AWWA/C115/A21.15.
 - 3. Gaskets per ANSI/AWWA C111/A21.11.



4. Flange adapters to push-on joint pipe sections shall be supplied by the manufacturer of the pipe.

3.5.2 Couplings and Connectors

- A. Sleeve Type, Buried:
 1. Cast iron or epoxy coated steel, middle rings, ASTM A513
 2. Reducer type where required
 3. Followers, two steel rings epoxy coated
 4. Bolts ANSI 21.11/AWWA C111, galvanized
 5. Two wedge section compressible gaskets
 6. Dresser Manufacturing Co. – Style 38, 162, or 128 as appropriate
- B. Sleeve Type, Exposed:
 1. Steel middle ring, shop prime.
 2. Reducer type for different pipe sizes.
 3. Two steel follower rings.
 4. Two wedge section compressible gaskets.
 5. Steel bolts.
 6. Dresser Manufacturing Co., Style 38.
- C. Flexible Connectors:
 1. Do not use rubber or elastomeric PVC type flexible couplings to connect pressure sewers.
 2. Material shall be compatible with pipes being joined.
 3. Maximum allowable deflection per joint shall be 15 degrees or per manufacturer's recommendation, whichever is less.
 4. Stainless steel metal retaining rings.
 5. Use suitable retaining control rods.
- D. Air Release and Drain Manholes:
 1. Precast concrete sections with a one-pour monolithic base in accordance with ASTM C478.
 2. Air Release and Air and Vacuum Release Valves of size and type specified herein are to be able to fit into structure with ample room for access and maintenance of these units.

3.5.3 Air Release Valves

- A. Air Release and Vacuum Valve shall be similar to a Clow F 3077, Valmatic VM-49BW.3 or approved equivalent, threaded joint end, valve with cast iron body and bronze body seat, all in accord with APCO 400 Sewage Valves with a working pressure of 150 psi. ASTM A48, Class 30 and ASTM B62.

Air Release and Vacuum Valve shall be installed in the Air Release chamber as shown along the pressure pipe and at any high points constructed due to changes in the pressure pipe route or elevations.



3.5.4 SDR 21 PVC Force Main, Flange Adapter and Thrust Blocks

- A. Joints
 - 1. All joints are to be made water-tight in accordance with the requirements specified herein.
 - 2. Pipe shall be jointed in strict accordance with the pipe manufacturer's instruction. Jointing of all pipe shall be done entirely in the trench.
 - 3. Lubricant for jointing of ball and spigot PVC pipe shall be applied as specified by the pipe manufacturer. Use only lubricant supplied by the pipe manufacturer.
 - 4. Ball and spigot PVC Pipe shall be pushed home by hand or use of bar and block. The use of power equipment such as a backhoe bucket is not recommended and shall only be used at the direction of the manufacturer.
 - 5. To join field-cut pipe, pipe shall be cut square. The cut end of the pipe surface shall be properly beveled to the size and shape of a factory-finished beveled end. All sharp edges shall be rounded off.

3.6 Execution – Pressure Sewers

3.6.1 Sleeve Couplings

- A. Thoroughly clean pipe ends for a distance of 8 inches from the ends prior to installing couplings, and use soapy water as a gasket lubricant.
- B. Slip a follower ring and gasket (in that order) over each pipe and place the middle ring centered over the joint.
- C. Insert the other pipe length into the middle ring the proper distance.
- D. Press the gaskets and followers evenly and firmly into the middle ring flares.
- E. Insert the bolts, finger tighten and progressively tighten diametrically opposite nuts uniformly around the adapter with a torque wrench applying the torque recommended by the manufacturer.
- F. Insert and tighten the tapered threaded lock pins.
- G. Insert the nuts and bolts for the flange, finger tighten and progressively tighten diametrically opposite bolts uniformly around the flange applying the torque recommended by the manufacturer.

3.6.2 Piping

- A. The minimum pipe diameters for pressure building sewers shall be two inches. All pipe should be sized based on sound engineering principals.
- B. Pipe shall be handled in an approved manner, using slings or other approved devices. No pipe shall be dropped from trucks or into trenches.
- C. Pipe shall be laid accurately to line and grade in three-quarter (3/4") crushed stone. The depth of the crushed stone shall be one half (1/2) the diameter of the pipe under the main and one half (1/2) the diameter of the pipe over the main or 6 inches both under and over the pipe, whichever is greater. Stone shall be placed in layers not over six inches thick, and each layer shall be thoroughly compacted by tamping and chinking on each side of pipe to provide uniform support. Impervious material may be required on service connections for a distance 10 feet from the inside wall of the foundation to where crushed stone can start. Pipe shall be laid with the spigot end pointing in the direction of the flow.



- D. Sewer pipe shall be laid at a minimum of ten feet from the water main. Should local conditions prevent a lateral separation of ten feet, a sewer may be laid closer than ten feet from a water main if:
- Approved by DPW
 - It is laid in a separate trench.
 - The elevation of the top (crown) of the sewer will be at least 18 inches lower than the bottom (invert) of the water main.
- E. Sewer pipe shall be laid at a minimum of 5 feet horizontally from a drainage main and 18 inches vertically from a drainage main (see 4.3.7)

3.6.3 Testing Pressure Sewer Pipe

- A. Except as otherwise directed, pressure sewers (force mains) shall be given combined pressure and leakage tests in sections of approved length. The Applicant shall furnish and install suitable temporary testing plugs or caps; necessary pressure pumps, pipe connections, meters, gauges, gates, and other necessary equipment; and required labor. The Owner and Engineer shall have the option of using their own gauges.
- B. Subject to approval and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Applicant may make the tests when he desires. However, pipelines in excavation or embedded in concrete shall be tested after the backfilling of the excavation or curing of the concrete and exposed piping shall be tested prior to field painting.
- C. The section of pipe to be tested shall be filled with water of approved quality, and air shall be expelled from the pipe. If blow offs are not available at high points for releasing air, the Applicant shall make the necessary excavations and do the necessary backfilling and make the necessary taps at such points and shall plug said holes after completion of the test.
- D. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
- E. The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test corrected to the gage location) to the pressure rating of the pipe or alternately, to two times the maximum calculated operating pressure of the pipe, as approved by the Engineer. If the Applicant cannot achieve the specified pressure and maintain it for a period of one hour, the section shall be considered as having failed the test.
- F. Following or during the pressure test, the Applicant shall make a leakage test by metering the flow of water into the pipe while maintaining in the section being tested a pressure equal to the pressure rating of the pipe. If the average leakage during the two-hour period exceeds a rate of leakage indicated in AWWA Section C600 per 24 hours per mile of pipeline, the section shall be considered as having failed the leakage test.
- G. If the section fails to pass the pressure and leakage test, the Applicant shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test.
- H. If, in the judgment of the City of Framingham, it is impracticable to follow the foregoing procedure exactly for any reason, modifications in the procedure shall be made as approved, but in any event the Applicant shall be responsible for the ultimate tightness of the line within the above leakage and pressure requirements. Passing the test does not absolve the Applicant from his responsibility if leaks develop later within the period of warranty.



- I. The sewer lines shall be inspected via closed-circuit television (CCTV) after completion with a 2 gpm flow of water to reveal pipe bellies. The remote camera shall also pan to view up the service connections to the Fernco fitting.

3.6.4 Pipe and Structure Abandonment

- A. Pipes left in place that are greater than 6 inches in diameter shall be filled with CDF regardless of material (e.g., DI, PVC), except for AC pipe. Pipes left in place that are equal to or less than 6 inches in diameter may be left unfilled.
- C. Structures left in place shall be demolished down to five feet below ground surface, the bottom shall be cracked and compacted, and the remaining structure filled with CDF. Demolition debris shall be removed, and the area regraded and compacted over the filled structure.
- D. In a guidance letter dated July 17, 1991, Identified as Control # C99 within the Agency Applicability Determination Index, the U.S. EPA determined that "the pumping of grout into buried lines is not a process which, in and of itself, would cause asbestos cement pipe to become regulated asbestos containing material." Therefore when abandoning asbestos cement pipe, care shall be used to prevent pipe material from becoming friable, thereby rendering it as regulated asbestos containing material.

3.7 Grease Traps

3.7.1 Exterior Grease Traps

- A. Exterior grease traps shall be designed by a registered Professional Engineer. The plans shall be stamped and include the design criteria and calculations used to size the grease trap.
- B. Grease traps shall be sized in accordance with Massachusetts Uniform State Plumbing Code 248 CMR 10.00 and shall have a minimum capacity of 1,000 gallons. The grease trap shall be sized to provide a minimum of 24 hours of detention time for the design flow.
- C. The discharge concentration for grease trap effluent fats, oils, and grease (FOG) shall not exceed 100 mg/l.
- D. The grease trap shall be located a minimum of 10 feet from buildings, property lines, water services, and in compliance with all applicable building and zoning codes. The grease trap shall be located where it is accessible for inspection and cleaning.
- E. Piping to and from the grease trap shall be in accordance with the *Sewer Construction Standards*. Inlet and outlet piping shall be 6-inch minimum diameter PVC (SDR 35), with allowable slopes between 2% and 6%.
- F. Sanitary wastewater flow into the grease trap is strictly prohibited. Sanitary flow from the building shall connect to a manhole located downstream of the grease trap. A manhole shall be provided upstream and downstream of the grease trap to facilitate bypass and treatment of flows if the grease trap must be temporarily taken out of service.
- G. The grease trap shall be constructed of reinforced concrete and shall be designed for AASHTO HS-20 loading at a minimum. A 1-inch thick butyl rubber gasket shall be provided between precast sections of tank. Buoyancy calculations shall be provided by the applicant, and if necessary, sufficient ballast (such as a buoyancy slab) shall be provided to counteract buoyancy forces when the grease trap is empty, assuming the groundwater table is at the ground surface.



Interior baffles shall be provided to retain collected grease and other materials and prevent the discharge of these materials into the City's sewer system.

- H. The grease trap shall have inlet and outlet tees constructed of ductile iron or Schedule 40 PVC pipe. The inlet tee shall extend down a minimum of 12-inches below the normal operating fluid depth in the tank. The outlet tee shall extend down to within 12-inches of the floor of the tank. The outlet invert shall be 2 inches lower than the inlet invert. A minimum of 2 access openings with a minimum diameter of 24-inches shall be provided, and shall be located directly over the inlet and outlet tees. Access openings shall be raised to grade with brick or concrete risers and frames and covers that conform to the City's *Sewer Construction Standards*.
- I. Water cooled grease traps are prohibited.
- J. The grease trap shall be tested to demonstrate watertightness prior to acceptance and use. Testing shall consist of a water infiltration / exfiltration test. The grease trap shall be filled to 4 inches below the outlet invert. Leakage into or out of the tank shall not exceed 10 gallons per 1,000 gallons of tank volume in a 72-hour period. Test shall be performed before backfilling, and shall be witnessed by the Department.
- K. The grease trap shall be filled to its normal fluid operating depth with clean water prior to its first use.
- L. Unless otherwise required by a schedule established by the DPW, owners or operators shall clean grease traps of accumulated grease and oil in accordance with all applicable local, state and federal laws, and no less frequently than a minimum of once every three months or whenever one quarter of the liquid depth of the trap consists of grease or oil, whichever occurs first. Grease traps shall be cleaned by physically removing accumulated grease, scum, oil or other floating substances and solids. Chemical, biological, or physical means (including flushing with water) shall not be used to release fats, wax, oil, or grease into the sewer, bypass the trap, or otherwise make the trap operate less effectively.

3.7.2 Interior Grease Traps

- A. At locations where Exterior Grease Traps cannot be constructed to serve a building, an interior grease trap shall be provided. Interior grease traps shall be the automatic grease and oil removal type and sized and installed in accordance with Massachusetts Uniform State Plumbing Code 248 CMR 10.00. The grease trap shall be sized using a one (1) minute draindown period. The grease trap shall be cleaned of accumulated grease and oil based on the manufacturer's recommendations, applicable local, state, and federal laws, or at a minimum monthly, or on a more frequent basis at the discretion of the DPW.

3.8 References

- A. All materials and execution shall conform to the highest applicable standards. If there is a conflict between other standards, or between other standards and these Design standards, then the most stringent criteria shall be used.
- B. The City commonly references ASTM standards as guidance for the materials and execution of work performed on the City's Infrastructure. The following summarizes select ASTM standards applicable to the sections in these Design Standards. This list is not exclusive as other standards may apply. The latest revision of each standard shall be referenced.

Standards

Title/Subject



248 CMR 10.00	Massachusetts Uniform State Plumbing Code 248 CMR 10.00
ANSI/AWWA C110/A21.10	Ductile-Iron and Gray-Iron Fittings for Water
ANSI/AWWA C111/A21.11-07	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
ANSI/AWWA C115/A21.15	Standard for Flanged Ductile-Iron Pipe With Threaded Flanges
ANSI/AWWA C150/A21.50-08	Thickness Design of Ductile-Iron Pipe
ANSI/AWWA C153/A21.53-06	Ductile-Iron Compact Fittings for Water Service
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A513	Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
ASTM A74	Standard Specification for Cast Iron Soil Pipe and Fittings
ASTM A746	Standard Specification for Ductile Iron Gravity Sewer Pipe
ASTM B62	Standard Specification for Composition Bronze or Ounce Metal Castings
ASTM C1244	Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C270	Standard Specification for Mortar for Unit Masonry
ASTM C32	Standard Specification for Sewer and Manhole Brick (Made From Clay or Shale)
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C564	Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM D-1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D207	Standard Specification for Shellac Varnishes
ASTM D2241	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC)
ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D478	Standard Specification for Zinc Yellow (Zinc Chromate) Pigments
ASTM D5813-04	Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems
ASTM D790	Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Insulating Materials
ASTM F1216	Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube



ASTM F2561-11	Standard Practice for Rehabilitation of a Sewer Service Lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-In-Place Liner
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F679	Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings





4 Drainage Construction Standards

4.1 General

- A. On-site retainage of stormwater and implementation of other stormwater management measures to control the rate, volume and characteristics of stormwater discharged to the City's storm drainage systems shall be required whenever feasible, with exceptions to be approved by the City. Storm drains, culverts, catch basins, manholes, retention/detention structures, water quality structures, permeable surfaces, and related best management practices (BMPs), shall be installed where necessary to provide adequate treatment and onsite infiltration or offsite disposal of surface water from all streets and adjacent land as shown on the proposed plans that require approval by the City prior to construction. Structural BMPs shall follow design practices outlined in Volume 2 of the Massachusetts Department of Environmental Protection (DEP) Stormwater Management Standards: "Structural BMP Specifications for the Massachusetts Stormwater Handbook".
- B. All projects that are reviewed for approval must meet the requirements set forth in the Stormwater Management Standards promulgated by the DEP under the Clean Water Act, M.G.L.c. 21, §§ 26-53 and its accompanying regulations 314 CMR 9.0 *Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters within the Commonwealth*; and 310 CMR 10.0 *Wetlands Protection Act Regulations*. Projects include all commercial and industrial construction or renovation; and all subdivisions as defined under the *Rules and Regulations Governing Subdivision of Land in the City of Framingham*.
- C. No stormwater discharge shall cause or contribute to an exceedance of water quality standards. Additional stormwater quality controls may be required to reduce pollutant loading from drainage systems that ultimately discharge to a water body listed as an impaired water on the most recent Massachusetts Integrated Report of Waters. No stormwater discharge (point or sheet flow) shall cause flooding or erosion on adjacent properties.
- D. Stormwater drainage systems shall incorporate Low Impact Development (LID) techniques, where feasible.
- E. All proposals shall include plans that show the size and location of existing storm drainage facilities which the proposed system will tie into. Plans shall provide designs and calculations using a recognized engineering formula showing that the no additional runoff will be introduced into the drainage system as well as calculations and designs showing how the drainage system will meet the DEP Stormwater Management Standards. The plans shall include details and descriptions of erosion control and stormwater management during construction.
- F. Driveways and other entrances to the street shall be constructed to prevent roadway drainage from entering the private property.
- G. This manual contains standards for some common Best Management Practices (BMPs), which can also be found in the DEP's *Massachusetts Stormwater Handbook*. The inclusion of these standards is not meant to be an exhaustive listing of approved BMPs. The *Massachusetts Stormwater Handbook* shall be considered as a guide for other BMPs.
- H. All private and public stormwater management systems shall comply with the most current NPDES Small MS4 permit, especially with respect to treatment of design storm flows and redevelopment requirements.



4.2 Private Connections to City Drainage System

- A. It is the responsibility of the property owner to manage and contain all stormwater drainage and groundwater on their property. Cellar floors and basement floors should be a minimum of 1 foot above the seasonal high ground water table to minimize the need for sump pumps. This is in accordance with the City's Rules and Regulations Governing Subdivision of Land, Section VII I (21) but is also a useful benchmark for all construction in the City.
- B. Private drains, including building storm drains for new or existing buildings, groundwater sump drains, cellar drains, and drains from irrigation systems, shall generally not be connected directly to the City's drainage system. Connections made after February 15, 2009 without City approval shall be considered as illicit connections and shall be removed by the property owner or the DPW. Please see separate regulations regarding private drainage connections to the City's drainage system.
- C. Private drains, including building storm drains for new or existing buildings, groundwater sump drains, cellar drains, and drains from irrigation systems, shall not be connected directly to the City's sanitary sewer system. Illicit connections shall be removed by the property owner at their expense.

4.3 Materials

- A. The Materials section summarizes the City's standardized components to be used. All materials shall conform to the latest version of the MassDOT Standard Specifications, as amended; policies and technical guidance in MassDEP's Stormwater Management Standards and the Massachusetts Stormwater Handbook; and the EPA NPDES Small MS4 permit.

4.3.1 Bedding Material

- A. Pipe, manholes, catch basins, and leaching basins shall be laid in any of the following materials, as specified hereafter or as approved by the inspector.
 - Pea stone (3/8 inch in size)
 - Angular crushed stone or rock, dense or open graded with little or no fines (1/4 inch to 1 1/2 inches in size).
 - AASHTO classifications A1 and A3: Clean, coarse grained materials, such as gravel, coarse sands and gravel/sand mixtures (1 1/2 inches maximum in size).
 - AASHTO classifications A-2-4 and A-2-5: Coarse grained materials with fines including silty or clayey gravels or sands. Gravel or sand must comprise more than 50 percent of Class III materials (1 1/2 inches maximum size).
 - Approved material shall be sifted to remove rocks larger than 3 inches.
- B. Backfill material placed above the bedding material and below the roadway foundation shall conform to 6.2.1. Roadway foundation and surface restoration shall conform to Section 5, Roadway Construction Standards, and Section 6, Existing Road Openings, as applicable.

4.3.2 Pipe

Polyvinyl chloride (PVC) pipe shall not be used in drainage systems within the City right-of-way or other roadways, except for underdrains.



4.3.2.1 High Density Polyethylene (HDPE) Pipe

- A. The pipe shall conform to MassDOT Section M5.03.10. Pipe shall be smooth interior wall and corrugated exterior wall, and be water-tight. Pipe shall be minimum 12-inch diameter. Ends shall be bell-and-spigot unless approved by the DPW for the specific application. Pipe shall comply with the requirements for test methods, dimensions and markings found in AASHTO Designations M252 and M294. Pipe shall support an HS-20 live load with a maximum deflection of 5% of the minimum pipe diameter. Pipe and fittings shall be made from virgin polyethylene compounds which conform to the applicable current edition of the AASHTO Material Specifications for cell classification as defined and described in ASTM D3350. Nominal sizes of 12- to 60-inch shall be either AASHTO Type 'S' or Type 'D.'

4.3.2.2 Polypropylene (PP) Pipe

- A. Pipe shall have a stiffness of 46 psi when tested in accordance with ASTM D2412. Pipe with 12" up to 30" ID shall have smooth interior wall and corrugated exterior wall, and be water-tight. Pipe from 30" to 60" ID shall have smooth interior wall and exterior wall with annular inner corrugations, and be water-tight to meet ASTM D3212. Pipe shall be minimum 12-inch diameter. Ends shall be bell-and-spigot unless approved by the DPW for the specific application. Pipe shall comply with the requirements for test methods, dimensions and markings found in AASHTO Designations M252 and M294. Pipe shall support an HS-20 live load with a maximum deflection of 5% of the minimum pipe diameter. Pipe and fittings shall be made from virgin polypropylene compounds which conform to the applicable current edition of the AASHTO Material Specifications as defined and described in ASTM D4101. Nominal sizes of 12- to 60-inch shall be either AASHTO Type 'S' or Type 'D.'

4.3.2.3 Reinforced Concrete Pipe (RCP)

- A. Pipe and flared ends shall conform to the AASHTO M170 for Standard Strength Reinforced Concrete Culvert Pipe for class III Pipe, Wall B. or ASTM C76 for Reinforced Concrete Culvert and Storm Drain Pipe. All pipe 24 inches in diameter or smaller shall be of the bell and spigot type. Pipes larger than 24 inches in diameter shall be tongue and groove or bell and spigot. A preformed flexible plastic sealing compound of Butyl Mastic Rope Sealer "1" size, "EZ Stick" as manufactured by Concrete Products supply or an approved equal shall be used for sealing water-tight joints.

4.3.2.4 Pipe Ends

- A. The DPW prefers headwalls to pipe ends for most drainage conditions. Designs for pipe ends shall be submitted for approval by the DPW.
- B. Flared end HDPE sections shall conform to MassDOT Section M5.03.10. They shall also meet AASHTO Designations M252 and M294 as well as cell specifications in ASTM D3350.
- C. Flared end RCP sections shall be fabricated to conform to the requirements of AASHTO M170, Class III except the edge bearing tests shall not be required. The flare shall be of the same thickness and materials as the barrel and shall have steel reinforcement equaling or exceeding the requirements of AASHTO M170, Class III except that a double row of steel will not be required. The end sections shall meet MassDOT Standard Specifications Section 230 and MassDOT Construction and Traffic Standard Details Drawing 206.8.0.



4.3.3 Drainage Structures

4.3.3.1 Manholes

4.3.3.1.1 General

- A. Manholes over 12 feet in depth shall have minimum of 5 feet inside diameter. When drop manholes are used the drop shall not be more than 3 ½ feet. Risers shall be brick, not concrete blocks. Risers shall be clay or shale brick, and shall conform to the requirements of AASHTO M 91, Grade MM or as specified in MassDOT M4.05.

4.3.3.1.2 Precast Manholes

- A. Precast Manholes shall be constructed of reinforced precast concrete monolithic base section, barrel section and dome section meeting the latest applicable requirements of ASTM C478 I and AASHTO M 199, or latest revision thereto. Special manholes shall also meet the requirements of MassDOT Standard Specifications, section M4.02.14, Precast Units. After curing a minimum of 14 days, the outside surface of the tapered or cone section of precast cement concrete drainage structures shall be dried and cleaned.
- B. Tongue and groove sections between barrel sections shall be mortared or use butyl rubber sealants. Live load design shall be H-20 loading. A 26-inch opening will be cast in the top section to accept a standard cast iron frame and cover. Inside diameter shall be a minimum of 4 feet.

4.3.3.1.3 Constructed in Place Manholes

- A. Constructed in Place Manholes shall be built of precast sump, 6-inch concrete barrel blocks, and 4-inch (pie) plates with an inside diameter of 4 feet unless set in the groundwater table. Such manholes shall have a solid (impenetrable) sump. Cement concrete blocks shall conform to ASTM C139. Live load design shall be of H-20 loading.

4.3.3.2 Catch Basins

4.3.3.2.1 General

- A. All basins shall have a sump of at least 48 inches (4 feet) below the invert of the outlet pipe, or otherwise approved by the DPW, and an inside diameter of 4 feet minimum.

4.3.3.2.2 Precast Catch Basins

- A. Precast Catch Basins shall conform to ASTM C478 and AASHTO M 199, or latest revision thereto.
- B. Live load design shall be H-20 loading. Catch basins which are limited by height shall be installed with a flat top slab, cast in place, designed for H-20 loading and cast iron frame cast in place.
- C. Direct inlet catch basins shall conform to D-4.1.

4.3.3.2.3 Constructed in Place Catch Basins

- A. Constructed in place catch basins shall be constructed of a precast sump, 6-inch cement block and 4-inch (pie) plates that conform to ASTM C139. The basin shall have a 4 foot inside diameter minimum. Live load design shall be HS-25 loading.



4.3.3.2.4 Leaching Basins

- A. Leaching basins shall be per MassDOT Construction and Traffic Standard Details, Drawing 205.20. Leaching basins shall only be used in areas with highly permeable soils where the bottom of the basin is at least 3 feet above seasonal high groundwater. Safe overflow of these devices shall be provided in the event of severe storm events or of clogging of the soils surrounding the device.

4.3.3.2.5 Drop Inlet Catch Basins

- A. Drop (aka Direct) inlet catch basins may be connected to standard catch basins. They shall not be connected to drainage manholes unless otherwise approved by DPW.

4.3.4 Frames and Covers

- A. Cast Iron shall meet requirements of ASTM A888 "Grey Cast Iron, Cast Iron Class 20." All castings shall be clean and without blow holes, sand holes or defects of any kind. Cast iron frames and covers shall be clean of all rust, dirt, and scale. Grates shall have the following wording cast into the outside borders: "Dump No Waste" and "Drains to Waterway". Text shall be bold capital letters, at least 1 inch high. Placement may be as per manufacturer.
- B. Frames shall be set upon a full bed of mortar, and mortar shall be brought up alongside of frame to provide a water-tight joint.

4.3.4.1 Manhole Covers

- A. Manhole frames and covers shall be at least Class 25 conforming to ASTM A48 "Standard Specification for Gray Iron Castings." Manhole frame shall have a clear opening of 24 inches and be a minimum of 8 inches in height. The surface of the cover shall have a diamond pattern with the words "FRAMINGHAM DRAIN" cast thereon for drainage manholes, as manufactured by East Jordan Iron Works (formerly LeBaron Foundry Co.) (EJIW) 2110Z/2111A, or equal.

4.3.4.2 Catch Basin Grates

- A. Catch basin grates located at low points shall be 24-inch square grate, East Jordan Iron Works (formerly LeBaron Foundry Co.), LF248-2-4F. Single or dual catch basin grate shall consist of a 24-inch square grate LeBaron Foundry Co. L24SG1-000 or approved equal with an 8-inch heavy duty frame (MassDOT Standard).
- B. Catch basin cascade grates shall consist of a 24-inch square grate with an 8-inch heavy duty frame (MassDOT Standard) East Jordan Iron Works (formerly LeBaron Foundry Co.), L24SG18L-000 or a L24SG18R-000 (depending on water flow direction) or approved equal with an 8-inch frame. Water flowing from left to right requires a Right-Hand Grate. Water flowing from the right to left requires a Left-Hand Grate.

4.3.4.3 Catch Basin Hoods

- A. Catch basin hoods shall be used to minimize the entry of oil, gasoline, and debris into drainage pipes. Catch basin hoods shall protrude no more than 12 inches beyond the end of pipe into the structure. Acceptable hoods are Ground Water Rescue Inc. Eliminator, Best Management Practices Inc. Snout® or equal approved by the DPW.

4.3.5 Granite Curb Inlets (Throat Stones)

- A. Granite shall conform to MassDOT Standard Specifications Sections M9.04.0, M9.04.1, and M9.04.2. The back face for a distance of 3 inches down from the top shall have no projections



greater than 1 inch. The front shall be straight split, free from drill holes, and shall have no projection greater than 1 inch or depression greater than 1/2 inch for a distance of 10 inches down from the top. For the remaining distance there shall be no depression or projection greater than 1 inch. The ends shall be squared with the top for the depth of the face finish. The granite curb inlet shall be 6 feet in length, plus or minus 1/2 inch from 17 to 19 inches in depth, 6 inches wide at the top and at least 6 inches wide at the bottom. The reveal shall be 10 inches. Curb inlets set on a radius of 160 feet or less shall be cut to that radius. The gutter mouth at least 3 inches in depth and at least 2 feet in length shall be cut in the front face of the stone. If there is no other curbing, or as applicable, transitional curbing shall be required on both sides of the inlet. The transitional curbing shall be 6 feet in length, with a height equal to the inlet and tapering to grade at the end.

4.3.6 Box Culverts, Headwalls, Wing Walls, and Endwalls

- A. Culvert, headwall, wingwall, and endwall materials and specifications shall meet MassDOT Standard Specifications Sections 230 and M4, and as shown on MassDOT Construction and Traffic Standard Details, Drawings 206.40 through 206.70, and 207.1.0 through 207.3.0.
- B. Stone shall conform to MassDOT, Section 258 and MassDOT Construction and Traffic Standard Details Drawing 206.7.0. Stone size shall be determined by the design storm flow discharging from the pipe. Stone for drainage swales shall be no smaller than 3 inches, unless otherwise approved by the Department.

4.3.7 Perforated Drain Pipe Trenches (Subdrain)

- A. Drain Pipe Trenches shall meet MassDOT Standard Specifications Section 260 and MassDOT Construction and Traffic Standard Details Drawing 209.1.0. Perforated pipe shall be either of the following.
 - Polyvinyl chloride (PVC) pipe up to and including 15 inches in diameter, conforming to ASTM D3034, SDR 35.
 - Perforated, polyethylene (PE) (flexible) pipe and fittings per ASTM D2737. Joints shall be coupling type.
- B. Filter fabric shall meet MassDOT Standard Specifications Section 9.50.0 (Table III – Type III Geotextile Fabric: Filtration/Drainage). Filter fabric shall be nonwoven needle-punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288. Apparent opening size shall be US Sieve 50 or higher.
- C. Subdrain bedding and fill material shall be crushed stone, 3/8 inch to 1 inch.

4.3.8 Dry Wells

- A. A dry well shall consist of either an excavated pit or a perforated concrete structure with an inside diameter of 5 feet to 12 feet. If an excavated pit, the dry well shall be filled with clean aggregate greater than 1-1/2 inches up to 3 inches. Fill shall be surrounded by filter fabric (Filter fabric shall be as for Perforated Drain Pipe Trenches). An optional observation well may be placed using 4-inch PVC flush with ground surface, and using a screw-top cap with lock.
- B. The DEP's Underground Injection Control regulations (310 CMR 27.00) define injection well as "a well into which fluids are being introduced", and specifically cites dry wells as a type of injection well. Therefore, if the dry well is designed so that the depth is greater than the diameter or width or length (whichever is greater), the well must conform to 310 CMR 27.00.
- C. The bottom of the dry well shall be at least 3 feet above seasonal high water table or bedrock. The depth of the well shall be 3 to 12 feet.



- D. Dry wells shall be designed to treat the runoff volume generated by the 3.25-inch/24-hour (2-year) Stormwater Quality Design Storm (NOAA). Dry wells shall be placed only in soil where the permeability allows a percolation rate of at least 0.50 inch /hour. The dry well shall be designed to empty within three days of filling under normal conditions.
- E. Dry wells shall not be used in the following locations:
 - In industrial and commercial areas where petroleum products, herbicides, pesticides, or solvents may be loaded/unloaded, stored, or applied within the drainage area, especially locations with soluble heavy metals and toxic organics in the runoff;
 - Where the soil around and below the dry well does not have the necessary permeability to infiltrate the entire Stormwater Quality Design Storm runoff volume; or
 - Where dry well installation would create a significant risk for basement seepage or adversely impact a septic system's disposal field.

4.3.9 Subsurface Infiltration

- A. Subsurface infiltration is a stormwater runoff impoundment constructed beneath the surface over permeable soils. Examples include: infiltration pits, chambers, perforated pipes, and galleys. Infiltration systems shall be designed and constructed in accordance with The Massachusetts Stormwater Handbook and the EPA NPDES Small MS4 permit.
- B. Pretreatment BMPs shall remove at least 25% TSS. In the following areas, at least 44% TSS shall be removed:
 - Areas with rapid infiltration (greater than 2.4 inches/hour);
 - Land use with a higher potential pollutant loads (LUHPPL);
 - Zone II or an Interim Wellhead Protection Area of a Public Drinking Water Source/Supply;
 - Discharge to or near a critical area (Outstanding Resource Waters or bathing beaches).
- C. The bottom of the infiltration system shall be at least 3 feet above seasonal high water table or bedrock.
- D. Infiltration systems shall be designed to treat the runoff volume generated by the 2-year and 10-year 24-hour storms.
- E. The infiltration system shall be designed to drain within three days of filling under normal conditions, and completely dewater between storms.
- F. Infiltration systems shall be placed only in soil where the permeability allows a percolation rate of at least 0.17 inch/hour. Percolation rates shall be field verified prior to completion of design, when feasible.
- G. An appropriate number of observation wells, access ports, or manholes shall be installed to enable inspections and maintenance.
- H. Infiltration systems shall not be used in the following locations:
 - In industrial and commercial areas where petroleum products, herbicides, pesticides, or solvents may be loaded/unloaded, stored, or applied within the drainage area, especially locations with soluble heavy metals and toxic organics in the runoff;
 - In areas with documented soil contamination;
 - Where the soil around and below infiltration basin does not have the necessary permeability to infiltrate the entire Stormwater Quality Design Storm runoff volume; or



- Where infiltration would create a significant risk for basement seepage or adversely impact a septic system's disposal field.

4.3.10 Drainage Swales

- A. The use of swales draining across a sidewalk into the gutter is generally unacceptable. In those cases where necessary, Department approval shall be required for the design. Flow shall be limited to less than one (1) cfs. These flows must be included in gutter capacity. Private drainage swales may not be used to drain more than two (2) adjacent subdivision lots. If private drainage facilities are required to drain more than 2 lots the system shall be piped and contained within a recorded private drainage easement. Maintenance of private systems shall be the responsibility of the adjacent property owners.
- B. Drainage swales shall be stabilized with vegetation or rip rap to prevent erosion.

4.4 Execution

- A. All steps shall be inspected and approved by the DPW before the next step in the process shall begin.

4.4.1 Pipe Laying

4.4.1.1 Minimum Cover over Drainage Pipes

- A. The minimum flow line depth for drainage pipes shall be 4 feet. The minimum cover over drainage pipes shall be 3 feet below the pavement slab or as specified by the type of pipe per manufacturer's specifications, whichever is greater. Where the clearance is less than 1 foot below the pavement, provide a design method to maintain the integrity of the pipe and right of way. For drainage pipe outside of the pavement, the minimum cover shall be 18 inches or as specified by the type of pipe, whichever is greater. Drainage pipe shall be installed with minimum distance from sewer / septic pipe as summarized in Section 3.3.1.2 H (substituting drainage for water).
- B. No backfilling of the pipe in the trench shall take place unless approved by a DPW inspector.

4.4.1.2 Minimum Drain Pipe Grades

- A. Main lines and cross runs – grades 1% minimum
- B. Building storm drainage stubs – 1% minimum
- C. Subdrain – 0.5% minimum
- D. All other – 0.5% minimum.
- E. Any slope greater than 8% requires Department approval.

4.4.1.3 RCP Pipe

- A. Pipe shall be carefully laid to the lines and grades as shown on the approved plans. The Contractor, when possible, shall use laser beam aligning equipment.
- B. See Section 4.3.1 for bedding material. The bottom of the trench shall be excavated to a flat grade 6 inches below the pipe invert for trenches in suitable earth and 12 inches below pipe invert for trenches in rock. When rock or ledge is encountered it shall be removed to such widths as will give a clearance of at least 12 inches on each side of the pipe or other structure and a sand cushion used. The width of trenches shall be sufficient to allow thorough compacting of the refill adjacent to the lower quarters of the pipe.



- C. RCP Pipe Trenches shall meet MassDOT Standard Specifications Section 260 and MassDOT Construction and Traffic Standard Details Drawing 208.10.
- D. Trenches at pipe joints shall be excavated as necessary to give ample room for properly making and inspecting the pipe joints. RCP pipe joints shall be cement mortared (as specified in MassDOT Section M4.02) carefully placed in the joints around its entire perimeter and mixed relatively dry, in the ratio of one part cement to two parts sand.
- E. Pipe bedding material shall be carefully and lightly tamped under pipe to provide uniform support. Fill to a minimum depth of 12 inches above the top of the pipe. Material for backfilling the rest of the trench, except for sub base (top 15 inches) shall be suitable material, approved by the Department. The compaction process shall be material placed in 12-inch lifts and thoroughly compacted by mechanical rammers, vibrators, or other methods to be approved by the Department (e.g., hydraulic plate compactors) to 90 percent Modified Proctor density in off-road or nonstructural areas and 95% in roadway or structural areas. Bucket compaction will not be accepted.
- F. When laying pipe in groundwater, pipe material and method of installation shall be approved by the Department. Water must not be permitted to rise in the trench until all pipes have been securely bedded, jointed and observed by the City and until backfilling has progressed to an elevation at least one foot above the top of the pipe. Temporary plugs shall be installed in open ends of pipe to prevent silt from washing into pipe during construction; and open ends of the pipe shall be closed with suitable plugs upon suspension of the work for any reason.

4.4.1.4 HDPE Pipe

- A. The requirements for laying of RCP pipe also apply to HDPE pipe. The following additional requirements apply to HDPE pipe.
- B. Installation of HDPE pipe shall be in accordance with either AASHTO Section 30 or ASTM D2321 and as recommended by the manufacturer.
- C. Because HDPE pipe will float in standing water, a dry trench shall be provided prior to laying the pipe. A qualified engineer shall be consulted to determine dewatering methods.
- C. A concrete pipe cap shall be used when pipe cover is inadequate to prevent buoyancy of the HDPE pipe.
- D. Haunching large-diameter pipes (greater than 30 inches) shall be performed using maximum 8-inch lifts and compacted to 90 percent standard proctor density.
- E. Water tight joints shall be used. Pipe shall be watertight according to the ASTM D3212. Joint design shall be bell-and-spigot with an elastomeric rubber gasket meeting ASTM F477 or equal approved by the Engineering Division.

4.4.1.5 PP Pipe

- A. The requirements for laying of HDPE pipe also apply to PP pipe. The following additional requirements apply to PP pipe.
- B. Minimum cover in traffic areas for diameters up to 48-inch ID pipe shall be one foot. Minimum cover for diameters between 48-inch and 60-inch ID pipe shall be two feet.

4.4.1.6 Pipe Ends

- A. Pipe ends shall be accurately aligned on compacted gravel fill unless otherwise approved by the Department. Rip Rap stone shall be placed to line and grade as shown on the plans on a prepared bed of embankment material or existing materials. Each stone shall be placed by hand, normal to



the slope and firmly embedded. Larger stones shall be placed directly at the drainage end to prevent erosion and displacement. Stone size shall be determined by the design storm flow discharging from the pipe.

4.4.1.7 Pipe Testing

- A. At the discretion of the Department, a mandrel test shall be conducted following completion of pipe laying. Placement of curb, gutter, sidewalk, or asphalt concrete pavement shall not occur until the DPW Inspector has approved the mandrel test. The DPW Inspector shall be present through the duration of the mandrel testing. Alternatively, a television survey may be performed on the line after installation, with the results being provided to the Department in electronic format as directed by the Department.
- B. The allowable deflection (reduction in vertical inside diameter) for all non-rigid pipe shall be 7.5 percent maximum. The deflection shall be tested by pulling a mandrel which is 92.5 percent of the inside pipe diameter through all installed pipe. The mandrel shall be the "go/no-go" type and shall be pulled without mechanical assistance. At each location in which the mandrel cannot pass, the cause shall be ascertained. Obstacles in the pipe shall be removed. If it is determined that the deflection exceeds 7.5 percent, that a gasket has been improperly installed or that the pipe has been damaged due to trenching for another utility, the respective section of pipe shall be re-bedded or removed, replaced and re-bedded using water tight repair couplings. A passing mandrel retest is required. At the contractor's discretion, any sections of non-rigid pipe not passing the mandrel test may be televised to ascertain the problem.

4.4.2 Manholes, Catch Basins, and Leaching Basins

- A. Contractor shall excavate to a depth of 12 inches below the bottom of and all around the proposed manhole or catch basin base, compact and fine grade and install washed screened gravel as a sub-base material. Pipes shall extend no more than 3 inches inside the interior wall and all openings around pipe entrances and lift holes shall be thoroughly grouted with non-shrink grout prior to back filling. Compaction process shall be the same manner as compaction around pipe.
- B. The tops of frames and covers shall be set 1/8 inch below finish grade pavement in the street. Final grade locations for installations outside of the paved roadway shall be as approved by the Department.
- C. All joints between the frame, grade rings, dome, barrels and base shall be set in place with non-shrink mortar. Inside the manhole, all joints where the sealing material is not flush with the inside wall shall be grouted with nonshrink mortar and finished by hand / wet-brushed.
- D. Grade adjustments shall be made using either precast grade rings/risers or clay/shale bricks.
- E. No backfilling of the structure in the excavation shall take place unless approved by a DPW inspector.

4.4.2.1 Manholes

- A. Manholes shall be constructed in series and shall have a distance of no more than 250 feet between manholes, unless otherwise approved by DPW.
- B. When ground water is higher than the elevation of the bottom of the manhole, $\frac{3}{4}$ -inch to 1-inch washed stone shall be placed around structure to a distance of at least half-way up the barrel of the highest pipe. The manhole shall be tested for tightness prior to backfill and approval.
- C. As circular concrete block walls are laid, the horizontal joints and key ways shall be flush full with mortar. As rectangular blocks are laid, all horizontal and vertical joints shall be flushed full with mortar.



4.4.2.2 Catch Basins

- A. When ground water is higher than the elevation of the bottom of catch basins, $\frac{3}{4}$ -inch to 1-inch washed stone shall be placed 2 feet all around structure to a distance of the high ground water elevation. The stone shall be placed against and over the end of the pipe opening to prevent entrance of the finer filling material. The catch basin shall be tested for tightness prior to backfill and approval.
- B. All catch basins that do not have a flat top slab designed for H-20 loading and cast iron frame cast in place shall be installed using blocks to make a square hole that will accept a frame and grate, and there shall be at least two full courses of brick for frame adjustment.
- B. Circular concrete block walls are laid up the horizontal and key ways shall be flush full with mortar above the outlet invert. The dome or cone section shall be constructed in the same manner. The opening between the pie plates shall be filled with washed, screened gravel and left open. A 24-inch opening shall be left open at the top for a frame and grate.

4.4.2.3 Leaching Basins

- A. Leaching basins shall be set in an excavation lined with a geotextile. The basin shall be placed on a pad of free draining crushed stone, with the excavation around the basin back-filled with similar material. Leaching catch basins shall be used as "off-line" devices (that is, they should not generally be piped in series as "flow-through" devices).

4.4.3 Box Culverts, Headwalls, Wing walls, and End walls

- A. Headwalls, Wing walls, and End walls shall be constructed at open ends of any drainage pipes where the same serve as outlets or inlets to the drainage system. Metal beam guard rails or chain link fencing may be required by the Department at culverts, headwalls, box culverts, and on steep side slopes.
- B. Box culverts shall be designed and installed as per MassDOT Standard Specifications, as amended.
- C. Stone shall be placed to line and grade as shown on the plans on a prepared bed of embankment material or existing materials. Each stone shall be placed in a controlled manner, normal to the slope and firmly embedded. Larger stones shall be placed directly at the drainage end to prevent erosion and displacement

4.4.4 Perforated Drain Pipe Trenches (Subdrain)

- A. The trench drain shall be excavated to a minimum of 24 inches below grade and lined with filter fabric with a 12-inch overlap on the top of the trench. If the pipes have a single line of perforation, pipe shall be installed with perforations down and backfilled. If there are two lines of perforation, the pipe shall be installed with the perforations on the sides of the pipe and then backfilled. The width of the trench shall be at 12 inches or double the diameter of the drainage pipe, whichever is greater. The end of the pipe shall be capped.
- B. Stones or other anchoring objects should be placed on the fabric at the edge of the trench to keep the trench open during windy periods. When overlaps are required between rolls, the uphill roll should lap a minimum of 2 feet over the downhill roll in order to provide a shingled effect.
- C. The drainage bedding and fill material shall be placed in lifts and compacted using plate compactors. A maximum loose lift thickness of 12 inches is recommended.
- D. Following the stone aggregate placement, the filter fabric shall be folded over the drainage bedding and fill material to form a 12-inch minimum longitudinal lap. The drainage bedding and



fill material shall be placed over the lap at sufficient intervals to maintain the lap during subsequent backfilling.

- E. Voids can be created between the fabric and the excavation sides and shall be avoided. Removing boulders or other obstacles from the trench walls is one source of such voids; therefore, natural soils should be placed in these voids at the most convenient time during construction to ensure fabric conformity to the excavation sides.
- F. Keep trenches dry until pipe is in place and granular material backfill is completed to one foot (12 inches) above top of pipe, unless otherwise noted.

4.4.5 Dry Wells

- A. Dry wells shall not be placed in a public way or a public easement, and shall not be placed into service until the drainage area is stabilized. Dry wells shall be sited a minimum of 10 feet away from the building. Excavated material shall be placed away from the excavated sides to prevent wall instability during excavation and backfilling. Large tree roots shall be trimmed flush with the sides to prevent puncturing or tearing of filter fabric during installation. The side walls shall be roughened where sheared and sealed by heavy equipment.
- B. An overland flow path of surface runoff exceeding the capacity of the well shall be identified. An overflow system leading to a stabilized channel or watercourse including measures to provide non-erosive flow conditions shall be provided.
- C. The following requirements apply to dry wells that do not utilize a concrete structure.
 - The bottom, sides and top of the well surface shall be lined with filter fabric. The fabric shall be wrapped and tied with wire or nylon twine or otherwise tightly secured around the horizontal inflow pipe where the pipe protrudes through the fabric. Fabric shall be wrapped over the top of the aggregate fill with a minimum of 12 inches of overlap in any direction. Fabric shall be overlapped 6 inches in “shingle” fashion when more than one section is required to enclose the aggregate.
 - The dry well shall be filled to within 12 inches of the finished surface elevation, leaving sufficient depth for topsoil placement (in areas where surface stabilization is accomplished through the use of vegetation).
 - Drainage aggregate shall be placed in lifts of no more than 12 inches and compacted using plate compactors. Voids between the fabric and excavation sides due to boulders or other obstacles shall be filled with natural soils to ensure fabric conformity to excavation sides.

4.4.6 Drainage Swales

- A. The maximum depth of a swale shall be 24 inches. Side slopes shall be no steeper than 2:1 (horizontal:vertical) with a minimum grade of 0.5 percent and carrying no more than 3 cfs during a five-year design event. The minimum bottom width for a swale, whether earthen, gravel, or paved is 2 feet.

4.4.7 Separation of Storm Drains and Water or Sewer Mains

- A. Horizontal Separation: Drainage mains shall be located at least 5 feet horizontally from sewer mains. Locations with respect to water mains are described in the Water Standards portion of these Construction Standards. The distance shall be measured from inside edge of pipe.
- B. Vertical Separation: Drainage mains shall be laid to provide a separation of at least 18 inches from either water or sewer lines. The minimum vertical separation is measured from outside of water or sewer main to outside of the storm drain main.



- C. Unusual Conditions: Storm drain crossings under unusual conditions must be approved on a case by case basis by the Department.

4.5 Maintenance

4.5.1 Maintenance of Drainage Systems on Private Property

- A. The owner of any property on which a drainage system is located is responsible for the maintenance and upkeep of the system. Prior to construction of said drainage system, the owner shall provide documents describe the long term operation and maintenance of all permanent erosion control and stormwater management measures. The inspection and maintenance of the drainage systems shall be performed at minimum on an annual basis, and more frequently depending on the circumstances.

4.5.2 Access for Maintenance of Drainage within Easements

- A. Access to all drainage in drainage easements shall be a minimum of 30 feet wide and maintained to allow earth-moving and other construction activities to occur within the easement (see 4.1.2.2).

4.6 Definitions

- A. Drainage Swale: A long narrow trench dug into the ground designed to manage stormwater runoff. Swales can be earthen (normally seeded or otherwise vegetated), gravel, or paved.
- B. Backflow Preventer: Device that stops the backflow of water into the drainage system.
- C. Fiber Rolls: coir (coconut fiber), straw, or excelsior woven roll encased in netting of jute, nylon, or burlap
- D. Mandrel Test: The roundness of a pipeline is tested by moving a slightly smaller steel shank, called a mandrel, through the inside of the pipeline. If the pipeline is out of round, the mandrel will be held and kept from moving forward.
- E. Haunching: During pipe installation, the action of holding the pipe in a fixed position in terms of lateral movement, usually by filling in both sides of the pipe at the same time.

4.7 References

- A. All materials and execution shall conform to the highest applicable standards. If there is a conflict between other standards, or between other standards and these Design standards, then the most stringent criteria shall be used.
- B. These standards draw and refer to the *Massachusetts Stormwater Management Standards* and the *Massachusetts Stormwater Handbook* (Massachusetts Department of Environmental Protection, January 2008 et seq.). These standards also draw significantly on the *Commonwealth of Massachusetts - Massachusetts Highway Department: Standard Specifications for Highways and Bridges* (1995 et seq.) and the *Commonwealth of Massachusetts - Massachusetts Highway Department: Construction and Traffic Standard Details* (1996 et seq.). These two documents are referred to collectively as the MassDOT Standards. In addition to the MassDOT Standards, the City references AASHTO, and ASTM as guidance for the materials and execution of work performed on the City Drainage Infrastructure. The following summarizes select standards applicable to the sections in these Design Standards. This list is not exclusive; other standards may apply. The latest revision of each standard shall be referenced.



- C. All stormwater designs, construction, and management shall comply with the requirements of the EPA NPDES Small MS4 permit, current version.

Standard	Title/Subject
N/A	Massachusetts Department of Transportation: Standard Specifications for Highways and Bridges, Construction and Traffic Standard Details (1996 et seq.)
AASHTO Section 30	Division II (General-Interim 1998)
AASHTO M 91	Sewer and Manhole Brick (Made from Clay or Shale)
AASHTO M 170	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
AASHTO M 199	Standard Specification for Precast Reinforced Concrete Manhole Sections (ASTM C478)
AASHTO M 252	Corrugated Polyethylene Drainage Pipe
AASHTO M 288	Standard Specification for Geotextile Specification for Highway Applications
AASHTO M 294	Corrugated Polyethylene Pipe, 300- to 1500-mm Diameter
ASTM A 48	Standard Specification for Gray Iron Castings
ASTM A 888	Grey Cast Iron, Cast Iron Class 20
ASTM C 76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C 139	Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
ASTM C 478	Precast Reinforced Concrete Manhole Sections
ASTM D 2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity — Flow Applications
ASTM D2412	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D 2487	Standard Practice for Classification of Soils for Engineering Purposes (USCS)
ASTM D 2737	Standard Specification for Polyethylene (PE) Plastic Tubing
ASTM D 3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
ASTM D4101	Standard Specification for Polypropylene Injection and Extrusion Materials
ASTM F 477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
NOAA	National Oceanographic and Atmospheric Administration: Technical Paper No. 40, May 19“1 "Rainfall Frequency Atlas of the United States"
OSHA 1926	29 CFR 1926 Safety and Health Regulations for Construction

NPDES Small MS4
Separated Storm Sewer Systems

National Pollutant Discharge Elimination System Small Municipal



EPA

Environmental Protection Agency





5 Roadway Construction Standards

5.1 Roadway Design

5.1.1 General

- A. All plans shall be on 24-inch x 36-inch sheets.
- B. Plan and Profile of sections shall be on separate sheets.
- C. The horizontal scale of the plan and profile shall be the same.
- D. Boring or test pits shall be taken as determined by the DPW. These shall show soil strata and high ground water elevations. Drought conditions shall be noted.
- E. Electric, telephone, cable television and fire alarm cables and ducts shall be placed in the grass strip or sidewalk outside of the traveled way, on the opposite side of the centerline of the street as the water main.
- F. Street light standard locations shall be determined by the DPW and Eversource Electric Company.
- G. DIG SAFE shall be contacted to determine the location of all existing underground utilities prior to any excavation. Call the Framingham Fire Department to mark out their lines.
- H. A note shall be placed on all plans stating "The City of Framingham DPW and Engineering Department shall be notified seventy-two (72) hours in advance of any roadway or municipal service construction. No portion of any utility shall be backfilled until approval for such backfilling is obtained from the DPW. Such approval does not constitute acceptance of such utilities by the City of Framingham."

5.1.2 Streets and Roadways

- A. For the purposes of these Standards, streets shall be classified as Local, Collector and Arterial. These classifications are shown in the City Subdivision Rules and Regulations as Residential Access, Residential Subcollector and Primary.
- B. Street design minimum standards for Primary Streets shall conform to the best accepted design practice as recommended by the Institute of Traffic Engineer's Street and Highway Design Manual and the MassDOT Project Development and Design Guide, in consultation with the DPW.
- C. Location and alignment shall conform to the requirements contained in the current edition of the City of Framingham Subdivision Regulations.
- D. Property lines at residential street intersections shall be rounded or cut back to provide for a radius of at least 7 feet less than the curb radius.
- E. The maximum grade for cul-de-sacs shall be four percent (4%).
- F. The pavement cross section shall be designed to provide a 20-year life based on soil and traffic conditions. The pavement cross section shall be approved by the City Engineer. The minimum pavement cross section shall be:
 - 1. Local Streets: 1.5 inches of Top Course material placed on 2.5 inches of Binder Course material founded on 4 inches of Dense Graded Crushed Stone on 8 inches of Processed



Gravel or Dense Graded Crushed Stone. This pavement structure shall be placed on the backfill.

2. Collector Streets: 2 inches of Top Course material placed on 4 inches of Binder Course material placed in two equal courses founded on 4 inches of Dense Graded Crushed Stone on 8 inches of Processed Gravel or Dense Graded Crushed Stone, with at least 4 inches of natural subbase.
 3. Arterial Streets: 3 inches Modified Top Course material placed in two courses on one 5-inch course of Binder Course material founded on 4 inches of Dense Graded Crushed Stone on 8 inches of Processed Gravel or Dense Graded Crushed Stone. with at least 4 inches of natural subbase.
- G. The existing water table shall be located and particular attention given to changes in the present and in the possible future water table caused by the movement of earth and other construction work.

5.1.3 Curbing

- A. Granite curbing shall be type VA-4, conforming to the requirements of MassDOT Standard Specifications.
- B. Hot mix asphalt (HMA) curbing shall be type 1, 2, or 3, conforming to the requirements of MassDOT Standard 106.2.0.

5.1.4 Sidewalks

- A. Sidewalks and wheelchair ramps shall be constructed of Portland cement concrete with fiber mesh or HMA concrete, conforming to the requirements of MassDOT Standard Specifications, with a minimum width of five (5) feet. Wheelchair Ramps (WCR) and brick red Detectable Warning Panels shall be installed in accordance with the "Rules and Regulations of the Architectural Access Board – 521 CMR."

5.1.5 Walls or Slopes

- A. Where walls or slopes must be constructed to properly support the street or adjacent land, such construction must be done in accordance with the specifications set forth in Section 5.2.14.

5.1.6 Driveways

- A. Driveways and private entrances shall be designed, permitted and constructed to conform to City of Framingham Bylaw (Article VI, Section 8) and MassDOT standards. Driveways shall be located a minimum of 25 feet from any intersecting street corner radius. For commercial and industrial development, a plan stamped by a licensed professional engineer showing the manner in which the proposed entrance meets these specifications must be submitted to the DPW and approved before such entrance is constructed. The engineer's plan must include calculated safe sight distances in each direction.

5.1.7 Protection of Utilities

- A. A subdivider shall protect all utilities and appurtenances installed under these standards from any and all damage until the ways are accepted by the City. Any damage to these utilities and appurtenances prior to acceptance by the City shall be repaired in a manner satisfactory to the DPW and the full cost of such repair shall be paid by the sub-divider. Any material used which does not meet the standards of the DPW shall be replaced by the sub-divider at no cost to the City.



5.2 Roadway Materials

5.2.1 Special Borrow

- A. Special borrow for fill shall conform to MassDOT Standard Spec. M1.02.0.

5.2.2 Processed Gravel for Subbase

- A. Gravel shall conform to MassDOT Standard Spec. M1.03.1.

5.2.3 Gravel Borrow

- A. Gravel shall conform to MassDOT Standard Spec. M1.03.0, Type b.

5.2.4 Crushed Stone for Subbase

- A. Washed crushed stone shall range in size from $\frac{3}{4}$ inch to $1\frac{1}{2}$ inch, conforming to MassDOT Standard Spec. M2.01.4 to M2.01.2 and shall be hard, durable and reasonably free from flat or laminated particles to furnish free draining material.

5.2.5 Dense Graded Crushed Stone for Subbase

- A. Dense graded crushed stone shall conform to MassDOT Standard Spec. M2.01.7.

5.2.6 Loam Borrow

- A. Loam Borrow shall conform to MassDOT Standard Spec. M1.05.0 or shall be the product of a commercial sand and gravel processing facility. It shall be uncontaminated by saltwater, foreign matter, or substances harmful to plant growth. The acidity range of the Loam Borrow shall be pH 5.5 to 7.0.

5.2.7 Fertilizer

- A. Fertilizer shall be of a 10-6-4 composition.

5.2.8 Grass Seed

- A. Seed composition shall be 60% Red Fescue, 20% Red Top, 20% Kentucky Blue. Seed shall be of the previous year's crop and in no case shall the weed seed content exceed 1% by weight.

5.2.9 Hot Mix Asphalt

5.2.10 A. Hot Mix Asphalt (HMA) shall conform to MassDOT Standard Section M 3.11.00.Superpave

- A. Superpave shall conform to MassDOT Document 00717

5.2.11 Portland Cement Concrete for Sidewalks

- A. Portland Cement Concrete for sidewalks shall conform to the applicable requirements of Section M4 and Section 701 of the MassDOT Standard Specifications. FIBERMESH fibers (100% virgin polypropylene, collated, fibrillated fibers) at a rate of 1.5 lb. per cubic yard of concrete shall be added for reinforcement. Installation shall be per manufacturer's recommendations.



5.2.12 Granite Curbing

- A. The stones shall conform to MassDOT Standard Spec. M9.04.1 for VA4.

5.2.13 Granite Curb Inlets

- A. Curb inlets shall conform to MassDOT Standard Spec. M9.04.5.

5.2.14 HMA Berm and Curb

- A. HMA Berm shall conform to MassDOT Standard Section M3.11.0. HMA Curb shall conform to MassDOT Standard Section M3.12.0.

5.2.15 Retaining Walls

- A. Walls shall be constructed of cast-in-place, precast reinforced concrete, stone and mortar, or prefabricated block. Prefabricated block retaining walls shall conform to all dimensional requirements as specified by the manufacturer. Methods of concrete construction shall conform to the applicable requirements of Section 901 of the MassDOT Standard Specifications. Cement shall be Portland cement meeting the requirements of ASTM C150. Steel reinforcement shall meet ASTM A615 or A616, whichever is applicable. Reinforcing steel shall be free of rust and dirt. The aggregate shall be crushed stone or screened gravel, and clean hard sand, and shall conform to ASTM C 33 latest revision. Water for concrete shall be clean and free from injurious amounts of mineral and organic substances.

5.2.16 Granite Bounds

- A. Bounds shall conform to MassDOT Standard Spec. M9/04.8. They shall be 4 feet in length. Granite bounds shall be of sound granite, the top and bottom faces parallel and the front and back shall be straight split. The bounds shall be cut to the dimensions shown on the detail and shall be plain or lettered as indicated on the plans or as directed. The stone shall be pointed on the top and on four sides and for a distance of not less than 6 inches below the top. The top shall be 6 inches square and shall have a drill hole in the center 1.5 inch in depth and 0.5 inch in diameter, with the bottom somewhat flared.

5.2.17 Guard Rail

- A. Guard Rail shall be COR-TEN® with steel or wood posts in conformance with MassDOT Standard M8.07.0.

5.2.18 Pavement Markings

- A. For existing pavement marking applications, pavement markings shall be white or yellow reflectorized thermoplastic, epoxy, or other matching material conforming to MassDOT Standard M7.01.
- B. For all new roadway construction, pavement markings shall be white or yellow reflectorized epoxy pavement markings conforming to MassDOT Engineering Directive E-05-003, dated June 16, 2005 and to MassDOT Standard Section 860.

5.2.19 Street Signs

- A. Street signs shall use only upper-case white letters with a blue background. Sign dimensions, material, colors, text and post height shall conform to the latest version of the MUTCD.



5.2.20 Traffic Signs

- A. Traffic Signs shall be reflectorized aluminum in conformance with MassDOT Standard Sections 828 and M9.30.0.
- B. Signs shall not be screen printed, with the exception of STOP, YIELD, and DO NOT ENTER signs. All should be of a vandal / graffiti proof type.
- C. Sign orientation to roadway shall follow the latest version of the MUTCD.

5.2.21 Dust Control

- A. Dust control may be required by the City. The process shall consist of the application of calcium chloride per the approval of the City, to be measured in specified amounts (gallons per square yard for liquid form and pounds per square yard for flake form). The contractor may be required to furnish sprinkler trucks or hoses to wet down surfaces in lieu of applying calcium chloride, if approved in advance by the DPW.

5.2.22 Handholes

- A. Handholes shall have minimum internal dimensions of 36 inches length and 36 inches width and internal depth of 24 inches unless otherwise approved by DPW. Handholes shall be designed to meet ASTM C-858 and ACI 318 with AASHTO HS-20 highway loading. Handholes shall be of Quazite® polymer concrete or equal. Handholes shall have 5,000 psi strength after 28 days. Reinforcing steel shall meet ASTM A-615 grade 60 with a minimum of 1-inch of cover provided. Handholes shall be provided with 12-inch by 18-inch knockouts as required.

5.2.23 Handhole Frame and Covers

- A. Handhole frame and covers shall be cast iron conforming to the details shown on the drawings. Cast Iron shall be minimum Class 25 conforming to ASTM A48 and as follows:
 - 1. Castings shall be free from scale, lumps, blisters, and sand holes.
 - 2. Frames and covers shall be of cast iron with diamond cover surface design. Machine contract surfaces to prevent rocking.
 - 3. Thoroughly clean and hammer inspect.
 - 4. Capable of meeting or exceeding AASHTO HS-20 loading unless otherwise indicated or specified.
 - 5. Handhole frames and covers include the words "TOF COMMUNICATIONS" written on their tops. Handhole frames and covers shall be East Jordan (EJ) Iron Works catalog no. 8047 with bolted gasketed cover, or equal.

5.2.24 Manhole Frame and Covers

- A. Manholes shall have minimum internal dimensions of 36 inches length and 36 inches width and maximum internal depth of 24 inches unless otherwise approved by DPW. Manholes shall be designed to meet ASTM C-858 and ACI 318 with AASHTO HS-20 highway loading. Concrete shall have 5,000 psi strength after 28 days. Reinforcing steel shall meet ASTM A-615 grade 60 with a minimum of 1-inch of cover provided. Handholes shall be provided with 5" knockouts as shown on the drawings and as required.
- B. Manhole? frame and covers shall be cast iron conforming to the details shown on the drawings. Cast Iron shall be minimum Class 25 conforming to ASTM A48 and as follows:



1. Castings shall be free from scale, lumps, blisters, and sand holes.
2. Frames and covers shall be of cast iron with diamond cover surface design. Machine contract surfaces to prevent rocking.
3. Thoroughly clean and hammer inspect.
4. Capable of meeting or exceeding AASHTO HS-20 loading unless otherwise indicated or specified.
5. Manhole frames and covers shall have the words "COF COMMUNICATIONS" written on their tops. Manhole frames and covers shall be East Jordan Iron Works catalog no. 8047 with bolted gasketed cover, or equal.

5.3 Roadway Execution

5.3.1 General Conditions

- A. Work within public roadways is not permitted between November 15 and April 1, unless special approval is granted by the DPW.

All street, sidewalk, sewer, water and drain construction and all materials used in such work shall conform to all requirements of the MassDOT Standard Specifications, except as superseded by the City of Framingham standards. All work and materials shall be subject to the inspection and final approval of the DPW.
- B. Clearing of street locations and major changes in the grading of land and streets brought to rough grade with proper compaction shall be completed before the installation of utilities and before the finished street is begun.
- C. The setting of granite curbing, the installation of utilities, and any other construction that is required in a street shall be completed before the finish course of bituminous concrete is laid.
- D. New roadways shall be constructed in conformance with the plans approved by the Planning Board.
- E. Where a subdivision road under construction connects to a public way, a dirt trap shall be constructed, to meet the requirements set forth in the National Pollutant Discharge Elimination Construction Permit requirements. The trap shall be the width of the proposed street, at least 15 feet in length and filled with 6 inches of 2-inch crushed stone. Regular maintenance to remove trapped dirt and to replace stone shall be provided to keep the public way clean.

5.3.2 Procedure

- A. It is assumed that under normal conditions work will proceed in accordance with the following schedule. Major shifts in the schedule must be approved by the DPW or their designate. Each step must be approved by the Public Works inspector on the job.
 - a. Clearing and cleaning, including excavating or stripping poor material.
 - b. Earthwork, including necessary cuts and fills.
 - c. Installation of sewer mains.
 - d. Installations of water mains.
 - e. Test water and sewer mains.



- f. Installation of drainage system.
- g. Installation of other underground utilities.
- h. Installation of road sub-drain where conditions warrant.
- i. Installation of sewer services.
- j. Installation of water services.
- k. Preparation of sub-grade surface.
- l. Gravel and dense graded crushed stone approved by City Engineer
- m. Application of gravel and dense graded crushed stone on approved sub-grade.
- n. Compaction testing.
- o. Certification of sub-base grades by Professional Engineer or Surveyor.
- p. Application of roadway binder courses.
- q. Installation of curbing.
- r. Application of gravel in sidewalks.
- s. Slope grading and wall construction.
- t. Regulatory and street signs
- u. Construction of sidewalks.
- v. Guard rails (if required)
- w. Application of asphalt concrete top course for roadway.
- x. Pavement markings
- y. Installation of stone bounds.
- z. Application of loam and seed for lawns and slopes.
- aa. Installation of street lights and street trees.
- bb. Restoration of the public ways as required by the DPW.

5.3.3 Clearing (including excavating or stripping poor material)

- A. All vegetation and debris shall be removed within the Right of Way unless specified by the DPW to remain. Then all muck (peat) and topsoil shall be entirely removed from the Right of Way. All material that does not conform to Special Borrow (MassDOT Standard Spec. M1.02.0) shall be removed to a depth of 16 inches below finish grade. No utilities shall be installed until this requirement is completed.

5.3.4 Preparation of Subgrade

- A. All fill areas within 4 feet of the proposed subgrade shall be filled with Special Borrow except it shall contain no stone larger than 6 inches in greatest dimension and shall be placed and compacted in layers not exceeding 12 inches in depth, compacted measurement.

All cut areas shall be excavated to 16 to 20 inches below finish grade, unless the material meets the standard for Gravel Borrow. Fill areas with a depth 4 feet or greater shall be filled with Special Borrow. All filled areas shall be rough graded and compacted to not less than 95 percent of the



maximum dry density of the material as determined by the Standard AASHTO Test Designation T 99, Compaction Test Method C at optimum moisture content.

The subgrade shall be shaped to a true surface conforming to the proposed cross section of the roadway and compacted in accordance with the procedure stated above. All depressions and high spots shall be filled with special borrow or removed and compacted until smooth and satisfactorily compacted. A tolerance of 1/2 inch above or below the finish subgrade will be allowed provided that 1/2 inch above or below grade is not maintained for a distance longer than 50 feet and that the required grade is maintained in the subgrade. Any portion of the subgrade which is not accessible to a roller shall be compacted with mechanical tampers. The DPW shall approve subgrade construction before sub-base material and pavement is applied.

5.3.5 Gravel Sub-base

- A. Before the gravel is spread, the subgrade shall be prepared as noted above and shaped to a true surface conforming to the proposed profile and cross section of the road. Gravel shall be spread and rolled true to lines and grades with an approved three-wheel roller or approved equal, weighing not less than ten (10) tons to yield an 8-inch depth after rolling. All sub-base layers shall be compacted to not less than ninety-five (95) percent of the maximum dry density of the material as determined by the Standard AASHTO T99 compaction test: method C at optimum moisture content. Any depression that appears during or after rolling shall be filled with gravel borrow or dense-graded crushed stone and compact until the surface is true and even. When required by the DPW, samples of the gravel to be used shall be tested for gradation by a sieve analysis and the compacted gravel shall be tested for compaction. All tests shall be paid for by the developer.

5.3.6 Dense Graded Crushed Stone

- A. Dense graded crushed stone shall be placed and compacted to produce a 4-inch layer on top of the gravel sub-base in conformance with MassDOT Standard Spec. Section 402.

5.3.7 Hot Mix Asphalt Roadways

- A. The binder course material shall be applied to the prepared sub-base with a 3/8-inch pitch per foot from crown to gutter line. Tack coat shall be required between the binder course and top course as specified in the MassDOT Standard Sections 460 and M3.11.06. In no case shall any hot mix asphalt be laid until the sub-base has been inspected and approved. Hot Mix Asphalt placement shall conform to MassDOT Standard Section 460. Pavement shall not be placed on frozen material or when weather conditions predict freezing temperatures. When binder course will be left over winter months, all castings shall be set to surface grade of the binder course of asphalt for the winter season and then reset before the top course of pavement is applied. No permanent asphalt pavement shall be laid after November 15th or before April 1st, unless approved by the DPW.

5.3.8 Sidewalks and Driveway Aprons

- A. Concrete shall be installed on an 8-inch gravel sub-base prepared in the same manner as for the traveled way with a minimum width of five feet six inches (5'6"). Satisfactory forms shall be installed to assist in securing proper alignment. The cement concrete walk surface shall be laid in one course to a finished depth of 4 inches. The walk shall have a cross slope of 1.5 percent toward the roadway to provide proper drainage. Driveway aprons and other sidewalk areas where vehicular traffic may reasonably be expected to occur shall be laid in one course, 6 inches thick, and shall be constructed to the same specifications as sidewalks and meet the proposed sidewalk grades.



- B. In no case shall sidewalks and aprons be laid until the gravel sub-base has been inspected and approved. The City of Framingham DPW shall be notified at least 24 hours prior to any planned sidewalk concrete pour to allow inspection of the gravel sub-base. Testing of grade shall be done with a 10-foot straight edge placed parallel to the center line of the course; there shall be no deviation from a true surface in excess 1/4 of an inch. Sidewalks shall be broom finished prior to scoring. The sidewalk slab shall be scored to form 5-foot panels. Sidewalks shall be 5 feet wide. Traverse preformed expansion joints shall be installed at 30-foot intervals.
- C. Wheelchair ramps shall be 6 inches thick and shall be installed in strict compliance with the current AAB/ADA Rules and Standards.
- D. The loam in the grass strip shall be 6 inches thick. Fertilizer shall be applied to the loam at a rate of 0.2 pounds per square yard and worked into the seed bed with an application of lime, if needed to achieve the required pH range. As soon as the seed is sown, it shall be covered with a thin layer of loam, rolled and watered. The grass strip shall be seeded at the rate of 3.6 pounds per 100 square yards. Grass shall grow to a satisfactory cover before being accepted by the City. In locations where erosion is possible, erosion controls shall be in place until the vegetation has substantially rooted (see Section 1.4 for Erosion Control requirements).
- E. Truncated dome warning panels shall be brick red in color.

5.3.9 Granite Curbing

- A. Granite curbing shall be installed in the gutter line of all proposed roadways. Curbing shall be set with a 7-inch reveal. Granite Curb Inlets shall be installed at all catch basins. Granite curb and inlets shall be constructed in conformance with MassDOT Standard Specification Section 501, except that cement concrete shall be placed beneath the center section of each curbstone and as backfill in front and behind the curb.
- B. Bituminous Berm shall conform to MassDOT Standard Section 470. Bituminous Curb shall conform to MassDOT Standard Section 501.

5.3.10 Retaining Walls

- A. Walls shall be constructed in accordance with Section 5.2.14 in locations designated by the DPW if, in its opinion, such retaining walls are necessary for the public interest and safety, and the protection of abutters and the general public. All retaining walls shall be constructed outside the street lines and shall not interfere with the sight distance of the traveled way. Prefabricated retaining walls shall be constructed in accordance with the manufacturer's specifications. Retaining walls greater than 4 feet in height shall require review and approval of the design by the City Engineer.

5.3.11 Slopes

- A. Side slopes shall be constructed at a maximum slope of 4 feet horizontally to 1 foot vertically (4:1) from the edge of the street side lines to the existing ground surface. Slopes shall be covered with loam, 6 inches in compacted depth, and fertilized, limed and seeded as described in Section 5.3.8.D. The slopes shall be maintained to repair erosion, gullies and other damage and reseeded as necessary until an adequate growth of grass is achieved.

5.3.12 Granite Bounds

- A. An inventory of all existing roadway monumentation shall be taken. All existing roadway monumentation shall remain and be protected. Any damage to roadway monuments prior to acceptance by the City shall be repaired in a manner satisfactory to the DPW and the full cost of



such repair shall be paid by the Contractor. Any material used which does not meet the standards of the DPW shall be replaced by the Contractor at no cost to the City. The monumentation shall be replaced, realigned, and/or reset to its intended position and certified as to the correct location by a Massachusetts registered professional land surveyor. All proposed impacts shall immediately be brought to the attention of the Engineering Division. Bounds shall be of granite as directed and shall be set at points designated by the Engineer and in conformity with these specifications. Replacement or new bound installation shall be directly overseen by a Professional Land Surveyor licensed in the Commonwealth of Massachusetts. Surveyor's notes and layout data shall be provided to the Engineering Division.

- B. Bounds shall be set in conformance with MassDOT Standard Specification Section 710. The bounds shall be set at the depth and position as directed, and they shall not project above the ground more than 6 inches after final grading. Bounds located in lawns shall be set with the top of the bound 2 inches below the surface. Bounds located in sidewalks or drives shall be set with the top of the bound flush with the surface. Material for backfilling shall consist of suitable excavated material carefully placed about the bound and thoroughly tamped. When the excavation is in earth not suitable for backfilling, the Contractor shall furnish clean gravel or sand for backfill.
- C. When the bound location falls on solid ledge and the use of a drill steel rod is directed by the Engineer, a 1.5 inch hole shall be drilled to a depth of 18 inches and a drill steel rod as specified under Subsection 710.40 shall be placed in the hole. The rod shall be set so that the hole is on the bound point. The drill steel rod shall project above the ledge from 1 inch to 2 inches, and shall be grouted with a 1:1 mortar mix.

5.3.13 Guard Rail

- A. Guard Rail shall be constructed in conformance with MassDOT Standard Section 601. See Construction Details for requirements.

5.3.14 Pavement Markings

- A. For existing pavement marking applications, pavement markings shall be placed in conformance with MassDOT Standard Section 860
- B. For all new roadway construction, pavement markings shall be placed in conformance with MassDOT Engineering Directive E-05-003, dated June 16, 2005.
- C. Traffic markings must be restored by end of day, either after removal or paving. Temporary markings are allowed.

5.3.15 Traffic Signs

- A. Proposed sign locations shall be staked in the field for review and approval by the City prior to installation.

5.3.16 Street Signs

- A. Proposed sign locations shall be staked in the field for review and approval by the City prior to installation.

5.3.17 Inspections

- A. Each step in the construction process shall be inspected and approved by the DPW before the next step shall begin.



5.3.18 Handhole Installation

- A. Handholes shall be set on 12-inches of crushed stone bedding and set level. Top of frame on handholes shall set even with finished grade.
- B. Handhole frames shall be set with tops conforming accurately to grade of pavement or finished ground surface or as indicated on drawings. Frames shall be set concentric with top of handhole and on a minimum of 2 courses of red brick and mortar bedding. A full bed of mortar shall be placed so that the space between the top of the brick and mortar and the bottom flange of the frame shall be completely filled and made watertight. Frame shall be grouted as needed to have a smooth transition between the frame and the concrete handhole. A thick ring of mortar extending to the outer edge of the concrete shall be placed all around the flange.

5.4 References

- A. All materials and execution shall conform to the highest applicable standards. If there is a conflict between other standards, or between other standards and these Design standards, then the most stringent criteria shall be used.
- B. These standards draw and refer to the *Commonwealth of Massachusetts - Massachusetts Highway Department: Standard Specifications for Highways and Bridges* (1995 et seq.) and the *Commonwealth of Massachusetts - Massachusetts Highway Department: Construction and Traffic Standard Details* (1996 et seq.). These two documents are referred to collectively as the MassDOT Standards. In addition to the MassDOT Standards, the City references AASHTO, and ASTM as guidance for the materials and execution of work performed on the City Roadway Infrastructure. The following summarizes select standards applicable to the sections in these Design Standards. This list is not exclusive; other standards may apply. The latest revision of each standard shall be referenced.

<u>Standard</u>	<u>Title/Subject</u>
AAB	Architectural Access Board
ADA	Americans with Disabilities Act
MUTCD	Manual on Uniform Traffic Control Devices
NA	Massachusetts Department of Transportation: Standard Specifications for Highways and Bridges
NA	Massachusetts Department of Transportation: Construction and Traffic Standard Details (1996 et seq.)
521 CMR	Rules and Regulations of the Architectural Access Board
AASHTO T 99	Standard Method of Test for the Moisture-Density Relations of Soils Using a 5.5-lb Rammer and a 12-in. Drop (Compaction Test Method C)
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A616	Standard Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement.
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C150	Standard Specification for Portland Cement





6 Existing Road Openings

6.1 General

- A. Any contractor, corporation, public utility or person desiring to open a public way must comply with the City's Street Opening Permit (SOP) policy and the associated standard operating procedures. For further information, please refer to City of Framingham Web site link as follows: http://www.framinghamma.gov/public_works/sop/default.htm.
- B. All work in a public way shall be done in compliance with the minimum standards of the Framingham DPW as set forth herein.
- C. All trench repair work must be guaranteed and bonded as required in the City's Street Opening Permit (SOP) policy.
- D. All work shall be conducted in strict accordance with the latest OSHA regulations.
- E. No excavation shall remain open after working hours (7:30 a.m. to 4:30 p.m. or as specified in specific City requirements). All excavations shall be backfilled and paved, or covered with steel plates as approved by DPW at the end of work each day. Steel plate use requires approval by the DPW. Steel plates are generally not accepted.
- F. All trenches, whether on public or private property, that are at least 3 feet in depth and less than 15 feet in width, regardless of the length, shall be permitted throughout the City of Framingham as required by Massachusetts law.
- F. All pavements shall be cut before excavation is to begin.
- G. Length of Trench Opening:
 - 1. The maximum length of open trench permissible at any time shall be two hundred (200 feet) feet, and no greater length shall be opened for pavement removal excavation, construction, backfilling, repairing, or any other operation without the express written permission of the City.
- H. Workmanship:
 - 1. The Permittee shall furnish all materials and conduct the job in an orderly, timely, quality controlled manner.
 - 2. The Permittee shall keep a competent foreman and sufficient competent employees to carry on the work with proper speed and in accordance with the requirements of law and other public authorities and to the reasonable satisfaction of the DPW (DPW).
 - 3. The Permittee shall conduct the work in a manner that will not unreasonably interfere with other work being done by the City, by contract or otherwise. If deemed necessary by the DPW, the work done under these standards shall conform to the progress of said other work. The Permittee shall cooperate with the contractors or employees who may be doing work for the City, and with public service corporations affected by the work in arranging for storage places, temporary support for structures, repairs, etc.
 - 4. All temporary repairs shall be properly maintained by the Permittee to assure good rideability conditions until the end of the guarantee period or until permanent restoration has been made, whichever first occurs.
 - 5. Permanent pavement restoration accomplished by utility companies shall be properly maintained to assure good rideability conditions until acceptance by the DPW.



6. All existing roadway monumentation shall be inventoried and protected. Any and all impacts shall be brought to the attention of the Engineering Division immediately.
 - I. Pavement markings shall conform to MassDOT Standard Section 860.

6.2 Traffic Management

- A. Contractor shall be responsible for all traffic management for the construction work zone, in compliance with the guidance set forth by the ATSSA Guide to Temporary Traffic Control, the MassDOT Work Zone Safety Guidelines, the MUTCD and all federal and state regulations.
- B. The DPW requires that a traffic management plan be prepared and submitted for review and approval. The plan shall show the routing of traffic during construction. The plan shall show the area and dimensions of the roadway pavement available for traffic during each stage of the work. The plan shall include all temporary barriers, signs, pavement markings, drums and other traffic control devices required to maintain traffic together with the limits of temporary pavement and necessary steel plates. The plan shall include all the requirements contained in the City of Framingham Policy on Street Opening Permits.

6.3 Excavation

- A. Removal of asphalt pavement:
 1. All initial excavations into paved street surfaces shall be precut in a neat line with pavement breakers or saws. The initial cutting of the pavement shall be restricted to the area directly over the sidewalls of the proposed trench to be excavated, or as directed by the DPW.
 2. Heavy duty pavement breakers may be prohibited by the City when the use endangers existing substructures or other property.
 3. No irregular shapes will be allowed. No shape will be allowed that would prevent compaction equipment from adequately compacting all of the area. The shape of pavement cutouts shall be rectangular, or a combination of rectangular and square shapes unless otherwise agreed to by the City and Permittee.
 4. Pavement edges shall be trimmed to a neat vertical face free of loose materials and neatly aligned with the centerline of the trench.
 5. Unstable pavement shall be removed over cave outs and overbreaks and the subgrade shall be treated as the main trench.
 6. The Permittee shall make every effort to avoid damage to existing pavement to remain. Any damage shall be promptly repaired by the Permittee.
- B. Removal of concrete pavement:
 1. Saw cutting of reinforced Portland cement concrete is required with the depth of the cut being the full depth of the pavement unless otherwise directed by the DPW to retain reinforcement. Sawcutting may be required by the DPW outside of the limits of the excavation over cave-outs, overbreaks and small floating sections.
 2. Reinforced concrete pavement, to the extent possible, shall be removed without cutting the reinforcement. The bars or mesh, when cut, shall be severed as close to the center of the trench as practicable and bent back to permit accomplishment of the work. When the pavement is ready to be permanently replaced, the reinforcement shall be bent back into position and reinforced with other bars or mesh which shall overlap the ends of existing



reinforcement not less than twelve (12) inches and be securely wired together. Contact faces between new and existing concrete pavement shall be bonded using an approved epoxy binding agent installed and applied in accordance with the manufacturer's instructions, unless otherwise directed by the DPW.

- C. All material excavated from trenches and piled adjacent to the trench or in any street shall be piled and maintained in a manner that will not endanger those working in the trench, pedestrians or users of the streets, and so that as little inconvenience and obstruction as possible is caused to those using streets and adjoining property. The excavated material shall be hauled away from the site by the end of each working day.
- D. The Permittee shall secure the necessary permission and make all necessary arrangements for all required storage and disposal sites.
- E. When excavated material is laid along the side of the trench, it shall be kept trimmed. Whenever necessary in order to expedite the flow of traffic or to abate the dirt or dust nuisance, toe boards or bins may be required by the DPW to prevent the spreading of dirt into traffic lanes. If any portion of the excavated material is allowed to be used as backfill, it shall be stockpiled separately from all other materials.
- F. Sections of sidewalks and curbs shall be removed to the nearest real joint or scored line.
- G. Tunneling, boring or other methods may be required by the DPW to avoid or minimize pavement removal.

6.3.1 Backfill

- A. Before backfilling, the Permittee shall notify the DPW for inspection. Backfilling shall not occur without DPW approval.
- B. In unpaved areas, excavations shall be backfilled as directed by the DPW with approved material conforming to MassDOT Spec M1.02.0 Special Borrow thoroughly compacted in layers not to exceed twelve inches (12 inches) in thickness until flush with the surrounding ground surface. All backfill shall be rough graded and compacted to not less than 95 percent of the maximum dry density of the material as determined by the Standard AASHTO Test Designation T 99, Compaction Test Method C at optimum moisture content. If the backfilled material settles, additional approved materials shall be installed by the Permittee, as required, to keep the surface even. After settlement is completed, the excavated area shall be left by the Permittee in as good a condition as before the work was started.
- C. Temporary sheeting and bracing used to support the side walls shall be removed, unless otherwise directed by the DPW, as backfilling progresses. When backfilling has reached the bottom of a brace, the latter and its horizontal rafter shall be removed, and this procedure shall be repeated throughout the backfilling operation. The sheeting shall be pulled in short increments, care being taken to avoid significant lateral movements of the sides of the trench. During and after pulling the sheeting, the backfill in the space formerly occupied by the sheeting shall be compacted.
- D. Whenever water is found standing in the excavation area, the water shall be removed by pump or other means before backfilling operations may commence.
- E. Backfilling shall be performed as soon as practicable so that the least possible subsequent settling will occur. In most cases backfilling shall occur on the same day as the excavation was begun. If this is not feasible due to the complex nature of work, emergency, or unpreventable conditions, the Permittee shall notify the DPW that same day, if not sooner, and take appropriate measures to protect public safety and infrastructure until work commences again the following day.



- F. Backfill in paved areas shall be granular gravel borrow, processed gravel, sand or crushed stone material. At the City's discretion, in-situ material conforming to MassDOT Spec M1.02.0, Special Borrow may be used for trench backfill above the pipe bedding material and below the roadway foundation materials. The backfill shall be spread in layers not exceeding eight inches (8 inches) in loose depth and thoroughly compacted, up to the pavement subgrade surface. All backfill shall be rough graded and compacted to not less than 95 percent of the maximum dry density of the material as determined by the Standard AASHTO Test Designation T 99, Compaction Test Method C at optimum moisture content.
- G. Broken pavement, large stones, roots and other debris shall not be used in backfill. Unused excavated material shall be removed from the jobsite and disposed of in a manner that will minimize interference and obstruction with pedestrian and vehicular traffic. No material shall be left within the right-of-way once the repair and/or installation is complete.
- H. Backfill material shall be in conformance with 6.2.4.
- The City will allow, and may in some cases require under certain conditions, as an alternate, Controlled Density Fill (CDF) under the following conditions:
1. Only Type IE, Excavatable, Fill will be allowed.
 2. This material shall not be used for bedding material or in situations that will cause floating of the utility lines, or in the presence of cast iron or steel pipes.
 3. CDF placement in trenches shall be fully barricaded or police protected for a minimum of three (3) hours after the pour or until a set is reached that will prevent a hazard to animals or humans.
 4. CDF shall be placed up to the pavement subgrade surface.
 5. CDF shall be separated from gas lines with a minimum of six (6) inches of sand cover over the lines.

6.3.2 Temporary Pavement

- A. Upon the completion of proper backfilling, the Permittee shall install temporary pavement. The Permittee shall take all reasonable measures to complete temporary pavement on the same day excavation work was begun. If same day paving is not achievable due to complexity of work, emergency, or unpreventable conditions, the Permittee must notify the DPW as soon as practicable that same day, if not sooner, and take appropriate measures to protect the public safety and infrastructure until work commences again the following day. The most stringent measures will be required on primary streets. Same day paving will typically be required if work is not expected to be continued the next day, regardless of location.
- B. The Permittee shall notify the DPW 48 hours prior to beginning paving operations for inspection. All hot mixed asphalt paving must first be approved by the DPW or designee as to depth and materials; *this applies to both temporary and permanent paving activities.*
1. Notification of the anticipated timing of all paving activity must be acknowledged by the DPW. Any notification delivered by facsimile machine must be preceded or followed up by a telephone conversation to assure its proper and timely receipt.
 2. Permittees shall endeavor to make a follow-up notification by 9:00 a.m. of each workday that paving is still anticipated. In the event of schedule changes or emergencies, the Permittee shall provide a minimum of one-hour notification to assure inspection availability.



3. If a City inspector is not able to be on site within 24 hours of the acknowledged anticipated start time of paving activity, the Permittee may be allowed to commence paving. Inspector may sample in-place material for specification compliance.
 4. Permittees who do not provide proper notification of paving activities may be subject to required removal and replacement of pavement for the purpose of inspection.
- C. All temporary pavement shall be hot mixed asphalt, conforming to MassDOT Standard Section 460, placed in two (2) inch compacted courses to a total depth of four (4) inches. If existing pavement depth is greater than eight (8) inches, temporary pavement shall be placed in two (2) inch compacted courses to a total depth of six (6) inches. If a layer of concrete, cobblestone, granite pavers, or other supporting material also exists, the Permittee shall install concrete to match that depth prior to installing temporary pavement.
 - D. If excavation (or pavement damage) occurs at or within twenty four (24) inches of the edge of trench, the Permittee shall place temporary pavement to the edge of existing sound pavement.
 - E. Hot mixed asphalt paving of trenches deemed by the DPW to be major excavation shall be paver applied, unless otherwise authorized by the DPW.
 - F. The Permittee shall maintain the temporary pavement and shall keep the temporary pavement in acceptable condition until the end of the guarantee period, or until permanent pavement is installed.
 - G. The Permittee shall perform the necessary restoration beyond the limits of the street pavement, including lawns, esplanades, shrubs, gardens, curbing, sidewalks, underdrains, separations fabrics, fences, walls, etc. Upon completion of the permanent repairs outside the limits of the street pavement, the Permittee shall notify the DPW in writing that the permanent repairs and/or replacements have been completed, setting forth the date of completion. The Permittee shall maintain the repaired area outside of the pavement for a period of three (3) years after completion, with the exception that once proper horticultural growth has been established, no further horticultural maintenance will be required.
 - H. Refilling of bar holes made in the street or sidewalk shall immediately, upon completion of the work, be filled with compacted, granular material up to three (3) inches below the paved surface and the remaining three (3) inches filled with an approved asphalt plug.
 - I. All traffic control signs (i.e. STOP, YIELD, DO NOT ENTER, ONE WAY, NO PARKING, SPEED LIMIT, CURVE WARNINGS, etc.) approved by the DPW for removal, relocation, replacement, etc. shall be immediately replaced by the Permittee, unless otherwise directed by the City's Traffic Engineer. No such traffic control sign shall be removed, relocated or replaced without the express approval of the DPW.
 - J. All traffic devices, signs, pavement markings or traffic loops disturbed, damaged, altered or removed by the Permittee shall be promptly replaced by the Permittee, unless otherwise directed by the DPW, in accordance with City and State of Massachusetts rules and regulations at the expense of the Permittee. The Permittee shall promptly repair all other damage caused by the work or activities. Street markings (centerlines, crosswalks, stop bars, lane markings, etc.) and traffic loops shall be replaced no later than thirty (30) days after completion of work or as may be directed by the City's Traffic Engineer. If work disturbs centerlines or lane markings on primary streets, the Permittee shall place temporary reflective markers immediately after the pavement is placed. Traffic markings must be restored by end of day, either after removal or paving. Temporary markings are allowed.



- K. The total thickness of the gravel base material and temporary pavement shall be of an adequate thickness to allow for the proper permanent roadway cross section. Extra gravel base may need to be installed.

6.3.3 Permanent Pavement

- A. The existing pavement shall be saw cut a minimum of six (6) inches beyond the initial excavation limits to expose a six (6) inch width of undisturbed soil.
- B. The temporary pavement, backfill and undisturbed soil shall be removed to the depth of the proposed pavement and disposed of off the site.
- C. The permanent pavement shall be:
 1. Local Streets: 1.5 inches of Top Course material placed on 2.5 inches of Binder Course material founded on 4 inches of Dense Graded Crushed Stone on 8 inches of Processed Gravel or Dense Graded Crushed Stone. This pavement structure shall be placed on the backfill.
 2. Collector Streets: 2 inches of Top Course material placed on 4 inches of Binder Course material placed in two equal courses founded on 4 inches of Dense Graded Crushed Stone on 8 inches of Processed Gravel or Dense Graded Crushed Stone.
 3. Arterial Streets: 3 inches Modified Top Course material placed in two courses on 5-inches of Binder Course material placed in two equal courses founded on 4 inches of Dense Graded Crushed Stone on 8 inches of Processed Gravel or Dense Graded Crushed Stone.
- D. Trench backfill and roadway foundation materials shall be checked for compliance with 95 percent compaction requirement. If compaction is found to be less than 95 percent, trench shall be re-compacted before paving will be allowed.
- E. Permanent pavement restorations shall not be allowed to commence until at least one hundred twenty (120) days have passed since the installation of approved temporary hot-mixed asphalt pavement.
- F. In cases where the existing pavement adjoining a proposed excavation is in need of rehabilitation, the City and Permittee may enter into a mutual agreement such that the Permittee undertakes the pavement rehabilitation as part of their pavement restoration.
- G. The Permittee will not be required to repair or replace damaged pavement existing prior to commencement of the work unless excavation operations result in small, unstable sections. These shall be removed and replaced as part of the work.
- H. Each course of hot-mixed asphalt shall be compacted separately, meeting the requirement of 92 percent minimum compaction of standard laboratory maximum theoretical density for the specific material.
- I. Mechanical compactors will be permitted for repairs less than 10 square yards. Repairs exceeding 10 square yards shall be rolled with an appropriately sized, power-driven, steel-wheeled roller to obtain specification density.
- J. Hot-mixed asphalt materials shall be laid upon an approved clean, dry, compacted surface, spread and struck off to the established grade and elevation, giving regard to the loss in depth between loose and compacted mixtures. Immediately after the hot mix asphalt mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted.



- K. All saw cut vertical faces of existing pavement shall be neat, free of loose materials, and tack coated with an approved asphalt emulsion by applying the emulsion material in conformance with MassDOT Standard Specifications Section 460.62, to fully cover the surfaces prior to pavement installation.
- L. A tack coat shall be applied to the sub-base surface, or previous course surface.
- M. If two or more excavations are made for the same utility or client in the same construction season and are within six (6) feet of each other, edge to edge, they shall be permanently restored as one trench, including the pavement between excavations.
- N. Same requirement shall apply, if in a future season, an excavation for the same utility or client occurs within six (6) feet and the first has not yet been permanently restored.
- O. If an excavation for the same utility or client falls within six (6) feet of another excavation already permanently restored, the permanent pavement of the second excavation shall include all surface pavement between both excavations.

6.3.4 Material Specification – Trenches

- A. Special borrow shall conform to MassDOT Spec. M1.02.0.
- B. Granular gravel borrow and processed gravel material backfill shall conform to MassDOT Spec. M1.03.0, Gravel Borrow Type (b) and MassDOT Spec. M1.03.01, respectively.
- C. Sand borrow shall conform to MassDOT Spec. M1.04.0.
- D. Controlled Density Fill (CDF) Type IE Excavatable shall conform to MassDOT Spec. M4.08.0.
- E. Pavement structure subbase material shall be either MassDOT M1.03.1 Processed Gravel for Subbase or MassDOT M2.01.7 Dense Graded Crushed Stone for Subbase. The material shall be spread in layers not exceeding eight (8) inches in loose depth and compacted to no less than 95 percent of the maximum dry density of the material, ASTM D1557.
- F. Temporary pavement shall be hot-mixed asphalt MassDOT Type I top course material conforming to MassDOT M3.01.0 and M3.11.07.
- G. Steel Plates. Steel plates shall not be used without DPW's approval. See Section 6.3, Special Conditions, for design and construction requirements.
 - 1. Plates and supporting members shall be steel, either new or used.
 - a. All materials shall be sound and free of damage or deterioration that would adversely affect functions.
 - b. Load and deflection calculations shall be used on ASTM A36 / A36M steel unless Contractor provides evidence that all steel used for the plate systems will be a higher strength grade.
 - 2. Steel plates in vehicular and pedestrian traffic areas shall be coated with an approved skid-resistant coating. Preparation of the surface and application of the coating shall be in accordance with all of the manufacturer's guidelines. Coatings shall be maintained on 100 percent of the surface of plates carrying vehicular and pedestrian traffic. Repairs shall be made to worn or deficient areas.
- H. Permanent pavement materials shall conform to the same MassDOT Standard Specifications as required for temporary pavement.



- I. Portland Cement Concrete shall conform to the requirements of Section M4 of the MassDOT Standard Specifications.
- J. Reinforcing shall be FIBERMESH fibers (100 percent virgin polypropylene, collated, fibrillated fibers) at a rate of 1.5 lbs. per cubic yard of concrete will be allowed for non-structural reinforcement. Installation shall be per manufacturer's recommendations.
- K. Loam shall conform to MassDOT Standard Specification Section 1.05, Loam Borrow. Loam shall have a finished depth of six (6) inches (minimum).
- L. Seeding shall conform to MassDOT Specification Section M6.03. Permittees shall be required to continually seed and water areas of loam until a satisfactory growth of grass is established.
- M. Filter fabric for underdrain shall be equivalent to Mirafi 140 by Fiber Industries.

6.4 Special Condition(s)

- A. Disposal of removed pavement, concrete, soil, or other material shall comply with the DPW's Waste Management and Soil Management specifications. The disposal location and management plan shall be pre-approved by the DPW, prior to the start of any work.

Steel Plates

- 1. Design Requirements:
 - a. The Permittee shall select and design the temporary steel plate and supporting system. The design calculations and Drawings shall be prepared, signed, and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts experienced in design of temporary traffic decking.
 - b. Design shall be in accordance with Loads and Design Criteria standard to the industry for this type of work, and with the following requirements:
 - (i) For vehicular ramps, limit maximum grade to 5 percent.
 - (ii) For pedestrian ramps, limit maximum grade to 8 percent.
 - (iii) Conform with Americans with Disabilities Act Accessibility Guidelines (ADAAG) at all pedestrian traffic locations.
 - (iv) Design of support members shall allow clearances for existing and relocated utilities.
 - (v) Provide access to utilities, fire hydrants, and other facilities requiring unique access. Requirements at each site shall be obtained from the respective agencies affected.
 - (vi) Plates shall overlap the trench width by at least 2 feet on each side.
- 2. Construction Methods:
 - a. Install and maintain the temporary steel plate systems only with express DPW approval.
 - b. Not more than two (2) steel plates shall be used at any time.
 - c. Steel plates shall not be used between November 15 and April 1 or at any time when snow is forecasted.
 - d. Place 48" x 48" orange and black construction sign, stating "Steel Plates 100 feet" to provide drivers with advanced notice.
 - e. Provide wood wedges under plate edges at uneven surfaces to minimize movement.



- f. Pin plates to existing asphalt as shown in the details provided in the Street Opening Permit “Steel Plate Detail 2009” available at <http://www.framinghamma.gov/index.asp?nid=207>.
3. Illumination:
 - a. Provide illumination in plated areas that will carry pedestrian traffic.
4. Maintenance:
 - a. Inspect the condition of temporary steel plates at least once a day. Continuously maintain plates to conform to design requirements and construction requirements. Immediately repair defects such as broken, bent, or loose plate members, and protruding fasteners. Patch adjacent paving as potholes develop, and immediately re-secure and bed loose transition members, plates, and ramps to the existing pavement.
 - b. Maintain steel plates free of accumulations of snow, ice, water, mud, and debris.
 - c. Perform maintenance, repair, or replacement whenever there is noticeable deterioration of any material or component from its original conditions.

6.5 References

All materials and execution shall conform to the highest applicable standards. If there is a conflict between other standards, or between other standards and these Design standards, then the most stringent criteria shall be used.

These standards draw and refer to the *Commonwealth of Massachusetts - Massachusetts Highway Department: Standard Specifications for Highways and Bridges* (1995 et seq.) and the *Commonwealth of Massachusetts - Massachusetts Highway Department: Construction and Traffic Standard Details* (1996 et seq.). These two documents are referred to collectively as the MassDOT Standards. In addition to the MassDOT Standards, the City references AASHTO, and ASTM as guidance for the materials and execution of work performed on the City Roadway Infrastructure. The following summarizes select standards applicable to the sections in these Design Standards. This list is not exclusive; other standards may apply. The latest revision of each standard shall be referenced.

Standard	Title/Subject
ATSSA	Guide to Temporary Traffic Control in Work Zones
MassDOT	Work Zone Safety Guidelines for Massachusetts Municipalities and Contractors
MassDOT Standards	Massachusetts Department of Transportation: Standard Specifications for Highways and Bridges
MassDOT Standards	Massachusetts Department of Transportation: Construction and Traffic Standard Details (1996 et seq.)
ADAAG	Americans with Disabilities Act Accessibility Guidelines
ASTM A36 / A36M	Standard Specification for Carbon Structural Steel
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³)
US DOT	Manual on Uniform Traffic Control Devices
US DOT	Manual on Uniform Traffic Control Devices





Plan Content Requirements

The following are required to be included on Site Utility Plans submitted to the DPW for advance project review, comment input and approval. Only plan submittals containing the proper level of information presented in the specified format will be plan reviewed and processed. Hence, to avoid rejections or delays the applicant should accurately prepare the appropriate Plan Submittal Package following the content items outlined below.

1. Drawing must be drawn to scale with the scale preference being 1"=20' including the depiction of a North Arrow. Orient such that North does not point towards the bottom of the sheet.
2. All drawing sheets shall have a border, title, and revision block that includes at a minimum:
 - a. Engineering firm name and address/contact information including telephone and email
 - b. Project name
 - c. Property address and street name
 - d. Drawing creation date
 - e. Scale
 - f. Revision block represented to facilitate the documentation of any follow-up revision plan submittals numbers/revision description/revision date with all revision information made on the drawing (layout or annotation) clearly cloud circled and each cloud noting the revision number
3. All existing vs. all proposed design construction conditions (drawing and annotation) must be distinguished by different line weight treatment as follows: Existing conditions depicted lighter or narrower and proposed design conditions shown heavier or bolder line weight representation.
4. Original Massachusetts licensed Professional Engineer's or Professional Land Surveyor's stamp and signature on all drawings.
5. In addition to key dimensions and location ties, the size, material, and vintage must be shown for all existing and proposed infrastructure (mains and services or branches) needed to support the project be it City and/or public and/or private owned (i.e. Water, Sewer, Storm Water, Traffic Signal, Telecom, Electric, Gas, etc.)
6. Locus map showing the parcel in relation to the surrounding properties
7. Name of record owner(s) of land shown on the plan
8. Identification of parcel by sheet, block, and lot number of Assessors Maps.
9. Property lines, easements and/or other legal rights within the property lines. Locations of all existing and proposed roadway monumentation.
10. Location of all buildings and lot lines on the lot, including ownership of lots, and street lines, including intersections within 300 ft.
11. Boundaries and existing and proposed topography of the property, including contours at a 2-foot interval, using (National Geodetic Vertical Datum 1929) NGVD29 as it may be updated from time to time and specifying NGVD29 on all elevation drawings, specifically indicating the areas on which the activity is proposed to occur, and clearly noting if the activity is on an area greater than 4,000 square feet or on Slopes 15% or greater
12. Dimensions of proposed buildings and structures, including gross floor area, floor area ratio, total lot coverage of building, and breakdown of indoor and outdoor floor area as to proposed use. Area dimensions to include Lot Coverage of Building, Paved Surface Coverage, and Landscaped Open Space and Other Open Space, with percentages of these items to be provided and to total 100 percent of the lot area.
13. Locations and dimensions, including total ground coverage, of all driveways, maneuvering spaces and aisles, parking stalls and loading facilities, and proposed circulation of traffic.
14. Location of pedestrian areas, walkways, flow patterns and access points, and provisions for handicapped parking.
15. Location, size, and type of materials for surface paving, curbing, and wheel stops.
16. Location, dimension, type and quantity of materials for open space, planting, and buffers where applicable.



17. Provisions for storm water drainage affecting the site and adjacent parcels, and snow disposal areas. Drainage computations and limits of floodways shall be shown where applicable.
18. Accurate depiction of rim and invert elevations for storm drainage and sanitary sewer, sanitary service wyes with distances to nearest structure, water line gates and water service valves
19. Cross sections, design details or profiles as appropriate
20. Curbing, sidewalk, driveway curb opening, parking areas, walkways, and road layout identified and dimensioned
21. Photometric plan showing the intensity of illumination expressed in foot-candles at ground level within the interior of the property and at the property boundaries; location, orientation, height, wattage, type, and style of outdoor luminaire.
22. Zoning Table to be located on both the front page of the submitted plans and on the Parking Plan/Site Plan page.
23. Water service, sewer, waste disposal, and other public utilities, accurately positioned, on and adjacent to the site.
24. The size and location of all existing and proposed buildings, structures, utilities, roads, driveways, parking areas, and areas of cut and fill on the site and the location of all structures on abutting properties within 100 feet of the property lines of the parcel
25. All wetlands and wetland resource areas as defined in M.G.L. Ch. 131, §40, and the Framingham Wetlands Protection Bylaw, Article V, §18 of the General By-laws, drainage patterns, and watershed boundaries. Also include a delineation of the 100-year floodplain and all bodies of water, including vernal pools, streams, ponds, and coastal waters within 125-feet of the project site/limit of work and the delineation of a 30-foot no-cut/no alteration zone
26. Location of any rare and endangered species as mapped by the Massachusetts Natural Heritage Program
27. The location of any proposed stockpile locations
28. Detailed drawings and design calculations of all temporary and permanent stormwater management and Erosion and Sediment control structures and devices. Drawing Legend depicting all symbols and line types



As-built Plan Requirements

An as-built plan of project improvements (roadway, site work, and utilities), in both hardcopy and electronic formats, shall be submitted for review and approval. A stamped paper hardcopy of the as-built plan shall be submitted for review. Once approved, a stamped hard copy and electronic copies (AutoCAD and PDF) of the as-built plan shall be submitted for archival. All drawing sheets shall not exceed ARCH Size D (24" x 36") and shall be prepared at readable plan scale, preferably consistent with the design plan scale. Plans shall be prepared in monochrome format utilizing gray scale and line types to differentiate features (color as-built plans will not be accepted).

Electronic as-built information shall be in both AutoCAD 2008 and Acrobat PDF formats. The AutoCAD file shall conform to the current version of the MassGIS Standard for Digital Plan Submission. The electronic CD/DVD media shall be properly labeled with the Project Name, date, and all file names.

The as-built plan shall include:

1. North arrow, scale, and date
2. Name of record owner(s) of land shown on plan
3. Identification of parcel by sheet, block, and lot number of Assessor's Maps
4. Property lines, easements, and/or legal rights within the property lines
5. Location of all buildings and lot lines on the lot, including ownership of lot, and street limits
6. Boundaries and final topography of the property, including contours at a minimum 2 foot interval, using (National Geodetic Vertical Datum 1929) NGVD1929 as it may be updated from time to time and specifying NGVD on all elevation drawings
7. Original Massachusetts licensed Professional Engineer's or Professional Land Surveyor's stamp and signature on all drawings
8. All drawing sheets shall have a border and a title block that include project name/street location, and Engineering Firm telephone contact numbers/address information
9. Drawing Legend depicting all symbols and line types
10. Utilities accurately positioned (Cable, Drainage, Electric, Gas, Telephone, Sewer, Water, Etc.) as applicable
11. Size and materials identified for all new City utilities and service connections (Storm Drainage, Sanitary Sewer and Water)
12. Key dimensions (and ties) depicted for all new City utilities and service connections. Ties shall include dimensions from fixed objects to water valves, angle fittings, reducing fittings, sleeves, service taps, etc. and dimensions from fixed objects to sewer cleanouts, main taps, couplings, angle fittings, etc.
13. Rim and invert elevations for storm drainage and sanitary sewer, sanitary service wyes with distances to nearest structure, water line gates and water service valves shall be accurately depicted
14. Cross sections, design details or profiles as appropriate
15. Curbing, sidewalk, driveway curb opening, parking areas, walkways, and road layout identified and dimensioned





Construction Details

Detail Number	Detail Title
G-1.0.0	Fiber Rolls and Silt Fences for Erosion Control
W-2.1.0	Typical Water Connection for 1" Service
W-2.1.1	Typical Water Connection for 1-1/2" to 2" Service
W-2.1.2	Typical Fire Service for 1 1/2" to 2"
W-2.1.3	Typical Fire Service (Tapping Sleeve)
W-2.1.4	Typical Connection (Tapping Sleeve)
W-2.2.0	Typical Thrust Restraint Wedge Action Type Joints
W-2.2.1	Typical Thrust Restraints Using Tie Rods and Friction Clamps
W-2.2.2	Typical Thrust Block Detail
W-2.3.0	Water Main Trench Detail
W-2.4.0	Gate Valve
W-2.4.1	Typical Anchor Tee Installation
W-2.4.2	Air Release Valve/Blow Off
W-2.4.3	Valve Location at Intersection
W-2.4.4	Water Gate Covers
W-2.4.5	Water Valve Box
W-2.5.0	Fire Hydrant Installation
W-2.6.0	Water Main Lowering Detail
W-2.6.1	Water Crossing Under Railroad
W-2.7.0	Detail of Cut and Remove of Water Connection 4" and Over
W-2.7.1	Detail of Cut and Capping of Water Connection 4" and Over
W-2.8.0	Meter Installation
S-3.1.0	Service Connection (Gravity)
S-3.1.1	Service Connection (Saddle)
S-3.1.2	Chimney
S-3.1.3	Service Connection (Grinder)
S-3.2.0	Above Grade Clean Out
S-3.3.0	Plug for Abandoning Sanitary Sewer
S-3.3.1	Plug for Sanitary Sewer
S-3.4.0	Typical Sewer Manhole
S-3.4.1	Typical Drop Manhole (Outside)
S-3.4.2	Forcemain Manhole
S-3.4.3	Sewer Manhole Cover
S-3.4.4	Manhole Seal
S-3.5.0	Sewer Crossing
S-3.6.0	Backwater Valve Assembly
S-3.7.0	Typical Grease Trap



Detail Number	Detail Title
S-3.7.1	Typical Grease Trap Sizing and Notes
D-4.1.0	Single Grate Catch Basin
D-4.1.1	Direct Inlet Catch Basin
D-4.1.2	Dual Grate Catch Basin
D-4.2.0	Drain Manhole
D-4.2.1	Eccentric Manhole
D-4.2.2	Sump Manhole
D-4.3.0	Manholes and Catch Basins General Notes and Dimensions
D-4.3.1	Raising Castings
D-4.4.0	Rip Rap Apron at Pipe Outfalls
D-4.4.1	Rip Rap Plunge Pool
D-4.5.0	Typical HDPE Pipe Trench Detail
D-4.6.0	Flared HDPE End Sections
D-4.7.0	Subdrain
D-4.8.0	Dry Well
R-5.1.0	Roadway Cross Section
R-5.1.1	Cut and Fill Slopes
R-5.1.2	Granite Curbs
R-5.1.3	Bituminous Berms
R-5.1.4	Pavement Transition
R-5.1.5	Roadway Widening and Overlay 6-Ft Wide or Greater
R-5.1.6	Roadway Widening and Overlay 6-Ft Wide or Less
R-5.1.7	Pavement Details for Trench Restoration
R-5.1.8	Continuous Zone Trench Restoration
R-5.2.0	Guard Rail
R-5.2.1	Guard Rail (Double Face)
R-5.3.0	Wheelchair Ramp Notes
R-5.3.1	Wheelchair Ramp Type A
R-5.3.2	Wheelchair Ramp Type B
R-5.3.3	Wheelchair Ramp Type C
R-5.3.4	Wheelchair Ramp Type D
R-5.3.5	Wheelchair Ramp Type E
R-5.3.6	Detectable Warning Panel
R-5.4.0	Typical Curb Cut Plan – Residential Driveways No Sidewalk
R-5.4.1	Full Depth Driveway Apron – Section No Sidewalk
R-5.4.2	Sidewalk Through Driveway
R-5.4.3	Full Depth Driveway – Section Cement Concrete Sidewalk Crossing
R-5.5.0	Cross Walk



Detail Number	Detail Title
R-5.5.1	Decorative Cross Walk
R-5.6.0	Steel Plate Installation
R-5.7.0	Traffic Sign Installation Notes
R-5.7.1	Traffic Sign Detail Sidewalk or Median Installation
R-5.7.2	Traffic Sign Detail Non-sidewalk Installation
R-5.7.3	Street Name Sign Installation Notes
R-5.7.4	Street Sign Detail Sidewalk Installation
R-5.7.5	Street Sign Detail Non-sidewalk Installation
R-5.7.6	Granite Bound Detail
R-5.8.0	Trench Detail for Communications Conduit



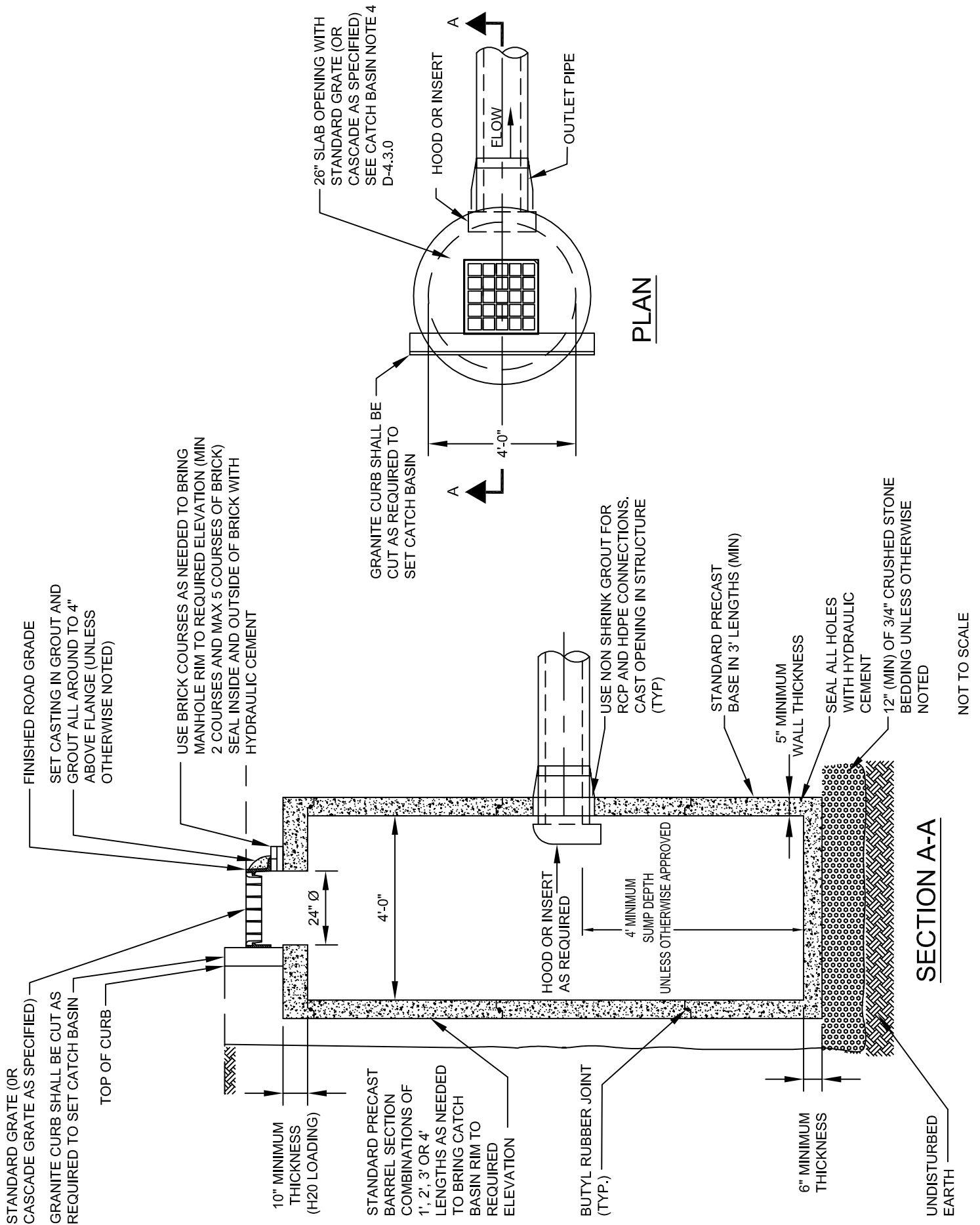
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DEPARTMENT OF PUBLIC WORKS

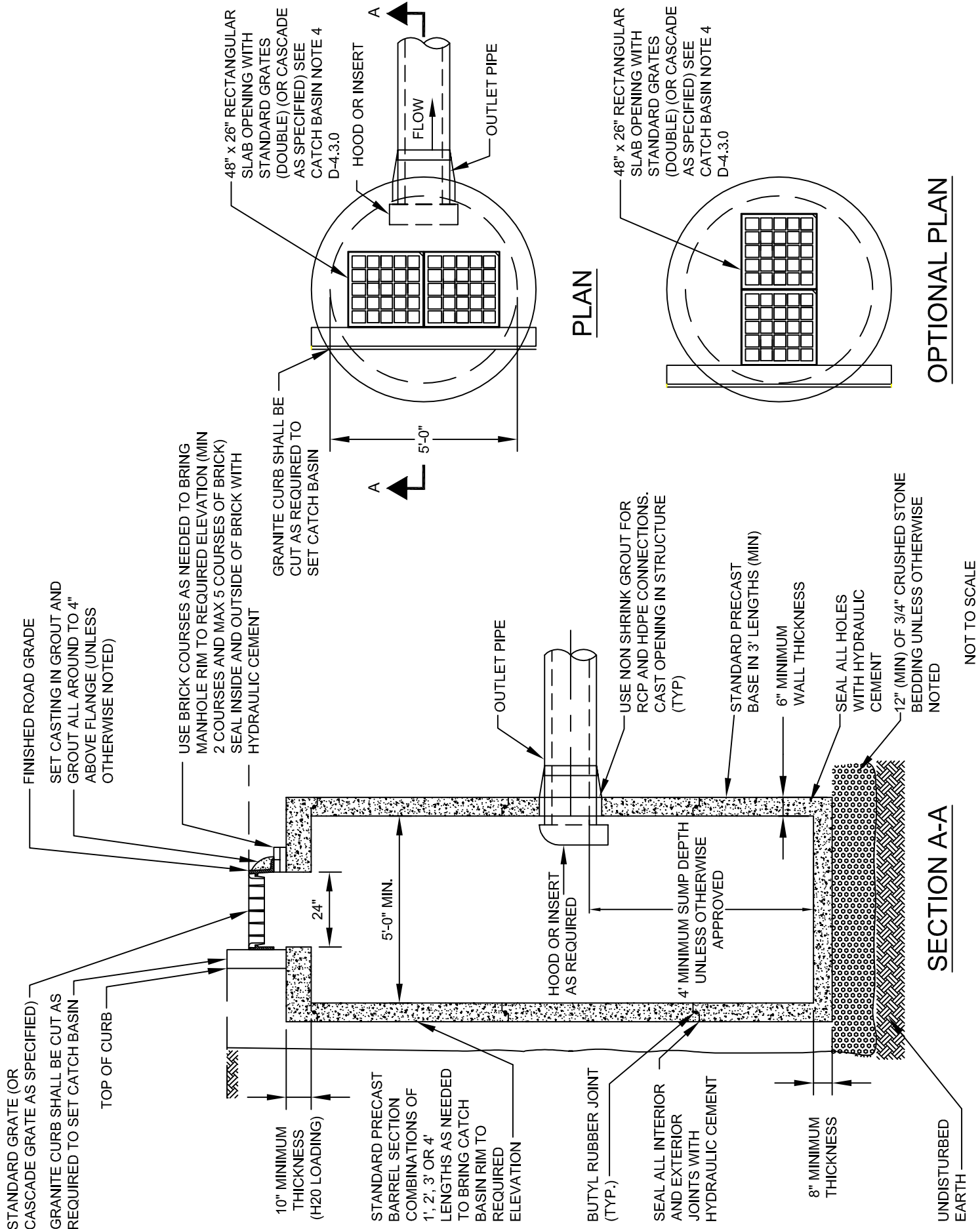
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DATE:
MARCH 2017

REV:
4

DETAIL NO.
D-4.1.0

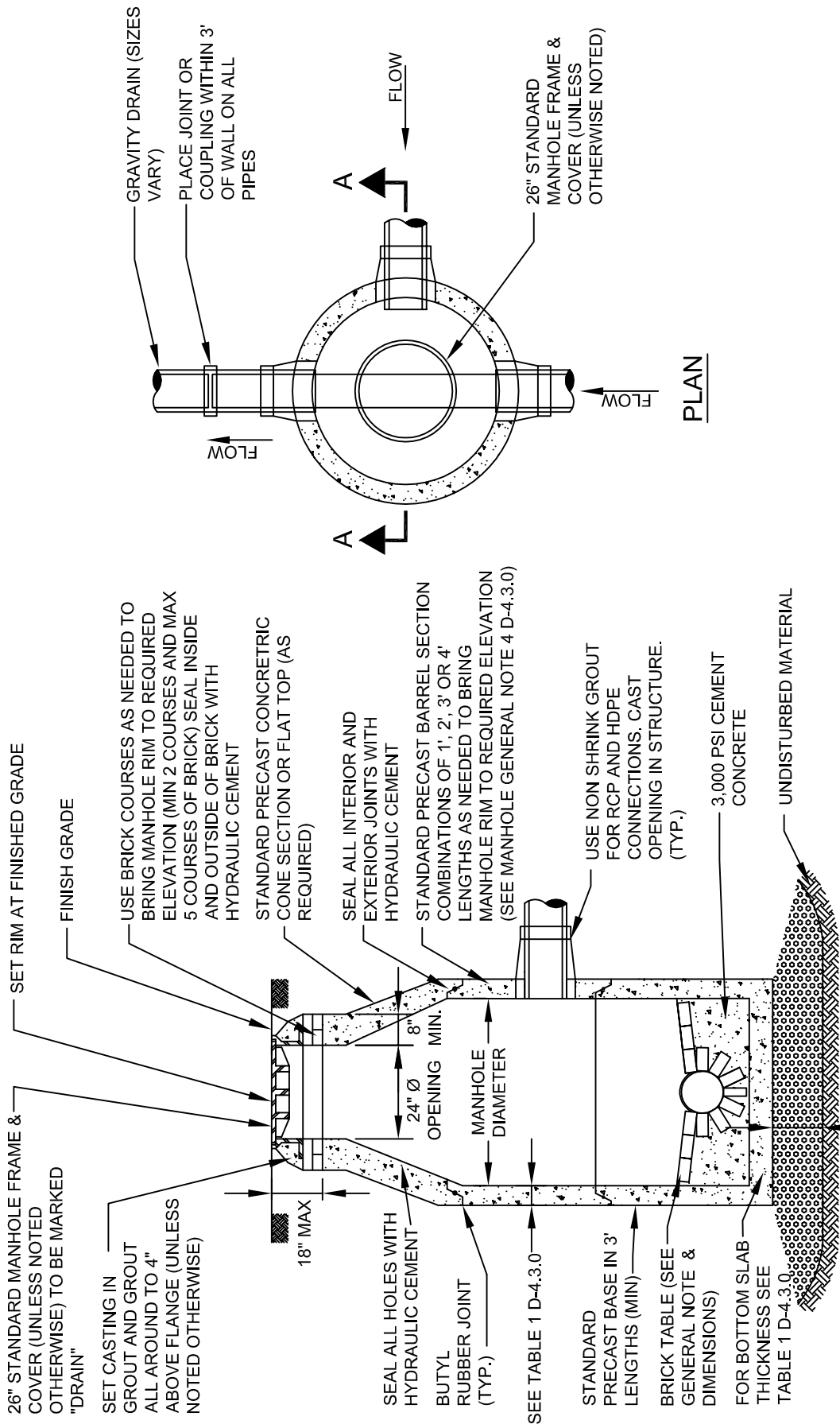




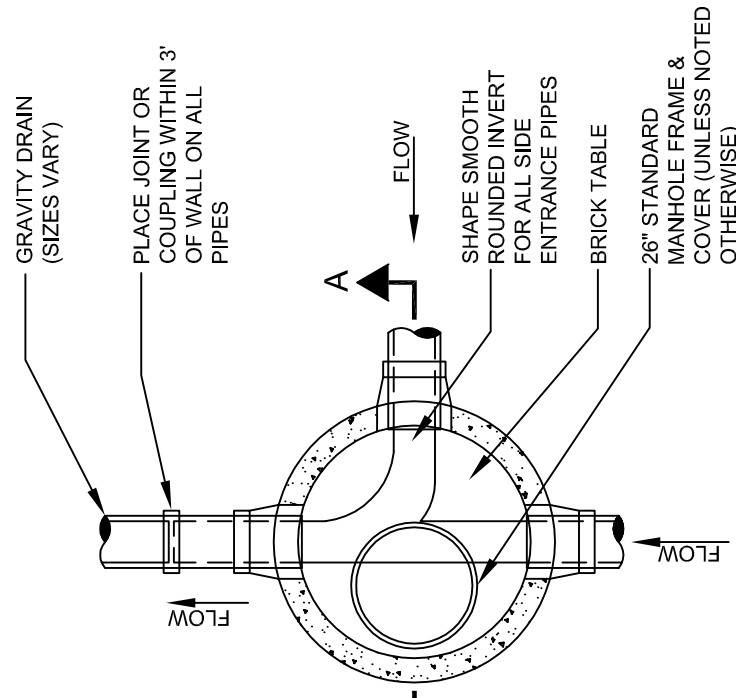
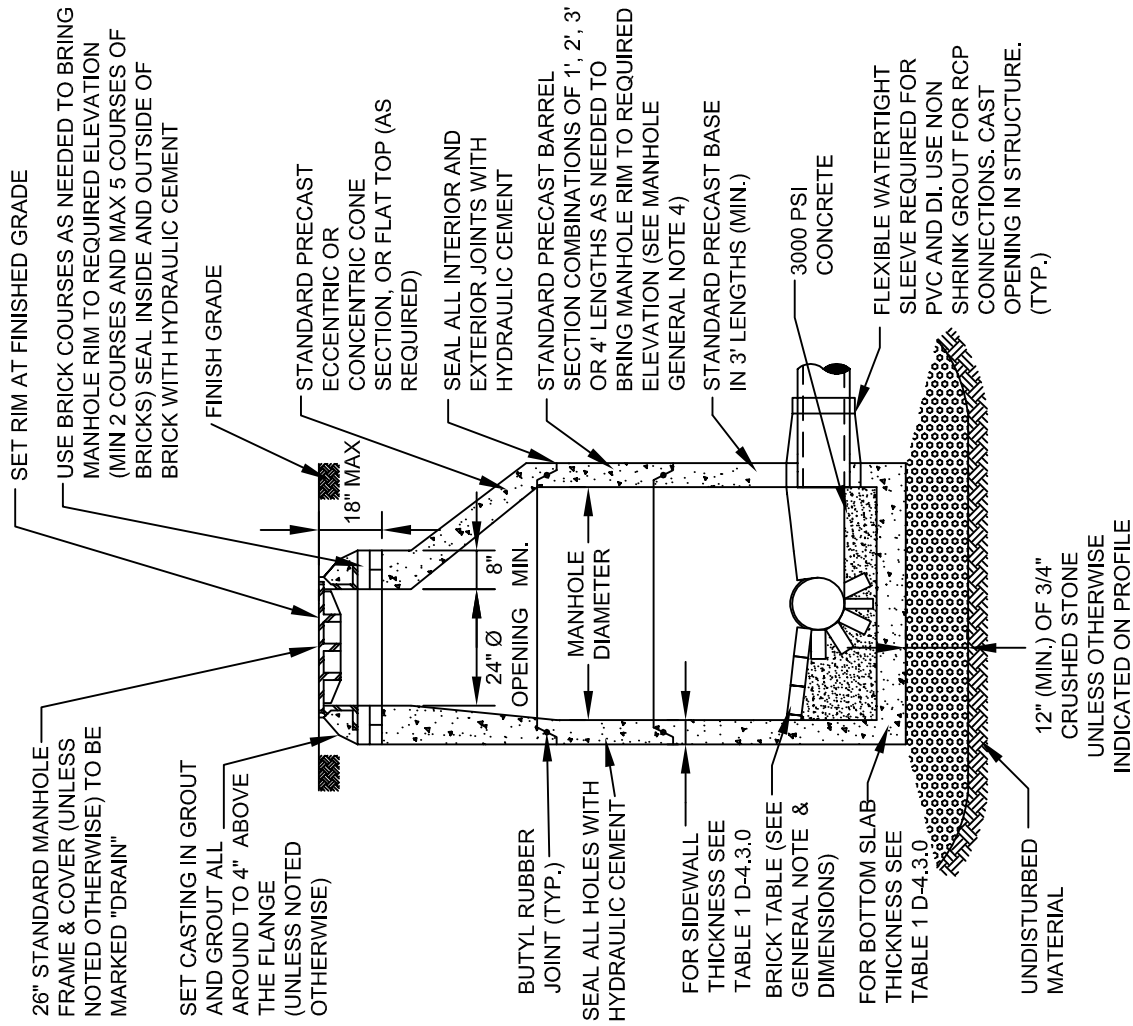
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TYPICAL DRAIN MANHOLE



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SECTION A-A

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CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

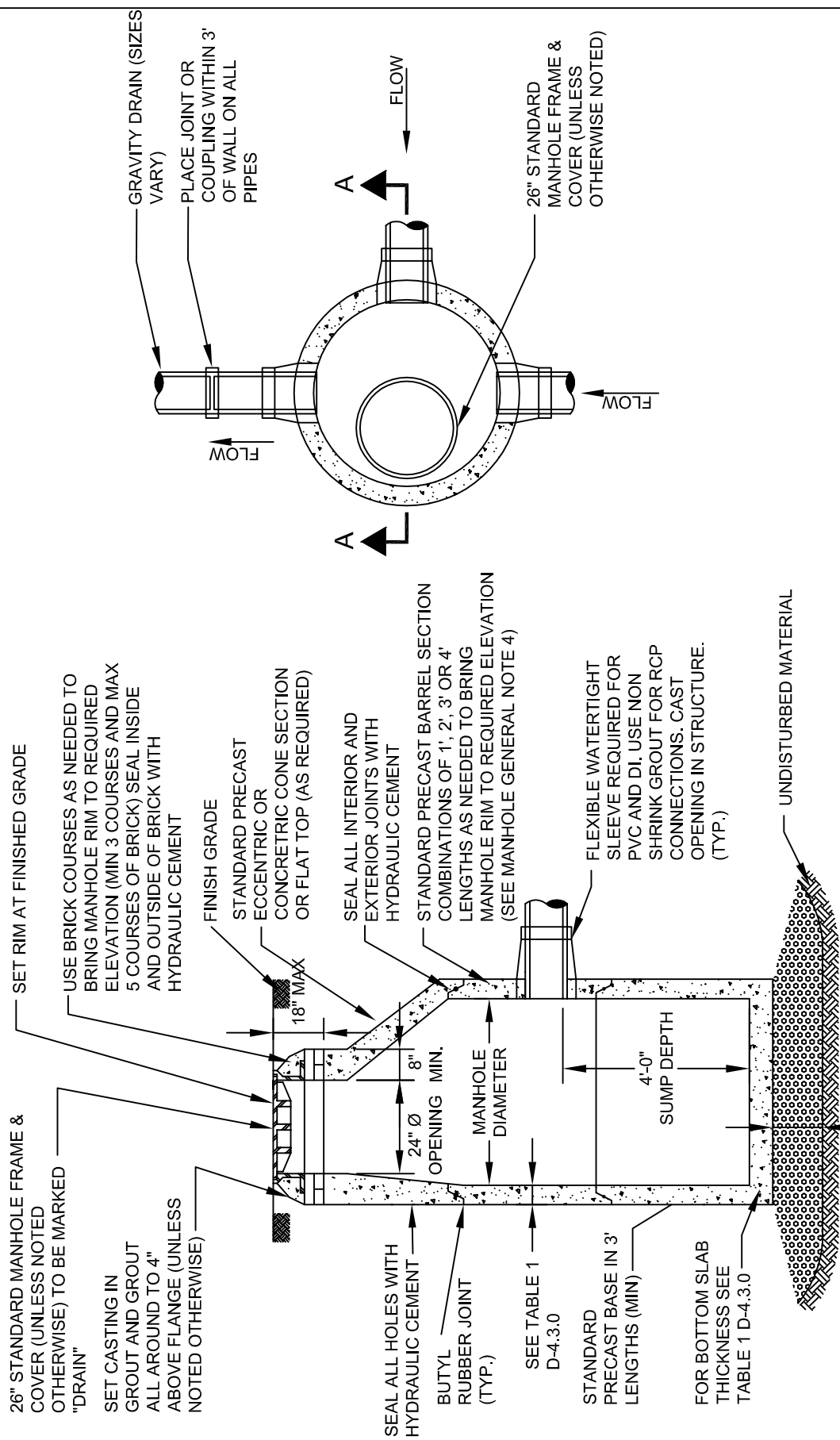
SUMP MANHOLE

DATE:
MARCH 2017

REV:
2

DETAIL NO.

D-4.2.2



PLAN

SECTION A-A

NOT TO SCALE

TABLE 1				
MANHOLE DIAMETER	SIDE WALL MIN. THICKNESS	BOTTOM SLAB MIN. THICKNESS	MAX PIPE DIAMETER *	
			RCP	DI/PVC
4'	5"	6"	24"	30"
5'	6"	8"	36"	42"
6'	6"	8"	48"	54"
8'	8"	8"	66"	72"
10'	10"	10"	72"	84"

* MAY VARY DEPENDING ON SIZE AND LOCATION OF ADDITIONAL PENETRATIONS OR RELATIONSHIP OF PENETRATIONS IN MANHOLE

GENERAL CATCH BASIN NOTES :

1. FACE OF PIPE SHALL NOT PROJECT MORE THAN 3-INCHES FROM FACE OF WALL ALONG CENTERLINE OF PIPE.
2. DESIGN PRECAST SECTIONS WITH FRAME AND GRATE FOR AASHTO H20 LOADING UNLESS OTHERWISE NOTED.
3. PRECAST TOP SLAB OPENING CAN BE CENTERED OR OFFSET AS NECESSARY.
4. GRATE VANES SHALL BE INSTALLED IN DIRECTION TO RECEIVE FLOWS.
5. CATCH BASIN BASE SHALL BE SOLID.

MANHOLE GENERAL NOTES :

1. DRAIN MANHOLE DIAMETER SHALL BE 4', 5', 6', 8' OR 10' AS SHOWN ON PLAN/PROFILE VIEWS.
2. DESIGN PRECAST SECTIONS WITH FRAME AND COVER FOR AASHTO H20 LOADINGS UNLESS OTHERWISE NOTED.
3. MANHOLES LARGER THAN 4' IN DIAMETER AT THE BASE SHALL BE REDUCED IN DIAMETER TO 4' AT THE NEXT RISER SECTION UNLESS NOTED OTHERWISE ON PLANS.





CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

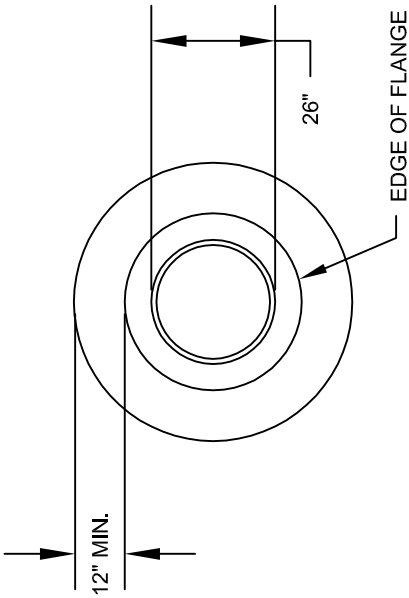
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DATE:
MARCH 2017

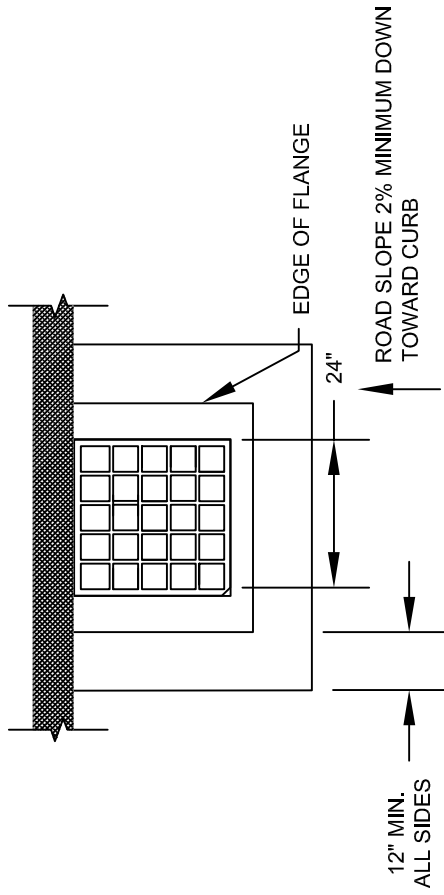
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DETAIL NO.

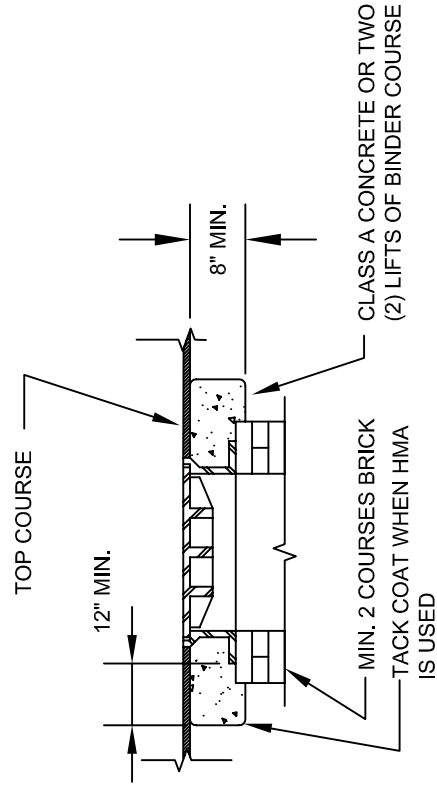
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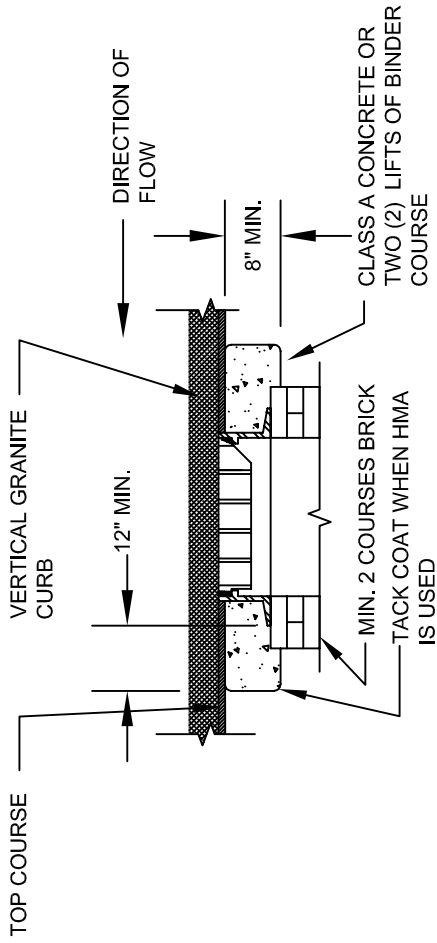
PLAN



PLAN

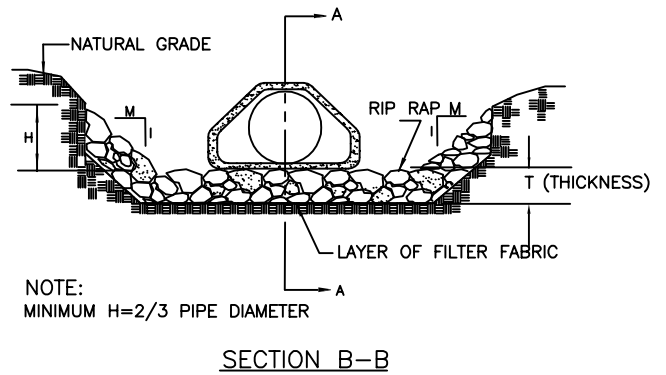
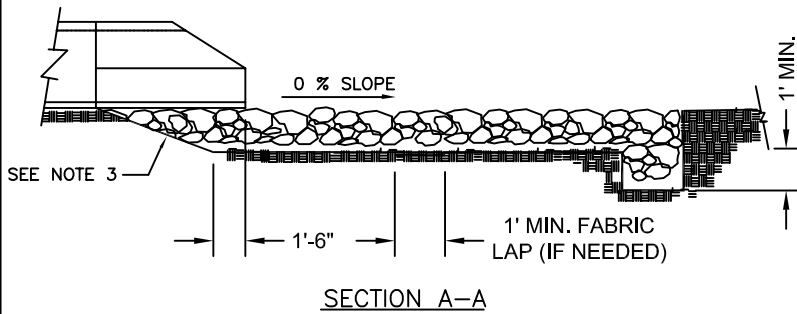
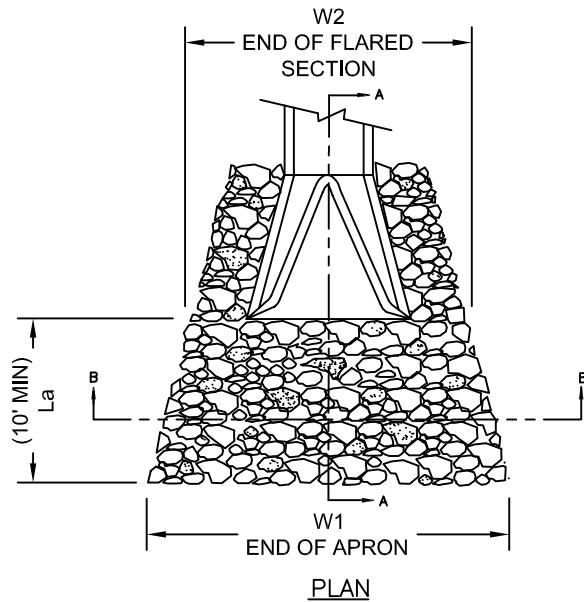


SECTION
MANHOLES



SECTION
CATCH BASINS

NOT TO SCALE



NOTES:

1. CLASS OR MEDIAN SIZE OF RIPRAP AND LENGTH, WIDTH AND DEPTH OF APRON TO BE DESIGNED BY THE ENGINEER.
2. REFER TO THE CONSTRUCTION STANDARDS FOR RIPRAP STANDARDS.
3. RIPRAP SHOULD EXTEND UP BOTH SIDES OF THE APRON AND AROUND THE END OF THE PIPE OR CULVERT AT THE DISCHARGE OUTLET AT A MAXIMUM SLOPE OF 2:1 AND A HEIGHT NOT LESS THAN TWO THIRDS THE PIPE DIAMETER OR CULVERT HEIGHT.
4. THERE SHALL BE NO OVERFLOW FROM THE END OF THE APRON TO THE SURFACE OF THE RECEIVING CHANNEL. THE AREA TO BE PAVED OR RIPRAPPED SHALL BE UNDERCUT SO THAT THE INVERT OF THE APRON SHALL BE AT THE SAME GRADE (FLUSH) WITH THE SURFACE OF THE RECEIVING CHANNEL. THE APRON SHALL HAVE A CUTOFF OR TOE WALL AT THE DOWNSTREAM END.
5. THE WIDTH W-1 OF THE END OF THE APRON SHALL BE EQUAL TO THE BOTTOM WIDTH OF THE RECEIVING CHANNEL. MAXIMUM TAPER TO RECEIVING CHANNEL 5:1.
6. ALL SUBGRADE FOR STRUCTURE TO BE COMPACTED TO 95% OR GREATER.
7. THE PLACING OF FILL, EITHER LOOSE OR COMPACTED IN THE RECEIVING CHANNEL SHALL NOT BE ALLOWED.
8. NO BENDS OR CURVES IN THE HORIZONTAL ALIGNMENT OF THE APRON WILL BE PERMITTED.
9. FILTER FABRIC SHALL BE INSTALLED ON COMPACTED SUBGRADE PRIOR TO PLACEMENT OF RIP RAP.
10. ANY DISTURBED AREA FROM END OF APRON TO RECEIVING CHANNEL MUST BE STABILIZED.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

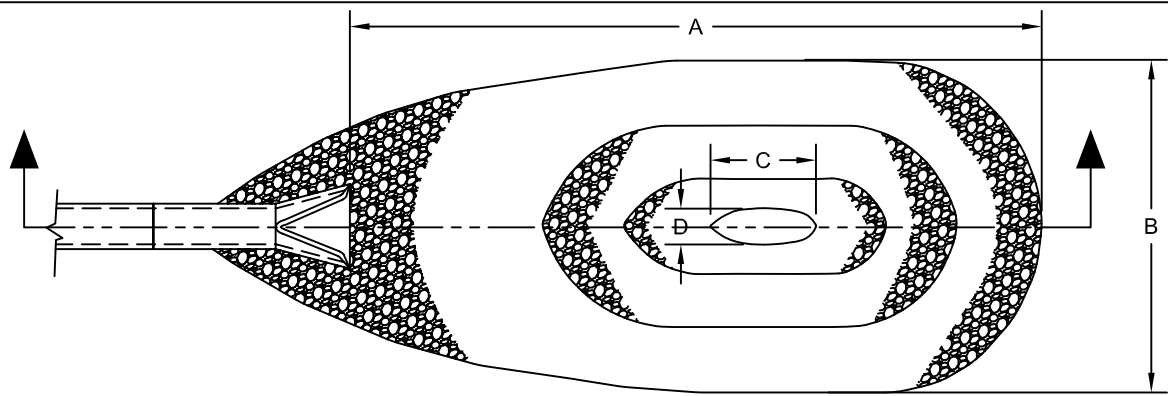
RIP RAP APRON
AT PIPE OUTFALLS

DATE:
MARCH 2017

REV:
1

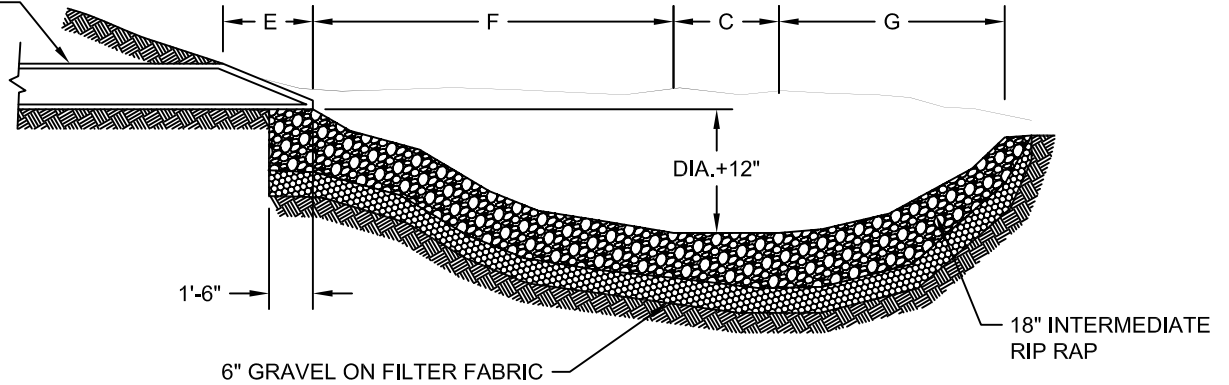
DETAIL NO.

D-4.4.0



PLAN

FLARED END SECTION
OR END WALL



SECTION VIEW

PIPE SIZE	A	B	C	D	E	F	G	WT. RIP RAP IN TONS
15"	10'	7'	1 ½'	1'	1'	4 ½'	3'	6
18"	12'	8'	2'	1'	1'	5'	4'	8
21"	15'	9'	2 ½'	1 ½'	1'	7'	4 ½'	12
24"	17'	10'	2 ½'	1 ½'	1'	8'	5 ½'	15
30"	20'	13'	3'	2'	2'	9'	6'	22
36"	24'	16'	3 ½'	2'	2'	9 ½'	7'	33

NOTES:

1. THIS DETAIL IS TO ONLY BE USED WHEN OUTFALL HAS A CONTINUOUS FLOW OF WATER AND WITH PRIOR APPROVAL OF THE ENGINEERING DIVISION.

NOT TO SCALE



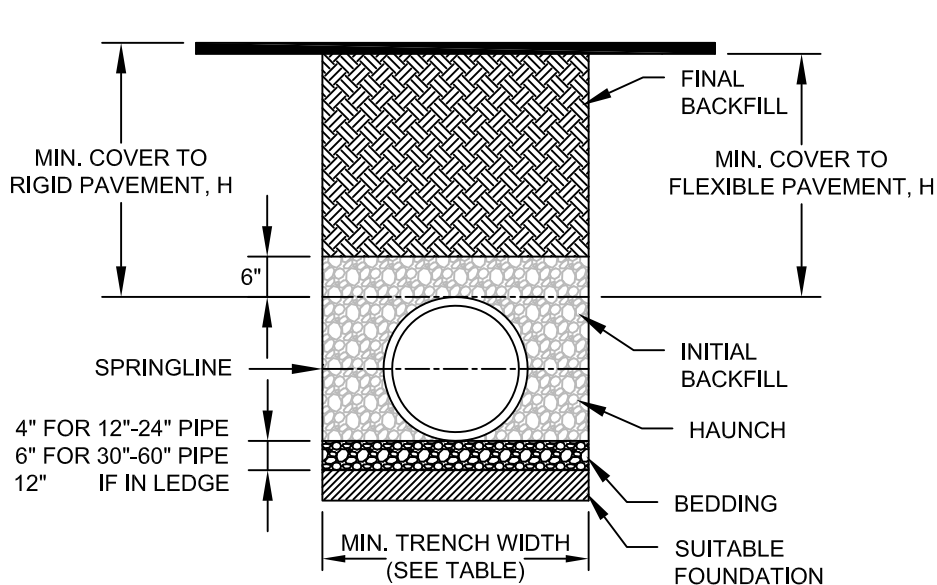
CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

RIP RAP PLUNGE POOL

DATE:
SEPT. 2008

REV:
0

DETAIL NO.
D-4.4.1



MINIMUM TRENCH WIDTHS

PIPE DIAM.	MIN. TRENCH WIDTH
12"	30"
15"	34"
18"	39"
24"	48"
30"	56"
36"	64"
42"	72"
48"	80"
54"	88"
60"	96"

NOTES:

1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321, "STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS", LATEST ADDITION.
2. MEASURES SHOULD BE TAKEN TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.
3. **FOUNDATION:** WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.
4. **BEDDING:** SUITABLE MATERIAL SHALL BE CLASS I, II OR III. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" FOR 12"-24"; 6" FOR 30"-60".
5. **INITIAL BACKFILL:** SUITABLE MATERIAL SHALL BE CLASS I, II OR III IN THE PIPE ZONE EXTENDING NOT LESS THAN 6" ABOVE CROWN OF PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION.
6. **MINIMUM COVER:** MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" FROM THE TOP OF PIPE TO GROUND SURFACE. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOATATION. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS 36" MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT. MATERIAL PLACED SHALL BE COMPACTED IN LIFTS WITH A MAXIMUM THICKNESS OF 12".

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

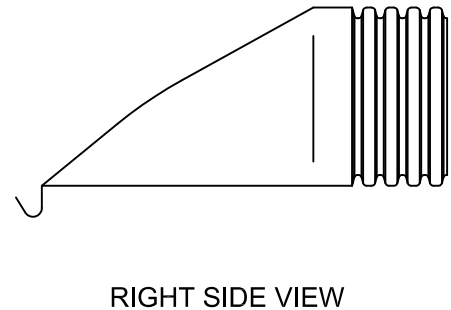
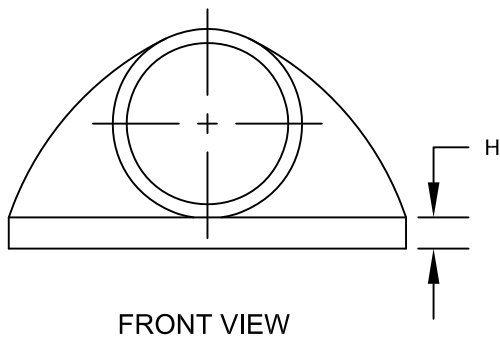
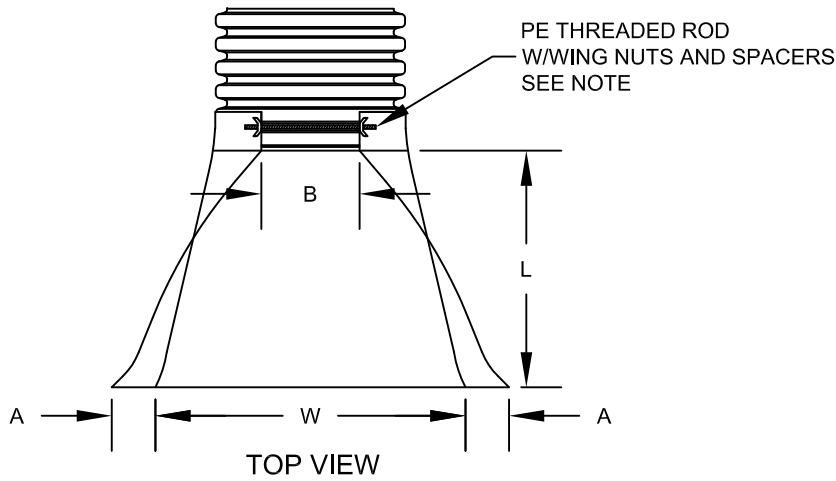
TYPICAL HDPE PIPE
TRENCH DETAIL

DATE:
MARCH 2017

REV:
1

DETAIL NO.

D-4.5.0



PIPE SIZE	A	B (MAX)	H	L	W
12 IN	6.50 IN	10.00 IN	6.50 IN	25.00 IN	29.00 IN
15 IN	6.50 IN	10.00 IN	6.50 IN	25.00 IN	29.00 IN
18 IN	7.50 IN	15.00 IN	6.50 IN	32.00 IN	35.00 IN
24 IN	7.50 IN	18.00 IN	6.50 IN	36.00 IN	45.00 IN
30 IN	7.50 IN	12.00 IN	8.60 IN	58.00 IN	63.00 IN
36 IN	7.50 IN	25.00 IN	8.60 IN	58.00 IN	63.00 IN

NOTES:

1. PE THREADED ROD W/WING NUTS PROVIDED FOR END SECTIONS 12"-24". 30" & 36" END SECTIONS REQUIRE TWO (2) THREADED RODS FOR ASSEMBLY.
2. ALL DIMENSIONS ARE NOMINAL.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

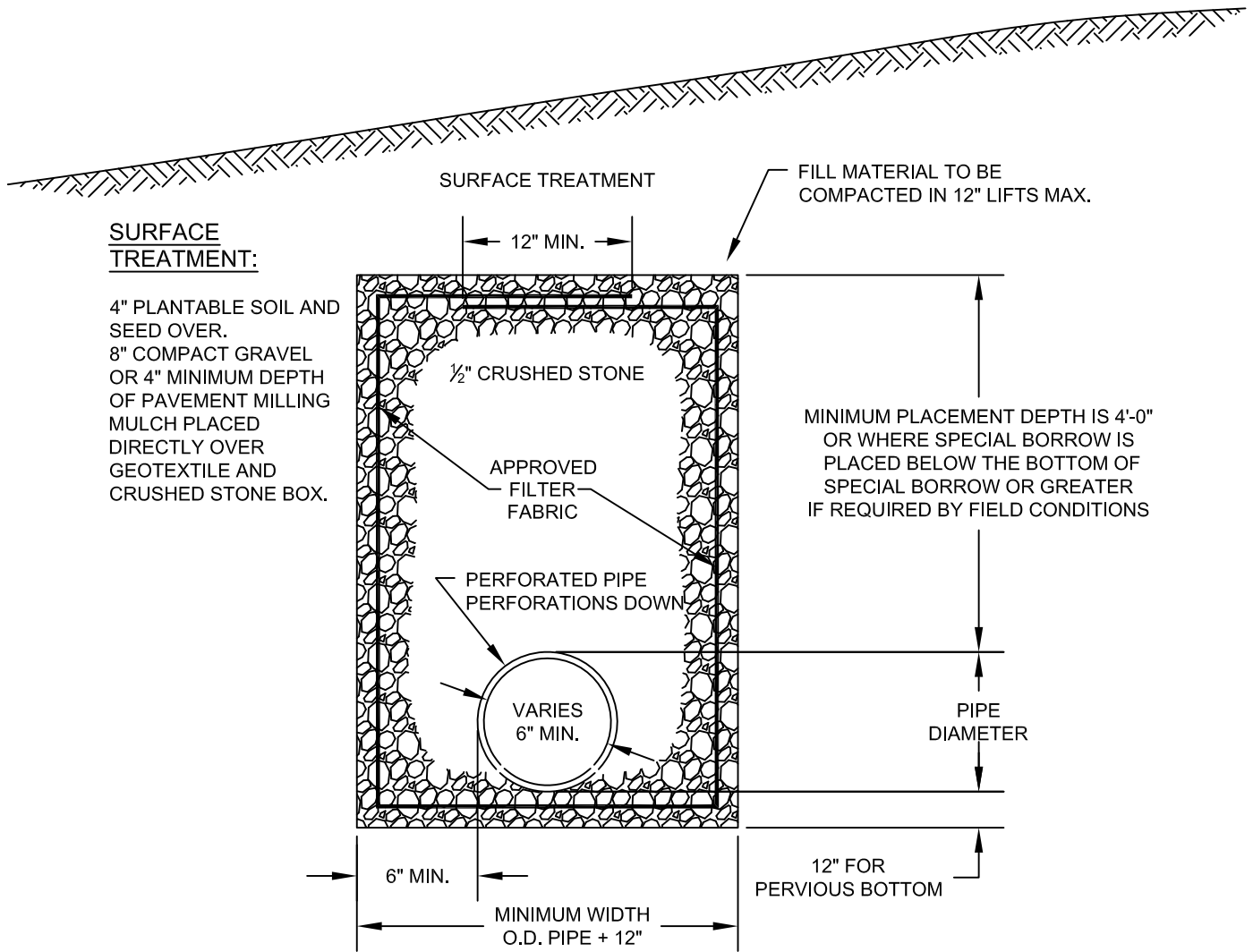
FLARED HDPE END SECTIONS

DATE:
SEPT. 2008

REV:
0

DETAIL NO.

D-4.6.0



NOTES:

1. PIPE UNDER R.O.W. SCHEDULE 20 OR 40 PERFORATED PVC.
2. OUTLET PIPE UNDER ROADWAY SHALL BE SCHEDULE 80.
3. PIPE SHALL BE SET AT BOTTOM OF TRENCH FOR IMPERVIOUS BOTTOM.
4. SUBDRAIN LOCATED APPROXIMATELY AT INTERSECTION OF TANGENTS.
5. GRAVEL (AND SPECIAL BORROW WHERE REQUIRED) SHALL INTERSECT CRUSHED STONE FOR SUBDRAIN.
6. FILTER FABRIC SHALL BE APPROVED, MHD TYPE III WATER PERMEABLE SYNTHETIC FABRIC.

NOT TO SCALE



CITY OF FRAMINGHAM
 DEPARTMENT OF PUBLIC WORKS

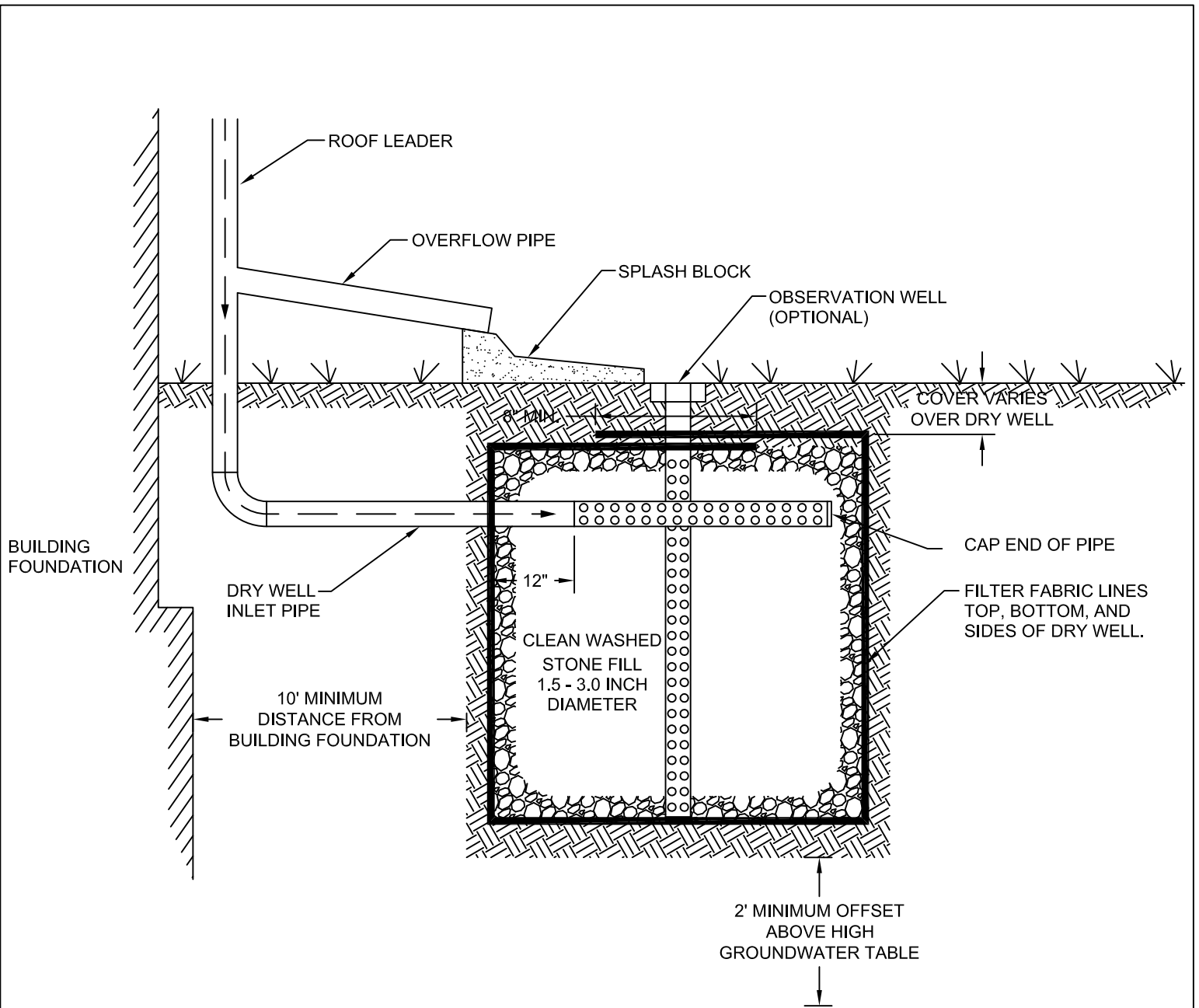
SUBDRAIN

DATE:
 SEPT. 2008

REV:
 0

DETAIL NO.

D-4.7.0



NOTES:

1. DRY WELL TO BE SIZED BY DESIGN ENGINEER FOR PROPOSED CONDITIONS.
2. OPTIONAL: INSTALL REINFORCED CONCRETE CHAMBER WITH HOLES, SURROUNDED WITH CLEAN WASHED STONE, AND FILTER FABRIC.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

DRY WELL

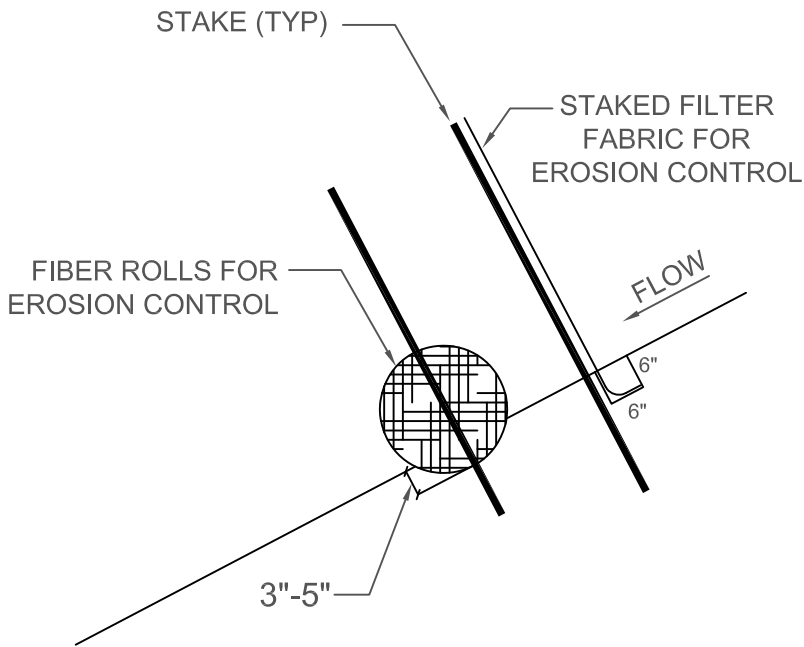
DATE:
MARCH 2017

REV:
3

DETAIL NO.

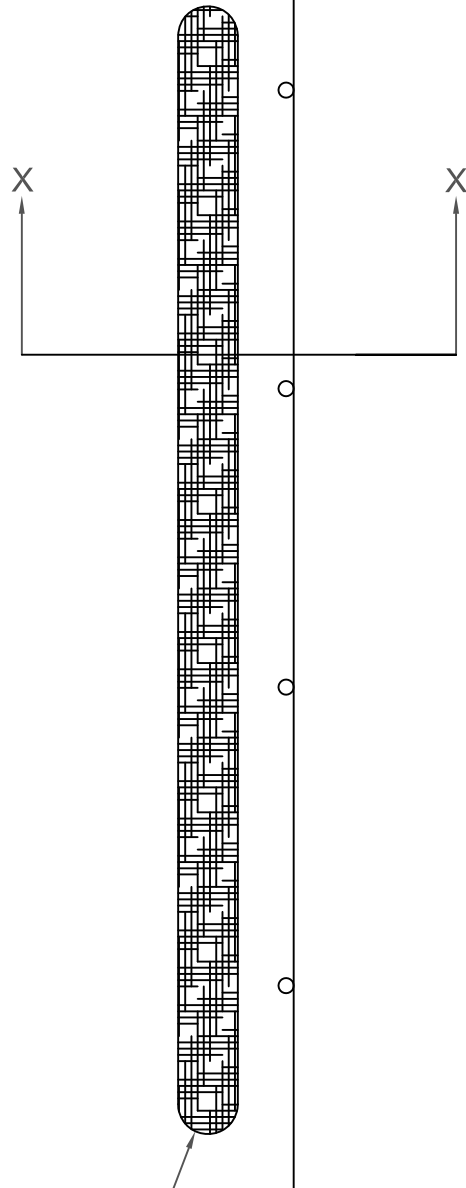
D-4.8.0

FILTER FABRIC FOR
EROSION CONTROL
(STAKE FILTER
FABRIC EVERY 6 FT)



6" X 6" TRENCH LAY FILTER FABRIC IN TRENCH
END UP SLOPE AND BACK FILL

SECTION X-X



FIBER ROLLS FOR
EROSION CONTROL
(STAKE EVERY 3' - 4')

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

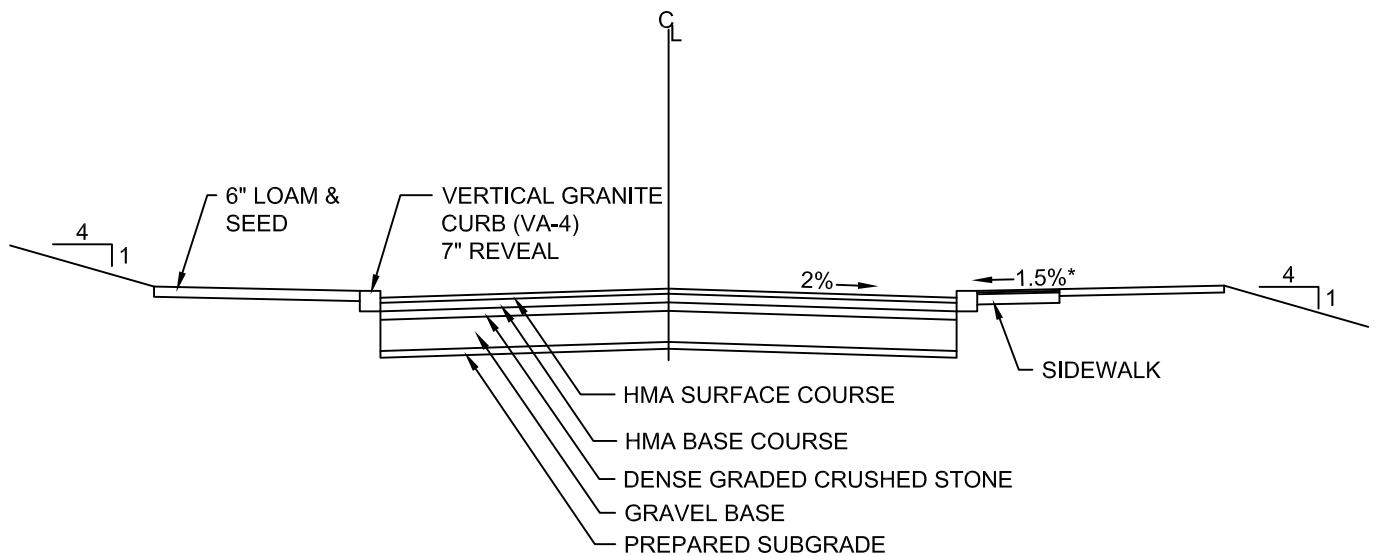
FIBER ROLLS AND SILT FENCES FOR
EROSION CONTROL

DATE:
JAN. 2016

REV:
0

DETAIL NO.

G-1.0.0



HOT MIX ASPHALT (HMA) PAVEMENT SCHEDULE			
MINIMUM THICKNESS (INCH)	LOCAL	COLLECTOR	ARTERIAL
HMA SURFACE COURSE	1.5	2	3
HMA BASE COURSE	2.5	4	5
DENSE GRADED CRUSHED STONE	4	4	4
GRAVEL BASE	8	8	8
PREPARED SUBGRADE	-	4	4

NOTE:
 ROADWAY CROSS SECTION DIMENSIONS, INCLUDING SIDEWALK(S), CURB(S), PARKING ACCOMMODATION, BIKE LANE(S), GRASS STRIP(S) AND OTHER ROADWAY ELEMENTS SHALL BE APPROVED BY THE DEPARTMENT OF PUBLIC WORKS OR OTHER APPLICABLE CITY ENTITY.

NOT TO SCALE

*TOLERANCE FOR CONSTRUCTION: ±0.5%



CITY OF FRAMINGHAM
 DEPARTMENT OF PUBLIC WORKS

TYPICAL ROADWAY
 CROSS-SECTION

DATE:
 MARCH 2017

REV:
 3

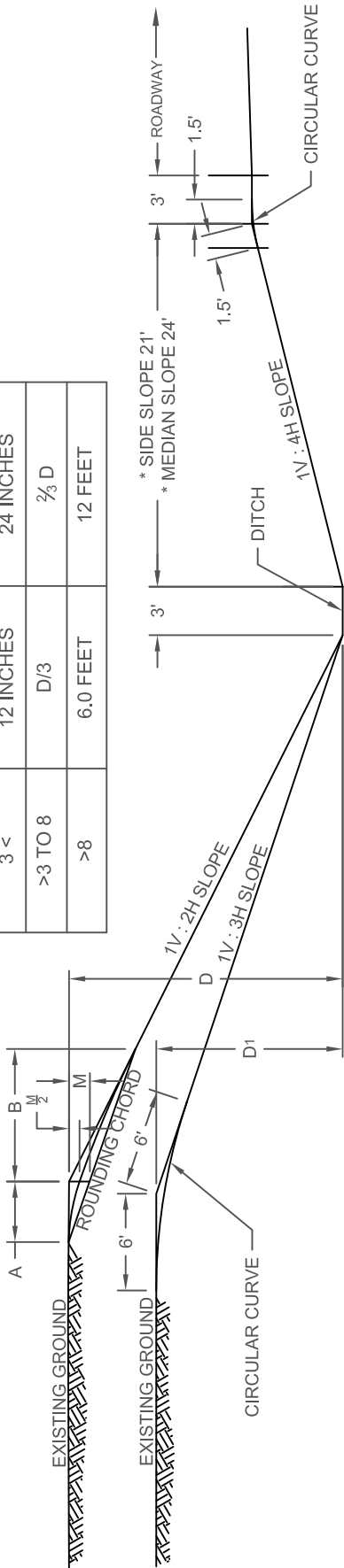
DETAIL NO.

R-5.1.0



ROUNDING TABLE FOR 1V : 2H SLOPE

D (FEET)	A	B
3 <	12 INCHES	24 INCHES
>3 TO 8	D/3	$\frac{2}{3}$ D
>8	6.0 FEET	12 FEET

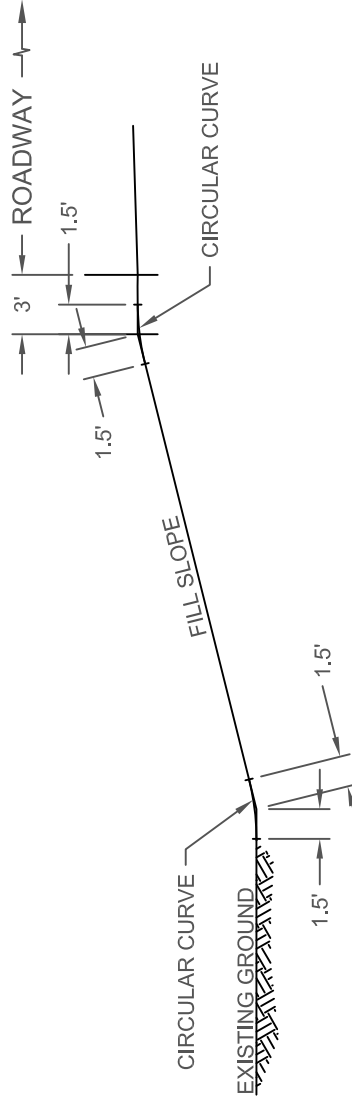


1V : 3H SLOPE ROUNDING

1. WHEN "D1" IS 1.5 FEET OR MORE ROUND AS SHOWN IN ROUNDING TABLE.
2. WHEN "D1" IS LESS THAN 1.5 FEET ROUND FULL LENGTH OF SLOPE.

CUT SLOPES

* USE SLOPE LENGTHS FOR LIMITED ACCESS OR HIGH SPEED ROADWAYS.

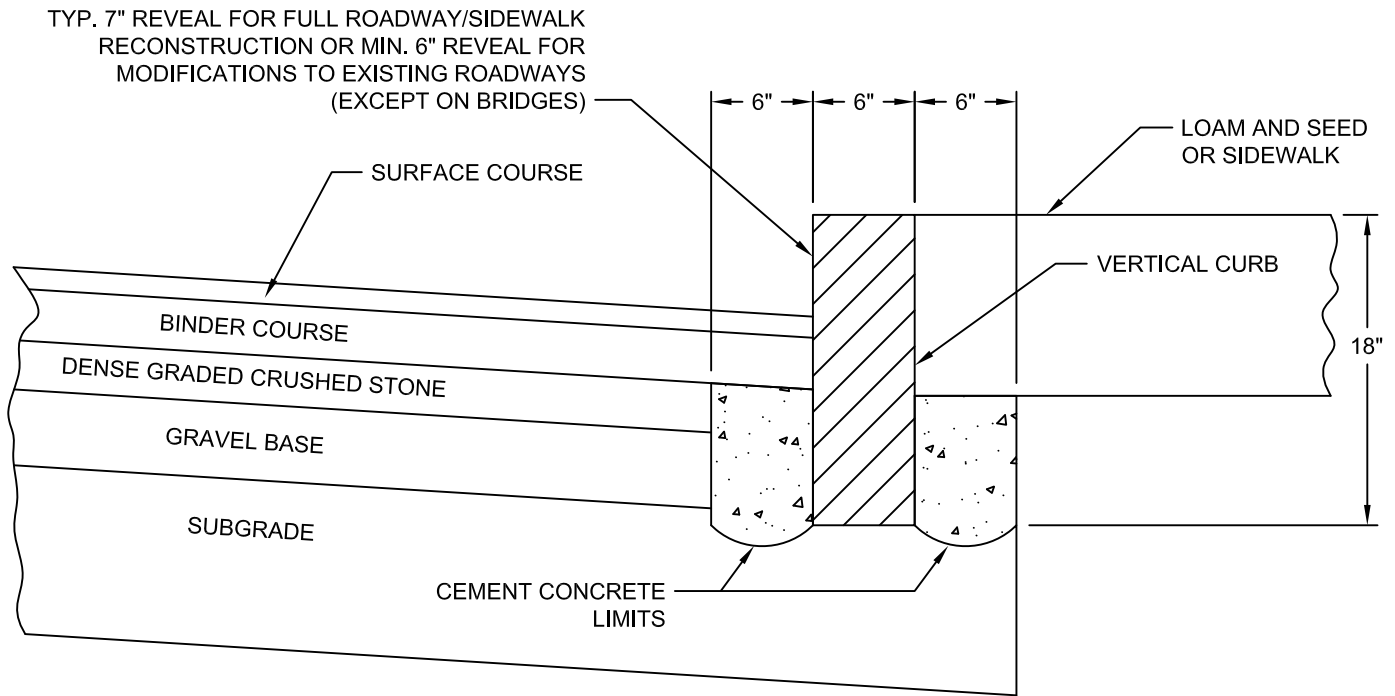


FILL SLOPES

NOTE:

1. THE DIMENSIONS SHOWN FOR ROUNDING CUT AND FILL SLOPES ARE APPROXIMATE, THEY ARE TO BE USED AS GUIDES.

NOT TO SCALE



NOTES:

1. CUT NEAT LINE 6" FROM CURB LINE AND REMOVE BASE AND SUBGRADE, REPLACE WITH CEMENT CONCRETE. COVER WITH BINDER AND TOP COURSE TO CURB.
2. ANY DESIGNATED CEMENT CONCRETE THAT IS ACCEPTABLE UNDER SECTION M4 OF THE STANDARD MHD SPECIFICATIONS MAY BE USED; ALL TEST REQUIREMENTS ARE WAIVED. BITUMINOUS CONCRETE SHALL NOT BE USED AS A SUBSTITUTE.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

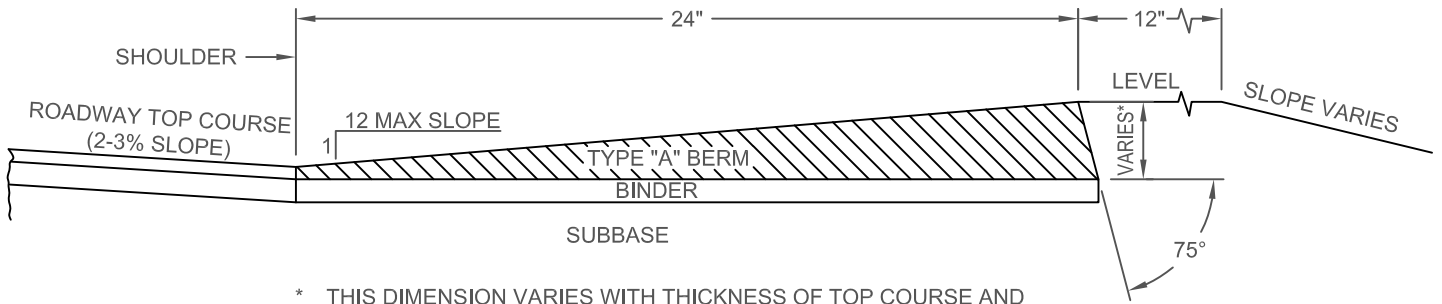
GRANITE CURBS

DATE:
MARCH 2017

REV:
3

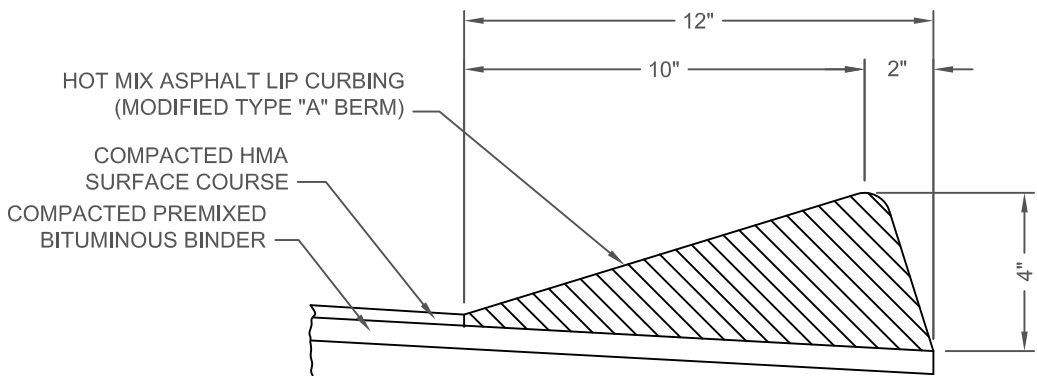
DETAIL NO.

R-5.1.2

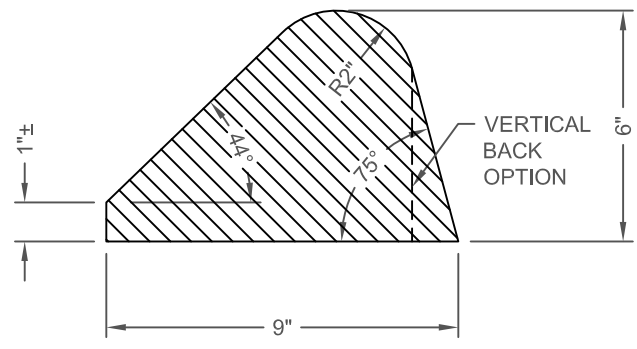


* THIS DIMENSION VARIES WITH THICKNESS OF TOP COURSE AND SLOPE OF SHOULDER.

TYPE "A" BERM



MODIFIED TYPE "A" BERM



TYPE - 2 BERM

NOT TO SCALE

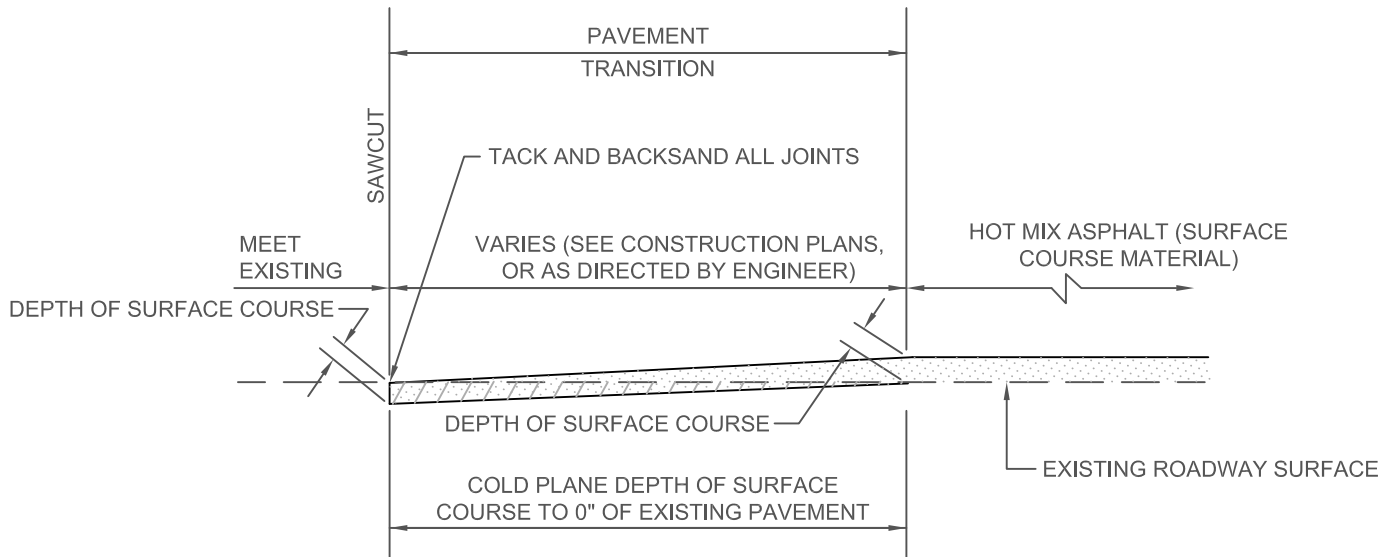


CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

DATE:
MARCH 2017

REV:
2

DETAIL NO.
R-5.1.3



NOTE:
 CLEAN SURFACE AND APPLY ASPHALT EMULSION TACK COAT PRIOR TO PLACING HOT MIX ASPHALT SURFACE OVERLAY.



CITY OF FRAMINGHAM
 DEPARTMENT OF PUBLIC WORKS

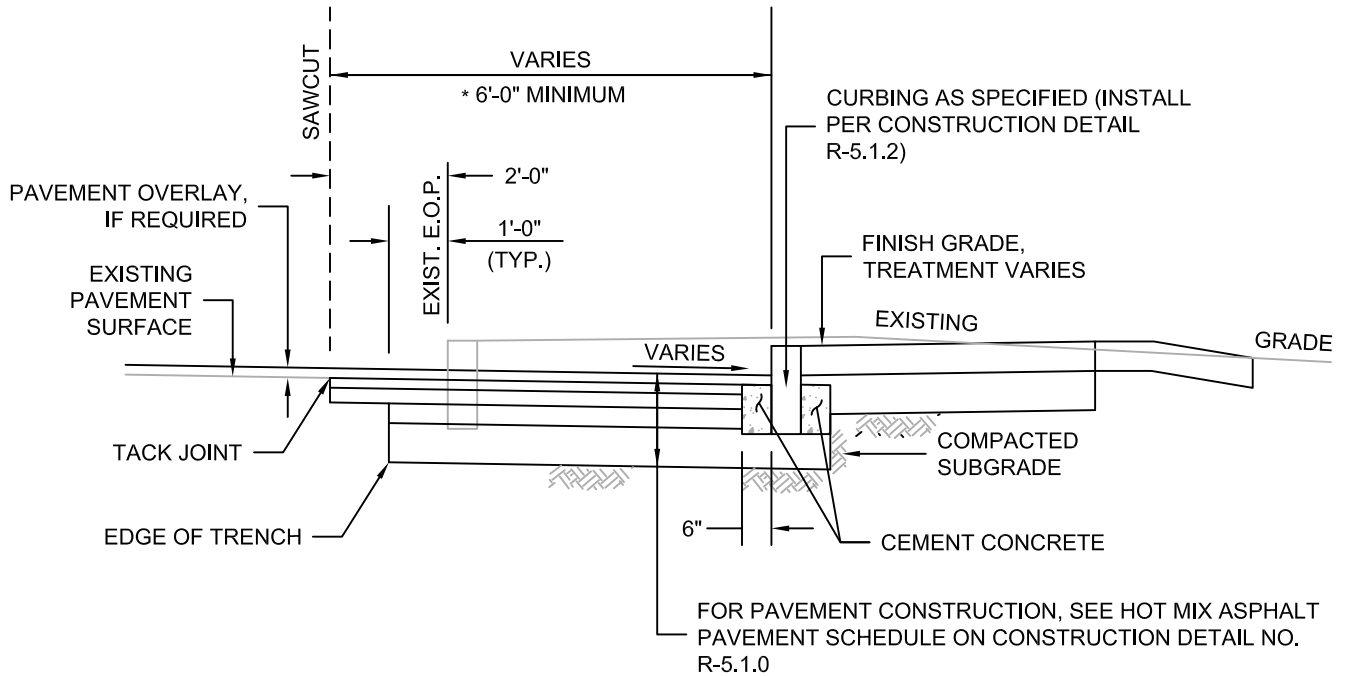
PAVEMENT TRANSITION

DATE:
 FEB. 2010

REV:
 0

DETAIL NO.

R-5.1.4



* NOTE: FOR PROPOSED WIDENING LESS THAN 6 FEET IN WIDTH, SEE CONSTRUCTION DETAIL R-5.1.6

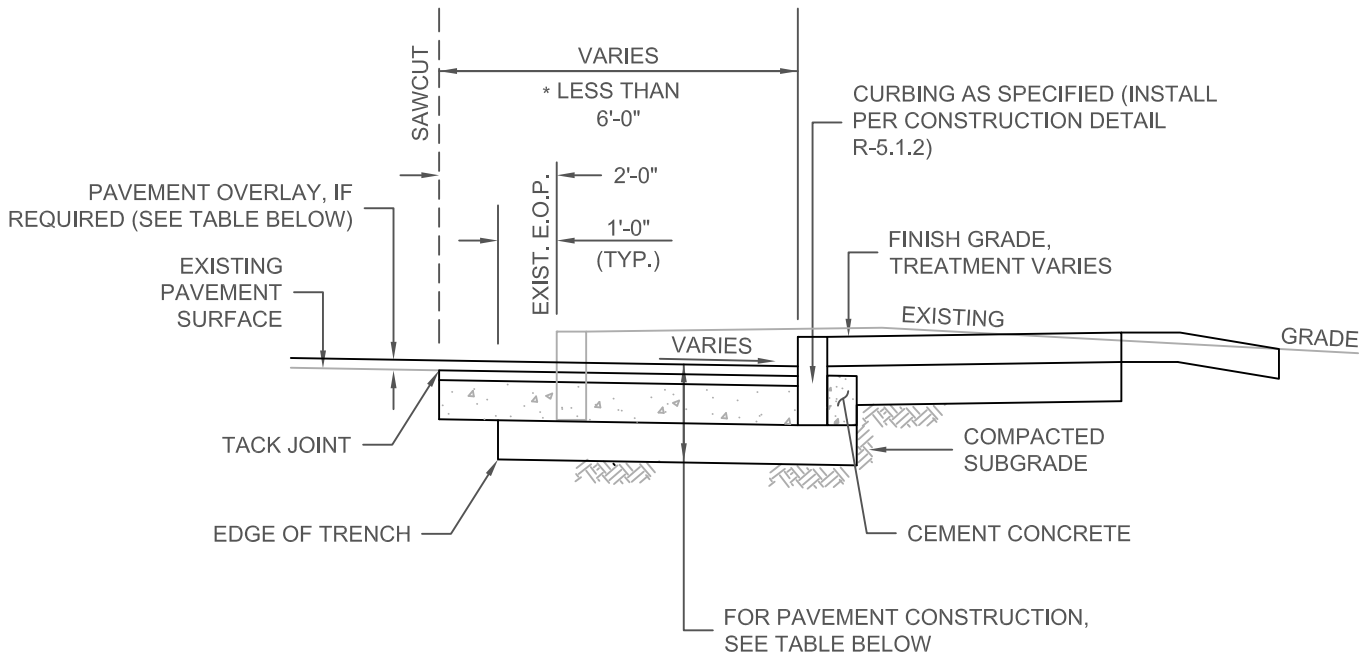


CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

ROADWAY WIDENING AND OVERLAY
6 FT WIDE OR GREATER

DATE:
MARCH 2017
REV:
1

DETAIL NO.
R-5.1.5



* NOTE: FOR PROPOSED WIDENING OF 6 FEET OR GREATER IN WIDTH, SEE CONSTRUCTION DETAIL R-5.1.5

PAVEMENT CONSTRUCTION FOR WIDENING 6 FEET OR LESS		
	FULL DEPTH CONSTRUCTION	PAVEMENT OVERLAY CONSTRUCTION
SURFACE:	4" HOT MIX ASPHALT (2" SURFACE COURSE MATERIAL OVER 2" BINDER COURSE MATERIAL)	2" HOT MIX ASPHALT, OR AS DIRECTED (SURFACE MATERIAL)
BASE:	8" HIGH-EARLY-STRENGTH CEMENT CONCRETE BASE COURSE	
SUBBASE:	8" GRAVEL BORROW (TYPE "B")	



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

ROADWAY WIDENING AND OVERLAY
6 FT WIDE OR LESS

DATE:
FEB. 2010

REV:
0

DETAIL NO.

R-5.1.6

CONTINUOUS ZONE (CZ) RESTORATION PERMANENT TRENCH RESTORATION

REMOVE TEMPORARY SURFACE COURSE AND GRAVEL AS REQUIRED. RESHAPE AND COMPACT GRAVEL SUB-BASE, INSTALL BASE AND PERMANENT RESURFACING. MATCH EXISTING PAVEMENT THICKNESS, SEE DETAIL R-5.1.0 FOR MIN PAVEMENT THICKNESS.

REMOVE TEMPORARY SURFACE COURSE AND GRAVEL AS REQUIRED. RESHAPE AND COMPACT GRAVEL SUB-BASE, INSTALL BASE AND PERMANENT RESURFACING. SEE DETAIL R-5.1.0 FOR PAVEMENT THICKNESS.

COLD PLANE AND OVERLAY (2" DEPTH) BETWEEN TRENCHES, AS REQUIRED, AND MIN 6" BEYOND BINDER COURSE

UNDISTURBED EXISTING PAVEMENT
6" MIN

SAW CUT AND TACK COAT ALL EDGES AND EXIST. PAVEMENT WITH ASPHALT EMULSION

REMOVE, REPLACE, COMPACT, AND GRADE SUB-BASE AS REQUIRED OR AS DIRECTED

SAW CUT AND TACK COAT ALL EDGES AND EXIST. PAVEMENT WITH ASPHALT EMULSION

UNDISTURBED EARTH

TRENCH WIDTH

TRENCH FILL AND SUB-BASE PLACED DURING TEMPORARY PAVEMENT RESTORATION

PERMANENT PAVEMENT RESTORATION

COMPACT TRENCH BACKFILL, INSTALL GRAVEL SUB-BASE, INSTALL 4" MIN DEPTH OF HOT MIX ASPHALT TYPE I (IF EXISTING DEPTH >8" THEN INSTALL 6" MIN DEPTH OF HOT MIX ASPHALT). BITUMINOUS CONCRETE SHALL BE INSTALLED IN 2 COURSES.

UNDISTURBED EXISTING PAVEMENT

SAW CUT AND TACK COAT ALL EDGES AND EXIST. PAVEMENT WITH ASPHALT EMULSION

12" PROCESSED GRAVEL SUBBASE OR DENSE GRADED CRUSHED STONE FOR SUBBASE

UNDISTURBED EARTH

1'-0" (TYP.)

TRENCH WIDTH

1'-0" (TYP.)

SEE PIPE TRENCH DETAIL, BACK FILL TO BE COMPACTED IN 4" LIFTS MAX TO 95% MAX DRY DENSITY.

TEMPORARY PAVEMENT RESTORATION



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

PAVEMENT DETAILS FOR TRENCH RESTORATION

DATE:
FEB 2016

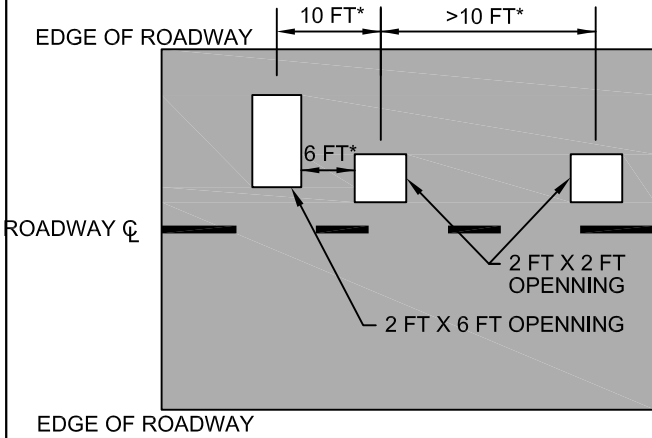
REV:
2

DETAIL NO.
R-5.1.7

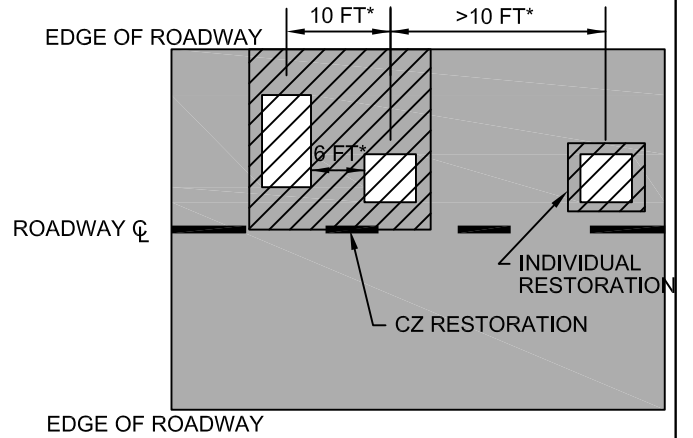
TEMPORARY PAVEMENT RESTORATION

PERMANENT PAVEMENT RESTORATION

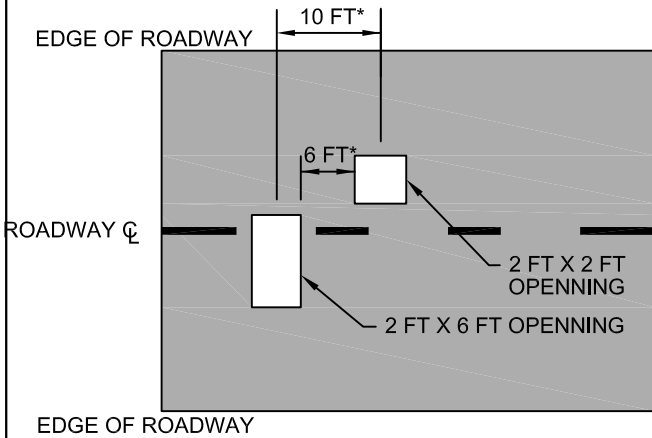
EXAMPLE OF THREE INDIVIDUAL EXCAVATIONS



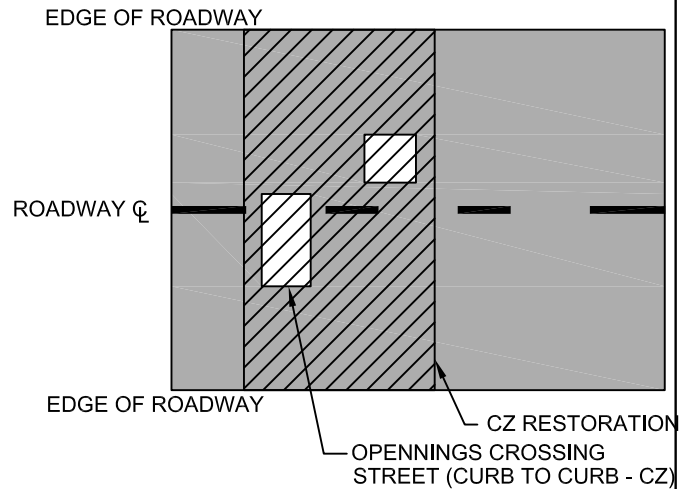
CONTINUOUS ZONE (CZ) RESTORATION: SAWCUT AND COLD PLANE MINIMUM 2 INCH DEPTH, REMOVE TEMPORARY PAVEMENT TO GRAVEL BASE UNLESS OTHERWISE APPROVED BY DPW, PLACE PERMANENT PAVEMENT.



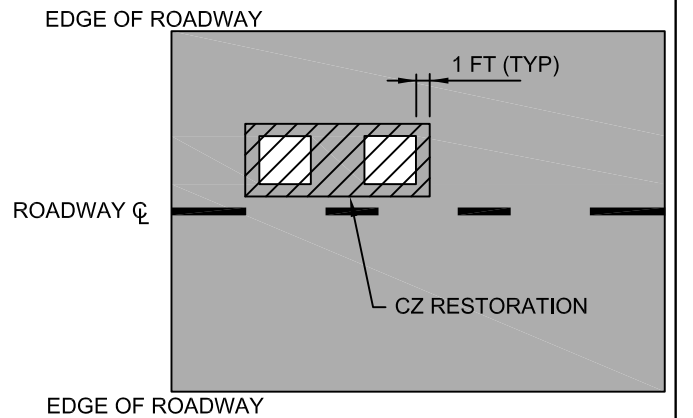
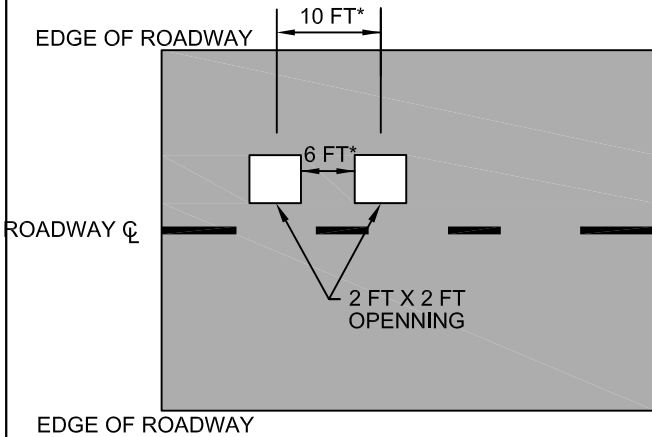
EXAMPLE OF TWO INDIVIDUAL EXCAVATIONS



CONTINUOUS ZONE (CZ) RESTORATION: SAWCUT AND COLD PLANE MINIMUM 2 INCH DEPTH, REMOVE TEMPORARY PAVEMENT TO GRAVEL BASE, PLACE PERMANENT PAVEMENT.



EXAMPLE OF TWO INDIVIDUAL EXCAVATIONS



* CONTINUOUS ZONE (CZ) RESTORATION REQUIRED WHEN CL OF TRENCH OPENNINGS ARE <10 FEET APART OR IF OUTER EDGE OF TRENCH OPENNINGS ARE <6 FEET APART.

** FOR PAVEMENTS RECENTLY REHABILITATED, THE TOWN MAY REQUIRE HEIGHTENED PAVEMENT RESTORATION REQUIREMENTS.



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

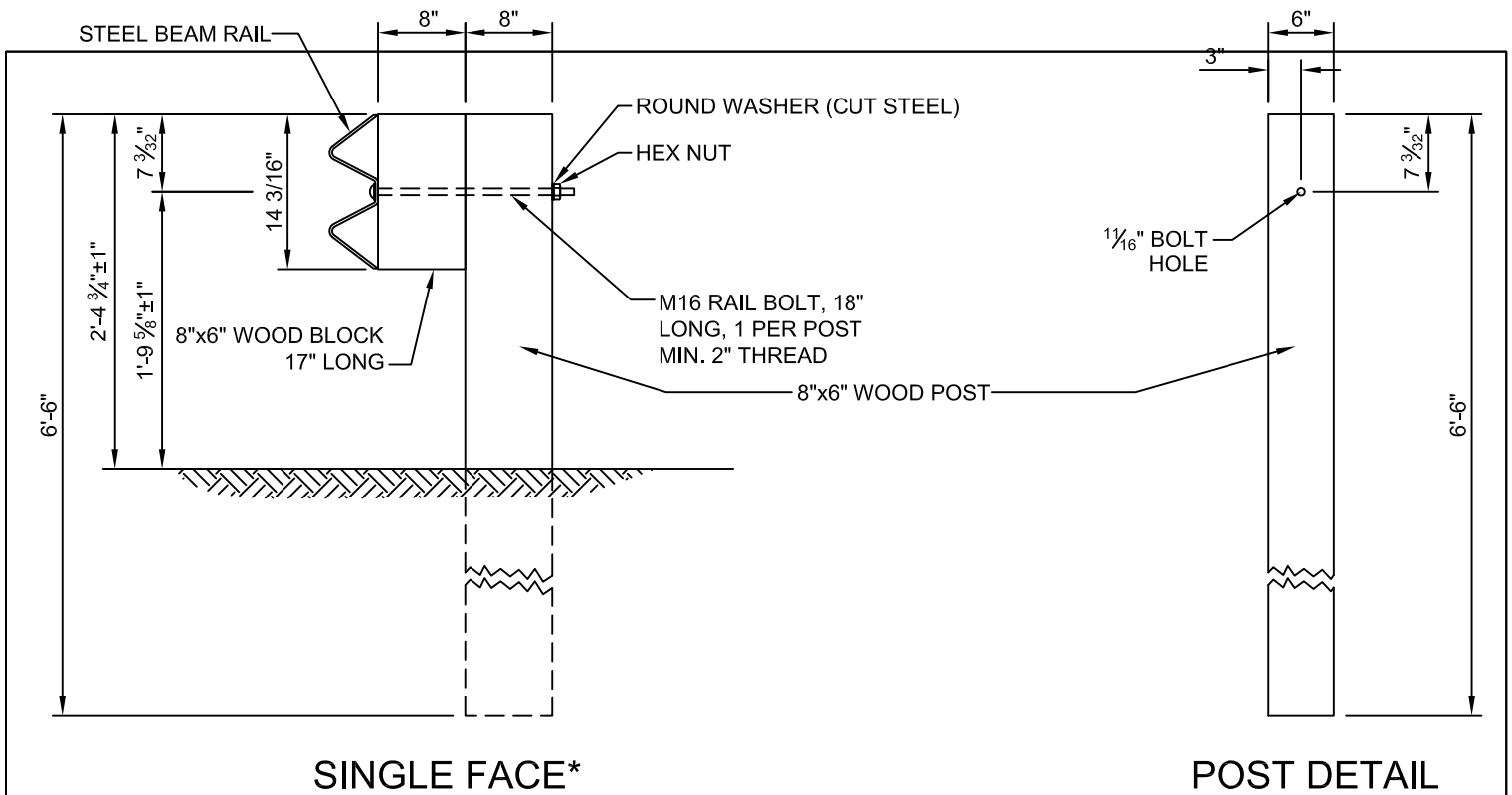
CONTINUOUS ZONE (CZ)
TRENCH RESTORATION

DATE:
MARCH 2017

REV:
1

DETAIL NO.

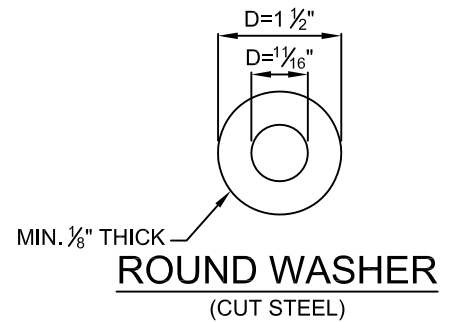
R-5.1.8



SINGLE FACE*

POST DETAIL

* WHEN PLACED IN MEDIAN, CHANGE TO THRIE BEAM, AND CHANGE HEIGHT TO 2'-8 1/2" ± 1"



NOTES:

1. POST SPACING, APPROACH END & TRAILING ENDS ARE THE SAME AS THOSE SHOWN FOR STEEL "H" POSTS PER MASSDOT 401.9.0.
2. ALL NUTS, BOLTS & WASHERS ARE TO BE GALVANIZED.
3. ALL SPLICES ARE TO BE MADE AT POSTS.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

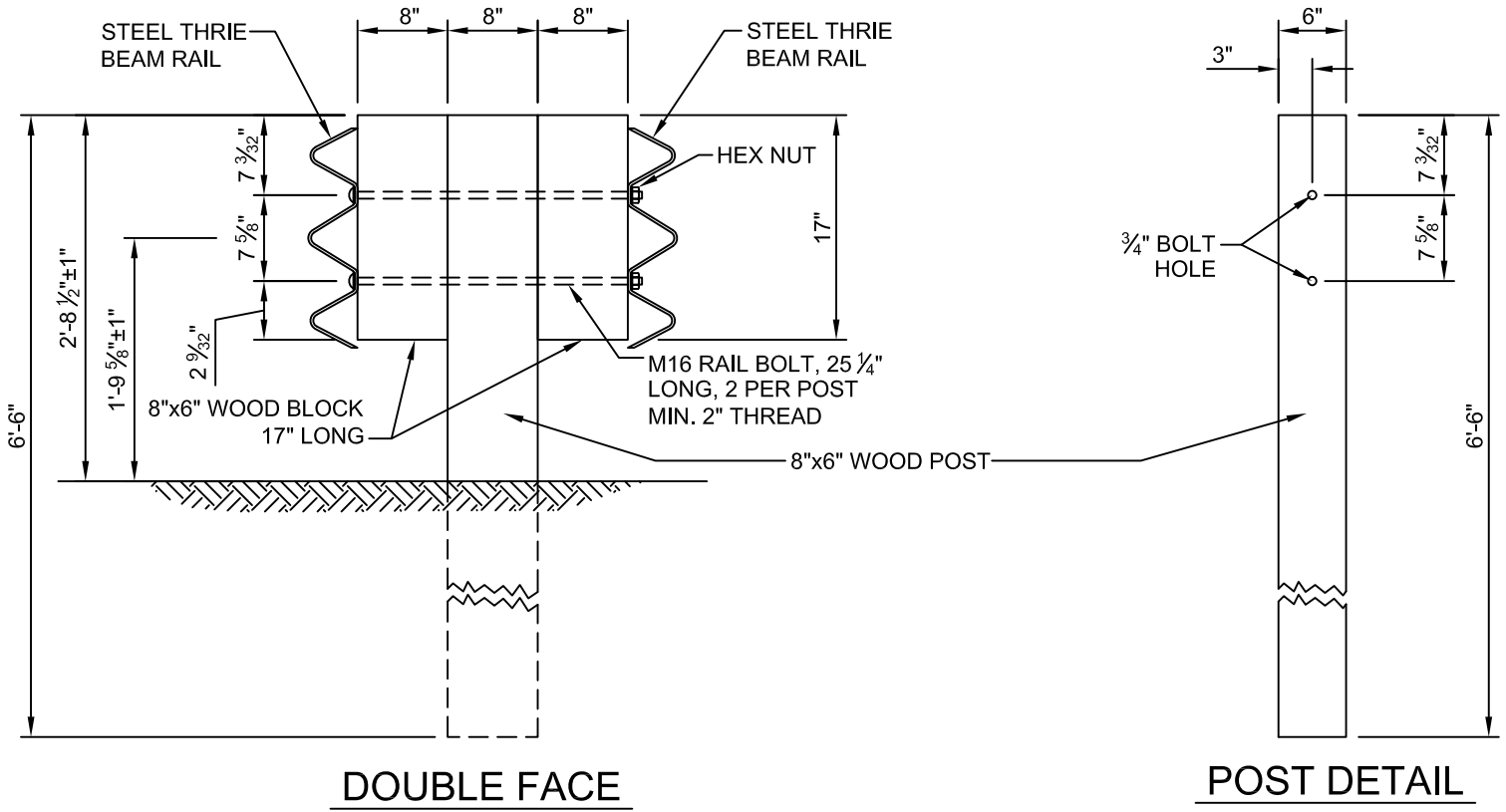
GUARD RAIL
(SINGLE FACE)

DATE:
MARCH 2017

REV:
1

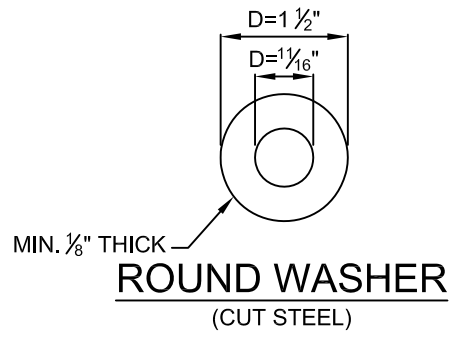
DETAIL NO.

R-5.2.0



DOUBLE FACE

POST DETAIL



NOTES:

1. POST SPACING, APPROACH END & TRAILING ENDS ARE THE SAME AS THOSE SHOWN FOR STEEL "H" POSTS PER MASSDOT 401.9.0.
2. ALL NUTS, BOLTS & WASHERS ARE TO BE GALVANIZED.
3. ALL SPLICES ARE TO BE MADE AT POSTS.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

GUARD RAIL
(DOUBLE FACE)

DATE:
MARCH 2017

REV:
1

DETAIL NO.

R-5.2.1

1. ROADWAY SIDEWALK CROSS SLOPES, FOR BRICK, CEMENT CONCRETE, AND HOT MIX ASPHALT, AS INDICATED IN THE CONSTRUCTION STANDARDS, WILL BE 1.5%. A CONSTRUCTION TOLERANCE OF $\pm 0.5\%$ IS ACCEPTABLE ON ROADWAY SIDEWALKS. SIDEWALKS ON BRIDGES SHALL BE CONSTRUCTED TO A CROSS SLOPE OF 1.0% IN ACCORD WITH MASSDOT BRIDGE POLICY. IN ACCORDANCE WITH 521 CMR THE RULES AND REGULATIONS OF THE ARCHITECTURAL ACCESS BOARD (AAB), THE SIDEWALK CROSS SLOPE CANNOT EXCEED 2.0%.
2. AN UNOBSTRUCTED PATH OF TRAVEL WITH A MINIMUM WIDTH OF 3'-3" (PREFERRED MINIMUM WIDTH OF 5'-0" FOR SIDEWALK MAINTENANCE) SHALL BE MAINTAINED PAST ALL OBSTRUCTIONS (UTILITY POLES, SIGNS, SIGNAL FOUNDATIONS, MASTS, MAILBOXES, ALONG DRIVE OPENINGS, ETC.).
3. THE WHEELCHAIR RAMP SLOPES AND SIDE SLOPES (TRANSITIONS) SHALL BE MAXIMUM OF 7.5% WITH A CONSTRUCTION TOLERANCE OF $\pm 0.5\%$. HOWEVER THESE SLOPES MAY BE FLATTER WHEN WARRANTED BY SURROUNDING CONDITIONS.
4. WHERE THE ROADWAY PROFILE EXCEEDS 4%, THE HIGH SIDE TRANSITION LENGTH UNDER ANY CONDITIONS NEED NOT EXCEED 15'-0" FOR A 6" CURB REVEAL.
5. IN NO CASE WHERE A STOP LINE IS WARRANTED, SHALL A RAMP BE PLACED ON THE TRAFFIC APPROACH SIDE OF THAT STOP LINE.
6. FIXED OBJECTS (I.E. UTILITY POLES, HYDRANTS, SIGNS, SIGNAL FOUNDATIONS, ETC.) MUST NOT ENCROACH ON ANY PART OF THE WHEELCHAIR RAMP INCLUDING TRANSITION SLOPES.
7. AT NO TIME IS ANY PART OF THE WHEELCHAIR RAMP, EXCLUDING CURB TRANSITIONS TO BE LOCATED OUTSIDE THE CROSSWALK. THE WHEELCHAIR RAMP ENTRANCE IS TO BE CENTERED IN THE CROSSWALK WHENEVER POSSIBLE.
8. CATCH BASINS WHICH ARE TO BE LOCATED IN THE VICINITY OF A WHEELCHAIR RAMP SHALL BE LOCATED UPGRADE OF THE RAMP ENTRANCE.
9. THE ENTRANCE OF A WHEELCHAIR RAMP SHALL BE FLUSH WITH THE ROADWAY.
10. TESTING SURFACE: WHEN TESTING WITH A STRAIGHTEDGE PLACED PARALLEL TO THE LINE OF THE SLOPE THERE SHALL BE NO DEVIATION FROM A TRUE SURFACE IN EXCESS OF $\frac{1}{4}$ ".
11. WHEELCHAIR RAMPS ON BRIDGES SHOULD BE AVOIDED. IF A WHEELCHAIR RAMP IS REQUIRED TO BE PLACED ON A BRIDGE, PRIOR WRITTEN APPROVAL IS REQUIRED. SPECIAL DETAILING OF THE REINFORCEMENT AND CURB SYSTEM WILL BE REQUIRED TO MAINTAIN THE PREFORMANCE OF THE RAILING/BARRIER SYSTEM.

CURB TRANSITION LENGTH FOR WHEELCHAIR RAMPS

ROADWAY PROFILE GRADE	*HIGH SIDE TRANSITION LENGTH (HST) 6" REVEAL	*HIGH SIDE TRANSITION LENGTH (HST) 7" REVEAL
%		
0	6'-6"	7'-10"
> 0 TO 1	7'-8"	9'-0"
> 1 TO 2	9'-0"	10'-8"
> 2 TO 3	11'-0"	13'-0"
> 3 TO 4	14'-0"	16'-8"
> 4	15'-0" MAX	17'-0" MAX

* BASED ON A DESIGN SLOPE OF 7.5%. VARIING CURB REVEAL MAY ALTER HST LENGTH.



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

WHEELCHAIR RAMP NOTES

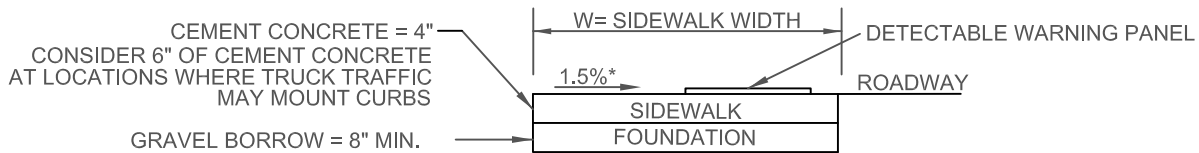
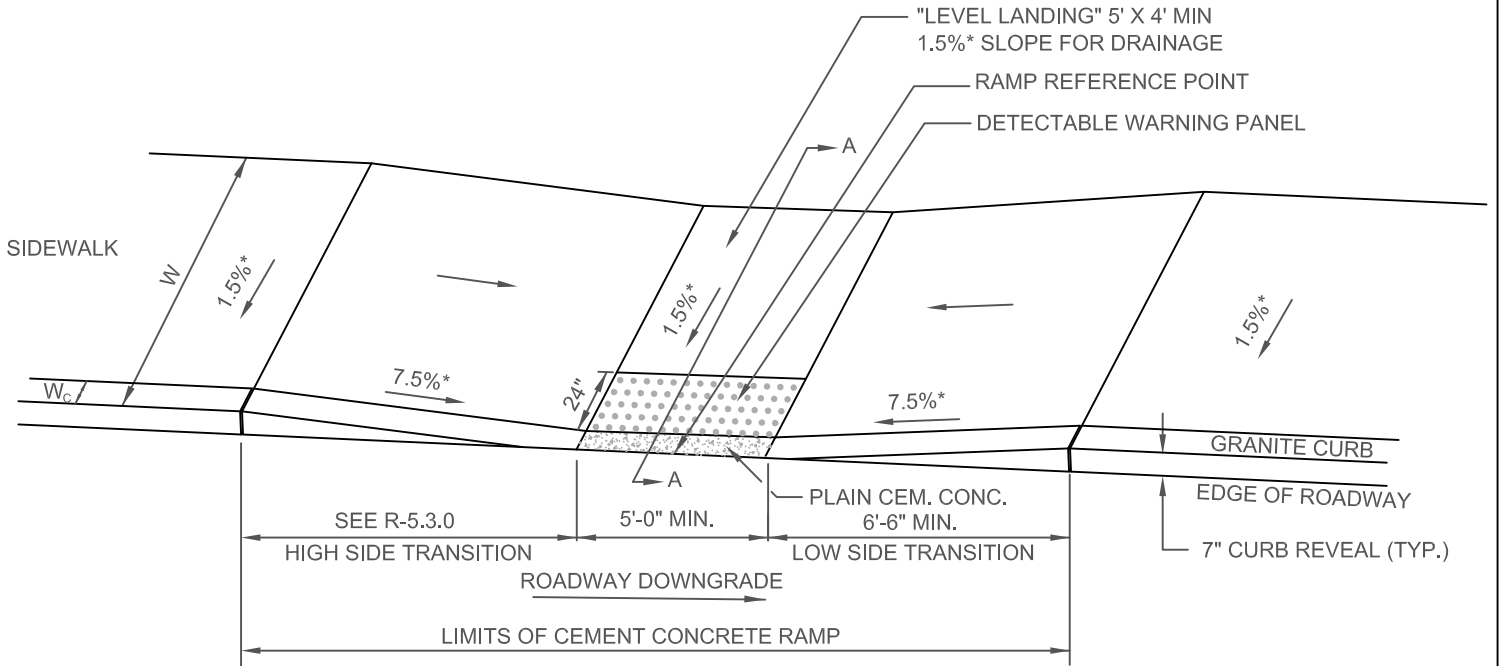
DATE:
MARCH 2017

REV:
4

DETAIL NO.

R-5.3.0

WHEELCHAIR RAMPS SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE CURRENT REGULATIONS OF THE ARCHITECTURAL ACCESS BOARD, THE AMERICANS WITH DISABILITIES ACT AND THE CURRENT MASSDOT CONSTRUCTION STANDARDS.



SECTION A-A

WHEELCHAIR RAMP TYPE A

NOT TO SCALE

LEGEND:

W = SIDEWALK WIDTH

W_c = CURB WIDTH

* = TOLERANCE FOR CONSTRUCTION $\pm 0.5\%$

USABLE SIDEWALK WIDTH PER AAB = $W - W_c$

USABLE SIDEWALK WIDTH PER AAB IS NOT TO BE LESS THAN 4'-0"

NOTE:

FOR DETECTABLE WARNING PANEL DETAIL SEE STANDARD DRAWING R-5.3.6



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

WHEELCHAIR RAMP TYPE A

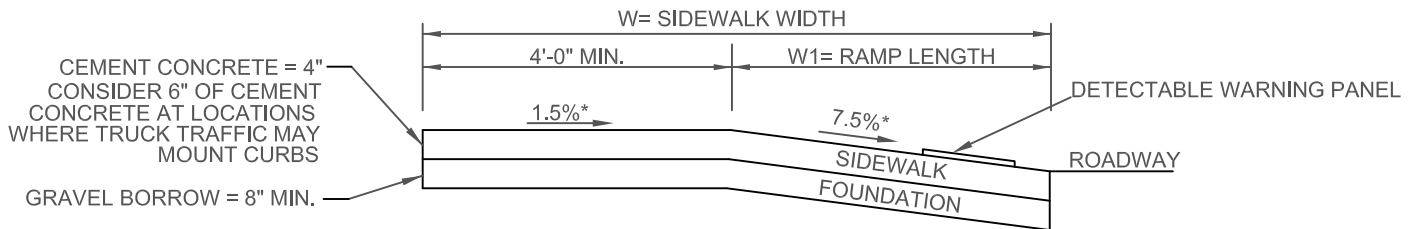
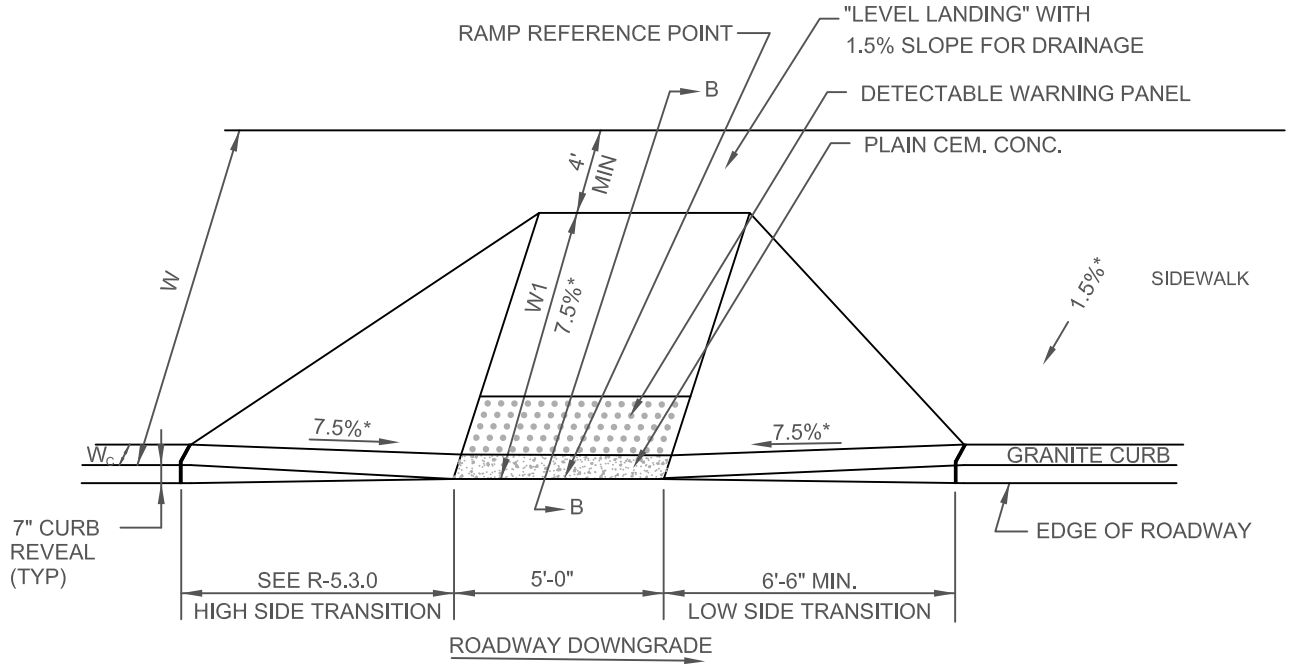
DATE:
MARCH 2017

REV:
2

DETAIL NO.

R-5.3.1

WHEELCHAIR RAMPS SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE CURRENT REGULATIONS OF THE ARCHITECTURAL ACCESS BOARD, THE AMERICANS WITH DISABILITIES ACT AND THE CURRENT MASSDOT CONSTRUCTION STANDARDS.



LEGEND:

W = SIDEWALK WIDTH

W_c = CURB WIDTH

* = TOLERANCE FOR CONSTRUCTION ±0.5%

USABLE SIDEWALK WIDTH PER AAB = W - W_c

USABLE SIDEWALK WIDTH PER AAB IS NOT TO BE LESS THAN 4'-0"

NOTE:

FOR DETECTABLE WARNING PANEL DETAIL SEE STANDARD DRAWING R-5.3.6



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

WHEELCHAIR RAMP TYPE B

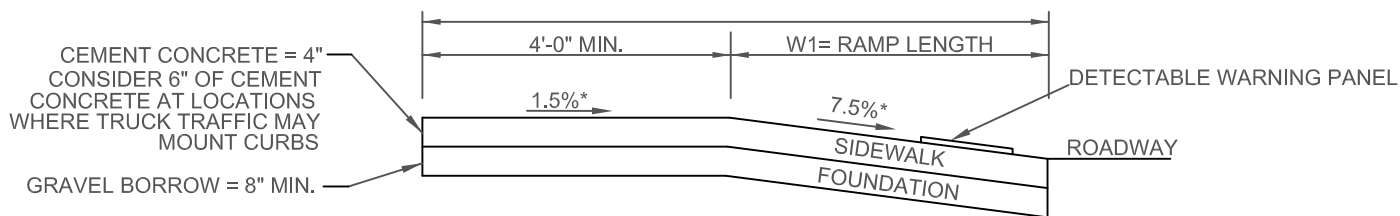
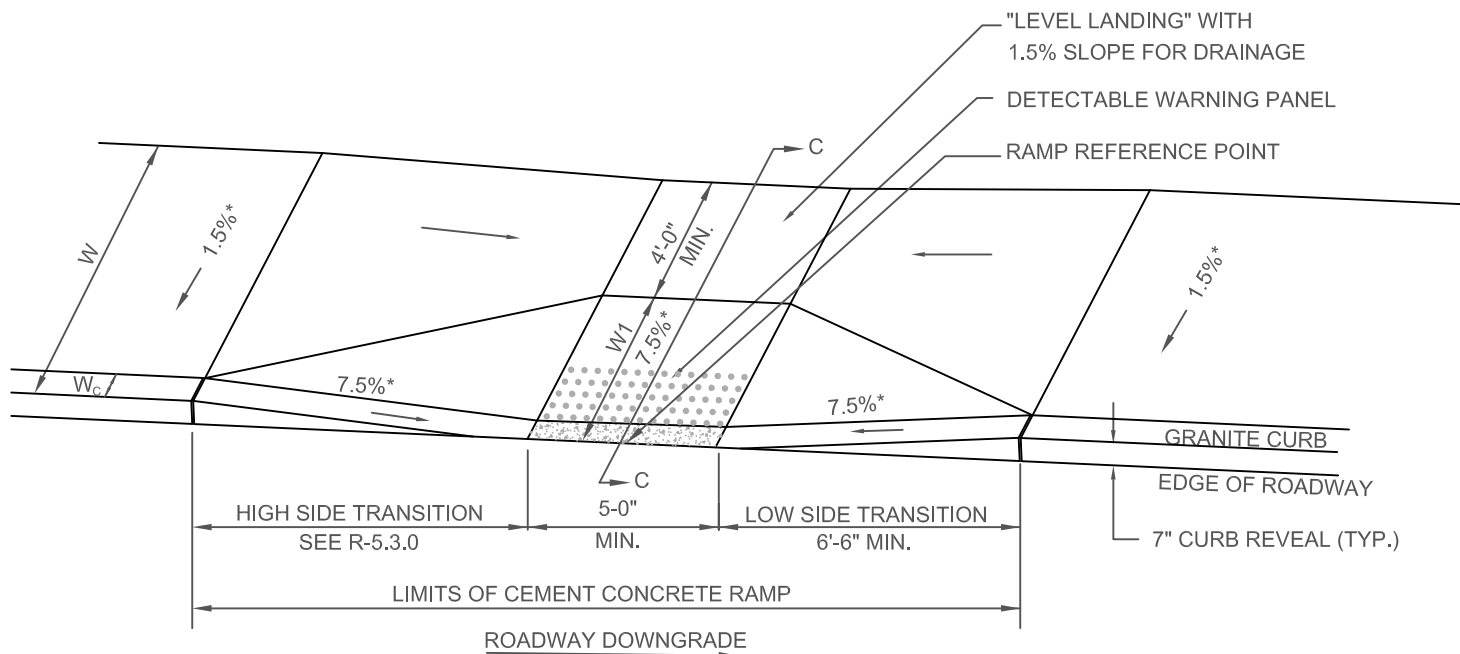
DATE:
MARCH 2017

REV:
2

DETAIL NO.

R-5.3.2

WHEELCHAIR RAMPS SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE CURRENT REGULATIONS OF THE ARCHITECTURAL ACCESS BOARD, THE AMERICANS WITH DISABILITIES ACT AND THE CURRENT MASSDOT CONSTRUCTION STANDARDS.



SECTION C-C

WHEELCHAIR RAMP TYPE C

NOT TO SCALE

LEGEND:

W = SIDEWALK WIDTH

W_c = CURB WIDTH

* = TOLERANCE FOR CONSTRUCTION ±0.5%

USABLE SIDEWALK WIDTH PER AAB = W - W_c

USABLE SIDEWALK WIDTH PER AAB IS NOT TO BE LESS THAN 4'-0"

NOTE:

FOR DETECTABLE WARNING PANEL DETAIL SEE STANDARD DRAWING R-5.3.6



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

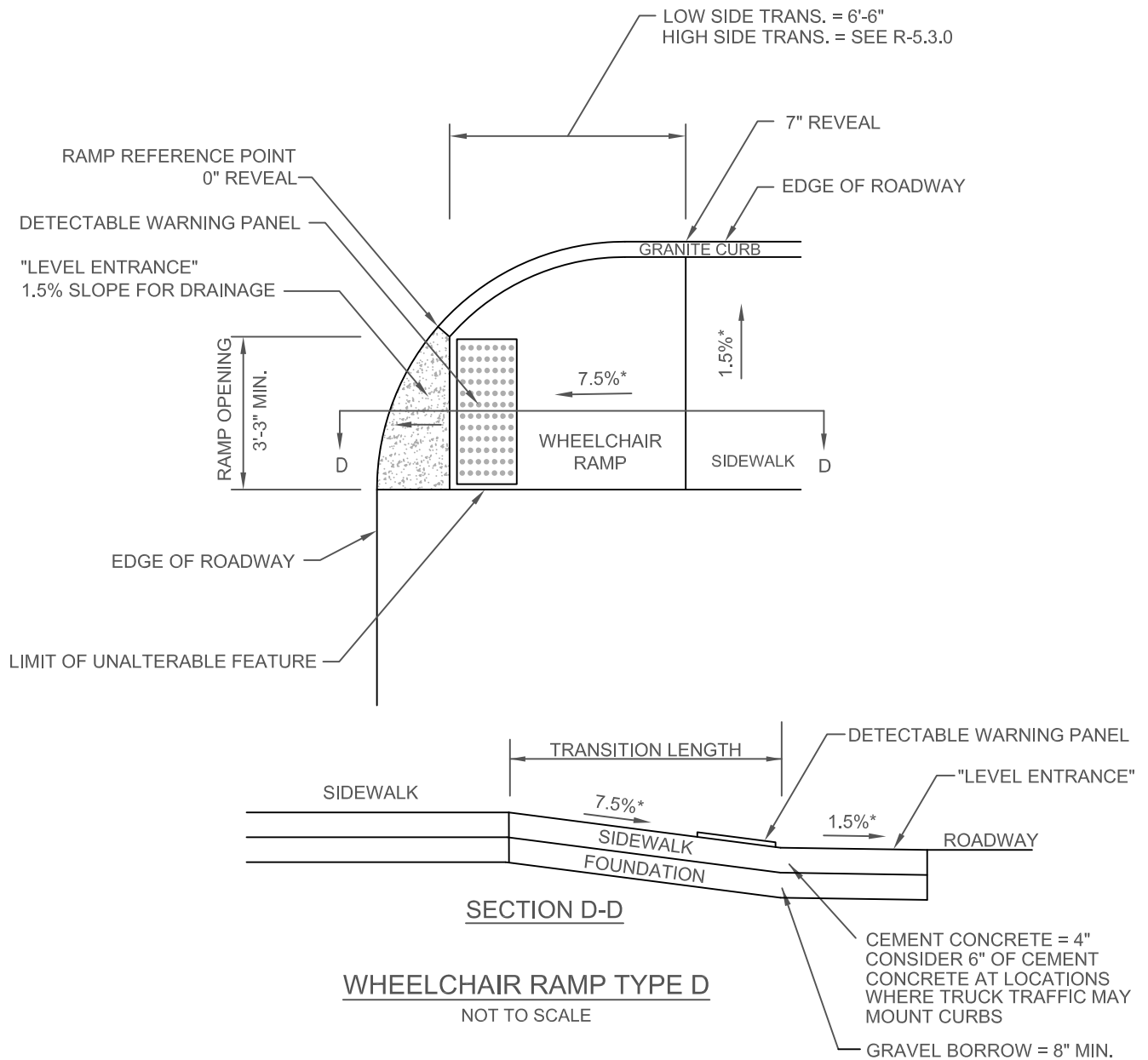
WHEELCHAIR RAMP TYPE C

DATE:
MARCH 2017

REV:
2

DETAIL NO.
R-5.3.3

WHEELCHAIR RAMPS SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE CURRENT REGULATIONS OF THE ARCHITECTURAL ACCESS BOARD, THE AMERICANS WITH DISABILITIES ACT AND THE CURRENT MASSDOT CONSTRUCTION STANDARDS.



* = TOLERANCE FOR CONSTRUCTION ±0.5%

NOTE:
FOR DETECTABLE WARNING
PANEL DETAIL SEE
STANDARD DRAWING R-5.3.6



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

WHEELCHAIR RAMP TYPE D

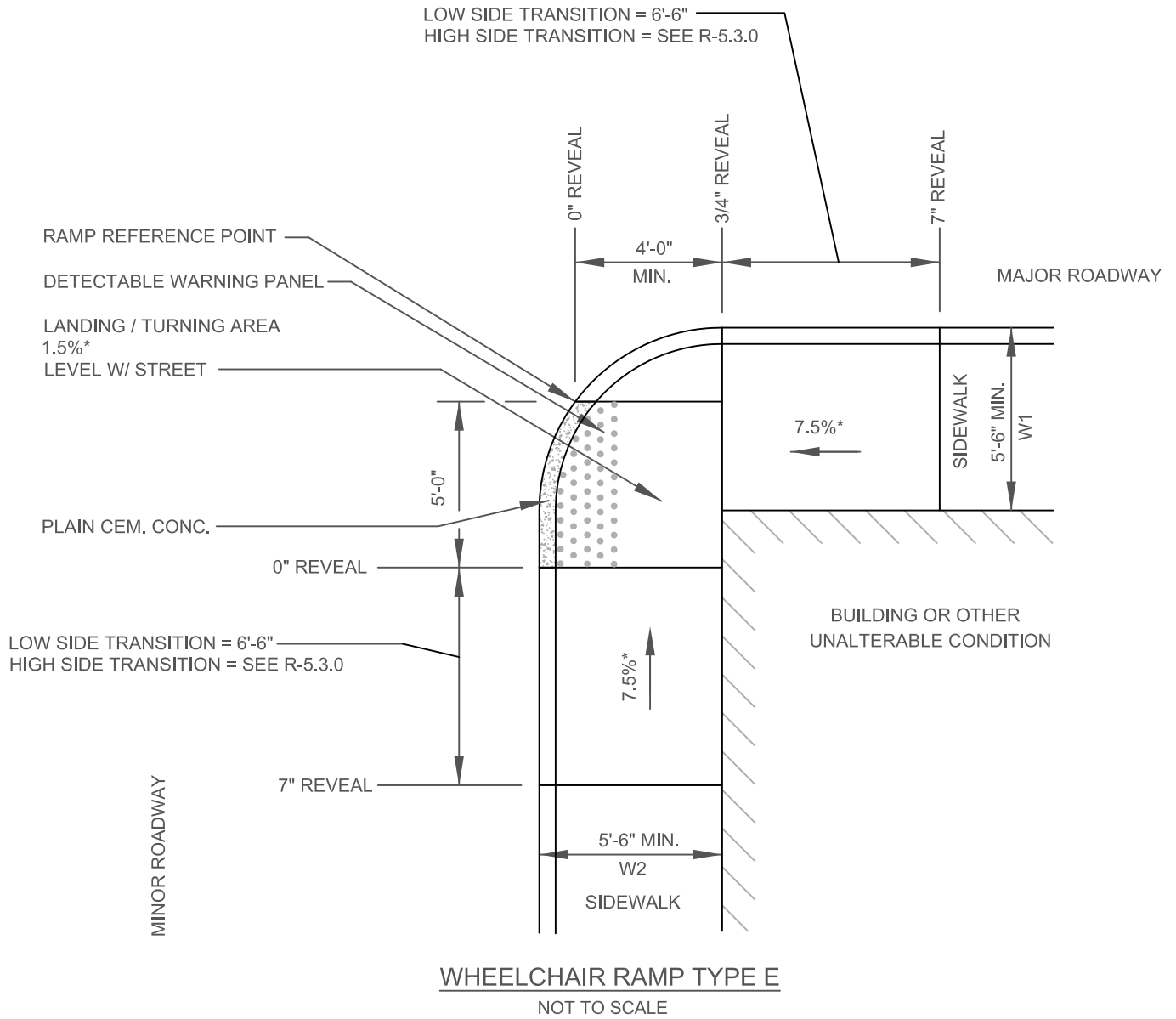
DATE:
MARCH 2017

DETAIL NO.

REV:
2

R-5.3.4

WHEELCHAIR RAMPS SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE CURRENT REGULATIONS OF THE ARCHITECTURAL ACCESS BOARD, THE AMERICANS WITH DISABILITIES ACT AND THE CURRENT MASSDOT CONSTRUCTION STANDARDS.



* = TOLERANCE FOR CONSTRUCTION ±0.5%

NOTE:
FOR DETECTABLE WARNING
PANEL DETAIL SEE
STANDARD DRAWING R-5.3.6



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

WHEELCHAIR RAMP TYPE E

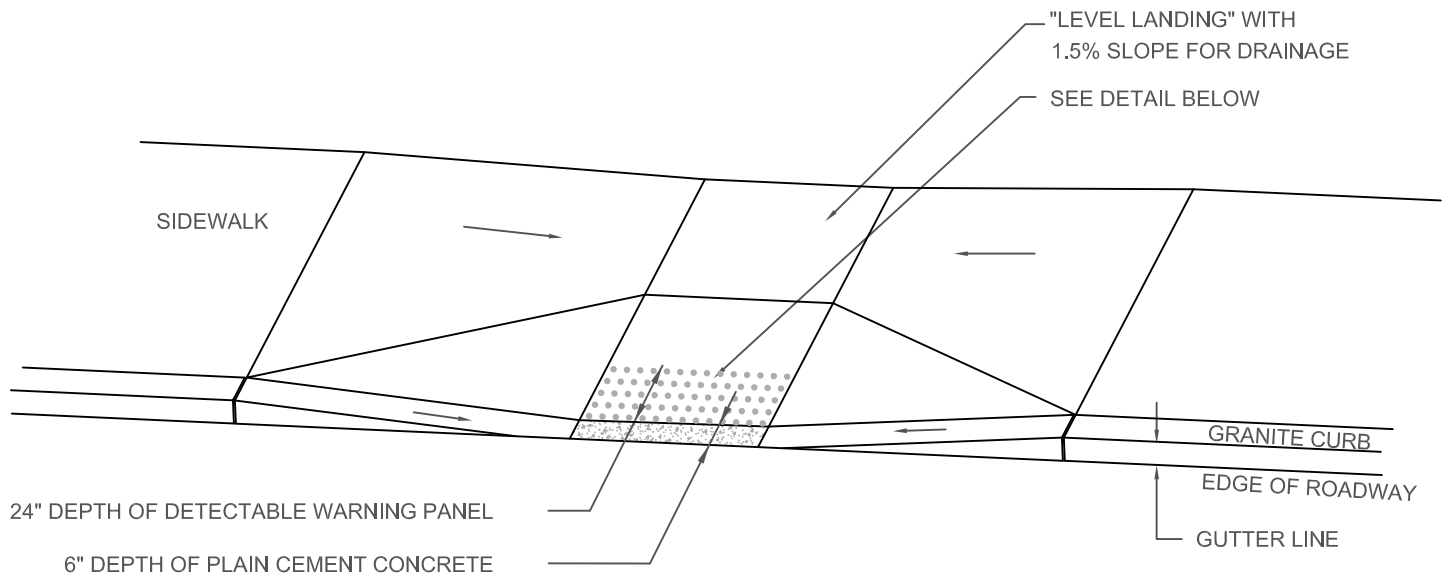
DATE:
MARCH 2017

REV:
2

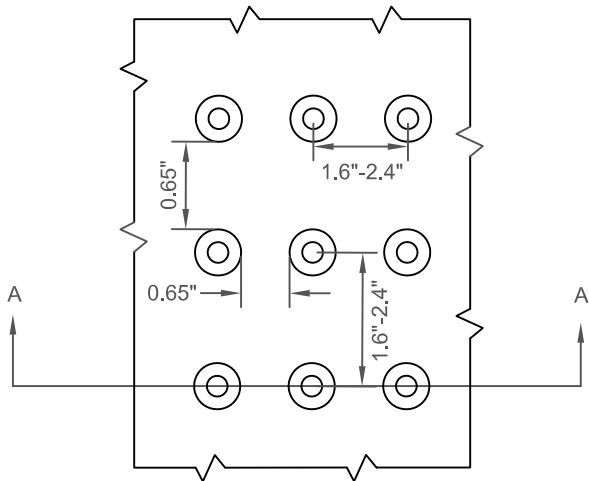
DETAIL NO.

R-5.3.5

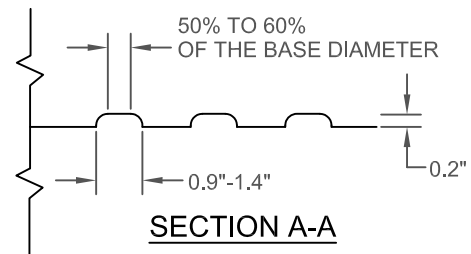
WHEELCHAIR RAMPS SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE CURRENT REGULATIONS OF THE ARCHITECTURAL ACCESS BOARD, THE AMERICANS WITH DISABILITIES ACT AND THE CURRENT MASSDOT CONSTRUCTION STANDARDS.



TYPICAL INSTALLATION



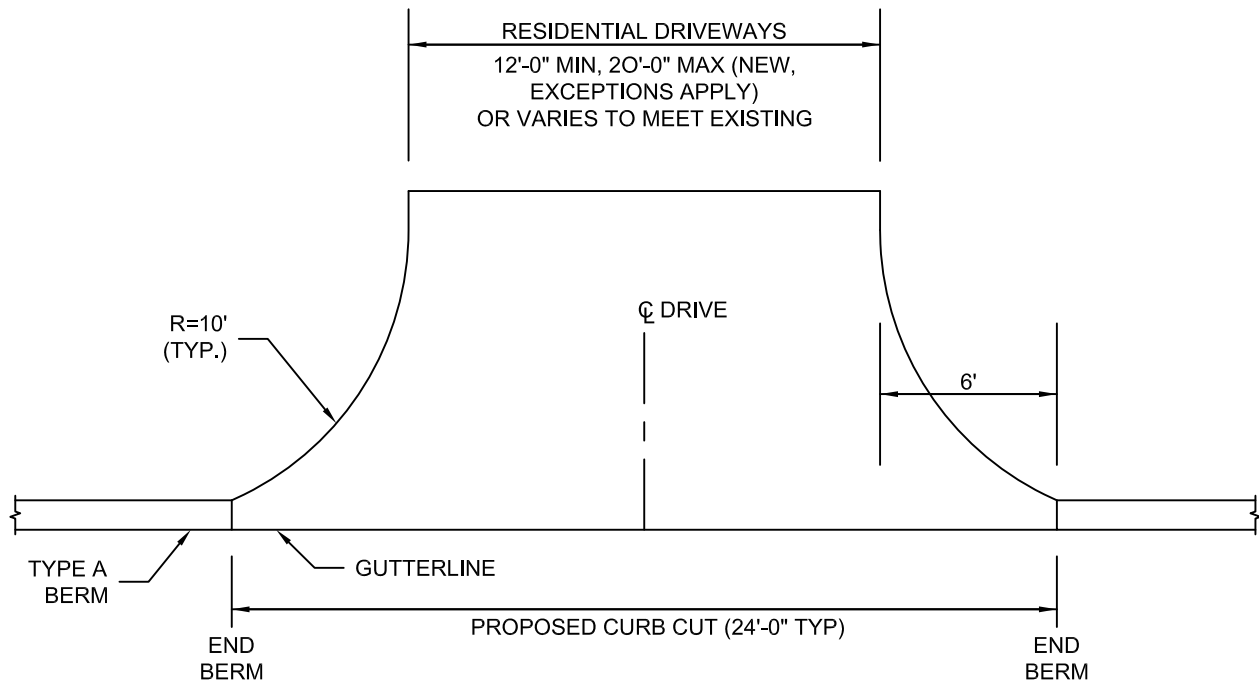
DETAIL OF DETECTABLE WARNING PANEL



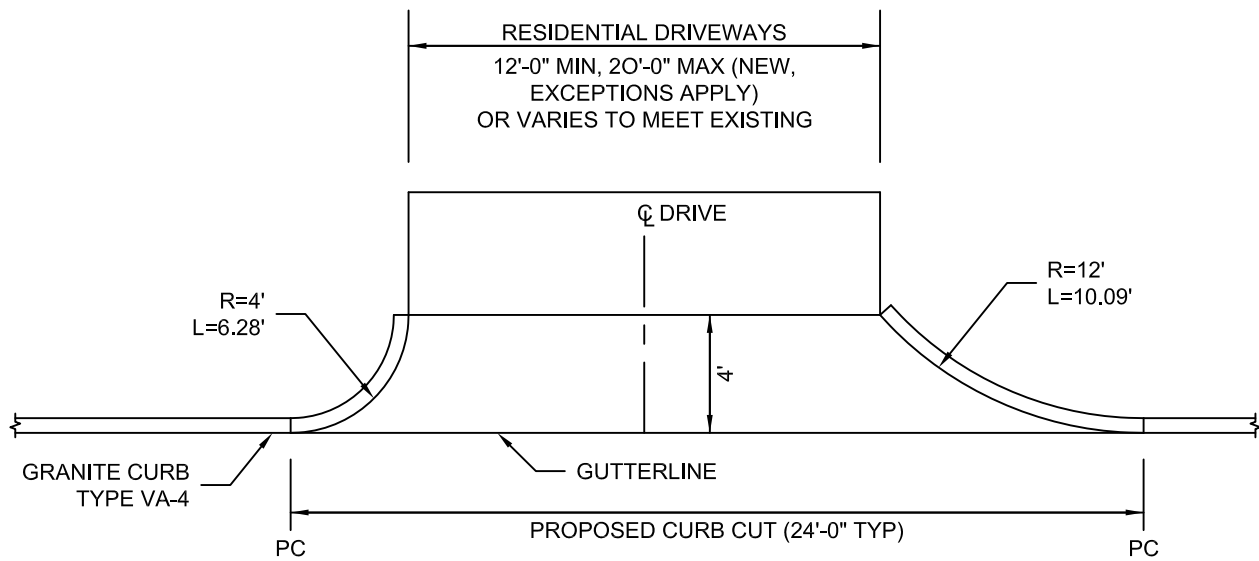
NOTE:

PANELS SHALL BE "BRICK RED" IN COLOR AND SHALL BE CAST-IN-PLACE WITH WHEELCHAIR RAMP CEMENT CONCRETE. SURFACE APPLIED TACTILE PANELS SHALL NOT BE UTILIZED.





TYPE "A" HOT MIX ASPHALT BERM



GRANITE CURB OR TYPE 2 HOT MIX ASPHALT BERM



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

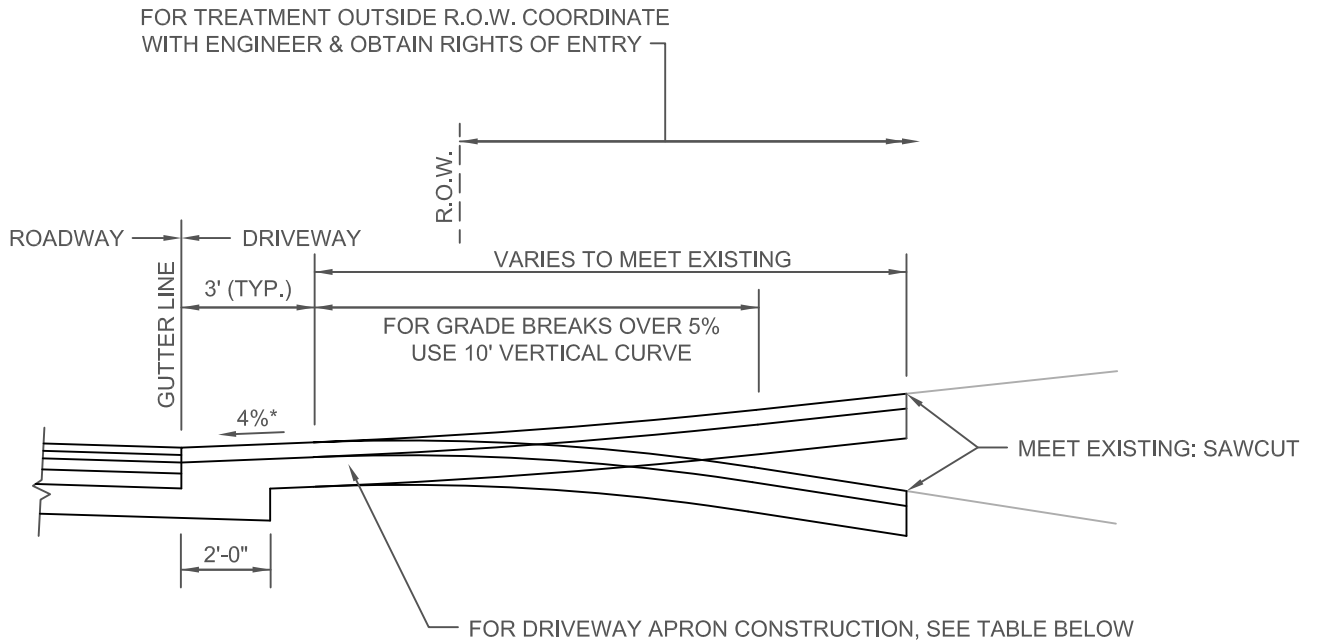
TYPICAL CURB CUT PLAN -
RESIDENTIAL DRIVEWAYS
NO SIDEWALK

DATE:
MARCH 2017

REV:
1

DETAIL NO.

R-5.4.0



NOTE: FOR PLAN, SEE DRAWING RS.09

DRIVEWAY APRON CONSTRUCTION		
	CEMENT CONCRETE CONSTRUCTION	HOT MIX ASPHALT
SURFACE:	6" CEMENT CONCRETE, 4,000 PSI, FIBER MESH PER CONSTRUCTION STANDARDS SECTION 5.2.10	4" HOT MIX ASPHALT (2" TOP COURSE MATERIAL OVER 2" BINDER COURSE MATERIAL)
SUBBASE:	8" GRAVEL BORROW (TYPE "B")	8" GRAVEL BORROW (TYPE "B")

R.O.W. = RIGHT OF WAY

* - DRIVEWAY APRON SLOPE TOWARDS ROADWAY MAY VARY TO MEET FIELD CONDITIONS; 1" LIP FOR CEMENT CONCRETE DRIVEWAYS

DRIVEWAY APRONS SHALL BE CONSTRUCTED OF HOT MIX ASPHALT OR CEMENT CONCRETE, UNLESS PRIOR WRITTEN APPROVAL IS GRANTED BY DPW.



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

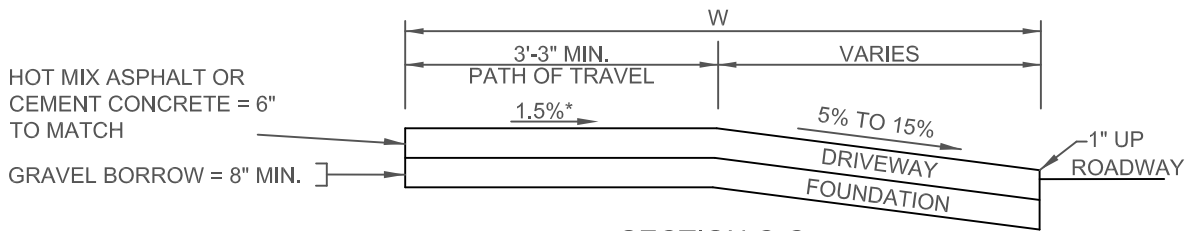
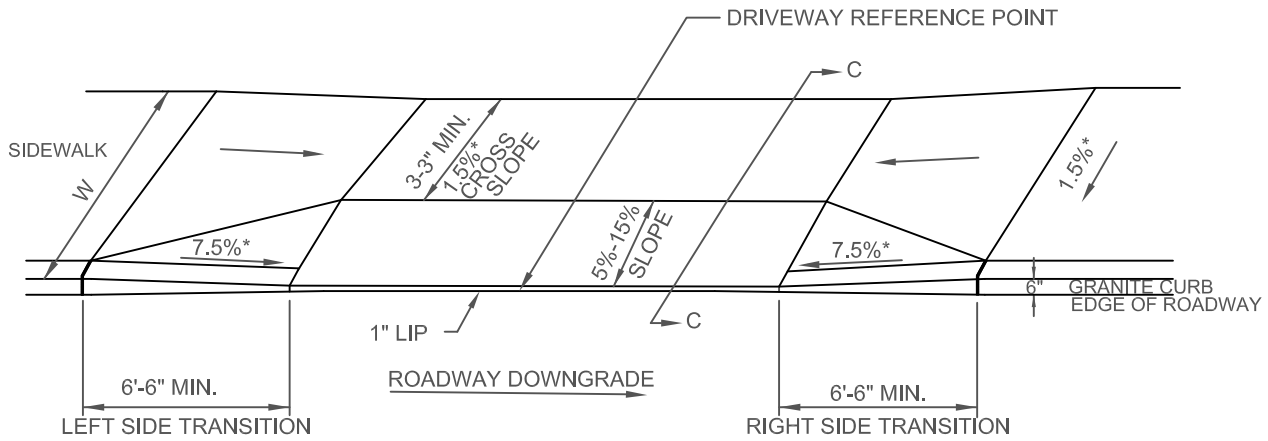
FULL DEPTH DRIVEWAY
APRON - SECTION
NO SIDEWALK

DATE:
FEB. 2010

REV:
0

DETAIL NO.

R-5.4.1



SECTION C-C

SIDEWALK THROUGH DRIVEWAYS WITHOUT CURB RETURNS (PREFERRED)

NOT TO SCALE

LEGEND:

HSL = HIGH SIDE TRANSITION LENGTH (AS REQUIRED TO MEET 7.5% MAX SLOPE)

W = SIDEWALK WIDTH

* = TOLERANCE FOR CONSTRUCTION ±0.5%

NOTES:

1. DRIVEWAYS SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE CURRENT REGULATIONS OF THE ARCHITECTURAL ACCESS BOARD, THE AMERICANS WITH DISABILITIES ACT AND THE CURRENT MASSDOT CONSTRUCTION STANDARDS.
2. WHERE NEW DRIVEWAYS CROSS EXISTING SIDEWALKS, THE SIDEWALK PORTION SHALL MATCH EXISTING.



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

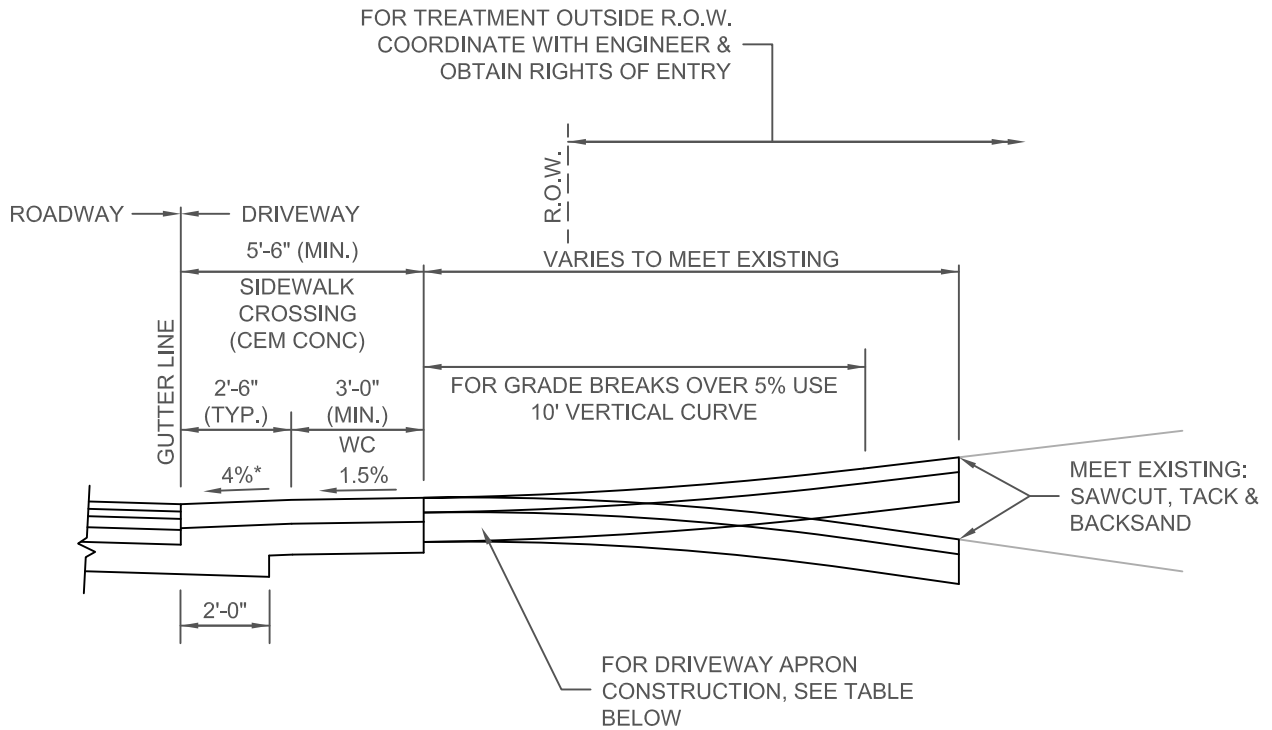
SIDEWALK THROUGH DRIVEWAY

DATE:
MAR 2017

REV:
3

DETAIL NO.

R-5.4.2



NOTES:

1. FOR PLAN, SEE DRAWING R-5.4.2.
2. FOR CEMENT CONCRETE SIDEWALK SEE DRAWING R5.4.2

DRIVEWAY APRON CONSTRUCTION	
SURFACE:	4" HOT MIX ASPHALT (2" TOP COURSE MATERIAL OVER 2" BINDER COURSE MATERIAL)
SUBBASE:	8" GRAVEL BORROW (TYPE "B")

WC = WHEELCHAIR (PATHWAY)

R.O.W. = RIGHT OF WAY

* - DRIVEWAY APRON SLOPE TOWARDS ROADWAY MAY VARY TO MEET FIELD CONDITIONS

DRIVEWAY APRONS SHALL BE CONSTRUCTED OF HOT MIX ASPHALT OR CEMENT CONCRETE, UNLESS PRIOR WRITTEN APPROVAL IS GRANTED BY DPW.



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

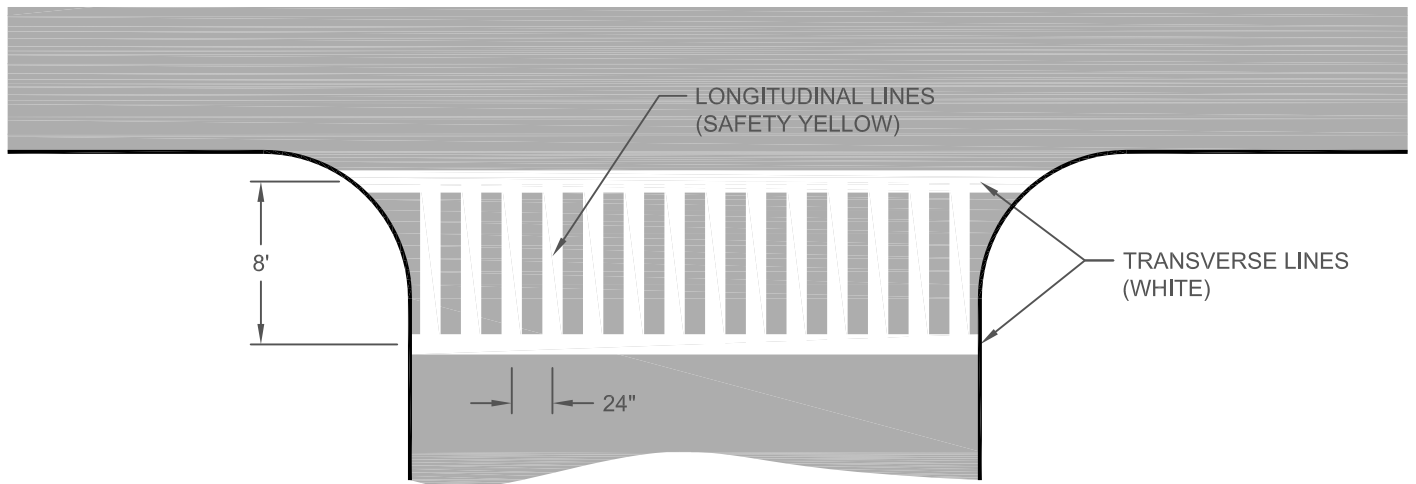
**FULL DEPTH DRIVEWAY - SECTION
CEMENT CONCRETE SIDEWALK
CROSSING**

DATE:
FEB. 2010

REV:
0

DETAIL NO.

R-5.4.3



PAVEMENT MARKING - FAST DRYING WATER-BORNE OR OTHER TRAFFIC PAINT

NOT TO SCALE

NOTES:

1. CROSSWALK MARKINGS SHALL CONSIST OF SOLID WHITE OR YELLOW (AS INDICATED) LINES (BOTH TRANSVERSE AND LONGITUDINAL) 12 INCHES IN WIDTH.
2. CROSSWALKS SHALL BE 8 FEET WIDE.
3. LONGITUDINAL LINES SHALL BE SPACED 24" APART ON CENTER FOR ALL NEW CROSSWALKS. EXISTING CROSSWALK REPAIRS SHALL MATCH EXISTING SPACING.
4. CROSSWALK LINES SHALL EXTEND ACROSS THE FULL WIDTH OF PAVEMENT OR TO THE EDGE OF THE INTERSECTING CROSSWALK.
5. CROSSWALKS SHALL BE MARKED AT ALL INTERSECTIONS WHERE THERE IS SUBSTANTIAL CONFLICT BETWEEN VEHICULAR AND PEDESTRIAN MOVEMENT.
6. CROSSWALK MARKINGS FOR NEW ROADWAYS SHALL BE INSTALLED USING EPOXY PAVING MARKING MATERIAL CONFORMING TO MASSDOT ENGINEERING DIRECTIVE E-05-003, DATED JUNE 16, 2005 AND TO MASSDOT STANDARD SECTION 860.
7. CROSSWALK MARKINGS FOR EXISTING ROADWAYS SHALL BE INSTALLED USING FAST DRYING WATER-BORNE TRAFFIC PAINT PAVING MARKING MATERIAL TO MEET MASSDOT SPECIFICATIONS M07.01.23 (WHITE) AND M07.01.24 (YELLOW).
8. THERMOPLASTIC SHALL NOT BE USED FOR ANY PAVEMENT MARKINGS.



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

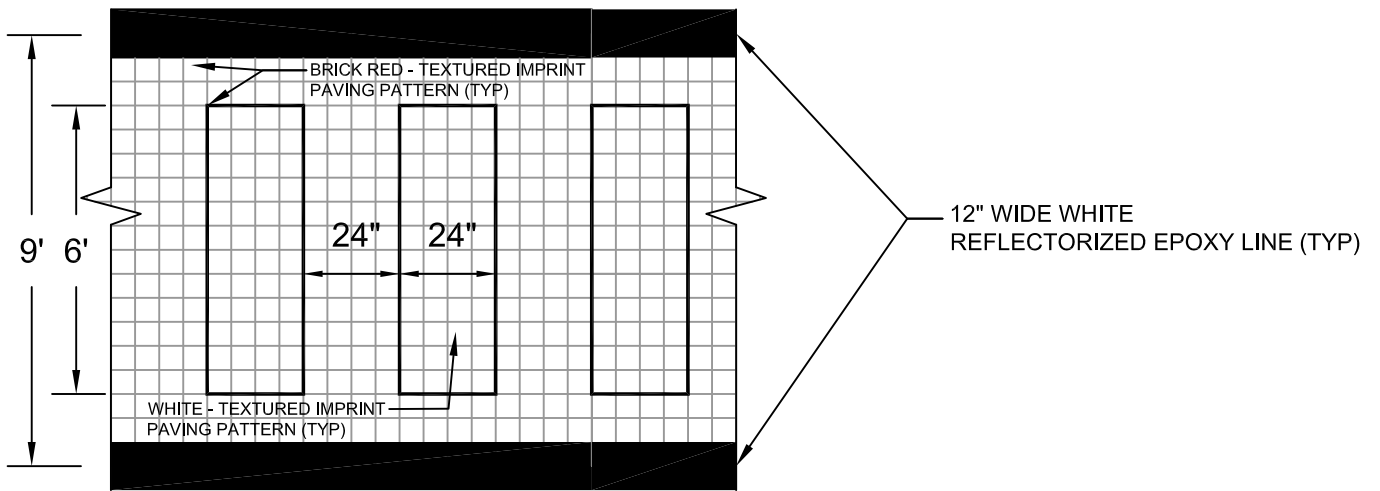
CROSS WALK

DATE:
MAR. 2014

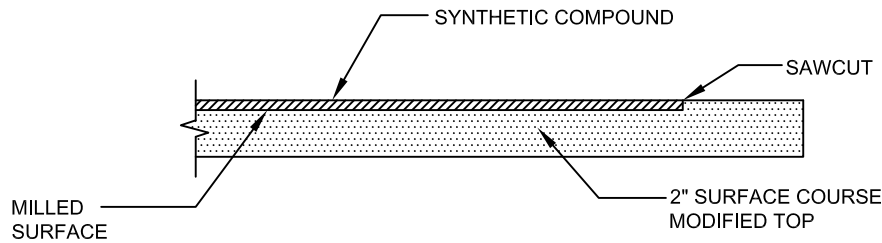
REV:
2

DETAIL NO.

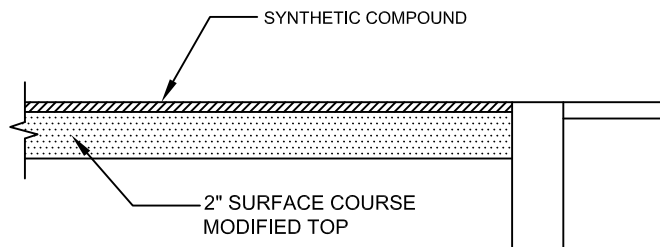
R-5.5.0



PLAN



TRANSVERSE SECTION



LONGITUDINAL SECTION

NOTES:

1. BRICK PATTERN TO BE STAMPED INTO MECHANICALLY HEATED SYNTHETIC COMPOUND.
2. REFER TO ITEM 706.9 FOR SPECIFICATIONS FOR TEXTURED DECORATIVE PAVEMENT CROSSWALK WHICH IS ON FILE WITH THE CITY OF FRAMINGHAM'S MUNICIPAL ENGINEERING DEPARTMENT.



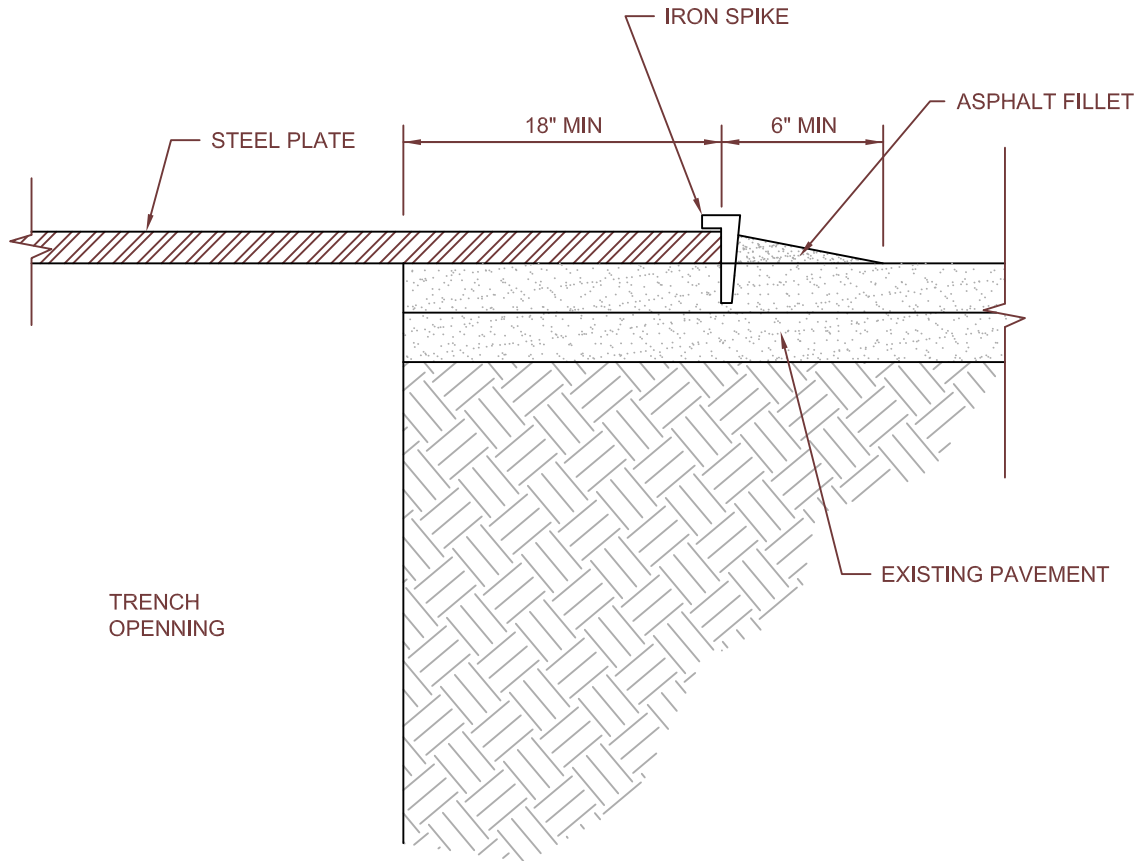
CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

DATE:
MARCH 2017

REV:
2

DETAIL NO.

R-5.5.1



NOTES:

1. USE OF STEEL PLATES ALLOWED ON A CASE BY CASE BASIS, PENDING WRITTEN APPROVAL BY TOWN.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGES OR CLAIMS RESULTING FROM THE USE OF STEEL PLATES.
3. MUTCD COMPLIANT RETROREFLECTIVE ORANGE CONSTRUCTION WARNING SIGNS (48"X48") WITH WORDING "STEEL PLATE AHEAD" SHALL BE INSTALLED IN ADVANCE OF STEEL PLATE INSTALLATION.
4. THE CONTRACTOR SHALL DESIGN AND UTILIZE STEEL PLATES OF ADEQUATE DIMMENSIONS AND THICKNESS FOR INTENDED USE AND VEHICLE LOADING. MAXIMUMUM ALLOWABLE DEFLECTION SHALL BE 0.025". IRON SPIKE FASTENERS SHALL BE INSTALLED AROUND THE PERIMETER OF THE STEEL PLATE.
5. SEE CONSTRUCTION STANDARDS SECTION 6.3 SPECIAL CONDITIONS FOR ADDITIONAL REQUIREMENTS.



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

STEEL PLATE INSTALLATION

DATE:
FEB. 2010

REV:
0

DETAIL NO.

R-5.6.0

2'-0" MIN.

STANDARD MUTCD TRAFFIC SIGN

GALVANIZED U-CHANNEL POST (2# / FT.)
3/8" HOLES DRILLED AT EVEN INCH SPACING

MARION LAP SPLICE

4" DIA. P.V.C. SLEEVE
THROUGH MEDIAN
OR SIDEWALK (CAST IN PLACE)

COMPACTED STONE DUST

GALVANIZED U-CHANNEL POST (1.12# / FT.)
3/8" HOLES DRILLED AT EVEN INCH SPACING

7'-0" MIN. VERTICAL CLEARANCE
8'-0" MIN. VERTICAL CLEARANCE ON DESIGNATED BICYCLE ROUTES

2'-8" MIN.

2" MAX

3'-0"

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

TRAFFIC SIGN DETAIL
SIDEWALK OR MEDIAN INSTALLATION

DATE:
FEB. 2016

REV:
2

DETAIL NO.

R-5.7.1

2'-0" MIN.

STANDARD MUTCD TRAFFIC SIGN

GALVANIZED U-CHANNEL POST (2# / FT.)
3/8" HOLES DRILLED AT EVEN INCH SPACING

MARION LAP SPLICE

2" MAX

EDGE OF PAVEMENT

3'-0"

7'-0" MIN. VERTICAL CLEARANCE
8'-0" MIN. VERTICAL CLEARANCE ON DESIGNATED BICYCLE ROUTES

2'-8" MIN.

GALVANIZED U-CHANNEL POST (1.12# / FT.)
3/8" HOLES DRILLED EVEN INCH

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

TRAFFIC SIGN DETAIL
NON-SIDEWALK INSTALLATION

DATE:
MARCH 2017

REV:
3

DETAIL NO.

R-5.7.2

1. EACH SIGN SHALL CONSIST OF (2) SINGLE SIDED PLATES USING DRIVE PINS TO SECURE PLATES TO POST.
2. OUTER EDGE OF SIGN SHALL BE SECURED WITH POP RIVETS AND 2" SPACER BETWEEN THE 2 PLATES.
3. FONT SHALL BE HIGHWAY GOTHIC B IN UPPER CASE ONLY.
4. PLATES SHALL HAVE ROUNDED CORNERS.
5. WHITE AVERY-DENNISON PRISMATIC PLATE SHALL BE UTILIZED.
6. THE SIGNS SHALL INCLUDE 5.5" TOWN SEALS (2 REQUIRED).
7. THE SIGNS SHALL INCLUDE A 0.5" WHITE BORDER.



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

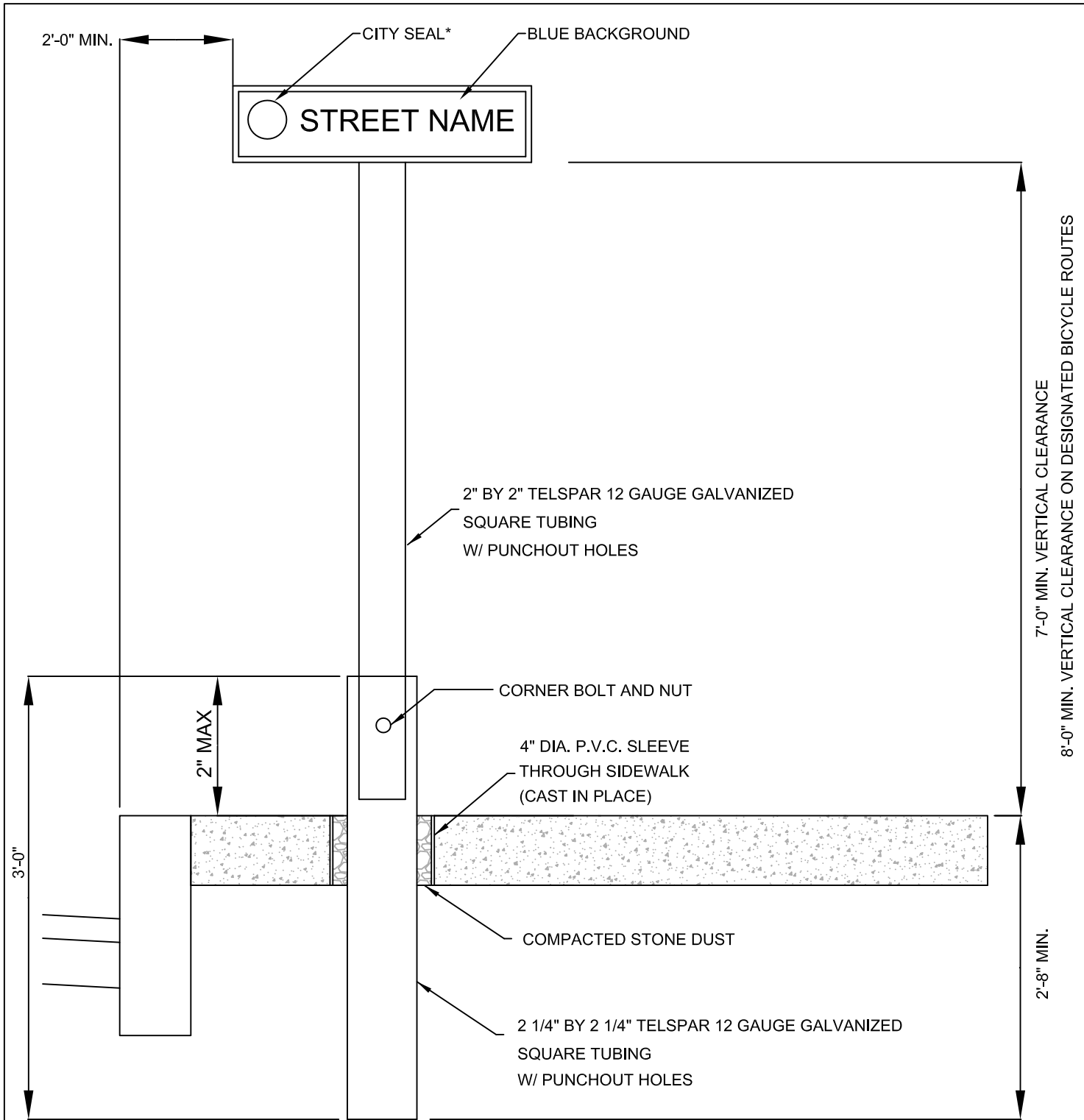
STREET NAME SIGN INSTALLATION
NOTES

DATE:
MARCH 2017

REV:
1

DETAIL NO.

R-5.7.3



NOT TO SCALE

*OMIT CITY SEAL IF SIGN IS LABELING A PRIVATE ROAD



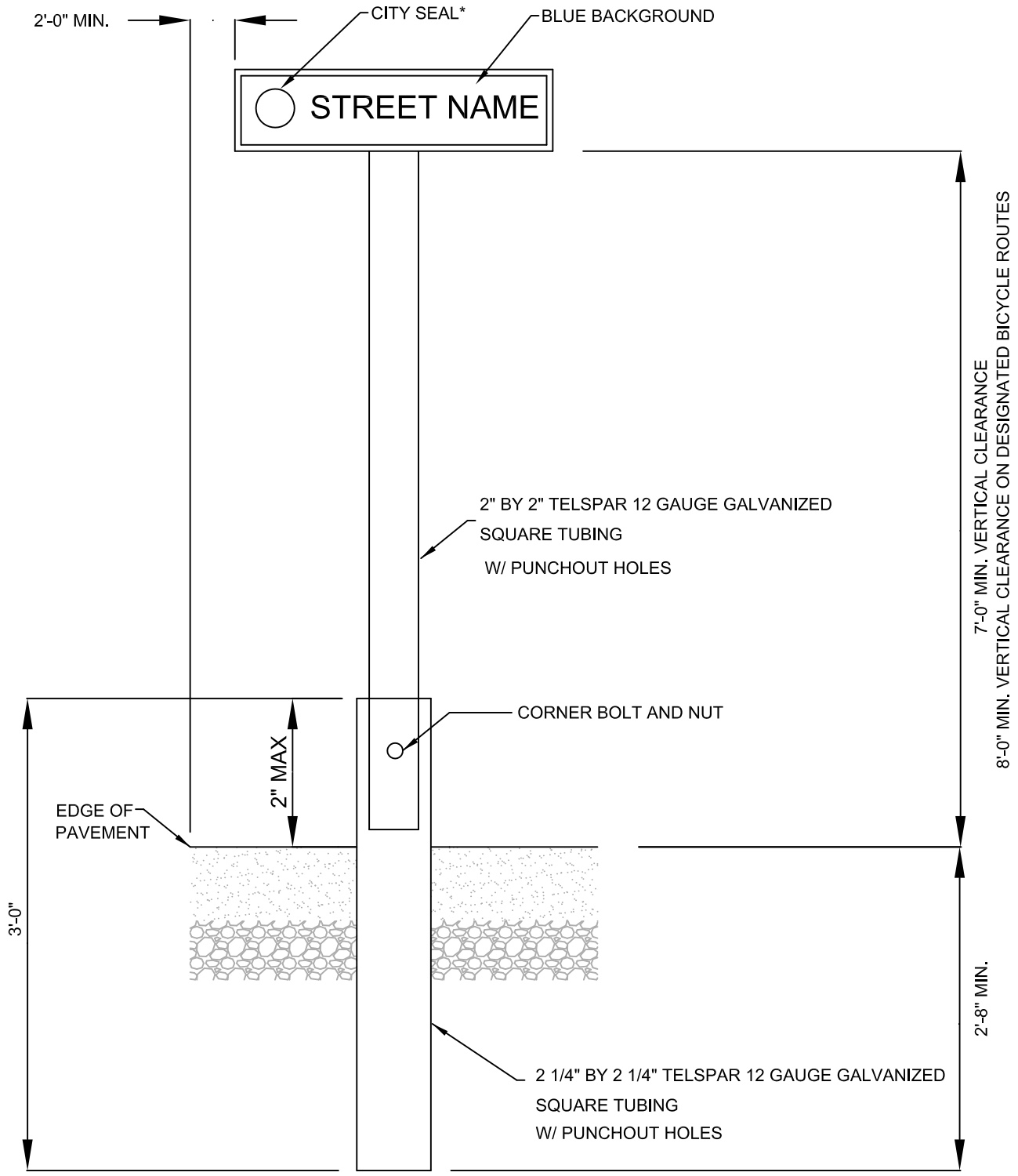
CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

STREET SIGN DETAIL
SIDEWALK INSTALLATION

DATE:
FEB 2016

REV:
3

DETAIL NO.
R-5.7.4

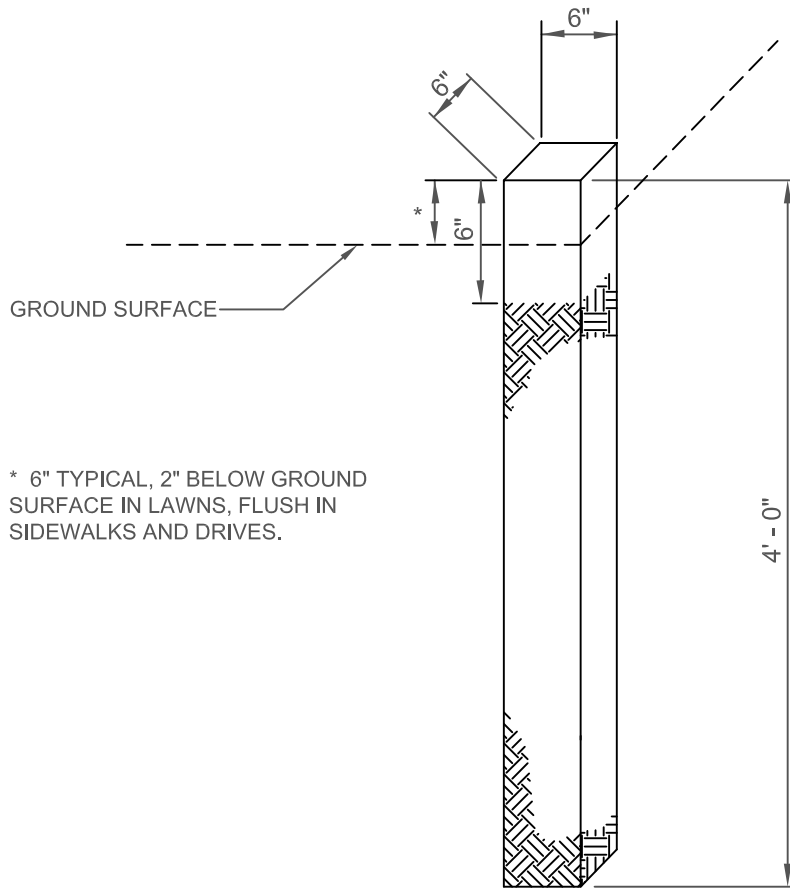


NOT TO SCALE

*OMIT CITY SEAL IF SIGN IS LABELING A PRIVATE ROAD

 <p>CITY OF FRAMINGHAM DEPARTMENT OF PUBLIC WORKS</p>	<p>STREET SIGN DETAIL NON-SIDEWALK INSTALLATION</p>	DATE: MARCH 2017	<p>DETAIL NO. R-5.7.5</p>
		REV: 3	

REPLACEMENT AND NEW BOUND INSTALLATION SHALL BE DIRECTLY OVERSEEN BY A PROFESSIONAL LAND SURVEYOR LICENSED IN THE COMMONWEALTH. SURVEYOR'S NOTES AND SETTING DATA SHALL BE PROVIDED TO THE ENGINEERING DIVISION.



* 6" TYPICAL, 2" BELOW GROUND SURFACE IN LAWNS, FLUSH IN SIDEWALKS AND DRIVES.

NOTES:

1. TOP AND 4 SIDES FOR A DISTANCE OF 6" FROM TOP SHALL BE HAMMERED SMOOTH.
2. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS.
3. ALL EXISTING ROADWAY MONUMENTATION SHALL BE INVENTORIED AND PROTECTED. ANY AND ALL PROPOSED IMPACTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEERING DIVISION IMMEDIATELY.
4. PLEASE REFERENCE ADDITIONAL GRANITE BOUND INFORMATION IDENTIFIED UNDER THE TOF CONSTRUCTION STANDARDS: SECTION 1.3.4 A AND B (ROADWAY BOUNDS AND MONUMENTS), SECTION 1.7.A.12 (CONDITIONS FOR STREET ACCEPTANCE - BOUND LAYOUT AND EASEMENT INSPECTION REPORT), SECTION 5.2.15 A (GRANITE BOUNDS), AND SECTION 5.3.12 A, B, AND C (GRANITE BOUNDS - INVENTORY AND REQUIREMENTS FOR SETTING OR REPLACING BOUNDS).

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

GRANITE BOUND DETAIL

DATE:
MAR. 2015

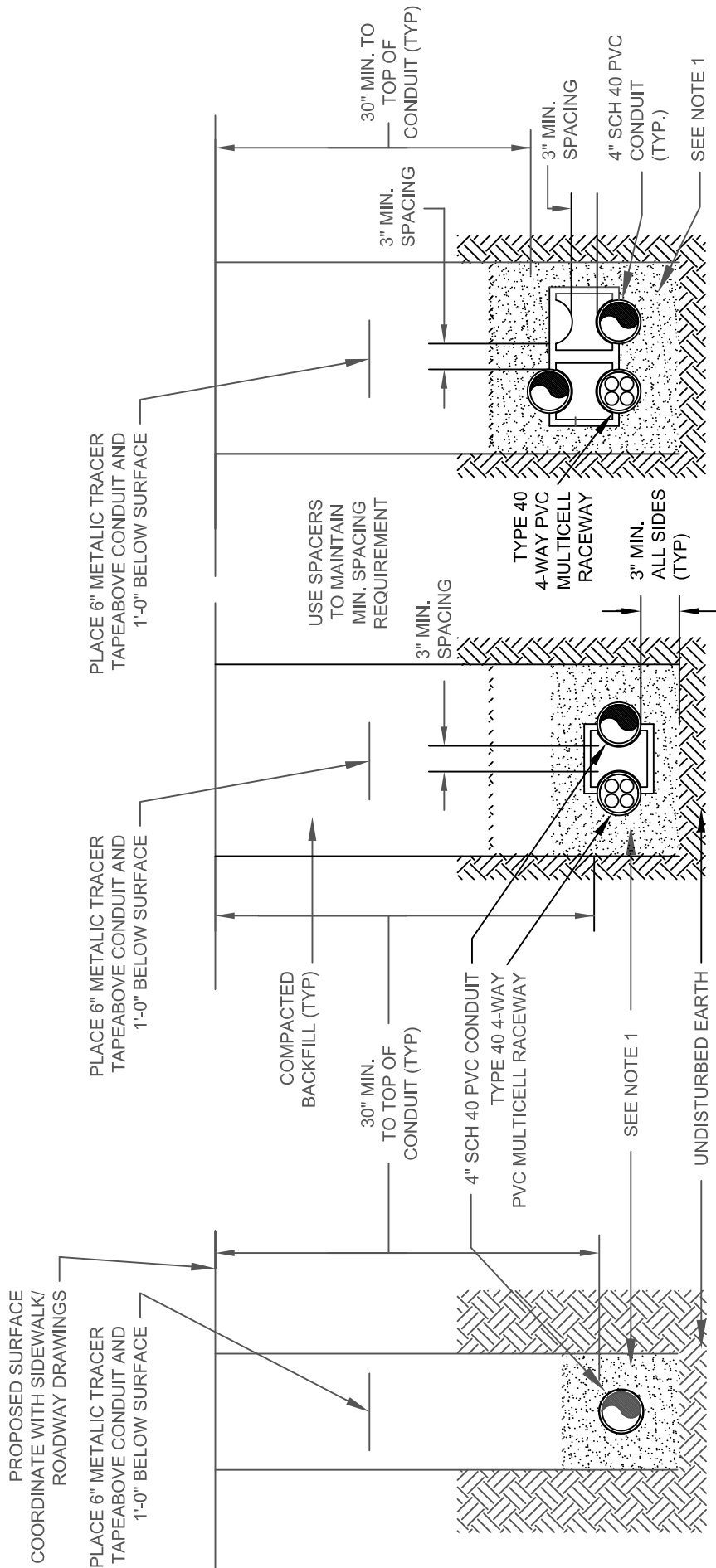
REV:
1

DETAIL NO.

R-5.7.6



TRENCH DETAIL FOR
COMMUNICATIONS CONDUIT



CONCRETE ENCASED
(1X1 CONFIGURATION)

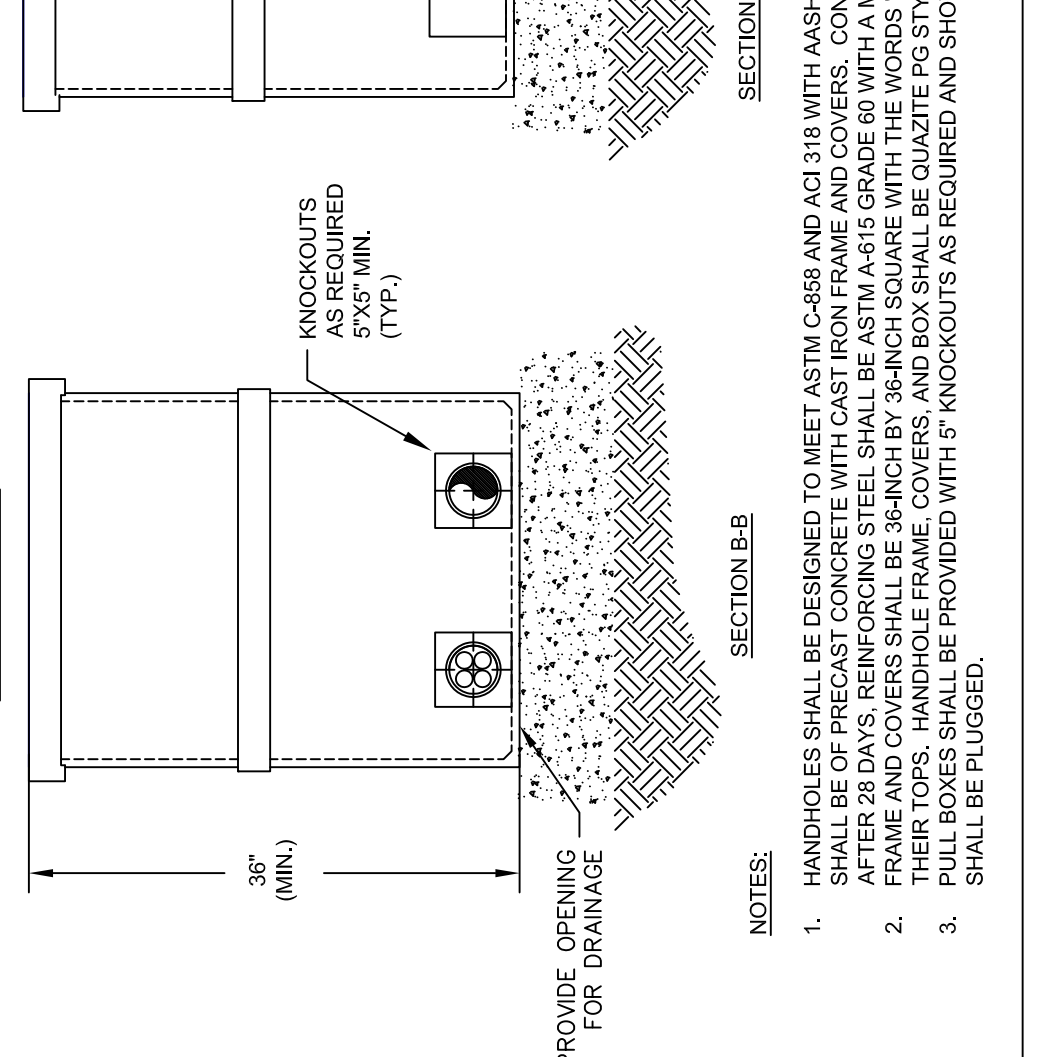
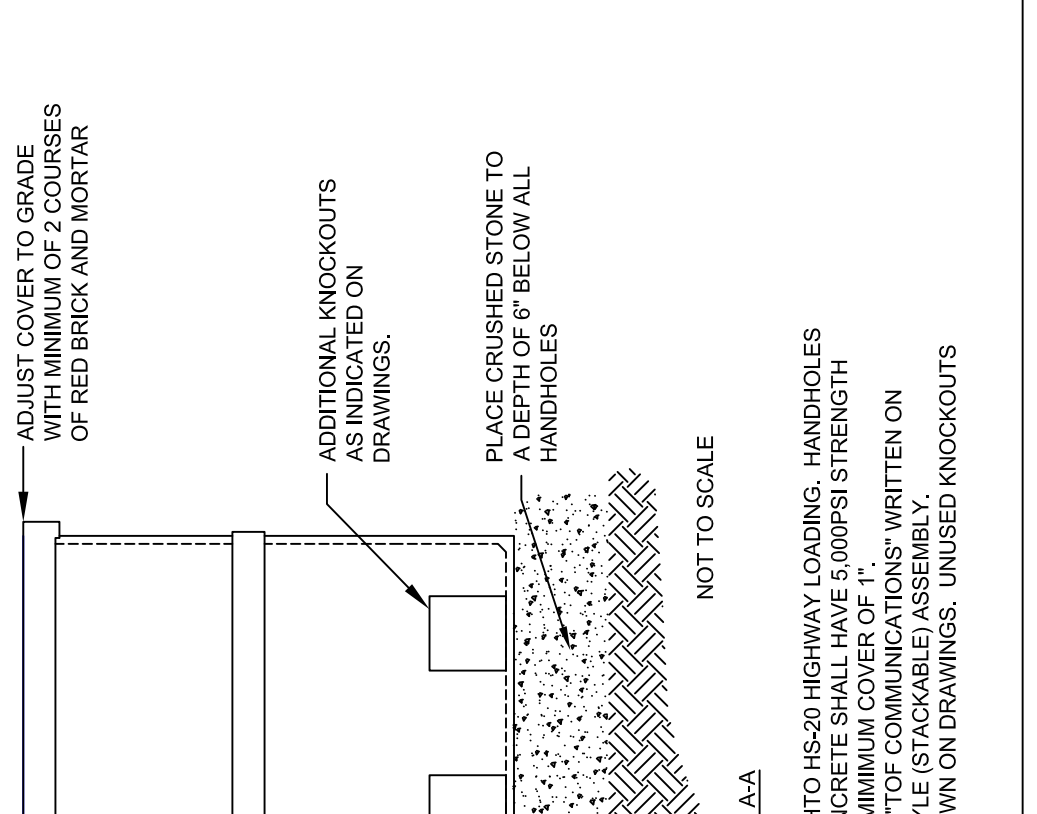
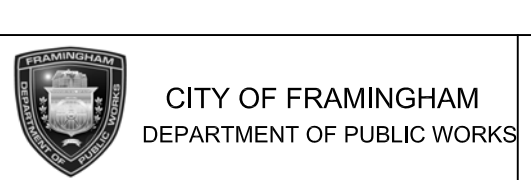
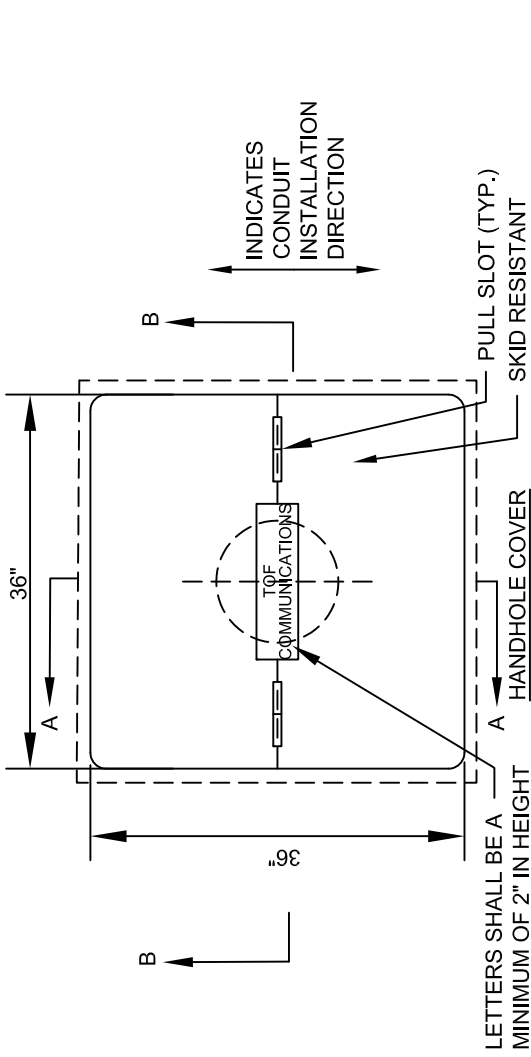
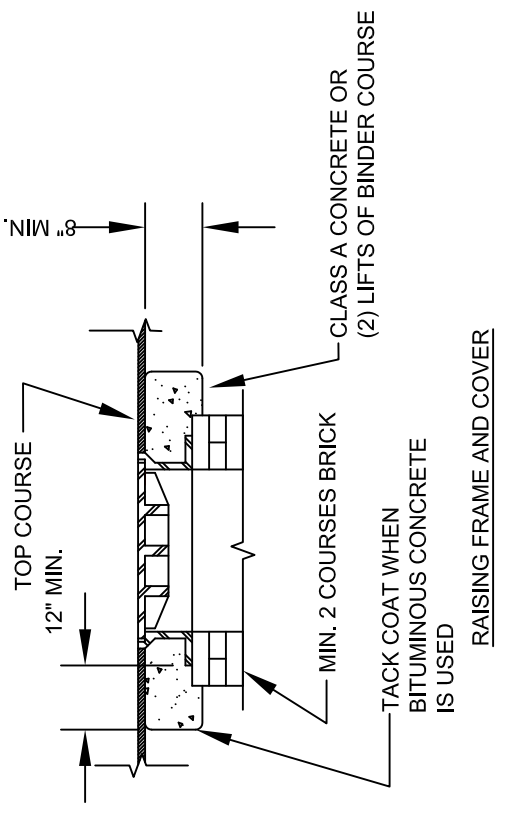
CONCRETE ENCASED
(1X2 CONFIGURATION)

CONCRETE ENCASED
(1X1 OR 1X2 CONFIGURATION OVER
1X2 CONFIGURATION)

NOTE:

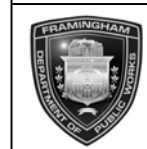
1. CONDUIT TO BE ENCASED IN CEMENT CONCRETE WITH 3" MINIMUM COVER ON ALL SIDES.
2. COVERS SHALL BE STEEL.

NOT TO SCALE



NOTES:

- HANDHOLES SHALL BE DESIGNED TO MEET ASTM C-858 AND ACI 318 WITH AASHTO HS-20 HIGHWAY LOADING. HANDHOLES SHALL BE OF PRECAST CONCRETE WITH CAST IRON FRAME AND COVERS. CONCRETE SHALL HAVE 5,000PSI STRENGTH AFTER 28 DAYS, REINFORCING STEEL SHALL BE ASTM A-615 GRADE 60 WITH A MINIMUM COVER OF 1".
- FRAME AND COVERS SHALL BE 36-INCH BY 36-INCH SQUARE WITH THE WORDS "TOP OF COMMUNICATIONS" WRITTEN ON THEIR TOPS. HANDHOLE FRAME, COVERS, AND BOX SHALL BE QUAZITE PG STYLE (STACKABLE) ASSEMBLY.
- PULL BOXES SHALL BE PROVIDED WITH 5" KNOCKOUTS AS REQUIRED AND SHOWN ON DRAWINGS. UNUSED KNOCKOUTS SHALL BE PLUGGED.



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

HAND HOLE FOR
COMMUNICATIONS CONDUIT

DATE:
MARCH 2017

REV:
1

DETAIL NO.
R-5.8.1



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

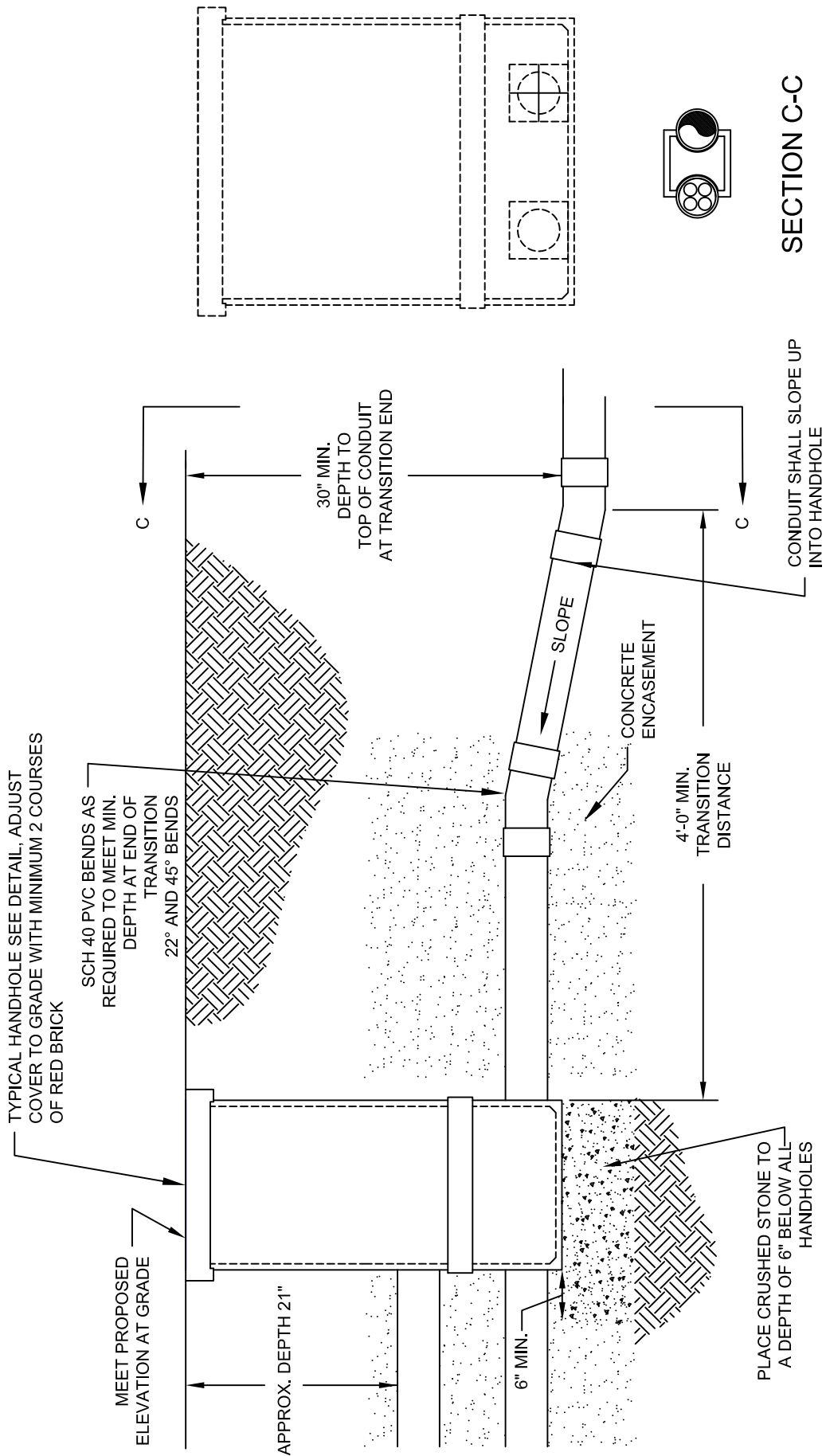
TRANSITION FROM
COMMUNICATIONS HAND HOLE
TO TRENCH

DATE:
MARCH 2017

REV:
1

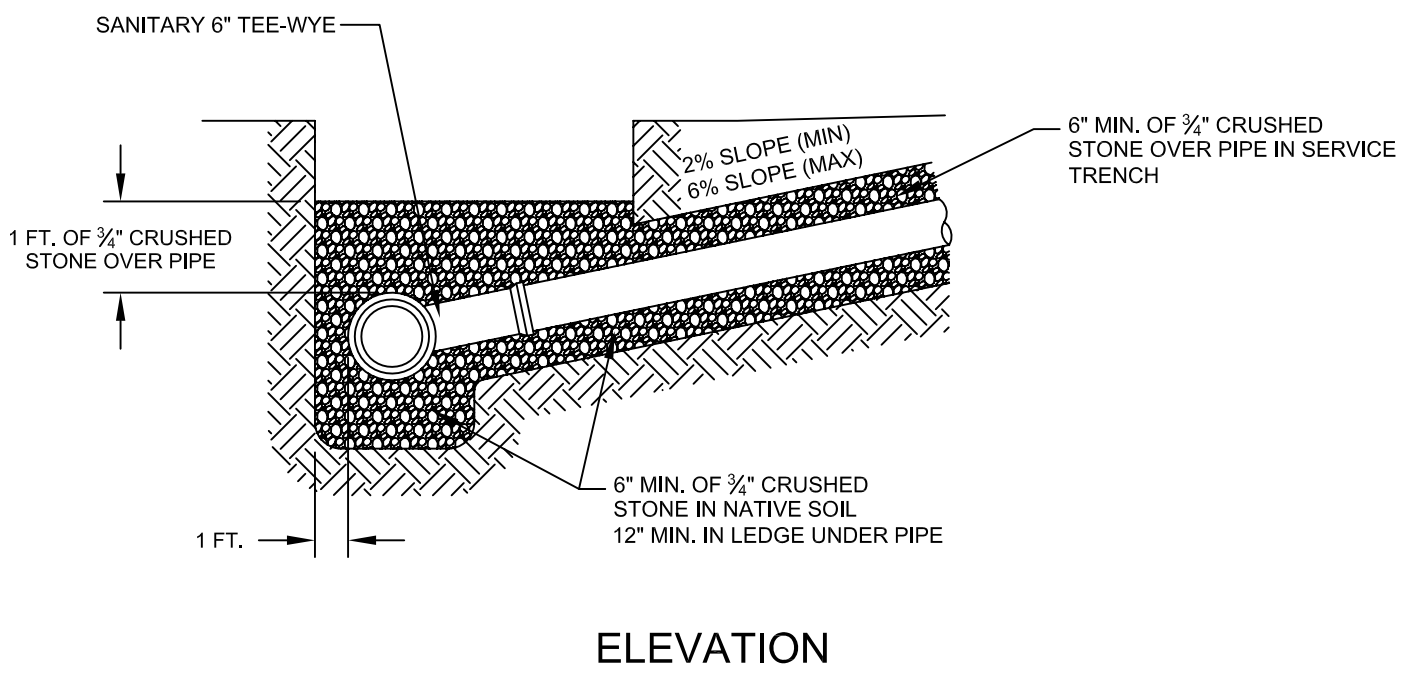
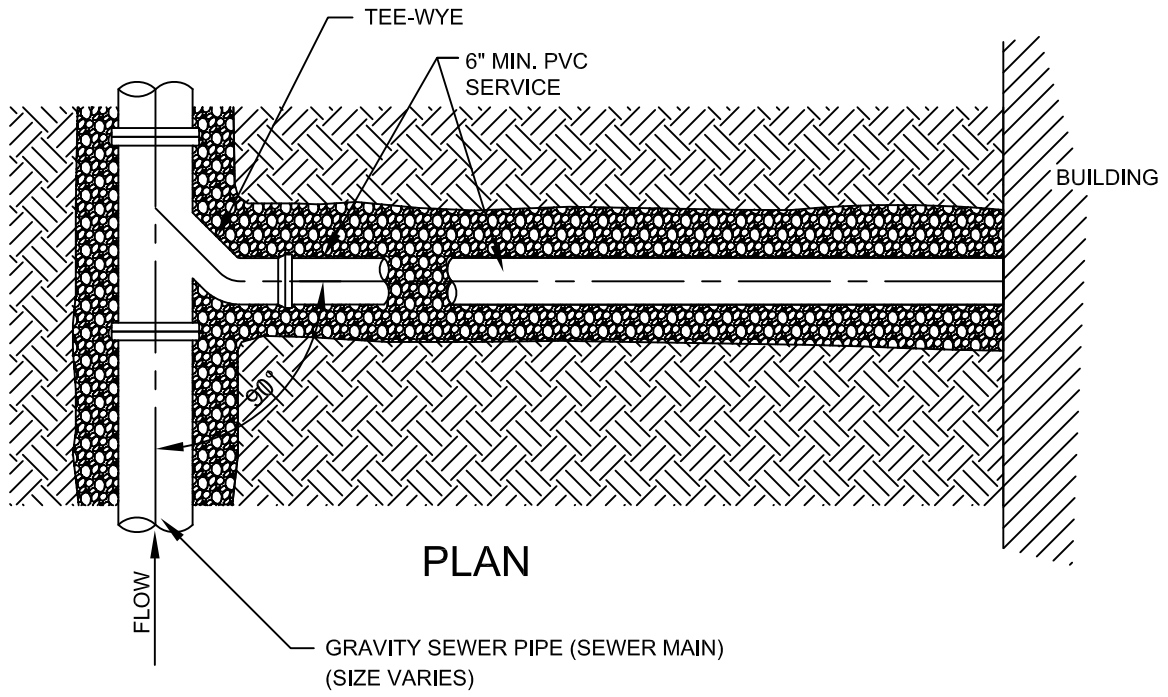
DETAIL NO.

R-5.8.2



NOT TO SCALE

- NOTES:
1. CONDUIT HAND HOLES SHALL BE INSTALLED EVERY 600 FEET (MAX) OF LENGTH.
 2. 90° BENDS MAY BE USED IF DEEMED NECESSARY AT THE TOWN'S DISCRETION AND SHALL BE COMPOSED OF GALVANIZED METAL.



NOT TO SCALE



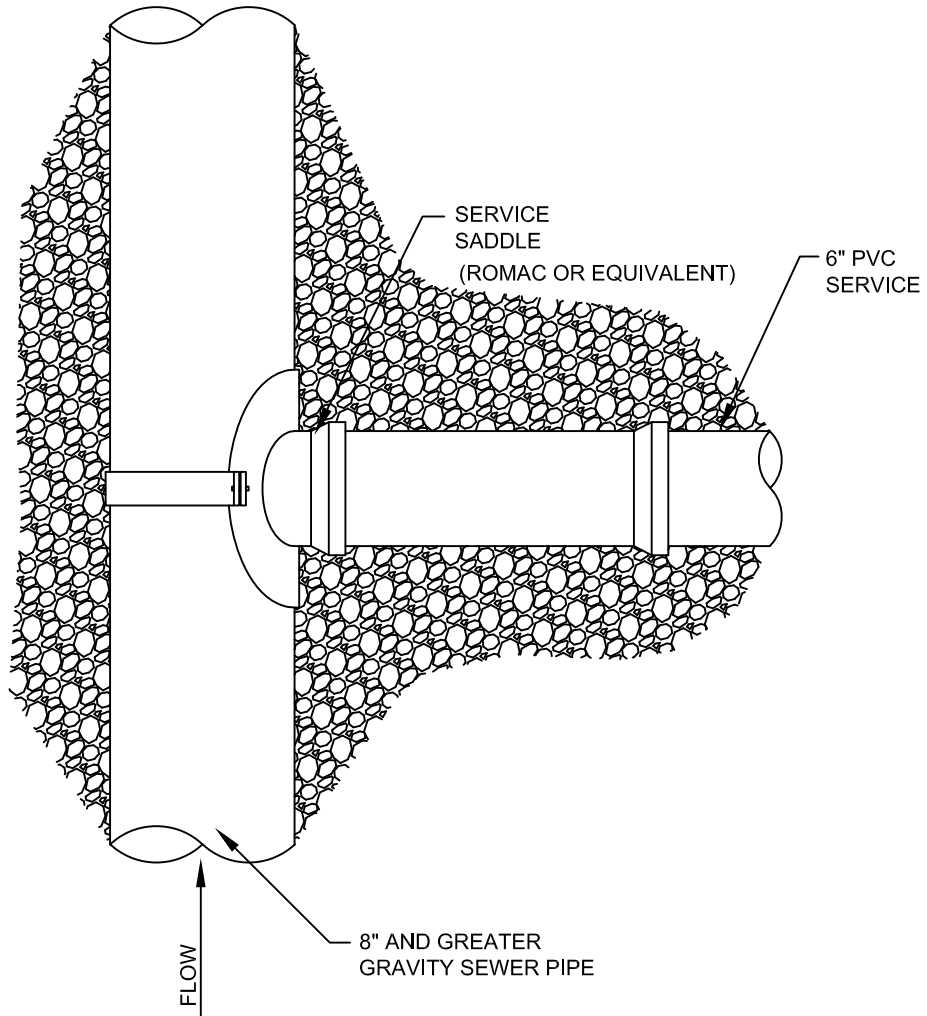
CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

SERVICE CONNECTION
(GRAVITY)

DATE:
FEB. 2010

REV:
1

DETAIL NO.
S-3.1.0



NOTES:

1. INSTALL SADDLE FIRST, THEN CORE HOLE.
2. INSERT-A- TEE SERVICE CONNECTORS MAY BE ALLOWED UPON SPECIFIC DPW APPROVAL.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

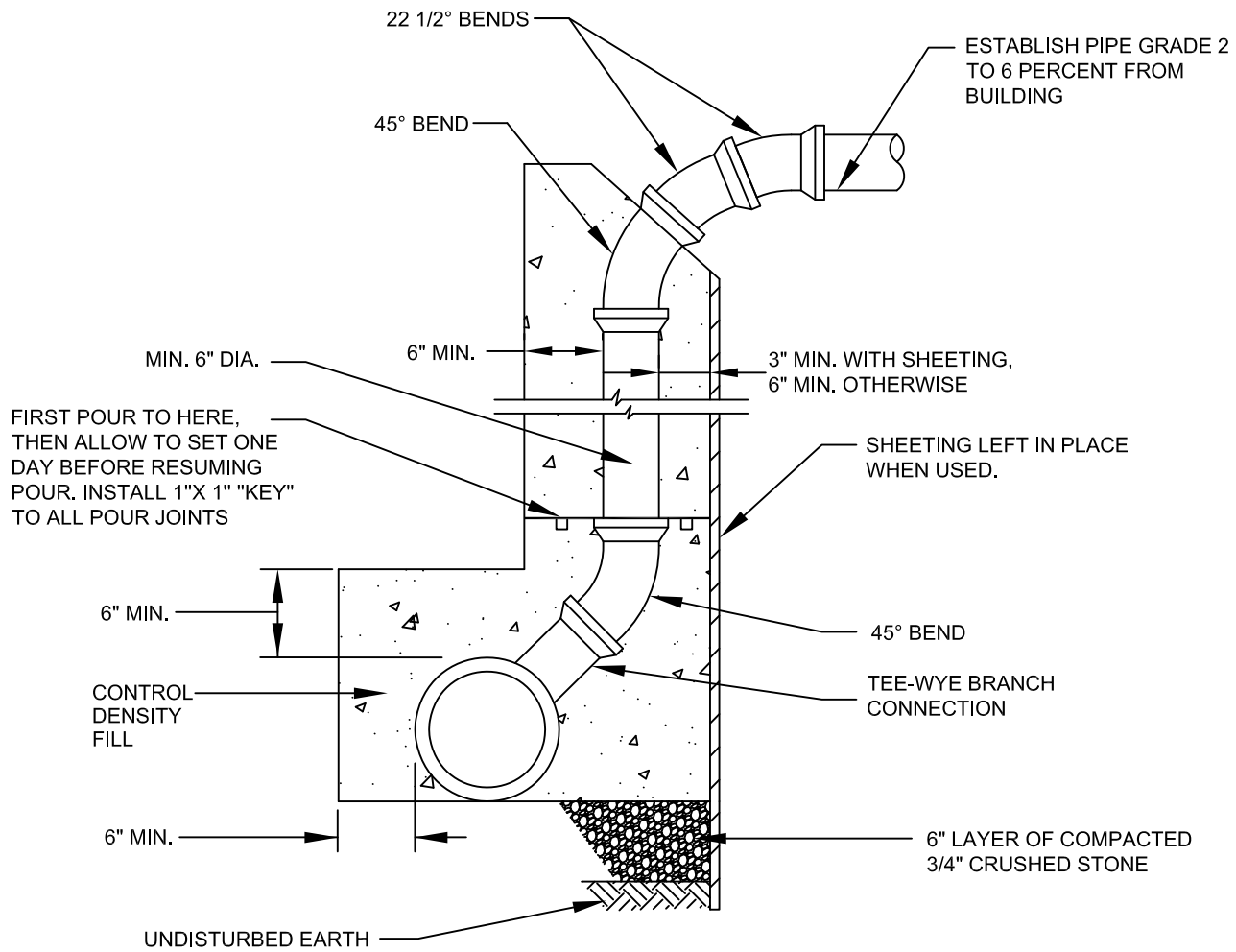
SERVICE CONNECTION
(SADDLE)

DATE:
MAR. 2012

REV:
1

DETAIL NO.

S-3.1.1



NOTE:

1. SEE SECTION 3.3.1.7.D.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

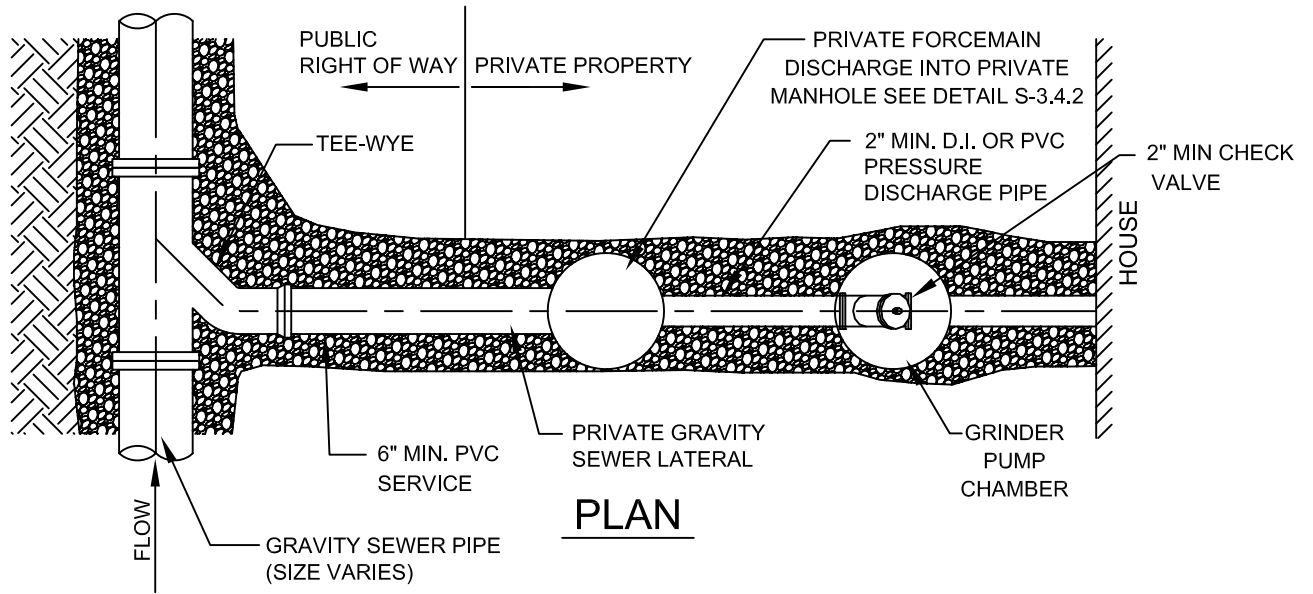
CHIMNEY

DATE:
MAR. 2012

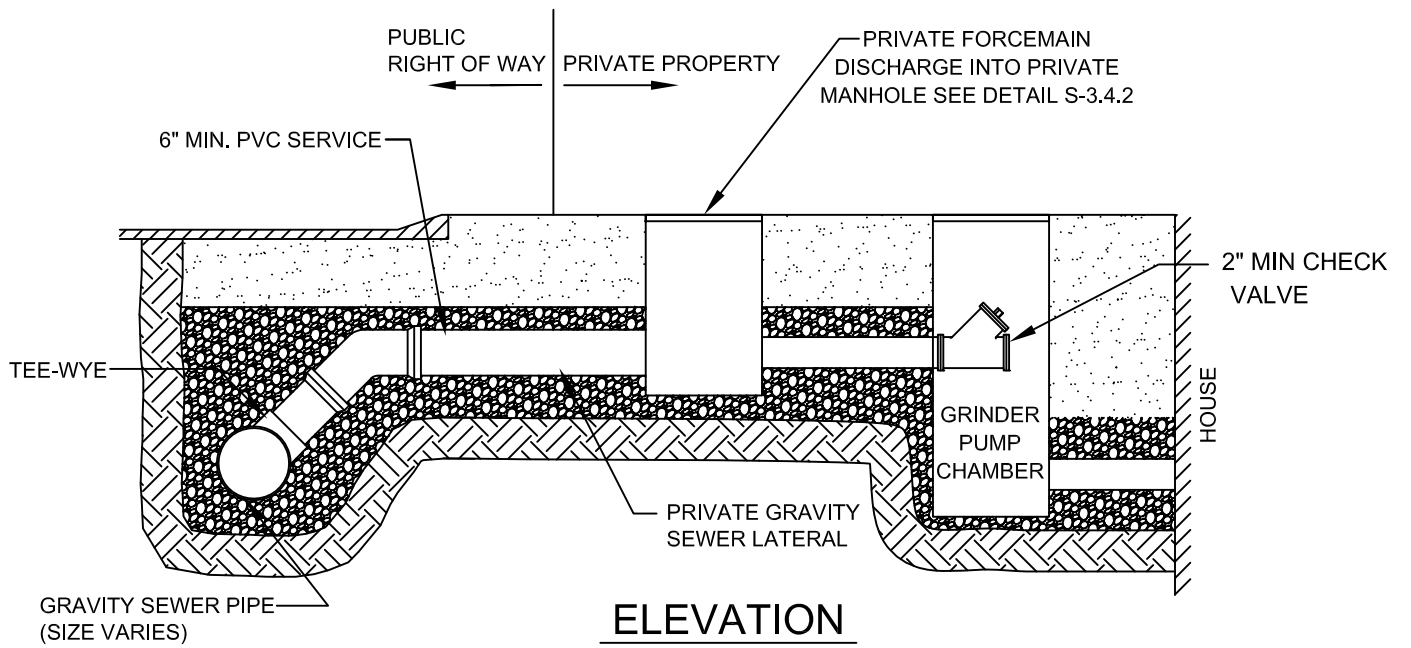
REV:
1

DETAIL NO.

S-3.1.2



PLAN



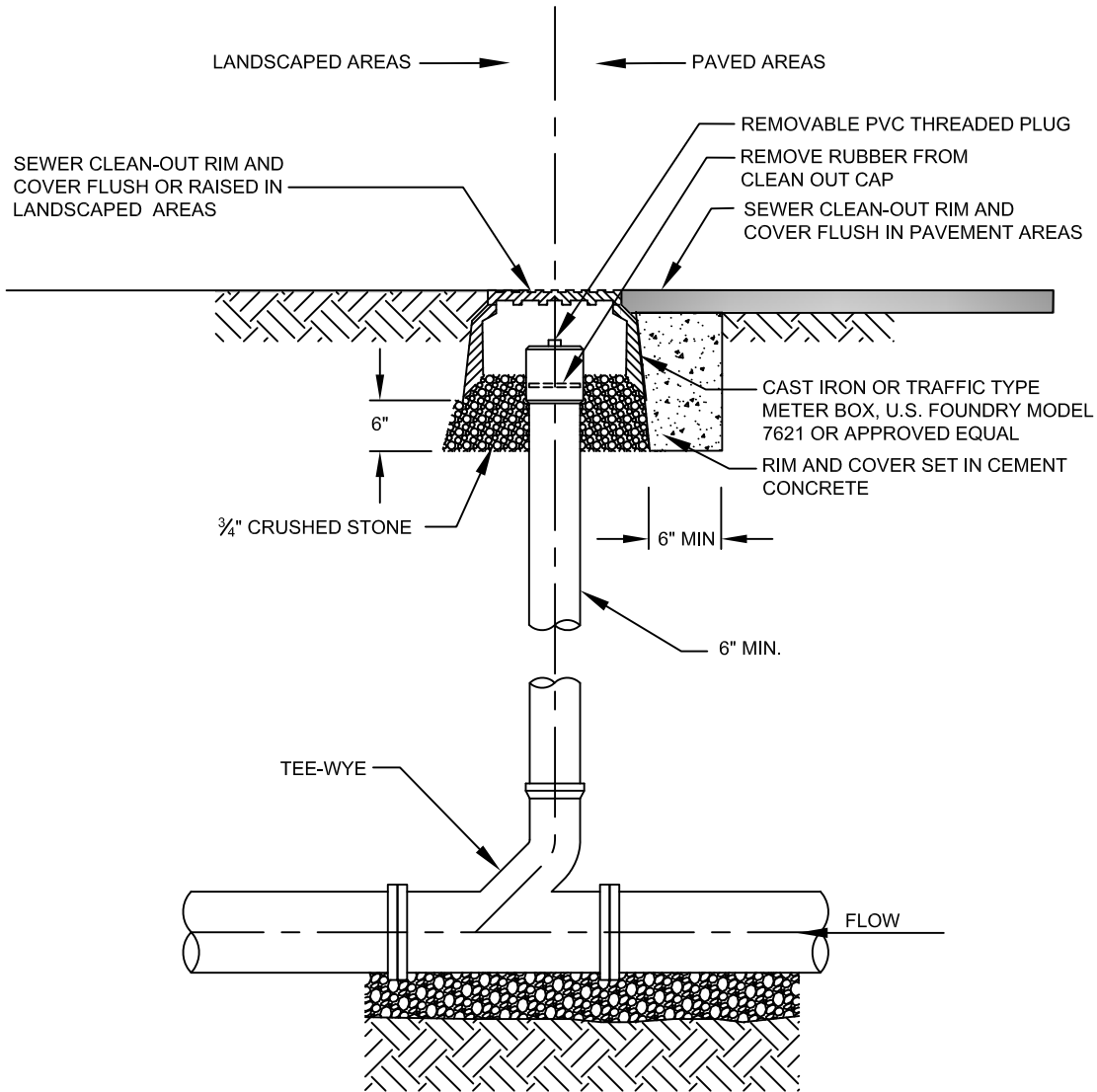
ELEVATION

NOTES:

1. PIPE SIZES AND DEPTHS VARY.

NOT TO SCALE





NOTES:

1. PLACE CLEAN OUT WITHIN 5 FEET OF HOUSE FOUNDATION.
2. CLEAN OUT SHALL BE ACCESSIBLE AT ALL TIMES.
3. 6" MIN. LAYER OF 3/4" CRUSHED STONE 12" IN LEDGE.
4. FLUSH MOUNT BOLT-DOWN BOX ACCEPTABLE UPON SPECIFIC APPROVAL BY DPW.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

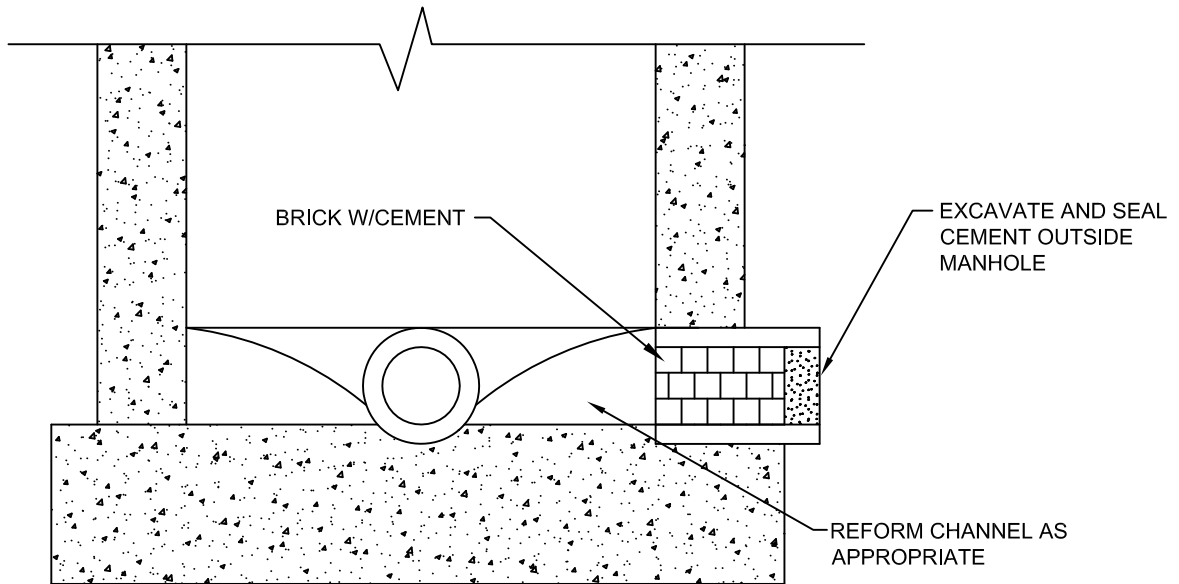
SEWER SERVICE
CLEAN OUT

DATE:
MARCH 2012

REV:
1

DETAIL NO.

S-3.2.0



NOTES:

1. THIS DRAWING DEPICTS CONCRETE PIPE.
2. USE MECHANICAL PLUGS WHEN ABANDONING PLASTIC PIPES.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

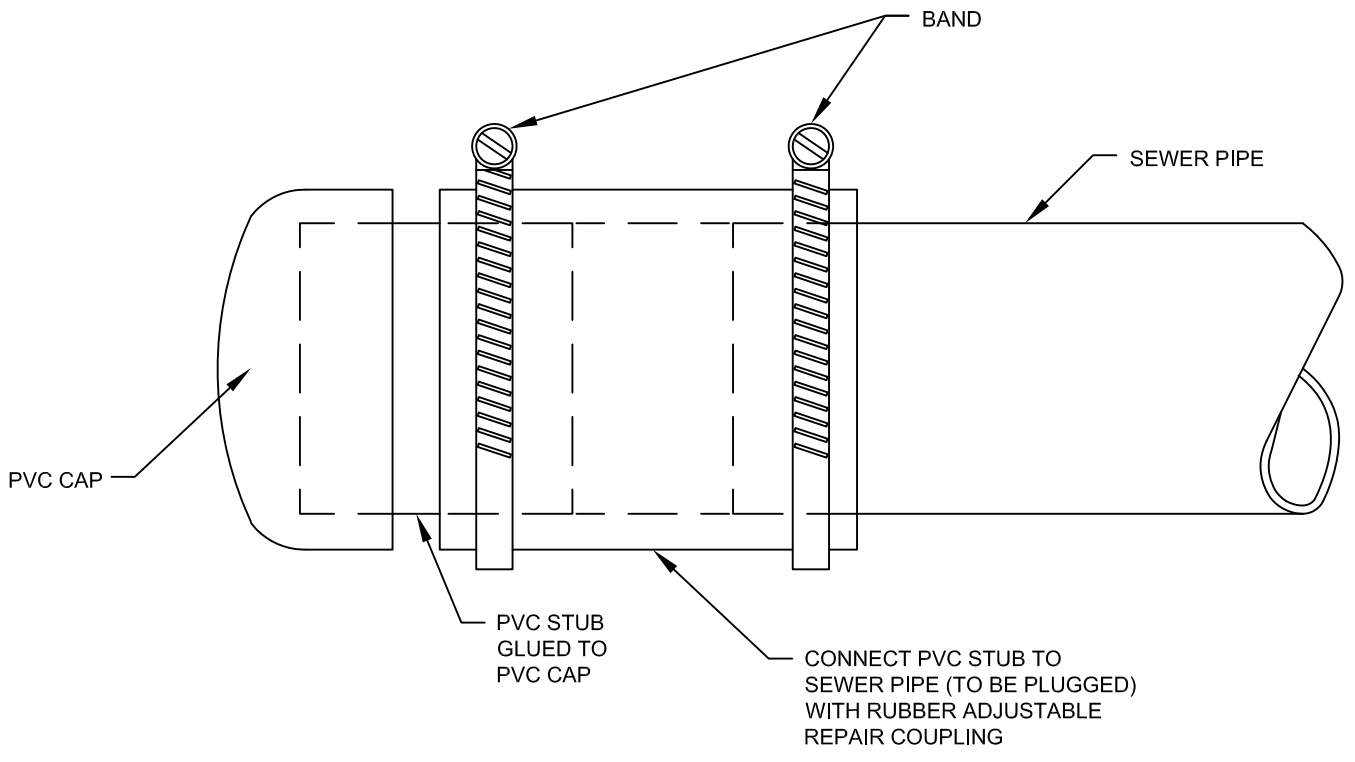
PLUG FOR ABANDONING
SANITARY SEWER

DATE:
SEPT. 2008

REV:
0

DETAIL NO.

S-3.3.0



NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

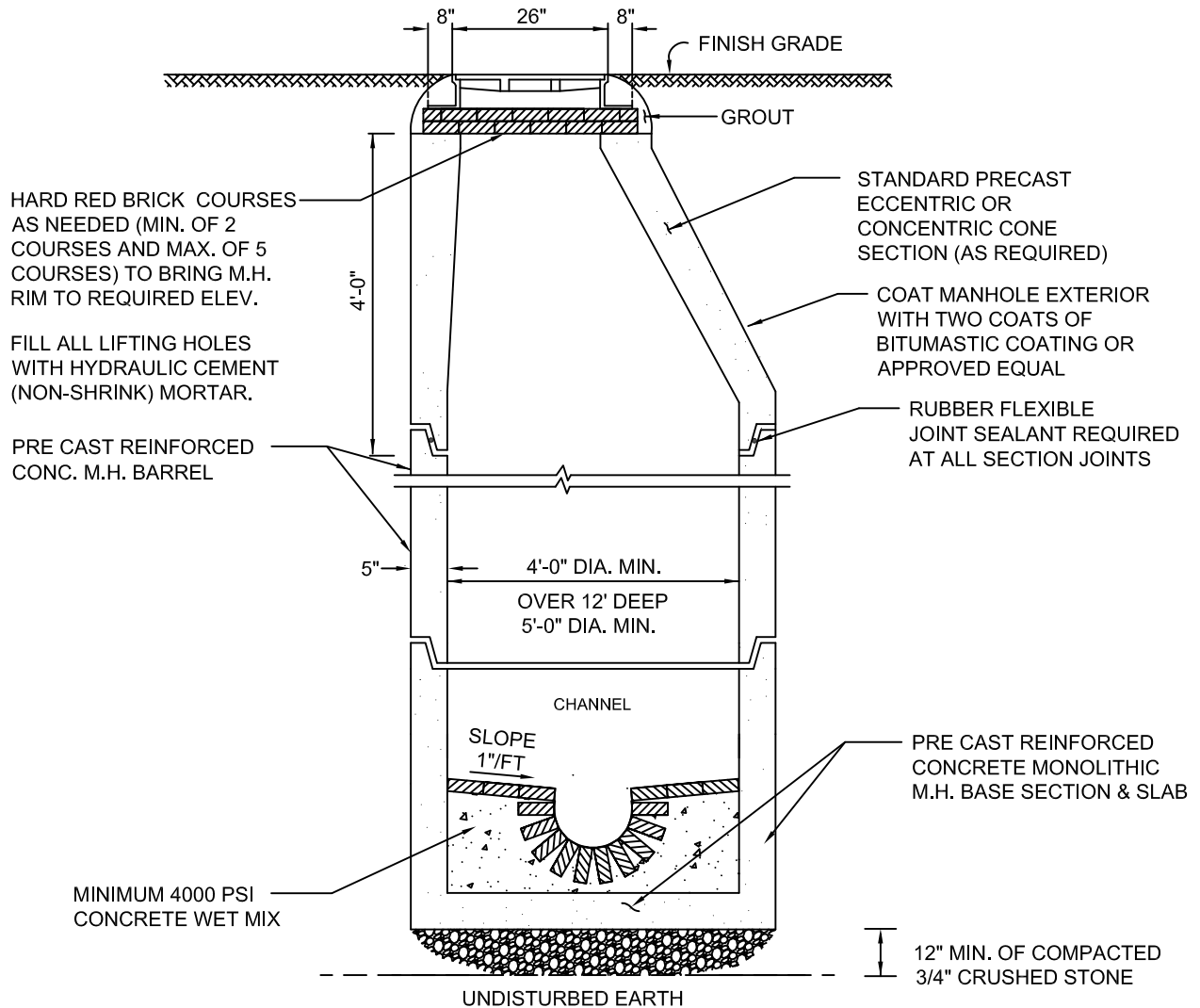
PLUG FOR SANITARY SEWER

DATE:
SEPT. 2008

REV:
0

DETAIL NO.

S-3.3.1



NOTES:

1. TYPICAL SANITARY MANHOLE TO BE 4 FEET IN DIAMETER.
2. 5'-0" DIAMETER FOR ALL MANHOLE DEPTHS GREATER THAN 12 FEET OR WHEN ORDERED BY THE ENGINEER.
3. 6" MIN. WALL THICKNESS AND 7" MIN. BASE THICKNESS WITH 5'-0" DIAMETER MANHOLES.
4. INNER EDGE OF BRICK TABLE TO BE AT ELEVATION OF CROWN OF TOP OF PIPE.
5. DESIGN LOAD - HS20.
6. ALL INVERTS SHALL BE 4,000 PSI CEMENT CONCRETE IN VOID AREAS AND RED SEWER BRICK CONSTRUCTION.
7. INVERTS SHALL NOT BE BUILT ABOVE GRADE. ALL INVERTS SHALL BE BUILT IN PLACE AFTER ALL PIPES HAVE BEEN INSTALLED.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

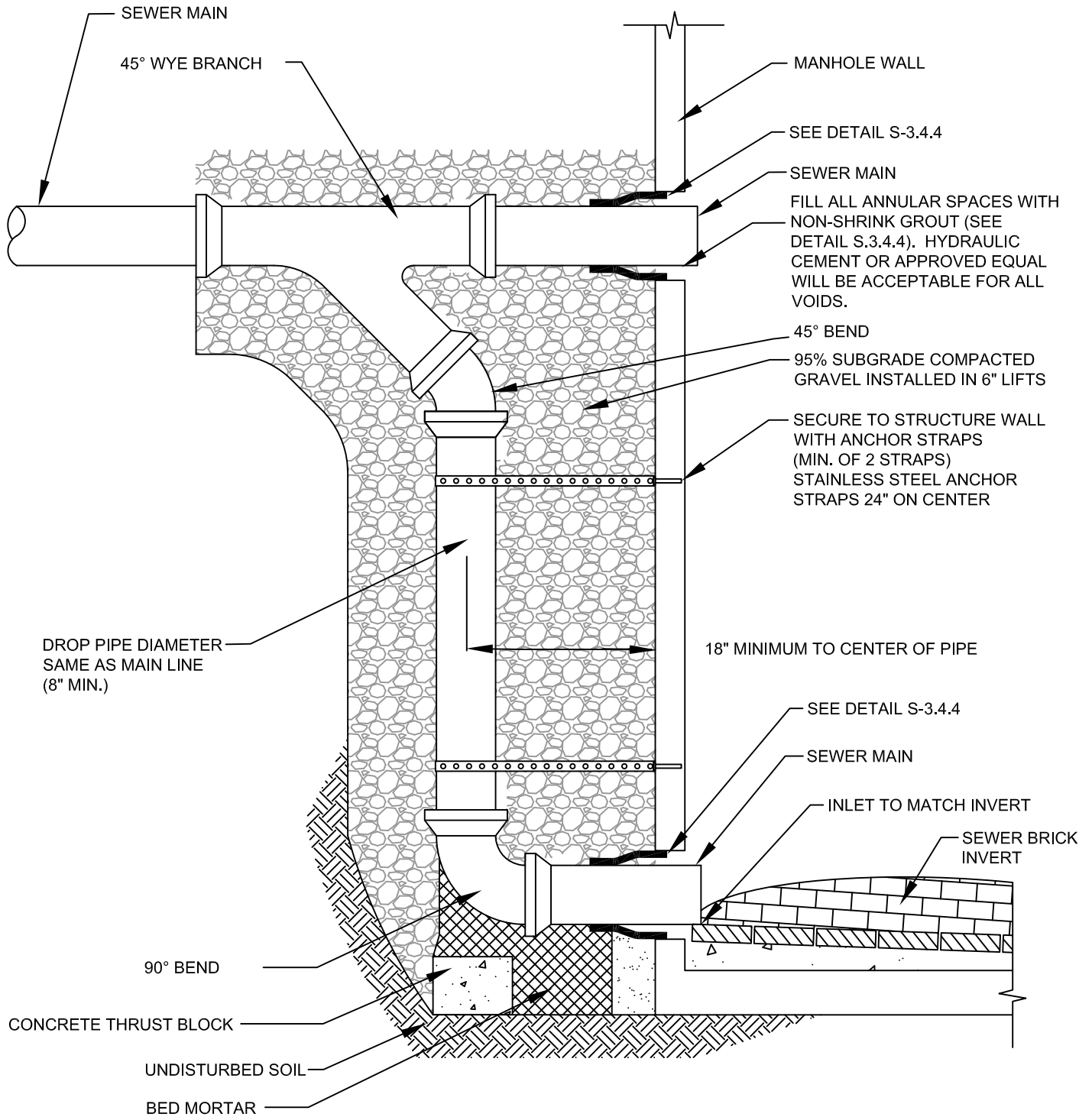
TYPICAL SEWER MANHOLE

DATE:
MARCH 2017

REV:
4

DETAIL NO.

S-3.4.0



NOT TO SCALE

NOTES

1. BOTH PVC PIPE OR DUCTILE IRON PIPE ARE ACCEPTABLE.
2. IF DUCTILE IRON PIPE IS USED, 90° BENDS SHALL BE POLY-WRAPPED WITHIN THE LIMITS OF THE MORTARED SECTION



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

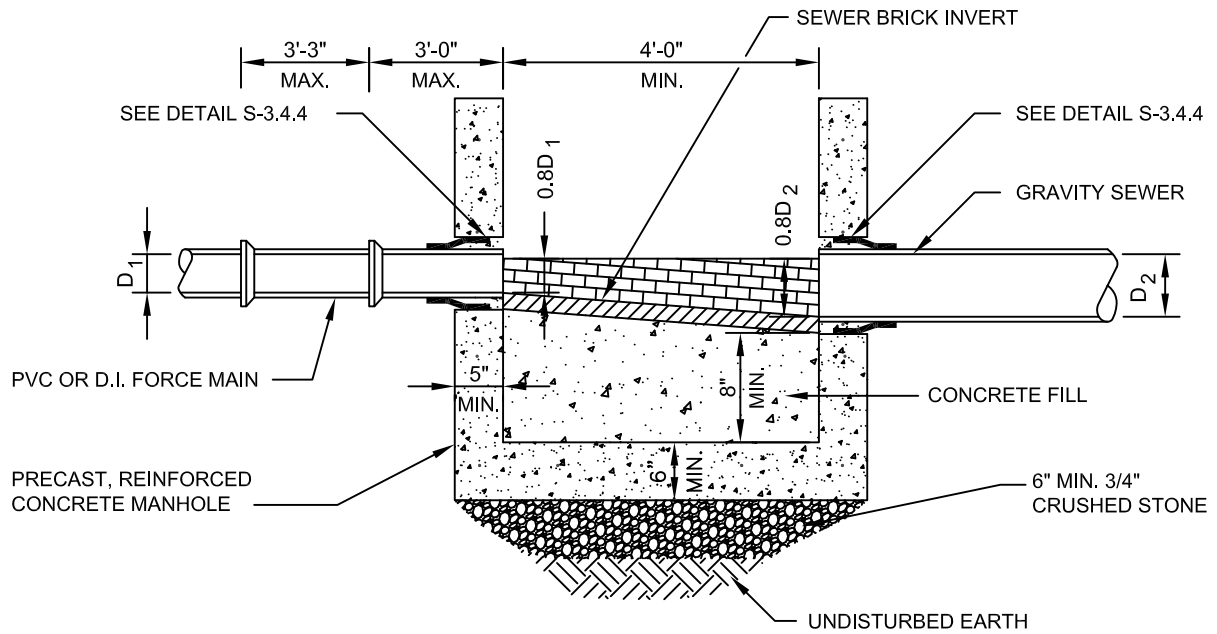
TYPICAL DROP MANHOLE
(OUTSIDE)

DATE:
MARCH 2015

REV:
5

DETAIL NO.

S-3.4.1



NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

FORCEMAIN DISCHARGE MANHOLE

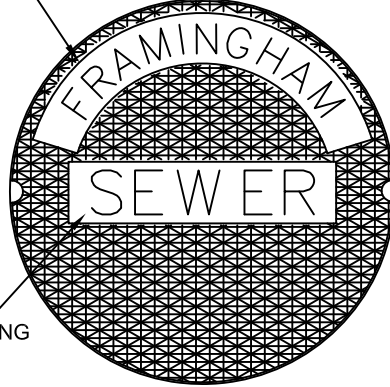
DATE:
SEPT. 2008

REV:
0

DETAIL NO.

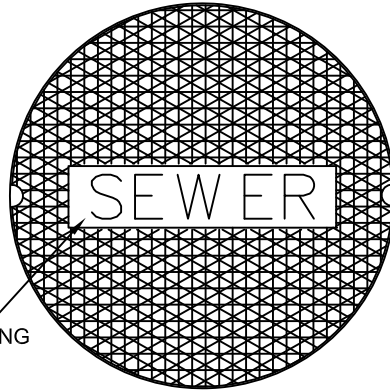
S-3.4.2

COVER SHALL READ
"FRAMINGHAM" IN 2"
LETTERING



COVER SHALL READ
"SEWER" IN 3" LETTERING

Public Manhole



COVER SHALL READ
"SEWER" IN 3" LETTERING

Private Manhole

NOTES:

1. COVER LETTERING DETAIL APPLIES TO ALL COVER SIZES AND WATERTIGHT MANHOLE COVERS IN ACCORDANCE WITH NOTES IN TYPICAL MANHOLE DETAIL.
2. ALL COVERS MUST BE MIN. 26 INCH WIDE.
3. ALL FRAMES MUST BE MIN. 6 INCH HIGH.
4. WATER TIGHT MANHOLE COVERS SHALL UTILIZE STAINLESS STEEL BOLTS.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

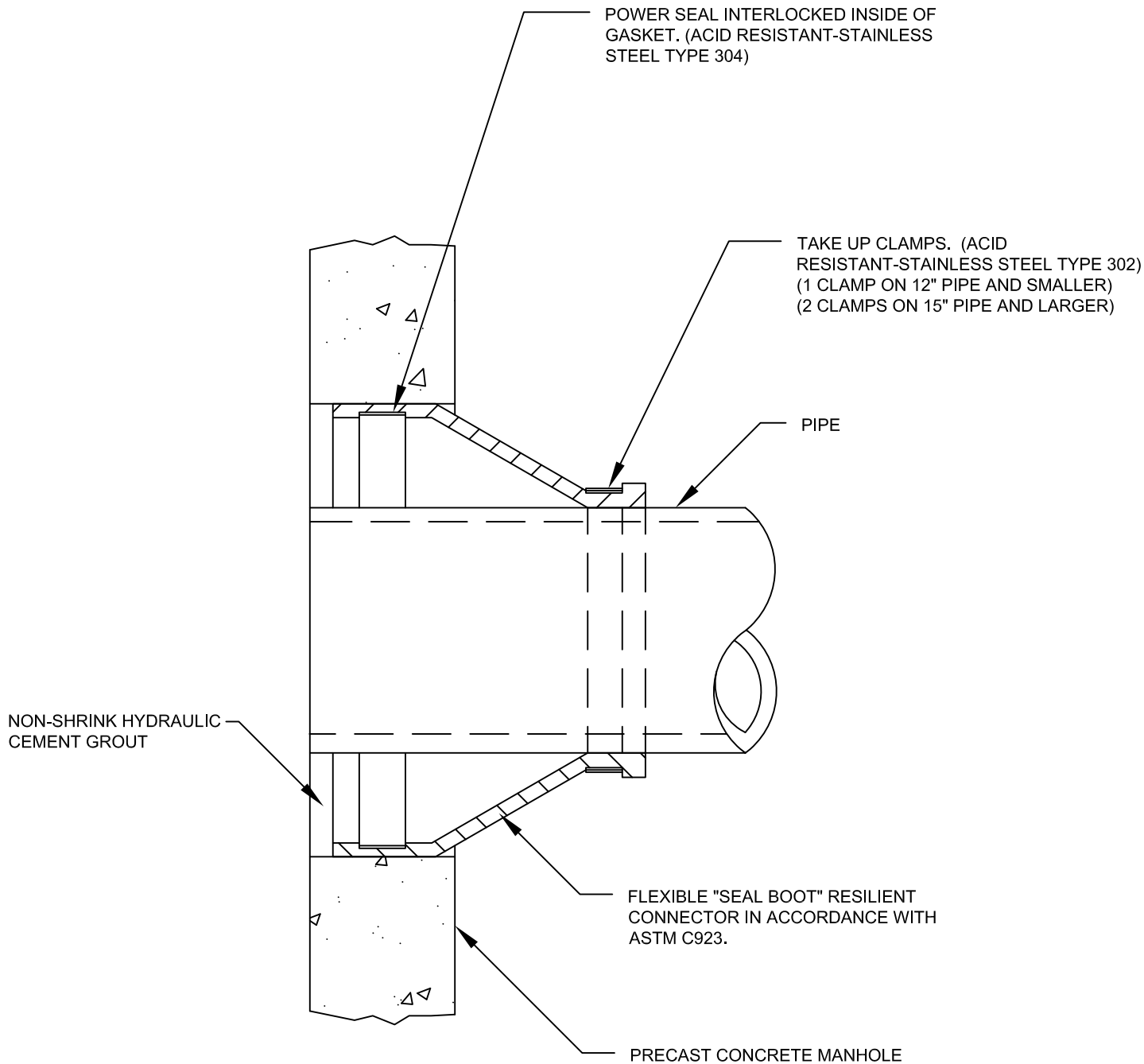
SEWER MANHOLE COVERS

DATE:
MARCH 2015

REV:
2

DETAIL NO.

S-3.4.3



NOT TO SCALE



CITY OF FRAMINGHAM
 DEPARTMENT OF PUBLIC WORKS

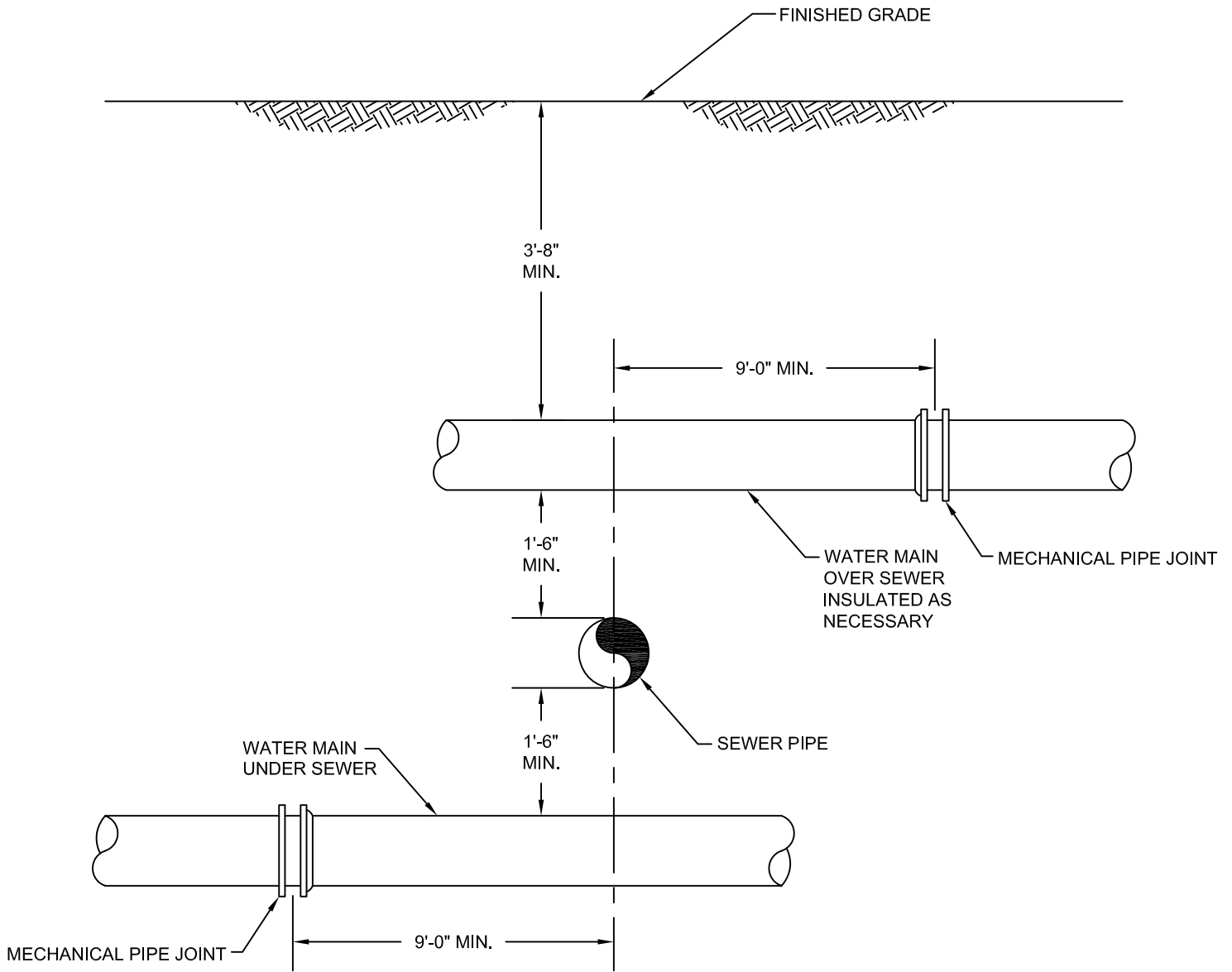
MANHOLE SEAL
 (TYPICAL)

DATE:
 MARCH 2011

REV:
 2

DETAIL NO.

S-3.4.4



NOTES:

1. SEWERS SHALL BE KEPT REMOTE FROM WATER SUPPLY PIPING AND STRUCTURES. WHEREVER FEASIBLE, SEWERS SHOULD BE LAID AT A MINIMUM HORIZONTAL DISTANCE OF 10 FEET FROM WATER MAINS. IF LOCAL CONDITIONS PREVENT THIS, THE WATER MAIN SHOULD BE LAID IN A SEPARATE TRENCH, AND THE ELEVATIONS OF THE CROWN OF THE SEWER PLACED AT LEAST 18 INCHES BELOW THE INVERT OF THE WATER MAIN.
2. WHENEVER SEWERS MUST CROSS UNDER WATER MAINS, THE CROWN OF THE SEWER SHOULD BE PLACED A MINIMUM OF 18 INCHES BELOW THE INVERT OF THE WATER MAIN. IN ADDITION, THE WATER MAIN MUST BE CONSTRUCTED WITH ONE FULL LENGTH OF PIPE CENTERED ABOVE THE CROSSING. THE WATER PIPE SHALL HAVE MECHANICAL JOINTS FOR A MINIMUM DISTANCE OF 10 FEET ON EACH SIDE OF THE CROSSING.
3. WHEN IT IS IMPOSSIBLE TO OBTAIN HORIZONTAL OR VERTICAL SEPARATION AS STIPULATED ABOVE, BOTH THE WATER AND THE SEWER PIPING SHALL BE CONSTRUCTED SUCH THAT THE PIPE JOINTS ARE PLACED AS FAR AWAY FROM THE CROSSING AS POSSIBLE AND THE PIPE CROSSING SHALL BE ENCASED IN CONTROL DENSITY FILL FOR A DISTANCE OF 10 FEET ON ALL SIDES OF THE CROSSING.
4. SEE SECTION 3.3.1.2 PIPE INSTALLATION.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

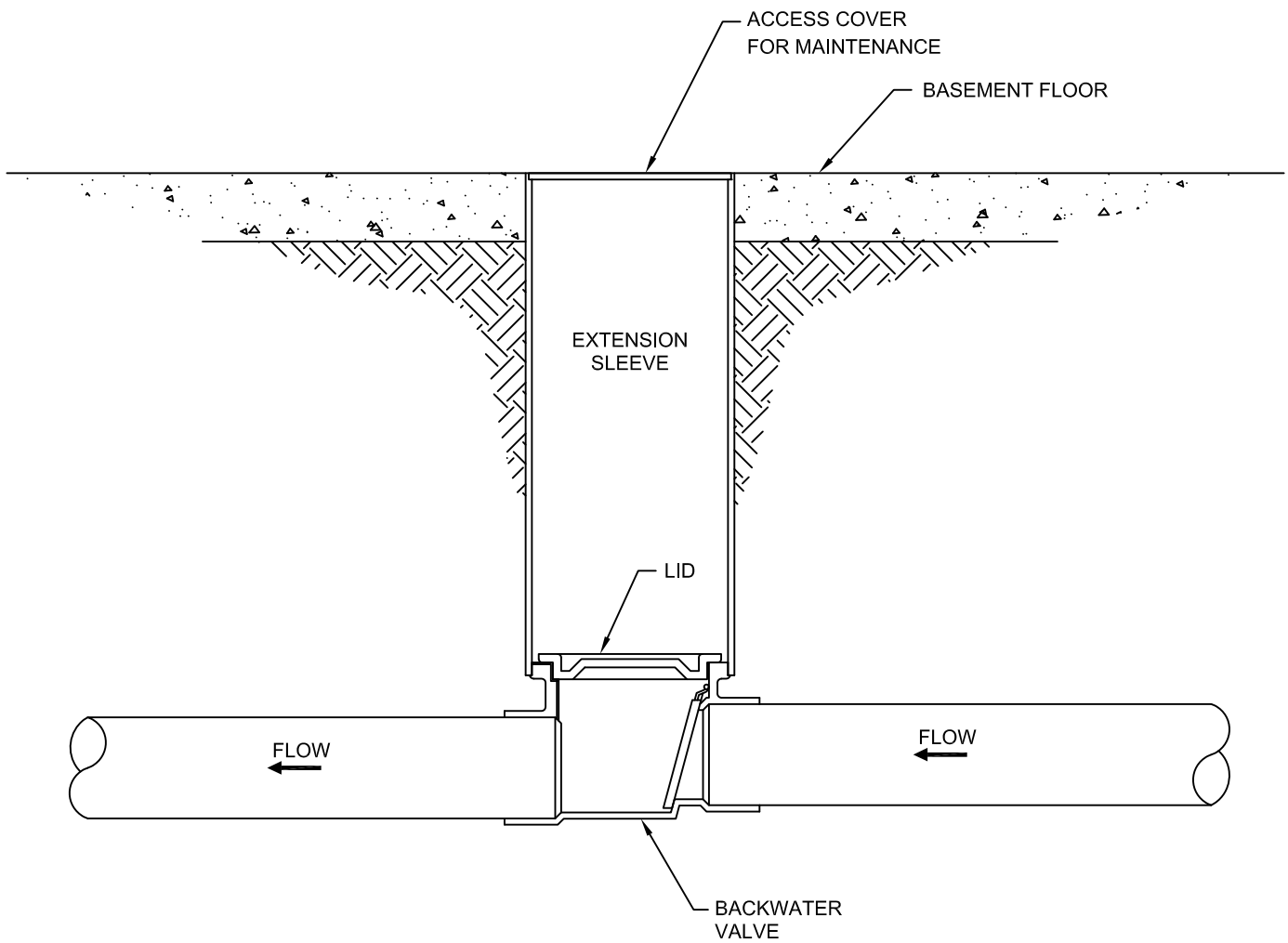
SEWER CROSSING

DATE:
MAR. 2012

REV:
1

DETAIL NO.

S-3.5.0



NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

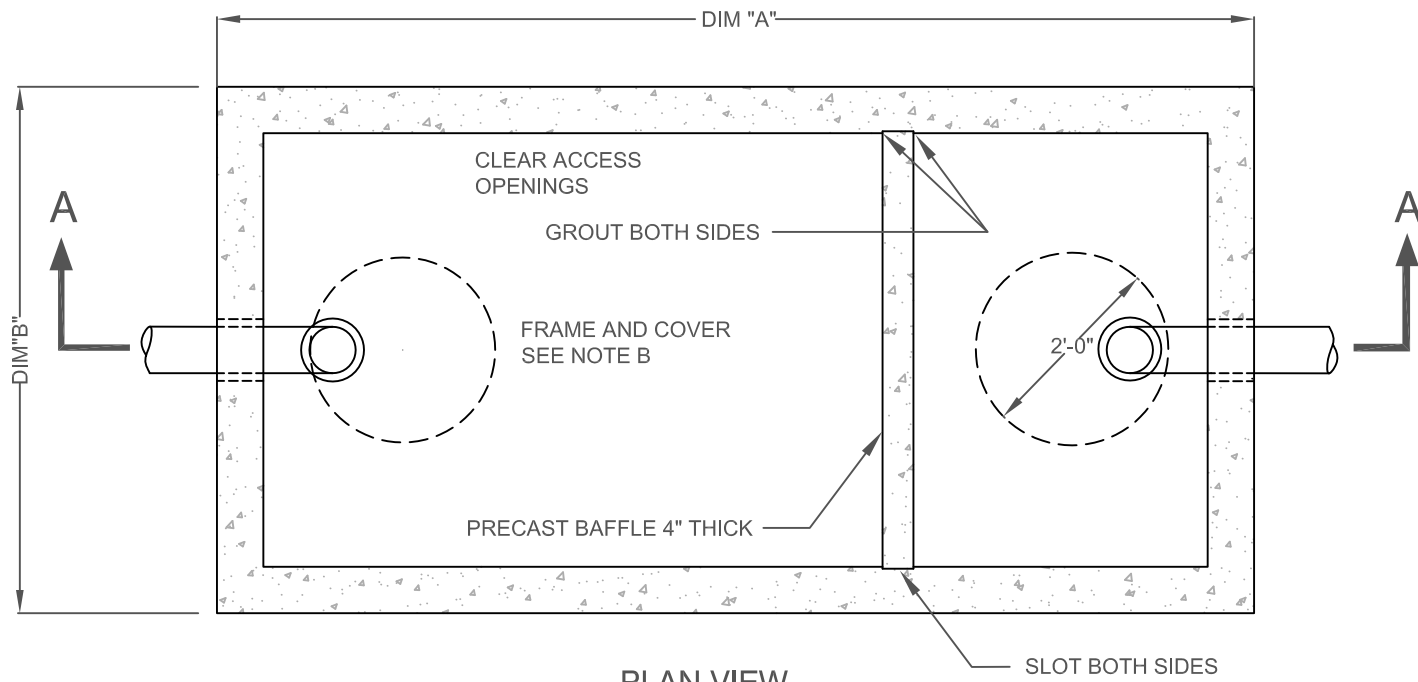
BACKWATER VALVE
ASSEMBLY

DATE:
SEPT. 2008

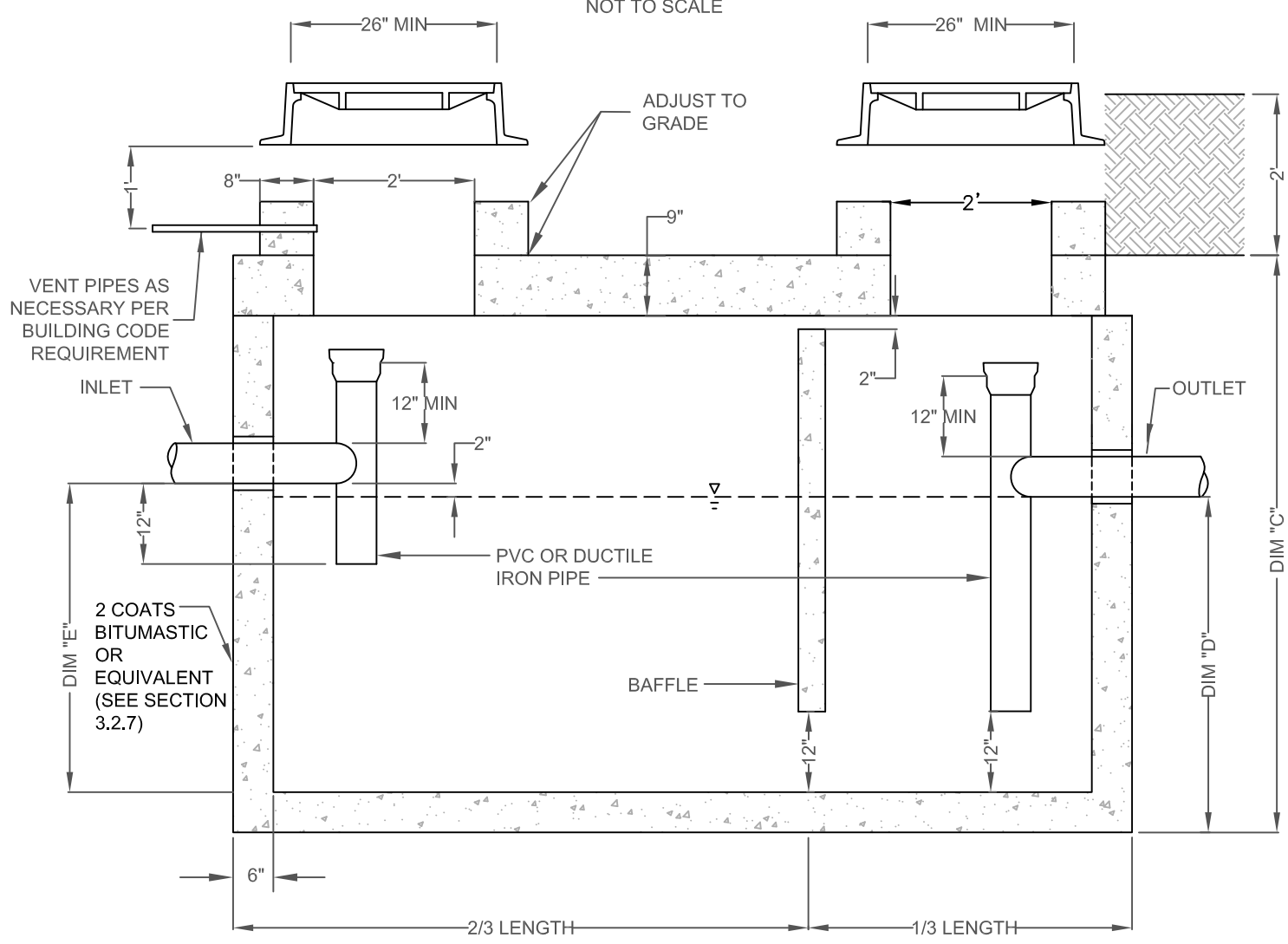
REV:
0

DETAIL NO.

S-3.6.0



PLAN VIEW
NOT TO SCALE



SECTION AA
NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

TYPICAL GREASE TRAP

DATE:
MARCH 2012

REV:
2

DETAIL NO.
S-3.7.0

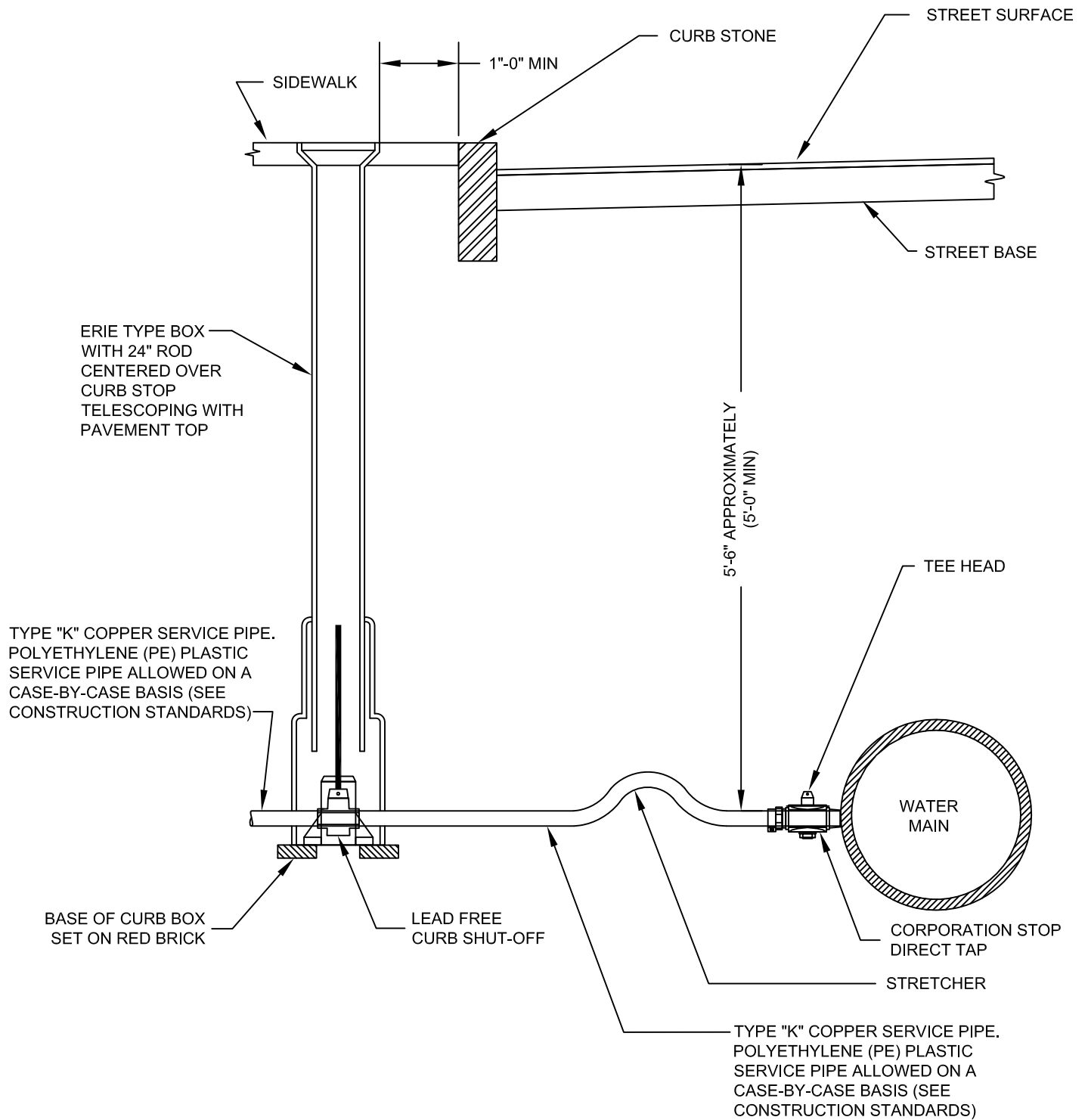
SIZING CHART

GALLON CAPACITY	DIM "A"	DIM "B"	DIM "C"	DIM "D"	DIM "E"
1000	9'-0"	5'-0"	7'-2"	4'-2"	3'-10"
1250	9'-0"	5'-0"	7'-2"	5'-2"	4'-10"
1500	11'-2"	5'-8"	7'-2"	4'-4"	4'-0"
1750	11'-2"	5'-8"	7'-2"	4'-11"	4'-7"
2000	12'-8"	6'-8"	8'-0"	4'-7"	3'-10"
2500	12'-8"	6'-8"	8'-0"	5'-6"	4'-9"
2750	12'-8"	6'-8"	8'-0"	6'-0"	5'-3"
3000	15'-7"	9'-7"	8'-6.5"	5'-0"	3'-9"
4000	15'-7"	9'-7"	8'-6.5"	6'-3"	5'-0"
5000	19'-11"	9'-11"	8'-11"	6'-2"	4'-9"
6000	19'-11"	9'-11"	10'-5"	7'-2"	5'-9"

NOTES:

1. CONCRETE : 28 DAY F'c= 4500 psi
2. REBAR : ASTM A615 GRADE 60.
3. MESH : ASTM A-185 GRADE 65.
4. DESIGN : AC1318-83 BUILDING CODE
ASTM C-857 MINIMUM STRUCTURAL DESIGN
LOADING FOR UNDERGROUND PRECAST
CONCRETE UTILITY STRUCTURES
5. LOADS : H-20 LOADING.
6. FILL w/CLEAN WATER PRIOR TO START UP OF SYSTEM.
7. LARGER SIZES MAY BE REQUIRED AS PER REVIEW OF FACILITY.
TRAP SIZE WILL BE 1,000 GALLONS MINIMUM.
8. FRAME AND COVER SHALL BE PER CITY OF FRAMINGHAM SEWER
CONSTRUCTION STANDARDS 3.4 FOR PRIVATE PROPERTY
INSTALLATIONS.
9. SEE GREASE TRAP CONSTRUCTION STANDARDS SECTION 3.7
FOR OTHER REQUIREMENTS.





NOT TO SCALE



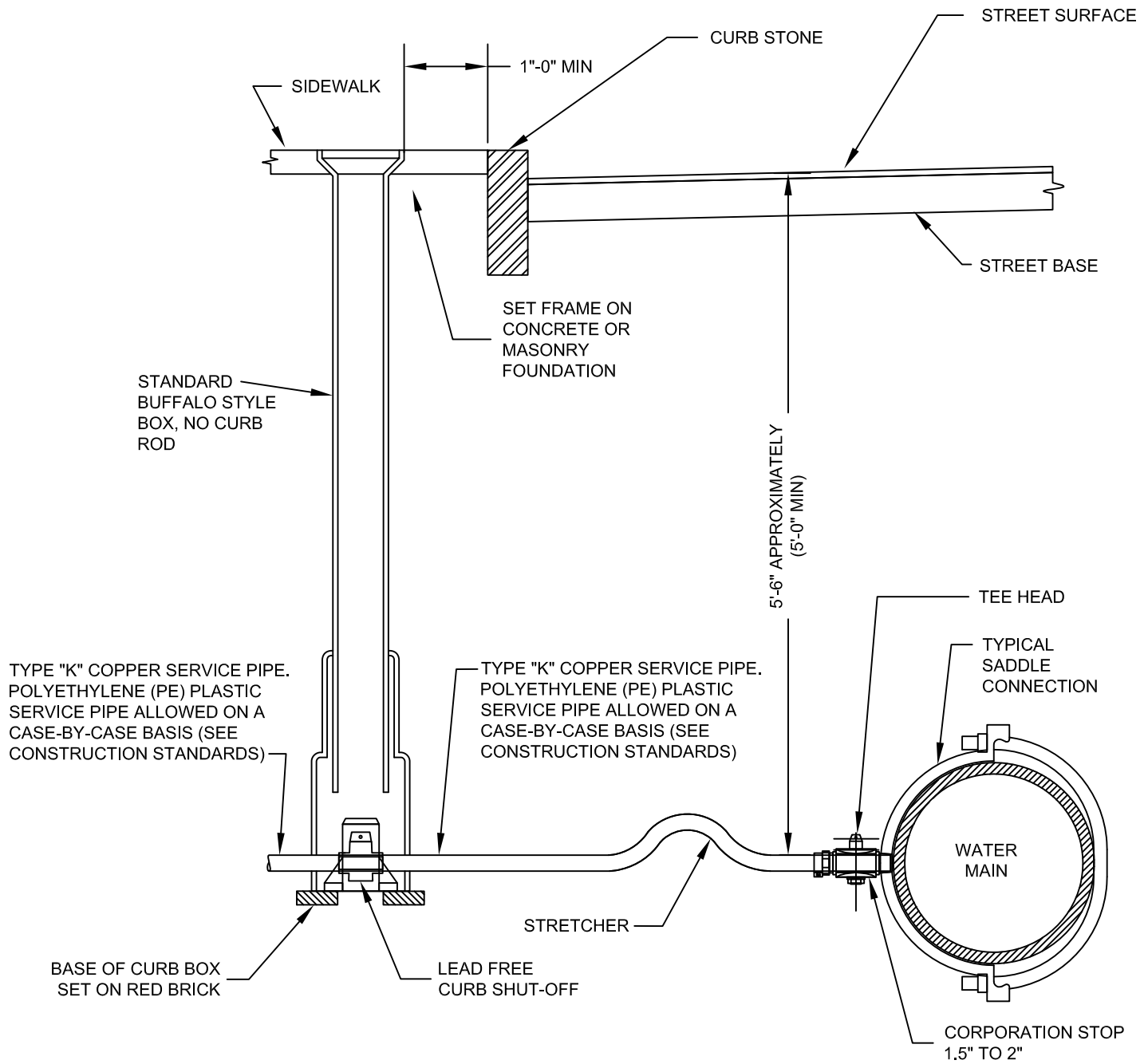
CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

TYPICAL WATER CONNECTION
FOR 1" SERVICE

DATE:
APRIL 2018

REV:
2

DETAIL NO.
W-2.1.0



NOT TO SCALE



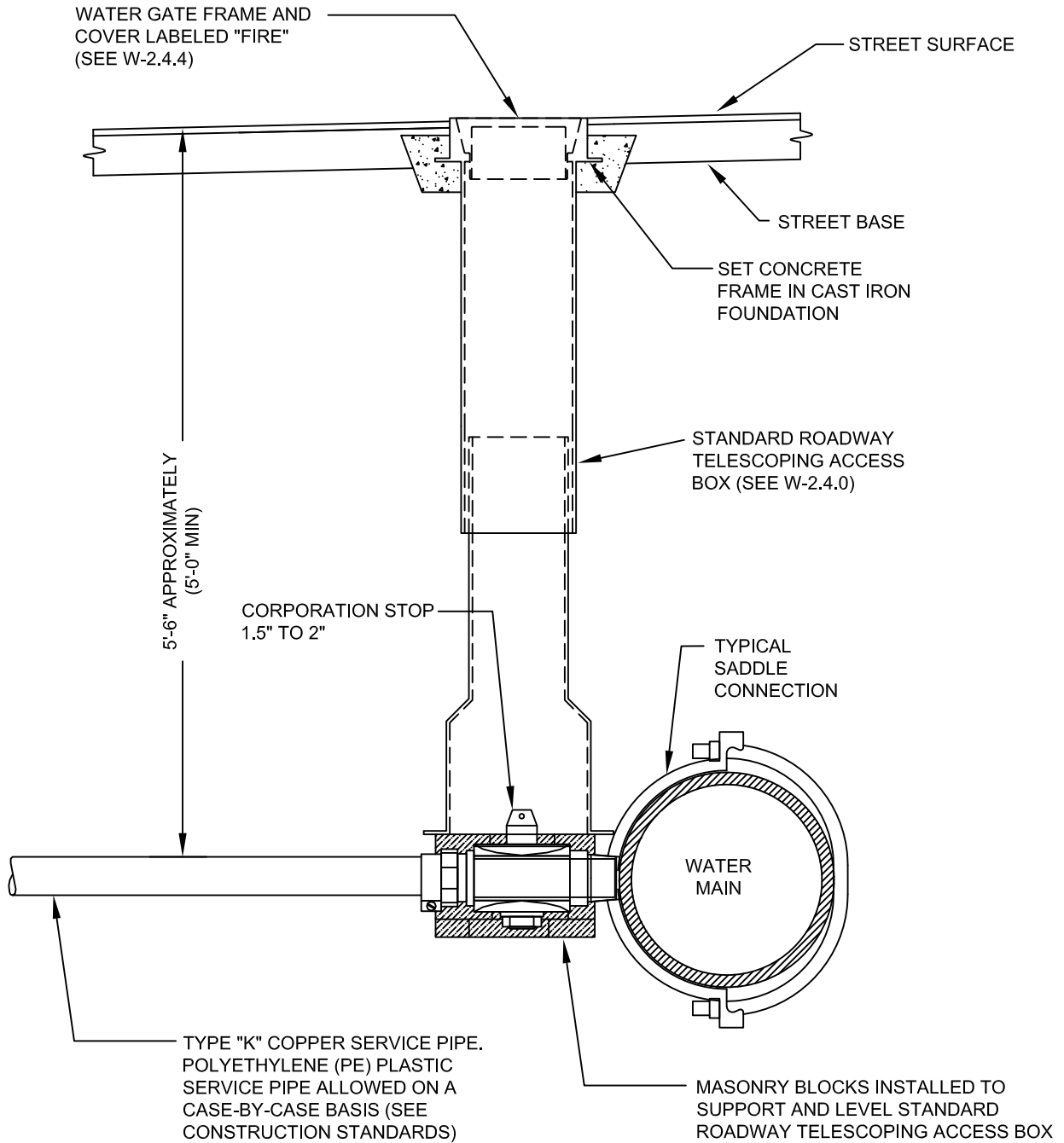
CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

TYPICAL WATER CONNECTION
FOR 1-1/2" TO 2" SERVICE

DATE:
APRIL 2018

REV:
2

DETAIL NO.
W-2.1.1



NOTES:

1. SEPARATE DOMESTIC AND FIRE SERVICES SHALL BE INSTALLED FROM THE BUILDING SERVICED TO THE PUBLIC WATER MAIN.
2. THE PROPERTY OWNER IS RESPONSIBLE FOR MAINTENANCE OF THE FIRE SERVICE FROM THE BUILDING SERVICED TO THE PUBLIC WATER MAIN.
3. SADDLE AND CORPORATION STOPS SHALL BE AWWA TAPER THREADS (MUELLER "CC") AS DESCRIBED IN AWWA STANDARD C800

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

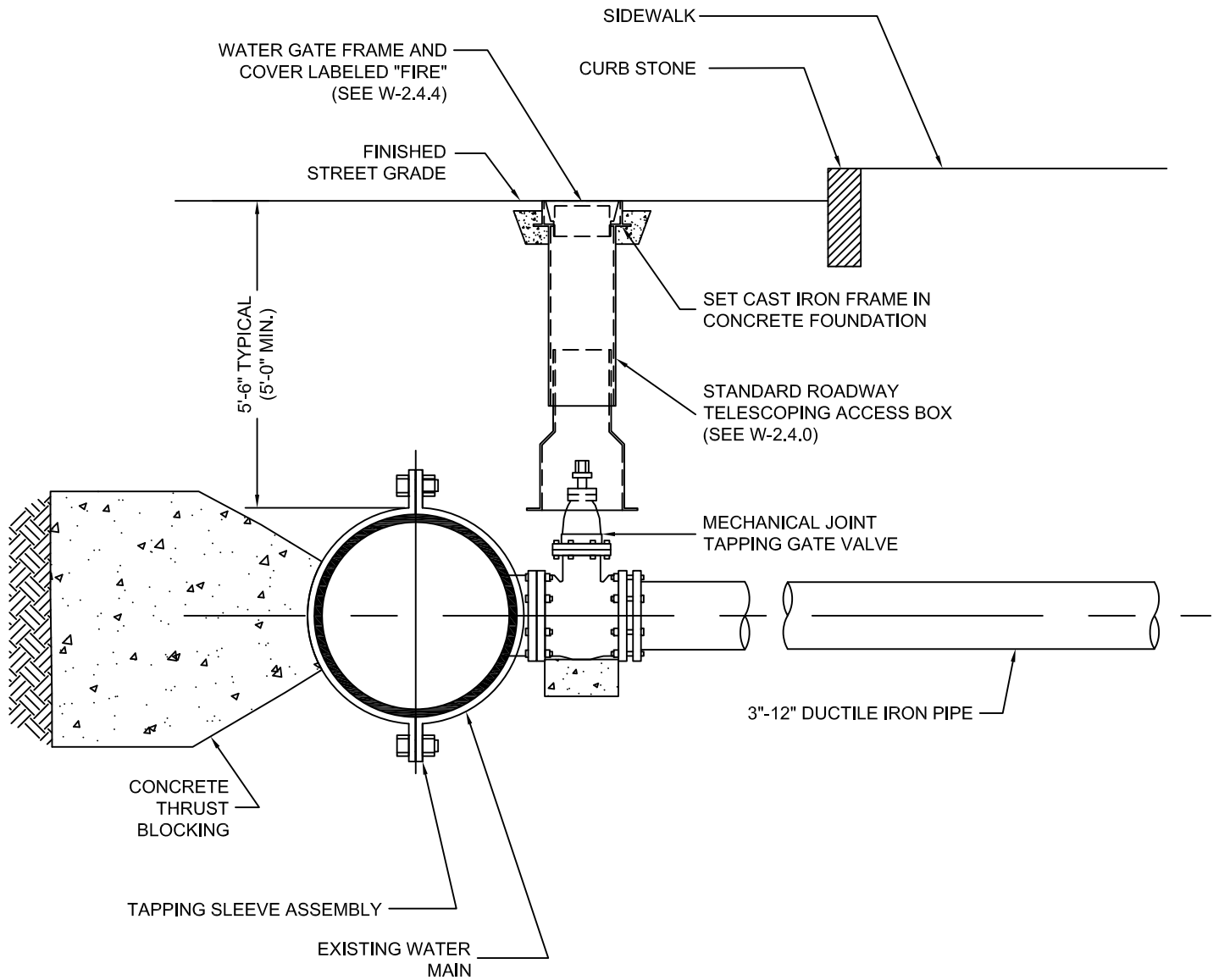
TYPICAL FIRE SERVICE
FOR 1-1/2" TO 2"

DATE:
FEB. 2016

REV:
0

DETAIL NO.

W-2.1.2



NOTES:

1. MAXIMUM TAPPING SLEEVE SHALL NOT BE GREATER THAN ½ DIAMETER OF CONNECTING MAIN.
2. MEGA LUG RESTRAINTS ON ALL MECHANICAL JOINTS.
3. SEPARATE DOMESTIC AND FIRE SERVICES SHALL BE INSTALLED FROM THE BUILDING SERVICED TO THE PUBLIC WATER MAIN.
4. THE PROPERTY OWNER IS RESPONSIBLE FOR MAINTENANCE OF THE FIRE SERVICE FROM THE BUILDING SERVICED TO THE PUBLIC WATER MAIN

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

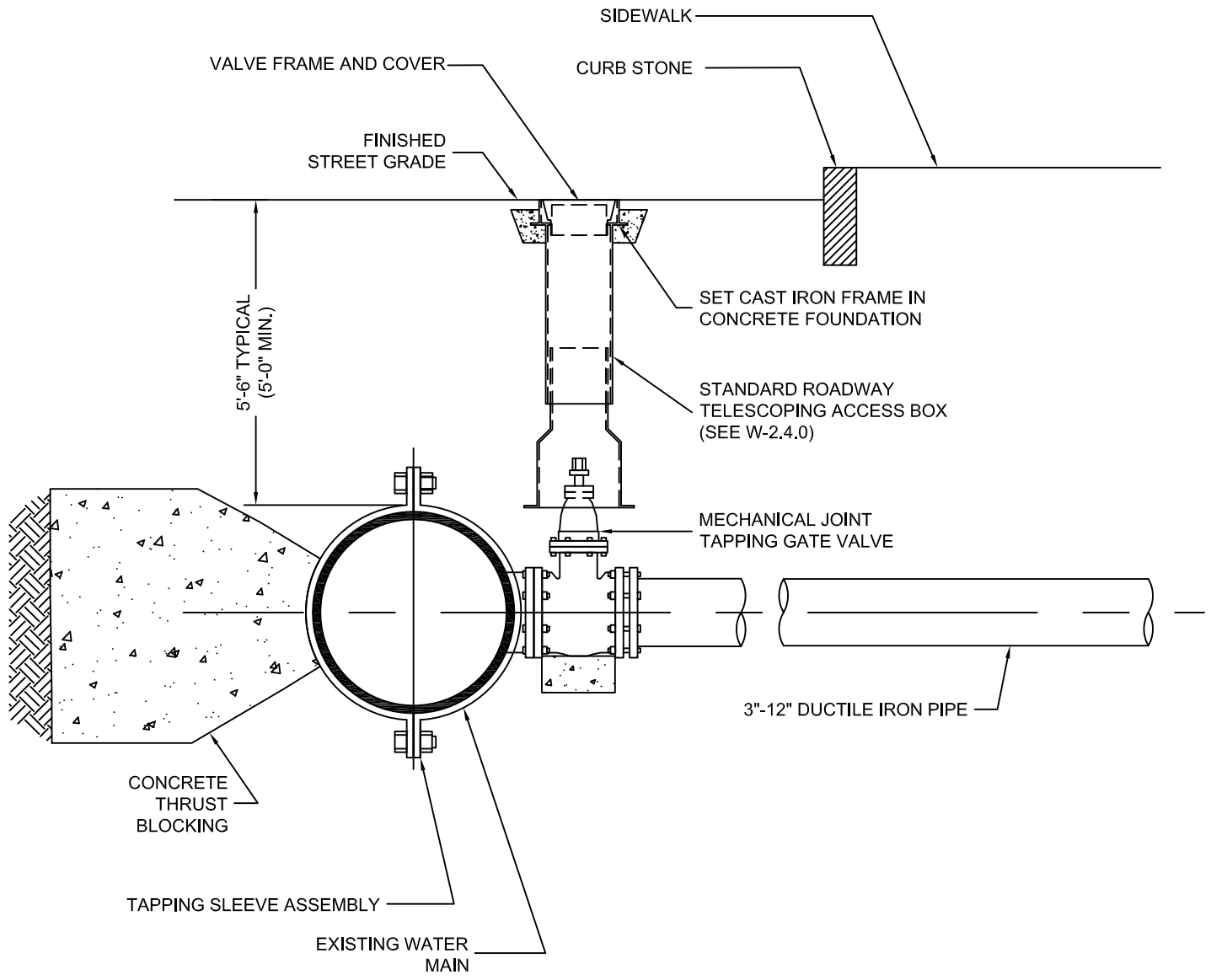
TYPICAL FIRE SERVICE
(TAPPING SLEEVE)

DATE:
FEB. 2016

REV:
0

DETAIL NO.

W-2.1.3



NOTES:

1. MAXIMUM TAPPING SLEEVE SHALL NOT BE GREATER THAN 1/2 DIAMETER OF CONNECTING MAIN.
2. MEGA LUG RESTRAINTS ON ALL MECHANICAL JOINTS.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

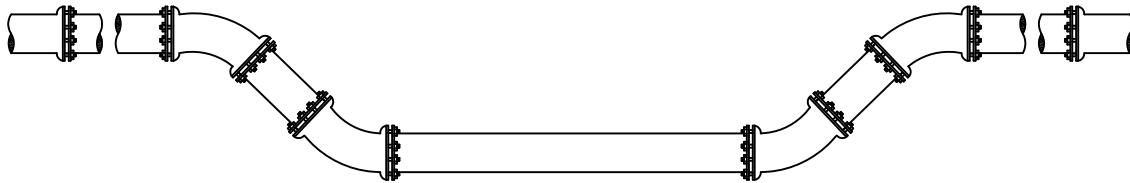
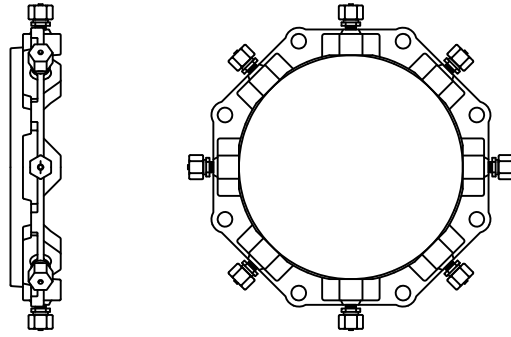
**TYPICAL CONNECTION
(TAPPING SLEEVE)**

DATE:
FEB. 2016

REV:
2

DETAIL NO.

W-2.1.4



NOTES:

1. DEVICES NEED TO BE PLACED BEYOND THE AREA OF RESTRAINTS IN ACCORDANCE WITH MANUFACTURES RECOMMENDATIONS.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

TYPICAL THRUST RESTRAINT
WEDGE ACTION TYPE JOINTS

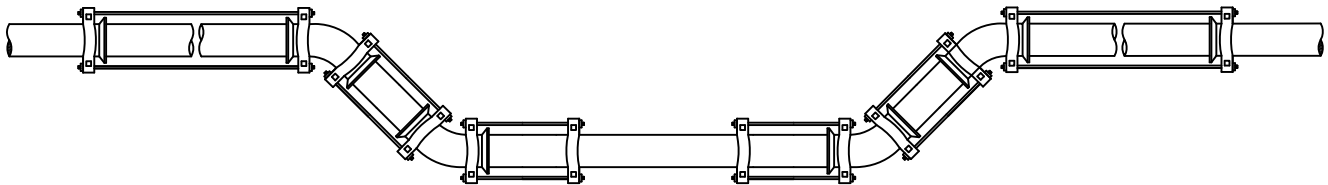
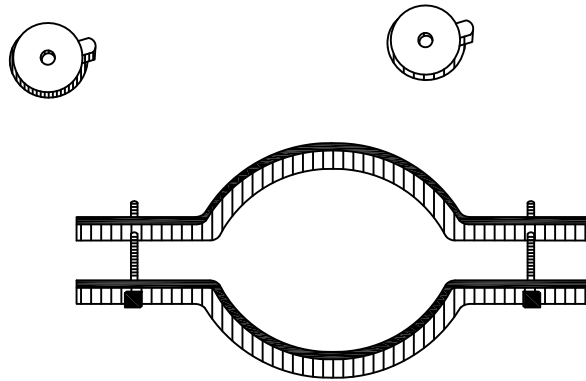
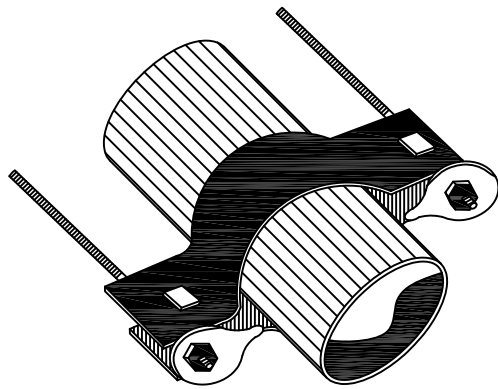
DATE:
SEPT. 2008

REV:
0

DETAIL NO.
W-2.2.0

SCHEDULE OF TIE RODS

PIPE SIZE	NUMBER OF RODS PER FITTING	DIAMETER OF RODS
4" - 12"	2	3/4"
16"	4	3/4"
20" - 24"	4	1 1/2"



NOT TO SCALE



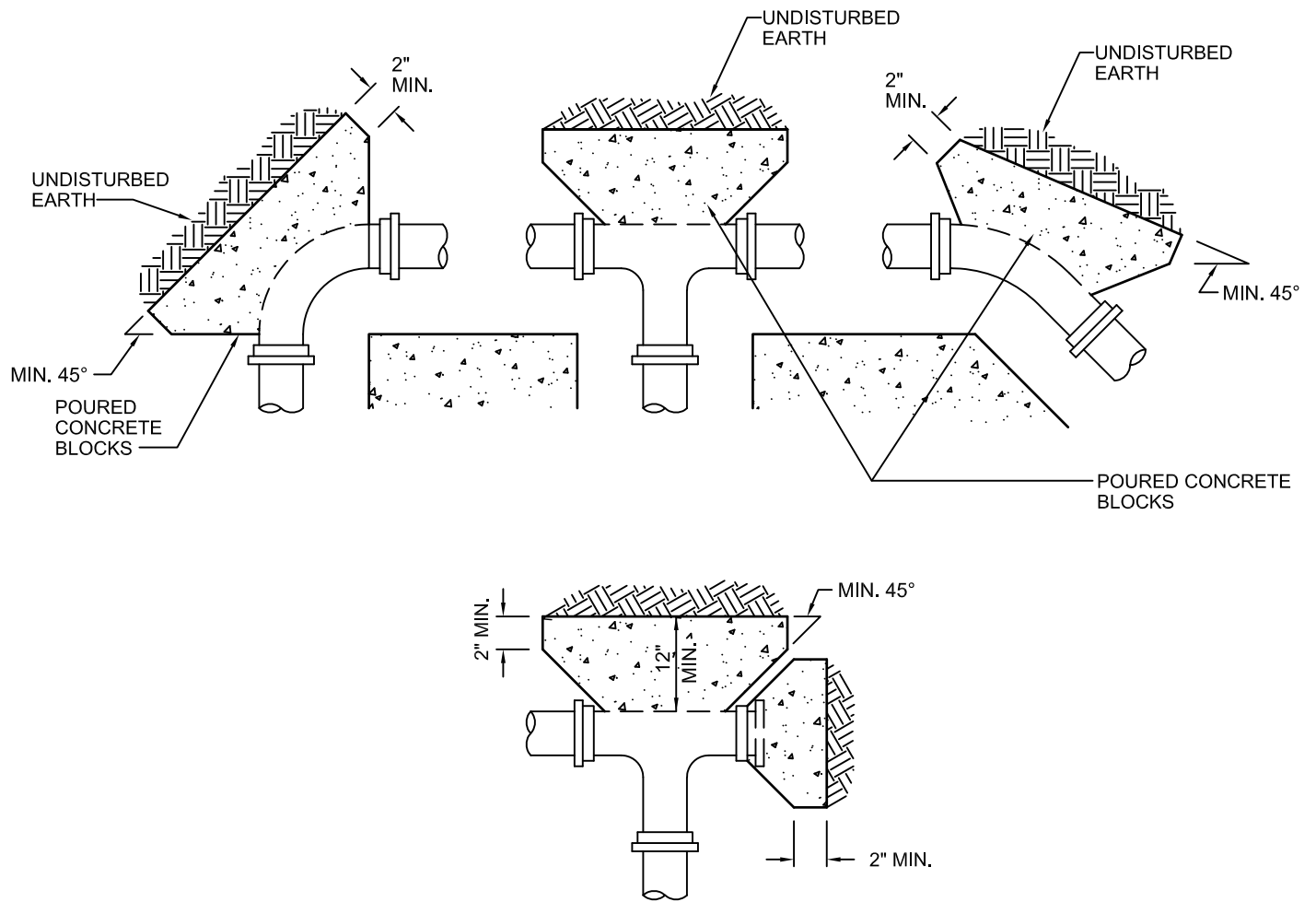
CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

TYPICAL THRUST RESTRAINTS USING
TIE RODS AND FRICTION CLAMPS

DATE:
SEPT. 2008

REV:
0

DETAIL NO.
W-2.2.1



PLAN VIEWS

NOTES:

1. SPECIFIC THRUST BLOCK DESIGN SHALL CONFORM TO AWWA GUIDELINES.
2. PLACE 4 mil. POLYETHYLENE BETWEEN CONCRETE AND FITTING (CONCRETE SHALL NOT INTERFERE WITH JOINT).
3. MINIMUM CONCRETE THICKNESS SHALL BE 12 INCHES.
4. THRUST BLOCK ORIENTATION SHALL BE SUCH THAT THE CENTER OF THE FITTING CORRESPONDS WITH THE CENTER OF THE THRUST BLOCK.
5. THE MINIMUM ALLOWABLE ANGLE (EITHER VERTICAL OR HORIZONTAL) SHALL BE 45 DEGREES.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

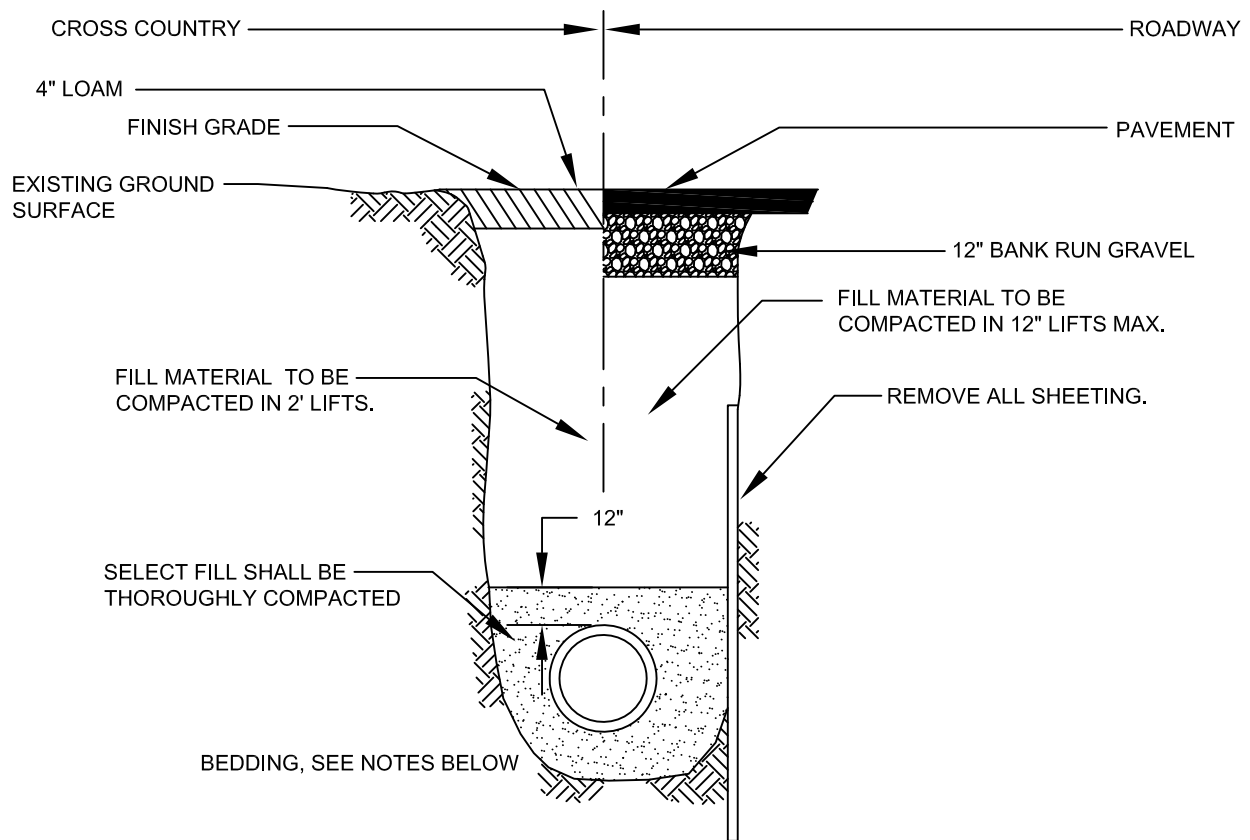
TYPICAL THRUST BLOCK DETAIL

DATE:
SEPT. 2008

REV:
0

DETAIL NO.

W-2.2.2



NOTE: 5'-0" MIN. COVER

NOTES:

1. CITY OF FRAMINGHAM MAY REQUIRE FLOWABLE FILL AT ITS DISCRETION.
2. FOR LOCATIONS WHERE LEDGE IS NOT ENCOUNTERED IN TRENCH, PIPE CAN LAY ON UNDISTURBED EARTH, OR ON SAND BEDDING CONSISTENT WITH AWWA GUIDELINES.
3. FOR LOCATIONS WHERE LEDGE IS ENCOUNTERED, SAND BEDDING SHALL BE MINIMUM OF 12" THICK UNDER PIPE.
4. FILL MATERIAL SHALL BE COMPACTED TO 95% PROCTOR DENSITY.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

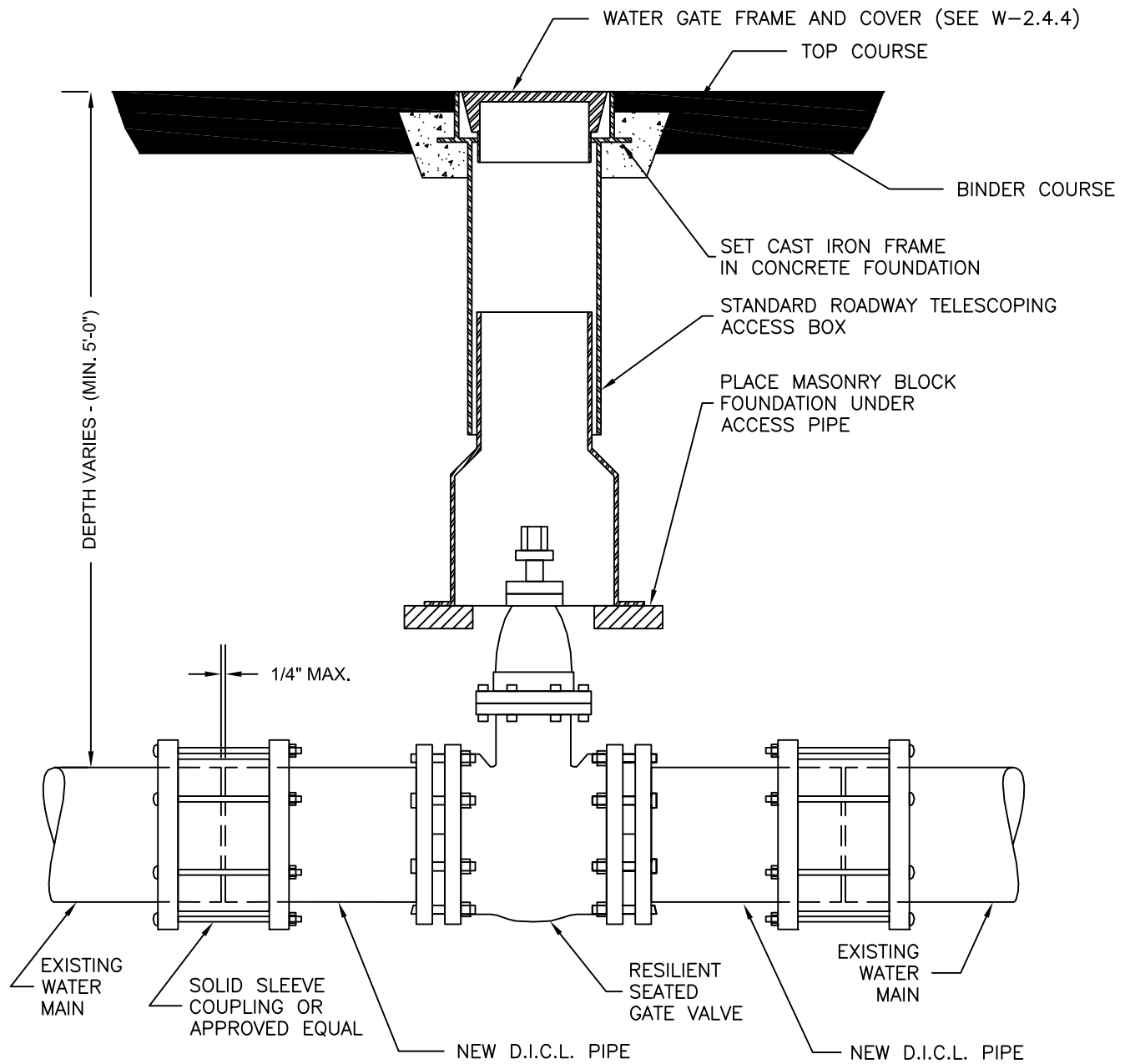
WATER MAIN TRENCH DETAIL

DATE:
MARCH 2011

REV:
2

DETAIL NO.

W-2.3.0



NOTE:

1. ALL EXCAVATION, BACKFILLING AND PAVING SHALL BE IN ACCORDANCE WITH THE TOWN OF FRAMINGHAM REQUIREMENTS.
2. WATER GATE COVER SHALL HAVE A MINIMUM HEIGHT OF 3.5 INCHES AND A MINIMUM WEIGHT OF 13 POUNDS, BRAND NAME BIBBY-STE-CROIX OR EQUAL.

NOT TO SCALE



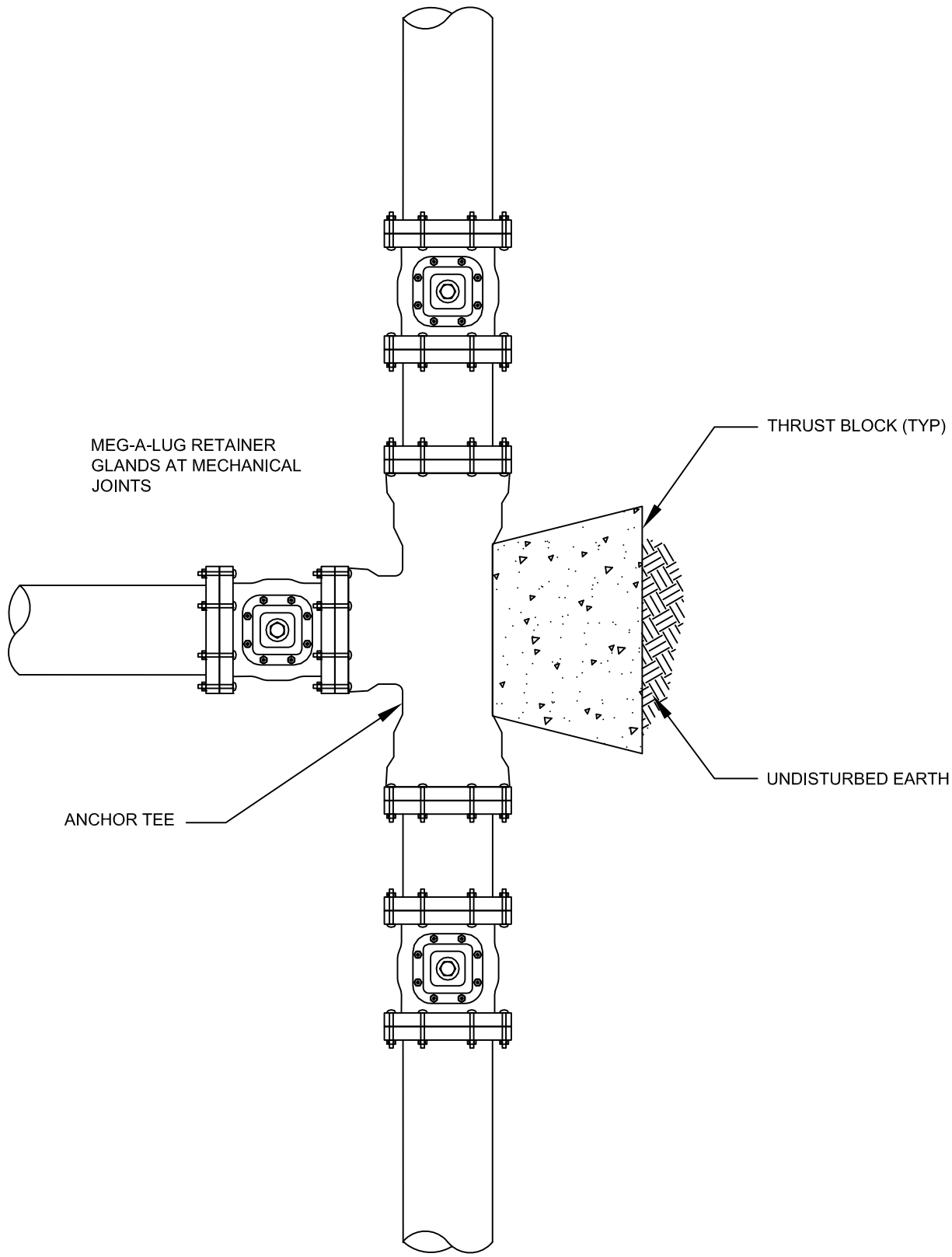
CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

GATE VALVE

DATE:
MARCH 2017

REV:
3

DETAIL NO.
W-2.4.0



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

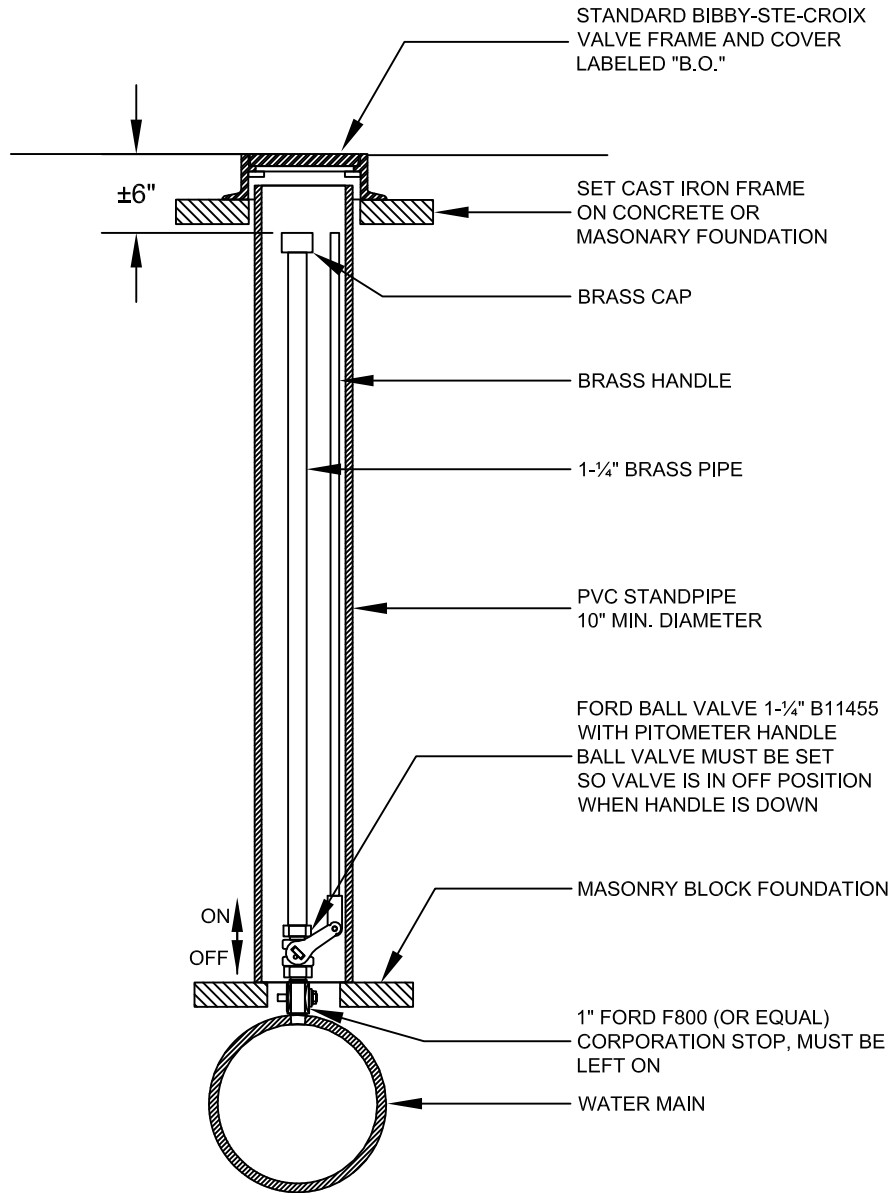
TYPICAL ANCHOR TEE
INSTALLATION

DATE:
SEPT. 2008

REV:
0

DETAIL NO.

W-2.4.1



NOT TO SCALE



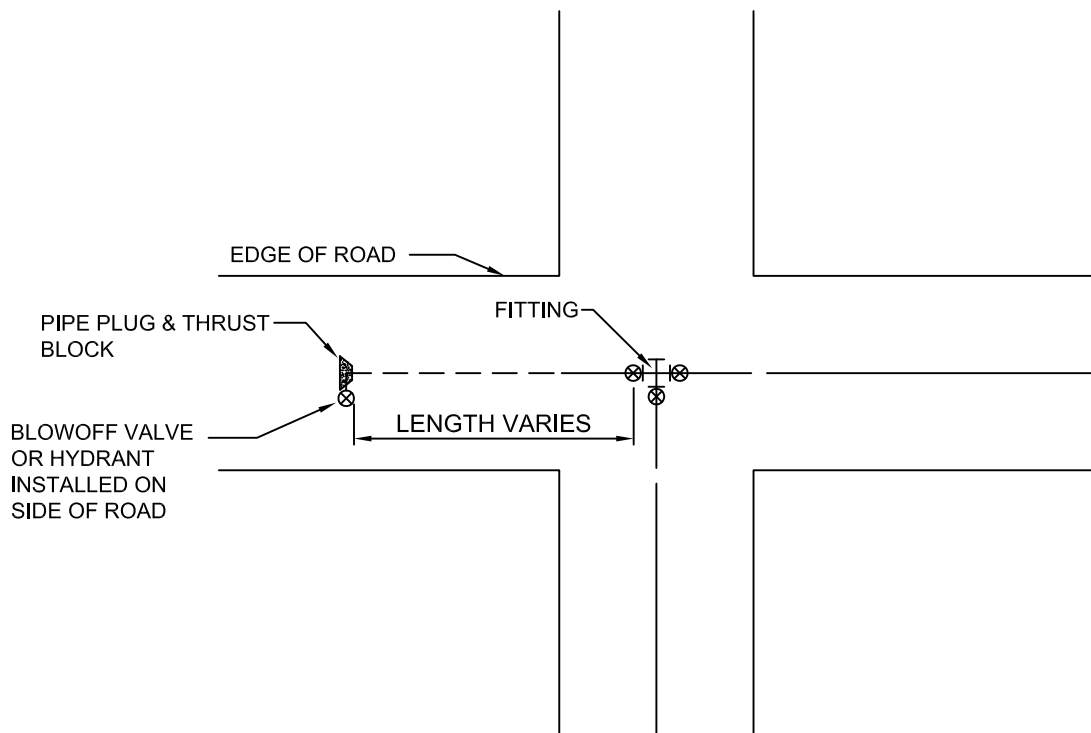
CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

AIR RELEASE VALVE/BLOW-OFF

DATE:
MARCH 2018

REV:
0

DETAIL NO.
W-2.4.2



NOTES:

1. INSTALL VALVES AT INTERSECTION IN A CLUSTER CONFIGURATION. PROVIDE A MINIMUM 18" TO 24" MAXIMUM NIPPLE FROM FITTING TO VALVE.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

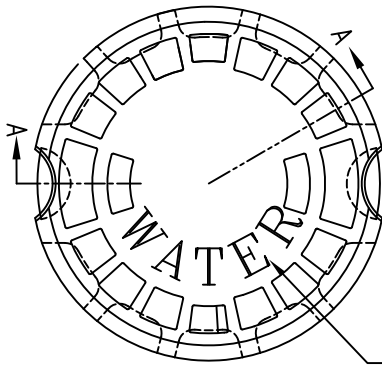
VALVE LOCATION AT INTERSECTION

DATE:
APRIL 2018

REV:
2

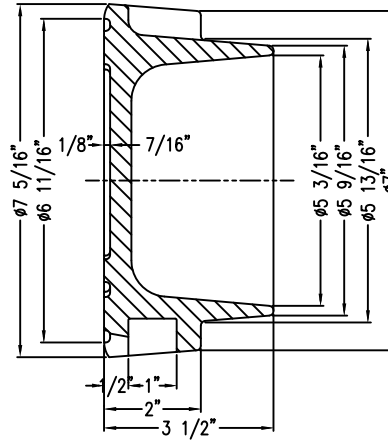
DETAIL NO.

W-2.4.3

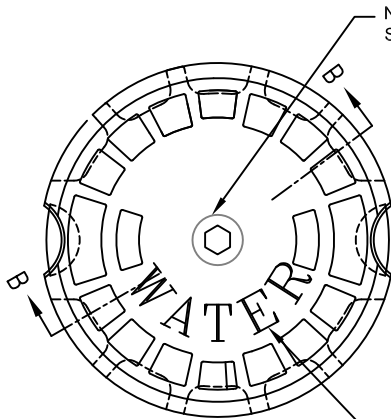


NOTE: COVER READS:
"WATER" IN 1 1/4"
LETTERS

GATE COVER



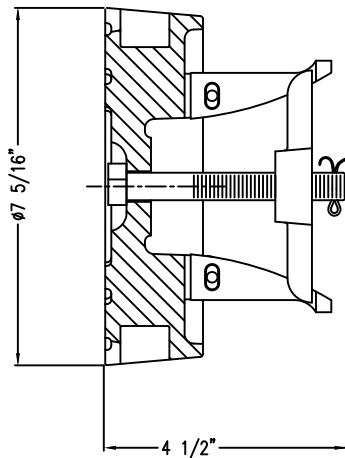
SECTION A-A



NOTE: LOCKING COVER.
STAINLESS STEEL BOLT

NOTE: COVER READS:
"WATER" IN 1 1/4"
LETTERS

DIVISION GATE COVER



SECTION B-B

NOTE:

1. WATER GATE COVER SHALL HAVE A MINIMUM HEIGHT OF 3.5 INCHES AND MINIMUM WEIGHT OF 13 POUNDS, BRAND NAME BIBBY-STE-CROIX OR EQUAL.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

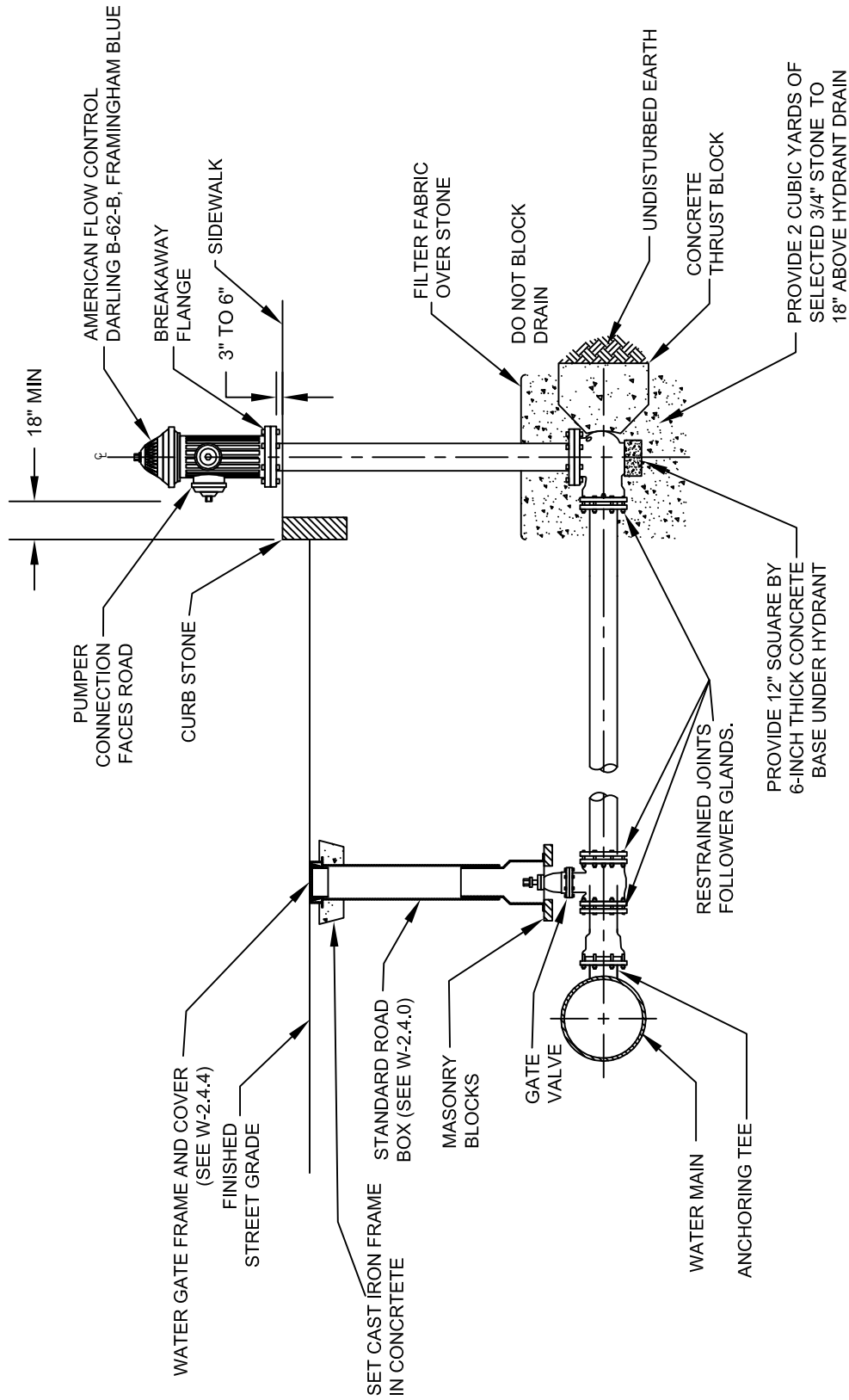
WATER GATE COVERS

DATE:
MARCH 2017

REV:
5

DETAIL NO.

W-2.4.4



NOT TO SCALE



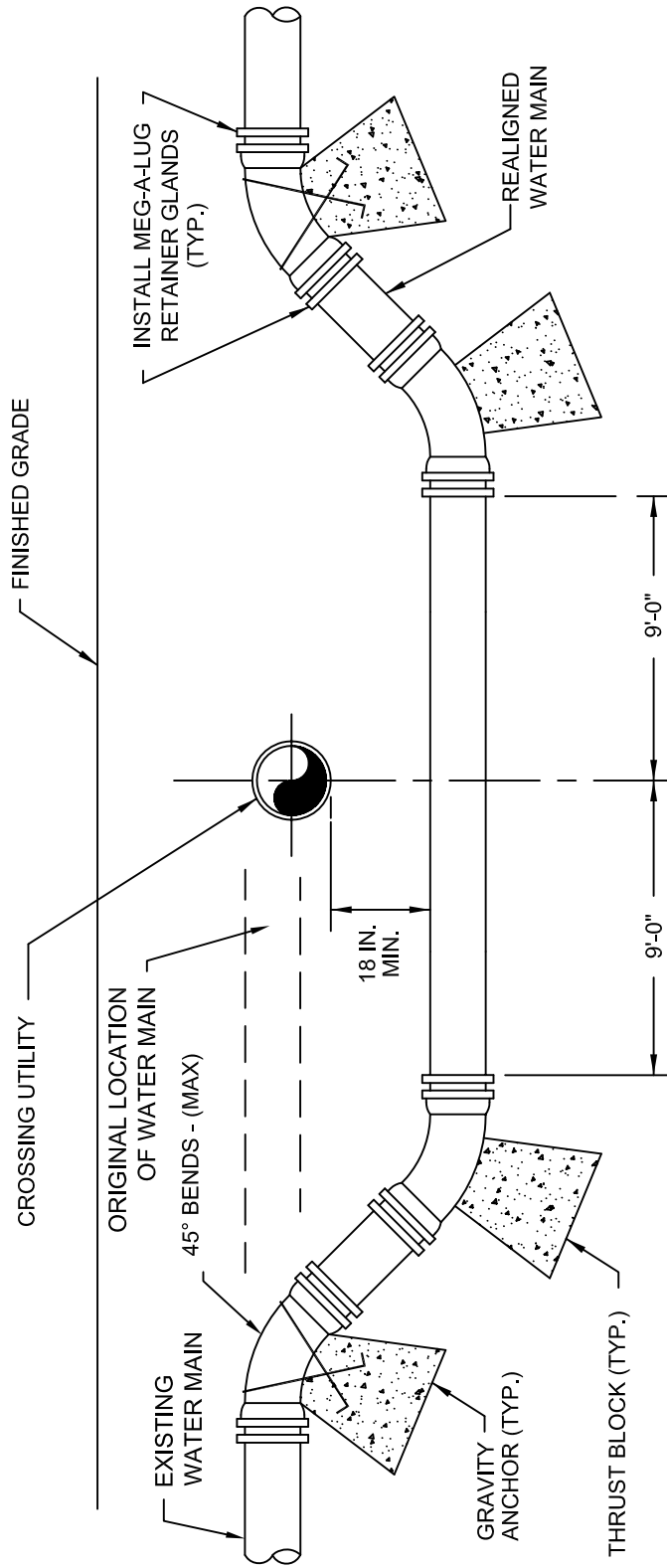
CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

FIRE HYDRANT INSTALLATION

DATE:
MARCH 2018

REV:
5

DETAIL NO.
W-2.5.0



NOTES:

1. ALL FITTINGS AND JOINTS IN LOWERING AREA TO BE RESTRAINED.
2. WHEN IT IS IMPOSSIBLE TO OBTAIN HORIZONTAL OR VERTICAL SEPARATION AS INDICATED IN THE DETAIL ABOVE, BOTH THE WATER AND THE SEWER SHOULD BE ENCASED IN CONTROL DENSITY FILL FOR A DISTANCE OF 10 FEET ON EITHER SIDE OF THE CROSSING.
3. ALL DUCTILE IRON PIPE AND FITTINGS SHALL BE WRAPPED WITH POLYETHYLENE ENCASEMENT WHEN CONTACTING CONTROL DENSITY FILL.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

WATER MAIN LOWERING DETAIL

DATE:
MARCH 2010

REV:
1

DETAIL NO.

W-2.6.0



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

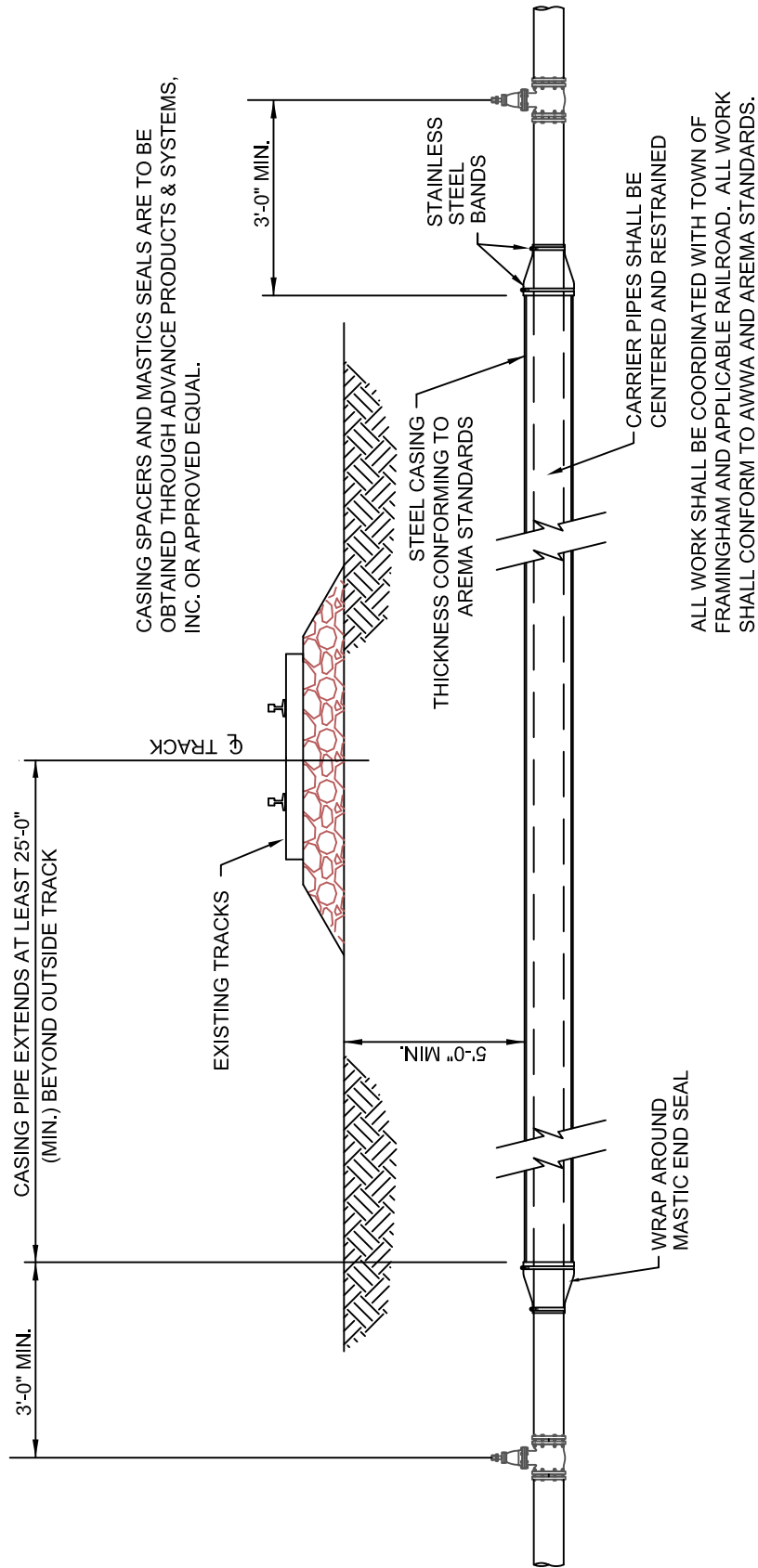
WATER CROSSING
UNDER RAILROAD

DATE:
SEPT. 2008

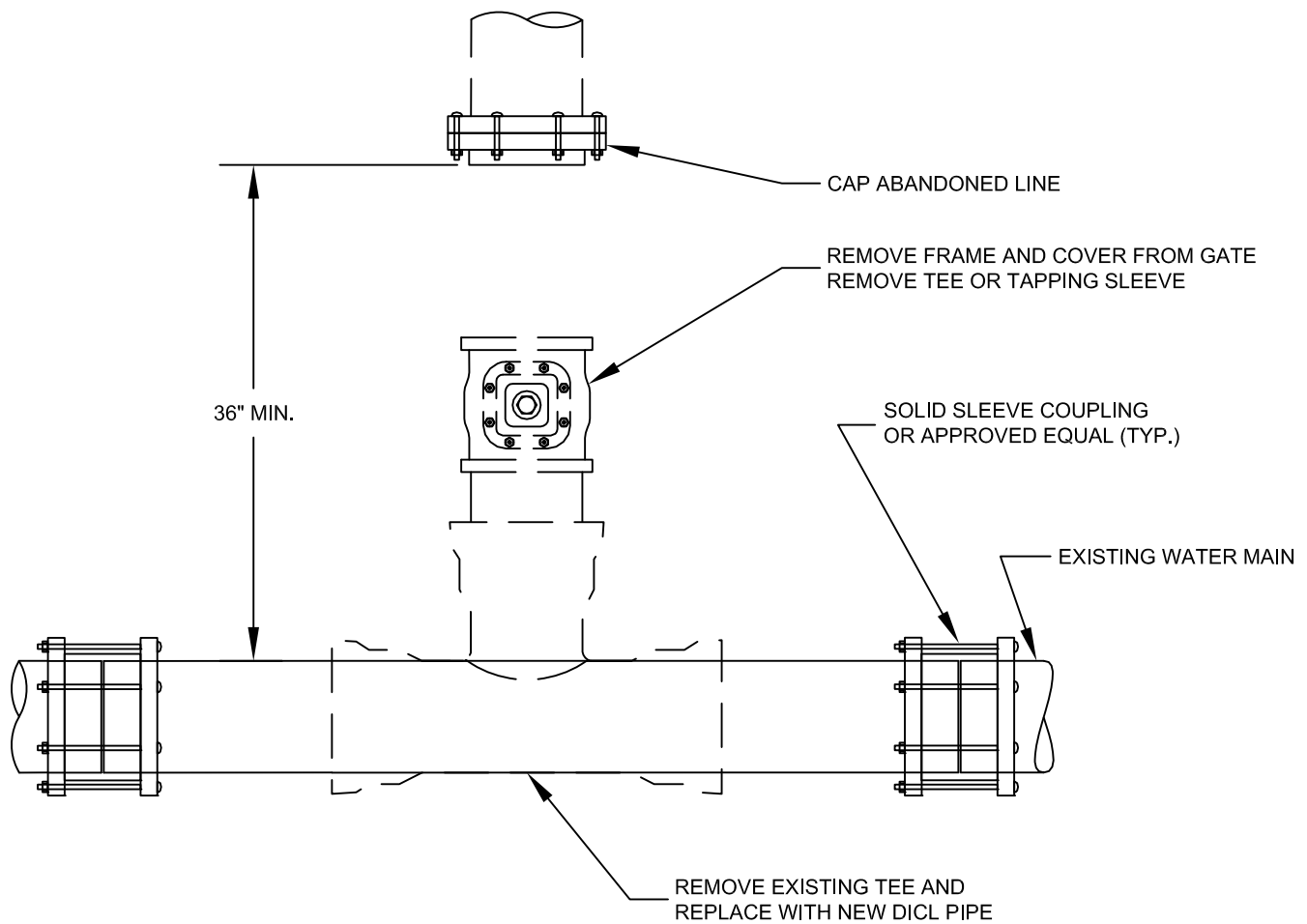
REV:
0

DETAIL NO.

W-2.6.1



NOT TO SCALE



NOTES:

1. ALL WORK MUST BE PERFORMED BY A FRAMINGHAM LICENSED AND BONDED CONTRACTOR.
2. THIS PROCEDURE WILL INVOLVE A MAIN LINE SHUT DOWN THAT THE CONTRACTOR WILL COORDINATE WITH FRAMINGHAM'S D.P.W. WATER OPERATIONS DIVISION.
3. 48-HOUR PRIOR WRITTEN NOTIFICATION OF ALL AFFECTED CUSTOMERS MUST BE PERFORMED BY THE CONTRACTOR.
4. ALL WORK MUST BE PERMITTED BY FRAMINGHAM AND ALL OTHER APPROPRIATE AGENCIES.
5. ALL WORK MUST BE INSPECTED BY FRAMINGHAM INSPECTOR OR DESIGNEE PRIOR TO BACKFILLING.

NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

DETAIL OF CUT AND REMOVE OF
WATER CONNECTION 4" AND OVER

DATE:
FEB. 2010

REV:
1

DETAIL NO.

W-2.7.0

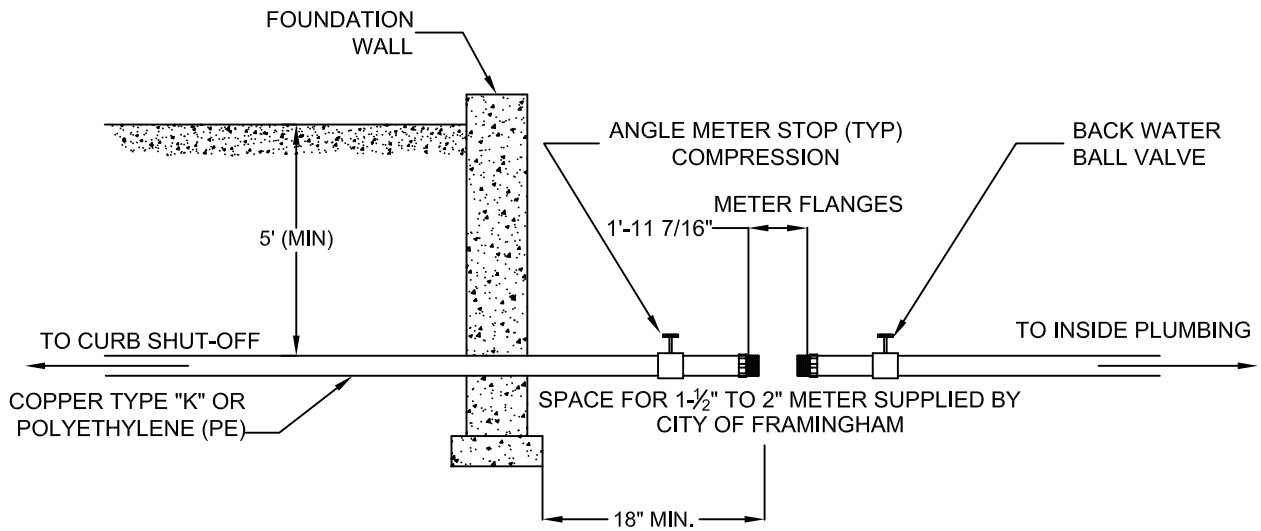
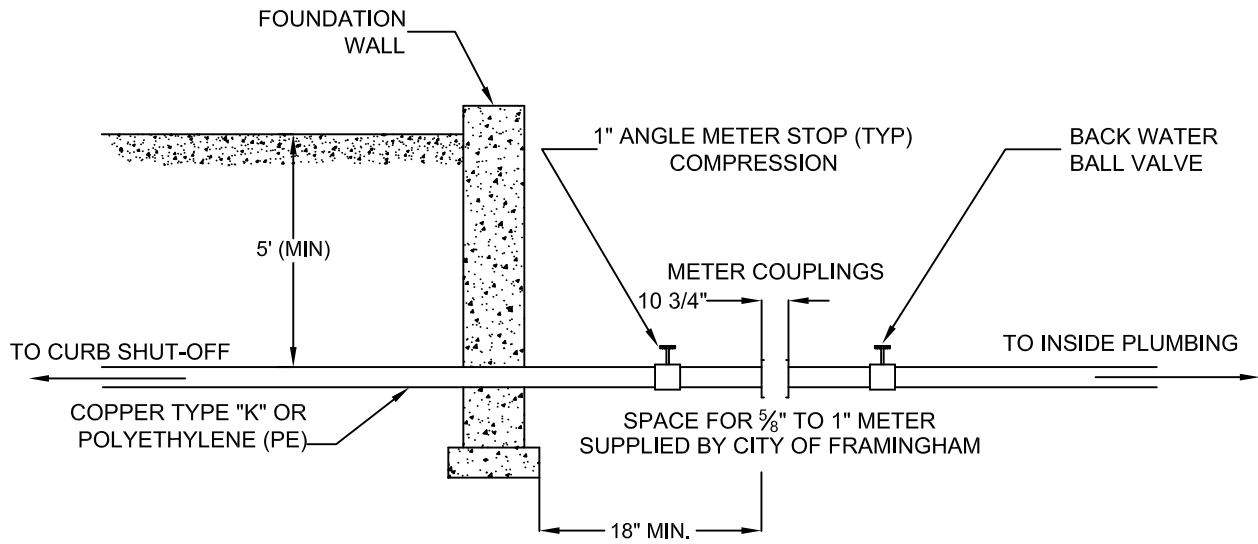
SIZING CHART

GALLON CAPACITY	DIM "A"	DIM "B"	DIM "C"	DIM "D"	DIM "E"
1000	9'-0"	5'-0"	7'-2"	4'-2"	3'-10"
1250	9'-0"	5'-0"	7'-2"	5'-2"	4'-10"
1500	11'-2"	5'-8"	7'-2"	4'-4"	4'-0"
1750	11'-2"	5'-8"	7'-2"	4'-11"	4'-7"
2000	12'-8"	6'-8"	8'-0"	4'-7"	3'-10"
2500	12'-8"	6'-8"	8'-0"	5'-6"	4'-9"
2750	12'-8"	6'-8"	8'-0"	6'-0"	5'-3"
3000	15'-7"	9'-7"	8'-6.5"	5'-0"	3'-9"
4000	15'-7"	9'-7"	8'-6.5"	6'-3"	5'-0"
5000	19'-11"	9'-11"	8'-11"	6'-2"	4'-9"
6000	19'-11"	9'-11"	10'-5"	7'-2"	5'-9"

NOTES:

1. CONCRETE : 28 DAY F'c= 4500 psi
2. REBAR : ASTM A615 GRADE 60.
3. MESH : ASTM A-185 GRADE 65.
4. DESIGN : AC1318-83 BUILDING CODE
ASTM C-857 MINIMUM STRUCTURAL DESIGN
LOADING FOR UNDERGROUND PRECAST
CONCRETE UTILITY STRUCTURES
5. LOADS : H-20 LOADING.
6. FILL w/CLEAN WATER PRIOR TO START UP OF SYSTEM.
7. LARGER SIZES MAY BE REQUIRED AS PER REVIEW OF FACILITY.
TRAP SIZE WILL BE 1,000 GALLONS MINIMUM.
8. FRAME AND COVER SHALL BE PER TOWN OF FRAMINGHAM
SEWER CONSTRUCTION STANDARDS 3.4 FOR PRIVATE
PROPERTY INSTALLATIONS.
9. SEE GREASE TRAP CONSTRUCTION STANDARDS SECTION 3.7
FOR OTHER REQUIREMENTS.





NOT TO SCALE



CITY OF FRAMINGHAM
DEPARTMENT OF PUBLIC WORKS

METER INSTALLATION

DATE:
SEPT. 2008

REV:
0

DETAIL NO.

W-2.8.0

APPENDIX C

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July 6, 2017
File No. 86640.31

Mr. Marc Moccio, PE
Wright-Pierce
40 Shattuck Road, Suite 305
Andover, MA 01810

**Re: Limited Hazardous Materials Survey Results
Saxonville Stormwater Pump Station
Framingham, Massachusetts**

Dear Mr. Moccio:

Nobis Engineering, Inc. (Nobis) prepared this Hazardous Materials Inspection Report to present the results of the limited hazardous building materials survey (HMBS) conducted at the Saxonville Stormwater Pump Station located near Concord Street in Framingham, Massachusetts. Nobis conducted this limited survey to support roof replacement, upgrades to manual louvers located on the sides of the building, and removal of motor exhaust piping and equipment cages inside the pump station.

SCOPE OF WORK

As per your email dated May 23, 2017 and our phone conversation on May 31, 2017, the areas to be inspected were limited to:

- Roof components
- Motor exhaust insulation
- Wall opening manual louvers
- Pump motor equipment cages

Nobis surveyed these building components for the presence of asbestos, lead-based paint (LBP), and polychlorinated-biphenyls (PCBs).

SURVEY LIMITATIONS

As stated above, inspection activities were limited to roof components, motor exhaust insulation, wall opening manual louvers, and motor equipment cages only. At your direction, louver caulking sampling was limited to interior caulking only, as the exterior wall opening for the equipment louvers was not to be disturbed during renovation.

Additional limitations are included in Appendix A.

INSPECTION ACTIVITIES

Nobis completed the limited hazardous materials inspection on June 23, 2017. Inspection results are presented in the following sections.

Asbestos Containing Materials (ACM) Inspection Results

Massachusetts regulations require that multiple samples be collected from homogeneous areas identified throughout the buildings to identify asbestos content in suspect ACM. Suspect ACM is identified by a Massachusetts-licensed Asbestos Inspector. Homogeneous areas consist of areas that appear to be similar in material color, texture, and date of installation or application. Each set of homogeneous bulk samples is analyzed using the “hit-stop” procedure. Per this procedure, analysis of additional duplicate samples collected from identical homogeneous areas is not required if asbestos is detected in any one of the samples from the homogeneous group.

Massachusetts-certified asbestos inspector Jeff Brunelle (AI00090) completed the HMBS. Samples were analyzed by polarized light microscopy (PLM) in accordance with the United States Environmental Protection Agency (EPA) “Method for Determination of Asbestos in Bulk Material”; EPA/600/R-93/116 (July 1993). Bulk samples were transmitted under a chain-of-custody to EMSL Analytical, Inc., an accredited Massachusetts-certified laboratory located at 5 Constitution Way, Unit A in Woburn, Massachusetts.

Bulk samples that tested positive for the presence of asbestos are presented in Table 1. Bulk samples that returned negative results for the presence of asbestos are presented in Table 2. Asbestos analytical data is included as Appendix B.

Nobis collected 22 bulk samples for of suspect ACM for laboratory analysis. Nineteen samples were analyzed by PLM (3 samples were omitted by the hit-stop procedure). Asbestos was detected in the composite samples collected from the parapet roof and in the composite sample collected from the tar and gravel roof layers.

Lead Based Paint (LBP) Survey Results

Master lead inspector Mel Blackman conducted an OSHA pre-demolition survey of the selected building components. Lead screening results are used to calculate worker exposure levels for OSHA compliance and to assess lead levels for proper handling and disposal of building materials during demolition and/or disposal.

Building components were tested for LBP using XRF. Sampling was conducted in accordance with EPA and United States Department of Housing and Development (HUD) guidance and acceptable practices adopted for inspecting for LBP.



According to EPA¹ and HUD regulations, lead-based paint is present on any surface containing lead equal to or greater than 1.0 mg/cm²; however, the OSHA Lead Construction Standard, Chapter 29, Section 1926.62 of the Code of Federal Regulations (29 CFR 1926.62) deals with worker exposure at any concentration of LBP. Based on current OSHA regulations, any painted surfaces containing lead at levels above 0.0 mg/cm² that will be disturbed during demolition activities must be handled as LBP.

Materials returning results greater than 1.0 mg/cm² include the brown metal pumps, cages, and pump components. All other tested components contained lead below 1.0 mg/cm². Refer to the Lead Inspection Report included as Appendix C for specific screening values for each building component tested.

Representative samples of LBP waste generated during demolition should be collected for toxicity characteristic leaching procedure (TCLP) lead analysis in accordance with 40 CFR Part 261 prior to material disposal. Under the Resource Conservation and Recovery Act (RCRA), the “acceptable” level of lead (i.e. not hazardous waste) in demolition debris is 5 milligrams per liter (mg/L) by TCLP. If demolition debris exceeds 5 mg/L of lead by TCLP, it must be disposed of as hazardous waste. Sampling and TCLP analysis of materials with low to mid-range XRF results may be used to establish lower limits under which materials can be disposed of as non-hazardous waste. If metal building components are to be recycled, lead abatement may not be necessary.

PCB Sampling Data

Nobis collected one caulk sample for laboratory analysis of PCBs, pursuant to the 2009 EPA directive. Sampling was performed by removing a minimum of 10 grams of suspected PCB-containing media from building components to accurately determine the concentration of PCBs.

Con-Test Analytical in East Longmeadow, Massachusetts analyzed PCB samples by EPA Method 8082 using the Soxhlet extraction method (SW-846 3540C). Table 3 summarizes PCB analytical results. The PCB analytical laboratory report is included as Appendix D.

PCBs were not detected above the TSCA 1.0 ppm cleanup standard for “high occupancy areas” in the samples submitted for analysis. None of the sampled materials were identified as PCB bulk product waste (PCBs ≥ 50 ppm).

CONCLUSIONS AND RECOMMENDATIONS

Nobis completed the limited hazardous materials survey on June 23, 2017. The objective of the inspection was to characterize specific building components that would be affected during building upgrades (roof components, motor exhaust insulation, wall opening manual louvers, and pump equipment cages) for proper abatement and disposal prior to demolition activities.

¹ United States Environmental Protection Agency, 40 CFR 745.65: Lead; Identification of Dangerous Levels of Lead; Final Rule, dated December 22, 2000 and amended January 5, 2001.



Asbestos Containing Materials

Nobis collected building material samples from the components subject to removal as part of the station upgrade project. Asbestos sampling results are presented in Tables 1 and 2. Asbestos was detected in the parapet roof materials and the tar and gravel roof layers. The other tested components did not contain detectable levels of asbestos.

Roof demolition activities will require asbestos abatement and disposal in accordance with local, State, and Federal regulations. EPA and Massachusetts regulations require a 10-day notification, and asbestos notification forms must be filed prior to the commencement of any asbestos abatement work. Any additional suspect ACM not included in this limited inspection, that will be disturbed during the station improvements, should be inspected and sampled.

Asbestos abatement must be conducted in accordance with the Commonwealth of Massachusetts Department of Labor and Workforce Development Chapter 453, Section 6.00 of the Code of Massachusetts Regulations (453 CMR 6.00), "The Removal, Containment, or Encapsulation of Asbestos;" and MassDEP 310 CMR 7.15 "Air Pollution Control Regulations," 310 CMR 18.00 and 19.00, "Solid Waste Regulations".

Abatement activities must be conducted in accordance with Federal, State, and local regulations and protocols, and by a certified asbestos abatement contractor. A Massachusetts-certified Asbestos Project Monitor must provide abatement oversight, background/ambient air sampling, a final visual inspection, and final clearance air sampling during and at the completion of abatement activities.

Lead-Based Paint

LBP (i.e. lead at a concentration greater than 1.0 mg/cm²) was identified brown metal pumps and pump components. LBP demolition/renovation is required to be performed by a contractor in compliance with the OSHA Rules for Occupational Health and Environmental Controls for Lead 29 CFR 1926.62, including implementation of a written worker protection program, personal air monitoring, and respiratory protection program. If metal components are to be recycled, lead abatement of the metal components may not be necessary.

PCBs

One sample of window caulking from the interior louvers was analyzed for the presence of PCBs. PCB analytical results are presented in Table 3. PCBs were not detected in this sample, therefore no special handling of this material is required to address PCBs, as this sample does not meet the regulatory definition of PCB bulk product waste (PCBs \geq 50 ppm).

Abatement/Disposal Cost Estimate

The preliminary cost estimate for abatement and disposal of asbestos roofing materials is \$10,000. This estimate includes prevailing wage rate costing. Actual abatement and disposal



costs may vary. Costing and quantities should be confirmed by the abatement contractor prior to securing funding for the project.

Thank you for the opportunity to be of service. Should you require additional information, please do not hesitate to contact us.

Sincerely,

NOBIS ENGINEERING, INC.



Jeff Brunelle
Project Manager



Stephen Vetere, PE, LSP
Director of Environmental Services

Attachments:

Table 1 – Summary of Positive Asbestos Analytical Results

Table 2 – Summary of Negative Asbestos Analytical Results

Table 3 – Summary of PCB Analytical Results

Table 4 – Abatement/Disposal Cost Estimate

Appendix A – Limitations

Appendix B – Asbestos Analytical Data Reports

Appendix C – Lead Inspection Report

Appendix D – PCB Analytical Data Report

c: File No. 86640.31 (w/attach.)

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Table 1
Summary of Positive Asbestos Analytical Results
Saxonville Stormwater Pump Station
Framingham, Massachusetts

Bldg	ID	Color	Material	Sample Location	Floor	% Asbestos
WPPS	3A	Black	Rolled Roofing/Sealant Composite	Parapet Roof	Exterior	10% Chrysotile
WPPS	4A	Black	Roof Base Layer Composite	Parapet Roof	Exterior	10% Chrysotile
WPPS	5A	Black	Roof Layers Composite	Tar & Gravel Roof	Exterior	5% Chrysotile

Table 2
Summary of Negative Asbestos Analytical Results
Saxonville Stormwater Pump Station
Framingham, Massachusetts

Bldg	ID	Color	Material	Location		% Asbestos
WPPS	01A/B	Grey	Left Louvre Caulking	Left Louvre	Interior	ND
WPPS	02A/B	Grey	Right Louvre Caulking	Right Louvre	Interior	ND
WPPS	06A/B	Black	Flashing Sealant	Roof	Interior	ND
WPPS	07A-F	White	Exhaust Insulation	Pump Motor	Interior	ND
WPPS	08A/B	White	Exhaust Insulation	Generator	Interior	ND
WPPS	09A/B	Tan	Vibration Damper	Pump Motor	Interior	ND

Table 3
Summary of PCB Analytical Results
Saxonville Stormwater Pump Station
Framingham, Massachusetts

Parameter	Sample ID
	WPPS PCB-1
Sampling Date	6/23/2017
Sampling Time	13:33
Material	Window Caulking
Room/Location	Interior Louvers
Color	Grey
PCB 1016	ND (0.75)
PCB 1221	ND (0.75)
PCB 1232	ND (0.75)
PCB 1242	ND (0.75)
PCB 1248	ND (0.75)
PCB 1254	ND (0.75)
PCB 1260	ND (0.75)
PCB 1262	ND (0.75)
PCB 1268	ND (0.75)

Notes:

1. Results are in mg/kg
2. Samples analyzed by Method SW-846 8082A with Soxhlet extraction
3. ND = Not detected above the lab reporting limits shown in parenthesis.

Table 4
Abatement/Disposal Cost Estimate
Saxonville Stormwater Pump Station
Framingham, Massachusetts

Material	Quantity	Units	Price Per Unit	Disposal Cost Estimate
Confirmed				
Tar and Gravel/Rolled Roofing	400	SF	\$ 25.00	\$ 10,000.00
Grand Total				\$ 10,000.00

Notes:

1. Price per unit rates are prevailing wage rates.

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APPENDIX A - LIMITATIONS

- 1) This hazardous materials survey was performed in accordance with generally accepted practices of other consultants undertaking similar work at the same time and in the same geographical area. The results of this survey are based on our professional judgment and are not scientific certainties. Specifically, Nobis Engineering, Inc. does not and cannot represent that the site contains no hazardous materials or other latent conditions beyond those observed during this inspection. No other warranty, express or implied, is made.
- 2) The observations and conclusions presented in this report were made solely on the basis of conditions described thereon and not on scientific tasks or procedures beyond the scope of described services or the budgetary, time, and work constraints (i.e. restricted demolition/sampling) imposed by the client. The work described in this report was performed in accordance with the terms and conditions described in our agreement, and subsequent discussions in the field with Town personnel.
- 3) During the Site inspection, observations were made of the site building. Where access to portions of the site building were unavailable, limited, or unsafe, Nobis Engineering, Inc. renders no opinion as to the presence of asbestos, lead, or other hazardous materials in those portions of the site.
- 4) No property boundary, site feature or topographic surveys of the site were performed by Nobis Engineering, Inc.
- 5) Our services did not include assessments for the presence of pesticides, herbicides, urea-formaldehydes, or radon, nor any air quality monitoring, or any chemical analyses of soil, surface water, groundwater, or any other materials at the site beyond which is included in the report.
- 6) The purpose of this report was to inspect limited portions of the site building for the presence of suspect asbestos-containing materials, lead based paint, and PCB in bulk products within the context of applicable Occupational Safety and Health Administration (OSHA), USEPA (EPA), the Massachusetts Department of Environmental Protection (MassDEP), and the Massachusetts Division of Labor Services (DLS) regulations. This report does not in any manner or form constitute a Management Plan or Abatement Design within the context of OSHA, EPA, MassDEP, and DLS regulations. No attempt was made to check the compliance of present or past owners of the site with federal, state or local laws.
- 7) This summary report has been prepared for the exclusive use of Wright-Pierce. This report shall not, in whole or in part, be conveyed to any other party without prior written consent of Nobis Engineering, Inc.

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EMSL Analytical, Inc.

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com> / bostonlab@emsl.com

EMSL Order: 131702780

Customer ID: NOBI51

Customer PO:

Project ID:

Attention: Jeff Brunelle
Nobis Engineering, Inc.
585 Middlesex Street
Lowell, MA 01851

Phone: (978) 683-0891

Fax: (978) 683-0966

Received Date: 06/26/2017 5:25 PM

Analysis Date: 06/29/2017

Collected Date:

Project: 86640

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
WPPS-1A <small>131702780-0001</small>	Left Louvre - Cauliking	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
WPPS-1B <small>131702780-0002</small>	Left Louvre - Cauliking	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
WPPS-2A <small>131702780-0003</small>	Right Louvre - Cauliking	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
WPPS-2B <small>131702780-0004</small>	Right Louvre - Cauliking	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
WPPS-3A <small>131702780-0005</small>	Parapet Roof - Rolled Roofing/Sealant Comp.	Black Non-Fibrous Homogeneous	20% Cellulose	70% Non-fibrous (Other)	10% Chrysotile
WPPS-3B <small>131702780-0006</small>	Parapet Roof - Rolled Roofing/Sealant Comp.				Positive Stop (Not Analyzed)
WPPS-4A <small>131702780-0007</small>	Parapet - Base Layer Comp.	Black Non-Fibrous Homogeneous	30% Cellulose	60% Non-fibrous (Other)	10% Chrysotile
WPPS-4B <small>131702780-0008</small>	Parapet - Base Layer Comp.				Positive Stop (Not Analyzed)
WPPS-5A <small>131702780-0009</small>	Tar & Gravel Roof Layers Comp.	Black Fibrous Homogeneous	35% Cellulose	60% Non-fibrous (Other)	5% Chrysotile
WPPS-5B <small>131702780-0010</small>	Tar & Gravel Roof Layers Comp.				Positive Stop (Not Analyzed)
WPPS-6A <small>131702780-0011</small>	Roof - Flashing Sealant	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
WPPS-6B <small>131702780-0012</small>	Roof - Flashing Sealant	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
WPPS-7A <small>131702780-0013</small>	Pump Motor - Exhaust Insul - Skinny	White Fibrous Homogeneous	10% Synthetic	90% Non-fibrous (Other)	None Detected
WPPS-7B <small>131702780-0014</small>	Pump Motor - Exhaust Insul - Skinny	White Fibrous Homogeneous	10% Synthetic	90% Non-fibrous (Other)	None Detected
WPPS-7C <small>131702780-0015</small>	Pump Motor - Exhaust Insul - Wide	White Fibrous Homogeneous	10% Synthetic	90% Non-fibrous (Other)	None Detected
WPPS-7D <small>131702780-0016</small>	Pump Motor - Exhaust Insul - Wide	White Fibrous Homogeneous	10% Synthetic	90% Non-fibrous (Other)	None Detected

Initial report from: 06/29/2017 17:35:53



EMSL Analytical, Inc.

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com> / bostonlab@emsl.com

EMSL Order: 131702780
Customer ID: NOBI51
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
WPPS-7E <small>131702780-0017</small>	Pump Motor - Exhaust Insul - Elbow	Gray Fibrous Homogeneous	15% Cellulose 15% Min. Wool	70% Non-fibrous (Other)	None Detected
WPPS-7F <small>131702780-0018</small>	Pump Motor - Exhaust Insul - Elbow	Gray Fibrous Homogeneous	15% Cellulose 15% Min. Wool	70% Non-fibrous (Other)	None Detected
WPPS-8A <small>131702780-0019</small>	Generator - Exhaust Insul	White Fibrous Homogeneous	10% Synthetic	90% Non-fibrous (Other)	None Detected
WPPS-8B <small>131702780-0020</small>	Generator - Exhaust Insul	White Fibrous Homogeneous	10% Synthetic	90% Non-fibrous (Other)	None Detected
WPPS-9A <small>131702780-0021</small>	Pump Air Handler - Vib. Dampner	Tan Fibrous Homogeneous	30% Glass	70% Non-fibrous (Other)	None Detected
WPPS-9B <small>131702780-0022</small>	Pump Air Handler - Vib. Dampner	Tan Fibrous Homogeneous	30% Glass	70% Non-fibrous (Other)	None Detected

Analyst(s)

Kevin Pine (19)

Steve Grise, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Samples received in good condition unless otherwise noted. Estimated accuracy, precision and uncertainty data available upon request. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Reporting limit is 1%

Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-107T3, VT AL998919, Maine Bulk Asbestos BA039

Initial report from: 06/29/2017 17:35:53



EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number (Lab Use Only):

131702780

EMSL ANALYTICAL, INC.
700 WASHINGTON ST
SUITE 101
ROSELAND, NJ 07068
PHONE: 908-988-1000
FAX: 908-988-1012

Company: Nobis Engineering		EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different <small>If Bill to is Different note instructions in Comments**</small>	
Street: 585 Middlesex St		<i>Third Party Billing requires written authorization from third party</i>	
City: Lowell	State/Province: MA	Zip/Postal Code: 01851	Country: USA
Report To (Name): J. Brunelle		Fax #:	
Telephone #: 978-703-6038		Email Address: jbrunelle@nobiseng.com	
Project Name/Number: 86640		U.S. State Samples Taken: MA	
Please Provide Results: <input type="checkbox"/> Fax <input checked="" type="checkbox"/> Email		Purchase Order:	

Turnaround Time (TAT) Options* – Please Check

3 Hour
 6 Hour
 24 Hour
 48 Hour
 72 Hour
 96 Hour
 1 Week
 2 Week

*For TEM Air 3 hr through 6 hr, please call ahead to schedule. *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.

PCM - Air <input type="checkbox"/> NIOSH 7400 <input type="checkbox"/> w/ OSHA 8hr. TWA PLM - Bulk (reporting limit) <input checked="" type="checkbox"/> PLM EPA 600/R-93/116 (<1%) <input type="checkbox"/> PLM EPA NOB (<1%) Point Count <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) Point Count w/Gravimetric <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) <input type="checkbox"/> NYS 198.1 (friable in NY) <input type="checkbox"/> NYS 198.6 NOB (non-friable-NY) <input type="checkbox"/> NIOSH 9002 (<1%)	TEM - Air <input type="checkbox"/> 4-4.5hr TAT (AHERA only) <input type="checkbox"/> AHERA 40 CFR, Part 763 <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> EPA Level II <input type="checkbox"/> ISO 10312 TEM - Bulk <input type="checkbox"/> TEM EPA NOB <input type="checkbox"/> NYS NOB 198.4 (non-friable-NY) <input type="checkbox"/> Chatfield SOP <input type="checkbox"/> TEM Mass Analysis-EPA 600 sec. 2.5 TEM - Water: EPA 100.2 Fibers >10µm <input type="checkbox"/> Waste <input type="checkbox"/> Drinking All Fiber Sizes <input type="checkbox"/> Waste <input type="checkbox"/> Drinking	TEM- Dust <input type="checkbox"/> Microvac - ASTM D 5755 <input type="checkbox"/> Wipe - ASTM D6480 <input type="checkbox"/> Carpet Sonication (EPA 600/J-93/167) Soil/Rock/Vermiculite <input type="checkbox"/> PLM CARB 435 - A (0.25% sensitivity) <input type="checkbox"/> PLM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - C (0.01% sensitivity) <input type="checkbox"/> EPA Protocol (Semi-Quantitative) <input type="checkbox"/> EPA Protocol (Quantitative) Other: <input type="checkbox"/>
---	--	--

Check For Positive Stop – Clearly Identify Homogenous Group

Samplers Name: _____ Samplers Signature: _____

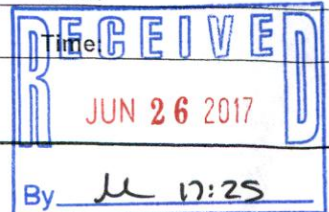
Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
WPPS-1A	LEFT LOUVER CAULKING		
WPPS-1B	" " "		
WPPS-2A	RIGHT LOUVER CAULKING		
WPPS-2B	" " "		
WPPS-3A	PARAPET ROOF ROLLED ROOFING/SEALANT COMP.		
WPPS-3B	" " "		
WPPS-4A	PARAPET BASE LAYER COMP.		
WPPS-4B	" " "		

Client Sample # (s): **WPPS-1A - WPPS-9B** Total # of Samples: **22**

Relinquished (Client): Date: _____ Time: _____

Received (Lab): _____ Date: _____

Comments/Special Instructions: _____





Asbestos Chain of Custody

EMSL Order Number *(Lab Use Only)*:

131702780

PHONE:
FAX:

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
WPPS - 5A	TERRAZZO GRAVEL ROOF LAYERS CONC.		
WPPS - 5B	" "		
WPPS - 6A	ROOF FLASHING SEALANT		
WPPS - 6B	" "		
WPPS - 7A	PUMP MOTOR EXHAUST INSUL - SKINNY		
WPPS - 7B	" " " "		
WPPS - 7C	" " " - WIDE		
WPPS - 7D	" " " "		
WPPS - 7E	" " " - ELBOW		
WPPS - 7F	" " " "		
WPPS - 8A	GENERATOR EXHAUST INSUL		
WPPS - 8B	" " "		
WPPS - 9A	PUMP AIR HANDLER VIB DAMPNER		
WPPS - 9B	" " "		

*Comments/Special Instructions:

RECEIVED
JUN 26 2017
 By ll 17:25

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MEL BLACKMAN
MASTER LEAD INSPECTOR

OSHA PRE-RENOVATION LEAD BASED
PAINT SURVEY

Project:

SAXONVILLE LEVEE PUMP STATION
FRAMINGHAM, MASSACHUSETTS

Date:

JUNE 23, 2017

Prepared For:

DPW/FRAMINGHAM
C/O NOBIS ENGINEERING, INC.
585 MIDDLESEX STREET
LOWELL, MASSACHUSETTS 01851
603-224-4182

Prepared & Inspected By:

MEL BLACKMAN
P O BOX 358
STONEHAM, MA 02180
781-820-8611

MEL BLACKMAN

MASTER LEAD INSPECTOR

P.O. BOX 358 - STONEHAM, MA. 02180

PHONE / FAX (781) 665-3806

1 Executive Summary:

Mel Blackman was retained by Nobis Engineering, Inc. of Lowell, Massachusetts to conduct an OSHA pre-renovation lead based paint survey located at the **Saxonville Levee Pump Station, in Framingham, Massachusetts on June 23, 2017**. The survey included representative sampling of interior and exterior painted surfaces of the accessible station components.

The intent of the lead paint survey was to identify building surfaces coated with lead based paint, utilizing XRF testing technology. The information collected, as a result of the testing, can be used to ensure OSHA compliance relative to worker exposure and proper disposal of renovation or demolition debris.

Some of the interior components tested were found to have high contents of lead based paint.

A summary of components coated with any lead based paint can be found in **Section 5**.

The information contained in this report summarizes the sampling and analytical methodologies, site description, materials found to contain lead, locations of surfaces, sample results and qualifications of personnel.

Massachusetts Childhood Lead Poisoning Prevention Program regulations 105 CMR 460.00 defines a dangerous level of lead for residential premises to be equal to or greater than 1.0 milligrams per square centimeter (mg/cm²). The New Hampshire Rules HeP-1600 agrees with Massachusetts, however, refers to that level of lead content as a "lead based substance". OSHA believes that exposure with "any" lead content may pose a potential health risk to workers.

2 Site Description:

The property inspected for the presence of lead based paint is located in **Framingham, Massachusetts**. The pump station was built in approximately 1979 for the Department of Public Works, Framingham. The purpose of this survey is to determine the extent of hazardous materials for an upcoming renovation project of the entire facility. Most surfaces were metal.

Surfaces tested consisted of doors & trim, window vents, pump cages, oil tank, equipment caps, exhaust pipes, pumps, pump motors, generators, burner, vent pipe, and pad.

3 Survey Personnel:

The OSHA survey for lead based paint was conducted by Mel Blackman, Massachusetts licensed Master Lead Inspector #M-1377, and New Hampshire Risk Assessor #RA-0026.

4 Testing Methodology:

Lead in paint sampling of representative bridge surfaces was conducted to assist with contractor compliance with the United States Department of Labor (US DOL) Occupational Safety and Health Administration (OSHA) Lead Exposure in Construction Standard (29 CFR 1936.62), and EPA Hazardous Waste Disposal Regulations (40 CFR Parts 260 through 271), as well as EPA's Renovation, Repair and Painting Final Rule (40 CFR 745), if applicable.

Representative surfaces from selected accessible areas of the bridge were analyzed using an X-Ray Fluorescence Analyzer (XRF). An RMD, LPA-1 Lead Paint Analyzer XRF, Serial Number 1409 was used, which is a complete lead paint analysis system that quickly, accurately, and non-destructively measures the concentration of LBP on surfaces.

In conducting the determination, various representative architectural elements were tested. Not all painted surfaces in each functional space were tested for the presence of lead-based paint. The contractor should assume that similar components that were not tested must be treated with the same caution and requirements as potentially having high lead concentrations.

Surfaces, which are listed as N/A, were not reachable for testing, and therefore the condition of the paint was listed. At least three to ten readings were taken for all similar groups of components.

The LPA-1 XRF relies on the measurement of the K-shell X-rays to determine the amount of lead present in the painted surface. K-shell X-rays can penetrate many layers of paint and allow a good measurement of the lead content of paint to be made without being significantly affected by the thickness or number of layers of paints on the surface of the sample.

The LPA-1 has the ability to analyze and compute corrections for the difference in the energy spectrums relating the different substrates. This analysis of the energy spectrum means that the lead paint reading displayed on the instrument already accounts for any substrate effects and no correction is required by the operator. The LPA-1's field of view is limited to a depth of 3/8", deep enough to handle virtually all painted surfaces, but not prone to detect lead objects located behind the surface.

There are two measurement modes of operation in the LPA-1 analyzer namely the "Standard Mode" and the "Quick Mode". In the "Standard" mode, the operator selects a fixed measurement time that remains constant irrespective of the lead signal. In the "Quick" mode, the analyzer automatically adjusts the measurement time to be the least time that is needed to make a definitive measurement with a 95% confidence level (2 sigma). The LPA-1 analyzer will finish a measurement once the 2-sigma confidence level is achieved and the data is statistically meaningful. This time period for conclusive measurements is typically between 1 to 5 seconds, but can extend to a measurement of 60 seconds depending on the action level for abatement.

I utilized the LPA-1 in the "Quick" mode to achieve a 95% confidence level down to 0.2 mg/cm² for the testing performed at this unit. The highest level of LBP reported by the LPA-1 using the "Quick" mode is a result of >9.9 mg/cm² (greater than 9.9 mg/cm²). Calibrations conducted indicated the instrument was functioning within the standard deviation as defined by the manufacturer.

Following the manufacturers' requirements for calibration, here are the results:

Cal. In: 1.1, 1.2, 1.1 mg/cm²

Cal. Out: 1.2, 0.8, 1.0 mg/cm²

5 Summary of XRF Testing Results:

The following list is arranged by location and component type. Surfaces found to have higher lead concentrations are listed first in each section. The contractor should assume that similar components that were not tested should be treated with the same caution and requirements as potentially having high lead concentrations. Surfaces, which may be listed as N/A, were not reachable for testing, and therefore it is assumed that they contain lead paint. The condition of the majority of painted surfaces containing high concentrations of lead paint is intact.

INTERIOR

Brown metal pump motors & components 0.7 – 4.0 mg/cm²

Brown metal pumps 0.9 – 2.5 mg/cm²

Brown metal equipment caps 0.3 – 0.5 mg/cm²

Red concrete pad 0.1 – 0.4 mg/cm²

Grey metal door & trim covering exterior window panels 0.3 – 0.4 mg/cm²

Green metal generator 0.0 – 0.3 mg/cm²

Red metal burner 0.0 – 0.2 mg/cm²

Brown metal vent pipe 0.1 – 0.2 mg/cm²

Black metal exhaust pipe 0.0 – 0.2 mg/cm²

Silver metal vents 0.0 – 0.1 mg/cm²

EXTERIOR

Grey metal oil tank 0.0 – 0.2 mg/cm²

Grey metal pump cage 0.1 – 0.3 mg/cm²

Grey metal door & trim 0.0 – 0.2 mg/cm²

Grey metal window vents 0.0 – 0.1 mg/cm²

Conclusions and Recommendations:

Some of the surfaces tested contain high levels of lead paint. A composite sampling of the aggregate waste stream from demolition would be necessary to determine whether the TCLP testing is considered hazardous waste. Prior to demolition of this building an OSHA site specific lead compliance plan should be developed including wasted segregation to minimize the potential generation of hazardous waste.

In areas where demolition is to occur and lead is present, the demolition debris waste stream should be further analyzed during segregation for compliance with EPA and MA DEP regulations to ensure proper disposal.

TCLP testing should be performed to characterize all waste prior to disposal. TCLP testing can be performed prior to waste segregation but results may not be indicative of the actual waste streams produced during demolition.

Demolition/renovation workers should be trained and protected in accordance with OSHA regulations 29 CFR 1926.62 and, if applicable, EPA's Renovation, Repair and Painting Final Rule (40 CFR 745), if applicable.

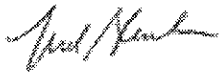
This section applies to all construction work where an employee may be occupationally exposed to lead. All construction work excluded from coverage in the general industry for lead by 29 CFR 1910.1025 (a)(2) is covered by this standard.

Construction work is defined as work for construction, alteration and/or repair, including painting and decorating. It includes but is not limited to the following:

- Demolition or salvage of structures where lead or materials containing lead is present
- Removal or encapsulation of materials containing lead;
- New Construction, alteration, repair, or renovation of structures, substrates, or portions thereof that contain lead, or materials containing lead.

- Handlers of salvageable materials and the treatment/disposal facility must be informed of the material's lead content. All personnel involved must be trained in personal protection and proper work practice procedures in accordance with OSHA regulations.
- All waste contaminated with lead paint should be disposed of in accordance with all state, local, and federal regulations.

Respectfully submitted



Mel Blackman

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July 3, 2017

Jeff Brunelle
Nobis Engineering
585 Middlesex Street
Lowell, MA 01851

Project Location: Saxonville PS, Framingham, MA
Client Job Number:
Project Number: 86640
Laboratory Work Order Number: 17F1450

Enclosed are results of analyses for samples received by the laboratory on June 26, 2017. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, reading "Meghan E. Kelley". The signature is written in a cursive style with a large, sweeping 'y' at the end.

Meghan E. Kelley
Project Manager

Table of Contents

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B180535	7
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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Nobis Engineering
585 Middlesex Street
Lowell, MA 01851
ATTN: Jeff Brunelle

REPORT DATE: 7/3/2017

PURCHASE ORDER NUMBER: MO 16-008

PROJECT NUMBER: 86640

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 17F1450

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Saxonville PS, Framingham, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
WPPS-PCB1	17F1450-01	Caulk		SW-846 8082A	

CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

SW-846 8082A

Qualifications:

O-32

A dilution was performed as part of the standard analytical procedure.

Analyte & Samples(s) Qualified:

17F1450-01[WPPS-PCB1]

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing. I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.



Lisa A. Worthington
Project Manager

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Saxonville PS, Framingham, MA

Sample Description:

Work Order: 17F1450

Date Received: 6/26/2017

Field Sample #: WPPS-PCB1

Sampled: 6/23/2017 13:33

Sample ID: 17F1450-01

Sample Matrix: Caulk

Sample Flags: O-32

Polychlorinated Biphenyls with 3540 Soxhlet Extraction

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	6/29/17	7/1/17 14:33	JMB
Aroclor-1221 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	6/29/17	7/1/17 14:33	JMB
Aroclor-1232 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	6/29/17	7/1/17 14:33	JMB
Aroclor-1242 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	6/29/17	7/1/17 14:33	JMB
Aroclor-1248 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	6/29/17	7/1/17 14:33	JMB
Aroclor-1254 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	6/29/17	7/1/17 14:33	JMB
Aroclor-1260 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	6/29/17	7/1/17 14:33	JMB
Aroclor-1262 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	6/29/17	7/1/17 14:33	JMB
Aroclor-1268 [1]	ND	0.75	mg/Kg	4		SW-846 8082A	6/29/17	7/1/17 14:33	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		87.3	30-150					7/1/17 14:33	
Decachlorobiphenyl [2]		97.0	30-150					7/1/17 14:33	
Tetrachloro-m-xylene [1]		44.0	30-150					7/1/17 14:33	
Tetrachloro-m-xylene [2]		41.9	30-150					7/1/17 14:33	

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Sample Extraction Data

Prep Method: SW-846 3540C-SW-846 8082A

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
17F1450-01 [WPPS-PCB1]	B180535	0.532	10.0	06/29/17

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

QUALITY CONTROL

Polychlorinated Biphenyls with 3540 Soxhlet Extraction - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B180535 - SW-846 3540C										
Blank (B180535-BLK1)										
Prepared: 06/29/17 Analyzed: 07/01/17										
Aroclor-1016	ND	0.20	mg/Kg							
Aroclor-1016 [2C]	ND	0.20	mg/Kg							
Aroclor-1221	ND	0.20	mg/Kg							
Aroclor-1221 [2C]	ND	0.20	mg/Kg							
Aroclor-1232	ND	0.20	mg/Kg							
Aroclor-1232 [2C]	ND	0.20	mg/Kg							
Aroclor-1242	ND	0.20	mg/Kg							
Aroclor-1242 [2C]	ND	0.20	mg/Kg							
Aroclor-1248	ND	0.20	mg/Kg							
Aroclor-1248 [2C]	ND	0.20	mg/Kg							
Aroclor-1254	ND	0.20	mg/Kg							
Aroclor-1254 [2C]	ND	0.20	mg/Kg							
Aroclor-1260	ND	0.20	mg/Kg							
Aroclor-1260 [2C]	ND	0.20	mg/Kg							
Aroclor-1262	ND	0.20	mg/Kg							
Aroclor-1262 [2C]	ND	0.20	mg/Kg							
Aroclor-1268	ND	0.20	mg/Kg							
Aroclor-1268 [2C]	ND	0.20	mg/Kg							
Surrogate: Decachlorobiphenyl	4.63		mg/Kg	4.00		116	30-150			
Surrogate: Decachlorobiphenyl [2C]	5.24		mg/Kg	4.00		131	30-150			
Surrogate: Tetrachloro-m-xylene	4.12		mg/Kg	4.00		103	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	4.00		mg/Kg	4.00		99.9	30-150			
LCS (B180535-BS1)										
Prepared: 06/29/17 Analyzed: 07/01/17										
Aroclor-1016	4.2	0.20	mg/Kg	4.00		105	40-140			
Aroclor-1016 [2C]	4.0	0.20	mg/Kg	4.00		99.5	40-140			
Aroclor-1260	3.9	0.20	mg/Kg	4.00		96.5	40-140			
Aroclor-1260 [2C]	3.7	0.20	mg/Kg	4.00		93.4	40-140			
Surrogate: Decachlorobiphenyl	4.58		mg/Kg	4.00		115	30-150			
Surrogate: Decachlorobiphenyl [2C]	5.13		mg/Kg	4.00		128	30-150			
Surrogate: Tetrachloro-m-xylene	4.13		mg/Kg	4.00		103	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	4.00		mg/Kg	4.00		100	30-150			
LCS Dup (B180535-BSD1)										
Prepared: 06/29/17 Analyzed: 07/01/17										
Aroclor-1016	4.4	0.20	mg/Kg	4.00		111	40-140	5.21	30	
Aroclor-1016 [2C]	4.1	0.20	mg/Kg	4.00		103	40-140	3.26	30	
Aroclor-1260	4.0	0.20	mg/Kg	4.00		101	40-140	4.26	30	
Aroclor-1260 [2C]	3.9	0.20	mg/Kg	4.00		97.8	40-140	4.61	30	
Surrogate: Decachlorobiphenyl	4.80		mg/Kg	4.00		120	30-150			
Surrogate: Decachlorobiphenyl [2C]	5.37		mg/Kg	4.00		134	30-150			
Surrogate: Tetrachloro-m-xylene	4.30		mg/Kg	4.00		107	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	4.19		mg/Kg	4.00		105	30-150			

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FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit
DL	Method Detection Limit
MCL	Maximum Contaminant Level
	Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.
	No results have been blank subtracted unless specified in the case narrative section.
O-32	A dilution was performed as part of the standard analytical procedure.

CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
---------	----------------

No certified Analyses included in this Report

The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2005	100033	02/1/2018
MA	Massachusetts DEP	M-MA100	06/30/2018
CT	Connecticut Department of Public Health	PH-0567	09/30/2017
NY	New York State Department of Health	10899 NELAP	04/1/2018
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2018
RI	Rhode Island Department of Health	LAO00112	12/30/2017
NC	North Carolina Div. of Water Quality	652	12/31/2017
NJ	New Jersey DEP	MA007 NELAP	06/30/2018
FL	Florida Department of Health	E871027 NELAP	06/30/2018
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2017
ME	State of Maine	2011028	06/9/2019
VA	Commonwealth of Virginia	460217	12/14/2017
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2017
VT-DW	Vermont Department of Health Drinking Water	VT-255716	06/12/2018
NC-DW	North Carolina Department of Health	25703	07/31/2018



Phone: 413-525-2332

Fax: 413-525-6405

Email: info@contestlabs.com

www.contestlabs.com

CHAIN OF CUSTODY RECORD

17F1450

Rev. 04.05.12

39 Spruce Street
East longmeadow, MA 01028

Company Name: Nobis
 Address: 585 MIDGROVE ST
Lowell MA
 Attention: J Brunelle
 Project Location: Saxonville PS, Framingham MA
 Sampled By: JNB
 Project Proposal Provided? (for billing purposes)
 yes _____ proposal date

Telephone: 978-703-6038
 Project # 80640
 Client PO# _____
DATA DELIVERY (check all that apply)
 FAX EMAIL WEBSITE
 Fax # _____
 Email: jbrunelle@nobis.org
 Format: PDF EXCEL GIS
 OTHER _____
 "Enhanced Data Package"

80640-SUNTEST																				

of Containers _____
 ** Preservation _____
 *** Container Code _____
Dissolved Metals
 Field Filtered
 Lab to Filter
 *** Cont. Code:
 A=amber glass
 G=glass
 P=plastic
 ST=sterile
 V= vial
 S=summa can
 T=tedlar bag
 O=Other _____
 ** Preservation
 I = Iced
 H = HCL
 M = Methanol
 N = Nitric Acid
 S = Sulfuric Acid
 B = Sodium bisulfate
 X = Na hydroxide
 T = Na thiosulfate
 O = Other _____
 * Matrix Code:
 GW= groundwater
 WW= wastewater
 DW= drinking water
 A = air
 S = soil/solid
 SL= sludge
 O = other _____

Con-Test Lab ID <small>(laboratory use only)</small>	Client Sample ID / Description	Collection		Composite	Grab	*Matrix Code	Conc. Code
		Beginning Date/Time	Ending Date/Time				
	WPS - PCB1	6/23/17	1333		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>

Comments: _____

Please use the following codes to let Con-Test know if a specific sample may be high in concentration in Matrix/Conc. Code Box:

 H - High; M - Medium; L - Low; C - Clean; U - Unknown

Relinquished by: (signature) _____ Date/Time: _____
 Received by: (signature) _____ Date/Time: 6-26-17 9:50
 Relinquished by: (signature) _____ Date/Time: 6-26-17 5:15
 Received by: (signature) _____ Date/Time: 6/26/17 1715

Turnaround ^{††}
 7-Day
 10-Day
 Other _____
RUSH [†]
 24-Hr 48-Hr
 72-Hr 4-Day
 Require lab approval

Detection Limit Requirements
 Massachusetts: _____
 Connecticut: _____
 Other: _____

Is your project MCP or RCP ?
 MCP Form Required
 RCP Form Required
 MA State DW Form Required PWSID # _____

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 ANALYTICAL LABORATORY

Doc# 277 Rev 5 2017

Login Sample Receipt Checklist - (Rejection Criteria Listing - Using Acceptance Policy) Any False Statement will be brought to the attention of the Client - State True or False

Client Nobis
 Received By JM Date 6/26/17 Time 1715
 How were the samples received? In Cooler T No Cooler On Ice T No Ice
 Direct From Sample Ambient Melted Ice
 Were samples within Temperature? 2-6°C T By Gun # 1 Actual Temp - 3.5
 By Blank # Actual Temp -
 Was Custody Seal Intact? N/A Were Samples Tampered with? F
 Was COC Relinquished? T Does Chain Agree With Samples? T
 Are there broken/leaking/loose caps on any samples? F
 Is COC in ink/ Legible? T Were samples received within holding time? T
 Did COC include all pertinent Information? Client? T Analysis? T Sampler Name? T
 Project? T ID's? T Collection Dates/Times? T
 Are Sample labels filled out and legible? T
 Are there Lab to Filters? N/A Who was notified?
 Are there Rushes? N/A Who was notified?
 Are there Short Holds? N/A Who was notified?
 Is there enough Volume? T
 Is there Headspace where applicable? N/A MS/MSD? N/A
 Proper Media/Containers Used? T splitting samples require N/A
 Were TB's received? N/A On COC? N/A
 Do All Samples Have the proper pH? N/A Acid Base

Vials	#	Containers:	#	#	#
Unp-		1 Liter Amb.		1 Liter Plastic	16 oz Amb.
HCL-		500 mL Amb.		500 mL Plastic	8oz Amb/Clear
Meoh-		250 mL Amb.	1	250 mL Plastic	4oz Amb/Clear
Bisulfate-		Col./Bacteria		Flashpoint	2oz Amb/Clear
DI-		Other Plastic		Other Glass	Encore
Thiosulfate-		SOC Kit		Plastic Bag	Frozen:
Sulfuric-		Perchlorate		Ziplock	

Unused Media

Vials	#	Containers:	#	#	#
Unp-		1 Liter Amb.		1 Liter Plastic	16 oz Amb.
HCL-		500 mL Amb.		500 mL Plastic	8oz Amb/Clear
Meoh-		250 mL Amb.		250 mL Plastic	4oz Amb/Clear
Bisulfate-		Col./Bacteria		Flashpoint	2oz Amb/Clear
DI-		Other Plastic		Other Glass	Encore
Thiosulfate-		SOC Kit		Plastic Bag	Frozen:
Sulfuric-		Perchlorate		Ziplock	

Comments:

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APPENDIX D

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Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 2 – Determination of Applicability
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. General Information

Important:

When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



From:

Framingham
Conservation Commission

To: Applicant

Julie Liu, PE
Name
110 Western Avenue
Mailing Address
Framingham MA 01702
City/Town State Zip Code

Property Owner (if different from applicant):

Name

Mailing Address

City/Town State Zip Code

1. Title and Date (or Revised Date if applicable) of Final Plans and Other Documents:

<u>Request for Determination of Applicability</u>	<u>November 20, 2019</u>
Title	Date
_____	_____
Title	Date
_____	_____
Title	Date

2. Date Request Filed:

November 20, 2019

B. Determination

Pursuant to the authority of M.G.L. c. 131, § 40, the Conservation Commission considered your Request for Determination of Applicability, with its supporting documentation, and made the following Determination.

Project Description (if applicable):

The Applicant proposes work to support the replacement of the Edgell Road Water Pumping Station, which includes activities such as installation of a bypass system, removal of 6 trees, and replacement of the pump station within the existing footprint. Portions of this work are within Riverfront Area, the State 100' Buffer Zone, and the Local 125' Buffer Zone.

Project Location:

663 Edgell Road
Street Address
100
Assessors Map/Plat Number

Framingham
City/Town
367
Parcel/Lot Number



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Determination (cont.)

The following Determination(s) is/are applicable to the proposed site and/or project relative to the Wetlands Protection Act and regulations:

Positive Determination

Note: No work within the jurisdiction of the Wetlands Protection Act may proceed until a final Order of Conditions (issued following submittal of a Notice of Intent or Abbreviated Notice of Intent) or Order of Resource Area Delineation (issued following submittal of Simplified Review ANRAD) has been received from the issuing authority (i.e., Conservation Commission or the Department of Environmental Protection).

1. The area described on the referenced plan(s) is an area subject to protection under the Act. Removing, filling, dredging, or altering of the area requires the filing of a Notice of Intent.

2a. The boundary delineations of the following resource areas described on the referenced plan(s) are confirmed as accurate. Therefore, the resource area boundaries confirmed in this Determination are binding as to all decisions rendered pursuant to the Wetlands Protection Act and its regulations regarding such boundaries for as long as this Determination is valid.

2b. The boundaries of resource areas listed below are not confirmed by this Determination, regardless of whether such boundaries are contained on the plans attached to this Determination or to the Request for Determination.

3. The work described on referenced plan(s) and document(s) is within an area subject to protection under the Act and will remove, fill, dredge, or alter that area. Therefore, said work requires the filing of a Notice of Intent.

4. The work described on referenced plan(s) and document(s) is within the Buffer Zone and will alter an Area subject to protection under the Act. Therefore, said work requires the filing of a Notice of Intent or ANRAD Simplified Review (if work is limited to the Buffer Zone).

5. The area and/or work described on referenced plan(s) and document(s) is subject to review and approval by:

Name of Municipality

Pursuant to the following municipal wetland ordinance or bylaw:

Name

Ordinance or Bylaw Citation



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Determination (cont.)

6. The following area and/or work, if any, is subject to a municipal ordinance or bylaw but not subject to the Massachusetts Wetlands Protection Act:

7. If a Notice of Intent is filed for the work in the Riverfront Area described on referenced plan(s) and document(s), which includes all or part of the work described in the Request, the applicant must consider the following alternatives. (Refer to the wetland regulations at 10.58(4)c. for more information about the scope of alternatives requirements):

- Alternatives limited to the lot on which the project is located.
- Alternatives limited to the lot on which the project is located, the subdivided lots, and any adjacent lots formerly or presently owned by the same owner.
- Alternatives limited to the original parcel on which the project is located, the subdivided parcels, any adjacent parcels, and any other land which can reasonably be obtained within the municipality.
- Alternatives extend to any sites which can reasonably be obtained within the appropriate region of the state.

Negative Determination

Note: No further action under the Wetlands Protection Act is required by the applicant. However, if the Department is requested to issue a Superseding Determination of Applicability, work may not proceed on this project unless the Department fails to act on such request within 35 days of the date the request is post-marked for certified mail or hand delivered to the Department. Work may then proceed at the owner's risk only upon notice to the Department and to the Conservation Commission. Requirements for requests for Superseding Determinations are listed at the end of this document.

1. The area described in the Request is not an area subject to protection under the Act or the Buffer Zone.
2. The work described in the Request is within an area subject to protection under the Act, but will not remove, fill, dredge, or alter that area. Therefore, said work does not require the filing of a Notice of Intent.
3. The work described in the Request is within the Buffer Zone, as defined in the regulations, but will not alter an Area subject to protection under the Act. Therefore, said work does not require the filing of a Notice of Intent, subject to the following conditions (if any).
- 1.) Erosion control barriers shall be installed per the plan of record.
 - 2.) A pre-construction site meeting shall be held on-site with Conservation Staff.
 - 3.) Conservation Staff shall be immediately notified if dewatering is needed to perform the proposed work, and a dewatering plan shall be forwarded to said Staff.
-
4. The work described in the Request is not within an Area subject to protection under the Act (including the Buffer Zone). Therefore, said work does not require the filing of a Notice of Intent, unless and until said work alters an Area subject to protection under the Act.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 2 – Determination of Applicability
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Determination (cont.)

5. The area described in the Request is subject to protection under the Act. Since the work described therein meets the requirements for the following exemption, as specified in the Act and the regulations, no Notice of Intent is required:

310 CMR 10.02(2)(a)(2)
 Exempt Activity (site applicable statutory/regulatory provisions)

6. The area and/or work described in the Request is not subject to review and approval by:

Name of Municipality

Pursuant to a municipal wetlands ordinance or bylaw.

Name

Ordinance or Bylaw Citation

C. Authorization

This Determination is issued to the applicant and delivered as follows:

by hand delivery on

by certified mail, return receipt requested on

12/6/19
 Date

Date

This Determination is valid for **three years** from the date of issuance (except Determinations for Vegetation Management Plans which are valid for the duration of the Plan). This Determination does not relieve the applicant from complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.

This Determination must be signed by a majority of the Conservation Commission. A copy must be sent to the appropriate DEP Regional Office (see <http://www.mass.gov/eea/agencies/massdep/about/contacts/>) and the property owner (if different from the applicant).

Signatures:

Robert B. Best _____

[Signature] _____

[Signature] _____

[Signature] _____

12/4/19
 Date



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

D. Appeals

The applicant, owner, any person aggrieved by this Determination, any owner of land abutting the land upon which the proposed work is to be done, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate Department of Environmental Protection Regional Office (see <http://www.mass.gov/eea/agencies/massdep/about/contacts/>) to issue a Superseding Determination of Applicability. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and Fee Transmittal Form (see Request for Departmental Action Fee Transmittal Form) as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Determination. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant if he/she is not the appellant. The request shall state clearly and concisely the objections to the Determination which is being appealed. To the extent that the Determination is based on a municipal ordinance or bylaw and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
Request for Departmental Action Fee
Transmittal Form

DEP File Number: _____

Provided by DEP _____

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. Request Information

1. Location of Project

_____	_____
a. Street Address	b. City/Town, Zip
_____	_____
c. Check number	d. Fee amount

2. Person or party making request (if appropriate, name the citizen group's representative):

Name

Mailing Address

_____	_____	_____
City/Town	State	Zip Code
_____	_____	
Phone Number	Fax Number (if applicable)	

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

Name

Mailing Address

_____	_____	_____
City/Town	State	Zip Code
_____	_____	
Phone Number	Fax Number (if applicable)	

4. DEP File Number:

Important:
 When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



B. Instructions

1. When the Departmental action request is for (check one):

- Superseding Order of Conditions – Fee: \$120.00 (single family house projects) or \$245 (all other projects)
- Superseding Determination of Applicability – Fee: \$120
- Superseding Order of Resource Area Delineation – Fee: \$120

Send this form and check or money order, payable to the *Commonwealth of Massachusetts*, to:

Department of Environmental Protection
 Box 4062
 Boston, MA 02211



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
Request for Departmental Action Fee
Transmittal Form

DEP File Number:

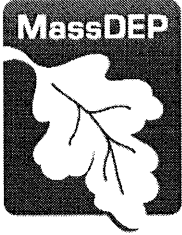
Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Instructions (cont.)

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.
3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see <http://www.mass.gov/eea/agencies/massdep/about/contacts/>).
4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

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Department of Environmental Protection

Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

December 31, 2019

Julie Liu
Framingham Water Division
110 Western Ave
Framingham, MA 01702

Re: City/Town: Framingham
PWS Name: Framingham Water Division
PWS ID #: 3100000
Program: System Modifications
Action: Approval – Distribution System Modifications
– BRP WS 32 – Edgell Road Pump Station
Activity No.: X284564

Dear Ms. Liu:

Please find attached the Northeast Regional Office of the Department of Environmental Protection's Drinking Water Program (MassDEP, or the Department) findings from its review of the permit application for the above referenced project.

With this notification, the Department grants formal approval for the Framingham Water Division to construct the modifications described in the submittals, subject to the understandings and conditions outlined in the attachment.

Please note that the signature on this cover letter indicates formal issuance of the attached document. If you have any questions regarding this letter, please contact Nick Zessoules at (978) 694-3230.

Sincerely,

Nick Zessoules
Environmental Engineer
Drinking Water Program

Sincerely,

Amy Lachance
Drinking Water Section Chief
Northeast Regional Office

cc: MassDEP Drinking Water Program/WQA, 1 Winter Street, Boston MA (no attachment)
Alan Gunnison, BETA Group, Inc., 701 George Washington Highway, Lincoln, RI 02865

File name: Y:\DWP Archive\NERO\Framingham-3100000-System Modifications-2019-12-31
Page 1 of 9

Regulatory Requirement and Criteria

The Massachusetts Drinking Water Regulations under 310 CMR 22.04, require public water systems to obtain the Department's approval for any proposed substantial modifications. As criteria for approval, the public water system must demonstrate that the facilities are in compliance with the Massachusetts Drinking Water Regulations (310 CMR 22.00) (the Regulations) and the Department's Guidelines and Policies for Public Water Supplies (the Guidelines).

Application Summary

On November 14, 2019, the Department received a permit application from the Framingham Water Division (Framingham) for construction of the Edgell Road Pump Station. The permit application consisted of a transmittal form, a completed permit application form, a cover letter, and a set of plans and specifications. The transmittal from indicates that the submittal was prepared by Alan Gunnison, a Massachusetts registered professional engineer. In addition to the initial submittal, the Engineer provided clarifications and additional data used for the design of the station in messages dated November 25, 2019 and December 12, 2019 in response to Department comments identified during its review of the submittal.

Background

The Edgell Pump Station is a pump station used as one of three other pump stations to supply water to Framingham's distribution system. According to a 2017 Water System Master Plan report, the station was first constructed in 1950, with renovations, to include replacing two of the pumps, completed in 1991.

According to the Water System Master Plan report, the station has three primary service pumps and a back-up pump, with the three service pumps having a nominal capacity of 9.4 mgd (equal to the sum of the rated capacities of each pump), and the back-up pump having a rated capacity of 7.0 mgd.

The Water System Master Plan report included an assessment of the condition of the pump station. That assessment noted signs of deterioration of the walls and other architectural components, HVAC and electrical upgrades, and recommended replacing the four pumps.

Summary of Work

1. Conceptual Overview:

- a. Conceptual Overview: As described in the submittal, the proposed work consists of the rehabilitation of an existing pump station. Components of the work will include a rehabilitation of the existing building, replacement of the pumps and associated piping, and the installation of an emergency generator. The submittal indicates that the existing pump station will be removed from service while the facility is rehabilitated, with a temporary pumping system capable of pumping provided as part of the work.
- b. Hydraulic Requirements:
 - i. The Edgell Road Pump Station pumps water into Framingham's Town pressure zone. That zone receives water from two other pump stations and has three storage tanks. The storage tanks have overflow elevations of approximately 371 feet. The two other pump station have

capacities of 8.0 and 5.4 mgd. One of the other pump stations has an emergency generator, and the other has a diesel driven 5 mgd capacity back-up pump.

- ii. The Edgell Road Pump Station draws water from MWRA Meter 211. Flow data provided by the MWRA and the consultant indicate that the average flow through that meter for the past three years has ranged from 2.451 to 2.122 mgd, and daily flows have ranged from 0.202 to 4.249 mgd, with daily flows less than 1 mgd on 23 days during 2015 through 2018, and greater than 4 mgd once during that time period. For the three meters that feed the Town service area, the flow data provided by the MWRA indicates that the average flows into the Town zone have ranged from 5.4 to 5.7 mgd over the past three years.
 - iii. As noted, the existing pump station has a nominal capacity of 9.4 mgd and a back-up capacity of 7.0 mgd. The engineer confirmed that the 7.0 mgd backup capacity would not be available while the primary pumps were in service, requiring a new pump station to have at least a capacity of 9.4 mgd in order to maintain the system's current capacity. As outlined in the information submitted, the existing pumps are operated based on water levels in the storage tanks, and this method of control will remain for the new pumping system.
- c. System Impacts: In response to the Department's concerns about impacts of the modifications on the system, the Engineer has indicated that the proposed modifications would not result in increased water age; otherwise the Engineer did not identify any other impacts on water quality within the system.

2. Description of Work Items:

- a. Site Work: The submittal indicates that site work will include installing piping and associated valves and other appurtenances for a temporary pumping system, replacing portions of the existing perimeter fence and access gate, replacing the existing cesspool with a connection to the sanitary sewer using a grinder pump and new sanitary sewer pipe, and the installation of a concrete pad for a generator.
- b. Structural/Mechanical/Electrical Work: Rehabilitation work to the building described on the plans includes replacing gutters and downspouts, replacing doors and windows, removing and replacing exterior and partition walls, and installing a new membrane roof system. The plans call for the existing foundation, to include the pipe trenches to remain. Mechanical work shown on the plans includes the installation of a new HVAC system, which the plans indicate will include a roof mounted heating and cooling unit, an exhaust fan, and associated supply and return air ductwork and registers. Plumbing work shown on the plans includes installing new bathroom plumbing fixtures. Electrical work shown on the plans includes demolition of the existing electrical equipment and the installation of a new transformer, switchgear, a main distribution new interior and exterior lighting fixtures. A new 300KW, diesel fired emergency generator, provided with an enclosure and double-walled fuel tank (which will also include a leak detection alarm) will also be installed, along with an automatic transfer switch and controls so that the generator will automatically start in the event of a loss of normal power. Instrumentation and controls work described in the submittal includes installing flow and pressure transmitters, a new remote terminal unit connected to the system's existing SCADA system, and intrusion and fire detection systems.
- c. Booster Pumps: The submittal indicates that the existing pumps will be removed and a total of three new pumps will be installed. The specifications described the pumps as horizontal, split-

case, centrifugal pumps, and that each pump will have a capacity of 2,200 gpm at a TDH of 115 feet, providing a total nominal capacity 9.5 mgd. The specifications call for the pumps to be provided with mechanical seals and with variable frequency driven, 100 horsepower motors. For control of the pump operations, the engineer has indicated that the pumps will operate based on the same tank level signals as used for control of the existing pumps. The specifications indicate that the pumps will operate at an operator-set constant speed when called to run. The specifications also indicate that the pumps will shut down when the suction pressure is below a set point or the discharge pressure exceeds a set point.

- d. **Piping & Appurtenances:** The submittal indicates that the existing piping in the pump station will be removed and replaced with new piping and appurtenances, with the new piping connecting where the pipe enters and exists the building in the existing trenches. The plans indicate that the new pipe will consist of ductile iron pipe and appurtenances conforming to ANSI standards. The plans provide for a check valve on the discharge of each pump and gate valves on the suction and discharge of each pump to allow each pump to be isolated if needed, with those valves conforming to AWWA Standards. For flow measurement, an existing flow meter located outside of the station will be used. The plans also provide for a surge relief valve to be provided on the discharge side of the pumps. The discharge of surge relief valve is shown as located outside of the building. The plans call for the discharge to be provided with an elbow so that any discharge is directed downward and with a Tideflex style check valve. The plans also provide for a concrete splash pad to be provided below the discharge. A new sump pump for the pipe trench, with the discharge shown as provided with a check valve and connecting to the existing discharge pipe, is also included in the plans.
- e. **Temporary Pumping System:** To replace some of the available capacity while the existing pump station is removed from service for the work, the plans call for a temporary pumping system to be provided. The plans indicate that the temporary system will be located on the property within the existing fenced area. The plans show that the temporary system will draw water through a new tapping sleeve connecting to the pipe that runs from the MWRA system to the existing pump station, and that the system will discharge pipe to a new tee in the pipe that conveys the discharge from the existing pump station. The specifications call for the temporary pumping system to be capable of maintaining a discharge pressure of between 70 and 76 psi with an average flow of 2.31 mgd. The specifications call for the system to consist of end-suction type pumps with mechanical seals powered by a diesel-fired engine. The specifications call for the piping for the system to include a flow meter and a surge relief valve.

Approval & Conditions

Pursuant to the Department's authority under 310 CMR 22.04(7) to require that each supplier of water operate and maintain its system in a manner that ensures the delivery of safe drinking water to consumers, this permit is made subject to the following conditions:

1. **Changes/Modifications:** Construction shall be completed in strict accordance with the submitted plans. Any changes made to the submitted plans or specifications affecting the capacity, hydraulic conditions, operating units, functioning of water treatment processes or quality of water to be delivered, shall receive prior written approval of the Department's Northeast Regional Office Drinking Water Program. Any such changes made without prior approval shall constitute a violation of the "Regulations" which may result in legal actions by MassDEP including revocation of this permit, criminal prosecution, court imposed penalties or civil administrative penalties assessed by MassDEP.

2. Additional Requirements: As a condition of approval, the applicant shall incorporate the following features into the construction:
 - a. Pump Control Settings: As noted, the operation of the pumps, to include the temporary pumps, will be based on water levels in storage tanks located in the service area. Framingham shall ensure that the setting used to control the pumps will provide adequate water turn-over within the tanks such that water quality within the tank and distribution system and an adequate storage volume is maintained at all times.
 - b. Suction Pressure Shut-Off: The control system shall be programmed to shut down the pumps if the suction pressure drops to 20 psi or less as called for in the Guidelines.
 - c. Pressure Gages: The Guidelines call for pressure gages on the suction and discharge of each pump. Those gages were not shown on the plans provided. Framingham shall have the gages installed as called for in the Guidelines.
 - d. Sample Tap: The Guidelines call for pump stations to have representative sample tap. In light of that requirement, a sample tap shall be provided at the station. The sample tap shall conform to the requirements for samples taps outlined under the Guidelines' General Design Considerations.
 - e. Surge Relief Valve Discharge: The surge relief valve discharge shall terminate at a sufficient height to provide an adequate air gap under all conditions, and the area shall be graded to prevent the discharge from causing damage to the facility or adjacent properties.
 - f. Temporary Pump System
 1. Piping Drains: Details on the plans provided as part of the submittal include taps that allow the pipes that connect to the temporary pumping system to be drained. The piping attached to the taps is shown as terminating in a sub-surface dry well. That type of termination creates a potential cross-connection. To protect the quality of water in the piping from any potential contamination due to a cross connection, the drains shall be removed, or the cross connection eliminated or otherwise protected (such as by "day-lighting" the end of the pipe).
 2. Pumps: As called for in the Guideline, at least two pumps shall be provided as part of the temporary system, with each pump provided with sufficient capacity to provide redundant capacity for the system.
 3. Piping and Taps for Sampling and Emergency Disinfection: The temporary system shall incorporate all applicable requirements for pump station piping and appurtenance called for in the Guidelines, to include providing taps for collecting samples and for emergency disinfection.
 4. Protection from Weather and Flooding: The system shall be located in an area not subject to flooding and provided with adequate protection to prevent damage or interruption in service due to weather.
 5. Disinfection: All components of the temporary system in contact with potable water shall be disinfected in accordance with applicable AWWA Standards, and as outlined herein, prior to activation.

6. **Security:** As noted, the plans show that the temporary system will be located within the existing fenced area. The fencing around the equipment shall be maintained throughout the work, and adequate additional measures implemented as necessary to prevent unauthorized access and vandalism as called for in the Guidelines.
 7. **Protection from Contamination during Operation:** All piping and equipment shall be installed and maintained in a manner to prevent contamination of the water supply.
 8. **Operation:** While in operation, the temporary system will be a component of the Framingham system. As such, and as called for in the Regulations, the operation and maintenance of the system shall be under the direct supervision of Framingham's primary operator. As called for in the Regulations, all emergencies shall be responded to by a certified operator within one hour.
 9. **Capacity:** As noted, the submittal calls for the temporary system to have adequate capacity to provide a flow equal to about the average daily flow, which is less than the capacity of the existing pump station. Since the other pump stations that supply water from the MWRA have sufficient capacity to meet maximum daily demands without this station in service, the Department will allow this temporary reduction in capacity, provided that Framingham maintains the capacity of the other stations during the construction period.
 10. **Backup Power:** The submittal only provides for a single source of power for the temporary system. The Guidelines call for pump stations to have standby power if the loss of power would cause a loss of essential service. Since the other pump stations that supply water to the service area have sufficient capacity, the Department will allow the single source of power, provided that the capacity of back-up power is maintained at the other pump stations.
- g. **Separation of Water Lines and Sanitary Sewer:** The plans include a new gravity sewer pipe that is shown as crossing a water conduit. The engineer has also indicated that a sleeve will be provided where the sewer crossing the conduit. Additionally, as a condition of approval, the sanitary sewer lines shall be installed with the separation between the potable water piping and the sewer piping conforming to the requirements of the Guidelines.
 - h. **Backflow Prevention Device Plans:** The proposal indicates that a reduced pressure zone assembly device will be installed at the facility. The Department has designated Framingham as responsible for the review of proposed backflow device installations. In light of that, Framingham shall review the proposed design data sheet and ensure that the proposed installation complies with the requirements of 310 CMR 22.22.
 - i. **RLDWA Compliance:** All piping and plumbing materials shall conform to the requirements of the Reduction of Lead in Drinking Water Act.
3. **Final Plans and Specifications:** The set of plans and specifications provided as part of the permit application are labeled "FOR PERMIT REVIEW ONLY" and do not have any professional engineering stamp. A copy of the final plans and specifications, with appropriate professional engineer stamps, shall be provided to the Department prior to construction, along with a letter detailing the differences between those documents and the documents submitted for approval. As previously noted, the Regulations require Department approval prior to any construction of substantial modifications of a Public Water Supply.

4. Operation During Construction: Work may be performed while the facilities may be supplying water to the public.
 - a. At all times, the existing facilities shall be operated as necessary to comply with the requirements of the Massachusetts Drinking Water Regulations and provide the Public Water System with a continuous source of supply.
 - b. The use of the temporary equipment shall be subject to MassDEP approval. Please refer to the requirements for requesting final approval.
5. Protection of the Environment:
 - a. The work includes demolition and will generate different types of waste. All wastes shall be disposed of in accordance with all applicable laws, rules, and regulations.
 - b. The work includes the use of diesel fueled equipment that will be located adjacent to equipment and facilities used to supply potable water. All fuel containing equipment shall be provided with secondary containment. Procedures shall be developed and implemented to prevent releases from fueling operations. All releases shall be reported in accordance with applicable regulations.
6. Use of Approved Materials, Equipment and Technology: No chemicals, drinking water additives, or treatment devices or equipment that come into direct contact with drinking water, shall be installed unless such devices or equipment have received the prior written approval of MassDEP. All temporary piping shall meet NSF Standard 61 certification and be disinfected and made in a reliable and sanitary manner such that impurities are not imparted to the water.
7. Compliance with Other Approvals: The applicant shall obtain all required local, State, and Federal approvals as condition of this approval. All work shall be completed in accordance with applicable laws, codes and regulations.
8. Disinfection: Prior to being placed in service, all facilities and equipment that which can convey or store potable water shall be disinfected in accordance with the applicable AWWA Standard and shall be free of coliform bacteria prior to being place into service. To determine adequate disinfection, samples from the completed facilities shall be collected and analyzed for coliform bacteria. The samples shall be collected no earlier than seven calendar days prior to when the facilities are to be placed on line. All samples shall be collected in accordance with good operating practices and analyzed in accordance with the requirements of 310 CMR 22.05. All lab reports shall be prepared on MassDEP approved forms. Copies of the laboratory analysis shall be provided to MassDEP for review and approval prior to any final inspection.
9. Final Inspection & Approval:
 - a. The applicant shall not operate any of the facilities or treatment units until MassDEP grants its Final Approval.
 - b. A Request for a Final Inspection shall be submitted to this office in accordance with MassDEP Policy 88-19 and the Guidelines.

1. The request shall include a Determination of Compliance prepared by the consulting engineer or water system representative that inspected the work that certifies the following:
 - (1) that the facility is fully operational, tested, and ready to be placed on line
 - (2) that the work was completed in accordance with MassDEP's approval,
 - (3) that all conditions of the approval letter have been met,
 - (4) that all materials, equipment and technology have received approval for use in drinking water,
 - (5) that the operations and maintenance procedures have been prepared and are available,
 - (6) that the operators have been trained and are ready to begin operating the facility,
 - (7) that all alarms have been tested and are operating properly.
 2. Along with the letter, the following documents shall be provided.
 - (1) If the work is not entirely complete, a copy of the punch list shall be provided. An opinion on the ability of the facilities and equipment to operate in full accordance with Regulations and Guidelines without being completely completed as approved shall also be provided, with any recommended mitigation measures for any of the items that are not complete noted.
 - (2) A copy of the water quality reports shall also be provided with request.
 - (3) A copy of the initial device test for any testable back-flow prevention devices installed as part of the work is also needed.
 - c. After a review of the letter and the sample results, MassDEP will then contact the applicant to arrange a final inspection if MassDEP determines such an inspection is necessary.
 - d. During the final inspection, the applicant shall demonstrate the proper operation of the facility and equipment, with the facility running to waste unless otherwise approved by the Department. As part of the final inspection, the applicant shall be prepared to demonstrate that the facilities and equipment can operate as intended.
10. Operation and Maintenance:
- a. An O & M Manual for the facility shall be prepared. The Operations & Maintenance Manual shall include a stand-alone schedule of inspections, testing, and preventative maintenance recommendations shall be provided for all the components of the system. That schedule shall incorporate the recommendations of the equipment manufacturer(s) and the design engineer.
 - b. As called for in the Guidelines, a contingency planning sheet with phone numbers for emergency contacts shall be provided in the facility.

- c. Once the O&M procedures have been prepared in accordance with these requirements, the applicant shall operate the facilities in accordance with the procedures and complete all recommended maintenance and inspections.
11. Staffing: Operation of the facilities shall conform to the requirements of 310 CMR 22.11B.
12. Emergency Planning: The facilities shall be incorporated in the system's emergency response planning. A revised Emergency Response Plan that meets the requirements of 310 CMR 22.04(13) shall be prepared prior to final approval of the completed facility.
13. Security: The Department recommends assessing the vulnerability of the facilities and equipment and including the results of the assessment in its security planning.
14. Maintenance of Records: The applicant/operator shall maintain a copy of this letter and the complete permit application for as long as the facilities described herein are in service. The applicant shall further update its inventory records as called for in the Regulations.

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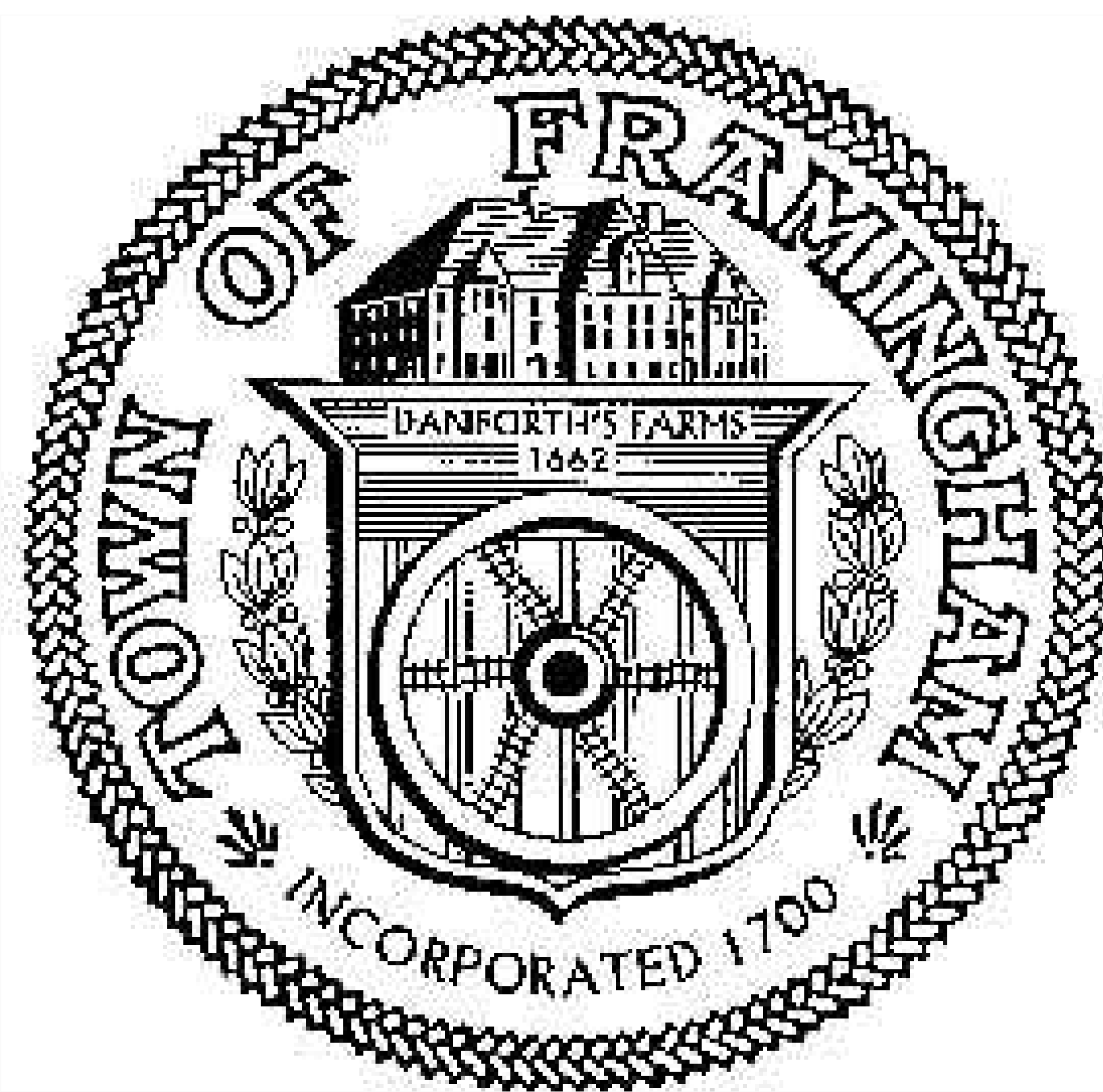
APPENDIX E

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CITY OF FRAMINGHAM, MASSACHUSETTS

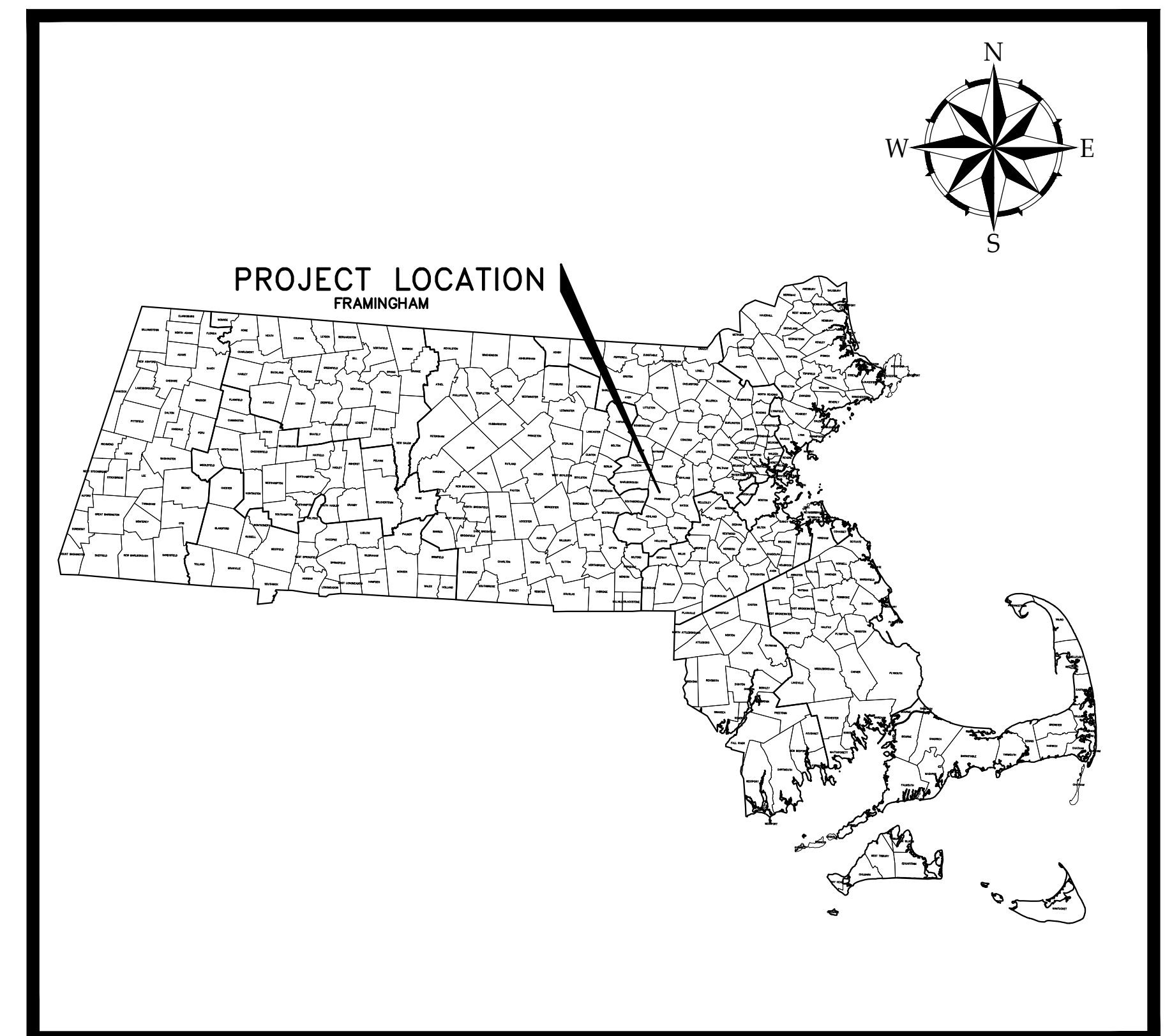
DEPARTMENT OF PUBLIC WORKS

EDGEHILL ROAD WATER BOOSTER STATION IMPROVEMENTS



227592.22

OCTOBER, 2019



PETER A. SELLERS

EXECUTIVE DIRECTOR
OF PUBLIC WORKS

WILLIAM R. SEDEWITZ, P.E.

CHIEF ENGINEER



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DEDHAM, MASSACHUSETTS 02026
800.446.5518 | www.woodardcurran.com
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GENERAL

SHEET	TITLE
G-000	COVER SHEET
G-001	SHEET INDEX

INSTRUMENTATION AND CONTROLS

SHEET	TITLE
I-001	INSTRUMENTATION AND CONTROLS LEGEND & NOTES

WATER STATIONS SCADA PANELS

I-101 THROUGH I-110	EDGEHILL ROAD PUMP STATION SCADA PANEL
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A

B

C

D

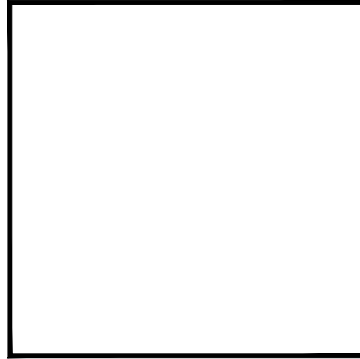
\\woodardcurran.net\shares\Projects\022759222\Framingham-TO to Edgell Road\wp\Drawings\General\022759222-5001.dwg, Oct 09, 2019 - 4:38pm FSCANLON

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DRAWN BY: RPM	2759222-5001.dwg

INSTRUMENTATION AND CONTROLS SHEET INDEX

CITY OF FRAMINGHAM, MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS	EDGEHILL ROAD WATER BOOSTER STATION IMPROVEMENTS
---	---

JOB NO:	022759222
DATE:	OCTOBER 2019
SCALE:	NTS
SHEET:	--- OF XXX

G-001

NOT FOR CONSTRUCTION

A

B

C

D

ELECTRICAL SYMBOLS

PANEL NOTES

FIELD NOTES

	LIMIT SWITCH NORMALLY CLOSED		TRANSFORMER
	LIMIT SWITCH HELD CLOSED		
	LIMIT SWITCH NORMALLY OPEN		CURRENT TRANSFORMER
	LIMIT SWITCH HELD OPEN		
	FLOAT SWITCH NORMALLY OPEN		THERMOCOUPLE
	PRESSURE SWITCH NORMALLY OPEN		
	TEMPERATURE SWITCH NORMALLY OPEN		RTD SENSOR
	TIME SWITCH (DROP OUT) NORMALLY OPEN		
	TIME SWITCH (PULL IN) NORMALLY OPEN		MUSHROOM PUSH BUTTON NORMALLY OPEN
	FLOW SWITCH NORMALLY OPEN		
	PUSH BUTTON NORMALLY CLOSED		ITEM REFERENCE
	PUSH BUTTON NORMALLY OPEN		
	SELECTOR SWITCH 2 POSITION		NOTE REFERENCE
	SELECTOR SWITCH 3 POSITION		
	SELECTOR SWITCH 4 POSITION		TERMINAL NUMBER
	BREAK		
	PANEL WIRING		FIELD WIRING
	SHIELDED CABLE		
	WIRES CROSSING		WIRES CONNECTING
	3 PHASE HEATER (DELTA)		
	3 PHASE HEATER (WYE)		3-POLE CIRCUIT BREAKER
	SOLENOID		
	COIL		MOTOR PROTECTOR
	HORN		
	CIRCUIT BREAKER		3-POLE CONTACTOR
	FUSE		
	CHASSIS GROUND		3-POLE DISCONNECT
	THERMAL OVERLOAD		
	120 VAC RECEPTACLE		TRANSFORMER
	TRANSFORMER		

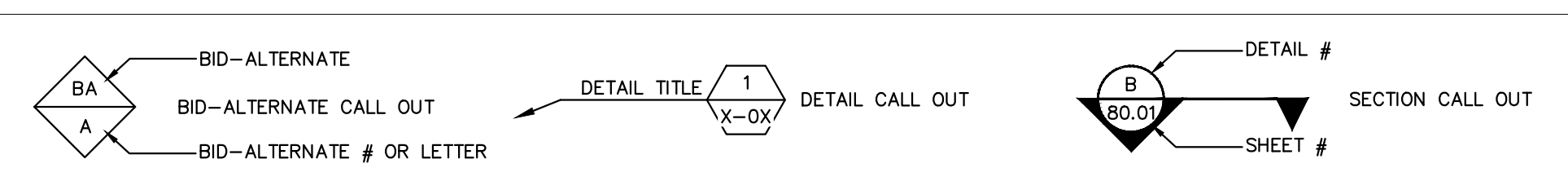
- INCLUDE A DRAWING POCKET INSIDE THE PANEL LARGE ENOUGH TO STORE A COMPLETE SET OF SYSTEM DIAGRAMS, AND DRAWINGS.
- ANALOG CABLES: 2-CONDUCTOR WITH SHIELD. BELDEN #8760 OR EQUAL.
- LEAVE FREE SPACE ABOVE PLC FOR VENTILATION.
- IDENTIFY ALL WIRES AS SPECIFIED BY THE NATIONAL ELECTRICAL CODE HANDBOOK AND THE FOLLOWING:

POWER DISTRIBUTION WIRES.....BLACK
NEUTRAL WIRES.....WHITE
AC CONTROL CIRCUIT WIRES.....RED
DC CONTROL CIRCUIT WIRES.....BLUE
DC COMMON WIRES.....WHITE W/BBLUE STRIPE
GROUND WIRES.....GREEN W/YELLOW STRIPE
WIRES THAT MAY REMAIN.....ORANGE
ENERGIZED WHEN THE MAIN DISCONNECT IS IN THE OFF POSITION
- SIZE ALL WIRE IN ACCORDANCE WITH NEC CODES. SINGLE CONDUCTORS: STRANDED COPPER WITH THWN INSULATION, RATED FOR 600 VAC, AND UL LISTED AS MTW, UNLESS NOTED OTHERWISE. MINIMUM CONDUCTOR SIZE: #14AWG. #16 AWG MAY BE USED ONLY FOR THE INDIVIDUAL WIRES CONNECTING DIRECTLY TO AN I/O TERMINAL ON THE PLC SWING ARM. THE HOT AND NEUTRAL CONDUCTOR SUPPLYING EACH SWING ARM SHALL REMAIN #14 AWG. GROUND CONDUCTOR SIZE: AS INDICATED ON THE DRAWINGS. WHERE NOT INDICATED, THEY SHALL BE #14 AWG OR LARGER.
- BOND PLC CHASSIS, PANEL DOORS, SIDE PANELS, BACK PANELS AND GROUND BUS TOGETHER WITH WIRES SIZED AS SHOWN ON THE DRAWING.
- TAG ALL WIRES AT EVERY TERMINATION POINT. SHORT WIRE LENGTHS, (LESS THAN 8") WHERE THE ENTIRE CONDUCTOR IS VISIBLE MAY BE TAGGED AT JUST ONE END. WIRE LABELS FOR WIRES SMALLER THAN NO. 4, SHALL BE VINYL, SELF ADHESIVE, WRAPAROUND, WITH MACHINE PRINTED NUMBERS AND LETTERS. WIRE SIZES NO. 4 AND LARGER AND MULTI CONDUCTOR CABLES SHALL BE MARKED WITH ONE-PIECE, NYLON LOCKING MACHINE PRINTED MARKER TIES EQUAL TO PANDUIT PLM SERIES. WIRE TAG NUMBER SHALL BE AS INDICATED ON THE DRAWINGS
- DO NOT ROUTE ANY COMMUNICATION CABLES IN WIREWAYS WITH 120 VAC WIRING. ROUTE ALL THESE CABLES AWAY FROM 120 VAC WIRING. WHERE 120 VAC CONDUCTORS MUST BE CROSSED, DO SO AT RIGHT ANGLES AND PROVIDE AT LEAST 1" SEPARATION.
- CONNECT NO MORE THAN TWO WIRES TO ANY ONE TERMINAL. PROVIDE TERMINAL BLOCKS WITH A SAFETY COVER OR BE FINGER SAFE TO PROTECT PERSONNEL FROM SHOCK. MOUNT ALL TERMINAL BLOCKS ON DIN RAILS. SUPPLY ALL HARDWARE NEEDED TO PROVIDE A COMPLETE TERMINAL STRIP ASSEMBLY, INCLUDING BUT NOT LIMITED TO: MISCELLANEOUS SEPARATORS, TOP JUMPER BARS, SIDE JUMPER BARS, MACHINE PRINTED TERMINAL BLOCK TAGS, FASTENERS, BRACKETS FOR RAISING 35MM RAIL, ETC
- RAISE AND CENTER ALL TERMINAL STRIPS SET BETWEEN WIRE WAYS TO FACILITATE WIRING, UNLESS OTHERWISE NOTED. PROVIDE A MINIMUM OF 1-1/2 INCH BETWEEN TERMINALS AND WIRE WAY ON BOTH SIDES OF TERMINAL STRIP. INSTALL END BARRIERS FOR EACH STYLE OF TERMINAL. INSTALL END STOPS ON EACH SECTION OF TERMINALS OR RELAYS. USE MACHINE PRINTED TAGS TO MARK TERMINAL STRIPS. WHEREVER POSSIBLE, MAKE ALL TERMINAL BLOCK CONNECTIONS FOR THE PANEL WIRING ON THE TOP OR RIGHT SIDE OF THE TERMINAL STRIP AND LEAVE THE BOTTOM OR LEFT SIDE FREE FOR FIELD TERMINATIONS, UNLESS NOTED OTHERWISE.
- PROVIDE ENGRAVED PLASTIC NAMEPLATES. EITHER PAINT FILLED ENGRAVINGS OR 2 COLOR LAMINATIONS ARE ACCEPTABLE.
- ALL OPERATOR CONTROL DEVICES (BUTTONS, SWITCHES, METERS, DISPLAYS, ETC.) SHALL HAVE NAMEPLATES.
- PROVIDE A SET OF AS-BUILT DRAWINGS WITH THE PANEL. THESE SHALL BE COMPLETE, ALLOWING ENGINEER TO PRODUCE A SET OF "RECORD" DRAWINGS SHOWING ALL WIRE NUMBERS WITHIN THE PANEL AND THE DEVICE TERMINAL NUMBERS TO WHICH THEY CONNECT. REQUIRED INFORMATION SHALL INCLUDE BUT NOT BE LIMITED TO:
 - A. ALL WIRE TAG NUMBERS.
 - B. TERMINAL CONNECTION POINTS FOR POWER AND NEUTRAL FEEDS.
 - C. ANY DEVIATIONS FROM THE EQUIPMENT LOCATIONS SHOWN ON THE DRAWINGS. PRIOR APPROVAL SHOULD BE OBTAINED BEFORE MAKING SUCH CHANGES.
- SAVE ALL MATERIAL DATA SHEETS AND LITERATURE. WHERE PRODUCT DATA IS PROVIDED ON THE PACKAGE, MAKE A CLEAR COPY OF THE DATA AND INCLUDE WITH OTHER DATA SHEETS. INCLUDE ALL THIS MATERIAL WITH THE PANEL DURING DELIVERY.
- EQUIPMENT LOCATIONS SHALL BE AS SHOWN ON THE DRAWINGS. THE PANEL BUILDER SHALL NOTIFY ENGINEER OF ANY PHYSICAL CONFLICTS OR OTHER PROBLEMS THAT COULD CAUSE PROBLEMS WITH THE INSTALLATION OR OPERATION OF THE PANEL BEFORE ASSEMBLING THE PANEL. RESOLUTION OF SUCH CONFLICTS SHALL BE APPROVED BY ENGINEER PRIOR TO PANEL ASSEMBLY.
- PROVIDE ALL EQUIPMENT AS SHOWN ON THE BILL OF MATERIALS INCLUDED IN THIS DRAWING PACKAGE. SUBMIT ANY DEVIATION FROM THE BILL OF MATERIALS FOR APPROVAL IN WRITING PRIOR TO FABRICATION.

- TAKE CARE WHEN CONDUIT ENTRY PENETRATIONS ARE MADE INTO ENCLOSURE TO PREVENT SCATTERING OF DRILL CHIPS & KNOCK-OUT SLUGS. DE-BUR PENETRATIONS AND REMOVE DEBRIS. SEAL ALL CONDUIT ENTRIES INTO ENCLOSURE FROM LIQUIDS & CONTAMINANTS. AVOID CONDUIT ENTRIES OVER CRITICAL COMPONENTS, SUCH AS PLCs AND DRIVES.
- ANALOG CABLES: 2 CONDUCTOR WITH SHIELD. BELDEN #8760 OR EQUAL.
- IDENTIFY ALL WIRES AS SPECIFIED BY THE NATIONAL ELECTRICAL CODE HANDBOOK AND THE FOLLOWING:

460 VAC	120/208 VAC
(L1).....BROWN	(L1).....BLACK
(L2).....ORANGE	(L2).....RED
(L3).....YELLOW	(L3).....BLUE
(NEUT).....GREY	(NEUT).....WHITE
24 VDC	INTRINSICALLY SAFE
(ALL).....BLUE	(ALL).....LIGHT BLUE
- SIZE ALL WIRES IN ACCORDANCE WITH NEC CODES. SINGLE CONDUCTORS SHALL BE STRANDED COPPER WITH THWN INSULATION, RATED FOR 600 VAC, AND UL LISTED AS MTW, UNLESS NOTED OTHERWISE. MINIMUM CONDUCTOR SIZE SHALL BE #14 AWG. GROUND CONDUCTOR SIZE SHALL BE AS INDICATED ON THE DRAWINGS. WHERE NOT INDICATED, IT SHALL BE #14 AWG OR LARGER.
- LOCATE CONDUIT ENTRIES INTO ENCLOSURES TO ASSURE ADEQUATE WIRE BENDING SPACE. ROUTE WIRING SO THAT DOOR MOUNTED EQUIPMENT WILL NOT INTERFERE WITH IT WHEN THE DOOR IS CLOSED.
- LOCATE INTRINSICALLY SAFE WIRING CONDUIT ENTRIES INTO ENCLOSURE AS CLOSE AS POSSIBLE TO THE WIREWAY PROVIDED FOR INTRINSICALLY SAFE FIELD WIRING SO THAT ALL INTRINSIC WIRING IS ISOLATED (AT LEAST 2") FROM ALL OTHER FIELD AND PANEL WIRING AND SECURED. ROUTE INTRINSICALLY SAFE FIELD WIRING THROUGH THE WIREWAY PROVIDED EXCLUSIVELY FOR INTRINSICALLY SAFE WIRING. ALL WIRING SHALL BE IN COMPLIANCE WITH THE NATIONAL ELECTRICAL CODE ARTICLE 504. OTHER APPLICABLE ARTICLES INCLUDE 501 & 515.
- ENGINEER HAS IDENTIFIED AS MANY OF THE PLC INPUTS AND OUTPUTS AS POSSIBLE THAT WILL BE NEEDED TO MAKE THE CONTROL PROGRAM OPERATE AS REQUIRED. ADDITIONAL I/O MAY BE IDENTIFIED WHEN THE CONTROL PROGRAM IS WRITTEN AND REQUIRE WIRING. THESE SHALL BE CONSIDERED PART OF THESE SHOP DRAWINGS. THE INSTALLING CONTRACTOR SHALL INSTALL 10% SPARE CONDUCTORS TERMINATED ON TERMINAL BLOCKS ON BOTH ENDS TO MEET ADDITIONAL I/O REQUIREMENTS.
- TAG ALL WIRES AT EVERY TERMINATION POINT. SHORT WIRE LENGTHS, (LESS THAN 8") WHERE THE ENTIRE CONDUCTOR IS VISIBLE MAY BE TAGGED AT JUST ONE END. WIRE LABELS FOR WIRES SMALLER THAN NO. 4, SHALL BE VINYL, SELF ADHESIVE, WRAPAROUND, WITH MACHINE PRINTED NUMBERS AND LETTERS. WIRE SIZES NO. 4 AND LARGER AND MULTI CONDUCTOR CABLES SHALL BE MARKED WITH ONE-PIECE, NYLON LOCKING MACHINE PRINTED MARKER TIES EQUAL TO PANDUIT PLM SERIES. WIRE TAG NUMBER SHALL BE AS INDICATED ON THE DRAWINGS.
- DO NOT ROUTE ANY COMMUNICATION CABLES IN WIREWAYS WITH 120 VAC WIRING. ROUTE ALL THESE CABLES AWAY FROM 120 VAC WIRING. WHERE 120 VAC CONDUCTORS MUST BE CROSSED, DO SO AT RIGHT ANGLES AND PROVIDE AT LEAST 1" SEPARATION.
- DO NOT CONNECT MORE THAN TWO WIRES TO ANY ONE TERMINAL.

MISCELLANEOUS SYMBOLS



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**INSTRUMENTATION AND CONTROLS
LEGEND & NOTES**

CITY OF FRAMINGHAM, MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

EDGEHILL ROAD WATER BOOSTER STATION
IMPROVEMENTS

JOB NO: 0227592.22
DATE: OCTOBER 2019
SCALE: NTS
SHEET: --- OF XXX

I-001

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WoodardCurran.net\Drawings\Projects\0227592.22\Framingham-TO-B-Edgell-Road-Water-Boosting-Station\0227592.22-1101-1-XXX.dwg, Oct 09, 2019, 4:38pm, PSCANLON

BILL OF MATERIAL

ITEM	QTY.	MANUFACTURER	PART NUMBER	DESCRIPTION	DESIGNATION
****ENCLOSURE & RELATED EQUIPMENT****					
1	1	HOFFMAN	A48P36	BACK PANEL, 45.00" x 33.00"	SUB PANEL
2	1	HOFFMAN	A48H36DLP3PT	ENCLOSURE, NEMA 4, 48.00" x 36.00" x 12.00"	ENCLOSURE
3					
4	1	HOFFMAN	LEDA2M3S	ENCLOSURE LIGHT KIT, LED, MAG. MOUNT WITH MOTION SENSOR	
5	1	HOFFMAN	LEDA20C	ENCLOSURE LIGHT POWER CORD ASSEMBLY	
6					
7					
8					
9					
10					
11	2	SAGINAW CONTROLS	SCE-BV4XKIT	ENCLOSURE VENTILATOR	
12					
****PLC & RELATED EQUIPMENT****					
16	1	ALLEN BRADLEY	5069-L306ER	COMPACTLOGIX 5380 CONTROLLER	PLC
17	3	ALLEN BRADLEY	5069-IB16	5069 COMPACT I/O 24V DC INPUT MODULE, 16 PT.	PLC, SLOTS 1 THROUGH 3
18	1	ALLEN BRADLEY	5069-OW16	5069 COMPACT I/O RELAY OUTPUT MODULE, 16 PT.	PLC, SLOT 4
19	2	ALLEN BRADLEY	5069-IF8	5069 COMPACT I/O ANALOG INPUT MODULE, 8 CHANNEL	PLC, SLOTS 5 & 6
20	1	ALLEN BRADLEY	5069-OF8	5070 COMPACT I/O ANALOG OUTPUT MODULE, 8 CHANNEL	PLC, SLOT 7
21	7	ALLEN BRADLEY	5069-RTB18-SCREW	5069 COMPACT I/O REMOVABLE TERMINAL BLOCKS	
22	1	ALLEN BRADLEY	5069-RTB64-SCREW	5380 CONTROLLER REMOVABLE TERMINAL BLOCK (KIT)	INCLUDES MOD & SA POWER TERMINAL BLOCKS
23					
24					
25					
26					
27					
28					
29					
30					
****OPERATOR INTERFACE EQUIPMENT****					
36	1	AUTOMATION DIRECT	EA9-T15WCL	24VDC OPERATOR INTERFACE, 15-INCH TOUCH SCREEN	OPERATOR INTERFACE (OIT)
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
****TERMINAL BLOCKS & RELATED EQUIPMENT****					
50	115	ALLEN BRADLEY	1492-JD3	TERMINAL BLOCK 2 TIER	TB1, TB2
51	35	ALLEN BRADLEY	1492-EBJD3	TERMINAL BLOCK END BARRIER, 2 TIER	TB1, TB2
52	6	ALLEN BRADLEY	1492-EAJ35	TERMINAL BLOCK END ANCHOR	TB1, TB2, & PLC MOUNTING
53	5	ALLEN BRADLEY	1492-CJ5J-10	TERMINAL BLOCK JUMPER, 10 POLE	TB1
54	30	ALLEN BRADLEY	1492-JG3	TERMINAL BLOCK, GROUNDING	TB2
55	1	ALLEN BRADLEY	199-DR1	DIN RAIL, STANDARD	PLC, & MISC. COMPONENT MOUNTING
56	2	ALLEN BRADLEY	1492-DR6	DIN RAIL, RAISED	TB1, TB2
57	5	ALLEN BRADLEY	1492-H4	FUSED TERMINAL BLOCK, NEON INDICATOR	FU1-FU5
58	15	ALLEN BRADLEY	1492-H5	FUSED TERMINAL BLOCK, LED INDICATOR	FU6, FU7-FU20
59	4	ALLEN BRADLEY	1492-N37	FUSED TERMINAL BLOCK END BARRIER	FU5, FU6, FU11, FU20
60	2	ALLEN BRADLEY	1492-N49	FUSE BLOCK SIDE JUMPERS 10 POLE	FU1-FU5, FU7-FU11, FU12-FU20
61	2	ALLEN BRADLEY	1492-SJS	FUSE BLOCK SIDE JUMPER INSULATING SLEEVE	FU1-FU5, FU7-FU11, FU12-FU20
62	1	ALLEN BRADLEY	1492-M5X12	GROUNDING TERMINAL BLOCK BLANK MARKING TAGS, 144 CT.	TB2
63	4	ALLEN BRADLEY	1492-M5X8	TERMINAL BLOCK BLANK MARKING TAGS, 2 TIER, 144 CT.	TB1, TB2
64	1	ALLEN BRADLEY	1492-MS8X12	FUSE BLOCK BLANK MARKING TAGS, 100 CT.	FU1-FU20
65	1	ALLEN BRADLEY	700-HL1L1	RELAY, SPDT, 120VAC COIL	PFR
66	8	ALLEN BRADLEY	700-HK36Z24-4	RELAY, SPDT, 24VDC COIL	CR0-CR7
67					
68	8	ALLEN BRADLEY	700-HN121	RELAY SOCKET	CR0-CR7
69	1	ALLEN BRADLEY	1492-MC6X10	SPDT RELAY (120VAC) BLANK MARKING TAGS, 100 CT.	PFR
70	1	ALLEN BRADLEY	1489-M1C200	CIRCUIT BREAKER, 20AMP, SINGLE POLE	CB1
71					
72	2	BUSSMANN	MDL-3-R	FUSE 3A, 250V TIME DELAY	FU7, PLUS SPARE
73	2	BUSSMANN	MDL-7-R	FUSE 7A, 250V TIME DELAY	FU5, PLUS SPARE
74	15	BUSSMANN	AGC-1-R	FUSE, 1A, 250V, FAST ACTING	FU2, FU4, FU8, FU10, FU12-FU16, FU19, FU20 PLUS SPARES
75	3	BUSSMANN	AGC-3-R	FUSE, 3A, 250V, FAST ACTING	FU1, FU3, PLUS SPARE
76	3	BUSSMANN	AGC-5-R	FUSE, 5A, 250V, FAST ACTING	FU11, PLUS SPARES
77	3	BUSSMANN	MDL-15-R	FUSE, 15A, 250V, TIME DELAY	FU6, PLUS SPARES
78	3	BUSSMANN	AGC-2-R	FUSE, 2A, 250V, FAST ACTING	FU9, PLUS SPARES
79	4	BUSSMANN	AGC-1/4-R	FUSE, 0.25A, 250V, FAST ACTING	FU17, FU18, PLUS SPARES
80	2	PHOENIX CONTACT	2905348	120VAC SURGE PROTECTOR	SUP1, PLUS 1 SPARE
81					
82					
83	4	ALLEN BRADLEY	1492-J4	TERMINAL BLOCK 1 TIER	TB1 (120VAC POWER)
84	2	ALLEN BRADLEY	1492-JG4	TERMINAL BLOCK GROUNDING	TB1 (120VAC POWER)
85	2	ALLEN BRADLEY	1492-EBJ3	TERMINAL BLOCK END BARRIER, 1 TIER	TB1 (120VAC POWER)
86	1	ALLEN BRADLEY	1492-M6X12	TERMINAL BLOCK BLANK MARKING TAGS, 1 TIER, 120 CT.	TB1 (120VAC POWER)
87	2	ALLEN BRADLEY	1492-CJ6J-2	1-TIER TERMINAL BLOCK JUMPER, 2 POLE	TB1 (120VAC POWER)
88					
89					
****WIREDUCT****					
93	6FT	PANDUIT	F1X4LG6	WIRING DUCT, 1"W x 4"H	
94	6FT	PANDUIT	C1LG6	WIRING DUCT COVER, 1"W	
95	6FT	PANDUIT	F1.5X4LG6	WIRING DUCT, 1.5"W x 4"H	
96	6FT	PANDUIT	C1.5LG6	WIRING DUCT COVER, 1.5"W	
97	18FT	PANDUIT	F2X4LG6	WIRING DUCT, 2"W x 4"H	
98	18FT	PANDUIT	C2LG6	WIRING DUCT COVER, 2"W	

ITEM	QTY.	MANUFACTURER	PART NUMBER	DESCRIPTION	DESIGNATION
****WIREDUCT (CONT.)****					
99	6FT	PANDUIT	F3X4LG6	WIRING DUCT, 3"W x 4"H	
100	6FT	PANDUIT	C3LG6	WIRING DUCT COVER, 3"W	
101					
102					
103					
104					
****HIGH VOLTAGE RELATED EQUIPMENT****					
108					
109					
110					
111					
112					
113					
114					
115					
116					
117					
118					
119					
120					
121					
122					
123					
124					
125					
126					
****POWER SUPPLIES****					
135					
136	1	ALLEN BRADLEY	1606-XLE240EN	24VDC POWER SUPPLY, 10 AMP	PWS1
137	1	ALLEN BRADLEY	1606-XLS240-UPS	DC UPS MODULE	UPSM
138	1	POWERSONIC	PS-12180F2	SEALED RECHARGEABLE LEAD-ACID BATTERY, 12V, 18.0AH	
139	2	AMP	4-520448-2	FASTON .250 SERIES CRIMP-ON INSULATED RECEPTACLE TYPE LUG	FOR BATTERY CONNECTIONS
140					
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142					
****COMMUNICATIONS****					
143	1	CALAMP	140-5028-504	215-240 MHZ VIPER LICENSED IP ROUTER RADIO MODEM	RADIO MODEM
144	1	PANEL FABRICATOR		RADIO MODEM SUPPORT SHELF	SEE DETAIL ON EQUIPMENT LAYOUT
145					
146	2	BLACK BOX	EVNSL641-0003	CAT6 ETHERNET PATCH CABLE, 3 FT.	SEE COMMUNICATIONS
147	1	BLACK BOX	EVNSL641-0007	CAT6 ETHERNET PATCH CABLE, 7 FT.	SEE COMMUNICATIONS
148	1	ALLEN BRADLEY	1783-BMS10CA	ETHERNET SWITCH, 10-PORT, MANAGED	ETHERNET SWITCH
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****MISCELLANEOUS PANEL EQUIPMENT****					
164	1	PANDUIT	UGB210-414-6	GROUND BAR	
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166	2	PANEL FABRICATOR		NAMEPLATE, PHENOLIC, ENGRAVED	SEE SCHEDULE ON EQUIPMENT LAYOUT
167	1	ALLEN BRADLEY	1492-REC15G	DUPLEX GFCI RECEPTACLE	
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175	1	EMEDCO	QS3743	WARNING LABEL "ARC FLASH AND SHOCK HAZARD"	
176	1	EMEDCO	SQS110	WARNING LABEL "DEVICE POWERED FROM SEVERAL SOURCES"	
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EDGELL ROAD PUMP STATION
SCADA PANEL BILL OF MATERIAL

CITY OF FRAMINGHAM, MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

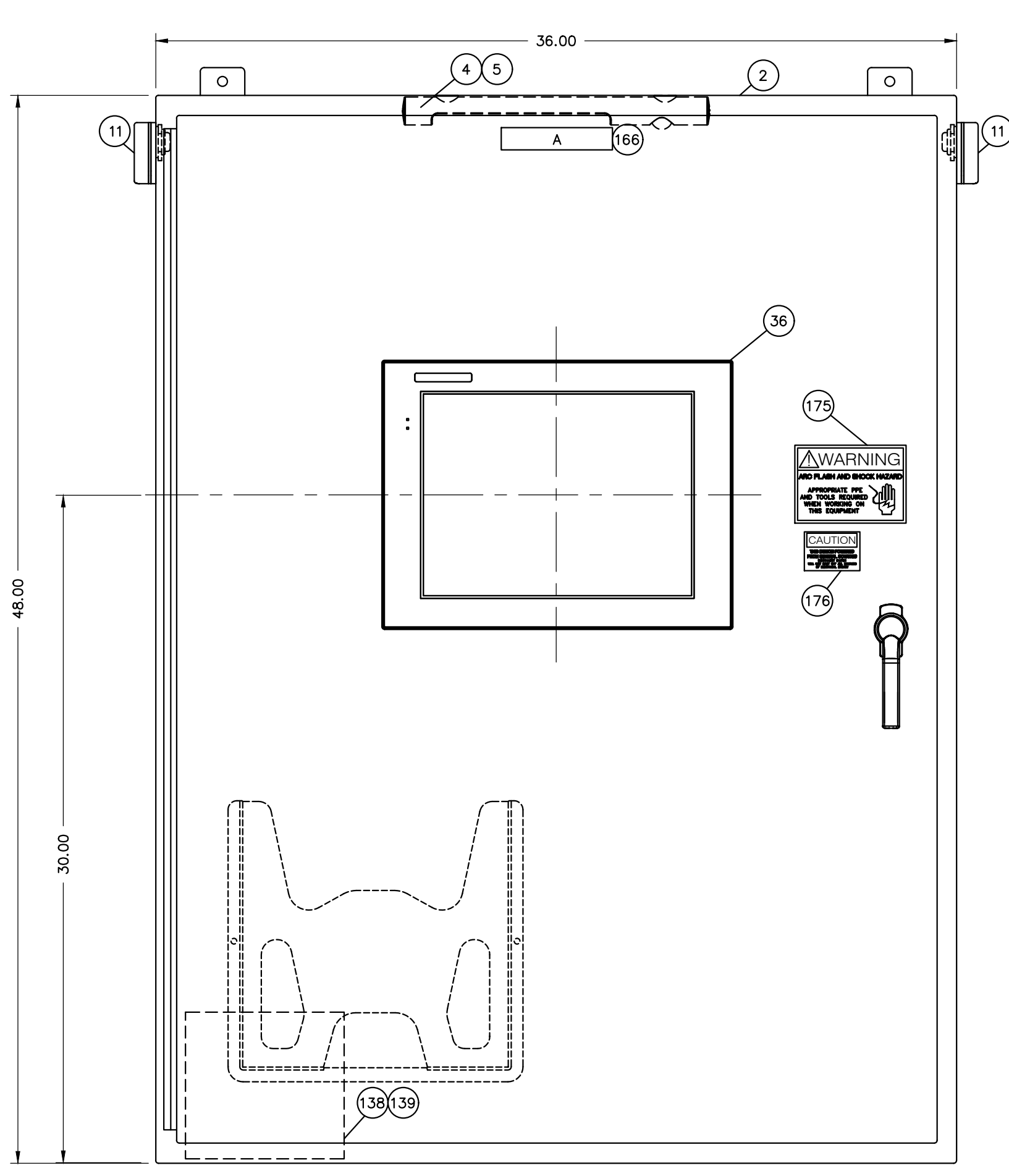
EDGELL ROAD WATER BOOSTER STATION
IMPROVEMENTS

JOB NO: 0227592.22
DATE: OCTOBER 2019
SCALE: NTS
SHEET: --- OF XXX

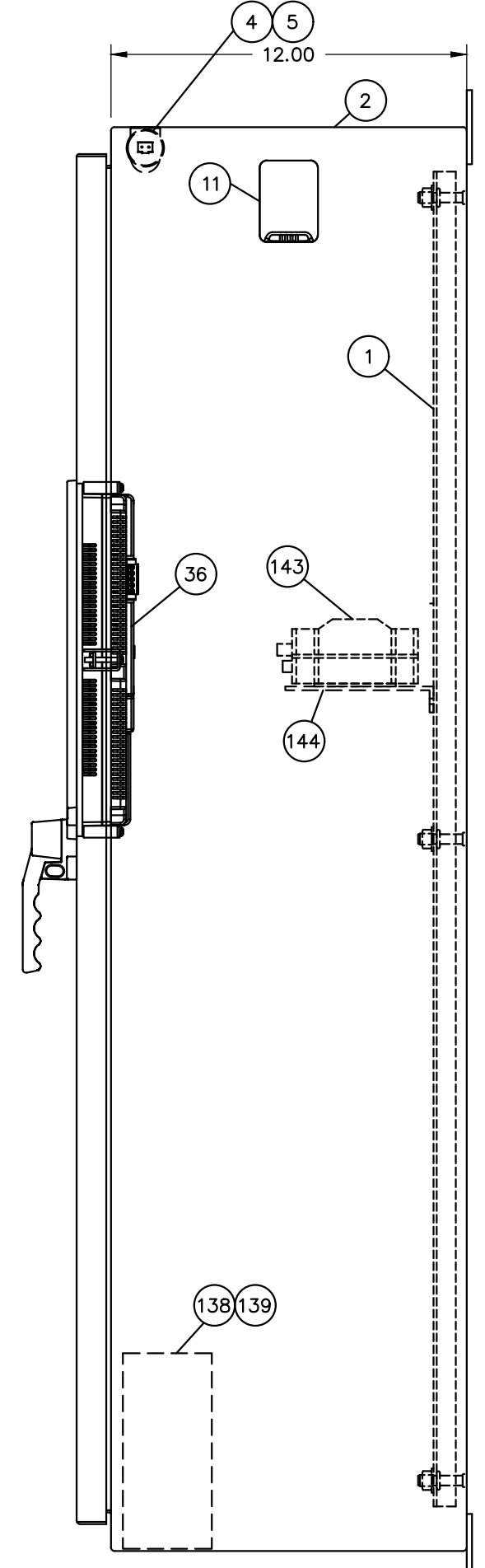
I-101

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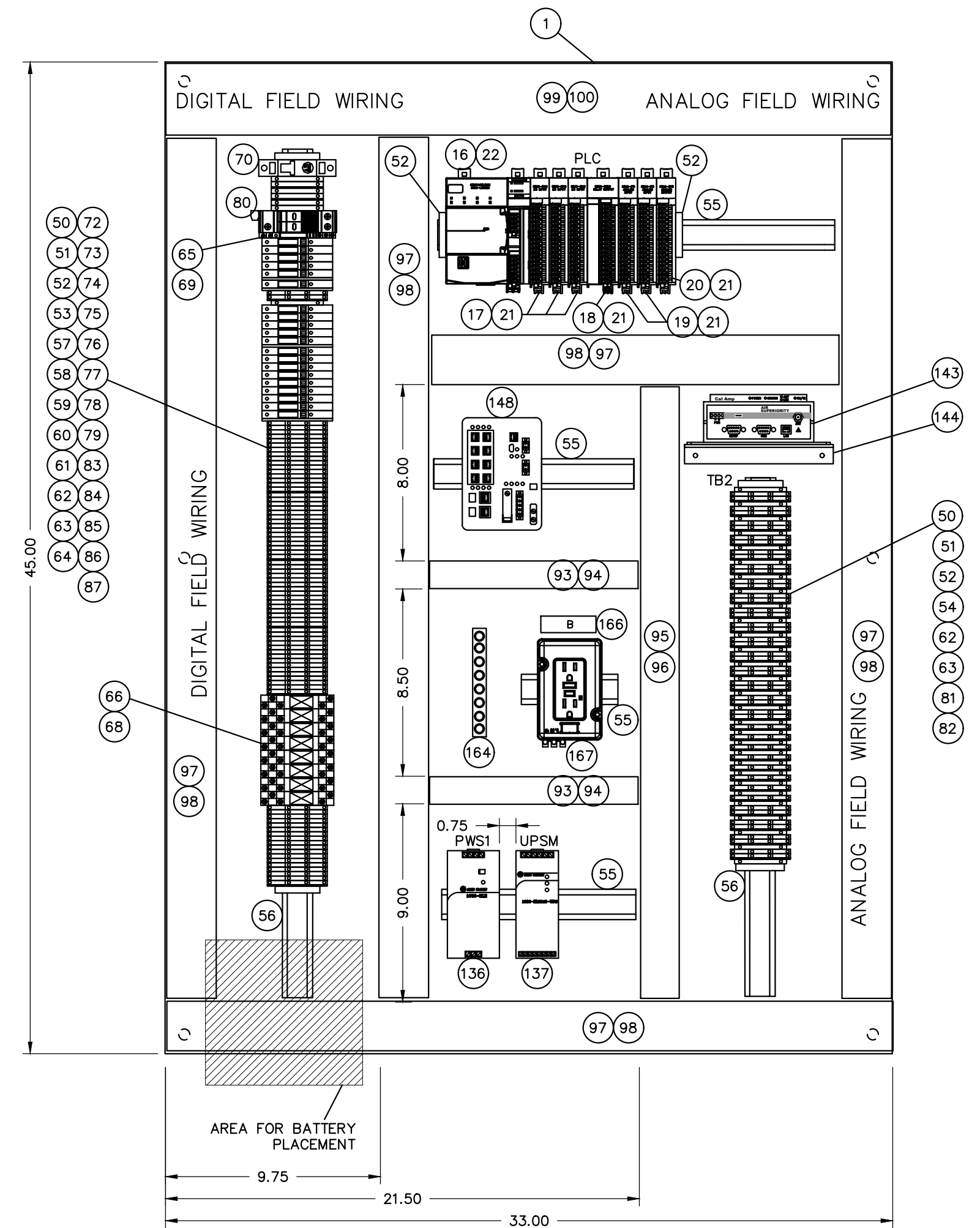
NAMEPLATE SCHEDULE			
ITEM	DIMENSION	DESCRIPTION	FABRICATION COMMENTS
A	5" x 1"	SCADA PANEL	NAMEPLATE TO BE BLACK WITH WHITE LETTERS WITH ADHESIVE BACK. TEXT SIZE TO BE .375
B	2.50" x .75"	GFCI RECEPTACLE FOR PROGRAMMING ONLY	NAMEPLATE TO BE BLACK WITH WHITE LETTERS WITH ADHESIVE BACK. TEXT SIZE TO BE .125



ENCLOSURE FRONT VIEW



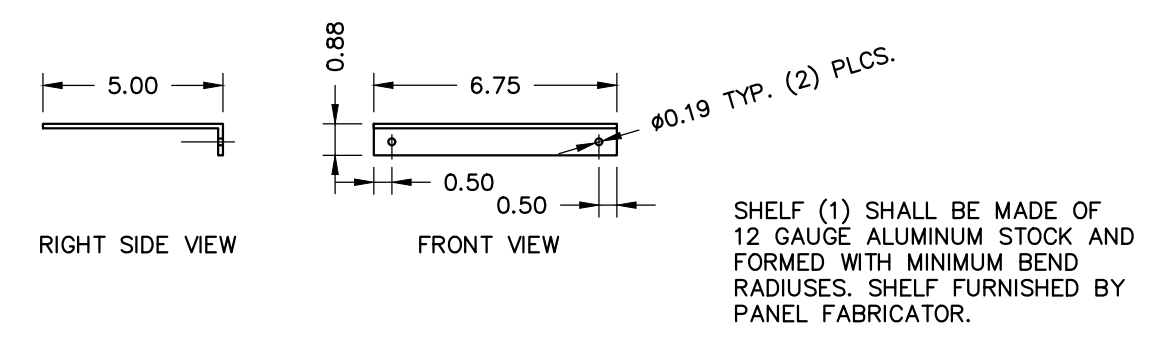
ENCLOSURE RIGHT SIDE VIEW



SUB PANEL

INSTALLING CONTRACTOR NOTES:

- CONTRACTOR SHALL USE CAUTION WHEN LANDING CONDUITS IN THE BOTTOM OF ENCLOSURE TO AVOID INTERFERING WITH BATTERY PLACEMENT (ITEM 138).
- CONTRACTOR SHALL INSTALL ENCLOSURE SO THAT BOTTOM OF CABINET IS APPROXIMATELY 30" FROM GROUND/FLOOR LEVEL TO FACILITATE USE OF OPERATOR INTERFACE (ITEM 36).



RADIO MODEM SUPPORT SHELF DETAIL

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DATE: 02/27/22 10:11 AM

**EDGELL ROAD PUMP STATION
SCADA PANEL COMPONENT LAYOUT**

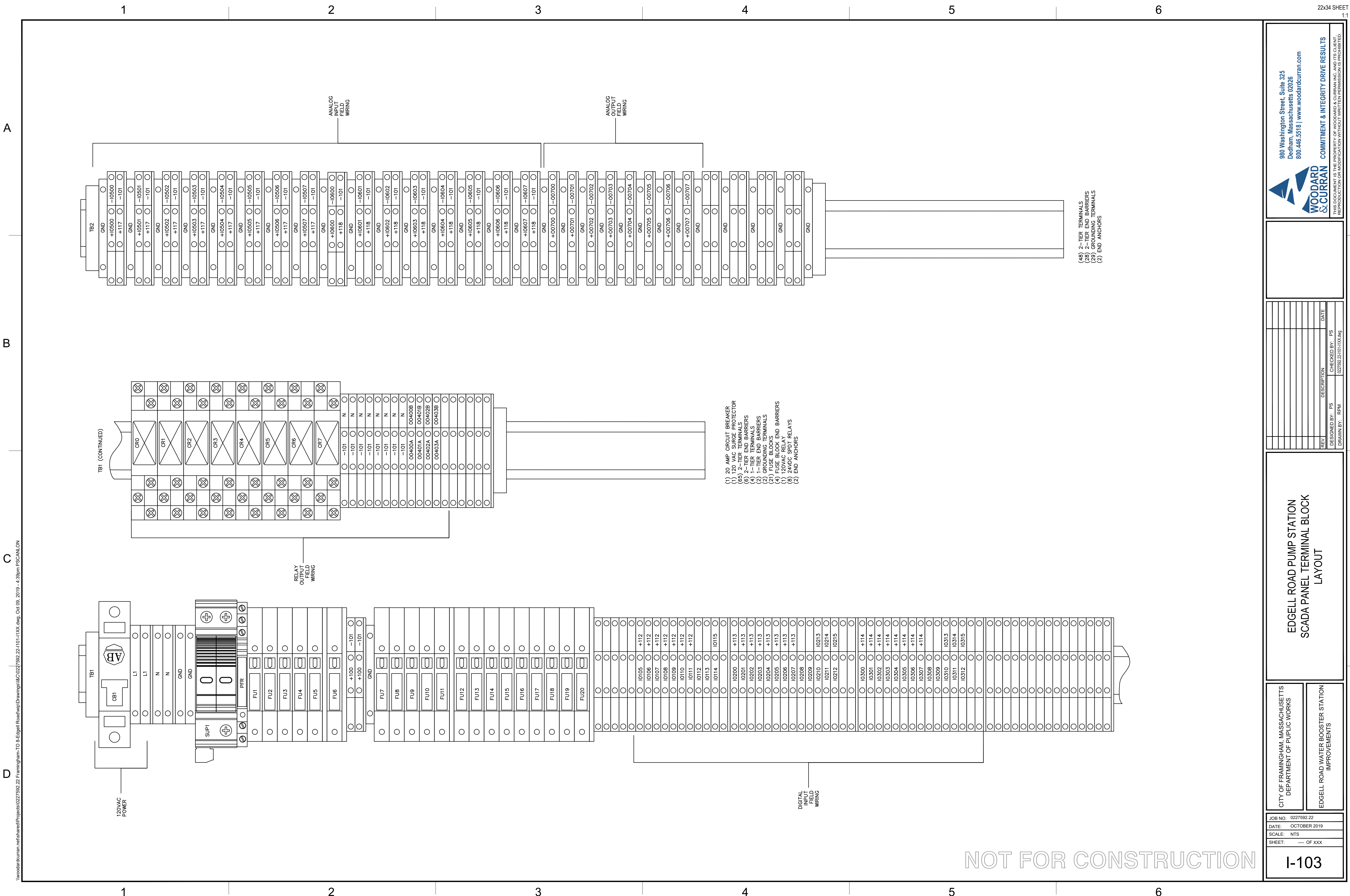
CITY OF FRAMINGHAM, MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

EDGELL ROAD WATER BOOSTER STATION
IMPROVEMENTS

JOB NO: 0227592.22
DATE: OCTOBER 2019
SCALE: NTS
SHEET: --- OF XXX

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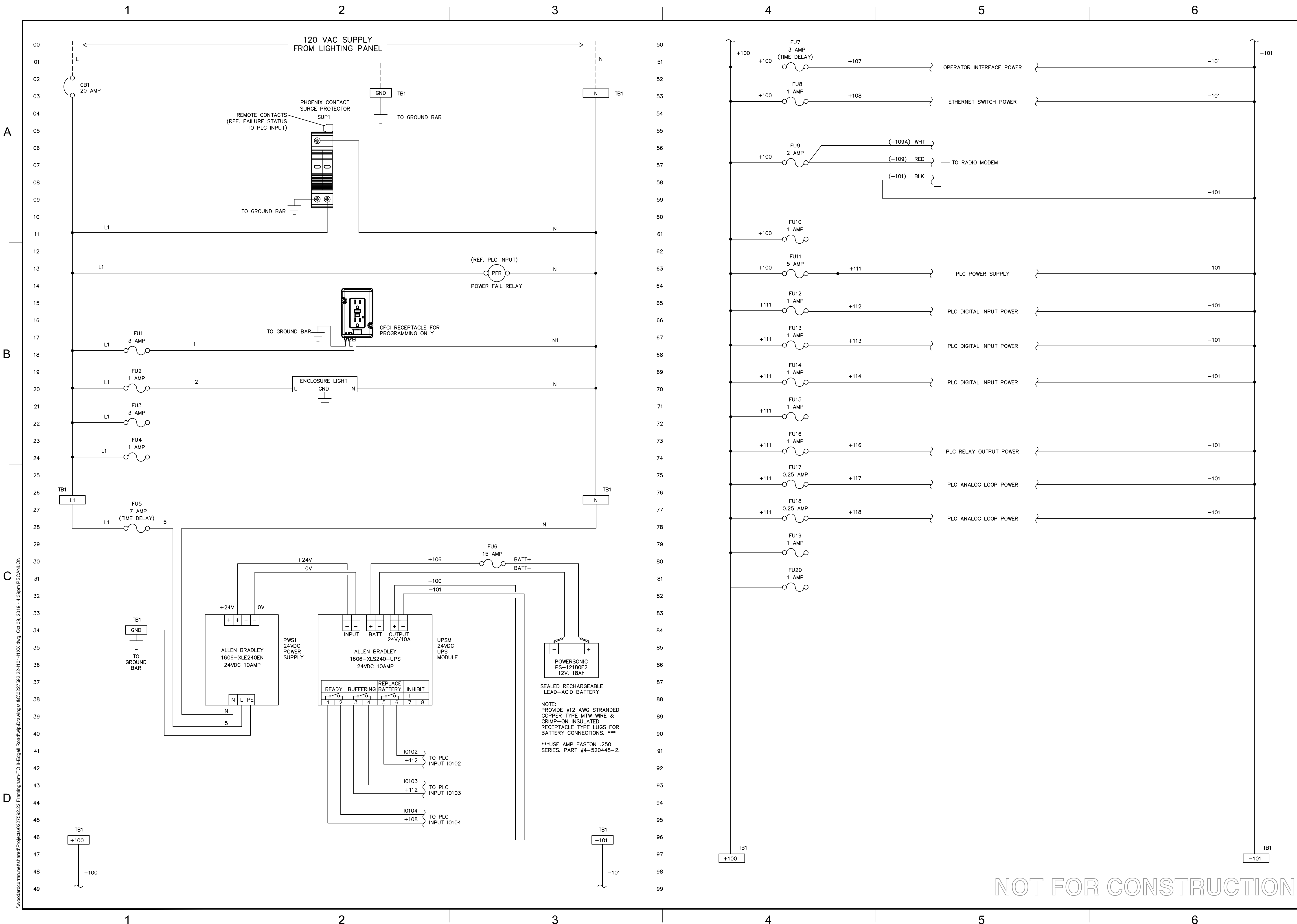
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**EDGELL ROAD PUMP STATION
SCADA PANEL TERMINAL BLOCK
LAYOUT**

CITY OF FRAMINGHAM, MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

EDGELL ROAD WATER BOOSTER STATION
IMPROVEMENTS



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PS	RPM

**EDGELL ROAD PUMP STATION
 SCADA PANEL POWER DISTRIBUTION**

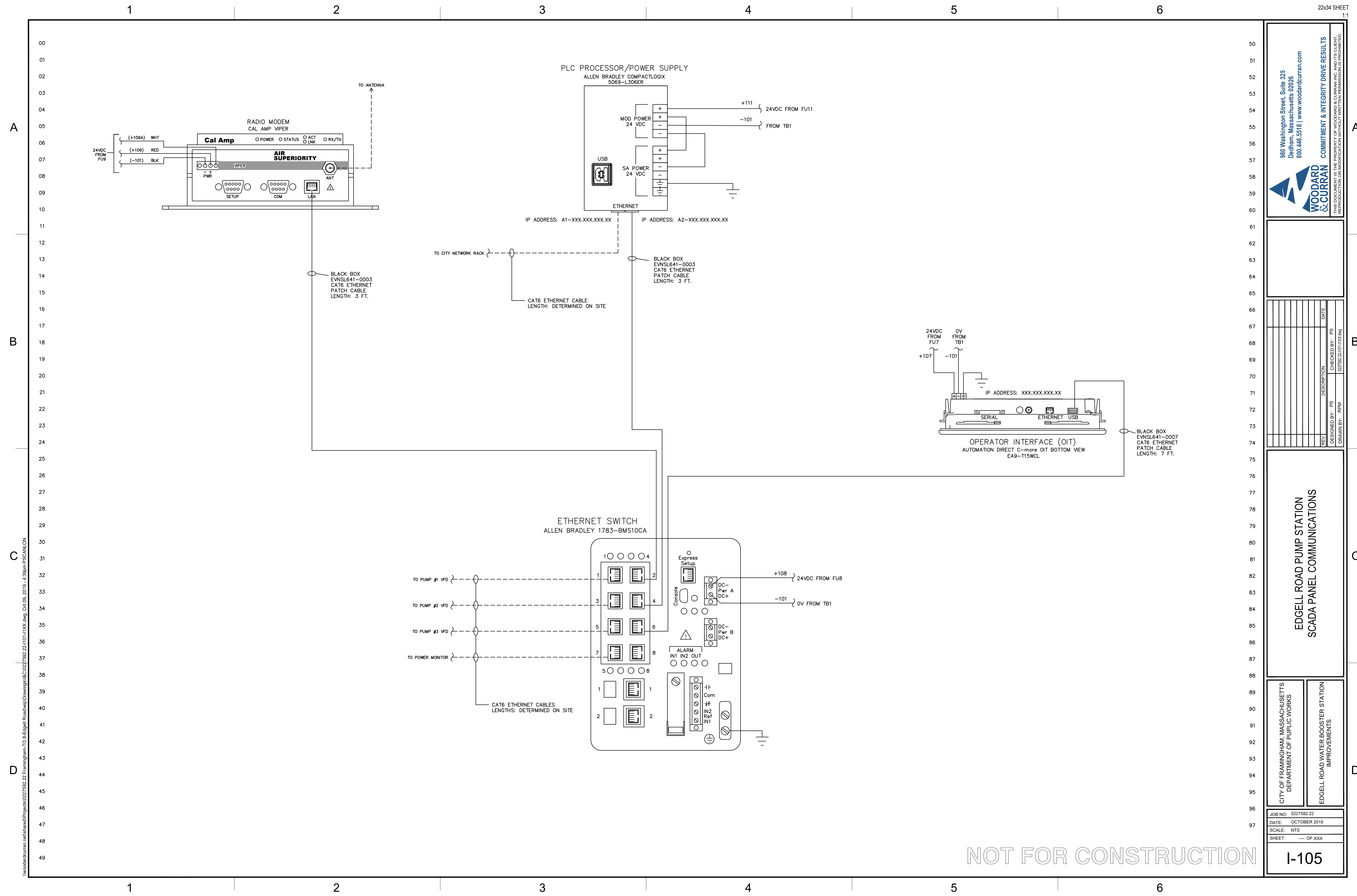
CITY OF FRAMINGHAM, MASSACHUSETTS
 DEPARTMENT OF PUBLIC WORKS

EDGELL ROAD WATER BOOSTER STATION
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**EDGELL ROAD PUMP STATION
SCADA PANEL COMMUNICATIONS**

CITY OF FRAMINGHAM, MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

EDGELL ROAD WATER BOOSTER STATION
IMPROVEMENTS

JOB NO: 0227592.22
DATE: OCTOBER 2019
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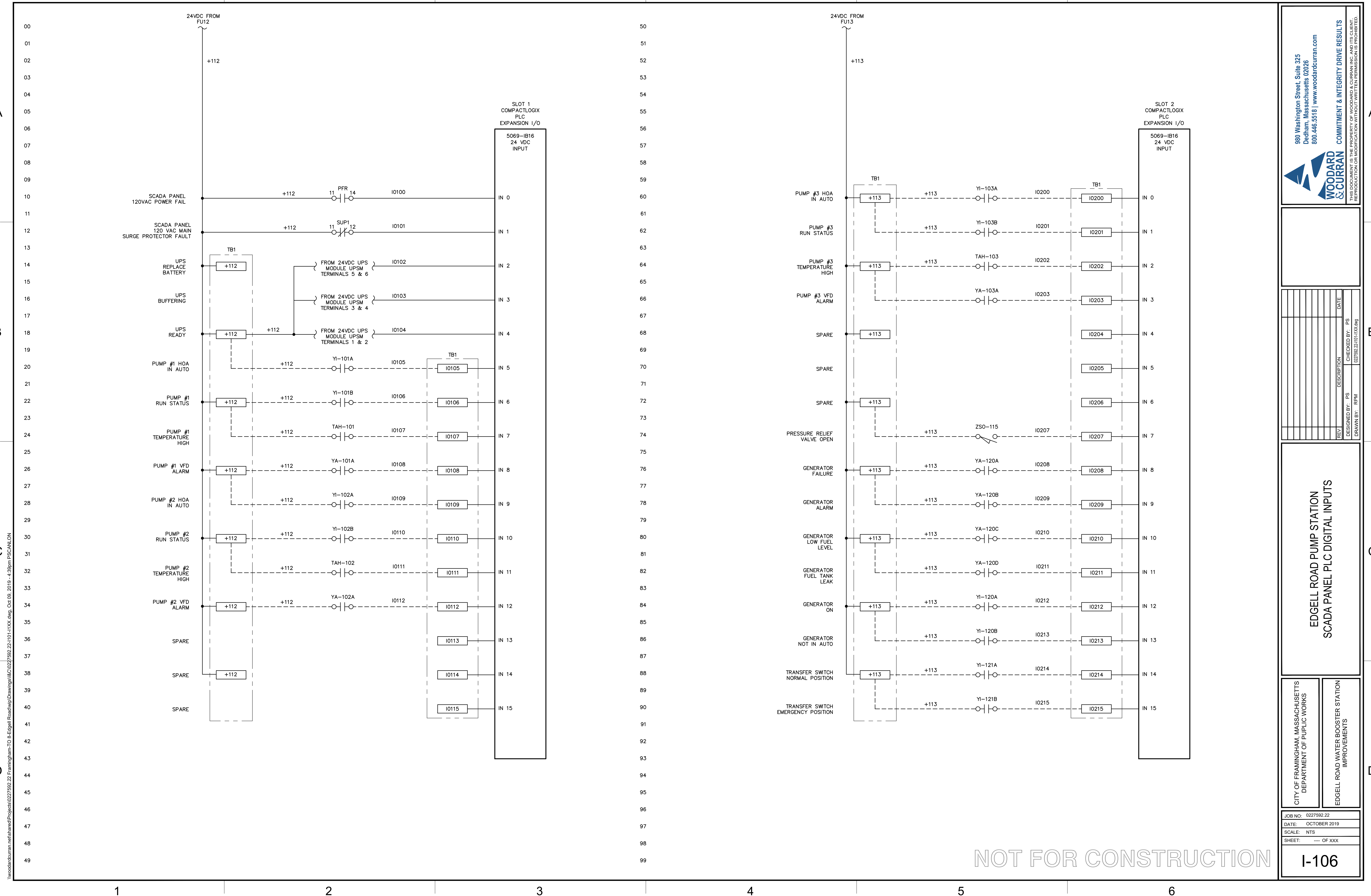
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EDGELL ROAD PUMP STATION
SCADA PANEL PLC DIGITAL INPUTS

CITY OF FRAMINGHAM, MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

EDGELL ROAD WATER BOOSTER STATION
IMPROVEMENTS

JOB NO: 0227592.22
DATE: OCTOBER 2019
SCALE: NTS
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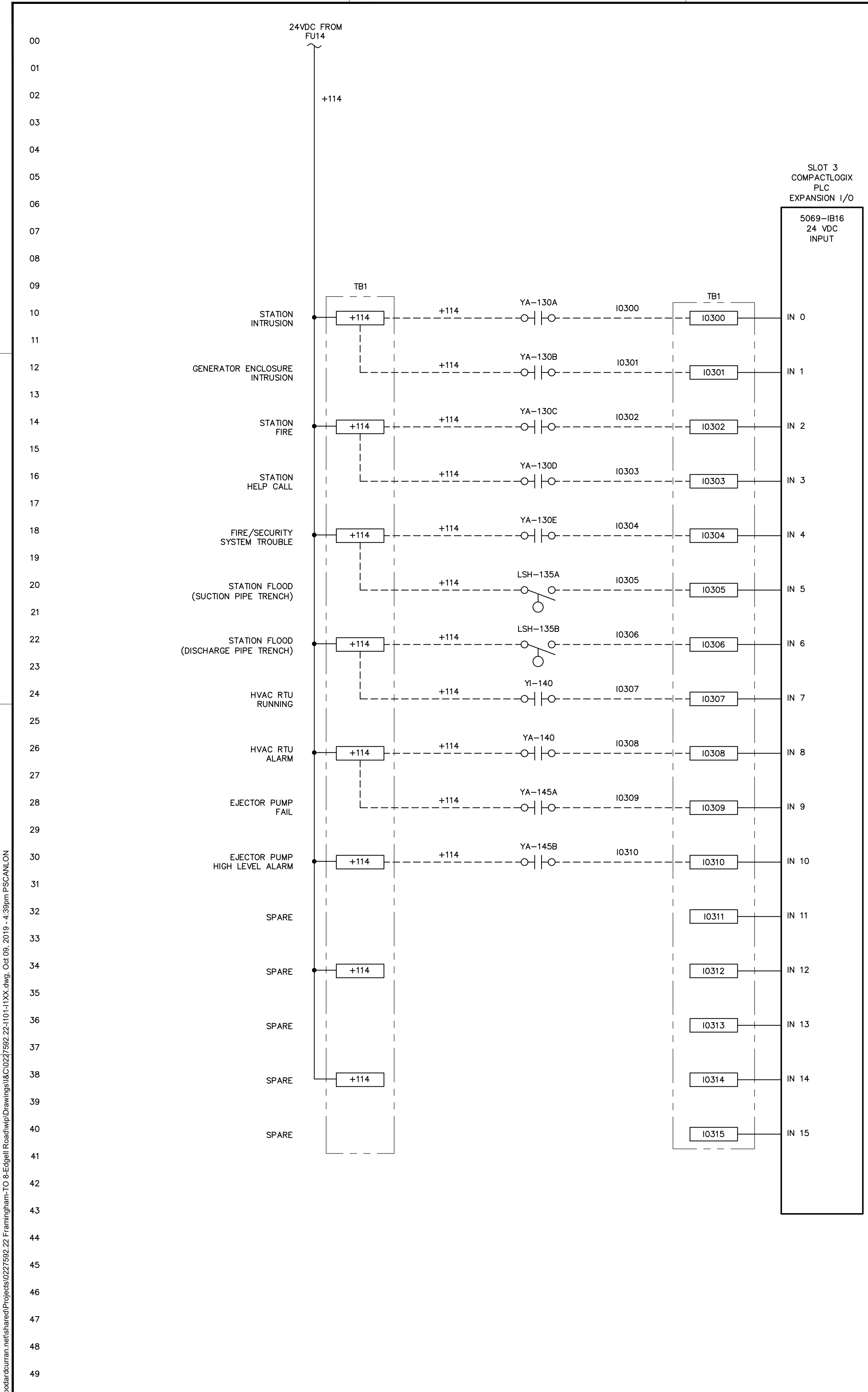
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**EDGELL ROAD PUMP STATION
SCADA PANEL PLC DIGITAL INPUTS**

CITY OF FRAMINGHAM, MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

EDGELL ROAD WATER BOOSTER STATION
IMPROVEMENTS

JOB NO: 0227592.22
DATE: OCTOBER 2019
SCALE: NTS
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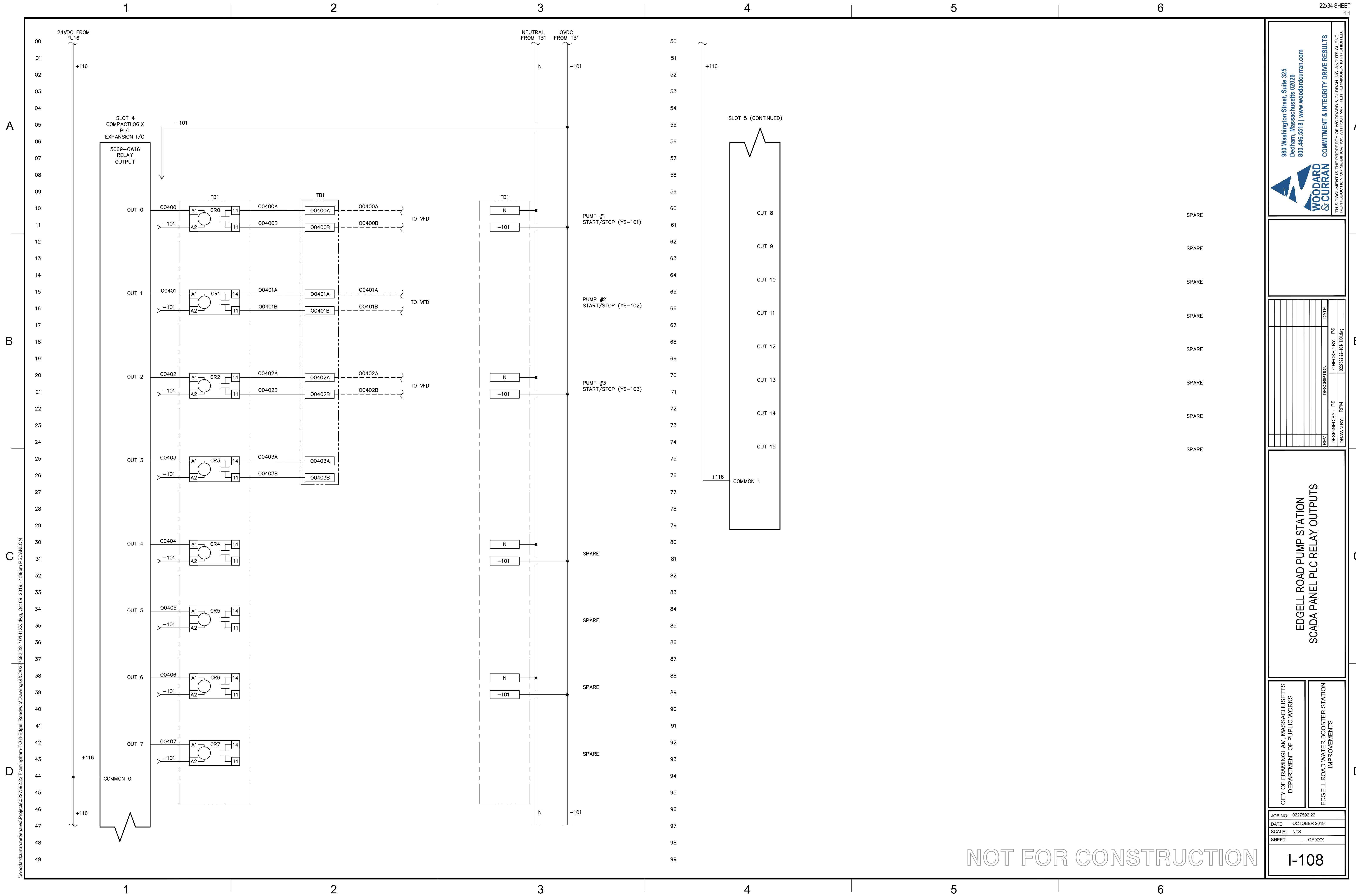
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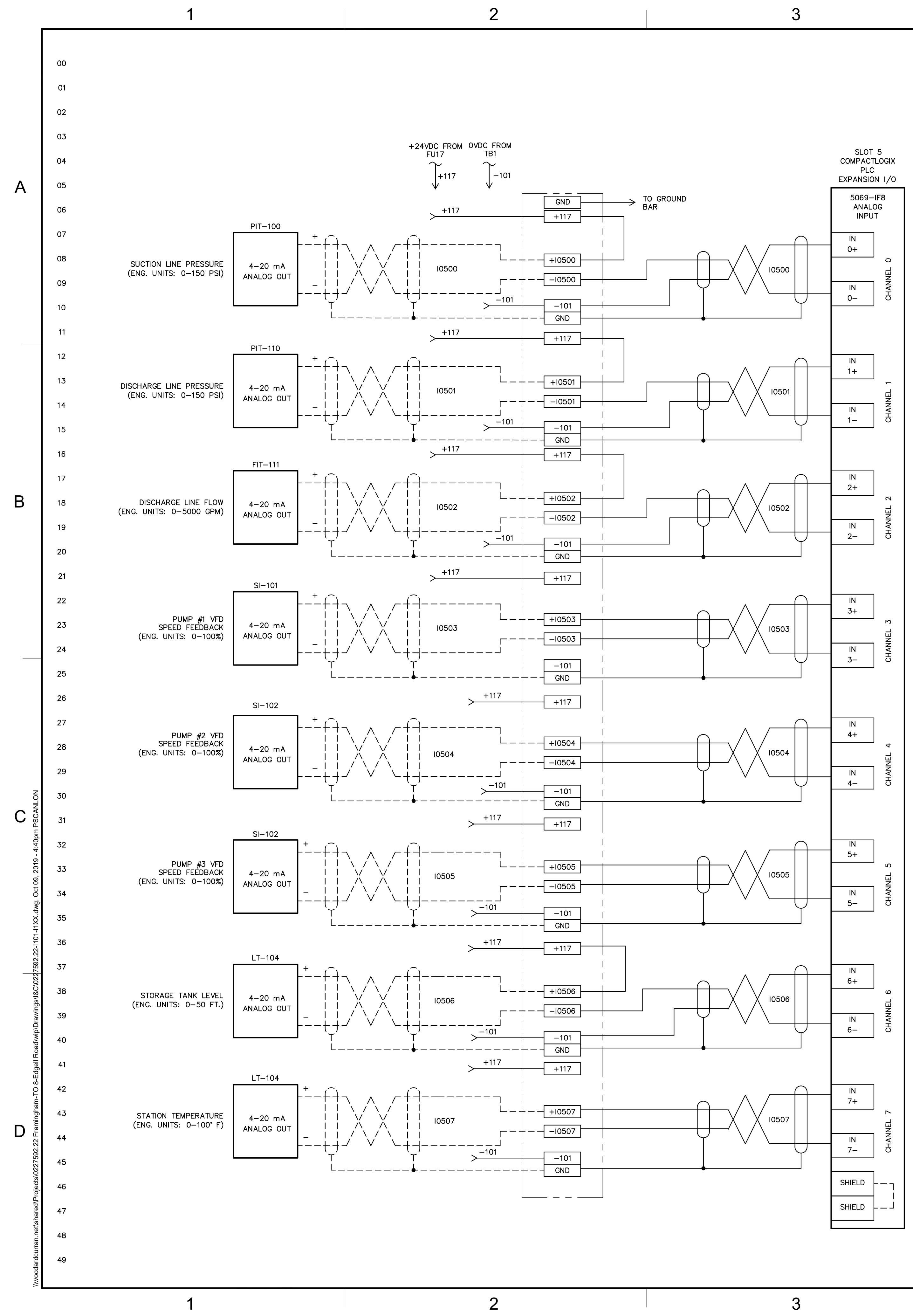
**EDGELL ROAD PUMP STATION
SCADA PANEL PLC RELAY OUTPUTS**

CITY OF FRAMINGHAM, MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

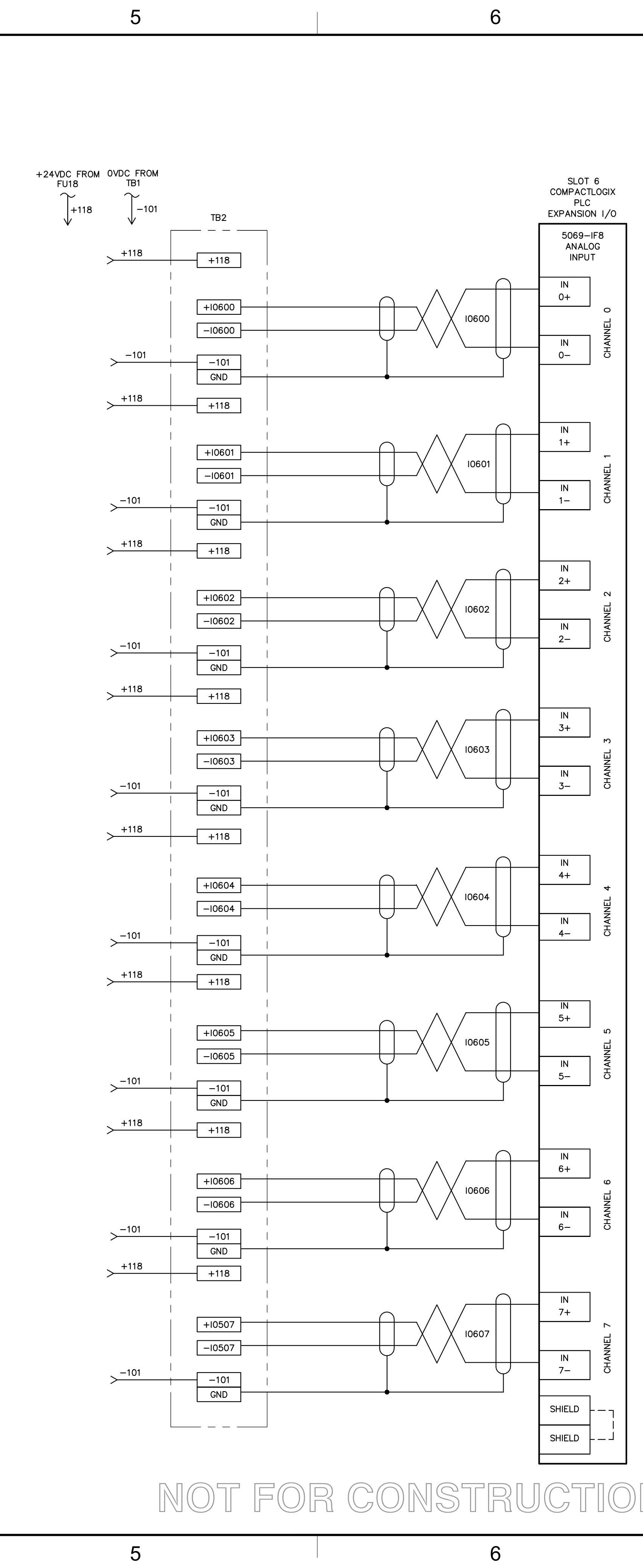
EDGELL ROAD WATER BOOSTER STATION
IMPROVEMENTS

JOB NO:	0227592.22
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EDGELL ROAD PUMP STATION
SCADA PANEL PLC ANALOG INPUTS

CITY OF FRAMINGHAM, MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS	EDGELL ROAD WATER BOOSTER STATION IMPROVEMENTS
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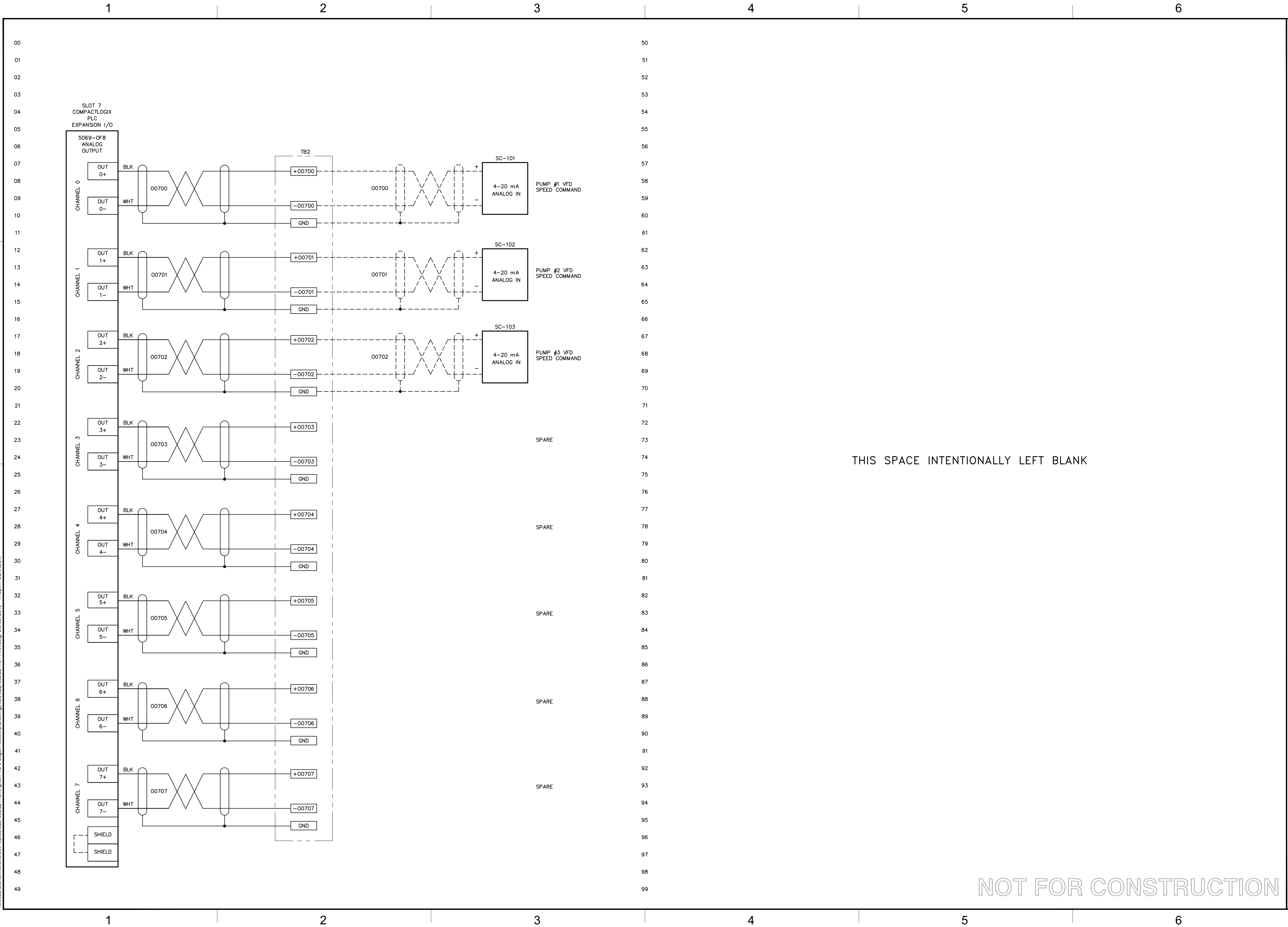
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 SCADA PANEL PLC ANALOG
 OUTPUTS

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 IMPROVEMENTS

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