

Town of Hudson
Engineering Department

Engineering Technical Guidelines & Typical Details



Prepared by:



August 2001
Revised August 2007
Revised February 2020

Town of Hudson
Engineering Department

Engineering Technical Guidelines & Typical Details

Table of Contents

Introduction 1

Definitions..... 3

Section 400 – Pavement..... 5

401 General 5

402 Reference Documents 5

Section 500 - Street Design Standards..... 7

501 Purpose 7

502 Reference Documents 7

505 Engineering Plan Requirements 7

510 Street Classifications 8

515 Horizontal Street Alignment 8

520 Vertical Street Alignment 9

525 Intersections 10

530 Roadway Taper 10

535 Pavement Thickness 10

540 Guardrail Placement 11

545 Vertical Clearance 11

550 Lateral Clearance 11

555 Signage 11

560 Traffic Signals 11

565 Construction Specifications 11

Section 600 – Traffic Studies 13

601 Purpose/Responsibilities for Traffic Studies 13

602 Reference Documents 13

610 Scope of Traffic Studies 13

620 Suggested Contents 13

Section 700 - Sanitary Sewer System..... 15

701 General 15

702 Reference Documents 15

710 Fees 15

720 Design of Sanitary Sewer 15

Section 800 - Water Distribution System..... 19

801 General 19

810 Fees 19

820 Construction Specifications 19

825 Water Main Materials and Installation 19

830 Water Service Materials and Installation 29

840 Water Meters 33

850 Terms of Warranty on Installation 33

Section 900 – Drainage.....	35
901 Purpose	35
902 Reference Documents.....	35
905 Design Requirements.....	35
910 Stormwater Management Report.....	36
920 Erosion Control Criteria	38
930 Construction Design Details.....	40
APPENDIX.....	42
Drainage Details	43
D-1 Standard Drainage Manhole.....	44
D-2 Precast Reinforced Catch Basin	45
D-3 Drainage Trench - RCP	46
D-4 Oil-Grease Separator	47
D-5 Headwall	48
D-6 Off Pavement Catch Basin Grate.....	49
D-7 On Pavement Catch Basin Grate.....	50
D-8 Granite Curb Inlet Detail	51
Road Details.....	52
R-1 Cross-Section Subdivision Street.....	53
R-2 Straight Cul-De-Sac.....	54
R-3 Offset Cul-De-Sac	55
R-4 Sloped Granite Curb Removed & Reset or Installed.....	56
R-5 Pavement Patch with Overlay.....	57
R-6 Pavement End Match	58
R-7 Sidewalk	59
R-8 Driveway Cross Section.....	60
R-9 Underdrain	61
R-10 Curb End.....	62
R-11 Handicap Sidewalk Ramp.....	63
R-12 Driveway Cross Section at Curb with Sidewalk	64
Sewer Details.....	65
S-1 Sewer Manhole	66
S-2 Standard Manhole - Part A	67
S-3 Internal Drop SMH.....	68
S-4 Sewer Trench Section	69
S-5 Building Service Connection.....	70
S-6 Sewer Cleanout.....	71
S-7 Chimney.....	72
S-8 Reserved.....	73
Water Details.....	74
W-1 Utility Separation (Main) Detail	75
W-2 Water Trench	76
W-3 Water 1" Release Valve Installation On Ductile Iron.....	77
W-4 Water 2" Release Valve Installation On Ductile Iron.....	78
W-5 Water Release Valve Installation On PVC.....	79
W-6 Water Tee Installation.....	80
W-7 Water Thrust Block Behind Fittings Installation	81
W-8 Water End Of Main Installation	82

W-9	Water Valve Box Detail.....	83
W-10	Water Hydrant Installation	84
W-11	Utility Separation (Service) Detail	85
W-12	1-1/2" - 2" Service and Valve Box Installation	86
W-13	Water Service Box Detail in Paved Areas Including Driveways	87
W-14	Water Service Meter Installation	88
W-15	Water Slab Construction.....	89
W-16	Catch Basin Insulation Detail.....	90
W-17	Storm Drain / Water Main Parallel Runs - Elevation View.....	91
W-18	Storm Drain / Water Main Intersecting Runs - Elevation View	92
W-19	Copper Water Service on PVC and Transite Mains.....	93
W-20	1" Water Service and Valve Box Installation.....	94
W-21	Large Water Service and/or Tapping Sleeve.....	95
W-22	Fire Water Service Installation with Standard Foundations.....	96
W-23	Fire Service Installation with Slab Foundations	97
W-24	Domestic Water Service Tapped Off Fire Service	98
W-25	1-1/2" thru 2" Water Service Entrance.....	99
W-26	Fire Service Entrance.....	100
W-27	Combined Fire Domestic Water Service Entrance.....	101
W-28	Fire Service With Yard Hydrants.....	102
W-29	Manufactured Housing or Slab Water Service Entrance.....	103
W-30	Domestic Irrigation Water Service Meter Installation	104

Introduction

These Engineering Technical Guidelines & Typical Details have been prepared to assist a developer in understanding the requirements of the Engineering and Highway Departments and to provide information working towards consistent design standards and policies. Engineering Highway Departments are responsible for design and construction review, operation and maintenance of public facilities that includes: transportation facilities, water distribution systems, sanitary sewer systems, and stormwater runoff quantity and quality management.

This booklet addresses the standards for construction of streets, water systems, sanitary sewer systems, stormwater facilities, erosion and sediment control, and traffic management facilities. These standards are to be incorporated in all designs and proposals for facilities that will be placed in public right-of-way and owned, operated, and maintained by the Town of Hudson.

Guidelines are provided to assist the design engineer with information regarding minimum standards. This information provided must not be a substitute for innovative or creative efforts or good engineering judgement. (Deviations from published standards require approval from the Town Engineer or Road Agent or designee.) All designs submitted to the Town must be certified (stamped and signed) by a Professional Engineer with a current registered license to practice civil engineering in the State of New Hampshire. All documents referenced within these guidelines are the latest edition unless otherwise stated.

Definitions

AASHTO - American Association of State Highway and Transportation Officials.

ASCE - American Society of Civil Engineers.

Access - Driveway or other point of entry such as a street, road, or highway that connects to the general street system. Where two public streets intersect, the secondary street will be the access.

Access Streets - Streets or minor ways designed or required to provide vehicular access to off-street loading or off-street parking facilities.

All Season Safe Sight Distance - A line which encounters no visual obstruction between two (2) points, measured from the driver's eye height at 3.5 feet to the top of an approaching vehicle at 4.35 feet above the pavement or travelway and so located as to represent the critical line of sight between the operator of a vehicle using the access and the operator of a vehicle approaching from either direction.

Arterial Street - Every public highway or major street.

- ◆ NH Route 3A (*Elm Street, Lowell Road, Webster Street, and River Road*).
- ◆ NH Route 102 (*Derry Street*).
- ◆ NH Route 111 (*Central Street*).
- ◆ Dracut Road

Collector Street - Any street designed or required to collect traffic from minor streets and distribute traffic to major streets.

- | | |
|-----------------------|-------------------|
| ◆ Barrett's Hill Road | ◆ Belknap Road |
| ◆ Burns Hill Road | ◆ Bush Hill Road |
| ◆ Greeley Street | ◆ Highland Street |
| ◆ Kimball Hill Road | ◆ Lawrence Road |
| ◆ Musquash Road | ◆ Old Derry Road |
| ◆ Pelham Road | ◆ Pine Road |
| ◆ Robinson Road | ◆ Wason Road |
| ◆ West Road | ◆ Windham Road |

Commercial Driveway - A driveway providing access to an office, retail or institutional building, or to an apartment building having five (5) or more dwelling units.

Commercial Streets - Streets designed, or required to serve industrial or mercantile concentrations and carry traffic to major streets.

Commercial Waste - Wastewater from a retail store, restaurant, office building, laundry, or other private business or service establishment.

Constituents of Concern - Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

Curb-Return Type Driveway - A driveway which is essentially a "T" intersection with constant curb cross section from curb-return to curb-return as found at the intersection of two streets.

Domestic Wastewater - Normal water-carried household and toilet wastes or waste discharged from any improved property excluding ground, surface, or stormwater.

Driveway - An improved or unimproved area serving as an area of access, entrance, exit, or approach from any highway to any parcel of land, regardless of public or private ownership.

Driveway Width - The driveway throat distance, measured at the property line.

Highway - Any travelway, dedicated to or accepted by the town, whether improved or unimproved, within the Town of Hudson that is available as public use for travel, regardless of whether or not its popular or legal name contains the term "street," "highway," "road," "roadway," "route," "avenue," "boulevard," or other such nomenclature which shall include any Class VI roads within Hudson. In this document the term street, road, route, roadway or avenue may be used interchangeably with Highway.

Industrial Driveway - A driveway directly serving substantial numbers of truck movements to and from loading docks of an industrial facility, warehouse, truck terminal, or community or regional mall loading area.

Industrial User - Any room, group of rooms, building or other enclosure used or intended for use in the operation of one (1) or more business enterprise for manufacturing, processing, cleaning, laundering, assembling or preparing any produce, commodity or article from which any process waste, as distinct from domestic wastewater, may be discharged. Industrial user shall also include any government nonresidential user of the wastewater system as identified in *the Standard Industrial Classification Manual, 1972, Office of Management and Budget*, as amended and supplemented, under the following divisions: Division E - Transportation, Communications, Electric, Gas and Sanitary, and Division I - Services.

Minor Street - Any city street not designated by the municipality as an Arterial Street or Collector Street.

Major Streets - Streets designed, or required, to carry large volumes of traffic to, from, or through the Town. Arterial or Collector Streets as listed in the Zoning Ordinance (and defined above) are considered to be major streets.

Parcel - Any piece of property in single ownership.

Process Waste - Wastewater originating from any Industrial User not classified as domestic wastewater.

Residential Driveway - A driveway providing access to a single-family residence, duplex, or an apartment building containing not more than four (4) dwellings.

Residential Streets - Streets designed or required to provide vehicular access to abutting residential properties.

Right-of-Way - The area of land owned, used by, or available to the Town for street (highway) purposes, including any ancillary purposes thereto.

Safe Stopping Distance - The recommended distance for safe stopping for the grade, average speed and other conditions as published by AASHTO. The distance shall be measured on the surface of the roadway as opposed to a visual line-of-sight distance.

Service Streets - Streets designed or required to provide vehicular access to abutting commercial or industrial properties.

Section 400 – Pavement

401 General

Pavement design and construction shall generally conform to *Standard Specifications for Road and Bridge Construction*, Division 400 – Pavement, as published by the State of New Hampshire Department of Transportation. However, the following exceptions may be considered:

- ◆ Winter asphalt mix designs may vary. Stamped designs should be submitted by a registered engineer for prior review and approval from the Town Engineer.
- ◆ Experimental pavements and subgrades may be acceptable. Stamped designs should be submitted by a registered engineer for prior review and approval from the Town Engineer.

402 Reference Documents

- ◆ *Standard Specifications for Road and Bridge Construction*, as published by the State of New Hampshire Department of Transportation.

Section 500 - Street Design Standards

501 Purpose

This section has been prepared to reflect Town policy, outline a uniformity of methods and procedures, and to communicate vital information to the Design Engineer. The contents include minimum design criteria for street design, as well as specification requirements for project construction items.

If a conflict is perceived, Town of Hudson Regulation 289-18 shall take precedence.

502 Reference Documents

- ◆ *Manual on Uniform Traffic Control Devices*, as published by the US Department of Transportation, Federal Highway Administration.
- ◆ *Highway Design Manual*, as published by the NH Department of Transportation.
- ◆ *A Policy on Geometric Design of Highways and Streets*, published by the American Association of State Highway and Transportation Officials.
- ◆ *Standard Specifications for Road and Bridge Construction*, as published by the State of New Hampshire Department of Transportation.

505 Engineering Plan Requirements

505.1 General Requirements

- 505.1.1 All work shall be in accordance with the *current Standard Specifications for Road and Bridge Construction*, as published by the State of New Hampshire Department of Transportation.
- 505.1.2 Plans must be drawn on plan and profile sheets twenty-two (22) inches vertical by thirty-four (34) inches horizontal.
- 505.1.3 Each sheet must have a title block and revision block.
- 505.1.4 The datum shall be United States Geological Survey on all construction plans.

505.2 Plan and Profile Sheets Layout – Profile Layout

- 505.2.1 The horizontal scale must be one (1) inch equals fifty (50) feet or other approved scale.
- 505.2.2 The vertical scale must be one (1) inch equals five (5) feet or other approved scale.
- 505.2.3 The profile shall contain existing grades drawn with dashed lines.
- 505.2.4 The profile shall contain proposed grades drawn with solid lines.
- 505.2.5 The profile of existing ground lines should be shown along the centerline of construction.
- 505.2.6 The profile of the proposed grade should be shown along the crown line of the new street.
- 505.2.7 Proposed grades should be shown at 50-foot intervals and at all vertical P.I.'s and at angle points.
- 505.2.8 The lengths of all vertical curves and the gradients of each tangent should be clearly labeled.
- 505.2.9 A profile for each storm drain, catch basin, manhole, or culvert must be shown in its entirety.
- 505.2.10 Sanitary sewer profiles must be shown.
- 505.2.11 Water main crossing information must be shown. The entire water main profile must be shown.

505.3 Plan and Profile Sheets Layout – Plan Layout

505.3.1 The following data must be included in the plan section of the plan and profile sheets:

- ◆ North arrow
- ◆ Construction centerline
- ◆ Names of all streets
- ◆ Right-of-way widths and improvement widths
- ◆ Curb-return details
- ◆ Centerline horizontal curve data
- ◆ Lot lines
- ◆ Lot numbers
- ◆ Existing underground and surface installations in relation to the centerline of construction stationing
- ◆ Storm drain installations, including structures and types of pipes and structures
- ◆ Street lights, conduit, junction boxes, and location of street light service
- ◆ All signs and pavement markings normally required by the *Manual on Uniform Traffic Control Devices* or the NHDOT.

510 Street Classifications

The following street classifications are to be used with the street design standards.

510.1 Major Street

Design of a major street requires close interaction with the Town Engineer. At a minimum, the design criteria for a minor street may be used as a base point; however, all major street design and construction will require custom specifications to be approved by the Town Engineer and the State of New Hampshire (as necessary).

510.2 Minor Street

- ◆ Cross-Section Subdivision Sheet, R-1
- ◆ Sloped Granite Removed & Reset or Installed, R-4.

515 Horizontal Street Alignment

515.1 General

Horizontal street alignment shall be designed to permit adequate visibility for both pedestrian and vehicular traffic.

Service streets shall be laid out so that their use by through traffic will be discouraged.

515.2 Right-of-Way Width

All proposed right-of-way shall have a width of at least fifty (50) feet.

515.3 Horizontal Curves

No horizontal curve shall have a centerline radius of less than one hundred fifty (150) feet except a horizontal curve on a turnaround on a dead-end way.

515.4 Cul-de-Sac

Streets that are not through streets shall be designed with an appropriate turn around. An acceptable form of turnaround is a cul-de-sac using a minimum right-of-way radius of

seventy-five (75) feet, and a minimum radius to the outside edge of pavement, or curb, of sixty-five (65) feet.

A detail for the Town of Hudson standard cul-de-sac is as shown in Straight Cul-de-Sac, Detail R-2. Detail R-3, Offset Cul-de-Sac, using an offset center, may be used upon request and approval by the Planning Board and Town Engineer.

A cul-de-sac (dead-end) street shall not exceed one thousand (1000) feet in length, and shall measure from the center point of the outside edge of the cul-de-sac turnaround to the point of intersection at the center line of an intersecting street. The "point of intersection" shall be defined as the center of the road (See Detail R-2).

515.5 Superelevation on Horizontal Curves

Superelevation is not typically used on public streets in Hudson, however; any street designs using superelevation are subject to review and approval by the Town Engineer. For design details and methodology, it is recommended that the NHDOT Design Manual or AASHTO's *A Policy on Geometric Design of Highways and Streets* be used.

515.6 Monumentation

Monuments shall be used in accordance with the Land Use Legislation, Sections 289-4 and 289-28.

- All existing survey control monuments which are disturbed, lost, or destroyed during construction or maintenance shall be replaced by the responsible party at his own expense.
- All existing survey control monuments which are covered over by a street improvement shall be raised to the new finished surface.
- Monuments shall be set at all block corners, angle points, points of curve in streets, property corners and at any other points the Hudson Planning Board may deem necessary to control the line of streets. The location of monuments are determined by the Planning Board.

515.7 Roadway Width

Major streets, collector streets and commercial streets shall be paved a minimum of 36 feet or wider where the Planning Board determines that the nature and/or intensity of the proposed use would require a wider pavement. Residential streets, service streets and access streets of 1,000 feet in length or less shall be paved 24 feet wide. Residential streets, service streets and access streets greater than 1,000 feet in length shall be paved 28 feet wide.

520 Vertical Street Alignment

520.1 General

Street in cut or fill sections shall be provided with side slopes not steeper than two (2) feet horizontal to one (1) foot vertical. All side slopes shall be conducted outside the right-of-way.

Vertical street alignment shall be designed to permit adequate visibility for both pedestrian and vehicular traffic.

520.2 Street Grades

Grades of all streets shall conform in general to the terrain and shall, so far as practicable, not exceed 4% for major streets and 7% for minor streets. No street shall have a grade less than 1%.

At intersections with major streets, the grade of the intersection shall not be more than two percent (2%) for a distance of one hundred (100) feet from the intersection.

520.3 Vertical Curves

No vertical curve shall have K values less than the following: 40 Sag; 30 Crest. Note: K values at stop condition situations shall be evaluated on an individual basis.

520.4 Stopping Sight Distance

Design stopping sight distance for horizontal and vertical curves in accordance with AASHTO's *A Policy on Geometric Design of Highways and Streets*.

525 Intersections

525.1 Intersection Angle

Proposed public streets shall be laid out to intersect as nearly as possible at right angles. No street shall intersect another at an angle of less than sixty degrees (60°).

Streets entering opposite sides of another street shall be laid out either directly opposite one another or with a minimum offset of one hundred twenty-five (125) feet between their centerlines.

All street deflections shall be curved.

525.2 Intersection Corner Radii

Intersecting property lines at street intersections shall be joined by a curve of at least one-half (1/2) the width of the wider street in radius.

525.3 Sight Distance on Public Streets

Street intersections shall be designed to permit adequate visibility for both pedestrian and vehicular traffic.

A minimum of four hundred (400) feet of sight distance is required for all intersections including driveways unless otherwise allowed by Planning Board and Town Engineer.

Specialized cases of sight distance evaluation, which may require greater than 400 feet, shall be provided in accordance with applicable sections of Hudson Regulation Chapter 193, Driveways, and AASHTO's *A Policy on Geometric Design of Highways and Streets*.

530 Roadway Taper

Design of roadway tapers shall be provided in accordance with *A Policy on Geometric Design of Highways and Streets*.

535 Pavement Thickness

Pavement thickness shall be designed at a minimum per Detail R-1. It is the applicant's responsibility to be sure that the pavement thickness design is adequate to support required loadings (i.e. emergency and maintenance vehicles) given the existing ground conditions.

540 Guardrail Placement

Roadway hazards that may require shielding by a roadside barrier can be placed into two basic categories: fixed objects and embankment hazards. Curb is not an adequate barrier for redirecting vehicles. Design of guardrails shall be in accordance with the *NHDOT Highway Design Manual and Roadside Design Guide* (30).

545 Vertical Clearance

A minimum vertical clearance of nineteen (19) feet shall be provided for all overhead obstacles measured from the crown of the street (allowing for future overlays) to the lowest portion of the obstacle. The minimum vertical clearance over sidewalks and bikeways shall be eight (8) feet.

550 Lateral Clearance

The lateral clearance between the curb face and the closest part of any fixed object, excluding traffic-control sign and parking meter posts not protected by a guardrail, shall be a minimum of thirty (30) inches.

555 Signage

Signage shall be designed based upon criteria contained in the *Manual on Uniform Traffic Control Devices*, as published by the US Department of Transportation.

560 Traffic Signals

The need for new traffic signals shall be based on warrants contained in *the Manual on Uniform Control Devices*, as published by the US Department of Transportation. Traffic evaluation reports shall be prepared using the recommended criteria listed under Section 600, Traffic Studies.

If the evaluation indicates that warrants for new traffic signals are or will be met, the developer should meet with the Town Engineer to review the existing traffic planning reports to determine how the current proposal can be incorporated into the existing plan.

565 Construction Specifications

565.1 The following specifications list Town requirements for materials and workmanship for various items of work. For any item of work not listed below, the current edition of *the Standard Specifications for Road and Bridge Construction*, as published by the State of New Hampshire Department of Transportation shall apply.

565.1.1 Division 200 - Excavation and Embankment

- ◆ Ledge and Boulder Excavation and Removal
 - ◆ All ledge and boulder excavation and removal activities shall conform with Section 203 of *the Standard Specifications for Road and Bridge Construction*, as published by the New Hampshire Department of Transportation and Town requirements for blasting permits/submittals. No ledge or boulders shall be buried within the Town owned Right-of-Way.
- ◆ Stump Removal and Disposal
 - ◆ Stumps shall be removed and disposed of in accordance with *New Hampshire Department of Environmental Services* standards. Prior Town approval is required for any on-site stump burials. Stumps cannot be buried or otherwise disposed of within the Town owned Right-of-Way.

- ◆ Off-Site Fill Material
 - ◆ Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
 - ◆ Contractor shall not import any fill over the amount of ten cubic yards cumulative total per source to any job site in the Town of Hudson without soils testing verifying the absence of all Constituents of Concern, and without prior approval by Engineering Department staff. Documentation such as test reports, certifications and sieve analyzes of fill shall be provided to the Engineering Department for approval prior to transporting the material to Hudson.
- 565.1.2 Division 300 – Base Courses
- 565.1.3 Division 400 – Pavements
- 565.1.4 Division 500 – Structures
- 565.1.5 Division 600 – Incidental Construction
 - ◆ Catch Basins
 - ◆ Catch basins shall be installed at such locations and to such dimensions and details as shown on the plans or as designed by the Engineer and in conformance with Details D-2.
 - ◆ Bituminous Sidewalk
 - ◆ Bituminous sidewalk shall be constructed as shown on the plans in accordance with Detail R-7.
 - ◆ Illumination System
 - ◆ The work consists of illumination construction as shown on the plans and as specified herein. Design and construction criteria shall meet or exceed NHDOT design and construction standards. The lighting design shall be reviewed and approved by the Town Engineer prior to construction.
- 565.1.6 Division 700 – Materials.
- 565.2 Miscellaneous Details
 - 565.2.1 Pavement patching for work within the roadway shall conform to the Pavement Patch with Overlay, Detail R-5.
 - 565.2.2 Pavement End Match, Detail R-6, shall be used when required to tie new pavement to existing pavement.

Section 600 – Traffic Studies

601 Purpose/Responsibilities for Traffic Studies

Traffic studies may be required by the Town in order to adequately assess the impacts of a development proposal on the existing and/or planned street system. The primary responsibility for assessing the traffic impacts associated with a proposed development will rest with the developer.

602 Reference Documents

Traffic study data should meet requirements set forth in the latest version of the following documents:

- ◆ *Highway Capacity Manual, Special Report 209*, as published by the Transportation Research Board, National Research Council.
- ◆ *Trip Generation [Rates, Plots and Equations]*, as published by the Institute of Transportation Engineers
- ◆ *Manual on Uniform Traffic Control Devices*, as published by the US Department of Transportation, Federal Highway Administration.
- ◆ *Highway Design Manual*, as published by the NH Department of Transportation.
- ◆ *A Policy on Geometric Design of Highways and Streets*, published by the American Association of State Highway and Transportation Officials.

610 Scope of Traffic Studies

Specific requirements will vary depending on the site location. The Town Engineer may request additional information as applicable to the project.

620 Suggested Contents

The following provides a list of basic items to include in submitted traffic studies: (Not all items may be applicable to a specific study.)

- 620.1 Site and study area boundaries
- 620.2 Existing and proposed site uses (include square feet, number of units)
- 620.3 Existing and proposed uses in the vicinity of the sites
- 620.4 Site locus map
- 620.5 Existing and proposed roadways and intersections.
- 620.6 Existing and projected traffic volumes (opening year and/or design year)
- 620.7 Project trip generation and design-hour volumes
- 620.8 Project trip distribution
- 620.9 Project trip assignment
- 620.10 Capacity analysis/level of service (LOS) – without and with project
- 620.11 Traffic signal data, if applicable
- 620.12 Traffic accident data
- 620.13 Sight distance information – proposed site drive and adjacent intersections
- 620.14 Conclusions and recommendations
 - ◆ Definition of site-related impacts
 - ◆ Capacity analysis of study area intersections
 - ◆ Proposed Improvements) to mitigate impacts
- 620.15 Summary
- 620.16 Appendix
 - ◆ Computerized analysis output sheets
 - ◆ Raw ATR and turning movement count data
 - ◆ Capacity analyses/LOS calculations

- ◆ Other relevant calculations
- ◆ Assumptions/reference data
- ◆ Maps
- ◆ Graphics.

Section 700 - Sanitary Sewer System

701 General

Sewer systems shall be designed and constructed to achieve total containment of sanitary wastes and maximum exclusion of infiltration and inflow. No combined stormwater and sanitary sewers are allowed.

In order to acquire sanitary sewer service from the Town of Hudson, the property proposed for development must abut a Town-owned sewer main located within the right-of-way or a Town owned easement. The main must have adequate capacity to handle the anticipated flow from the developer's project.

If the proposed development does not meet the above criteria, the developer must either construct a new sewer main extension, or propose an adequate subsurface disposal system which is approvable by the State of NH Department of Environmental Services.

702 Reference Documents

- ◆ *Sewer Use Ordinance No. 77*, by the Town of Hudson.
- ◆ *Gravity Sanitary Sewer Design and Construction (FD-5)*, as published by ASCE and WPCF.
- ◆ *Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities*, as published by the NH Department of Environmental Services Water Division, Latest Edition.

710 Fees

Sewer service connection fees shall be in accordance with current Hudson Codes and Policies. For specific information, contact the Engineering Division.

Participation in the Industrial Pretreatment Program will be required for Industrial Users and users discharging process or specific types of commercial wastes. Participation in this program requires annual fees in addition to the connection and user fees.

720 Design of Sanitary Sewer

720.1 Design flow basis for new sewer flows shall be designed based upon Env-Wq-1008.03 Table 1008-1. Flow calculations must account for infiltration.

720.2 Design criteria shall be per *Env-Wq 700 Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities*, as published by the NH Department of Environmental Services Water Division, and *Gravity Sanitary Sewer Design and Construction*, as published by ASCE and WEF.

720.3 All design and construction must be in conformance with all federal, state and local rules.

720.4 Gravity Systems

720.4.1 Minimum Size. No sewer shall be less than eight (8) inches in diameter.

720.4.2 Slope. All sewers shall be designed and constructed to give mean velocities, when flowing full, or not less than 2 feet per second nor greater than 10.0 feet per second. Velocities outside of this range may be reviewed on an individual basis with the Town Engineer.

720.4.3 Separation. Separation distances between water and sewer must be a minimum of ten (10) feet horizontally. If a crossing is required, the water shall pass over the sewer at a minimum of eighteen (18) inches above the sewer. If

the design is unable to meet the above criteria, special details in accordance with State of New Hampshire Regulations shall be provided. All crossing information shall be clearly shown on the plan. A typical utility separation schematic can be found in the Standard Details section of the Appendix, as Detail W-18, Water Utility Separation.

720.5 Pressure Systems/Pump Stations

720.5.1 All pressure systems will be designed by a Licensed Professional Engineer.

720.5.2 Design criteria shall generally conform to the Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities, as published by NH Department of Environmental Services Wastewater Engineering Bureau (Env-Wq 700).

720.5.3 Pumping station for more than one building unit; to be owned by more than one individual or by the Town will be a suction lift type station; Gorman Rupp.

720.6 Manholes

720.6.1 Manholes shall be in accordance with Standard Details S-1, S-2 and S-3 in the Appendix.

720.6.2 Barrel Blocks are not an acceptable form of manhole construction.

720.6.3 Manhole covers shall be East Jordan Iron Works 30-inch or approved equal, with "SEWER" imprinted on the cover.

720.7 Waterways Crossings

720.7.1 Sewers crossing waterways or wetlands shall be of watertight pipe. The pipes and joints shall be tested in place; shall exhibit zero infiltration; and shall be designed, constructed, and protected against anticipated hydraulic and physical, longitudinal, vertical, and horizontal loads, erosion, and impact. Sewers laid on piers across ravines or streams shall be allowed only when it can be demonstrated that no other practical alternative exists. Such sewers on piers shall be constructed in accordance with the requirements for sewers crossing under streams. Construction methods and materials of construction shall be such that sewers will remain watertight and free from change in alignment or grade.

720.7.2 Permits from other local, state and federal agencies are required for work in or adjacent to waterways.

720.7.3 Inverted siphons shall be designed in accordance with *Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities*, as published by NH Department of Environmental Services Wastewater Engineering Bureau (Env-Wq 704.18).

720.8 Service Connections

720.8.1 The connection of a building sewer into an existing public sewer shall be made at the curb fitting, if provided, or the "Y" branch, if such a branch is available at a suitable location.

720.8.2 Where a building sewer is to tie in to a sewer main and the elevation difference between the invert of the building sewer and the top of sewer main is greater than two (2) feet, a chimney will be used to make the appropriate connection. A standard detail for a chimney can be found in the Appendix as Detail S-7, Chimney.

720.8.3 Clean-outs or manholes are required at all change of directions or the property line/ R.O.W. The maximum spacing between sewer manholes for gravity sewers less than 15 inch diameter shall be 300 feet. For sewers 15 inch diameter or greater refer to Env-Wq 704.15 Table 704-5: Manhole Spacing Requirements.720.8.4Clean-outs shall be provided at a maximum spacing of seventy-five (75) feet on straight runs. A standard clean-out detail may be found in the Appendix as Detail S-6.

- 720.8.5 Floor drains, roof drains, sump pumps or any other non-sanitary sewerage drain cannot be connected to a building's sewer service connection.
- 720.9 Construction Criteria
- 720.9.1 General Specifications
General construction specifications shall be in accordance with the details included in the details section of this booklet.
- 720.9.2 Technical Specifications for Pipe
Pipe selection shall conform to *Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities*, as published by NH Department of Environmental Services Wastewater Engineering Bureau (Env-Wq 704.05).
- 720.9.3 Technical Specifications for Manholes
Manhole design, selection and construction shall conform to *Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities*, as published by NH Department of Environmental Services Wastewater Engineering Bureau (Env-Wq 704). Standard details for manhole construction are included as S-1 and S-2 in the Appendix.
- 720.9.4 Leakage Testing
Leakage Testing requirements shall be tested for water tightness by the use of testing as specified by *Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities*, as published by NH Department of Environmental Services Wastewater Engineering Bureau (Env-Wq 704.06).
- 720.9.5 Trench Construction
Trench construction criteria are as specified by *Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities*, as published by NH Department of Environmental Services Wastewater Engineering Bureau (Env-Wq 704.11). A standard detail for sewer trench construction is included as S-4 in the Appendix. All excavation activities shall also conform to section 565.1 above.
- 720.9.6 Common Borrow
- ◆ Inorganic natural soils and/or rock having not more than 5% by weight passing the No. 200 sieve.
 - ◆ Maximum stone size six (6) inch and material well graded throughout entire site range.
 - ◆ Free from roots, leaves, and other organic materials.
 - ◆ Free of ice or frost and no aggregations of soil particles frozen.
 - ◆ Moisture content of borrow within plus or minus four percent (4%) optimum moisture content at the borrow source.
 - ◆ Refer to 565.1.1 for additional requirements
- 720.9.7 Force Mains
Force main construction shall conform to *Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities*, as published by NH Department of Environmental Services Wastewater Engineering Bureau (Env-Wq 704.07 and 704.08). Testing of force mains shall conform to Env-Wq 704.09.
- 720.9.8 Sewer Main Installation
Sewer mains shall be installed using a pipe laser to the grades and slopes shown on the approved plans. Sewer main installation shall comply with Env-Wq Table 704.1 - Minimum Pipe Slope. Sewer mains smaller than 48 inches in nominal diameter shall be laid with a straight alignment between manholes.

Section 800 - Water Distribution System

801 General

In order for a development to obtain water service from the Town, the property must abut a Town-owned water main located within a right-of-way or within an approved easement. The main must have adequate flow and pressure to meet both domestic and fire suppression requirements.

If the main does not meet the above criteria, the developer must construct a water main extension prior to obtaining water service and/or provide a water booster pump station if pressure requirements cannot be met by the existing service.

If construction of a water main extension is not feasible, the developer must construct a public or private water supply system in compliance with the State of New Hampshire Drinking Water Regulations (Env-Dw 300-400).

810 Fees

Water service connection fees shall be in accordance with applicable Hudson Codes and Ordinances. Other fees for review of design may be required as deemed necessary by the Town Engineer. For additional information, contact the Engineering Division.

820 Construction Specifications

All water design and construction shall be in accordance with the following specifications.

Standard details for construction of most water-related items are included in the Appendix as details W-2 through W-30. Other relevant details include R-1 – Cross-Section Subdivision Street, R-4 - Sloped Granite Curb, R-5 - Pavement Patch with Overlay, and R-6 – Pavement End Match.

Excavation for water system installation shall also conform to section 565.1 above.

Rules and Regulations of the Hudson Water Utility, adopted February 4, 2020, by the Hudson Board of Selectmen shall supercede any of the requirements listed below.

825 Water Main Materials and Installation

825.1 General

825.1.1 Materials of construction - All water mains shall be constructed with cement lined ductile iron water main meeting or exceeding the product specifications below. All water pipes shall be certified as being manufactured in the United States of America. All components shall be zinc coated or as approved by the Engineering Department.

825.1.2. Materials sizing - All water main sizing shall be approved by the Engineering Department.

825.1.3 Utility separation - All water mains and appurtenances shall be separated from other utilities and septic fields in accordance with the New Hampshire Code of Administrative Rules Env-Wq 704.19 and Env-Wq 1000 and as detailed in the Standard Details.

825.1.4. In the absence of a recognized and/or approved industry standard for such hardware, Hudson Water Utility's field inspectors will be the final judge as to the acceptability of miscellaneous hardware used in the installation of water mains.

825.2 Product Specifications

825.2.1 Ductile Iron Water Main

- ◆ Ductile iron water main shall conform to AWWA Standard C-151-17 and be double cement lined and sealed coated to meet AWWA Standard C-104-16. Joints shall be push-on and shall conform to AWWA C-111-17.

- ◆ Interior seal coat shall be at least two (2) mils thick and shall conform to AWWA C-104-16.
 - ◆ Exterior of pipe shall be petroleum asphaltic coated with a minimum of four (4) mils dry film thickness.
 - ◆ Class 52 wall thickness, four-inch diameter through ten-inch diameter inclusive.
 - ◆ Class 52 wall thickness, 12-inch and 16-inch diameter.
 - ◆ Class 50 wall thickness, 20-inch diameter and larger.
 - ◆ Nominal laying length shall average no less than eighteen (18) feet per pipe.
- 825.2.2 PVC Pipe (NOT ALLOWED AT THIS TIME)
- ◆ Small diameter (4-inch) PVC shall conform to AWWA Standard C-900.
 - ◆ Pipe shall meet or exceed DR-18-150 psi working pressure standards.
 - ◆ Pipe shall be of the push-on type with rubber gaskets.
 - ◆ Pipe shall be 20' 0" nominal length.
- 825.2.3 Ductile Iron Mechanical Joint Fittings
- ◆ All mechanical joint fittings shall be compact ductile iron Class 350 AWWA - C-153 for 3-inch through 24-inch fittings and shall be cement lined in accordance with AWWA/ANSI C-104/A-21.40-16 or be fusion bonded meeting or exceeding AWWA C116 standards.
 - ◆ Interior seal coated with a minimum of four (4) mils dry film thickness in accordance with AWWA C104-16. Exterior petroleum asphaltic coated with a minimum of four (4) mils dry film thickness.
 - ◆ Mechanical joint nuts and bolts shall be Cor-Ten unless otherwise specified.
 - ◆ All fittings shall be supplied with "Megalug accessories" unless otherwise specified.
 - ◆ Hudson Water Utility prohibits the use of cast iron fittings.
 - ◆ Hudson Water Utility prohibits the use of fittings not manufactured in the United States.
- 825.2.4 Mechanical Joint Resilient Wedge Gate Valves
- ◆ Acceptable valves are:
 - ◆ American Flow Control Model 2500 resilient wedge valve.
 - ◆ Mueller A-2360 resilient wedge gate valve.
 - ◆ U.S. Pipe Metroseal.
 - ◆ AVK Series 45 resilient wedge valve.
 - ◆ M&H series 4067 resilient wedge valve.
 - ◆ Clow F-6100 resilient wedge valve for 4-inch through 12-inch diameter sizes inclusive.
 - ◆ The use of any valves other than those mentioned above will require prior written approval from Hudson Water Utility.
 - ◆ All valve body and bonnet bolts shall be high strength stainless steel.
 - ◆ The valve stem shall be "open-left" and be non-rising. The operating nut shall be 2-inch square.
 - ◆ Supply with M.J. accessories per the Mechanical Joint section of these specifications.
 - ◆ Valves shall have all internal and external surfaces shop coated with a high performance, two-part, heat-curable, NSF 61 approved, thermosetting epoxy to a minimum of ten (10) mils dft thickness.
- 825.2.5 Mechanical Joint Butterfly Valves
- ◆ Acceptable valves as manufactured by:
 - ◆ M & H.
 - ◆ Mueller.
 - ◆ Pratt Groundhog.

- ◆ For 16-inch through 24-inch diameter sizes inclusive.
 - ◆ The use of any valves other than those mentioned above will require prior written approval from Hudson Water Utility.
 - ◆ All valve body and bonnet bolts shall be high strength stainless steel.
 - ◆ The valve stem shall be “open-left” and be non-rising. The operating nut shall be 2-inch square.
 - ◆ Supply with M.J. accessories per the Mechanical Joint section of these specifications.
 - ◆ Valves shall have all internal and external surfaces shop coated with a high performance, two-part, heat-curable, NSF 61 approved, thermosetting epoxy to a minimum of ten (10) mils dft thickness.
- 825.2.6 Ductile Iron Couplings
- ◆ Acceptable coupling shall either be solid Mechanical joint style or straight and transition type couplings shall be constructed entirely of ductile iron.
 - ◆ Acceptable products are:
 - ◆ Romac 501 Coupling.
 - ◆ Smith Blair 441 Coupling.
 - ◆ Ford FC-1.
 - ◆ M.J. couplings shall be provided with M.J. accessories per the Mechanical Joint section of these specifications.
- 825.2.7 Mechanical Joint Tapping Sleeves
- ◆ Tapping sleeve shall be a mechanical joint, split sleeve with outlet flange conforming to AWWA C-110 Sections 10-14 with drilling recessed for tapping valve.
 - ◆ The sleeve must be of ductile iron construction and include a ¾-inch F.I.P. threaded test plug in the body of the sleeve.
 - ◆ The side rubber gaskets shall be rectangular in cross section and fit into grooved channels in the casting. These gaskets shall extend the entire length of the sleeve and shall not require cutting or trimming to match M.J. end gaskets.
 - ◆ Sleeves shall be furnished with standard accessories including: glands, gaskets, and Cor-Ten T-bolts and nuts, or equivalent. All flange bolts shall be 316 stainless steel.
 - ◆ Interior and exterior to be bituminous coated with a minimum four (4) mils dry film thickness.
- 825.2.8 Stainless Steel Tapping Sleeves (Wrap Around Style)
- ◆ Acceptable products are:
 - ◆ Romac.
 - ◆ Ford.
 - ◆ Tapping sleeves shall be manufactured of 304 stainless steel. The flange connection to the valve shall be manufactured of ductile iron and shall be welded to the stainless steel neck.
 - ◆ All nuts, bolts and washers shall be of 304 stainless steel.
 - ◆ Provide a ¾-inch test plug of 304 stainless steel in the body of the sleeve for pressure testing before tapping the pipe.
 - ◆ Stainless steel tapping sleeves may not be used on transite pipe and cast iron and may only be used on ductile iron pipe where the tap size is 1/2 or less of the diameter of the pipe being tapped.
- 825.2.9 Tapping Valves
- ◆ Tapping valves shall meet the specifications for mechanical joint resilient seat wedge valves except one end of the valve shall be equipped with a flange for attaching to the tapping sleeve’s flange.
 - ◆ Tapping valves must be capable of accepting a full-size tapping cutter.
- 825.2.10 Valve Boxes

- ◆ All valve boxes shall be manufactured in the United States.
- ◆ Valve boxes shall be cast iron, two-piece, sliding type with a top flange and a minimum inside shaft diameter of five (5) inches.
- ◆ The bottom section shall be thirty-six (36) inches long, unless otherwise specified on the plans, and provided with belled (buffalo) base in accordance with the Standard Details.
- ◆ The top section shall be twenty-six (26) inches long and designed to slide over the base section in accordance with the Standard Details.
- ◆ The cover shall be a heavy 2-inch drop type, non-tilting cast/ductile iron unit that is recessed in the box top to prevent plow breakage. The cover shall be provided with two pick holes for easy removal and have the word "WATER" clearly cast into the cover.
- ◆ All valve box components shall be coated with a bituminous coating in accordance with AWWA C110-12.
- ◆ Valve boxes for 2-inch valves shall be constructed as shown in Detail W-4 in the attached Standard Details.

825.2.11 Grip Ring Pipe Retainers

- ◆ Use in conjunction with mechanical joint fittings where specified. Grip ring to be manufactured by Romac Industries, Inc.
- ◆ Grip ring and special M.J. glands shall be manufactured of ductile iron conforming to ASTM A536.
- ◆ Special M.J. glands shall be painted yellow to differentiate them from standard M.J. glands.

825.2.12 Megalug Retainers

- ◆ Use in conjunction with mechanical joint fittings where specified.
- ◆ Install in place of standard M.J. gland.
- ◆ Joint flexibility must be retained after the joint is completed.
- ◆ Megalugs to be manufactured of ductile iron conforming to ASTM A536.
- ◆ Dimensions of Megalug must allow use with standard M.J. Bell and "T" head bolts. "T" head bolts to be zinc coated or blue epoxy coated.
- ◆ Megalug must restrain up to 250 psi of working pressure with a 2:1 safety factor.
- ◆ Twist-off nuts shall be used to insure proper actuation of the restraining lugs.

825.2.13 Fire Hydrants

- ◆ Acceptable products are as follows:
 - ◆ U.S. Pipe Metropolitan 250(M-94) main valve opening 5¼" in all Hudson Water Utility systems, "open-left".
 - ◆ Mueller Super Centurion A-423 - 5¼" main valve opening, "open-left".
- ◆ All hydrants will be provided for a 6-foot depth of bury.
- ◆ All hydrants shall be equipped with working drain holes.
- ◆ All hydrants shall be equipped with breakaway flanges.
- ◆ All hydrants shall open left and shall be equipped with a 1½-inch pentagon operating-nut.
- ◆ All hydrants shall be painted as follows:
 - ◆ Primer - Benjamin Moore Rust Inhibitive Yellow, SN 65163 6526B
 - ◆ Finish - Impervo Sun Yellow, SN 13312 51R20 1055, or
 - ◆ As specified by the Hudson Engineering and Fire Departments.
- ◆ All hydrants shall comply with 2019 policies and procedures for public and private fire hydrants.

825.2.14 Gravel Aggregate for around Main

- ◆ Bank-run gravel shall be a granular material, well graded from fine to coarse with a maximum size of six (6) inches and shall meet or exceed the NHDOT specifications for Gravel Aggregate, Item 304.20 of the NHDOT

specification, obtained from approved natural deposits, and unprocessed except for the removal of unacceptable material and stones larger than the maximum size permitted. It shall not contain vegetation, masses or roots, or individual roots more than eighteen (18) inches long or more than one-half (½) inches in diameter. It shall be substantially free from loam and other organic matter, clay, and other fine or harmful substances.

825.2.15 Sand

- ◆ Aggregate for sand shall be sand of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation shall meet the grading requirements of the following table:

Sieve <u>Designation</u>	Percent by Weight <u>Passing Square Mesh Sieve</u>
3/8 inch	85-100
No. 200	0-5

825.2.16 Common Borrow

- ◆ Inorganic natural soils and/or rock having not more than 5% by weight passing the No. 200 sieve.
- ◆ Maximum stone size six (6) inch and material well graded throughout entire site range.
- ◆ Free from roots, leaves, and other organic materials.
- ◆ Free of ice or frost and no aggregations of soil particles frozen.
- ◆ Moisture content of borrow within plus or minus four percent (4%) optimum moisture content at the borrow source.
- ◆ Refer to 565.1.1 for additional requirements

825.3 Product Delivery, Storage, and Handling

- ◆ All pipe shall be shipped with lifts separated by work separators such that pipe-to-pipe contact is prevented during the transit and/or storage of the pipe.
- ◆ Care shall be taken during the loading, trucking, unloading and handling of all pipe and fittings so as not to damage the materials or surrounding area. Pipe and fittings shall not be dropped directly from the truck to the ground. The Contractor is responsible for any pipe or fittings damaged during delivery, handling or storage. All damaged materials will be removed from the site immediately.
- ◆ Pipe may not be strung along the line of work unless approved by a Hudson Water Utility Engineer or Inspector. Materials must be stored in such a manner that it does not obstruct driveways, sidewalks, etc.

825.4 Product Installation

825.4.1 Ductile Iron Water Main

- ◆ Ductile iron water main shall be bedded and installed as shown in Detail W-2 in the Standard Details.
- ◆ Thoroughly clean the groove and bell socket and insert the gasket, making sure that it faces the proper direction and that it is correctly seated.
- ◆ After cleaning dirt or foreign material from the plain end, apply lubricant supplied by the pipe manufacturer in accordance with their recommendations. The lubricant is supplied in sterile cans and every effort shall be made to keep it sterile.
- ◆ Plain end must be beveled; square or sharp edges may damage or dislodge the gasket and cause a leak. The plain end of field cut pipe must be beveled with a heavy file, grinder, or pipe saw to remove all sharp edges. Recoat all cut ends with bitumastic when used for push-on joint.
- ◆ Push the plain end into the bell of the pipe. Keep the pipe straight while pushing. Make deflection after the joint is assembled.
- ◆ Pipe can be pushed into the bell socket with a long bar, a pipe jack, lever puller or backhoe. The pipe supplier may provide a pipe jack or lever puller

on a rental basis. A timber header should be used between the pipe and jack or backhoe bucket to avoid damage to the pipe.

- ◆ Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing, or other material (or people) shall be placed in the pipe at any time.
- ◆ Pipe placement - as each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be placed on wood blocking set on grade about eighteen (18) inches behind the bell prior to backfilling.
- ◆ Direction of bells - it is common practice to lay pipe with the bells facing the direction in which work is progressing.
- ◆ Temporary pipe plugs - at times when work is not in progress, the open end of the pipes shall be closed by means of a watertight plug or other means acceptable to Hudson Water Utility. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe floatation should the trench fill with water.
- ◆ Maximum cumulative (horizontal and vertical planes) pipe deflection is listed below:

Pipe Size (in.)	Deflection Angle (degrees)	Max. Allowable Offset (in.)*
3-12	4	15
16+	3.2	12
20+	2.4	9

* For 18-foot pipe lengths.

Any deviation in joint deflection in excess of the above-stated amount must be approved by Hudson Water Utility.

- ◆ All water mains shall be installed with a minimum cover of 5' 0" from top of bell.
- ◆ Install release valve as detailed on the plans at all high points on the pipeline. If a high point is created by the Contractor at a point other than those designated on the plans, the Contractor shall install a release valve at said high point. The release valve shall be installed as shown in Detail W-4 in the Standard Details.
- ◆ A release valve shall be installed at the end of each dead end main. The size of the release valve shall be as designated on the plans or as specified by the Hudson Water Utility. The release valve shall be installed as shown in Detail W-4 in the Standard Details.
- ◆ Backfill to be installed in accordance with Detail W-2 in the Standard Details.

825.4.2 Small Diameter PVC

- ◆ Small diameter PVC water main shall be bedded and installed as shown in Detail W-2 in the Standard Details.
- ◆ The installation of small diameter water main shall be the same as that of ductile iron water main with the following exceptions:
 - ◆ No deflection may be taken in the joint of the pipe. Any change in direction with this type of pipe shall be accomplished by "arc"ing" the pipe.
 - ◆ The water main shall be installed directly on grade, with the grade being established by shaping six (6) inches of sand bedding to the barrel of the pipe with the bell hole excavated into the sand bedding.

- ◆ All small diameter PVC pipe shall be installed with a 10-gauge tracer wire as manufactured by BMS, Division of Ablestar Corp., Avon, MA, or equivalent.
- ◆ Cut pipe shall be beveled prior to installation in a push-on joint, but no bitumastic coating is required on the cut pipe.
- ◆ Direct tapping of small diameter PVC is not allowed. Tapping saddles shall be used for all taps on small diameter PVC water mains. Tapping saddles shall be as specified in Section 2 - Water Service Materials and Installation.
- ◆ All water mains shall be installed with a minimum cover of 5' 0" from top of bell.
- ◆ Install release valve as detailed on the plans at all high points on the pipeline. If a high point is created by the Contractor at a point other than those designated on the plans, the Contractor shall install a release valve at said high point. The release valve shall be installed as shown in Detail W-5 in the Standard Details.
- ◆ A release valve shall be installed at the end of each dead end main. The size of the release valve shall be as designated on the plans or as specified by the Hudson Water Utility. The release valve shall be installed as shown in Detail W-5 in the Standard Details. The dead end main shall be installed in accordance with Detail W-8 in the Standard Details.
- ◆ Backfill to be installed in accordance with Detail W-2 in the Standard Details.

824.4.3 Ductile Iron Mechanical Joint Fittings

- ◆ All fittings shall be inspected prior to installation to ensure the gasket seats are free of excess coating. Excess coating, if present, shall be manually removed so as to ensure proper seal of gasket; however, all bare metallic surfaces created as the result of removing the excess coating shall be re-coated with similar material to prohibit corrosion.
- ◆ Fittings shall be placed, supported and installed in strict accordance with the manufacturer's instructions and as directed by Hudson Water Utility. All bolted joints shall be torqued as follows:
 - ◆ Mechanical Joint 4"-24" Diameter Pipe - ¾" bolts torqued to 75 to 90 ft.-lbs.
 - ◆ After bolts are inserted and made finger tight, tighten diametrically opposite nuts progressively and uniformly around joint with properly calibrated torque wrench to the values as specified above.
 - ◆ Back up bends, tees, and other fittings in pipelines buried in ground with Class A concrete thrust blocks placed against undisturbed earth unless otherwise specified. A layer of four (4) mil poly shall be placed between the concrete and the fitting. See Standard Details W-6, W-7 and W-8 for Thrust Block Installation Details.
- ◆ Unless otherwise specified, all M.J. joints shall be installed with grip rings or Megalug retainers.
- ◆ Maximum cumulative (horizontal and vertical planes) deflection per joint shall not exceed the angles listed below:

Joint Size (in.)	Deflection Angle (degrees)
3 - 4	6.4
6	5.6
8 - 12	4.0
16	2.8
20	2.4
24	1.6

Any deviation in joint deflection in excess of the above-stated amount must be approved by Hudson Water Utility.

825.4.4 Mechanical Joint Wedge Gates and Butterfly Valves

- ◆ The valve body shall be set level such that the operator is plumb with the vertical plane which is perpendicular to the ground surface.
- ◆ The valve joints shall be assembled in accordance with the installation requirements for mechanical joint fittings as defined above. All joint bolts shall be torqued using a calibrated torque wrench in accordance with the manufacturer's specifications.
- ◆ Care shall be taken to ensure that the fusion-bonded epoxy coated exterior is not damaged. Any damaged areas shall be repaired by the Contractor in accordance with the manufacturer's recommendation at the sole expense of the Contractor.
- ◆ All valves shall be restrained on both sides by means of threaded rods to the nearest fitting if length is less than ten (10) feet. If length is greater than ten (10) feet, use grip ring retainer or Megalug retainer glands on both sides of the valve. The rods used shall be stainless steel. The size and location of the rods shall be installed in accordance with Detail W-6 in the Standard Details.
- ◆ All valves shall be installed complete with valve box and cover. Install valve box and cover in accordance with Detail W-9 in the Standard Details.

825.4.5 Ductile Iron Couplings

- ◆ Clean pipe ends for distance of twelve (12) inches on each side.
- ◆ Use soapy water or non-toxic gasket lubricant on pipe.
- ◆ Slip follower and gasket over each pipe to a distance of six (6) inches from end; place middle ring on pipe end until centered over joint. Use reference marks to determine exact center location.
- ◆ Insert other pipe end into middle ring and bring to proper position in relation to pipe laid.
- ◆ Press gaskets and followers into middle ring flares.
- ◆ After bolts are inserted and nuts made finger-tight, tighten diametrically opposite nuts by use of torque wrench to set torque between 65 and 75 ft.-lb.

825.4.6 Mechanical Joint, Stainless Steel Tapping Sleeves and Valve

- ◆ Install in strict accordance with the manufacturer's instructions. Pressure test sleeve and valve with air at a minimum of 50 psi prior to beginning tap. While the sleeve is under pressure from the air test, liberally spray the tapping sleeve and valve with a soapy water solution. Make up all body bolts to torques specified by the manufacturer.
- ◆ Provide thrust blocking at the back of the tapping sleeve in accordance with the plans. The size and location of the thrust block shall be determined based on the application.
- ◆ Install the tapping sleeve such that the flanged face of the sleeve is plumb with the vertical plane.
- ◆ Install the tapping valve in accordance with the manufacturer's specifications. The mechanical joint outlet of the valve shall be made up in accordance with the specifications regarding mechanical joints. The sleeve and valve shall be installed in accordance with standard detail for valve installations.
- ◆ The coupon from the valve tap shall be supplied to Hudson Water Utility after the tap.

825.4.7 Valve Boxes and Covers

- ◆ Valve boxes shall be installed concentric to the operating nut and plumb with the vertical plane. The belled base section shall be placed on blocking in such a way that no additional loading is transferred to the valve.
- ◆ Longer valve box bottoms and/or tops will be specified as required for water mains at depths that exceed the limitations of the above-specified valve box.
- ◆ Valve boxes located in traveled ways shall be left flush with the pavement or gravel shoulder unless otherwise specified. Valve boxes located in other non-paved areas shall be left flush with finish grade unless otherwise specified.
- ◆ Install valve box and cover in accordance with the Detail W-9 in the Standard Details.

825.4.8 Grip Ring Pipe Retainer

- ◆ Clean pipe to remove as much dirt and corrosion as possible from the surface.
- ◆ Slide the gland, grip ring, and M.J. gasket on to pipe end. Make sure the tapered side of the grip ring faces the gland.
- ◆ Insert the pipe end into the M.J. fitting.
- ◆ Slide the gasket into the M.J. bell pocket as far as possible. The gland (and grip ring) may be used to tap the gasket into place if required.
- ◆ Slide the grip ring up the pipe until its face is against the M.J. gasket.
- ◆ Slide the gland up the pipe until it engages the grip ring.
- ◆ Install T-bolts in the M.J. fitting and gland. Tighten hand tight.
- ◆ Using a torque wrench, tighten the nuts to 75-90 ft-lb. Care must be taken to assure that the flanges of the gland and M.J. fitting remain parallel. This can be done by alternating side-to-side while tightening. Wait ten (10) minutes and re-torque.

825.4.9 Megalug Retainers

- ◆ Follow execution specifications for mechanical joint fittings.
- ◆ Once gland is made up in accordance with step 8.25.4.8, proceed to tighten. Twist off lugs on restraining lugs in a diametric pattern. Twist lugs until each one is in contact with the pipe before completing tightening. Tighten heads in a diametric pattern until all heads have twisted off the nut.

825.4.10 Fire Hydrants

- ◆ Install fire hydrants in accordance with Detail W-10 in the Standard Details.
- ◆ All fire hydrants are to be installed on a 6-inch water main branch. If the hydrant is within ten (10) feet of the hydrant valve rod the hydrant to the valve with two ¾-inch stainless steel rods. If the hydrant is more than ten (10) feet from the hydrant valve, then install the hydrant with a Megalug or a grip ring retainer.
- ◆ All fire hydrants shall be installed with a hydrant valve attached to an anchor tee off the water main.
- ◆ Hydrant must be installed plumb with the vertical.
- ◆ All hydrants must be installed with breakaway coupling located between six (6) inches and twelve (12) inches of the finished grade surrounding the hydrant.
- ◆ All hydrant bases to be installed in 3' x 3' x 3' cube of 1½-inch crushed stone to allow for free draining of the hydrant. A layer of six (6) mil poly or geotech fabric shall be laid on the top surface of the stone before completing the backfilling of the hydrant.
- ◆ Backfill around the hydrant from the ground surface to one (1) foot above the top of the hydrant shoe shall be with select common borrow.
- ◆ All hydrants shall comply with 2019 policies and procedures for public and private fire hydrants.

825.4.11 Gravel Aggregate

- ◆ The bank-run gravel shall be spread in layers of uniform thickness not exceeding twelve (12) inches before compaction and moistened or allowed to dry as directed. Then it shall be thoroughly compacted by means of suitable power-driven tampers or other power driven equipment.
- 825.4.12 Sand
- ◆ The sand shall be spread in layers of uniform thickness not exceeding eight (8) inches before compaction and moistened or left in natural state as directed. Then it shall be thoroughly compacted by means of suitable power-driven tampers or other power-driven compaction equipment.
- 825.4.13 Common Borrow
- ◆ Spread selected borrow in layers of uniform thickness not exceeding twelve (12) inches before compaction and moistened or allowed to dry as directed. Compact thoroughly by means of suitable power-driven tampers or other power-driven equipment.
 - ◆ Refer to 565.1.1 for additional requirements
- 825.5 Product Testing
- 825.5.1 Pressure and Leakage Testing
- ◆ All water mains and fire services shall be subjected to pressure and leakage testing in accordance with the latest version of AWWA Standard C-600. Allowable leakage for each section of water main tested shall be compared against the chart attached at the back this specification section in order to determine the acceptability of the test.
 - ◆ The Contractor shall hire a testing company who is acceptable to Hudson Water Utility to complete the required pressure and leakage test. The tester shall submit certified leakage testing results in writing to Hudson Water Utility for each section of main tested. The tester shall be approved by Hudson Water Utility prior to initiating the pressure test. Hudson Water Utility shall be notified a minimum of twenty-four (24) hours in advance prior to any pressure and leakage testing. Pressure and leakage testing must be completed in the presence of a Hudson Engineering Department inspector unless otherwise arranged.
 - ◆ The pipe to be tested shall be filled with water from Hudson Water Utility distribution system, and all air shall be expelled from the water main through the use of hydrants, air releases, services and blowoffs located at the high points. If temporary air releases are installed by the Contractor, they shall be removed and plugged with a brass plug upon the successful completion of the pressure test.
 - ◆ If a section of main fails pressure and leakage testing, the Contractor shall locate, uncover, and repair or replace the defective section of pipe, fitting, valve or joint at no additional expense to Hudson Water Utility. The Contractor's tester shall then conduct additional pressure and leakage testing until satisfactory test results are achieved.
- 825.5.2 Flushing and Disinfection
- ◆ The Contractor shall conduct flushing operations using methods and procedures conforming to AWWA C651. The Contractor shall flush the water main under the direction of Hudson Engineering Department's Inspector. Flushing may be required during the late evening hours if it is determined that flushing will result in off colored water to Hudson Water Utility existing customers.
 - ◆ The Contractor shall conduct disinfection operations using methods and procedures conforming to AWWA C651. The residual at the end of the disinfection procedure shall exceed twenty-five (25) ppm. The chlorinated water shall set in the main for twenty-four (24) hours. At the end of the twenty-four (24) hour period, a chlorine residual shall be taken from the

main, and it must exceed ten (10) ppm or the main shall be rechlorinated. The chlorinated water shall be flushed from the main upon completion of the chlorination process and a bacteriological sample shall be taken from the main once the chlorine residual of the water being discharged from the main has dropped below 1.5 ppm.

- ◆ Samples from the disinfected main will be taken by Hudson Water Utility or an approved outside vendor and will be run through Hudson Water Utility lab. If the sample does not pass, then the Contractor shall perform additional flushing and disinfection operations until such time as a good bacteria test is achieved. Additional flushing and disinfection operations shall be run at the Contractor's expense. Bacteriological tests will be run by Hudson Water Utility at a cost of \$300.00 per test to the Contractor.
- ◆ The Contractor shall supply suitable sampling taps at the end of the disinfected water main for the purpose of bacteriological testing. The Contractor shall remove these taps and plug the water main with a brass corporation plug upon successful completion of the main disinfection.
- ◆ All costs associated with flushing and disinfecting the water main shall be borne by the Contractor.

Allowable Leakage per 1000 Feet of Pipeline* - gph

NOMINAL PIPE DIAMETER - INCHES

Avg. Test Pressure (psi)	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54
450	.48	.64	.95	1.27	1.59	1.91	2.23	2.55	2.87	3.18	3.82	4.78	5.73	6.69	7.64	8.60
400	.45	.60	.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.60	4.50	5.41	6.31	7.21	8.11
350	.42	.56	.84	1.12	1.40	1.69	1.97	2.25	2.53	2.81	3.37	4.21	5.06	5.90	6.74	7.58
300	.39	.52	.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60	3.12	3.90	4.68	5.46	6.24	7.02
275	.37	.50	.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49	2.99	3.73	4.48	5.23	5.98	6.72
250	.36	.47	.71	.95	1.19	1.42	1.66	1.90	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41
225	.34	.45	.68	.90	1.13	1.35	1.58	1.80	2.03	2.25	2.70	3.38	4.05	4.73	5.41	6.03
200	.32	.43	.64	.85	1.06	1.28	1.48	1.70	1.91	2.12	2.55	3.19	3.82	4.46	5.09	5.73
175	.30	.40	.59	.80	.99	1.19	1.39	1.59	1.79	1.98	2.38	2.98	3.58	4.17	4.77	5.36
150	.28	.37	.55	.74	.92	1.10	1.29	1.47	1.66	1.84	2.21	2.76	3.31	3.86	4.41	4.97
125	.25	.34	.50	.67	.84	1.01	1.18	1.34	1.51	1.68	2.01	2.52	3.02	3.53	4.03	4.53
100	.23	.30	.45	.60	.75	.90	1.05	1.20	1.35	1.50	1.80	2.25	2.70	3.15	3.60	4.05

830 Water Service Materials and Installation

830.1 General

830.1.1 Materials of Construction

- ◆ Main to Stop-Materials for this portion of the service shall be 1" or greater Type K copper, as determined by the Hudson Water Utility.
- ◆ Stop to House - All water services shall be of either 1" inch or greater Type K copper, 1¼" or greater 200 psi Copper tube size polyethylene pipe meeting or exceeding the product specifications below. Size to be determined by Hudson Water Utility.

830.1.2 Materials Sizing - All water services shall be sized by the Engineering Services Department of Hudson Water Utility.

- 830.1.3 Utility Separation - All water services shall be separated from other utilities and septic fields in accordance with the New Hampshire Code of Administrative Rules Env-Wq 700 and as shown in Detail W-18 in the Standard Details. If the minimum required separation cannot be achieved special details must be developed in accordance with NHDES rules.
- 830.1.4. In the absence of a recognized and/or approved industry standard for such hardware. Hudson Engineering Department field inspectors will be the final judge as to the acceptability of miscellaneous hardware used in the installation of water services.
- 830.2 Product Specifications
- 830.2.1 Small Diameter PE
- ◆ Small diameter (1¼-inch, 1½-inch, and 2-inch) PE shall conform to SD 200 psi PE pressure class pipe, if allowed by the Engineering Department.
- 830.2.2 Copper Tubing
- ◆ All copper tubing shall be type "K" and shall conform to the latest revision of AWWA C-800.
 - ◆ Copper tubing shall be of the soft, coiled type and shall conform to ASTM B88.
- 830.2.3 Polyethylene Tubing
- ◆ All polyethylene tubing shall conform to the latest revision of ASTM D2737.
 - ◆ Polyethylene tubing shall be "copper tube size - CTS" and shall be rated for 200 psi at 73.4 F.
- 830.2.4 Stainless Steel Pipe Inserts
- ◆ Inserts shall be manufactured for use with CTS polyethylene and shall be manufactured of 304 stainless steel.
- 830.2.5 Corporations
- ◆ Acceptable corporations are as manufactured by:
 - ◆ Mueller 300 corporation with Cambridge 110 compression couplings.
 - ◆ Ford w/ "T" compression nut.
 - ◆ Cambridge brass series 202 compression coupling.
 - ◆ Corporations shall have a Teflon coated ball stop.
 - ◆ Corporations shall have a CC inlet thread and a compression outlet.
 - ◆ Plug style corporations are not acceptable.
- 830.2.6 Curb Valves
- ◆ Acceptable Curb valves are as manufactured by:
 - ◆ Mueller 300 curb valve with Cambridge 110 compression couplings.
 - ◆ Ford w/ "T" compression nut.
 - ◆ Cambridge brass series 301 compression coupling.
 - ◆ Curb stops shall have a Teflon coated quarter turn ball stop.
 - ◆ No drain holes are allowed on curb stops.
 - ◆ Plug style curb stops are not acceptable.
- 830.2.7 Tapping Saddles
- ◆ Acceptable tapping saddles are:
 - ◆ Mueller DE2s epoxy coated, double stainless steel strap.
 - ◆ Ford FS202 epoxy coated, double stainless steel strap.
 - ◆ Romac Style 202N nylon coated, double stainless steel strap.
 - ◆ Smith Blair 317 nylon coated, double stainless steel strap.
- 830.2.8 Service Boxes
- ◆ Service box shall be of an arch style pattern with a 5-foot to 6-foot slide type adjustable riser, unless otherwise specified on the plans. Minimum I.D. on the service box shall be 1.0-inch.

- ◆ Service box shall be supplied with a plug style cover. The cover shall be cast or ductile iron and shall screw onto the service box riser. The cover shall have "WATER" integrally cast into the cover.
- ◆ Service box shall be provided with a ½-inch diameter by 30-inch long 304 stainless steel service box rod. A brass or stainless steel cotter pin shall be provided to secure the service box rod to the curb stop.
- ◆ All service box components shall be coated with a bituminous coating in accordance with AWWA C110-12.
- ◆ Service boxes for 2-inch curb valves shall be constructed and installed in accordance with Detail W-20 in the Standard Details at the back of these specifications.
- ◆ Service boxes shall be manufactured in the United States.

830.2.9 Brass Goods

- ◆ All brass goods shall be manufactured from 85-5-5-5 ASTM B62 brass.
- ◆ Brass goods shall be supplied with iron pipe threads or compression couplings. Acceptable compression brass goods are as manufactured by Mueller, McDonald, and Ford (T style only). All other brass goods must be pre-approved.
- ◆ All brass goods shall be rated for a minimum working pressure of 150 psig.

830.3 Product Installation

830.3.1 Small Diameter PVC

- ◆ Small diameter PVC water services shall be bedded and installed as shown in Detail W-2 in the Standard Details.
- ◆ The installation of small diameter water services shall be the same as that of ductile iron water main with the following exceptions:
 - ◆ No deflection may be taken in the joint of the pipe. Any change in direction with this type of pipe shall be accomplished by "arcing" the pipe.
 - ◆ The water service shall be installed directly on grade, with the grade being established by shaping six (6) inches of sand bedding to the barrel of the pipe with the bell hole excavated into the sand bedding.
 - ◆ All small diameter PVC pipe shall be installed with a 10-gauge tracer wire as manufactured by BMS, Division of Ablestar Corp., Avon, MA, or equivalent.
 - ◆ Cut pipe shall be beveled prior to installation in a push-on joint.

830.3.2 Copper Tubing

- ◆ Copper tubing water services shall be bedded and installed as shown in Detail W-2 in the Standard Details.
- ◆ Copper tubing shall be installed with brass compression fittings that meet the specifications for these fittings as detailed in the service pipe section of these specifications. The use of soldered fittings underground prior to Hudson Water Utility meter is prohibited.
- ◆ No crimping tools may be used on copper tubing.
- ◆ If copper becomes kinked or egg-shaped in its installation, the use of that section of copper containing the kink or egg shape will be disallowed. Final decision as to the acceptability of a "kink" or a section of "egg-shaped" pipe shall be made by Hudson Water Utility.

830.3.3 Polyethylene Tubing

- ◆ Polyethylene tubing water services shall be bedded and installed as shown in Detail W-20 in the Standard Details.
- ◆ All polyethylene tubing shall be installed with a 10-gauge tracer wire as manufactured by BMS, Division of Ablestar Corp., Avon, MA, or equivalent.
- ◆ Polyethylene tubing shall be joined with stainless steel insert stiffeners and brass compression couplings that meet the specifications for these fittings,

as detailed in the service pipe section of these specifications. The use of plastic friction inserts with stainless steel clamps is prohibited.

830.3.4 Stainless Steel Inserts/Compression Couplings

- ◆ Stainless steel inserts shall be sized for the pipe in which they are used. In no case shall an insert be inserted into a line by overlapping the steel ends of the insert.
- ◆ The insert shall be installed such that one-half (½) of the insert is in each section of the pipe being connected.
- ◆ The compression coupling shall be centered over the connection point of the pipes being joined. The coupling shall be tightened in accordance with the manufacturer's recommendations. Do not overtighten the coupling.

830.3.5 Corporations

- ◆ Corporations shall be installed on all water services at the service tap into the water main.
- ◆ Corporations may be direct-tapped into ductile iron water main as follows:

Tap Size	Main Sizes Which May Be Direct-Tapped
1"	6" and up
2"	12" and up

- ◆ Corporations which cannot be direct-tapped must be tapped through a tapping saddle or a brass compression tee with a threaded branch.

830.3.6 Curb Valves

- ◆ 1-inch valves shall be installed with a service box.
- ◆ 2-inch curb valves shall be installed with a gate box top and a five-foot section of 4-inch Schedule 40 PVC pipe in accordance with Detail W-20 in the Standard Details.
- ◆ Curb valves shall be installed as close as practicable to one (1) foot of the edge of the municipal ROW within the municipal ROW.
- ◆ Curb valves shall be installed with the operator plumb and vertical.
- ◆ Curb valves shall be set on a 2" x 6" x 12" piece of pressure-treated blocking or a flat rock of similar dimensions.
- ◆ If the water main is constructed of PVC or Transite, install Mueller 300 insulated curb stop per Standard Detail W-19.

830.3.7 Service Boxes

- ◆ Service box bases shall be centered over the curb stop ball valve and shall be plumb and vertical in all directions. The box bottom shall be placed on the same blocking or flat surface as the curb stop.
- ◆ Service box tops shall be magnetized and painted florescent blue. The box top shall be flush with the existing finished grade.
- ◆ Service box rod shall be stainless steel minimum of ½" diameter and a minimum length of 36 inches.
- ◆ Service boxes installed in sidewalks, drives or pavement shall be installed inside a gate box top. See Detail W-13 in the Standard Details.
- ◆ Maintain a minimum of a 4-foot clearance in all directions from curb box to other utilities, structures, appurtenances, or obstructions.

830.4 Product Testing

830.4.1 Pressure Testing

- ◆ All water services must be visually inspected by a Hudson Engineering Department Inspector prior to backfilling. The corporation, curb valve and any couplings must be left exposed for the test. The test shall involve pressuring the service and visually inspecting each joint along the service to insure that there is no leakage.

840 Water Meters

840.1 General

- ◆ Hudson Water Utility or agent supplies and installs 5/8" to 1" meters at its expense. The cost of supplying and installing meters, any fittings, valves or meter horns required for the meter installation will be at the Owner's expense.
- ◆ Hudson Water Utility supplies to all domestic meters 1½" or larger at its expense. The Owner shall pay for the expense of installation in accordance with the meter installation as shown in Detail W-24 in the Standard Details.
- ◆ The Owner shall pay for all meters utilized for combined fire and domestic service at their cost in accordance with the meter installation Detail W-26 in the Standard Details. The cost of supplying and installing any fittings, valves or meter horns required for the meter installation will be at the Owner's expense.

840.2 Product Installation

- ◆ The meter can only be installed in a warm (continually above 45°F), clean, dry and accessible location. The location provided for the meter shall be in accordance with Detail W-14 in the Standard Details.
- ◆ Where meters are installed in buildings constructed on a slab on grade, the service entrance shall be in accordance with Detail W-15 in the Standard Details.
- ◆ Remote meters are to be installed with each meter. The remote reader cable will be installed by Hudson Water Utility operator during the setting of the meter. The remote meter must be installed on the outside of the building near the electric meter or at a location preapproved by Hudson Water Utility operator.
- ◆ If the remote meter wire must be run behind sheetrock or within any finished wall, then it is the Owner's responsibility to have their Contractor install remote meter wire provided by Hudson Water Utility operator.
- ◆ Hudson Water Utility operator cannot set the meter until the remote wire has been installed.
- ◆ The remote meter will be installed at a height of forty-two (42) inches above the finished grade. No plants or bushes shall be planted in the area of the remote reader which will inhibit access to the remote reader.

850 Terms of Warranty on Installation

- 850.1 The Owner will be held responsible for the repair of any service or main leaks up to one (1) year after the successful pressure testing and disinfection has been accepted by the Hudson Water Utility or agent.
- 850.2 The Owner will have the opportunity to make repairs at his cost under the direction of authorized Hudson Water Utility Field Inspector, or any leaks will be repaired by authorized Hudson Water Utility or agent, and the cost of such repairs will be at the Owner's expense.
- 850.3 The Owner will be responsible for the repair or correction of trench settlement. Hudson Water Utility retains the right to repair the settlement, and the cost of repairs will be charged to the Owner.

Section 900 – Drainage

901 Purpose

The Town notes that generally speaking, the stormwater drainage plan is probably the single-most important element of a development project. Note that traditionally it has been one of the most neglected elements. The Hudson Planning Board recognizes that only a Professional Engineer, licensed in accordance with RSA 310-A, can certify the adequacy of proposed drainage plans. Applicants are expected to make the same recognition or to discuss this matter with the Planning Board. The Planning Board emphasizes that the criteria listed in the Site Plan Regulations § 275-9A (1) through (6) are minimum requirements stated for these general regulations. It is expected that the Town Engineer or authorized agent will have the latitude to more precisely define the criteria once a specific proposal is before the Planning Board.

This section is designed to assist an applicant to understand which items are of specific interest to the Town when reviewing a proposal for development within the Town.

This section is designed to be guidance for the applicant and is not intended to be a substitute for good engineering judgement.

902 Reference Documents

- ◆ *Manual on Drainage Design for Highways*, as published by the State of New Hampshire Department of Transportation.
- ◆ *New Hampshire Stormwater Manual*, as published by the State of New Hampshire Department of Environmental Services.
- ◆ *Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire*, as published by NHDES, Rockingham County Conservation District, and the USDA Natural Resources Conservation Service.
- ◆ *Design and Construction of Urban Stormwater Management Systems*, as published by the Water Environment Federation (WEF) and ASCE.
- ◆ *National Pollutant Discharge Elimination System (NPDES) standards* as published by the U.S. Environmental Protection Agency (EPA).
- ◆ *Standard Specifications for Road and Bridge Construction*, latest edition (including documented amendments), as published by the State of New Hampshire Department of Transportation.
- ◆ *Alteration of Terrain (Env-Wq 1500)*, as published by the New Hampshire Department of Environmental Services.
- ◆ *Municipal Separate Storm Sewer System (MS4) Permit for New Hampshire*, as issued by the U.S. Environmental Protection Agency (EPA).

905 Design Requirements

- 905.1 Drainage design criteria shall be in accordance with the *Manual on Drainage Design for Highways*. Additional drainage design information may be obtained from the New Hampshire Stormwater Manual and *Design and Construction of Urban Stormwater Management Systems*. These references discuss appropriate methodology, erosion protection, and routing techniques.
- 905.2 If a discrepancy is found between the references, the more stringent requirement shall apply. Upon request from the developer, and upon submission of back up documents, the Town Engineer or designated agent may allow the less stringent criteria to be used.
- 905.3 At a minimum, a 25-year storm design frequency shall be used to evaluate existing and proposed drainage conditions. If any State of New Hampshire roadways or drainage

structures may be impacted by the development, then a minimum of the State of New Hampshire design storm frequencies must be used (typically 25 years).

910 Stormwater Management Report

A stormwater management report for development within the Town of Hudson shall conform to Hudson Regulation Chapter 290, Stormwater Management, and should include at a minimum the following information:

- 910.1 Existing and proposed methods of handling storm-water runoff so that there will be no increase in the amount of runoff that leaves the boundaries of the site. (The Planning Board may permit an increase in off-site stormwater runoff on submission of a detailed downstream study and on the recommendation of the Town Engineer.)
- 910.2 Plans shall be provided showing the entire drainage area affecting or being affected by the development of the site. Proposed lot boundaries and drainage areas shall be clearly shown on the plan.
- 910.3 The direction of flow of runoff through the use of arrows shall clearly be shown on the plan.
- 910.4 The location, type, elevation, size and sizing calculations for all existing and proposed catch basins, drywells, drainage ditches, storm sewers, swales, retention basins, and other treatment devices that will be used to meet the stormwater treatment requirements included in the Town's Site Plan Regulations shall be shown on the plan. Sizing of stormwater treatment devices shall be consistent with the design guidance and sizing criteria included in the NH Stormwater Manual.
- 910.5 Engineering calculations used to demonstrate no net increase in peak flow rates for stormwater runoff leaving the site based upon the 2, 10, 25 and 50-year storm frequency shall be provided, consistent with the State Alteration of Terrain requirements, if the project will significantly alter the existing drainage patterns due to such factors as the amount of new impervious surfaces (such as pavement and building areas) being proposed.
- 910.6 If the project will affect drainage flow to an existing roadway culvert, or if a detention or retention area is proposed, a minimum of a 50-year storm shall be used to evaluate potential off-site effects. If a state-owned or maintained culvert is affected by the development, State of New Hampshire Department of Transportation Guidelines shall be used for evaluation of the culvert.
- 910.7 The drainage plans and report shall be certified by a Licensed Professional Engineer, registered in the State of New Hampshire.
- 910.8 Drainage design should follow the guidelines presented in the *New Hampshire Stormwater Manual. Volumes 1, 2, and 3*, as published by the New Hampshire Department of Environmental Services, Rockingham County Conservation District and the USDA Natural Resources Conservation Service, and additional guidelines published in the *Manual on Drainage Design for Highways*, as published by the State of New Hampshire Department of Transportation.
- 910.9 If infiltration or exfiltration is proposed as part of the drainage solution, test pit information regarding estimated seasonal high water table shall be provided at the elevation of the proposed infiltrating or exfiltrating device.

910.10 Calculations for the infiltration or exfiltration system. These calculations should account for frozen ground conditions, when the devices may not function at their optimal design.

910.11 Any other specific study, calculation or investigation as requested by the Town Engineer.

910.12 An example Stormwater Management Report Table of Contents follows:

- ◆ Project Overview
 - ◆ Owner
 - ◆ Address of development
 - ◆ Location of the site
 - ◆ Description of receiving waters
 - ◆ Nature and purpose of the land disturbing activity
 - ◆ Limits of disturbance
 - ◆ Construction Schedule.
- ◆ Existing Conditions Summary
 - ◆ Define topography, drainage patterns, soils, ground cover, critical areas, adjacent areas, upstream areas draining through site, existing development, existing stormwater facilities, on- and off-site utilities, construction limitations, buffers, wetlands, streams, sensitive areas, downstream water quality impairments, etc.
 - ◆ Include an existing conditions plan (drawing) showing the above existing conditions and labeled per the narrative above.
- ◆ Proposed Stormwater Treatment Summary
 - ◆ Comparison of Existing and Proposed Drainage Patterns and Impervious Surfaces
 - ◆ Comparison of Existing and Proposed Peak Flow Rates for Offsite Discharges
 - ◆ Evaluation and use of Low Impact Development Practices (including, but not limited to, measures to minimize impervious surface area, maintain groundwater recharge and vegetative buffers, and stormwater capture and reuse, etc.)
 - ◆ Summary of Stormwater Treatment Measures and Pollutant Removal Efficiencies for Impervious Surfaces and demonstration of meeting Site Plan treatment requirements
 - ◆ Considerations for addressing certain downstream water quality impairments using onsite or offsite mitigation measures.
- ◆ Off-Site Analysis
 - ◆ Describe the tributary area (include at least ¼-mile downstream), drainage channels, conveyance systems and downstream receiving waters.
 - ◆ Review existing or potential problems resulting from the development including, but not limited to, sedimentation, erosion, water quality issues, chemical spills.
 - ◆ Demonstrate either that development of the site will not affect the downstream systems negatively
 - ◆ Demonstrate adequate capacity of the downstream system to handle flow conditions after development.
 - ◆ As applicable, include an off-site drainage plan (the plan may be part of the existing conditions plan).
- ◆ Special Reports, Studies, Maintenance Information
 - ◆ As applicable, include test pit log forms, soil conditions data, and wetland delineation information.
 - ◆ As applicable, include information regarding long-range maintenance of any closed drainage systems, detention/retention facilities, winter deicing practices, snow storage, etc.
- ◆ Appendix
 - ◆ Include copies of all tables, graphs, and charts used in any of the above calculations.

920 Erosion Control Criteria

920.1 Introduction

With expanded population growth, conversion of land to urban uses is increasing. Land is disturbed and exposed to erosion during this period of conversion. Soil displaced by erosion contributes to both on-site and off-site damages. The purpose of this guideline is to control soil erosion and sedimentation resulting from site construction and development. Subdivision and site plans shall include plans for controlling erosion and sedimentation as provided below.

920.2 Requirements

The applicant shall submit an erosion and sediment control plan to the Town Engineer for any tract of land being developed or subdivided, where one or more of the following conditions are proposed:

- 920.2.1 A cumulative disturbed area exceeding 20,000 square feet.
- 920.2.2 Construction of a street or road.
- 920.2.3 A subdivision of three or more building lots or dwelling units.
- 920.2.4 Disturbance of critical areas (as defined in Hudson Regulation § 276-2).

920.3 Design Standards

The following shall be applied in planning for erosion and sediment control:

- 920.3.1 All erosion and sediment control measures in the plan shall meet the Best Management Practices set forth in the *New Hampshire Stormwater Manual, Volume 3*, as published by the New Hampshire Department of Environmental Services.
- 920.3.2 Whenever practical, natural vegetation shall be retained, protected or supplemented. The stripping of vegetation will be performed in a manner that minimizes soil erosion.
- 920.3.3 Appropriate control measures shall be installed prior to removal of vegetation.
- 920.3.4 The area of disturbance shall be kept to a minimum. Disturbed areas remaining idle for more than thirty (30) days shall be stabilized.
- 920.3.5 Measures shall be taken to control sediment and retain it within the project area. Sediment in runoff water shall be trapped and retained within the project area using approved measures. Very poorly drained soils and water bodies shall be protected from sediment.
- 920.3.6 Off-site surface water and runoff from undisturbed areas shall be carried non-erosively through the project area, or diverted away from disturbed areas where feasible.
- 920.3.7 Naturally occurring streams, channels, and wetlands shall be used for conveyance of runoff leaving the project area after appropriate sedimentation control and stormwater treatment measures have been employed.
- 920.3.8 All temporary erosion and sediment control measures shall be removed after final site stabilization. Trapped sediment and other disturbed soil area resulting from the removal of temporary measures shall be permanently stabilized within thirty (30) days.
- 920.3.9 Velocities of less than ten (10) feet per second are required prior to entering a sedimentation swale.
- 920.3.10 Flows less than ten (10) cubic feet per second are required prior to entering a sedimentation swale
- 920.3.11 All slopes equal to or steeper than 2:1 adjacent to a public right-of-way must have special stabilization details provided with the submission.

- 920.3.12 Velocities of ten (10) feet per second or less are desirable within a closed drainage system. Higher velocities may be allowed provided special design criteria have been used.
- 920.3.13 A minimum velocity of two feet per second (2 fps) is required within a closed drainage system.
- 920.3.14 Proposed riprap within a public right-of-way shall be paced a minimum of twelve (12) inches deep.
- 920.3.15 All new developments shall comply with the latest MS4 rules, requirements, and Regulations.

920.4 Plan Requirements

In addition to the general plan requirements, the following information should be provided:

- 920.4.1 Earth Stockpiles
- 920.4.2 Equipment storage, including refueling areas
- 920.4.3 Method of stump disposal
- 920.4.4 Areas of soil disturbance
- 920.4.5 Areas of cut and fill
- 920.4.6 Areas of Poorly and Very Poorly Drained soils
- 920.4.7 Areas of poorly and/or very poorly drained soils proposed to be filled
- 920.4.8 Locations of all structural and vegetative erosion and sedimentation control measures
- 920.4.9 Identification of all permanent control measures
- 920.4.10 Identification of permanent snow storage areas
- 920.4.11 Identification of snow management measures during construction
- 920.4.12 Construction schedule
- 920.4.13 Earth movement schedule
- 920.4.14 Description of temporary and permanent vegetative measures, including seeding specifications
- 920.4.15 Description of all structural erosion and sedimentation control measures, with detailed drawings of each
- 920.4.16 Design calculations for all temporary and permanent structural control measures
- 920.4.17 A proposed schedule for the inspection and maintenance of all measures
- 920.4.18 Identification of all permanent control measures and responsibility for continued maintenance
- 920.4.19 Calculations showing volume peak discharge, and velocity of present and future runoff.
- 920.4.20 Temporary solid waste and sanitary waste storage and disposal locations.

920.5 Responsibility for Installation/Construction

The applicant shall bear final responsibility for the installation, construction, and disposition of all erosion and sediment control measures required by this document. The Town may require a bond or other security in an amount and with the surety conditions satisfactory to the Town, providing for the actual construction and installation of such measures within a period specified by the Town and expressed in the bond or other surety. Site development shall not begin before the erosion and sediment control plan is approved. Erosion and sediment control measures shall be installed as scheduled in the approved plan.

920.6 Erosion Protection Details

Suggested construction details for various erosion protection items may be found in the *New Hampshire Stormwater Manual Volume 3*. These details are not a substitute for engineering judgement.

- ◆ Riprap
- ◆ Silt fence

- ◆ Haybale barrier
- ◆ Jute matting
- ◆ Stormwater Pollution Prevention Plan (SWPPP) reports
- ◆ Construction reports

920.7 Inspection/Maintenance

The applicant shall inspect and maintain all soil erosion and sediment control measures, including devices and plantings as specified in the approved plan, in effective working condition. Responsibility for inspection and maintenance by subsequent owners of the property on which permanent measures have been installed shall be included in the deed and shall run with the land. If the Owner fails to adequately inspect and maintain such measures, the Town shall have the authority to perform the required maintenance. The cost of such work shall be borne by the Owner.

At the completion of all sitework, all catch basins, culverts, sedimentation swales, and basins shall be inspected for excess sediment. Any sediment buildup must be removed. A maintenance schedule for future removal of sediment shall be established. The cost of such work shall be borne by the Owner.

920.8 Other Required Permits

In addition to local approval, State approval under RSA 485-A:17, known as the Significant Alteration of the Terrain Permit, may be required.

930 Construction Design Details

930.1 All stormwater drainage pipes shall have a minimum of four (4) feet of cover over the top of the bell, under pavement within public right-of-way unless otherwise approved by the Town Engineer or authorized agent. Cover in unpaved areas not subject to traffic may be reduced upon approval by the Town Engineer or authorized agent.

930.2 All construction of proposed stormwater drainage pipes for use on public property shall conform to the *Standard Specifications for Road and Bridge Construction*, latest edition (including documented amendments), as published by the State of New Hampshire Department of Transportation except as noted in this document.

930.3 Standard details for construction of catch basins, drain manholes, catch basin grates, drainage trenches, headwalls, and flared end sections may be found in the Appendix as Details D-1 through D-8.

930.4 All stormwater drainage pipe slopes shall be two percent (2%) or greater (conforming to required velocity limitations), unless otherwise approved by the Town Engineer. All stormwater drainage mains shall be installed using a pipe laser to the grades and slopes shown on the approved plans.

930.5 A minimum of two courses of brick is required on all proposed catch basin frame construction, with a maximum adjustment of 12 inches allowed

930.6 All catch basins shall have a twenty-four (24) inch opening with ORF hole.

930.7 Cascade grates are required for all proposed catch basins in roadway areas equal to or greater than five percent (5%) slope.

930.8 Catch basin frames and grates are to be standard NHDOT Type B.

- 930.9 State of New Hampshire Type B grates shall be used in all public rights-of-way maintained by the Town of Hudson.
- 930.10 A curb inlet drainage structure is required at all vertical sags (low points) in a proposed roadway.
- 930.11 Double catch basin grates are not typically allowed in a public right-of-way maintained by the Town of Hudson, unless otherwise approved by the Town Engineer.
- 930.12 A curb opening at a low point in a roadway is generally not an acceptable means of stormwater control for a proposed roadway. This method has proven unsuccessful during the winter months.
- 930.13 Underdrain is required for construction of new roadways in all portions of the roadway proposed in an area requiring cutting of existing ground or as determined necessary by the Town Engineer or authorized agent.
- 930.14 All reinforced concrete drainage pipes must be gasketed.
- 930.15 Drain manhole covers shall be East Jordan Iron Works 30-Inch cover or approved equal, and have "DRAIN" imprinted into the cover.
- 930.16 Common borrow for drainage shall conform to 565.1.1.

Appendix

Standard Details

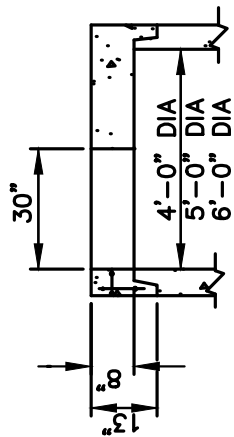
Drainage Details

Detail	Name
D-1	Standard Drainage Manhole
D-2	Precast Reinforced Catch Basin
D-3	Drainage Trench - RCP
D-4	Oil – Grease Separator
D-5	Headwall
D-6	Off Pavement Catch Basin Grate
D-7	On Pavement Catch Basin Grate
D-8	Granite Curb Inlet Detail

NOTE:
ALTERNATE ECCENTRIC TOP SHALL BE DESIGNED TO MEET OR EXCEED H-20 LOADING

30" NEW HAMPSHIRE STANDARD MANHOLE FRAME AND COVER, H-20 LOAD RATING WITH "DRAIN" IMPRINTED MORTAR BED

ADJUST FRAME TO GRADE WITH TWO COURSES OF HARD RED BRICK MINIMUM, OR PRECAST CONCRETE RINGS 12" MAXIMUM ADJUSTMENT



ALTERNATE COVER

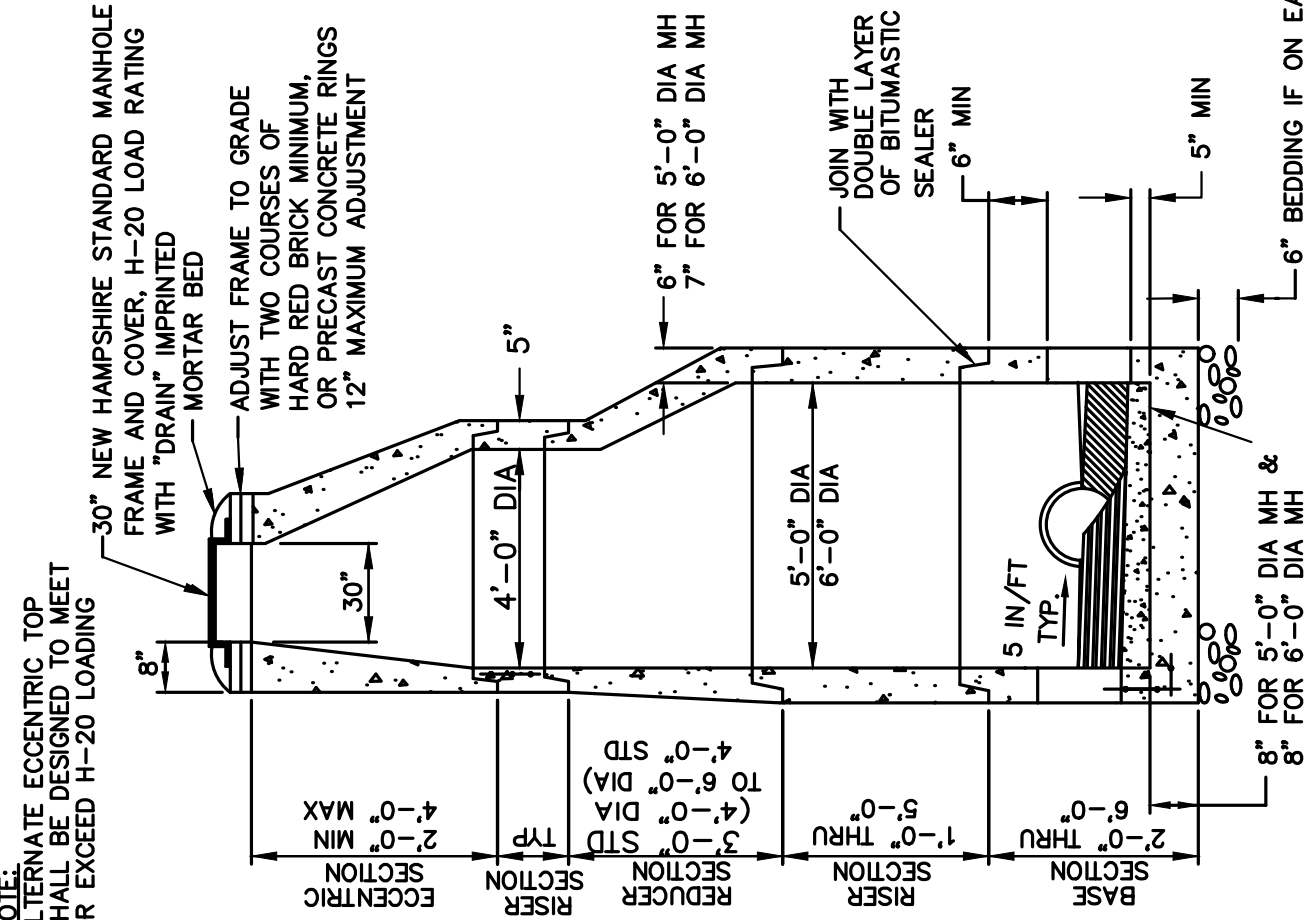
GENERAL NOTES FOR MH's AND CB's

- REINFORCING STEEL SHALL CONFORM TO THE LATEST ASTM A185 SPECIFICATIONS:

SECTION SIZE	STEEL REQUIREMENT
4'-0" DIA	0.12 SQ.IN./L.F.
5'-0" DIA	0.15 SQ.IN./L.F.
6'-0" DIA	0.18 SQ.IN./L.F.
8'-0" DIA	0.24 SQ.IN./L.F.
- CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 4000 PSI MINIMUM.
- DESIGN SPECIFICATIONS SHALL CONFORM TO ASTM C478 LATEST EDITION.
- BASE SECTIONS SHALL BE POURED MONOLITHICALLY.
- PIPE JOINTS SHALL BE:
 LOCK JOINT, FLEXIBLE SLEEVE
 KOR-N-SEAL FLEXIBLE SLEEVE
 A-LOK RUBBER GASKET
- A FLEXIBLE JOINT SHALL BE PROVIDED WITHIN THE FOLLOWING DISTANCES:

PIPE TYPE	PIPE SIZE	DISTANCE
RCP & CI	ALL SIZES	4'-0"
DI	ALL SIZES	NONE REQUIRED

 UNDER SEVERE CONDITIONS WHEN DIFFERENTIAL SETTING CAN NOT BE CONTROLLED WITHIN NORMAL LIMITS, VARIATIONS IN THE STUB LENGTH MAY BE NECESSARY.



CLASS A CONCRETE INVERT TO MID-DIAMETER OF LARGEST PIPE

6" BEDDING IF ON EARTH
12" BEDDING IF ON LEDGE

STANDARD DRAINAGE MANHOLE

NOT TO SCALE



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL D-1

STANDARD DRAINAGE MANHOLE

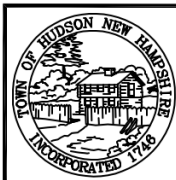
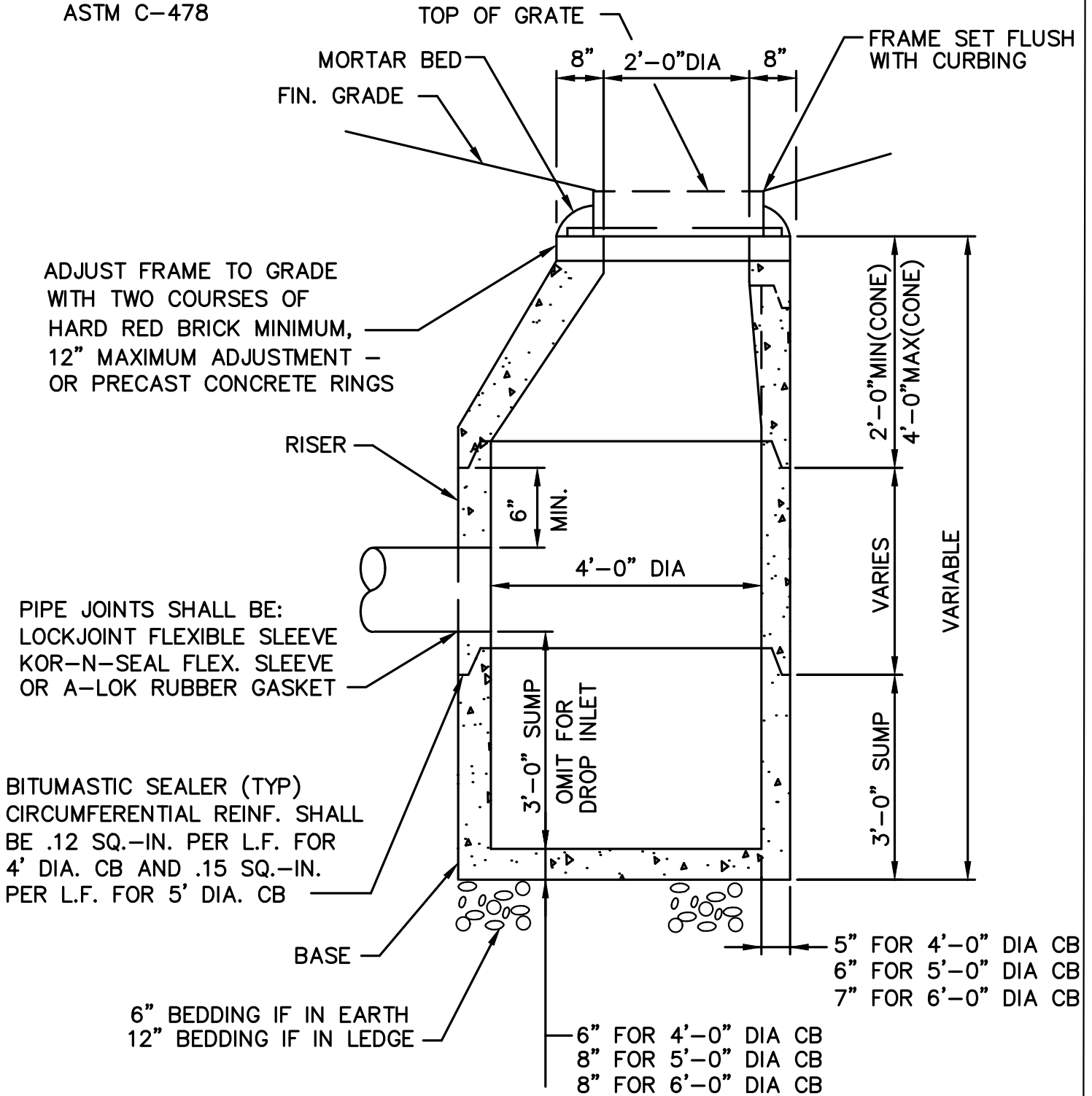
TOWN OF HUDSON AUGUST-01

REV: JULY 2019 SCALE: NTS

PRECAST REINFORCED CATCH BASIN

NOT TO SCALE

PRECAST SECTIONS SHALL CONFORM TO ASTM C-478



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL D-2

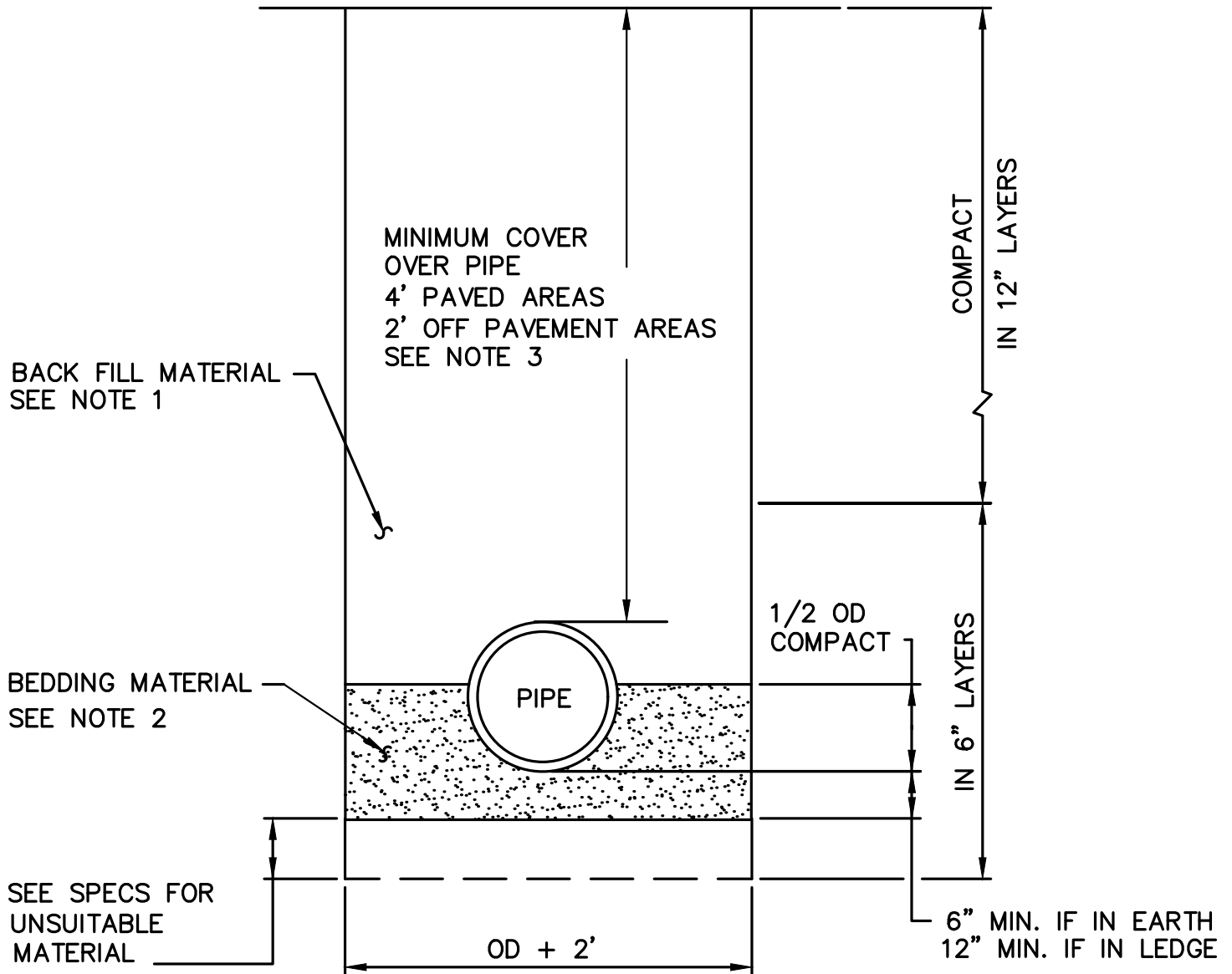
PRECAST REINFORCED CATCH BASIN

TOWN OF HUDSON AUGUST-01

REV: SCALE: NTS

DRAINAGE TRENCH – RCP

NOT TO SCALE



NOTES:

1. COMMON BORROW BACKFILL SHALL BE COMPACTED TO 90% PROCTOR.
NO ROOTS OVER 6" IN DIAMETER ALLOWED.
2. BEDDING SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATTER AND METTING ASTM C33, STONE SIZE #67
 - 100% PASSING 1 INCH SCREEN
 - 90-100% PASSING 3/4 INCH SCREEN
 - 20-50% PASSING 3/8 INCH SCREEN
 - 0-10% PASSING #4 SIEVE
 - 0-5% PASSING #8 SIEVE

WHERE ORDERED BY THE ENGINEER TO STABILIZE THE TRENCH BASE. GRADED SCREENED GRAVEL OR CRUSHED STONE 1/2 TO 3/4 INCH SHALL BE USED.



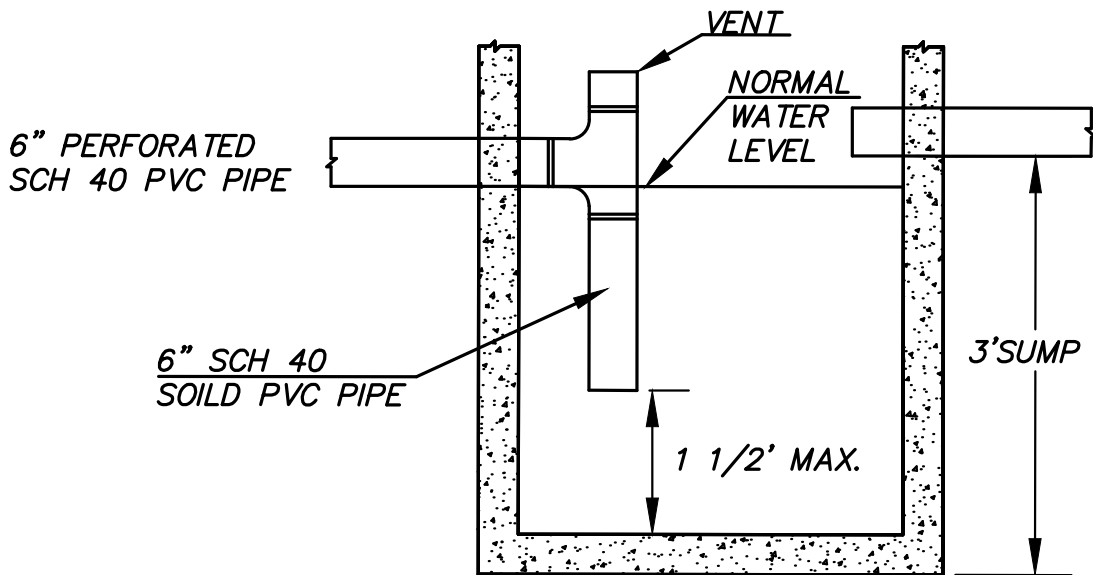
TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL D-3

DRAINAGE TRENCH – RCP

TOWN OF HUDSON
REV:

AUGUST-01
SCALE: NTS



- NOTE:
- MAINTAIN A MINIMUM OF 12" FROM THE FLAT COVER TO THE TOP OF PVC VENT
 - REQUIRED FOR ALL CATCH BASIN DISCHARGING TO DETENTION BASIN OR INFILTRATION BASIN
 - REQUIRED IN PARKING AREAS

OIL-GREASE SEPARATOR
NOT TO SCALE



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL D-4

OIL-GREASE SEPARATOR

TOWN OF HUDSON AUGUST-01

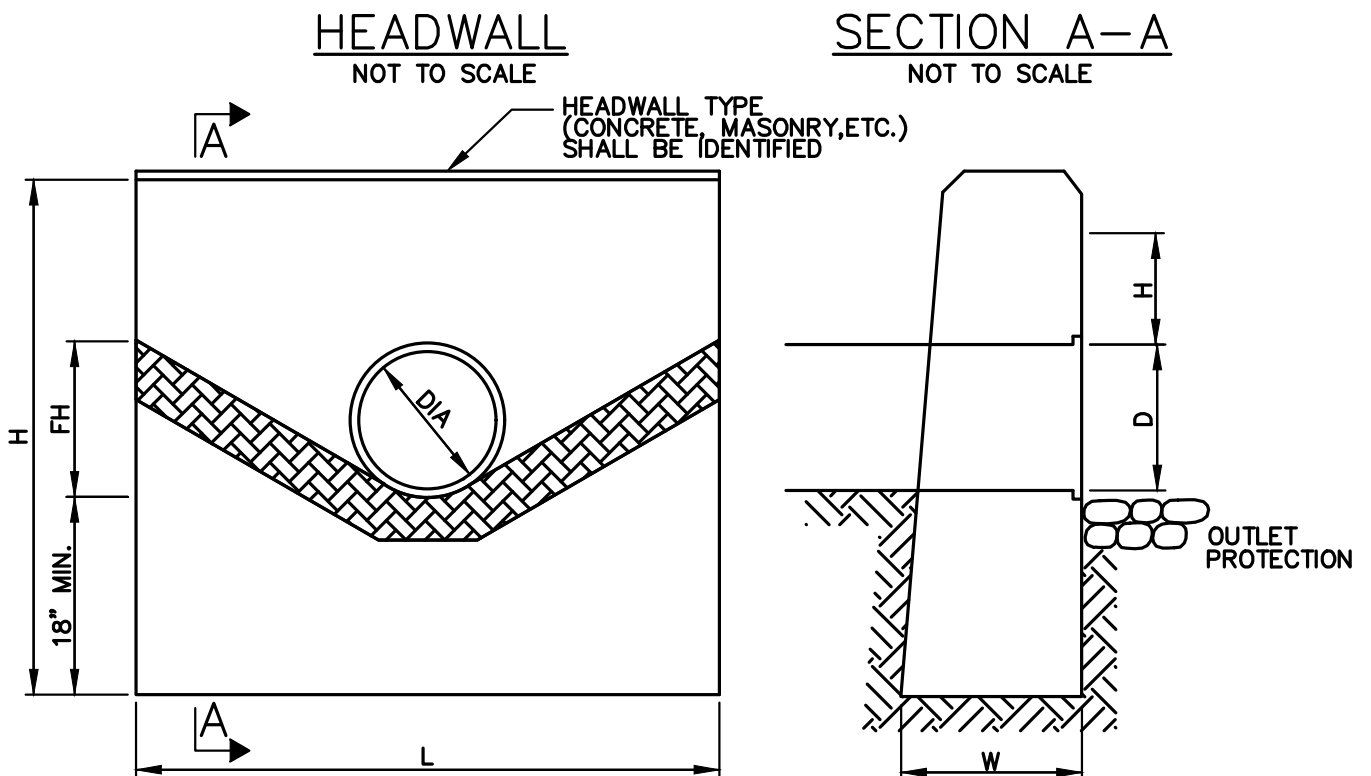
REV: 8/23/19 SCALE: NTS

WHERE MORE THAN ONE HEADWALL IS PRESENT, HEADWALL INFORMATION MAY BE SUMMARIZED IN A TABLE WITH THE FOLLOWING INFORMATION

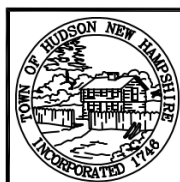
DIA.	DIA.	HEADWALL LENGTH	HEADWALL HEIGHT	FILL HEIGHT	PIPE COVER	BOTTOM HEADWALL WIDTH	INVERT
	D	L	H	FH	h	w	
'A'							
'B'							
'C'							

NOTES:

1. ALL DIMENSIONS GIVEN IN FEET AND INCHES EXCEPT PIPE DIAMETER.
2. PROVIDE BELL END AT INLET HEADWALL, AND SPIGOT END AT OUTLET END HEADWALL.
3. OUTLET PROTECTION SHALL BE DESIGNED AS PER NHDOT STANDARDS.



CONSTRUCTION PLANS MUST INCLUDE SPECIFIC DETAILS



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL D-5

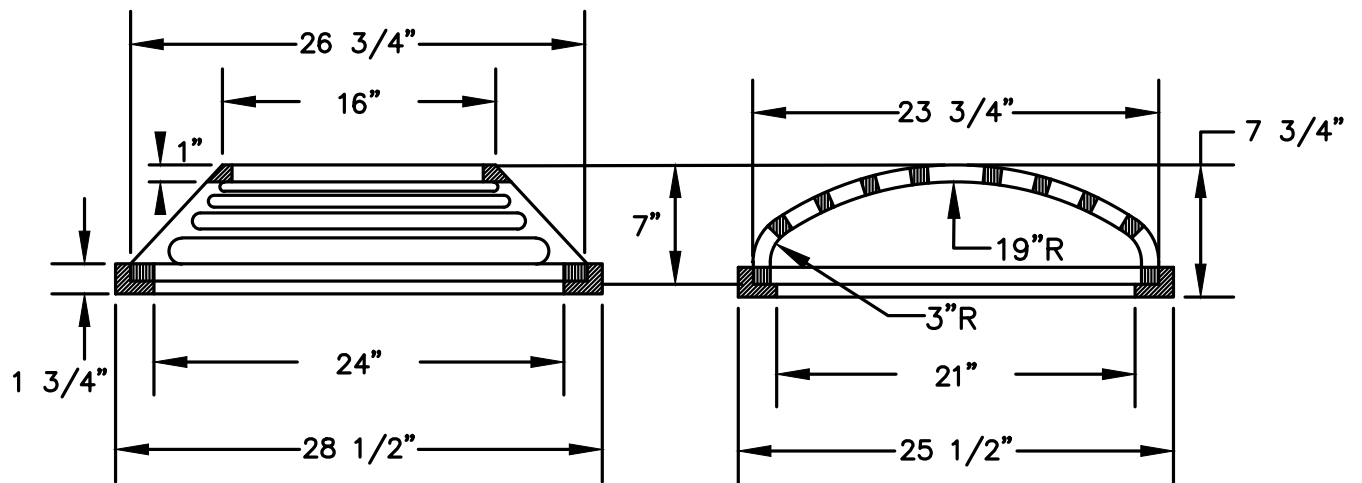
HEADWALL

TOWN OF HUDSON
REV:

AUGUST-01
SCALE: NTS

OFF PAVEMENT CATCH BASIN GRATE

NOT TO SCALE



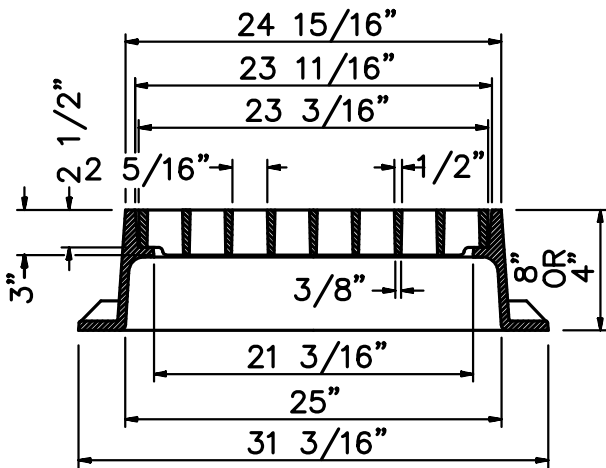
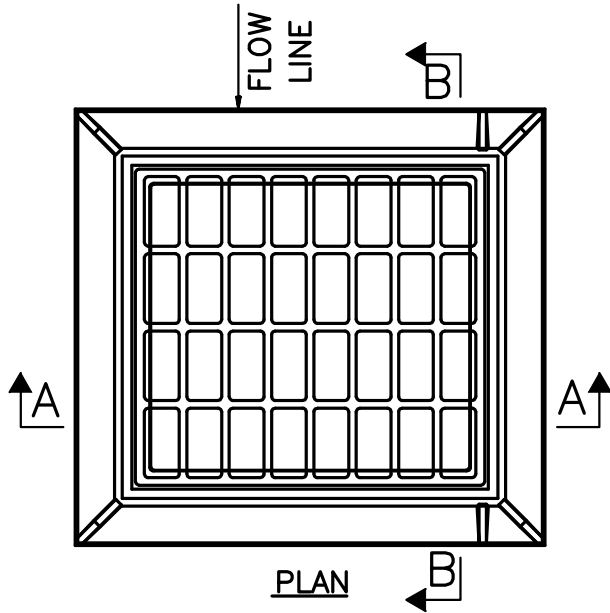
TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL D-6
OFF PAVEMENT
CATCH BASIN GRATE

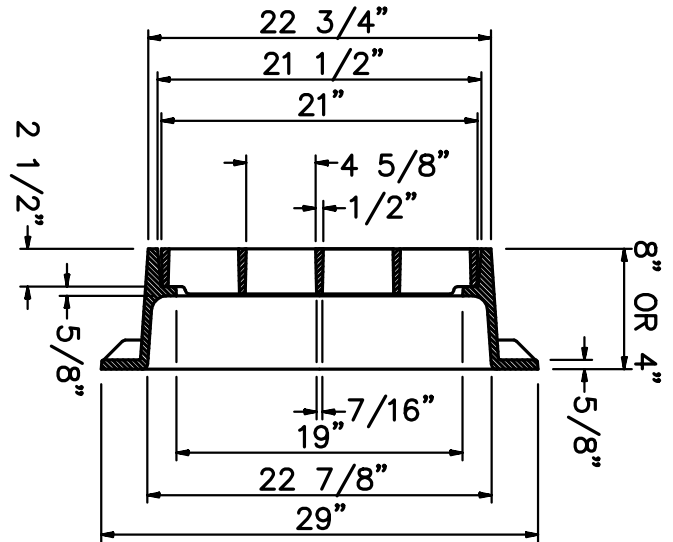
TOWN OF HUDSON AUGUST-01
REV: SCALE: NTS

ON PAVEMENT CATCH BASIN GRATE

NOT TO SCALE

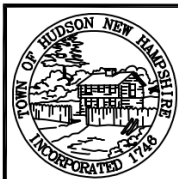


SECTION A-A



SECTION B-B

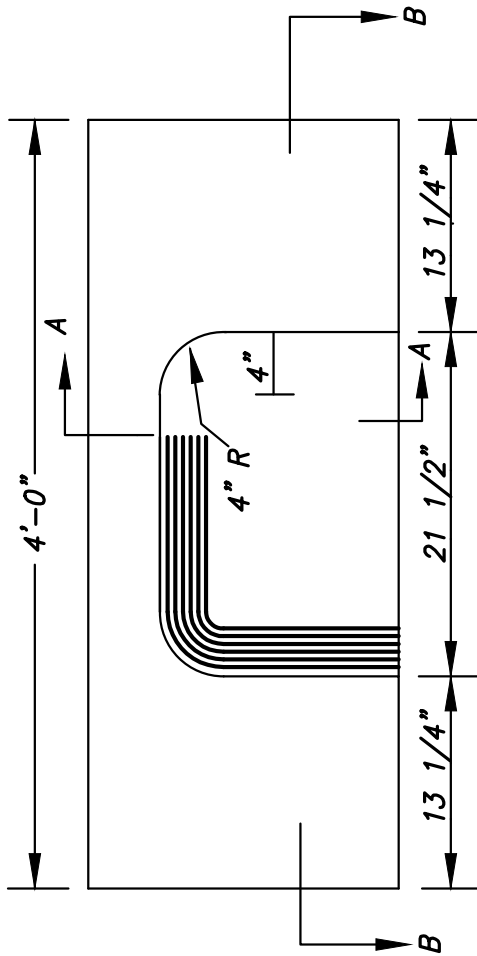
NHDOT TYPE B



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

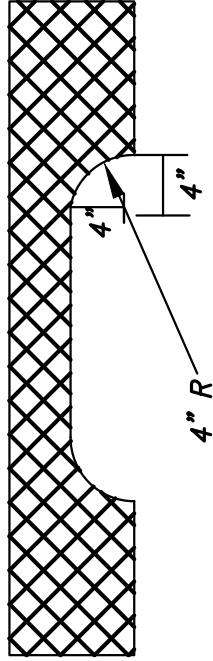
DETAIL D-7
ON PAVEMENT
CATCH BASIN GRATE

TOWN OF HUDSON AUGUST-01
REV: JULY 2019 SCALE: NTS



ELEVATION OF TYPE B

TO BE USED WITH CATCH BASIN
TYPE B AND DROP INLET TYPE B
IF CALLED FOR ON THE PLANS



GRANITE CURB INLET DETAIL

NOT TO SCALE



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

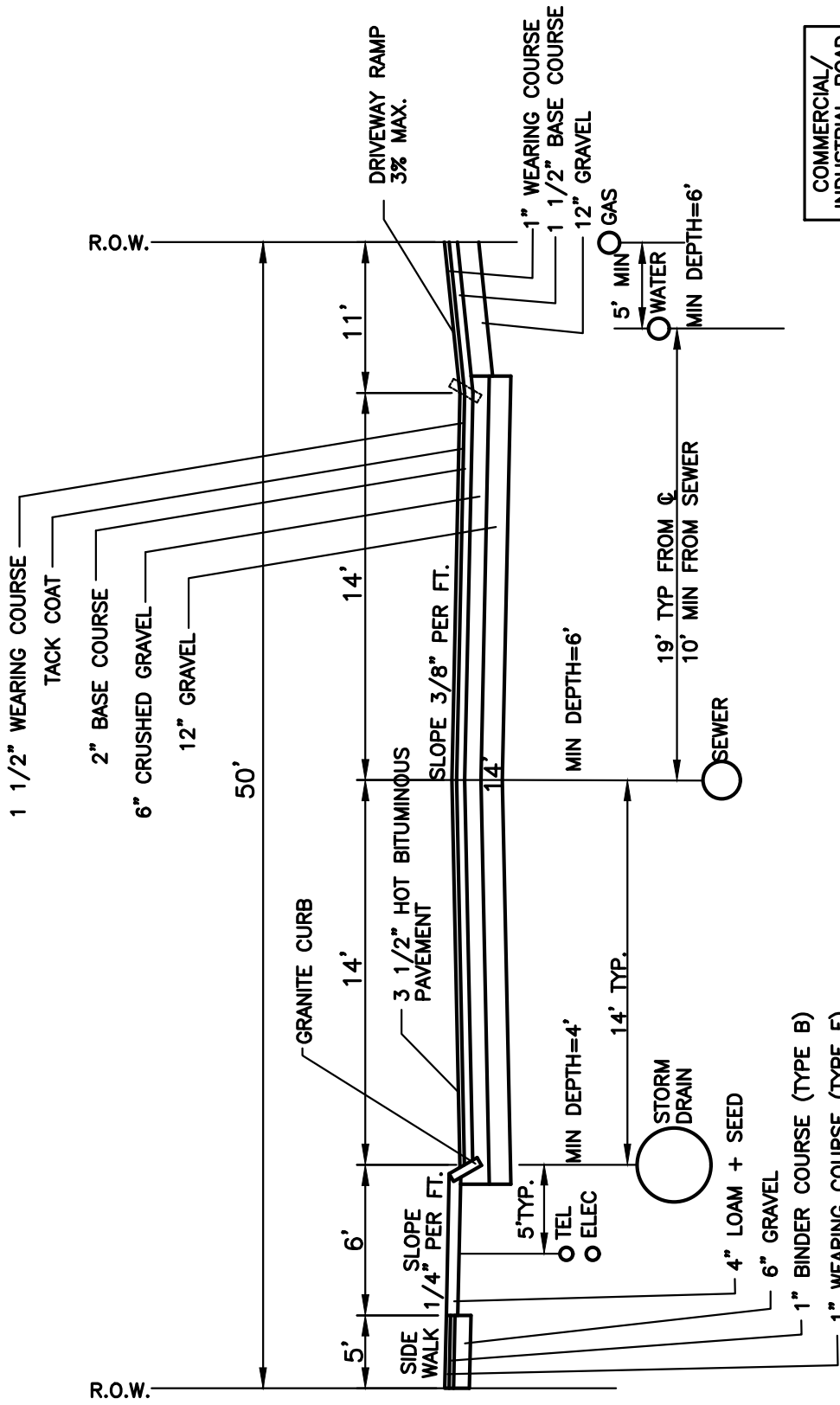
DETAIL D-8

GRANITE CURB INLET DETAIL

TOWN OF HUDSON JULY-07
REV: SCALE: NTS

Road Details

Detail	Name
R-1	Cross-Section Subdivision Street
R-2	Straight Cul-de-Sac
R-3	Offset Cul-de-Sac
R-4	Sloped Granite Curb Removed & Reset or Installed
R-5	Pavement Patch with Overlay
R-6	Pavement End Match
R-7	Sidewalk
R-8	Driveway Cross Section
R-9	Underdrain
R-10	Curb End
R-11	Handicap Sidewalk Ramp
R-12	Driveway Cross Section at Curb with Sidewalk



COMMERCIAL/
INDUSTRIAL ROAD
1 1/2"
2 1/2"

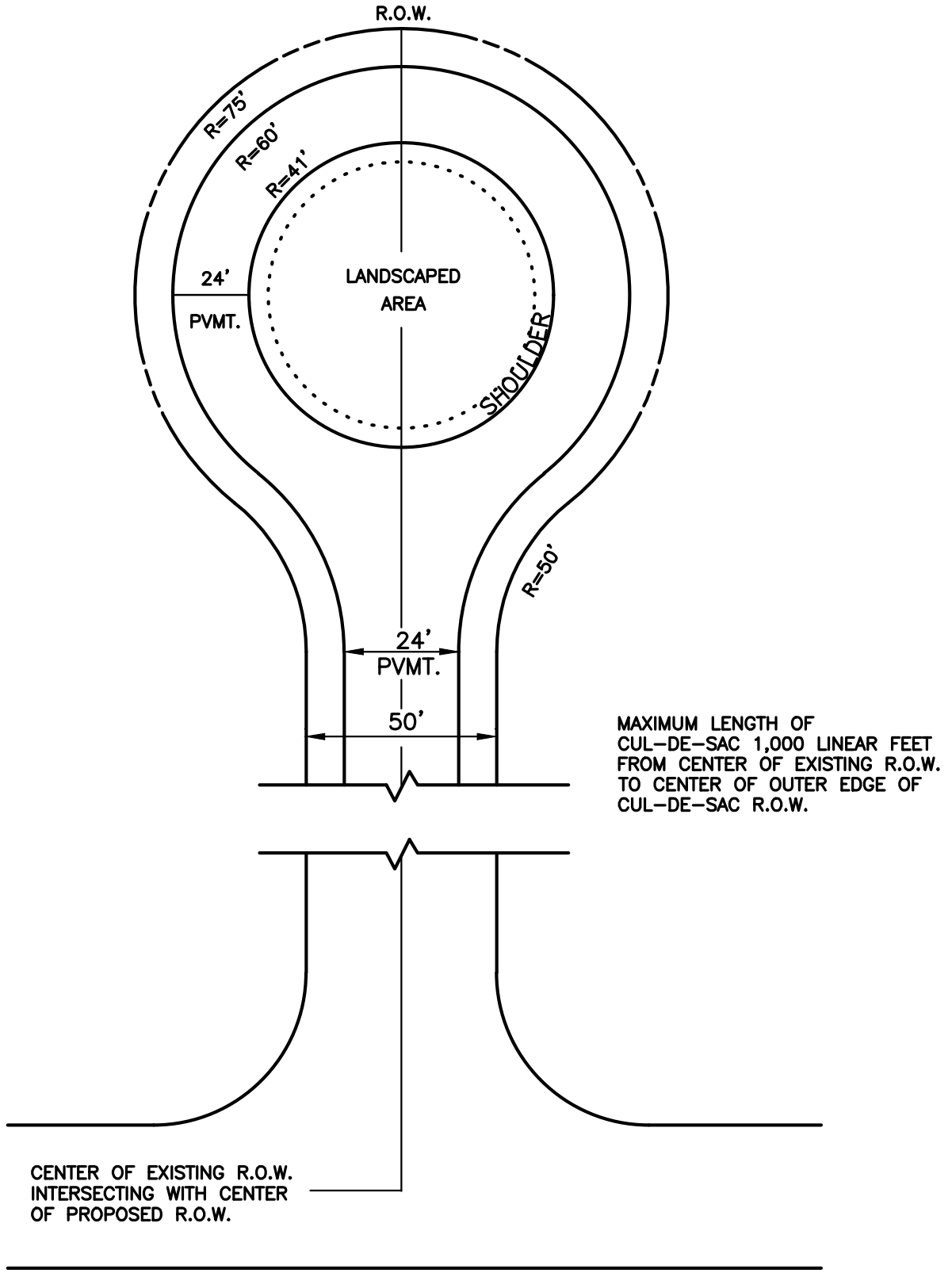
CROSS-SECTION SUBDIVISION STREET

NOT TO SCALE

NOTES:

AT CROSSINGS WHERE 10' HORIZONTAL SEPARATION OF SEWER AND WATER IS NOT POSSIBLE, 18" VERTICAL SEPARATION SHALL BE PROVIDED. SEE INSERT "A".
SEE 515.7 ROADWAY WIDTH FOR PAVED WIDTH REQUIREMENTS FOR DIFFERENT STREET TYPES.

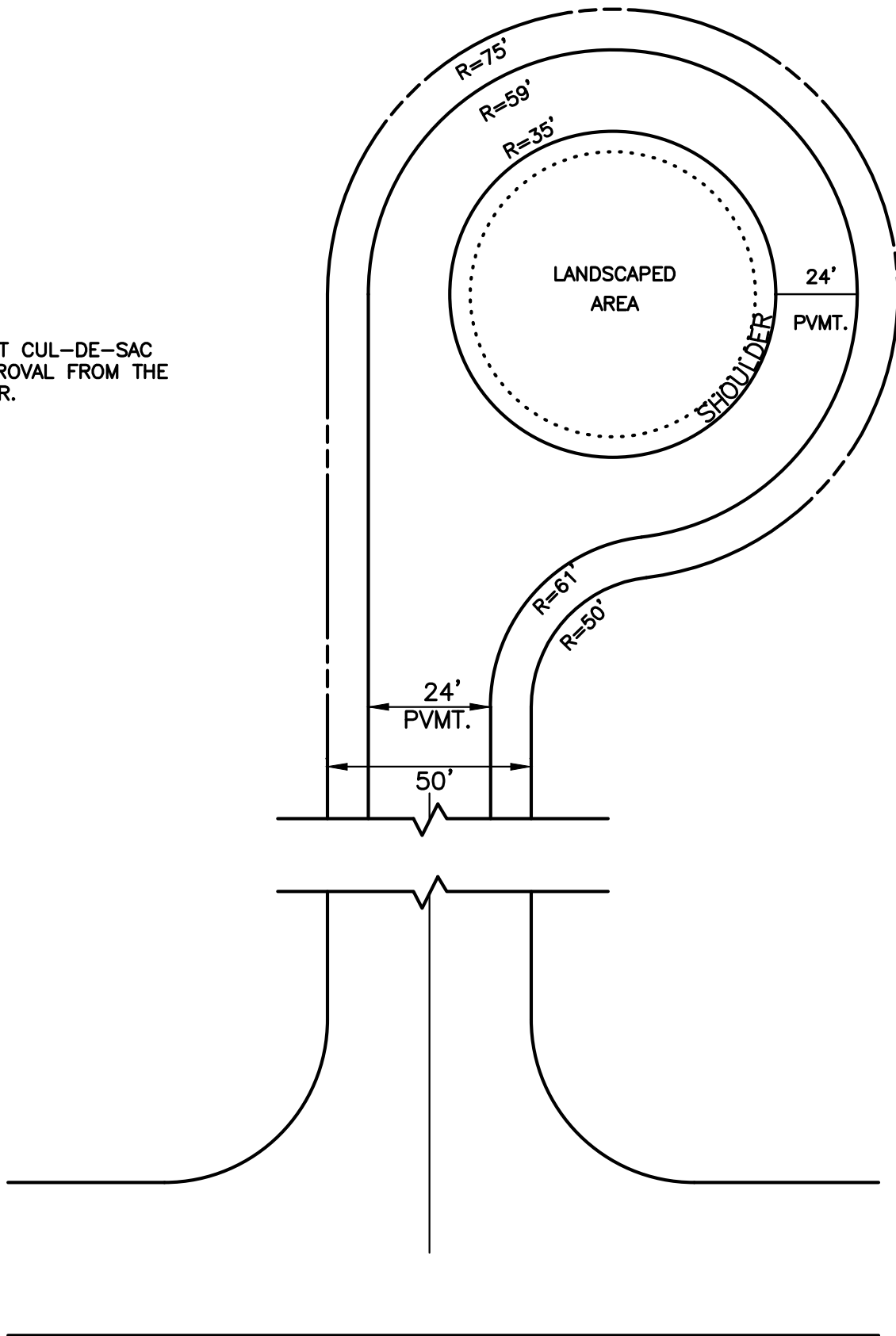
DETAIL R-1
CROSS-SECTION
SUBDIVISION STREET
TOWN OF HUDSON AUGUST-01
REV: JULY 2019 SCALE: NTS



STRAIGHT CUL-DE-SAC
 NOT TO SCALE

DETAIL R-2
 STRAIGHT CUL-DE-SAC
 TOWN OF HUDSON AUGUST-01
 REV: JULY 2019 SCALE: NTS

USE OF OFFSET CUL-DE-SAC
REQUIRES APPROVAL FROM THE
TOWN ENGINEER.



OFFSET CUL-DE-SAC

NOT TO SCALE

DETAIL R-3

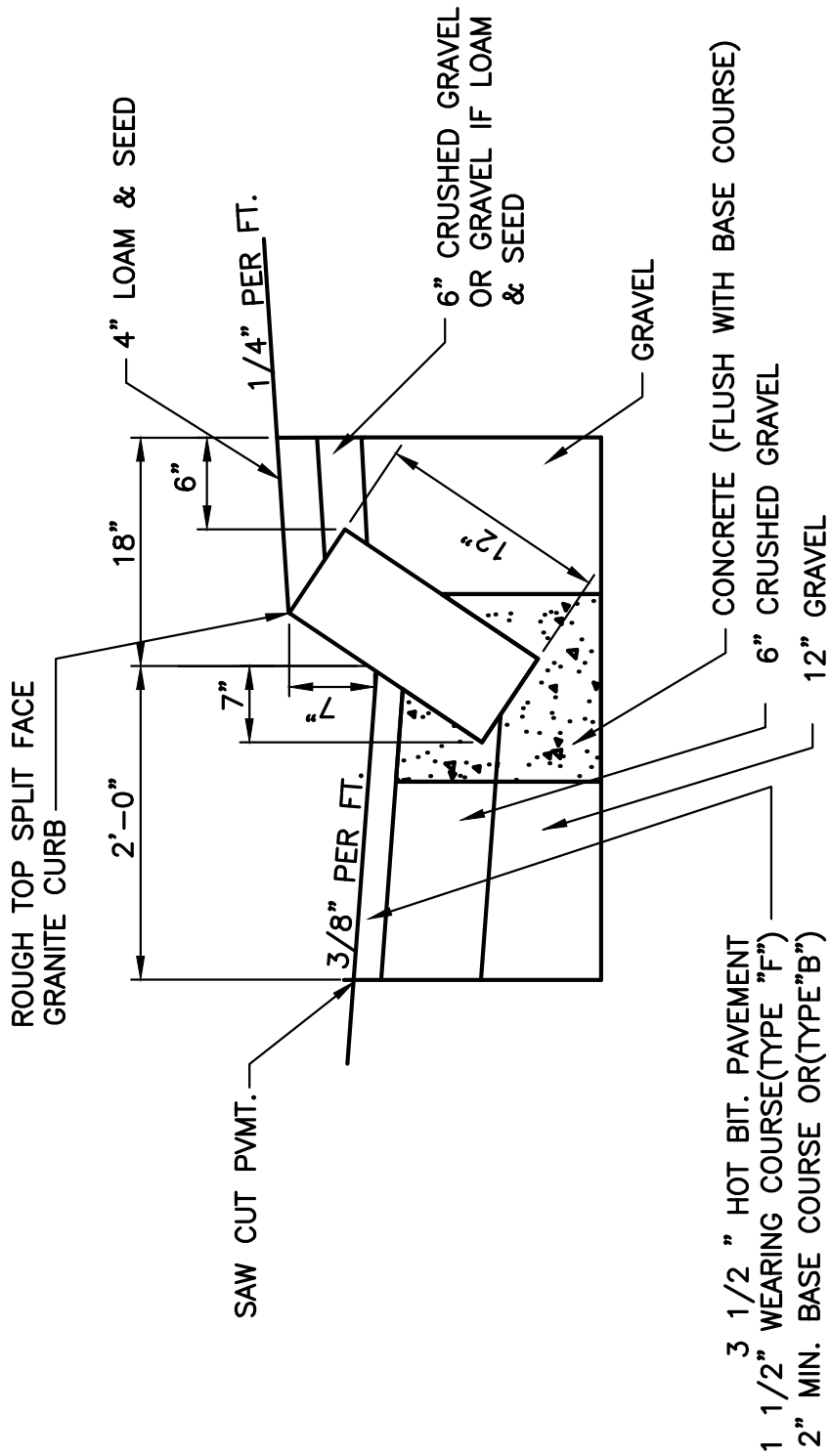
OFFSET CUL-DE-SAC

TOWN OF HUDSON

AUGUST-01

REV: JULY 2019

SCALE: NTS



**SLOPED GRANITE CURB REMOVED
& RESET OR INSTALLED**

NOT TO SCALE



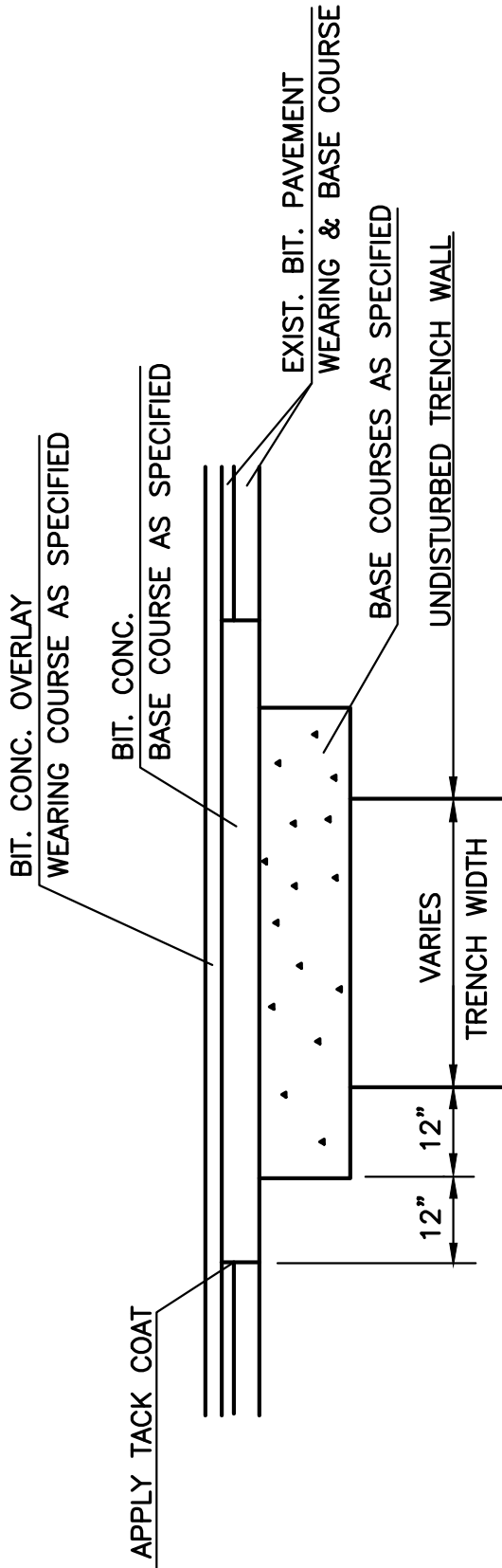
TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL R-4

~~SLOPED GRANITE CURB REMOVED
& RESET OR INSTALLED~~

TOWN OF HUDSON AUGUST-01

REV: 8/23/19 SCALE: NTS



NOTE: AT END OF OVERLAY, SAW CUT AND REMOVE EXISTING PAVEMENT.
 BUTT PROPOSED OVERLAY TO EXISTING WEARING COURSE.

PAVEMENT PATCH
WITH OVERLAY

NOT TO SCALE

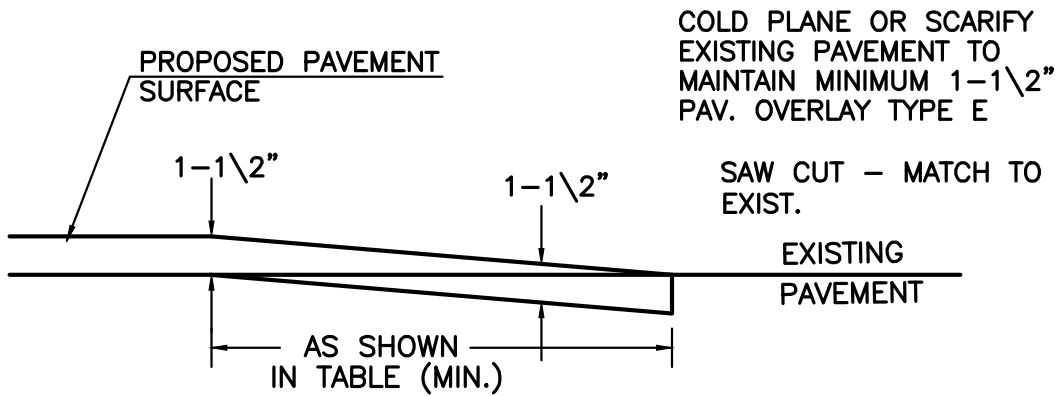


TOWN OF HUDSON
 12 SCHOOL STREET
 HUDSON, NH 03051

DETAIL R-5

PAVEMENT PATCH WITH OVERLAY

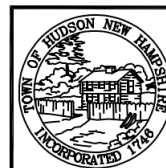
TOWN OF HUDSON AUGUST-01
 REV: 8/23/19 SCALE: NTS



PAVEMENT END MATCH

NOT TO SCALE

	< 5%	> 5%
NEGATIVE SLOPE	5'	10'
POSITIVE SLOPE	5'	20'



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL R-6

PAVEMENT END MATCH

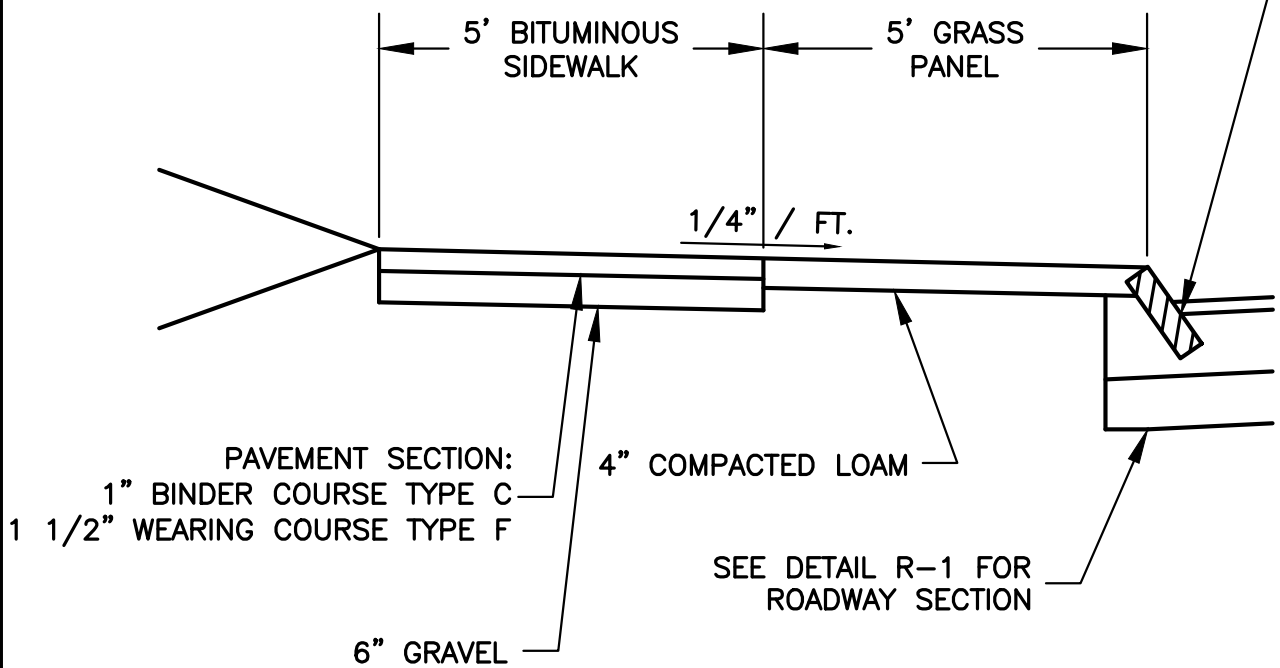
TOWN OF HUDSON AUGUST-01

REV: SCALE: NTS

SIDEWALK

NOT TO SCALE

SEE DETAIL R-4 FOR CURB SECTION



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL R-7

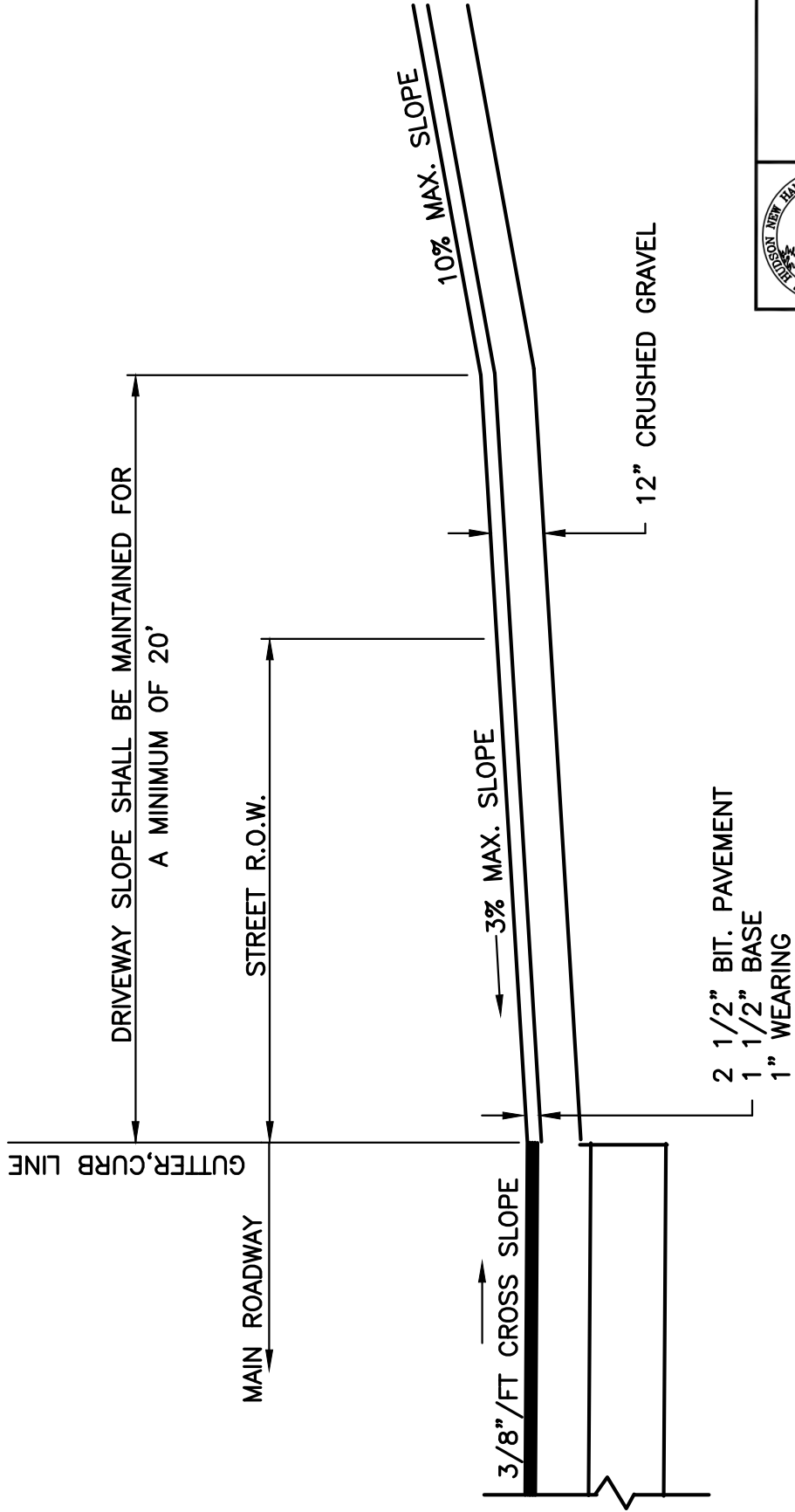
SIDEWALK

TOWN OF HUDSON

AUGUST-01

REV: JULY 2019

SCALE: NTS

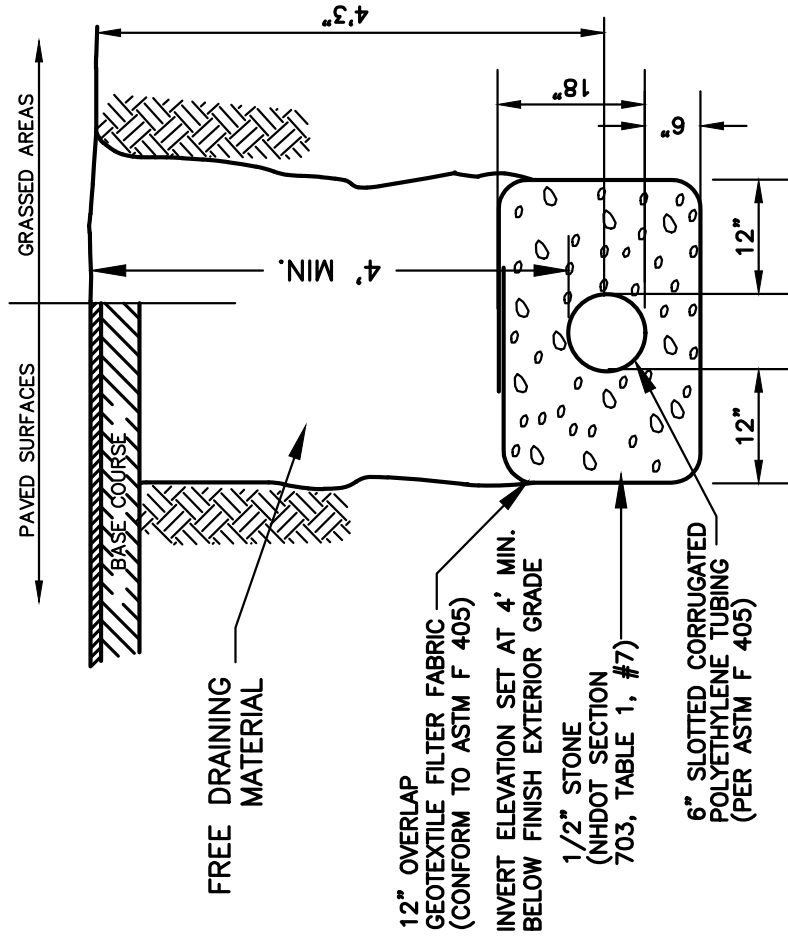


DRIVEWAY CROSS-SECTION
 NOT TO SCALE



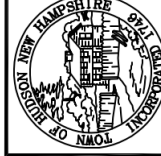
TOWN OF HUDSON
 12 SCHOOL STREET
 HUDSON, NH 03051

DETAIL R-8
DRIVEWAY CROSS-SECTION
 TOWN OF HUDSON AUGUST-01
 REV: 8/23/19 SCALE: NTS



EARTH CONSTRUCTION

UNDERDRAIN
NOT TO SCALE

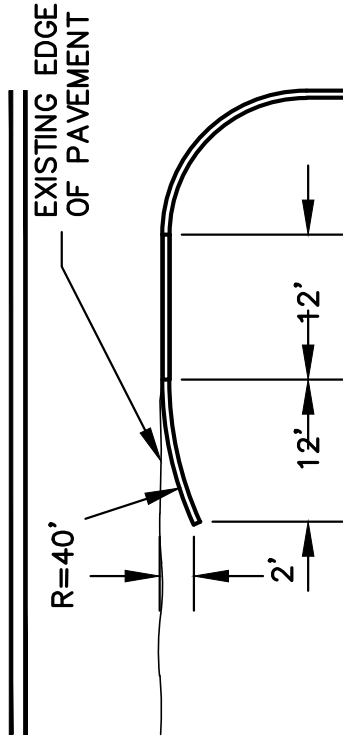


TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

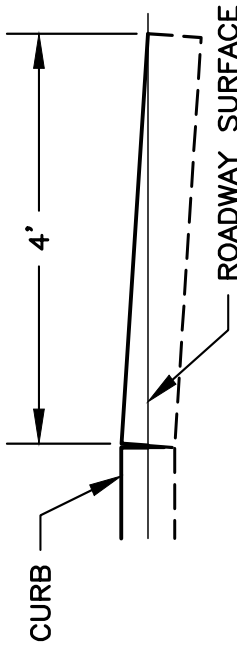
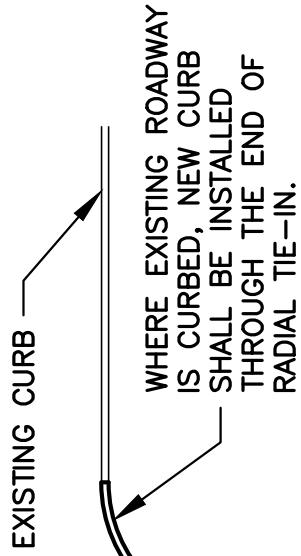
DETAIL R-9
UNDERDRAIN

TOWN OF HUDSON AUGUST-01
REV: SCALE: NTS

EXISTING ROADWAY

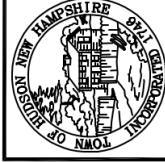


WHERE EXISTING STREET IS NOT CURBED, NEW CURB SHALL BE INSTALLED THROUGH THE END OF RADIAL TIE-IN, PLUS AN ADDITIONAL 24' OF CURB AS SHOWN. THE LAST 4' SECTION SHALL BE TIPPED DOWN AS SHOWN ON INSERT 'A'.



PROPOSED ROADWAY

INSERT 'A'

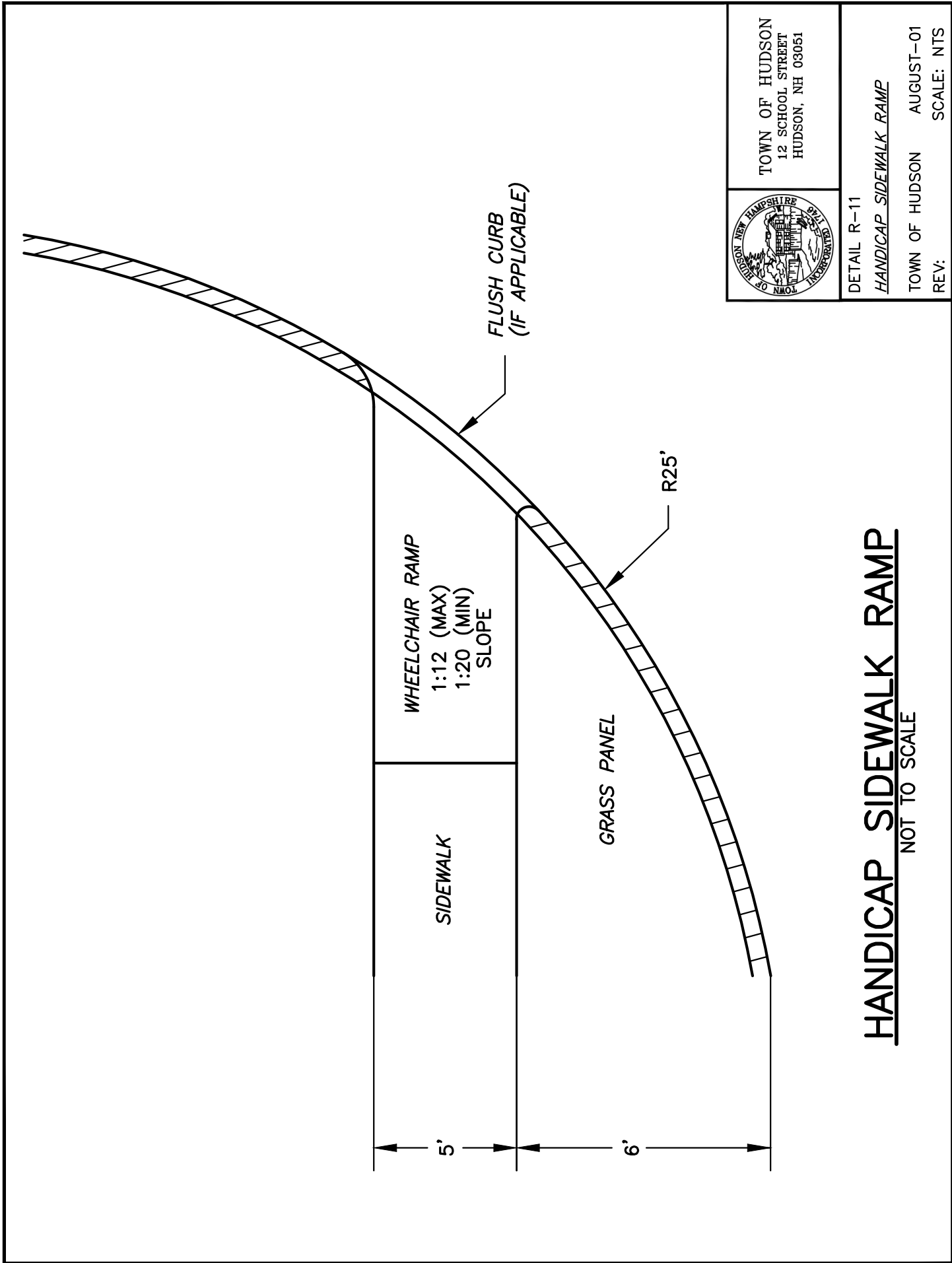


TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL R-10
CURB END

TOWN OF HUDSON
REV: AUGUST-01
SCALE: NTS

CURB END
NOT TO SCALE



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

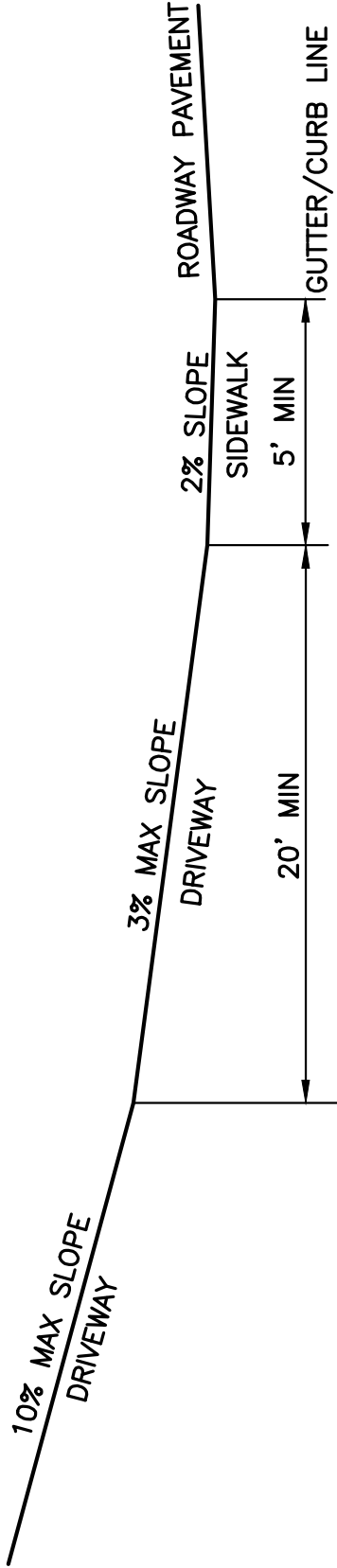
DETAIL R-11

HANDICAP SIDEWALK RAMP

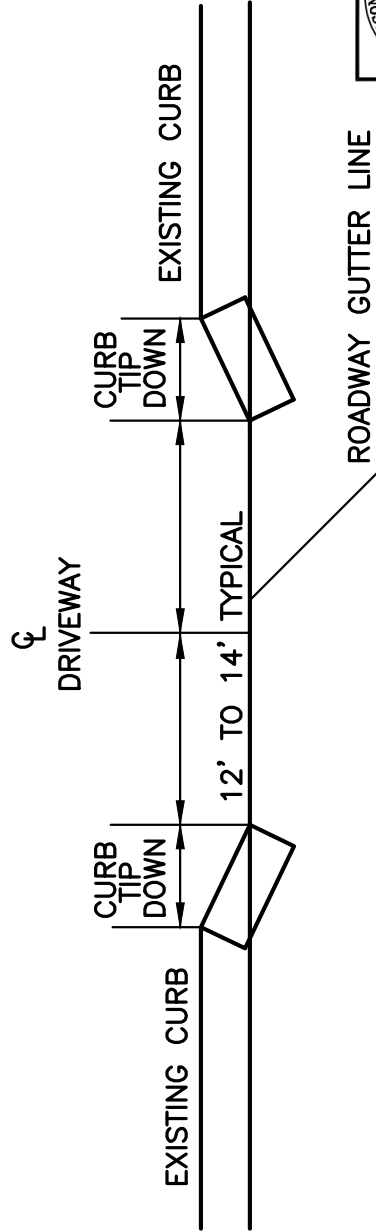
TOWN OF HUDSON AUGUST-01
REV: SCALE: NTS

HANDICAP SIDEWALK RAMP

NOT TO SCALE



SIDEWALK PAVEMENT:
 1" WEARING COURSE— TYPE F
 1 1/2" BINDER COURSE— TYPE C
 6" CRUSHED GRAVEL



DRIVEWAY CROSS SECTION AT
CURB WITH SIDEWALK

NOT TO SCALE



TOWN OF HUDSON
 12 SCHOOL STREET
 HUDSON, NH 03051

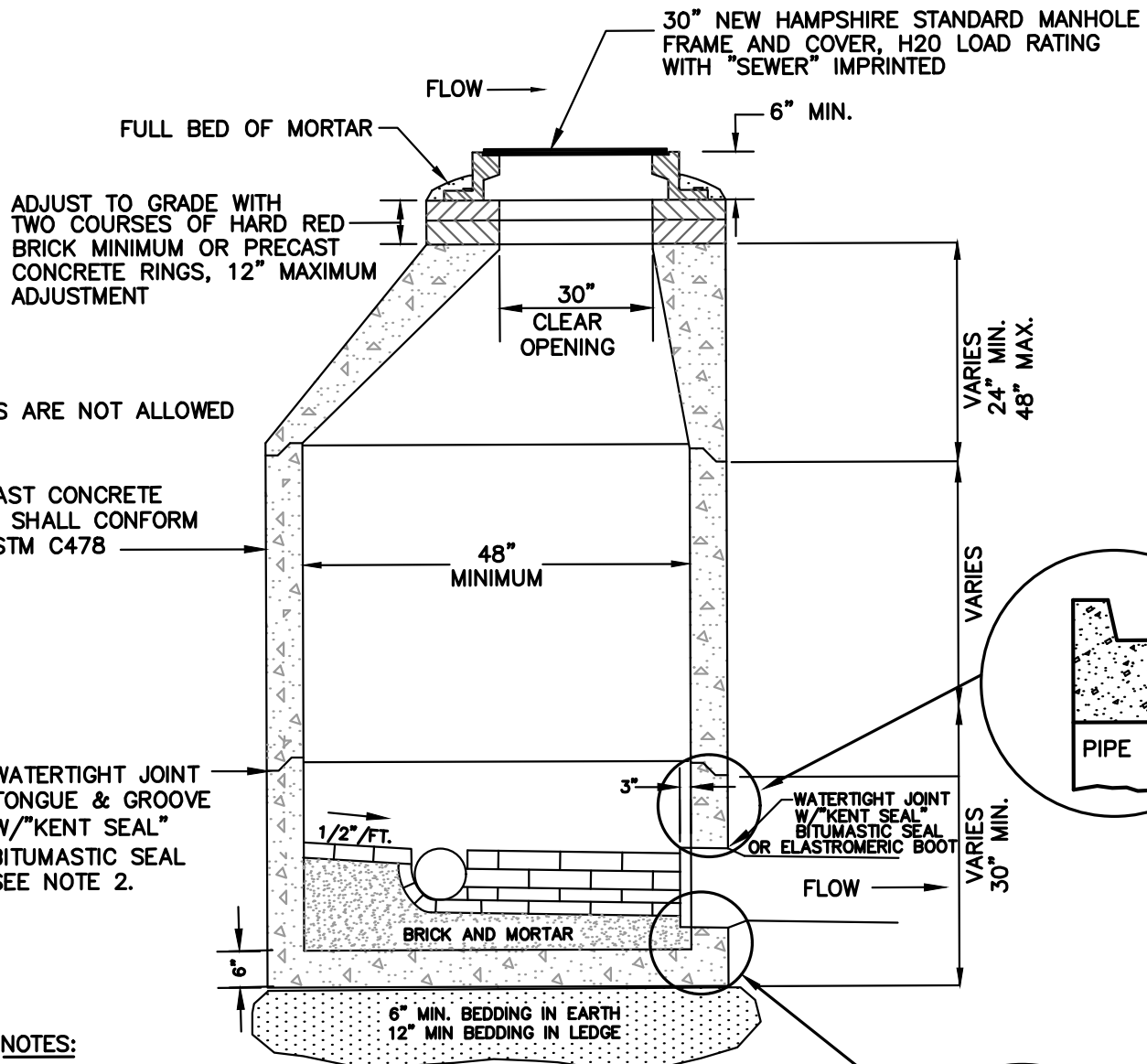
DETAIL R-12

DRIVEWAY CROSS SECTION AT
CURB WITH SIDEWALK

TOWN OF HUDSON AUGUST-01
 REV: 8/23/19 SCALE: NTS

Sewer Details

Detail	Name
S-1	Sewer Manhole
S-2	Standard Manhole Part A
S-3	Internal Drop SMH
S-4	Sewer Trench Section
S-5	Building Service Connection
S-6	Sewer Cleanout
S-7	Chimney
S-8	Reserved



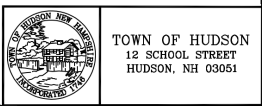
NOTES:

1. ALL GASKETS AND SEALANTS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS WRITTEN INSTRUCTIONS.
2. FOR BITUMASTIC TYPE JOINTS THE AMOUNT OF SEALANT SHALL BE SUFFICIENT TO FILL AT LEAST 75% OF THE JOINT CAVITY. APPROVED BITUMASTIC SEALANTS
 RAM-NEK
 KENT SEAL No. 2

ALL SECTIONS SHALL BE CONCRETE CLASS AA (4000 PSI). CIRCUMFERENTIAL REINFORCEMENT SHALL BE 0.12 SQ. IN. PER L.F. IN ALL SECTIONS AND SHALL BE PLACED IN THE CENTER THIRD OF THE WALL. THE TONGUE OR THE GROOVE OF THE JOINT SHALL CONTAIN ONE LINE OF CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 0.12 SQ. IN. PER L.F.

TYPE OF PIPE	SIZE	MAX. DIST. TO FIRST JOINT
R.C.P. & C.I.	ALL	48"
C.I.P.	ALL	48"
P.V.C.	>15"	48"
V.C.P.	0-12"	18"
V.C.P.	>12"	36"

BASE SECTION TO BE FULL WALL THICKNESS AND MONOLITHIC TO A POINT 6" ABOVE THE PIPE CROWN.



SEWER MANHOLE

NOT TO SCALE

DETAIL S-1
SEWER MANHOLE
 TOWN OF HUDSON AUGUST-01
 REV: 8/23/19 SCALE: NTS

NOTES

1. ALL MANHOLES, INCLUDING ALL COMPONENT PARTS, SHALL HAVE ADEQUATE SPACE, STRENGTH AND LEAKPROOF QUALITIES CONSIDERED NECESSARY BY THE ENGINEER FOR THE INTENDED SERVICE. SPACE REQUIREMENTS AND CONFIGURATIONS, SHALL BE AS SHOWN ON THE DRAWING. MANHOLES MAY BE AN ASSEMBLY OF PRECAST SECTIONS, WITH OR WITHOUT STEEL REINFORCEMENT, WITH ADEQUATE JOINTING, OR CONCRETE CAST MONOLITHICALLY IN PLACE WITH OR WITHOUT REINFORCEMENT. IN ANY APPROVED MANHOLE, THE COMPLETE STRUCTURE SHALL BE OF SUCH MATERIAL AND QUALITY AS TO WITHSTAND (H-20 LOADING) WITHOUT FAILURE AND PREVENT LEAKAGE IN EXCESS OF ONE GALLON PER DAY PER VERTICAL FOOT OF MANHOLE, CONTINUOUSLY FOR THE LIFE OF THE STRUCTURE. A PERIOD GENERALLY IN EXCESS OF 25 YEARS IS TO BE UNDERSTOOD IN BOTH CASES.
2. BARRELS AND CONE SECTIONS SHALL BE PRECAST REINFORCED OR NON-REINFORCED CONCRETE, OR Poured IN PLACE REINFORCED OR NON-REINFORCED CONCRETE.
3. PRECAST CONCRETE BARREL SECTIONS, CONES AND BASES SHALL CONFORM TO ASTM C 478.
4. LEAKAGE TEST SHALL BE PERFORMED IN ACCORDANCE WITH THE SPECIFICATIONS (5 POUNDS FOR 5 MINS., NO DROP BELOW 4 POUNDS).
5. INVERTS AND SHELVES MANHOLES SHALL HAVE A BRICK PAVED SHELF AND INVERT, CONSTRUCTED TO CONFORM TO THE SIZE OF THE PIPE AND FLOW. AT CHANGES IN DIRECTION, THE INVERTS SHALL BE LAID OUT IN CURVES OF THE LONGEST RADIUS POSSIBLE TANGENT TO THE CENTER LINE OF THE SEWER PIPES. SHELVES SHALL BE CONSTRUCTED TO THE ELEVATION OF THE HIGHEST PIPE. CROWN AND SLOPE TO DRAIN TOWARD THE FLOW THROUGH CHANNEL. UNDERLAYMENT OF INVERT AND SHELF SHALL CONSIST OF BRICK MASONRY. INVERTS AND SHELVES SHALL BE PLACED AFTER TESTING.
6. FRAMES AND COVERS MANHOLE FRAMES AND COVERS SHALL PROVIDE A 30 INCH CLEAR OPENING. A 3 INCH (MINIMUM HEIGHT) LETTER "S" OR THE WORD "SEWER" SHALL BE CAST INTO THE TOP SURFACE. CASTINGS SHALL BE EVEN-GRAINED CAST IRON AND SHALL BE EQUAL TO CLASS 30, CONFORMING TO ASTM A 48.
7. BEDDING SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATTER AND MEETING ASTM C33
100 PASSING 1 INCH SCREEN
90-100 PASSING 3/4 INCH SCREEN
20-55 PASSING 3/8 INCH SCREEN
0-10 PASSING #4 SIEVE
0-5 PASSING #8 SIEVE
WHERE ORDERED BY THE ENGINEER TO STABILIZE THE BASE. SCREENED GRAVEL OR CRUSHE STONE 1/2 TO 1-1/2 INCH SHALL BE USED.
8. FLEXIBLE JOINT A FLEXIBLE JOINT SHALL BE PROVIDED WITHIN THE FOLLOWING DISTANCES:
RCP & CI PIPE (ALL SIZES): 48"
AC & VC PIPE (UP THROUGH 12" DIA.): 18"
AC & VC PIPE (LARGER THAN 12" DIA.): 36"
9. SHALLOW MANHOLE IN LIEU OF A CONE SECTION, WHEN MANHOLE DEPTH IS LESS THAN 6 FEET, A REINFORCED CONCRETE SLAB COVER MAY BE USED. IT MUST HAVE AN ECCENTRIC ENTRANCE OPENING AND BE CAPABLE OF SUPPORTING H-20 LOADS.
DI PIPE - NONE REQUIRED
PVC (ASTM 3034) - UP THROUGH 15: DIA - NONE REQUIRED
PVC (ASTM F 679) - LARGER THAN 15: DIA - 48" - 60"
PVC (ASTM F 789) - ALL SIZES - 48" - 60"
ABS (ASTM D 2680) - ALL SIZES - SAME AS PVC ABOVE
- 9b. UNDER SEVERE CONDITIONS WHEN DIFFERENTIAL SETTING CANNOT BE CONTROLLED WITHIN NORMAL LIMITS, VARIATIONS IN THE STUB LENGTH MAY BE NECESSARY OTHER PLASTIC PIPES SHALL BE REVIEWED ON A CASE BY CASE BASIS.
10. MANHOLE STEPS ARE NOT PERMITTED.
11. MAXIMUM DISTANCE BETWEEN SEWER MANHOLES SHALL BE 300 FEET.
12. SEWER MANHOLE SHALL BE REQUIRED FOR ALL (EXISTING AND NEW) INDUSTRIAL AND COMMERCIAL USERS AND WILL BE LOCATED AT ROW/PROPERTY LINE.

NOTE
SEPARATE CONSTRUCTION SPECIFICATIONS MUST BE ATTACHED OR INCLUDED IN THE CONTRACT DOCUMENTS. THESE STANDARD DRAWINGS ARE NOT COMPLETE WITHOUT THESE SPECIFICATIONS.



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL S-2

STANDARD MANHOLE - PART A

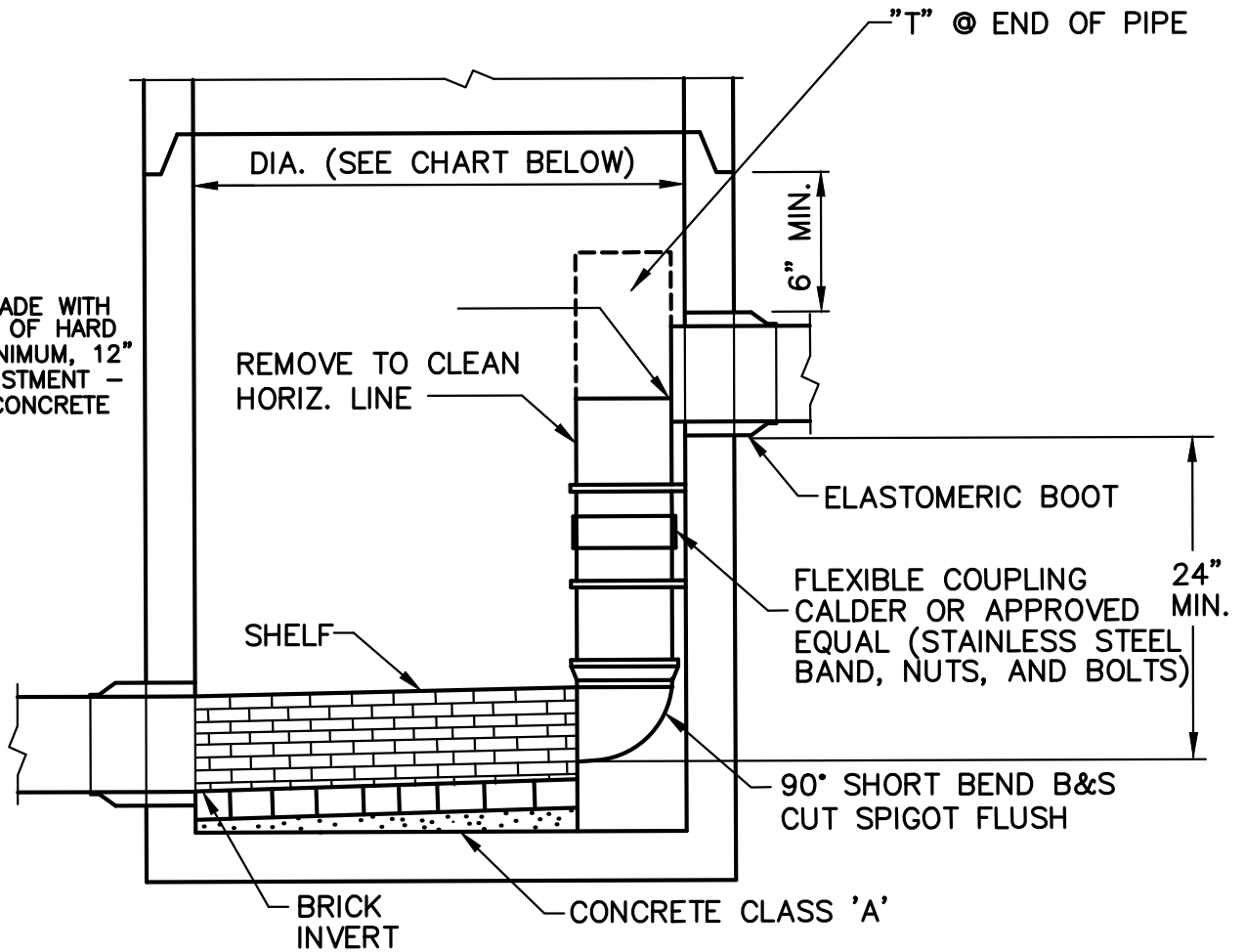
TOWN OF HUDSON AUGUST-01

REV: 8/23/19

SCALE: NTS

STANDARD MANHOLE - PART A

ADJUST TO GRADE WITH
TWO COURSES OF HARD
RED BRICK MINIMUM, 12"
MAXIMUM ADJUSTMENT -
OR PRECAST CONCRETE
RINGS

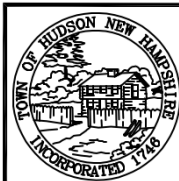


MAN HOLE SIZE CHART

- ONE 8" DROP USE 4' DIA.
- ONE 10" DROP USE 4' DIA.
- TWO 8" DROP USE 5' DIA.
- TWO 10" DROP USE 5' DIA.
- ONE 12" DROP USE 5' DIA.
- ONE 15" DROP USE 5' DIA.
- ONE 18" DROP USE 6' DIA.
- ONE 24" DROP USE 6' DIA.

INTERNAL DROP SMH

NOT TO SCALE



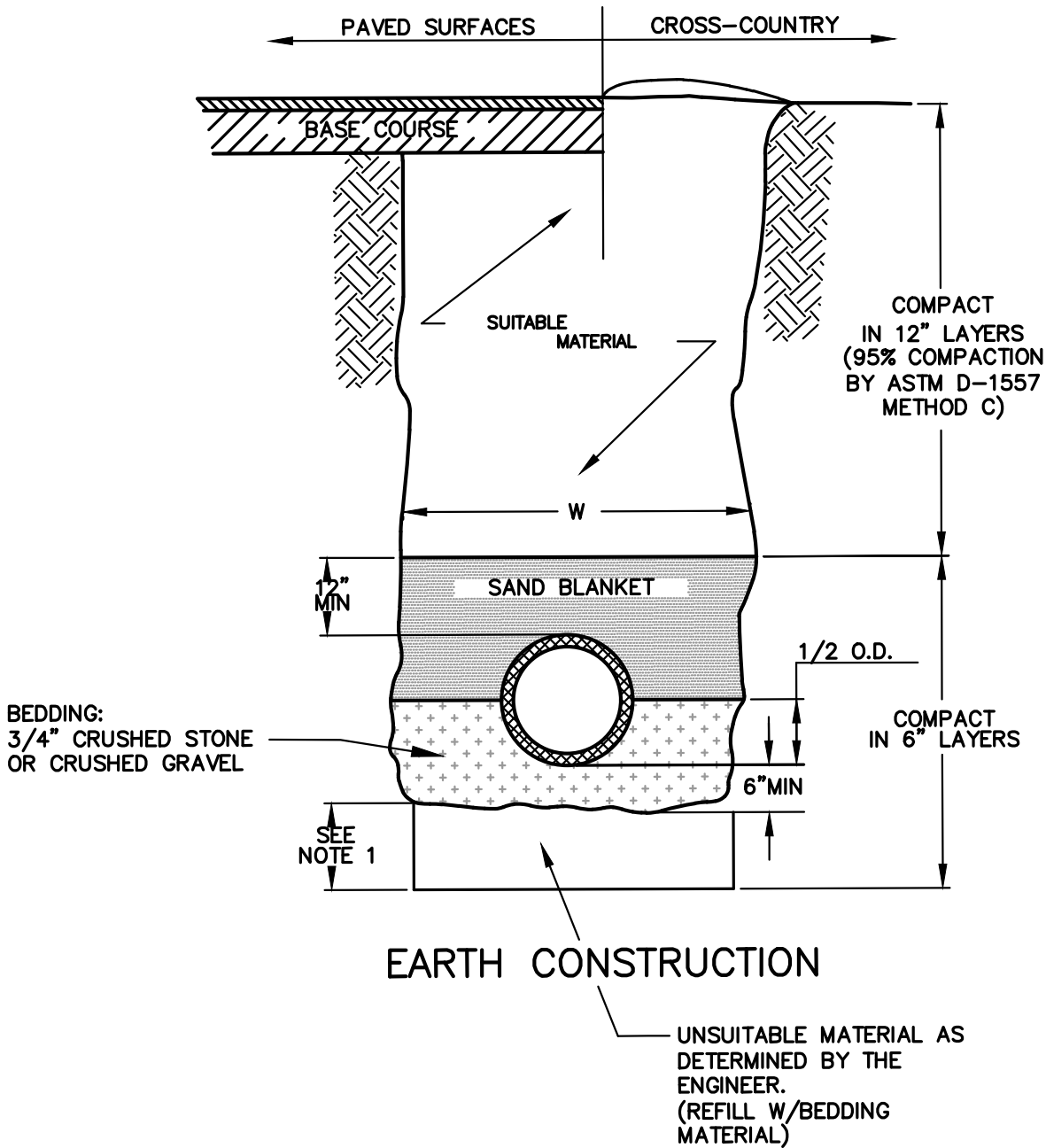
TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL S-3

INTERNAL DROP SMH

TOWN OF HUDSON AUGUST-01

REV: JULY 2019 SCALE: NTS

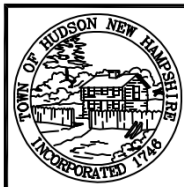


NOTES:

1. ORDERED EXCAVATION OF UNSUITABLE MATERIAL BELOW GRADE, REFILL WITH BEDDING MATERIAL.

SEWER TRENCH SECTION

NOT TO SCALE



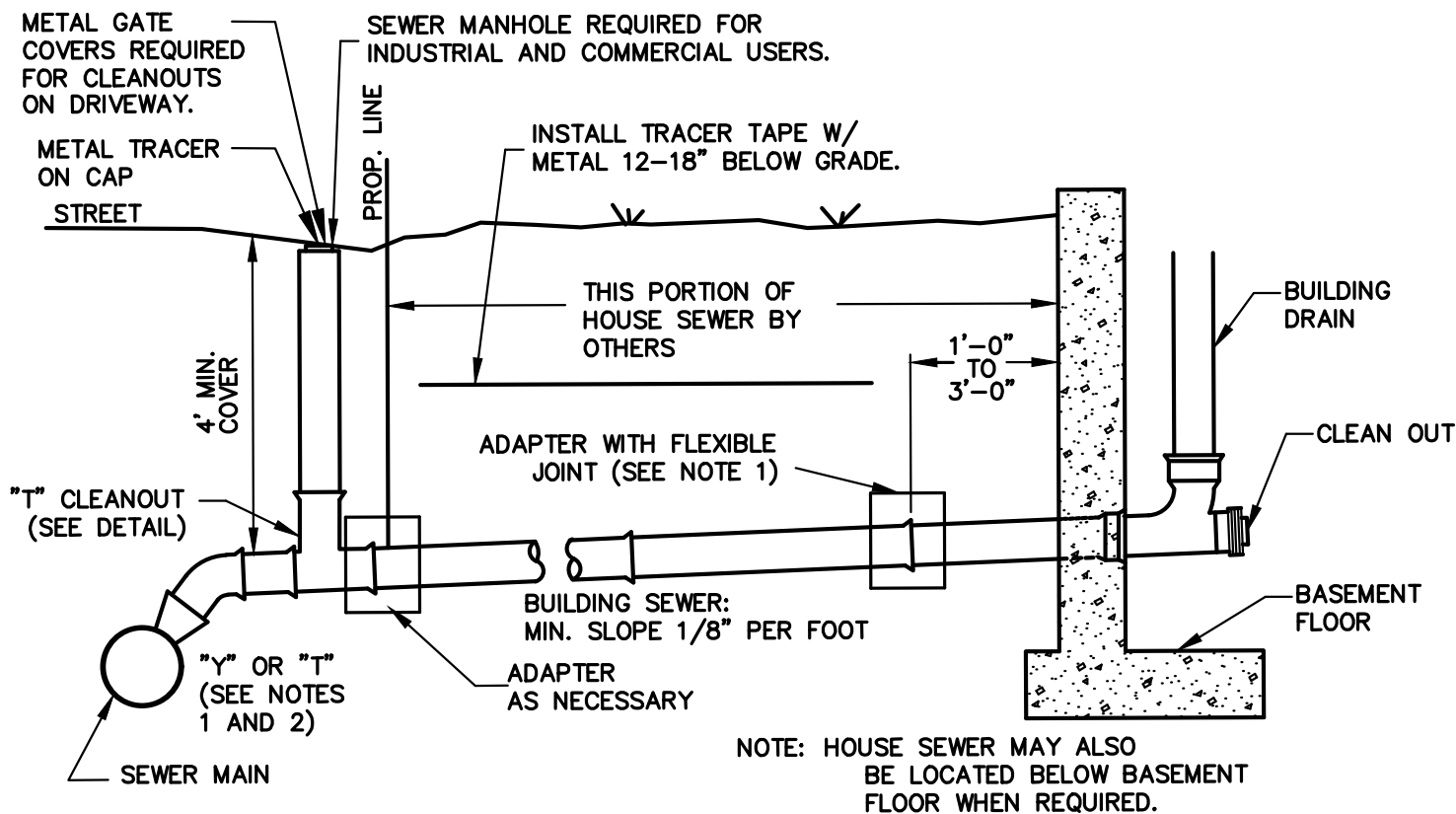
TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL S-4

SEWER TRENCH SECTION

TOWN OF HUDSON AUGUST-01

REV: SCALE: NTS



1. JOINTS SHALL BE DEPENDENT UPON A NEOPRENE OR ELASTOMERIC GASKET FOR WATERTIGHTNESS. ALL JOINTS SHALL BE PROPERLY MATCHED WITH THE PIPE MATERIALS USED. WHERE DIFFERING MATERIALS ARE TO BE CONNECTED, AS AT THE STREET SEWER "Y" OR AT THE FOUNDATION WALL, APPROPRIATE ADAPTERS SHALL BE USED.
2. WHERE A "T" OR "Y" IS NOT AVAILABLE IN THE EXISTING STREET SEWER, AN APPROPRIATE CONNECTION SHALL BE MADE IN ACCORDANCE WITH THE TOWN ENGINEER
3. PIPE SHALL BE 6" DIAMETER MINIMUM FROM SEWER MAIN TO EASEMENT (© R.) AND 4" DIAMETER MINIMUM FROM CLEANOUT TO BUILDING FOUNDATION

BUILDING SERVICE CONNECTION

NOT TO SCALE



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL S-5

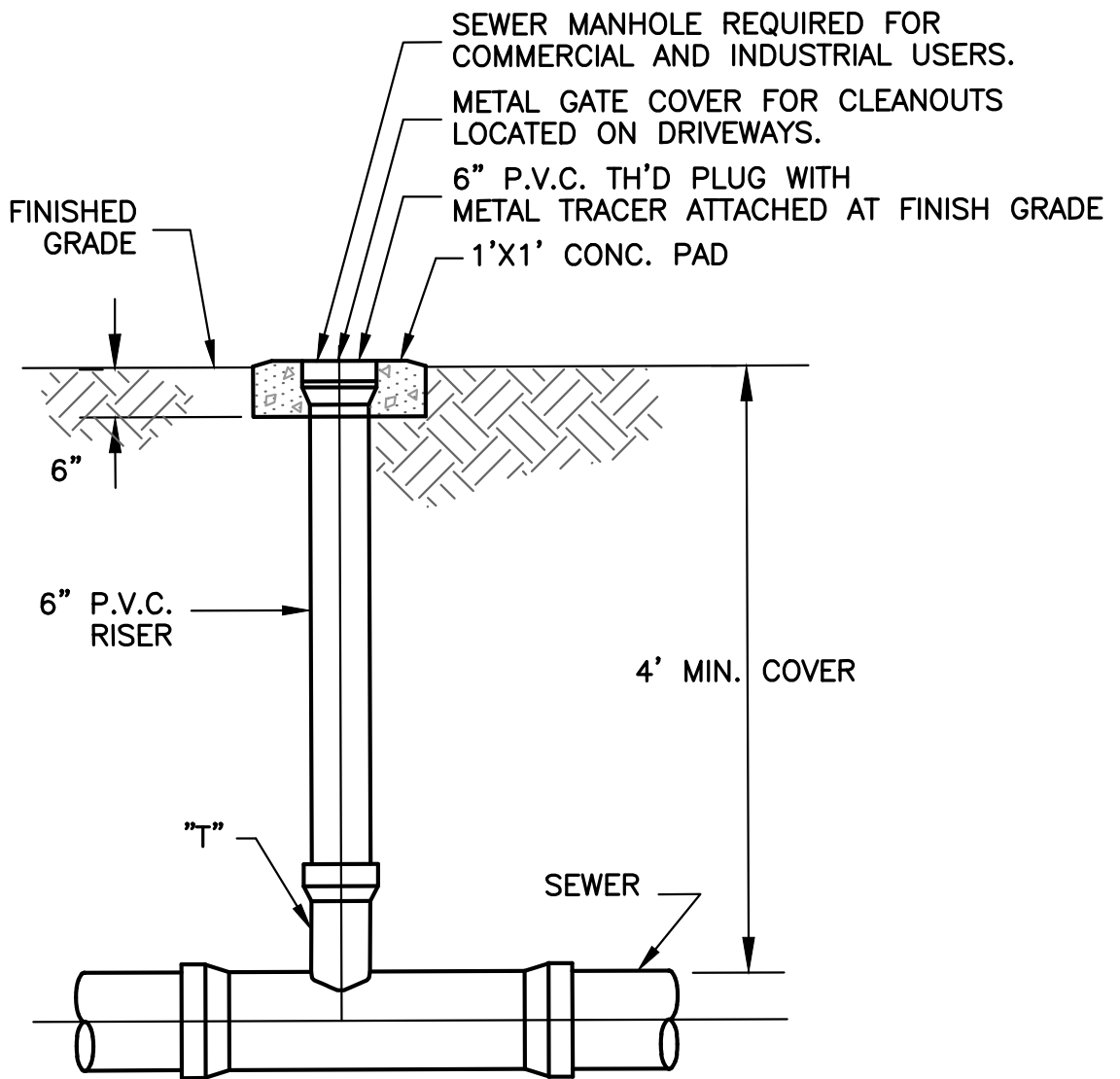
BUILDING SERVICE CONNECTION

TOWN OF HUDSON

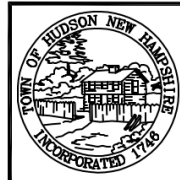
AUGUST-01

REV: 8/23/19

SCALE: NTS



SEWER CLEANOUT
 NOT TO SCALE



TOWN OF HUDSON
 12 SCHOOL STREET
 HUDSON, NH 03051

DETAIL S-6

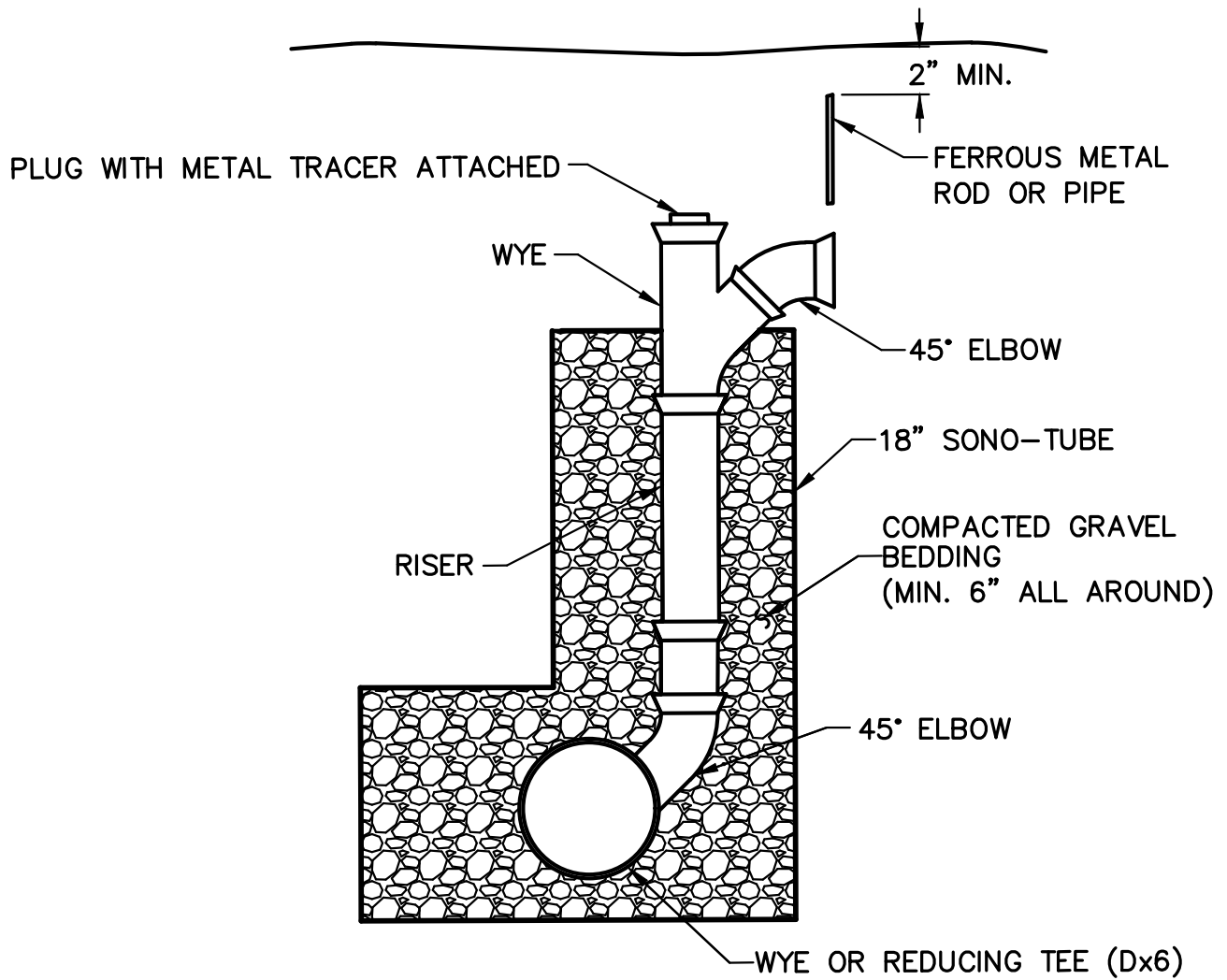
SEWER CLEANOUT

TOWN OF HUDSON

AUGUST-01

REV: 8/23/19

SCALE: NTS



CHIMNEY
NOT TO SCALE



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL S-7

CHIMNEY

TOWN OF HUDSON

AUGUST-01

REV:

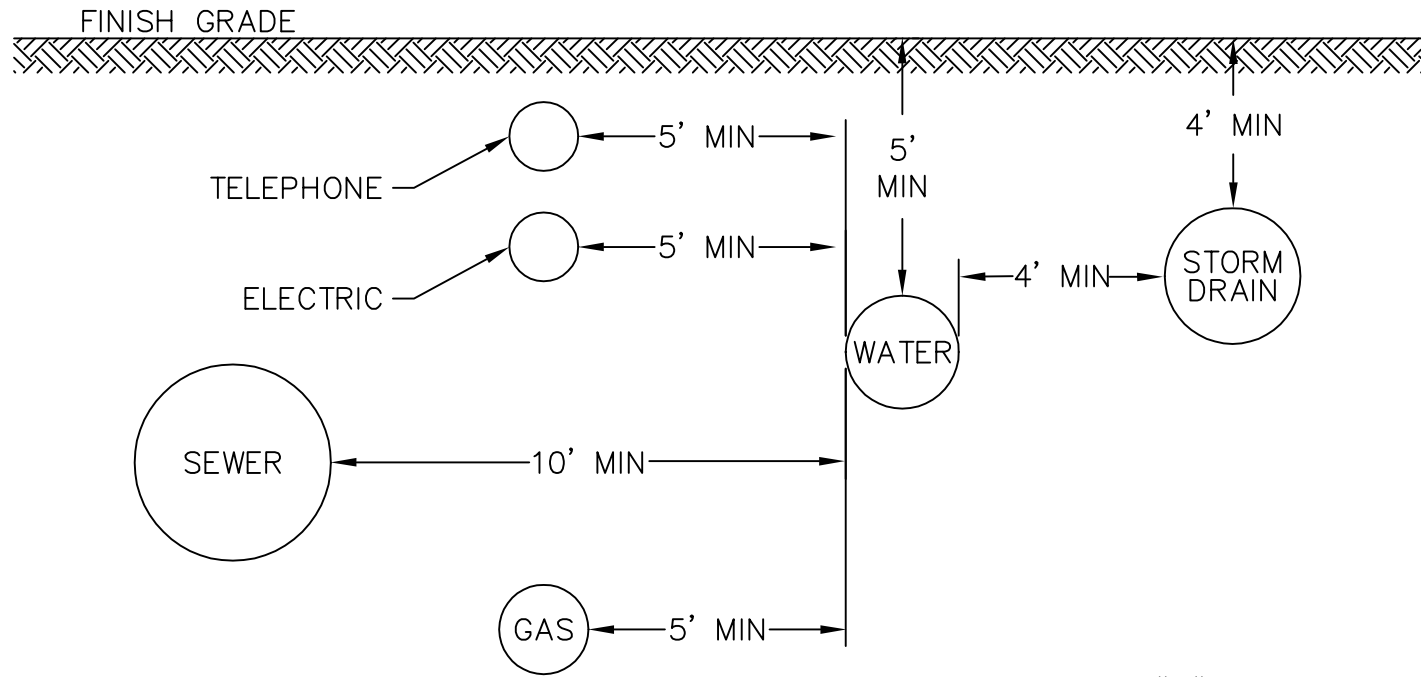
SCALE: NTS

S-8 Reserved

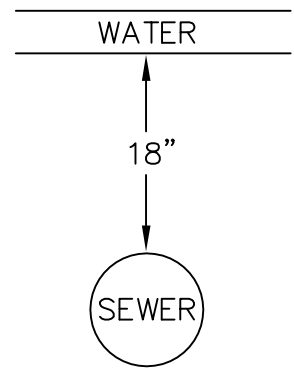
Water Details

Detail	Name
W-1	Utility Separation (Main) Detail
W-2	Water Trench
W-3	Water 1" Release Valve Installation On Ductile Iron
W-4	Water 2" Release Valve Installation On Ductile Iron
W-5	Water Release Valve Installation On PVC
W-6	Water Tee Installation
W-7	Water Thrust Block Behind Fittings Installation
W-8	Water End Of Main Installation
W-9	Water Valve Box Detail
W-10	Water Hydrant Installation
W-11	Utility Separation (Service) Detail
W-12	1-1/2" – 2" Water Service and Valve Box Installation
W-13	Water Service Box Detail in Paved Areas Including Driveways
W-14	Water Service Meter Installation
W-15	Water Slab Construction
W-16	Catch Basin Insulation Detail
W-17	Storm Drain / Water Main Parallel Runs - Elevation View
W-18	Storm Drain / Water Main Intersecting Runs - Elevation View
W-19	Copper Water Service on PVC and Transite Mains
W-20	1" Water Service and Valve Box Installation
W-21	Large Water Service and/or Tapping Sleeve
W-22	Fire Water Service Installation with Standard Foundations
W-23	Fire Service Installation with Slab Foundations
W-24	Domestic Water Service Tapped Off Fire Service
W-25	1-1/2" Through 2" Water Service Entrance
W-26	Fire Service Entrance
W-27	Combined Fire Domestic Water Service Entrance
W-28	Fire Service With Yard Hydrants
W-29	Manufactured Housing or Slab Water Service Entrance
W-30	Domestic Irrigation Water Service Meter Installation

DRAWING: \\HD-FILES\RYTH\ENGINEERING\WATER\0-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]



INSERT "A"



NOTES:

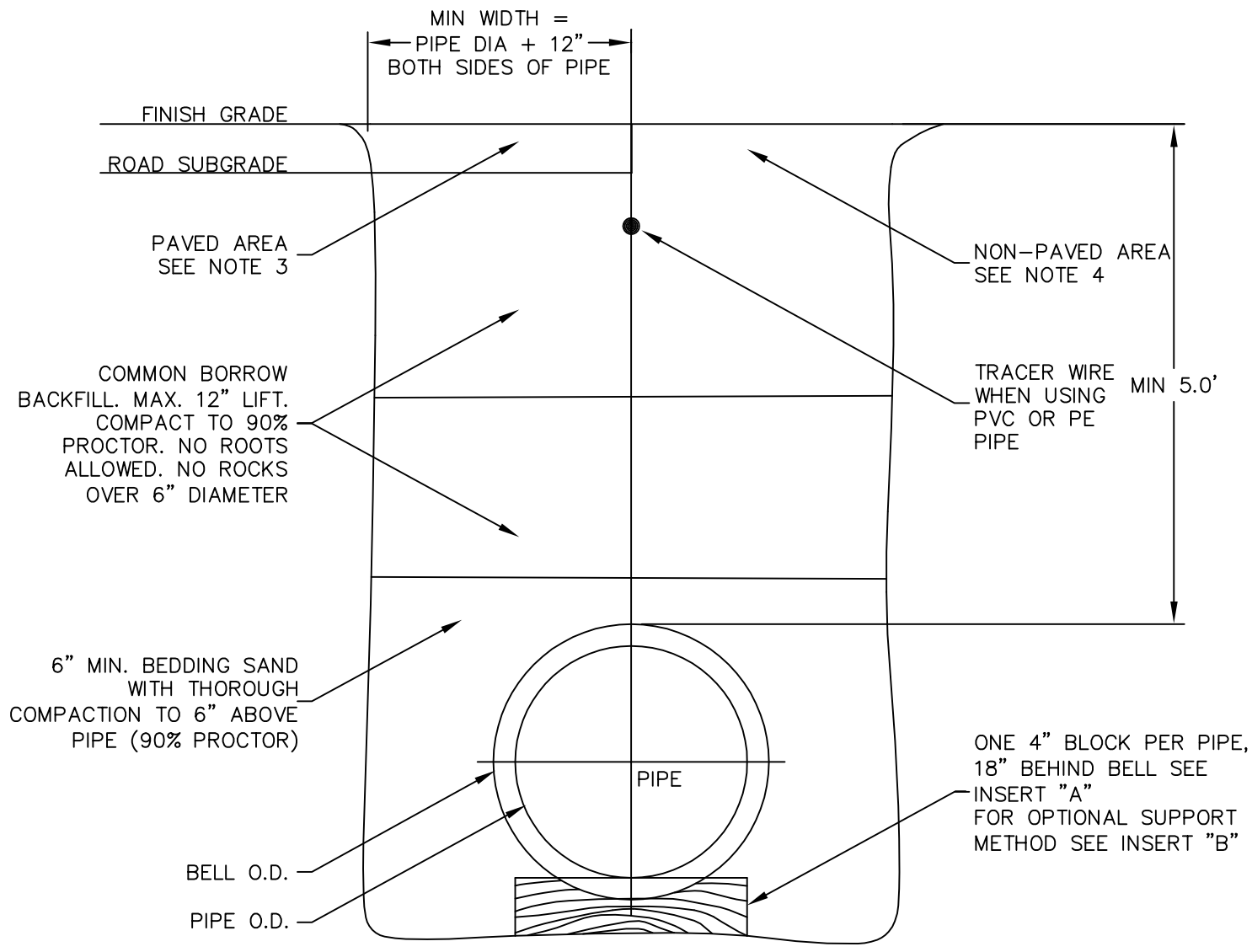
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL WATER MAINS SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. SEE DETAIL A-2 FOR TRENCH DETAIL.
4. SEE DETAIL A-11 FOR OUTSIDE SERVICE ENTRANCE DETAIL.
4. AT CROSSINGS WHERE 10' HORIZONTAL SEPERATION IS NOT POSSIBLE, 18" VERTICAL SEPERATION SHALL BE PROVIDED. SEE INSERT "A".

DRAWINGS COURTESY PENNICHUCK WATER WORKS.

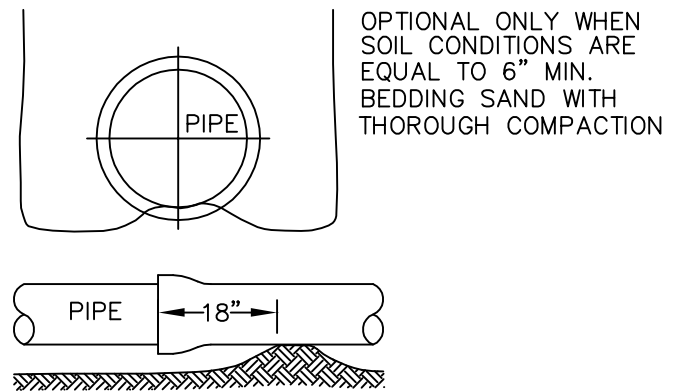
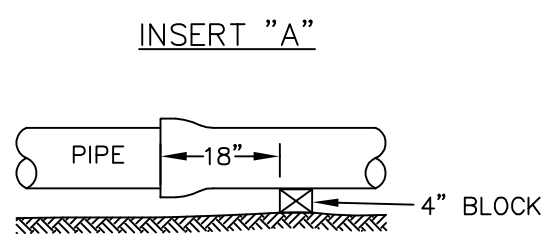
	<p>TOWN OF HUDSON 12 SCHOOL STREET HUDSON, NH 03051</p>
--	--

DETAIL W-1
 WATER UTILITY SEPARATION
 REV: 2019 SCALE: NTS

DRAWING: \\HD-FILES\RVTH\ENGINEERING\WATER\0-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]



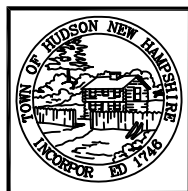
INSERT "B"



NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. REQUIREMENTS FOR SUBBASE AND BASE MATERIAL TYPE ARE TO BE IN ACCORDANCE WITH TOWN OF HUDSON STANDARDS. SEE DETAIL R-1.
4. REQUIREMENTS FOR GRAVEL, LOAM AND/OR SEED ARE TO BE IN ACCORDANCE WITH TOWN OF HUDSON STANDARDS. SEE DETAIL.

DRAWINGS COURTESY
PENNICHUCK WATER
WORKS.

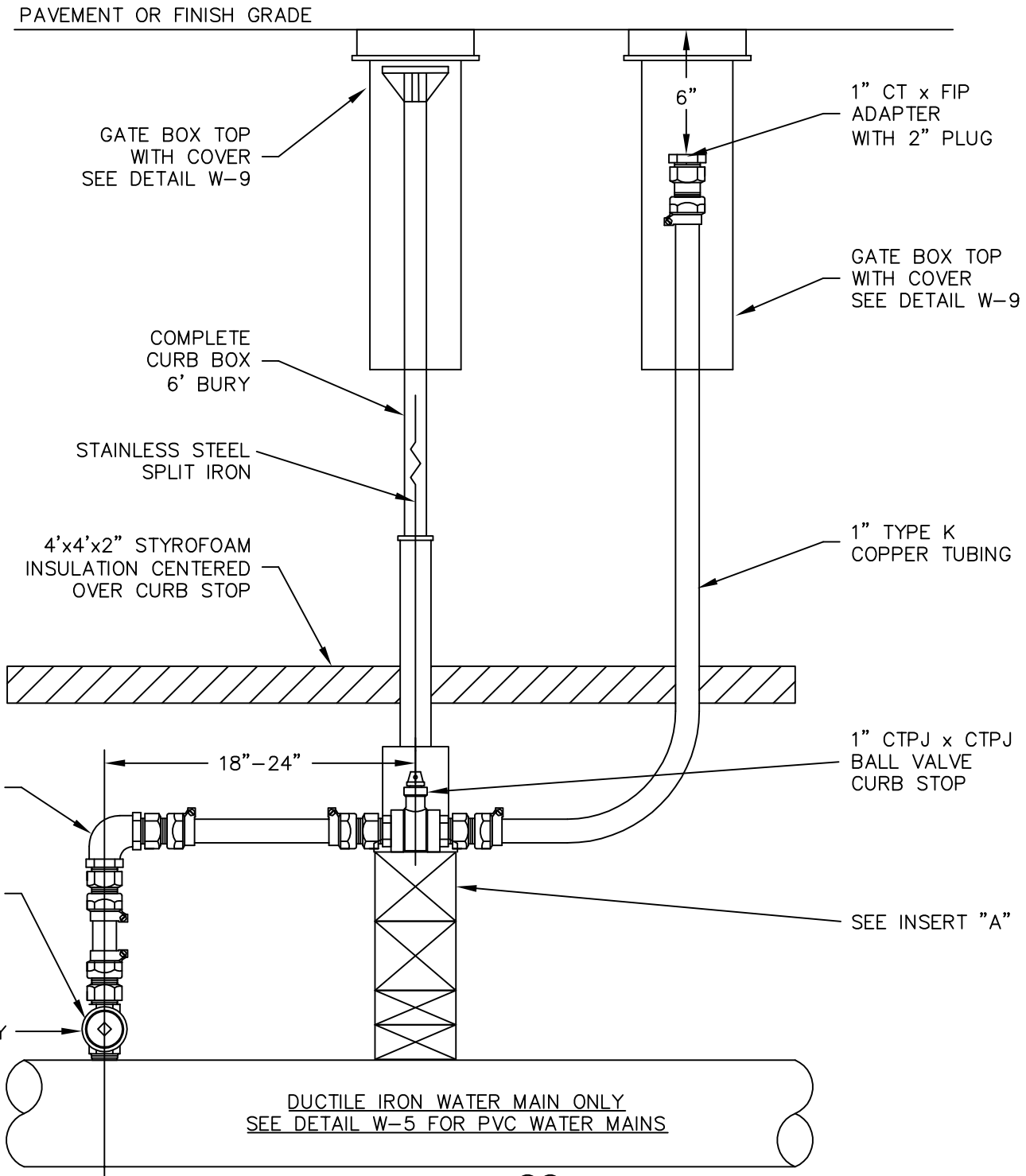


TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-2
WATER TRENCH
REV: 2019

SCALE: NTS

DRAWING: \\HD-FILES\RVTH\ENGINEERING\WATER\0-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]



1" BRASS FIP BEND
 1" CC x MIP BALL PATTERN CORPORATION SEE NOTE 2
 24" MIN FROM ANY FITTING

1" CT x FIP ADAPTER WITH 2" PLUG
 GATE BOX TOP WITH COVER SEE DETAIL W-9

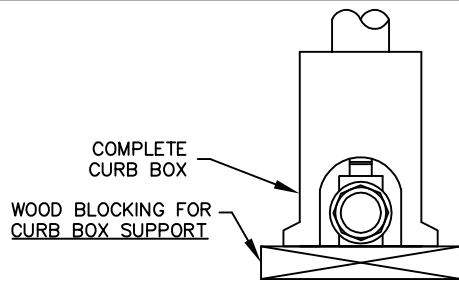
COMPLETE CURB BOX 6' BURY
 STAINLESS STEEL SPLIT IRON
 4'x4'x2" STYROFOAM INSULATION CENTERED OVER CURB STOP

1" TYPE K COPPER TUBING

1" CTPJ x CTPJ BALL VALVE CURB STOP

SEE INSERT "A"

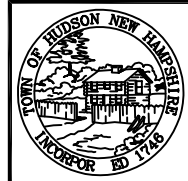
DUCTILE IRON WATER MAIN ONLY
 SEE DETAIL W-5 FOR PVC WATER MAINS



DRAWINGS COURTESY PENNICHUCK WATER WORKS.

NOTES:

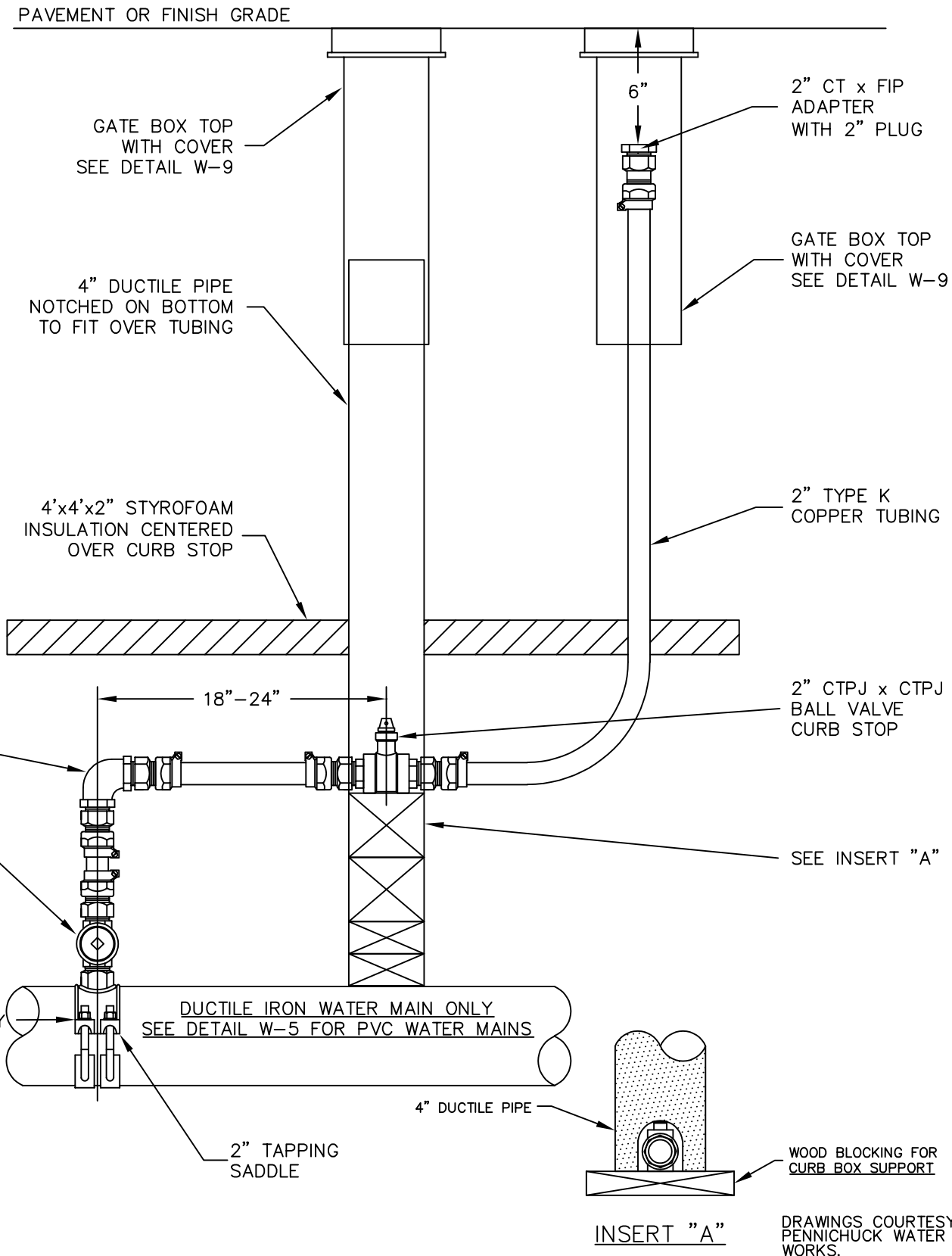
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO P.W.W. TECHNICAL SPECIFICATIONS.
2. WATER MAIN MAY BE DIRECT TAPPED WHEN IT IS 6" OR LARGER DUCTILE IRON.
3. SEE DETAIL W-5 FOR INSTALLATION ON PVC WATER MAINS.



TOWN OF HUDSON
 12 SCHOOL STREET
 HUDSON, NH 03051

DETAIL W-3
 WATER 1" RELEASE VALVE
 INSTALLATION ON DUCTILE IRON
 REV: 2019 SCALE: NTS


DRAWING: \\HD-FILES\RVTH\ENGINEERING\WATER\0-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]



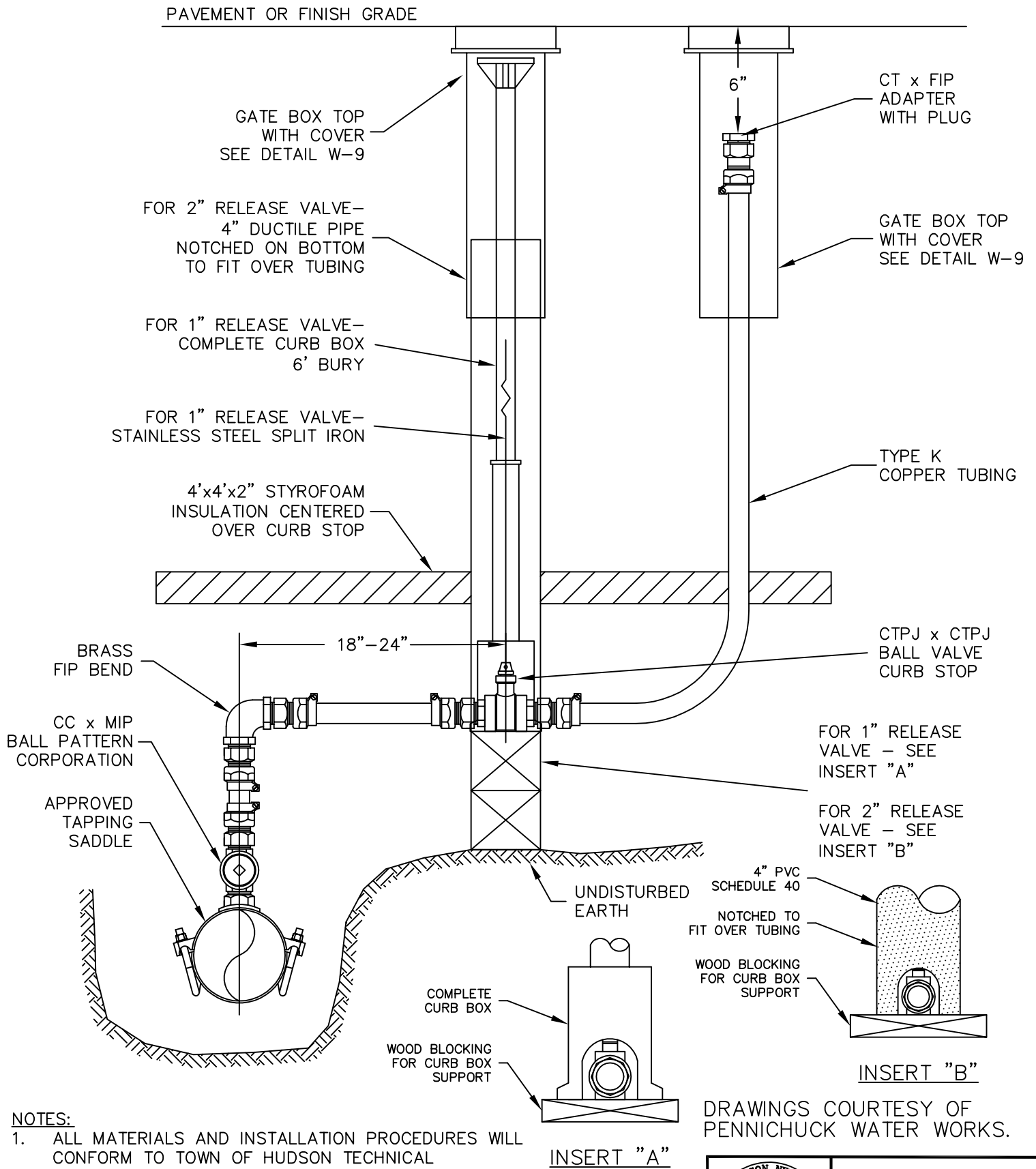
NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. WATER MAIN MAY BE DIRECT TAPPED WHEN IT IS 16" OR LARGER DUCTILE IRON.
3. SEE DETAIL W-5 FOR INSTALLATION ON PVC WATER MAINS.

DRAWINGS COURTESY
PENNICHUCK WATER
WORKS.

	<p>TOWN OF HUDSON 12 SCHOOL STREET HUDSON, NH 03051</p>
<p>DETAIL W-4 <i>WATER 2" RELEASE VALVE</i> <i>INSTALLATION ON DUCTILE IRON</i> REV: 2019 SCALE: NTS</p>	

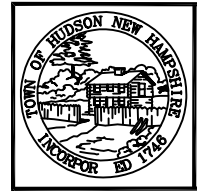
DRAWING: \\HD-FILES\RVTH\ENGINEERING\WATER\0-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]



NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. IF TAPPING SADDLE IS 1", SEE DETAIL W-3 FOR SIZE OF FITTINGS AND APPROPRIATE GATE BOX TYPE.
3. IF TAPPING SADDLE IS 2", SEE DETAIL W-4 FOR SIZE OF FITTINGS AND APPROPRIATE GATE BOX TYPE
4. SEE DETAILS W-3 AND W-4 FOR INSTALLATION ON DUCTILE IRON WATER MAINS.

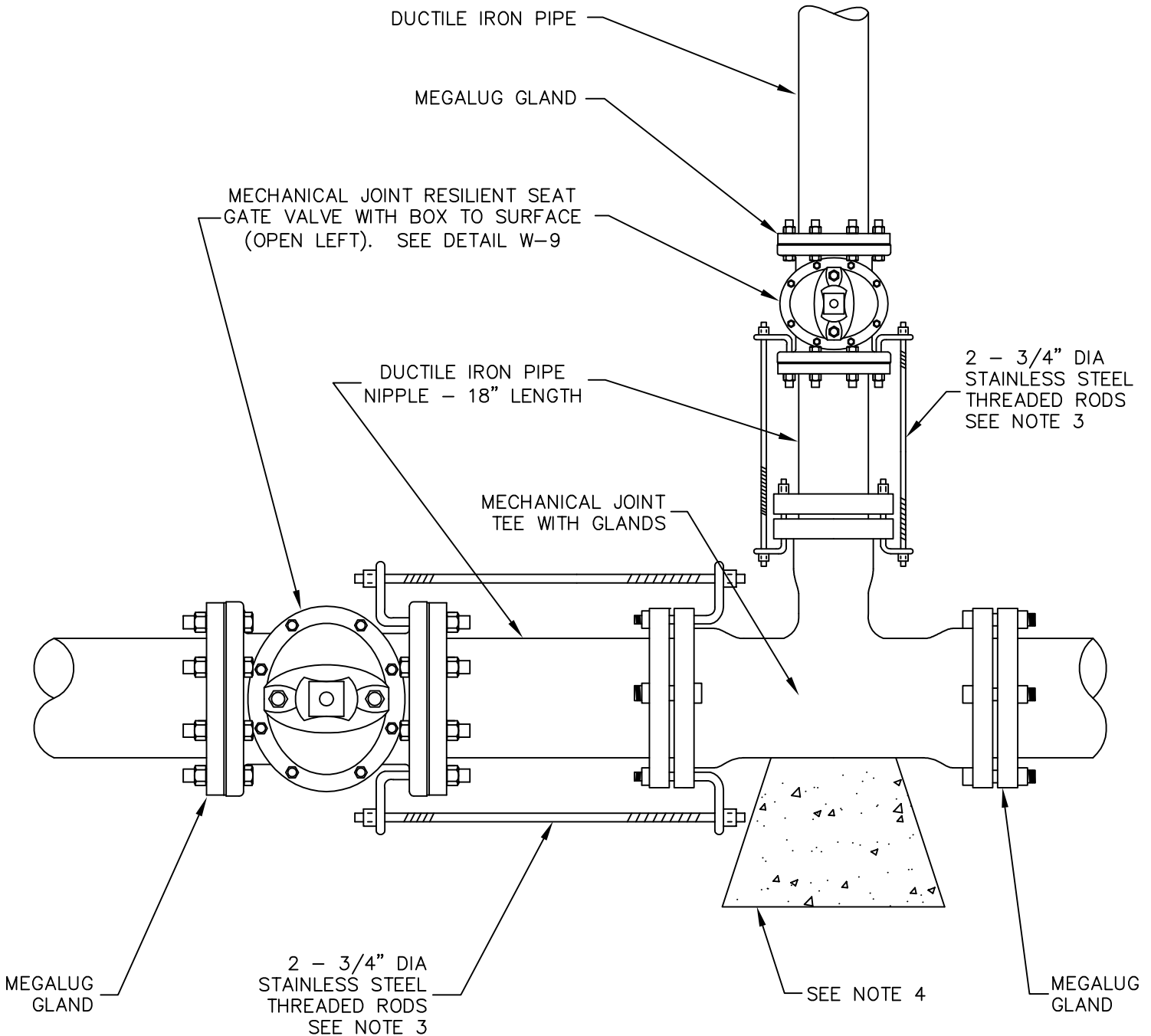
DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



TOWN OF HUDSON
 12 SCHOOL STREET
 HUDSON, NH 03051

DETAIL W-5
 WATER RELEASE VALVE
 INSTALLATION ON PVC

REV: 2019 SCALE: NTS



NOTES:

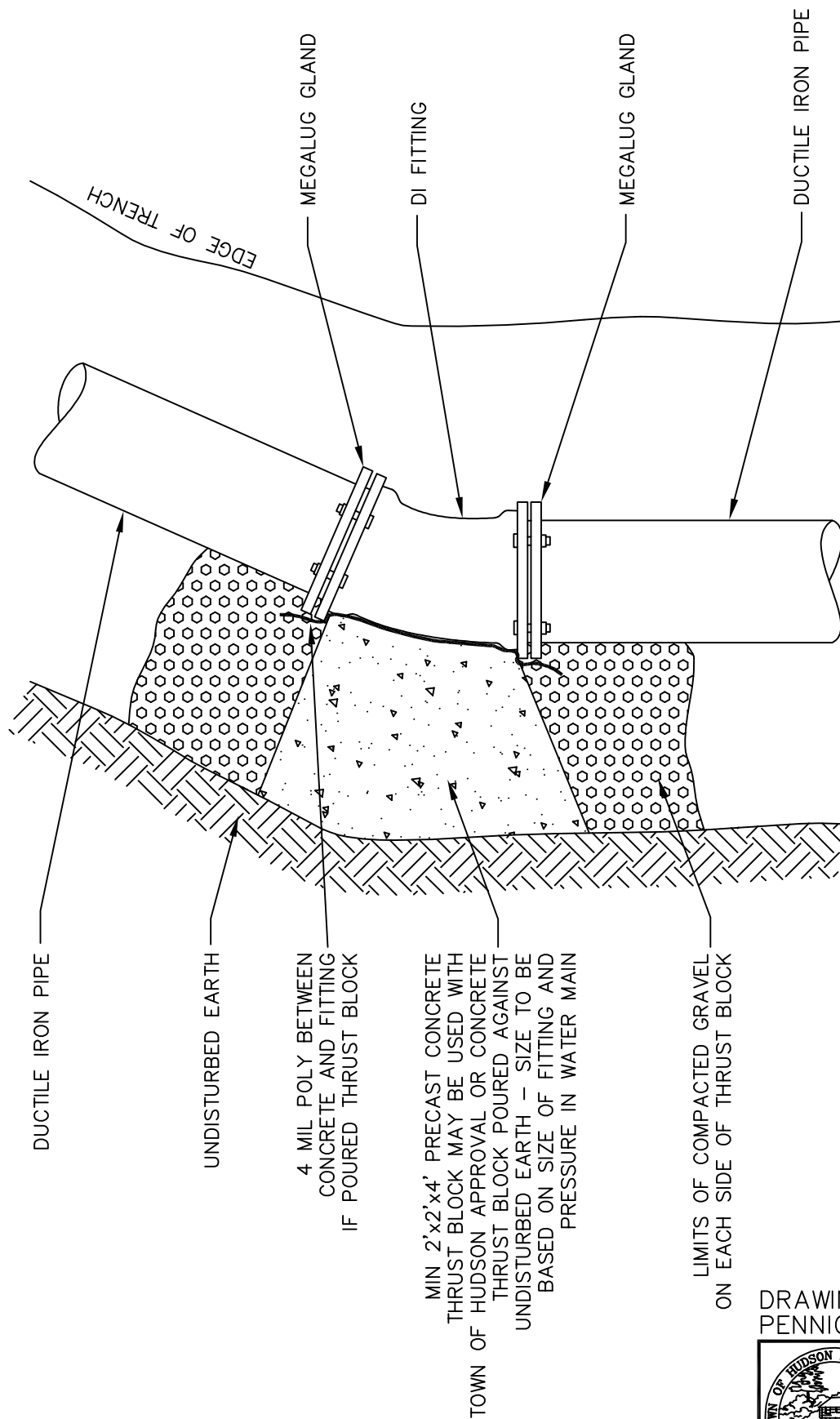
1. ALL MATERIAL AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTHS OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. ALL THREADED RODS AND NUTS MUST BE STAINLESS STEEL.
4. MIN 2'x2'x4' PRECAST CONCRETE THRUST BLOCK MAY BE USED WITH P.W.W. APPROVAL OR CONCRETE THRUST BLOCK POURED AGAINST UNDISTURBED EARTH - SIZE TO BE BASED ON SIZE OF FITTING AND PRESSURE IN WATER MAIN. SEE DETAIL W-7.

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-6
WATER TEE INSTALLATION
REV: 2019 SCALE: NTS



- NOTES:**
1. ALL MATERIAL AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
 2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.

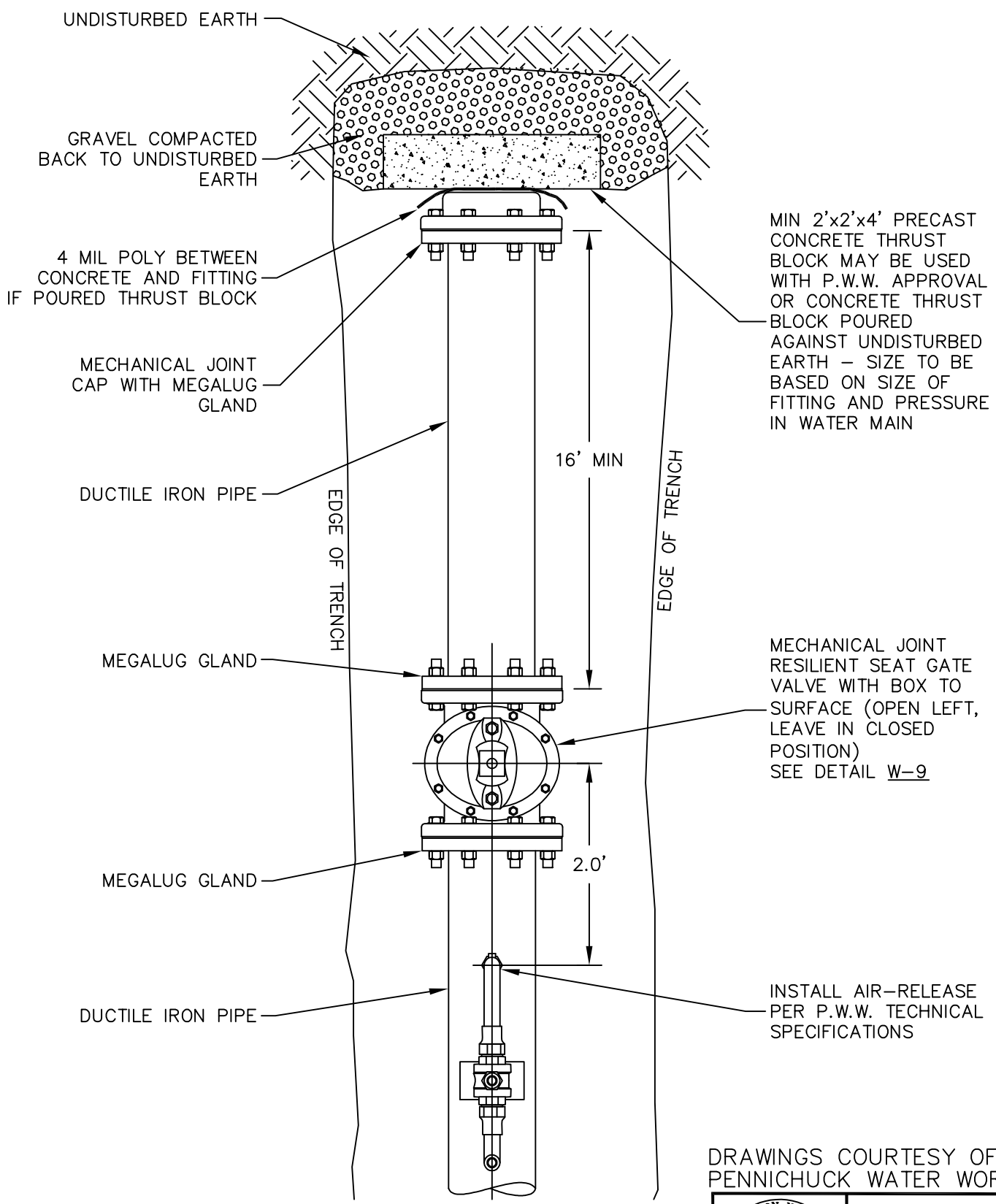
DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-7
WATER THRUST BLOCK
BEHIND FITTINGS INSTALLATION
REV: 2019 SCALE: NTS

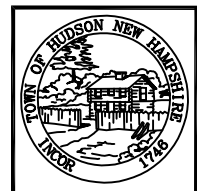
DRAWING: \\HD-FILES\RVTH\ENGINEERING\WATER\0-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]



NOTES:

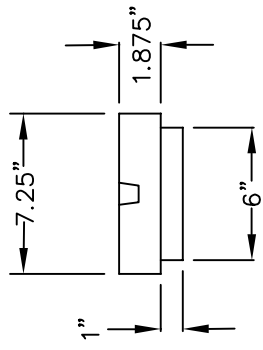
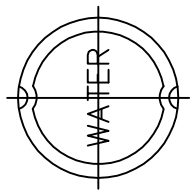
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



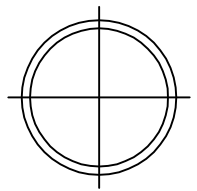
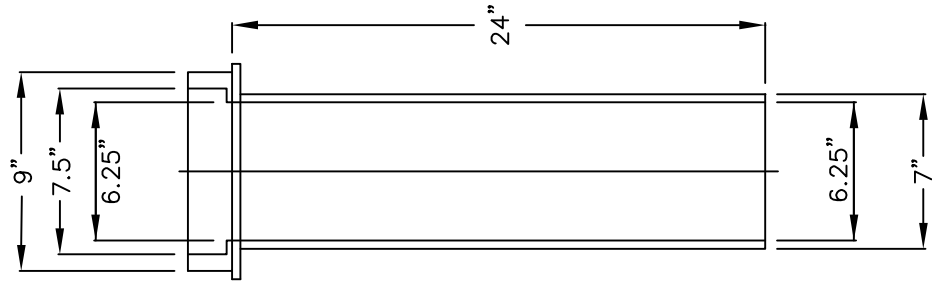
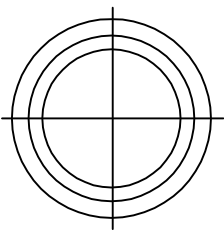
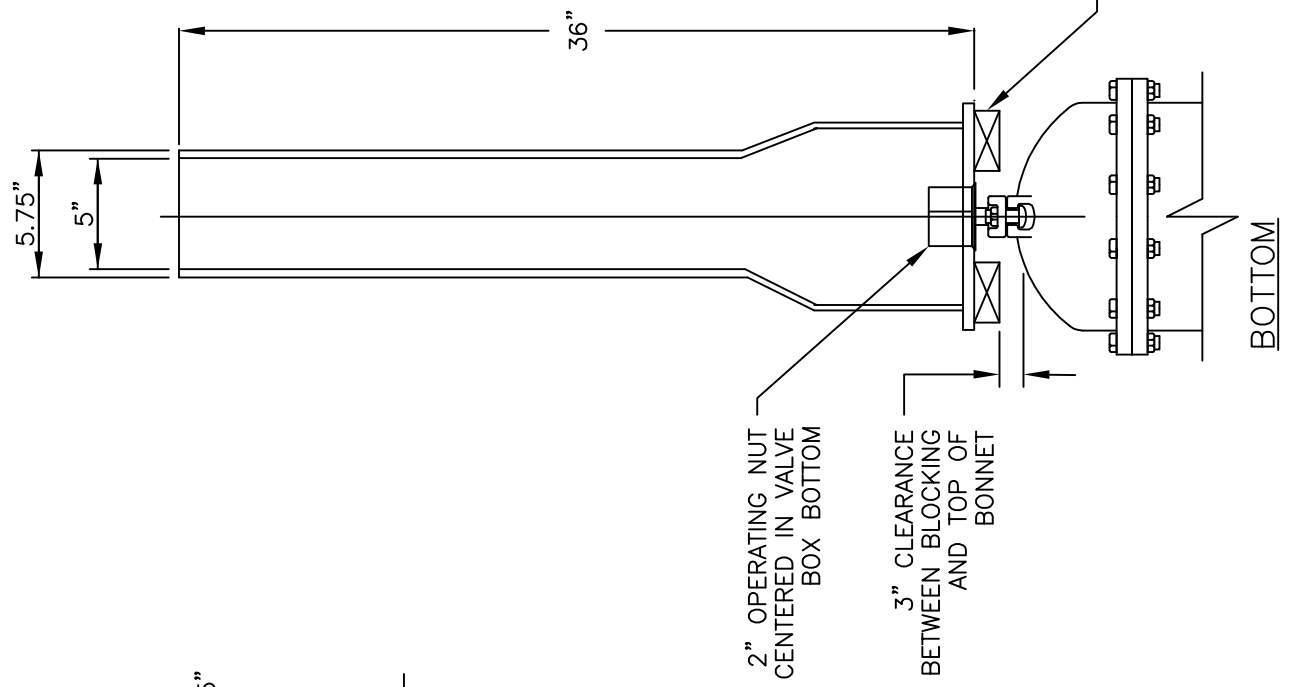
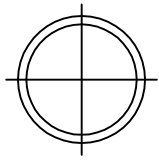
TOWN OF HUDSON
 12 SCHOOL STREET
 HUDSON, NH 03051

DETAIL W-8
 WATER END OF MAIN INSTALLATION
 REV: 2019 SCALE: NTS



DROP STYLE COVER

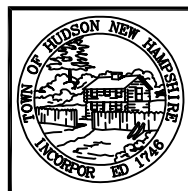
NOTE: COVER MUST BE MARKED "WATER"



TOP

* PARTS FOR STANDARD 5" VALVE BOX COMPLETE, LONGER PARTS AVAILABLE IF NECESSARY

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

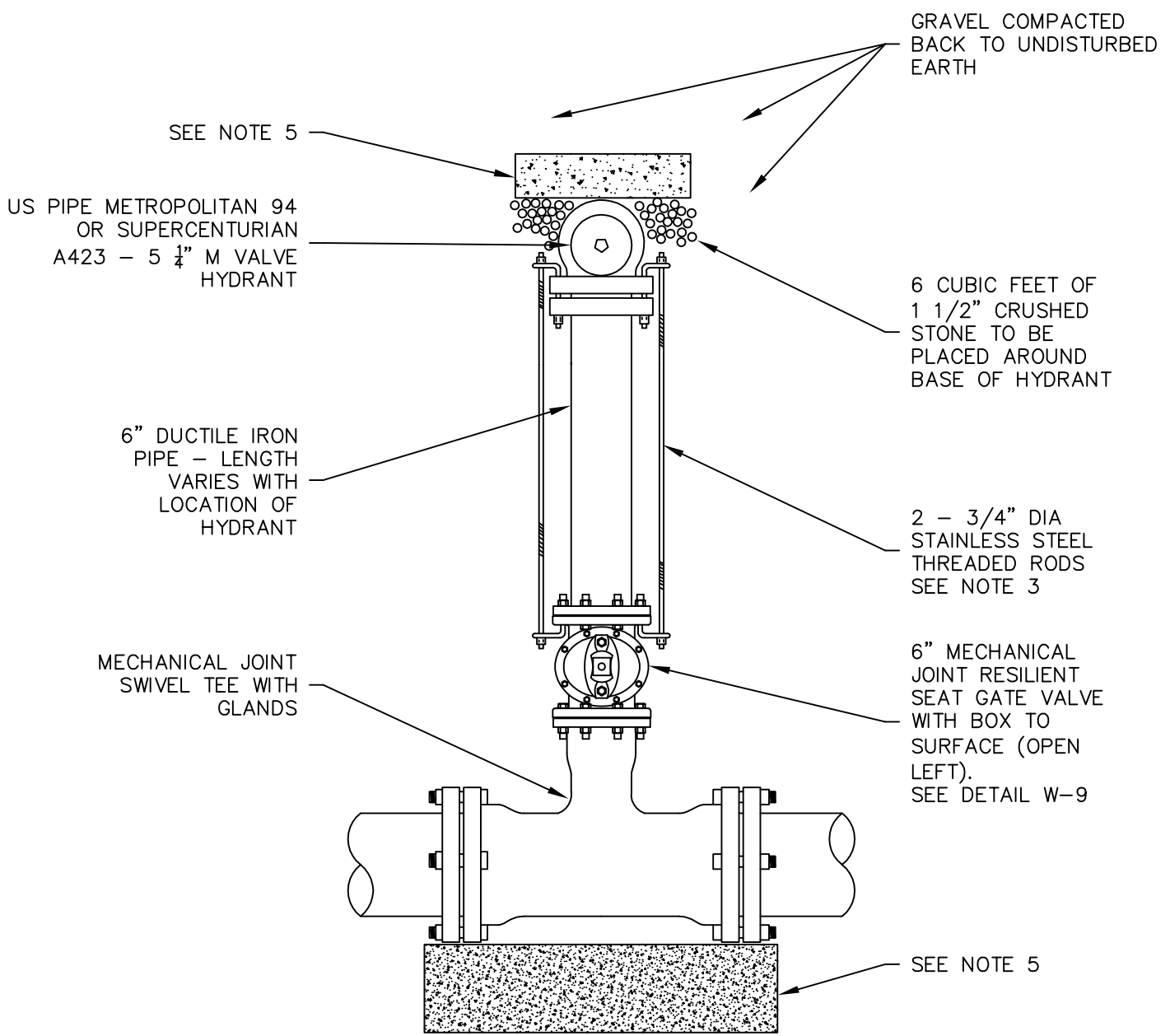


TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-9
WATER VALVE BOX
REV: 2019

SCALE: NTS

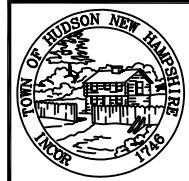
DRAWING: \\HD-FILES\RVTH\ENGINEERING\WATER\0-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]



NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. ALL THREADED RODS AND NUTS MUST BE STAINLESS STEEL.
4. WHEN DISTANCE FROM WATER MAIN TO HYDRANT IS MORE THAN 10', SUBSTITUTE MEGALUGS IN LIEU OF THREADED ROD OR GRIP RINGS.
5. MIN OF 2-2'x2'x4' PRECAST CONCRETE THRUST BLOCK MAY BE USED WITH TOWN OF HUDSON APPROVAL OR CONCRETE THRUST BLOCK POURED AGAINST UNDISTURBED EARTH - SIZE TO BE BASED ON SIZE OF FITTING AND PRESSURE IN WATER MAIN. SEE DETAIL W-7.

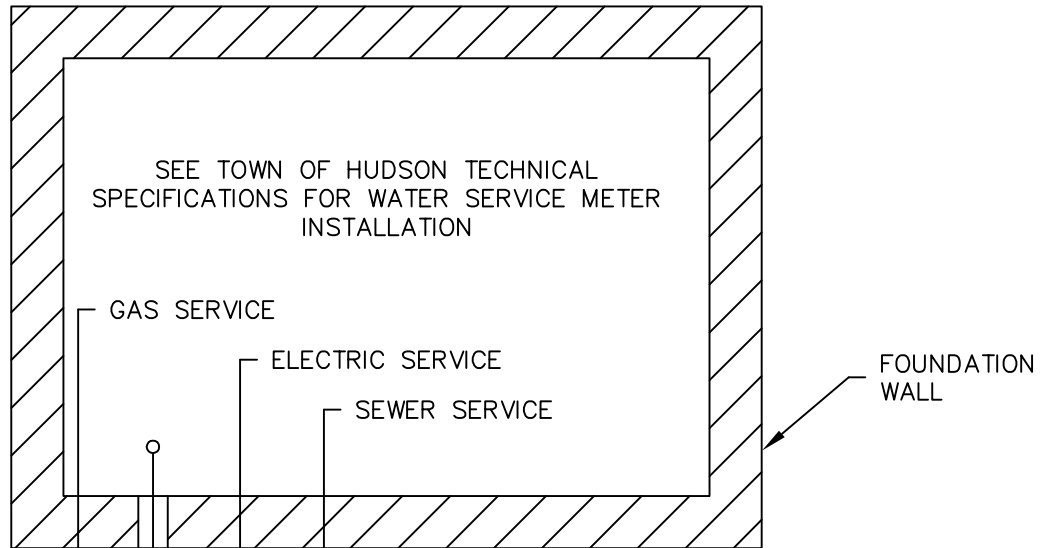
DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-10
WATER HYDRANT INSTALLATION
REV: 2019 SCALE: NTS

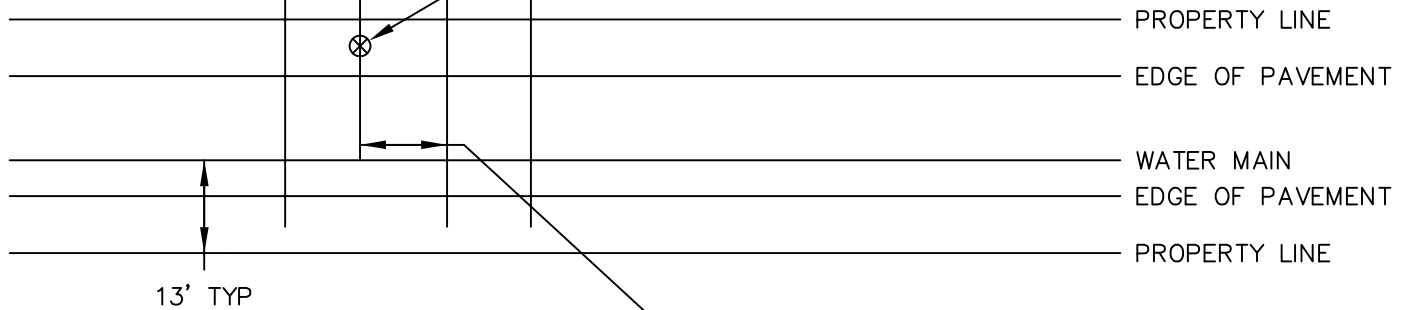
DRAWING: \\HD-FILES\RVTH\ENGINEERING\WATER\0-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]



5.0' MIN EDGE TO EDGE SEPARATION REQUIRED. WHEN GAS CROSSES THE WATER SERVICE, THE CROSSING MUST BE AT A RIGHT ANGLE TO THE WATER SERVICE.

10.0' MIN EDGE TO EDGE SEPARATION

WHEN PROPERTY LINE DOES NOT EXIST BECAUSE DEVELOPEMENT IS ON COMMUNITY PROPERTY, LOCATE SERVICE CURB STOPS 5.0' OUT OF PAVEMENT OR 12' MAXIMUM FROM EDGE OF PAVEMENT



5.0' MIN EDGE TO EDGE SEPARATION REQUIRED. WHEN ELECTRIC CROSSES THE WATER SERVICE, THE CROSSING MUST BE AT A RIGHT ANGLE TO THE WATER SERVICE.

NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. SERVICE ENTRANCE SHALL BE MADE IN THE FRONT OR SIDE OF BUILDING.
4. SERVICE ENTRANCE MADE IN REAR OF HOUSE WILL NOT BE ACCEPTED UNLESS PREVIOUSLY APPROVED BY P.W.W.
5. SERVICE ENTRANCE LOCATION WILL BE DETERMINED BY THE P.W.W. REPRESENTATIVE ON SITE.
6. IF SERVICE IS TAPPED OFF A FIRE SERVICE, THEN SEE DETAIL W-24.

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

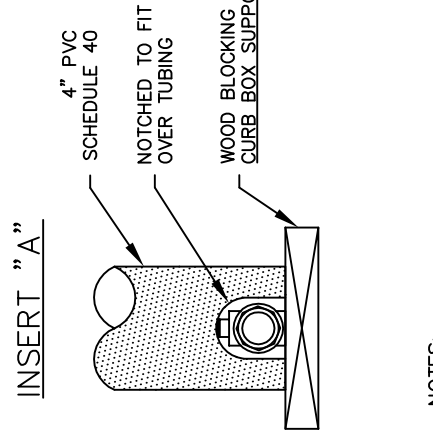
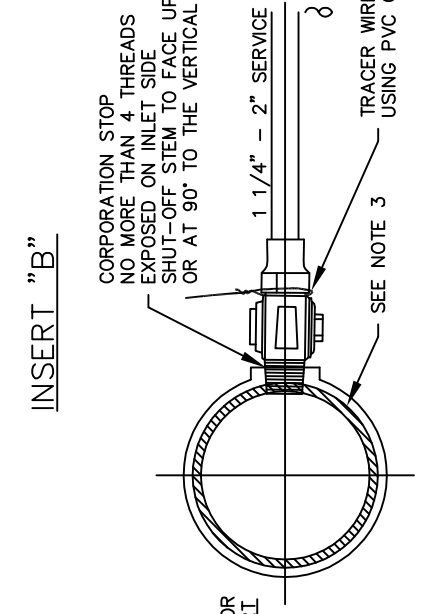
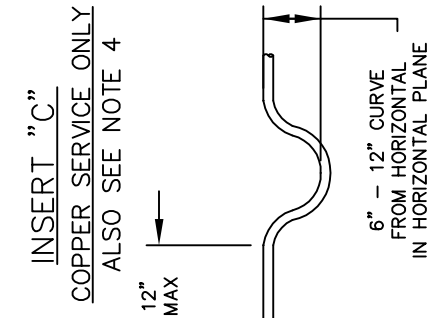
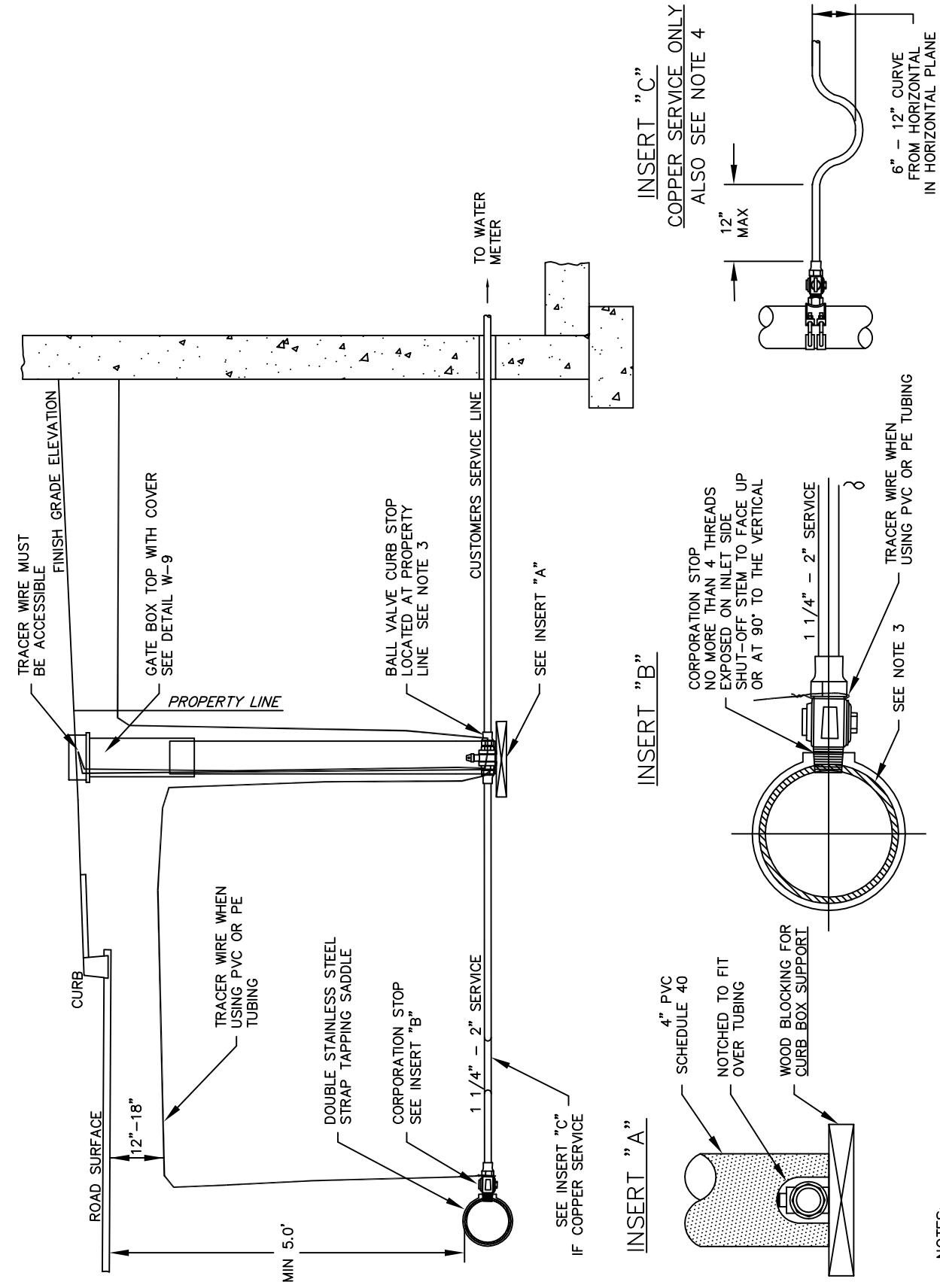
DETAIL W-11

OUTSIDE WATER SERVICE ENTRANCE


REV: 2019

SCALE: NTS

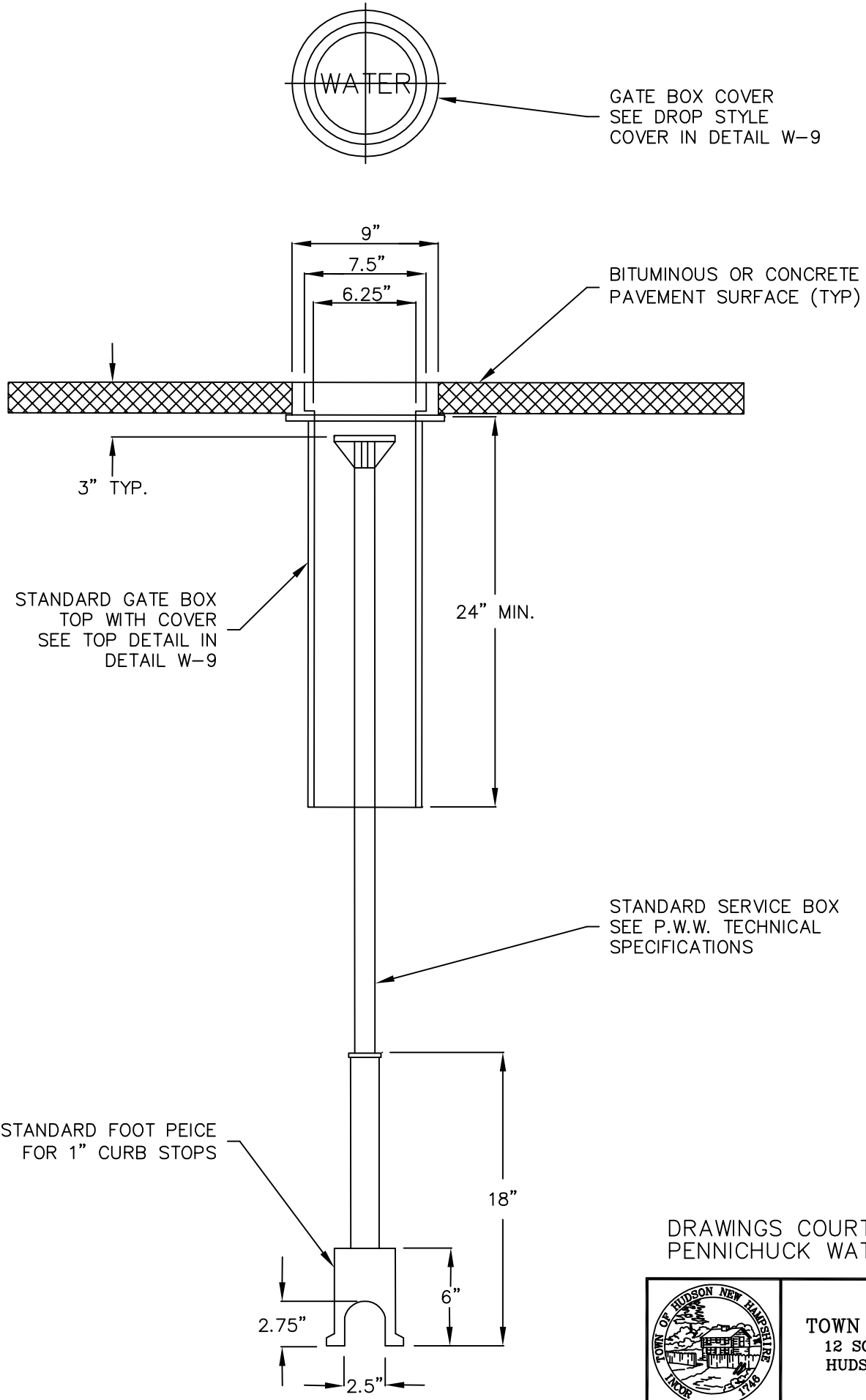
DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



- NOTES:**
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
 2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
 3. IF WATER MAIN IS PVC OR TRANSITE, A DOUBLE STAINLESS STEEL STRAP TAPPING SADDLE MUST BE USED TO CONNECT THE CORPORATION TO THE WATER MAIN.
 4. IF WATER MAIN IS PVC OR TRANSITE, AND THE NEW WATER SERVICE IS COPPER THEN SEE DETAIL W-19.
 5. IF WATER MAIN IS A FIRE SERVICE, THEN SEE DETAIL W-24.

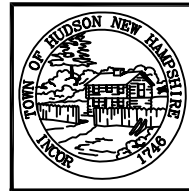
	<p>TOWN OF HUDSON 12 SCHOOL STREET HUDSON, NH 03051</p>
	<p>DETAIL W-12 WATER 1" - 2" SERVICE & VALVE BOX INSTALLATION</p>
<p>REV: 2019</p>	<p>SCALE: NTS</p>

\\HD-FILESRVTH\ENGINEERING\$\WATER\0-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]



NOTE:
 ALL MATERIALS AND INSTALLATION
 PROCEDURES WILL CONFORM TO
 TOWN OF HUDSON TECHNICAL SPECIFICATIONS.

DRAWINGS COURTESY OF
 PENNICHUCK WATER WORKS.



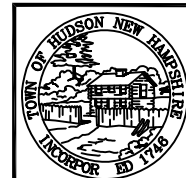
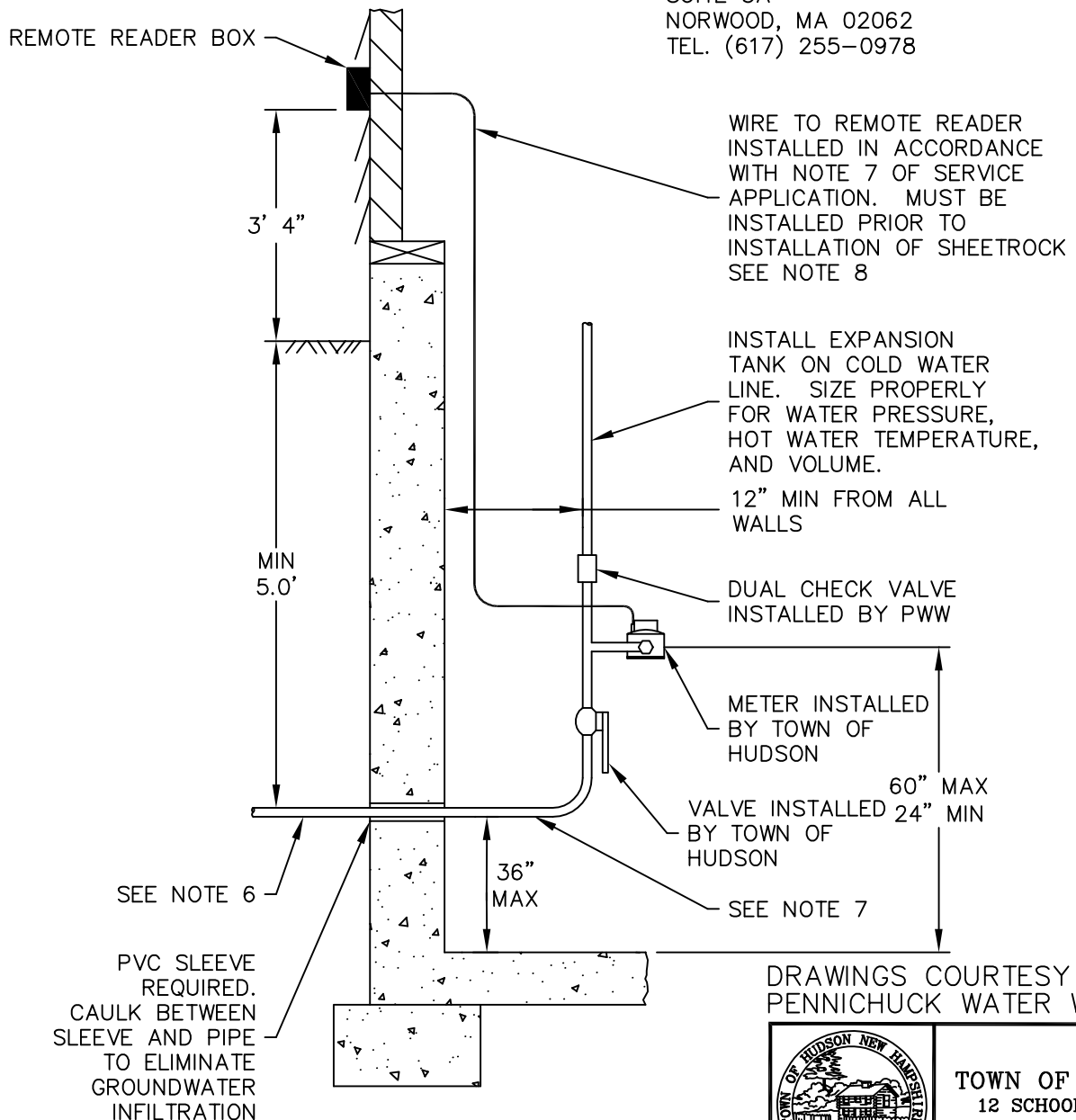
TOWN OF HUDSON
 12 SCHOOL STREET
 HUDSON, NH 03051

DETAIL W-13
 WATER SERVICE BOX IN PAVED AREAS
 REV: 2019 SCALE: NTS

NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON SPECIFICATIONS.
2. SEE SERVICE APPLICATION REQUIREMENTS.
3. INSTALLATION UNDER FOOTING OR THROUGH FOUNDATION WALL AT OWNER'S EXPENSE.
4. OWNER MUST PROVIDE A CLEAN, DRY, ACCESSIBLE, AND WARM (CONTINUALLY ABOVE 45° F) LOCATION FOR THE WATER METER.
5. OUTSIDE READER MUST BE LOCATED ADJACENT TO DRIVEWAY.
6. SERVICE LINE FROM STREET, SIZE & MATERIALS TO BE APPROVED BY TOWN OF HUDSON. ONLY TYPE "K" COPPER TUBING OR 200 PSIG RATED CTS POLYETHYLENE TUBING ARE ACCEPTABLE FOR SERVICE LINES. SAND TO BE USED FOR BACKFILL FOR A MINIMUM OF 6" ABOVE AND BELOW THE SERVICE LINE.
7. PROVIDE A MINIMUM OF 24" OF STRAIGHT COPPER AT SERVICE ENTRANCE INSIDE OF BUILDING TO ALLOW FOR INSTALLATION OF TOWN OF HUDSON METER AND VALVES.
8. METER WIRE TO BE 22 AWG 3-STRAND (BLACK/RED/GREEN COLOR CODE) SOLID STRAND CABLE AVAILABLE FROM:

ACT SERVICES, INC.
 916 PLEASANT STREET
 SUITE 3A
 NORWOOD, MA 02062
 TEL. (617) 255-0978

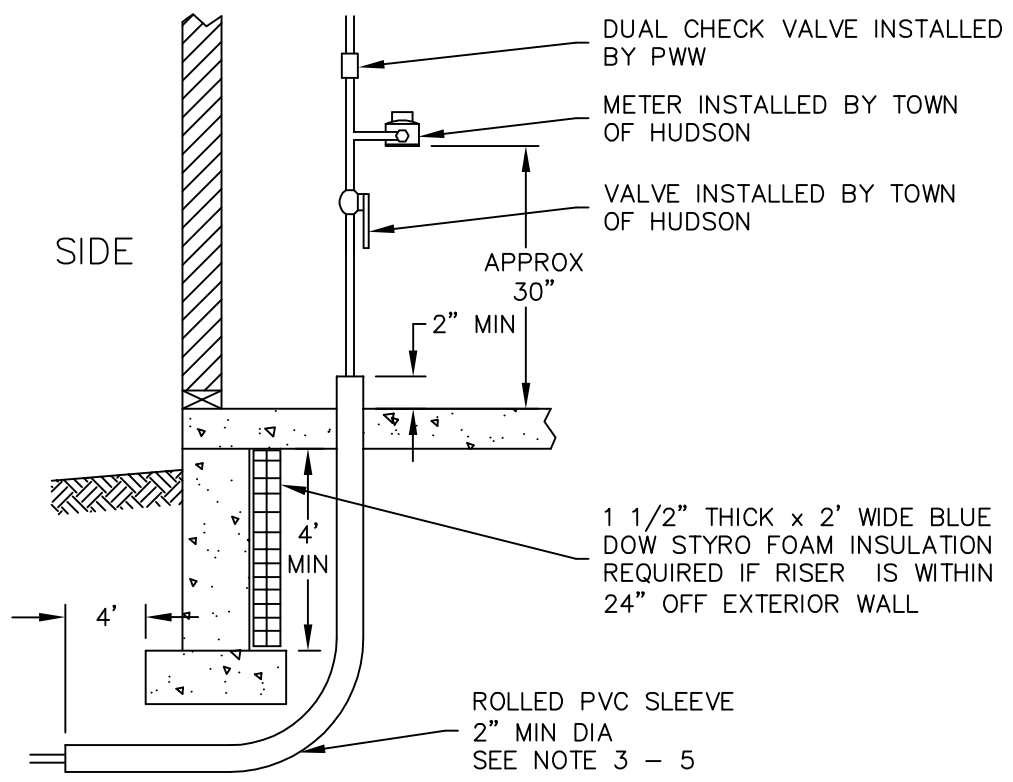
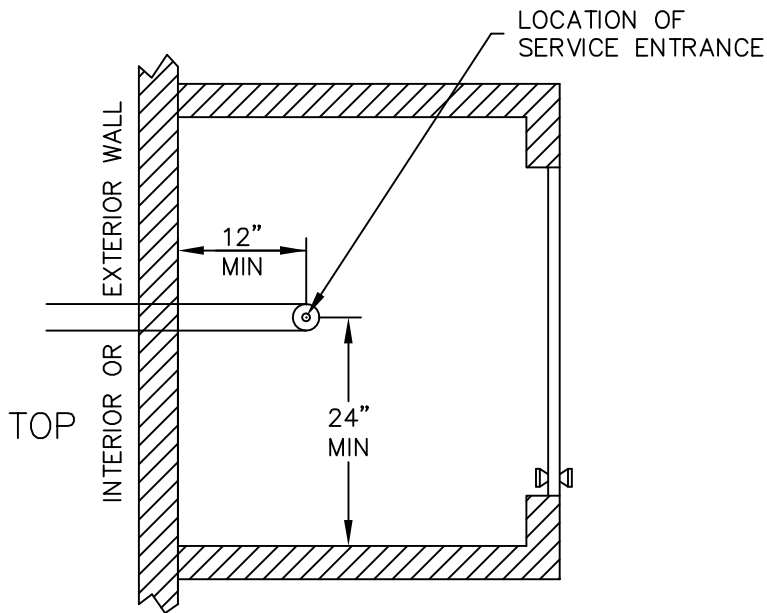


TOWN OF HUDSON
 12 SCHOOL STREET
 HUDSON, NH 03051

DETAIL W-14
 WATER SERVICE METER INSTALLATION
 REV: 2019 SCALE: NTS

DRAWING: \\HD-FILES\RVTH\ENGINEERING\WATER\0-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]

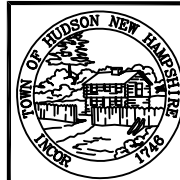
DRAWING: \\HD-FILES\RVTH\ENGINEERING\WATER\O-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]



NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL WATER SERVICES IN SLAB CONSTRUCTION BUILDINGS MUST BE INSTALLED IN PVC PIPE SLEEVES AS SHOWN.
3. NOTES 4 THROUGH 8 ON DETAIL W-14 ALSO APPLY.
4. SLEEVE IS TO EXTEND 4" BEYOND THE EXTERIOR LINE OF THE FOUNDATION WALL WITH ONE CONTINUOUS PIECE OF SLEEVE.
5. ON SLEEVES GREATER THAN 2" IN DIAMETER, SOLVENT WELDED JOINTS WILL BE ACCEPTABLE. HOWEVER, MANUFACTURED BENDS WILL NOT BE ACCEPTABLE.
6. A CLOSET OR UTILITY ROOM MUST BE PROVIDED.

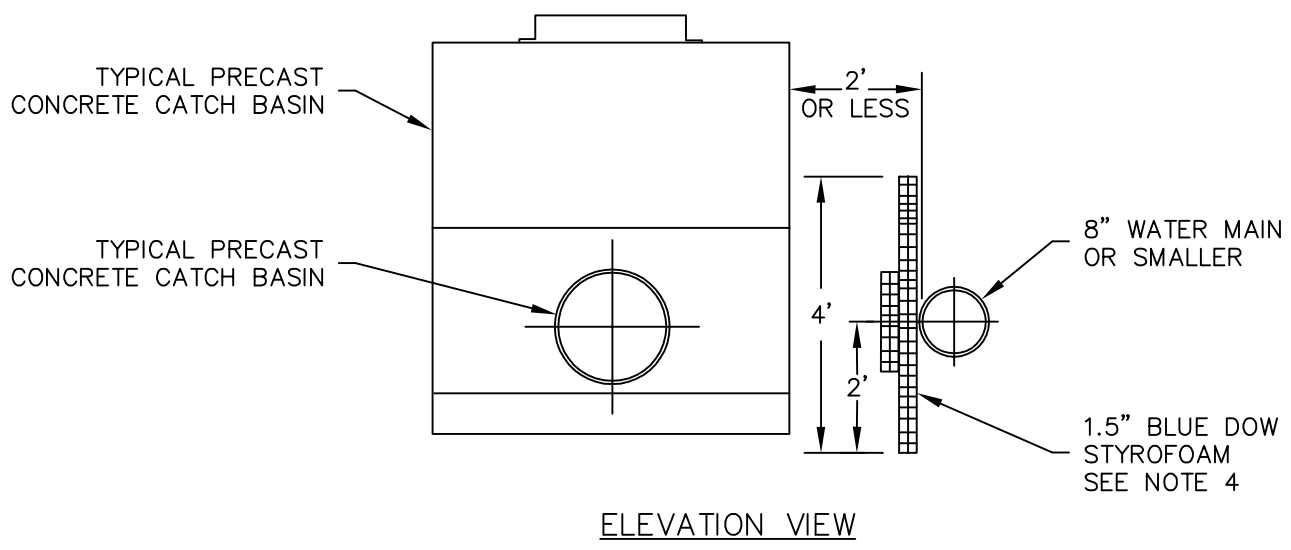
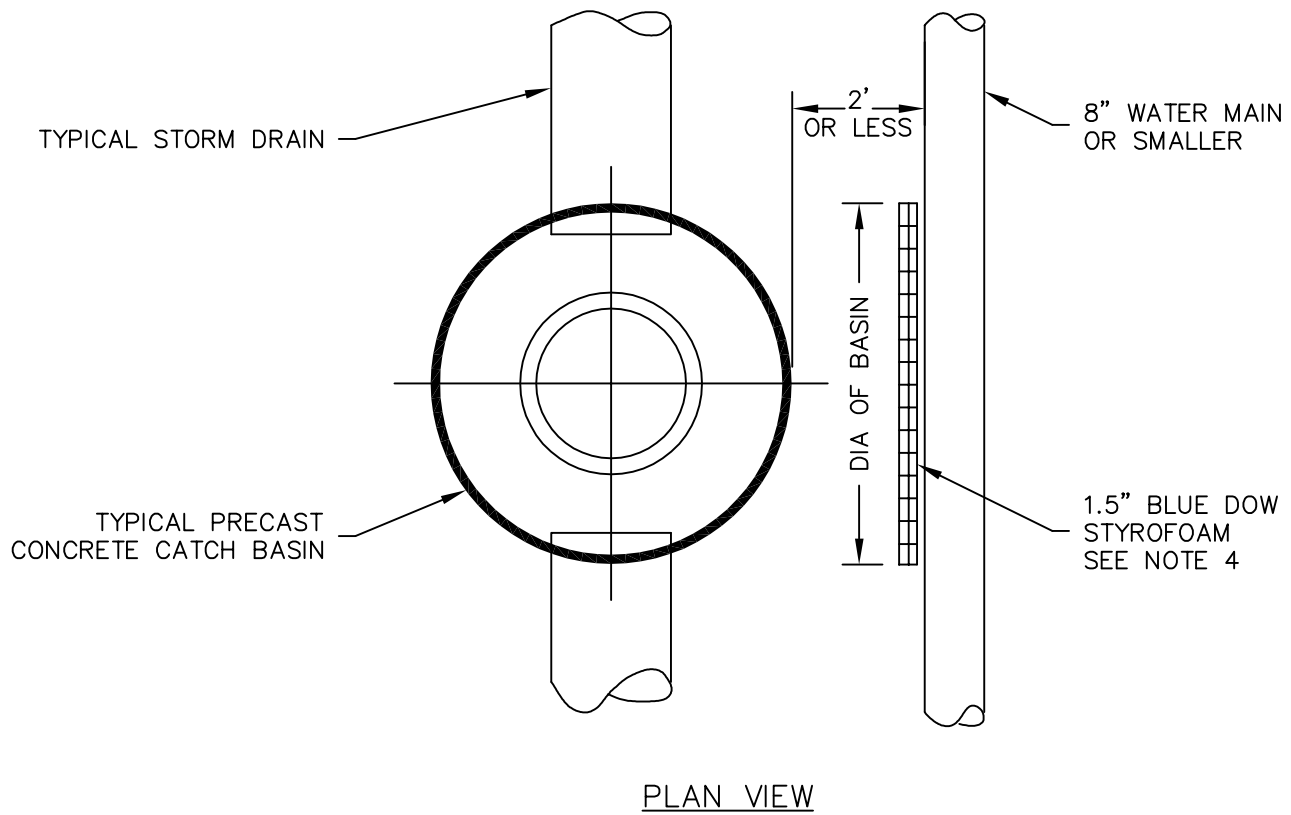
DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-15
WATER SLAB CONSTRUCTION
REV: 2019 SCALE: NTS

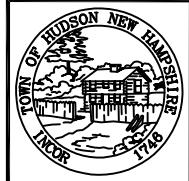
DRAWING: \\HD-FILES\RVTH\ENGINEERING\WATER\0-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]



NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. P.W.W., INC. RESERVES THE RIGHT TO MODIFY INSULATION REQUIREMENTS AS NECESSARY BASED ON FIELD CONDITIONS, ETC.
4. ALL BUTT JOINT SEAMS TO BE OVERLAPPED WITH 1' PIECE OF INSULATION CENTERED OVER SEAM.

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



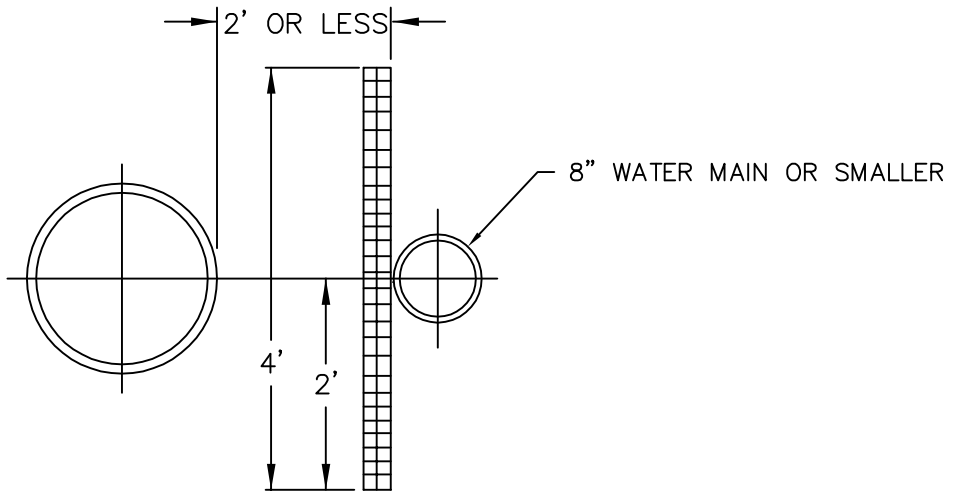
TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-16
CATCH BASIN INSULATION

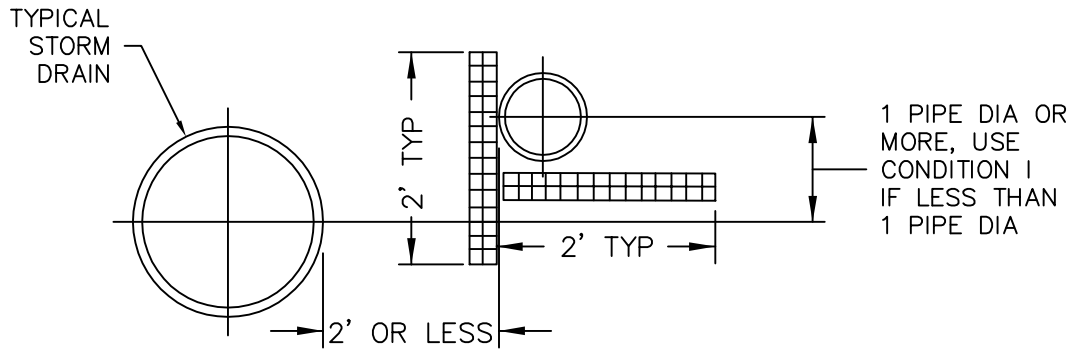
REV: 2019

SCALE: NTS

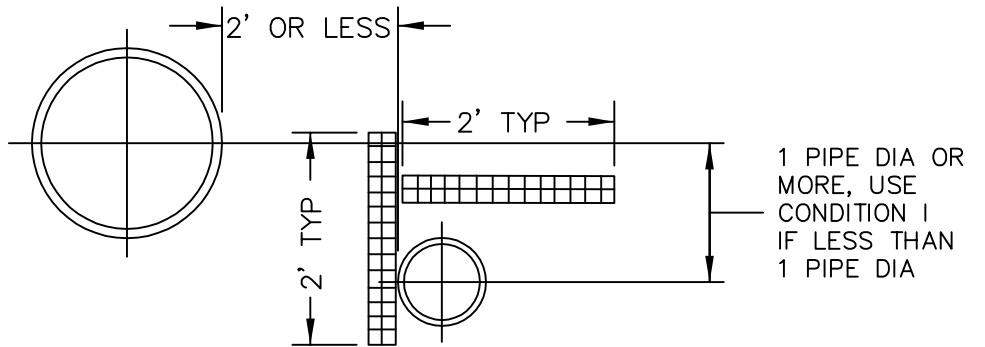
CONDITION I



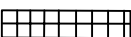
CONDITION II



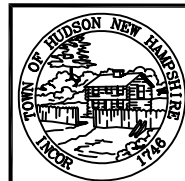
CONDITION III



NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. P.W.W., INC. RESERVES THE RIGHT TO MODIFY INSULATION REQUIREMENTS AS NECESSARY BASED ON FIELD CONDITIONS, ETC.
4. INSULATION TO BE RUN HORIZONTALLY AS LONG AS CONDITIONS I, II, OR III ABOVE EXIST. ALL BUTT JOINT SEAMS TO BE OVERLAPPED WITH 1' PIECE OF INSULATION CENTERED OVER SEAM.
5.  - 1.5" (MIN) BLUE DOW STYROFOAM

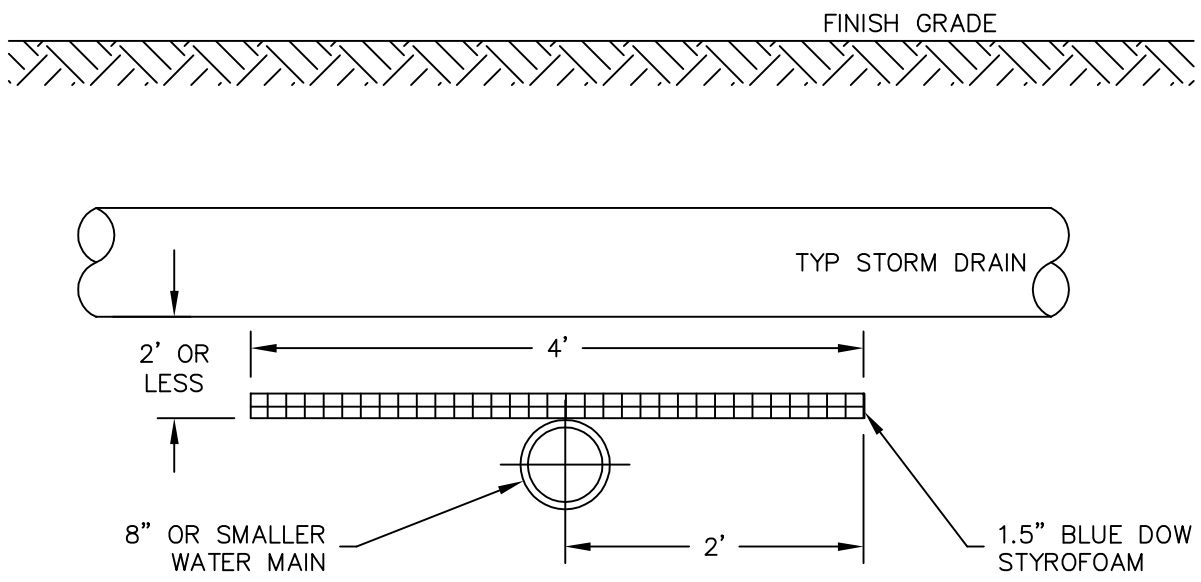
DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



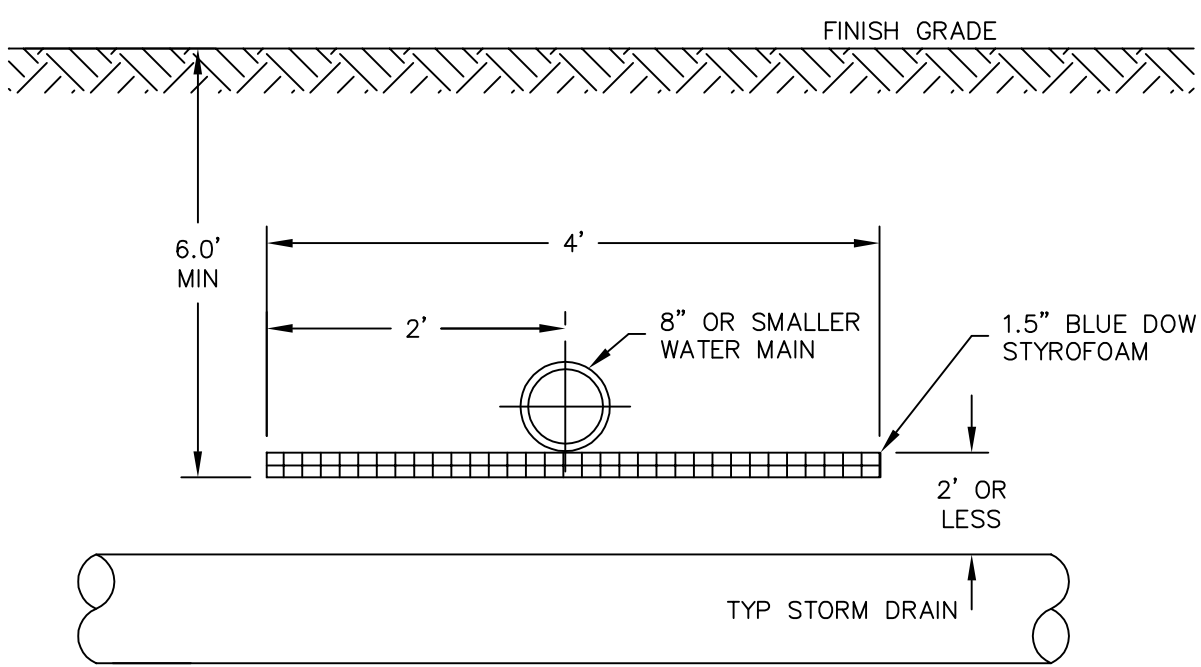
TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-17
STORM DRAIN / WATER MAIN
PARALLEL RUNS - ELEVATION VIEW
REV: 2019 SCALE: NTS

DRAWING: \\HD-FILES\RYTH\ENGINEERING\WATER\0-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]



CONDITION I

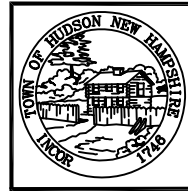


CONDITION II

NOTES:

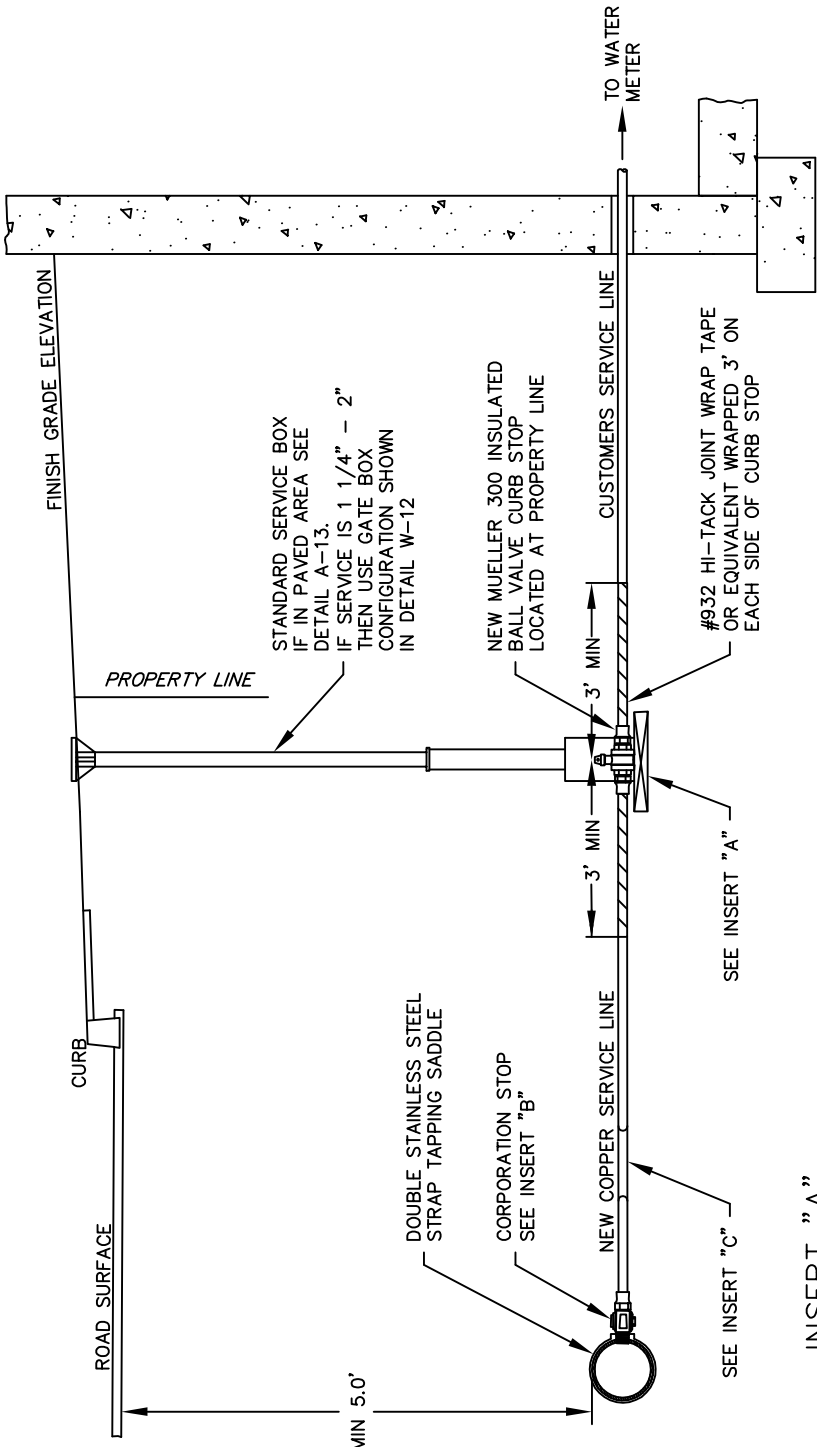
1. THE TOWN OF HUDSON RESERVES THE RIGHT TO MODIFY INSULATION REQUIREMENTS AS NECESSARY BASED ON FIELD CONDITIONS, ETC.
2. THE LENGTH OR WIDTH OF INSULATION SHALL EXTEND 1 STORM DRAIN PIPE DIAMETER BEYOND THE EDGE OF STORM DRAIN PIPE IN EACH DIRECTION OR A MINIMUM OF 2' BEYOND THE CENTERLINE OF THE STORM DRAIN PIPE, WHICHEVER IS GREATER.
3. ALL BUTT JOINT SEAMS TO BE OVERLAPPED WITH A 1' PIECE OF INSULATION CENTERED OVER SEAM.

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

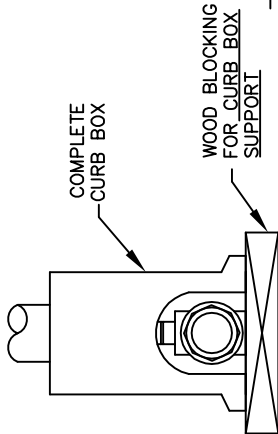


TOWN OF HUDSON
 12 SCHOOL STREET
 HUDSON, NH 03051

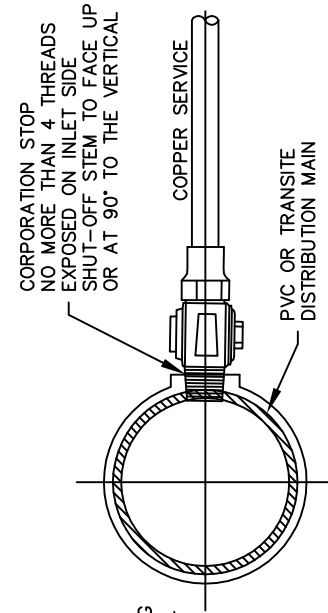
DETAIL W-18
 STORM DRAIN, WATER MAIN
 INTERSECTING RUNS - ELEV. VIEW
 REV: 2019 SCALE: NTS



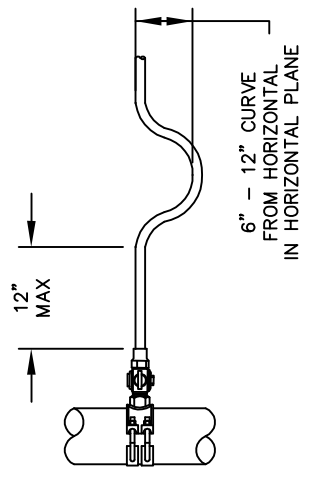
INSERT "A"



INSERT "B"

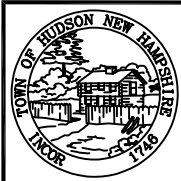


INSERT "C"



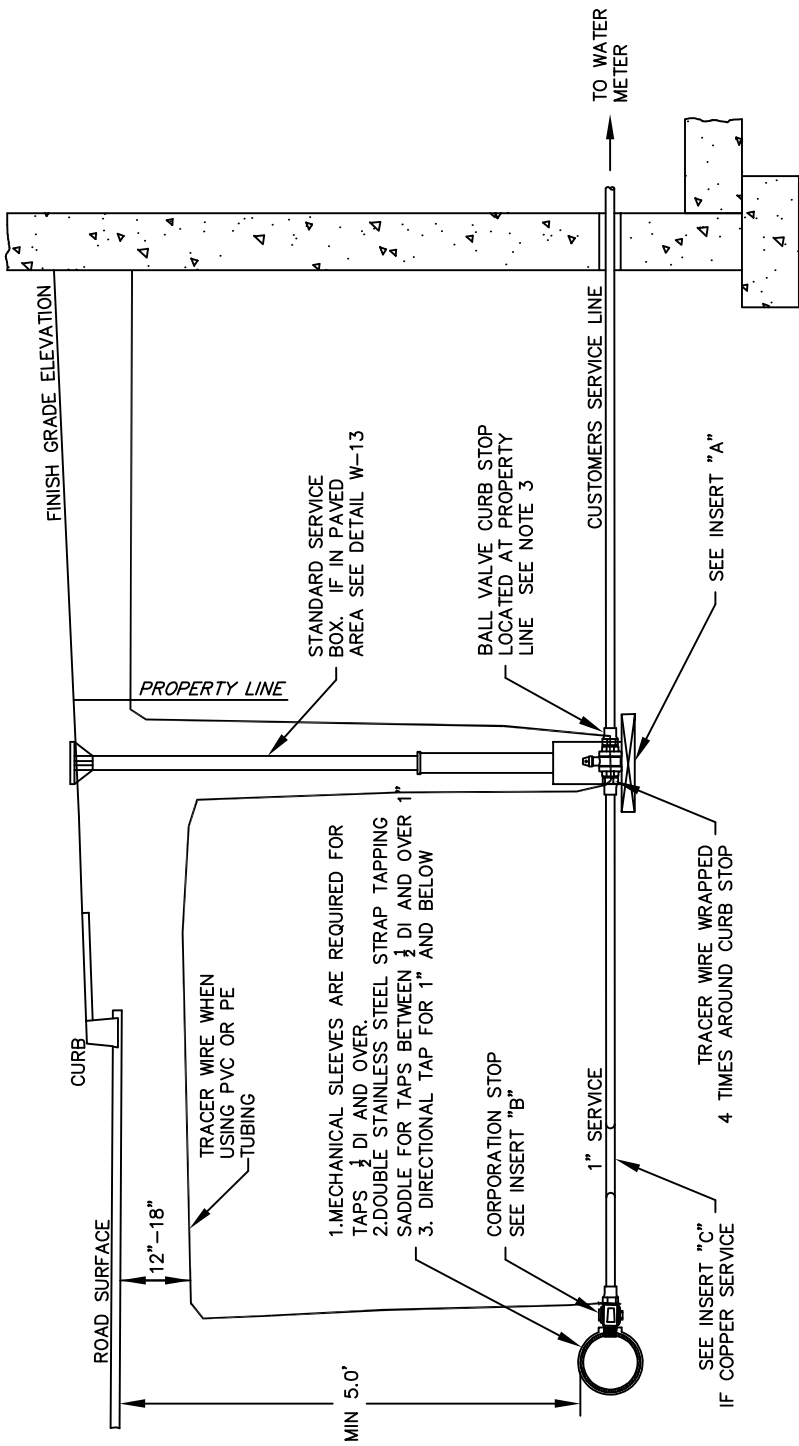
- NOTES:**
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
 2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
 3. A DOUBLE STAINLESS STEEL STRAP TAPPING SADDLE MUST BE USED TO CONNECT THE CORPORATION TO THE WATER MAIN.
 4. IF WATER MAIN IS A FIRE SERVICE, THEN SEE DETAIL W-24.

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

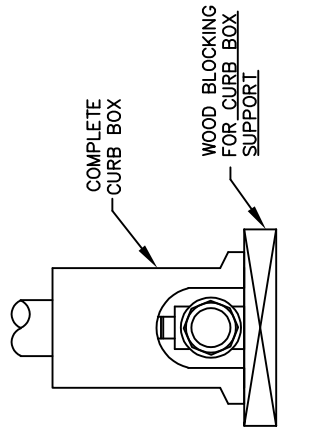


TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

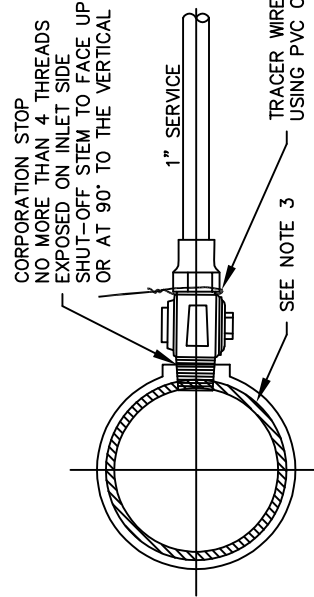
DETAIL W-19
COPPER WATER SERVICE
ON PVC AND TRANSITE MAINS
REV: 2019 SCALE: NTS



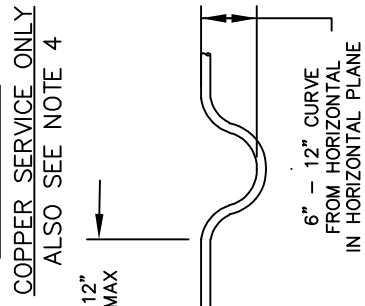
INSERT "A"



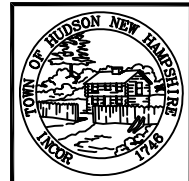
INSERT "B"



INSERT "C"

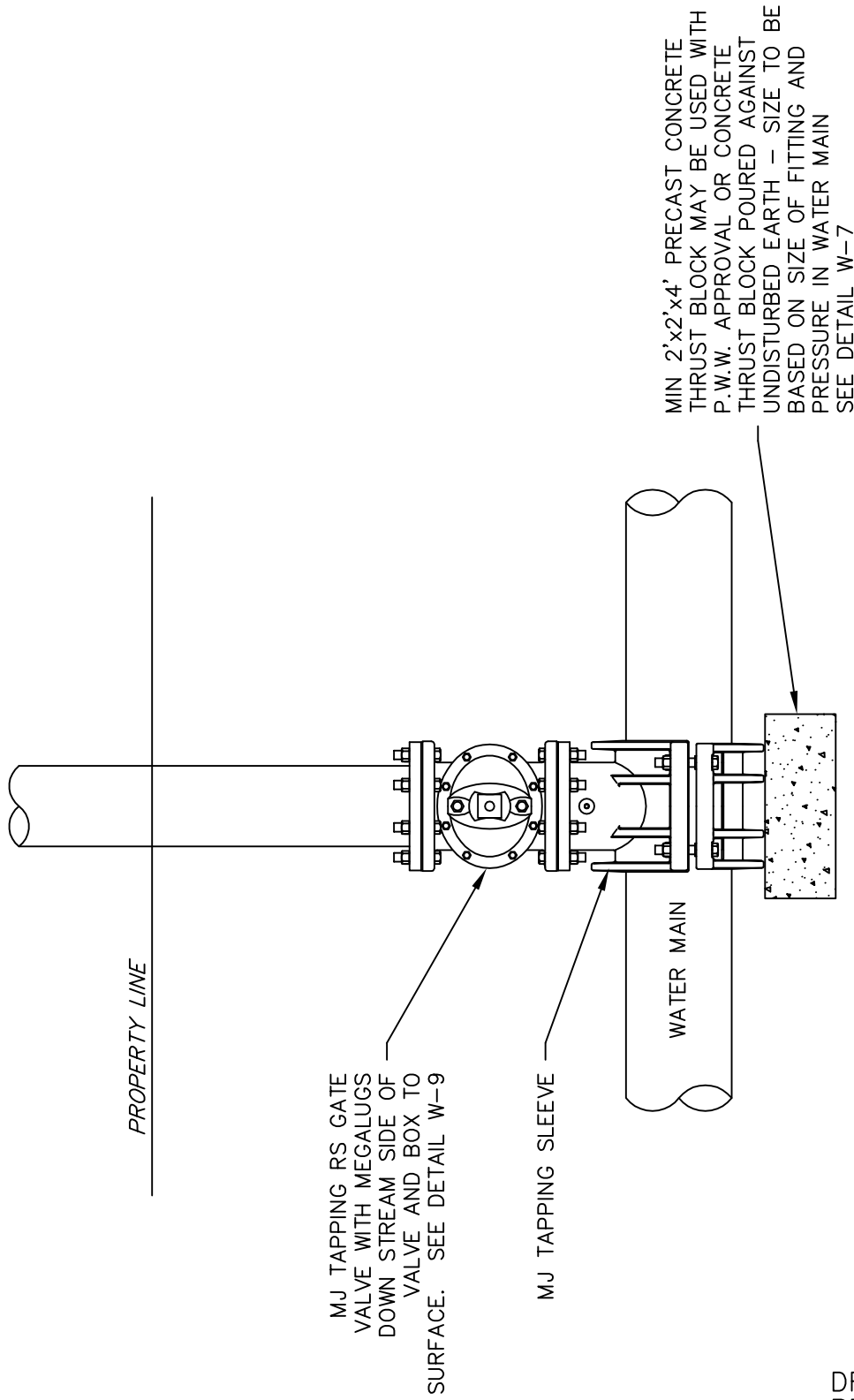


- NOTES:
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
 2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
 3. IF WATER MAIN IS PVC OR TRANSITE, A DOUBLE STAINLESS STEEL STRAP TAPPING SADDLE MUST BE USED TO CONNECT THE CORPORATION TO THE WATER MAIN.
 4. IF WATER MAIN IS PVC OR TRANSITE, AND THE NEW WATER SERVICE IS COPPER THEN SEE DETAIL W-19.
 5. IF WATER MAIN IS A FIRE SERVICE, THEN SEE DETAIL W-24.



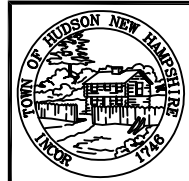
TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-20
1" - 2" WATER SERVICE
AND VALVE BOX INSTALLATION
REV: 2019 SCALE: NTS



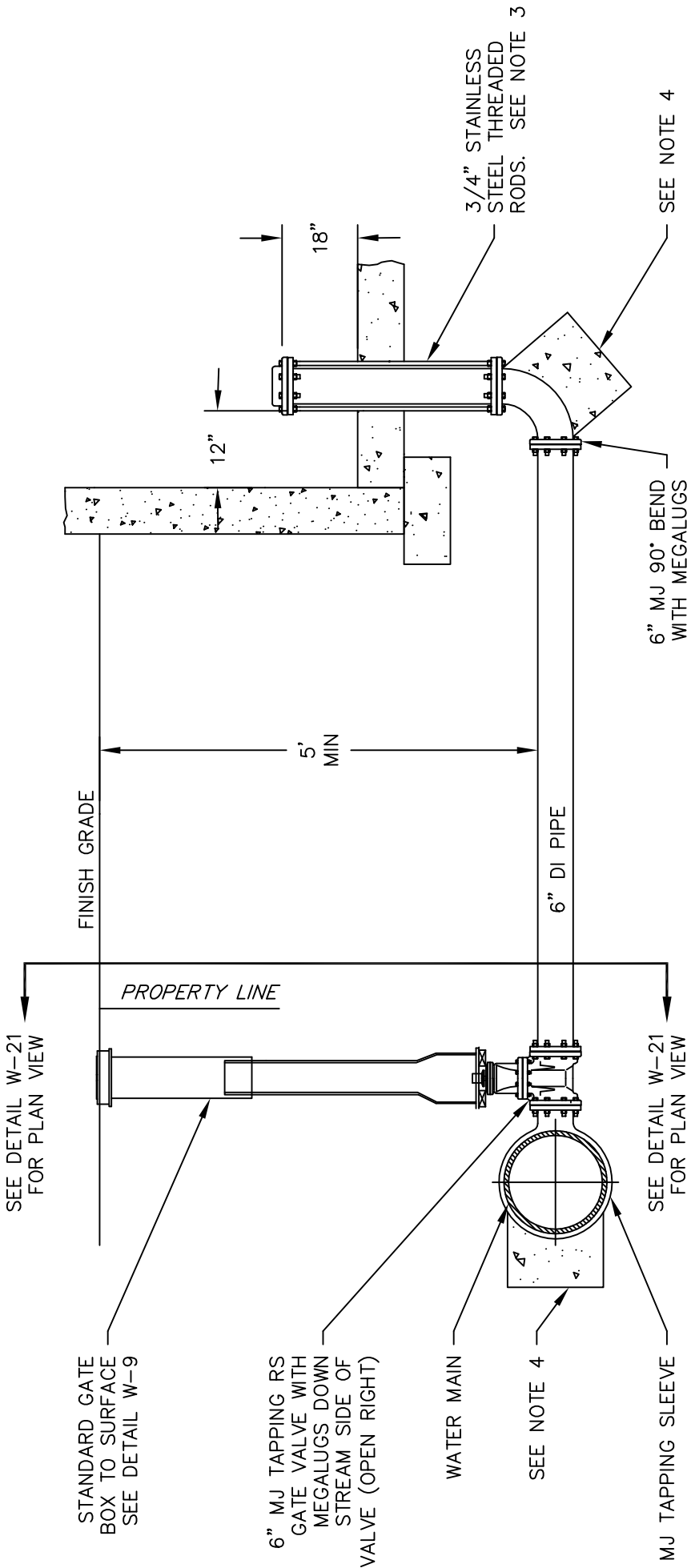
- NOTES:**
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
 2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
 3. SEE DETAIL W-22 FOR CROSS-SECTIONAL VIEW.

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



TOWN OF HUDSON
 12 SCHOOL STREET
 HUDSON, NH 03051

DETAIL W-21
LARGE WATER
SERVICE CONNECTION
 REV: 2019 SCALE: NTS



NOTES:
 1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.

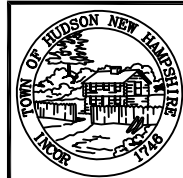
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.

3. ALL THREADED RODS AND NUTS MUST BE STAINLESS STEEL.

4. MIN 2'x2'x4' PRECAST CONCRETE THRUST BLOCK MAY BE USED WITH TOWN OF HUDSON APPROVAL OR CONCRETE THRUST BLOCK POURED AGAINST UNDISTURBED EARTH - SIZE TO BE BASED ON SIZE OF FITTING AND PRESSURE IN WATER MAIN. SEE DETAIL W-7.

5. SEE DETAIL W-23 FOR FIRE SERVICE INSTALLATION WITH SLAB FOUNDATIONS.

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

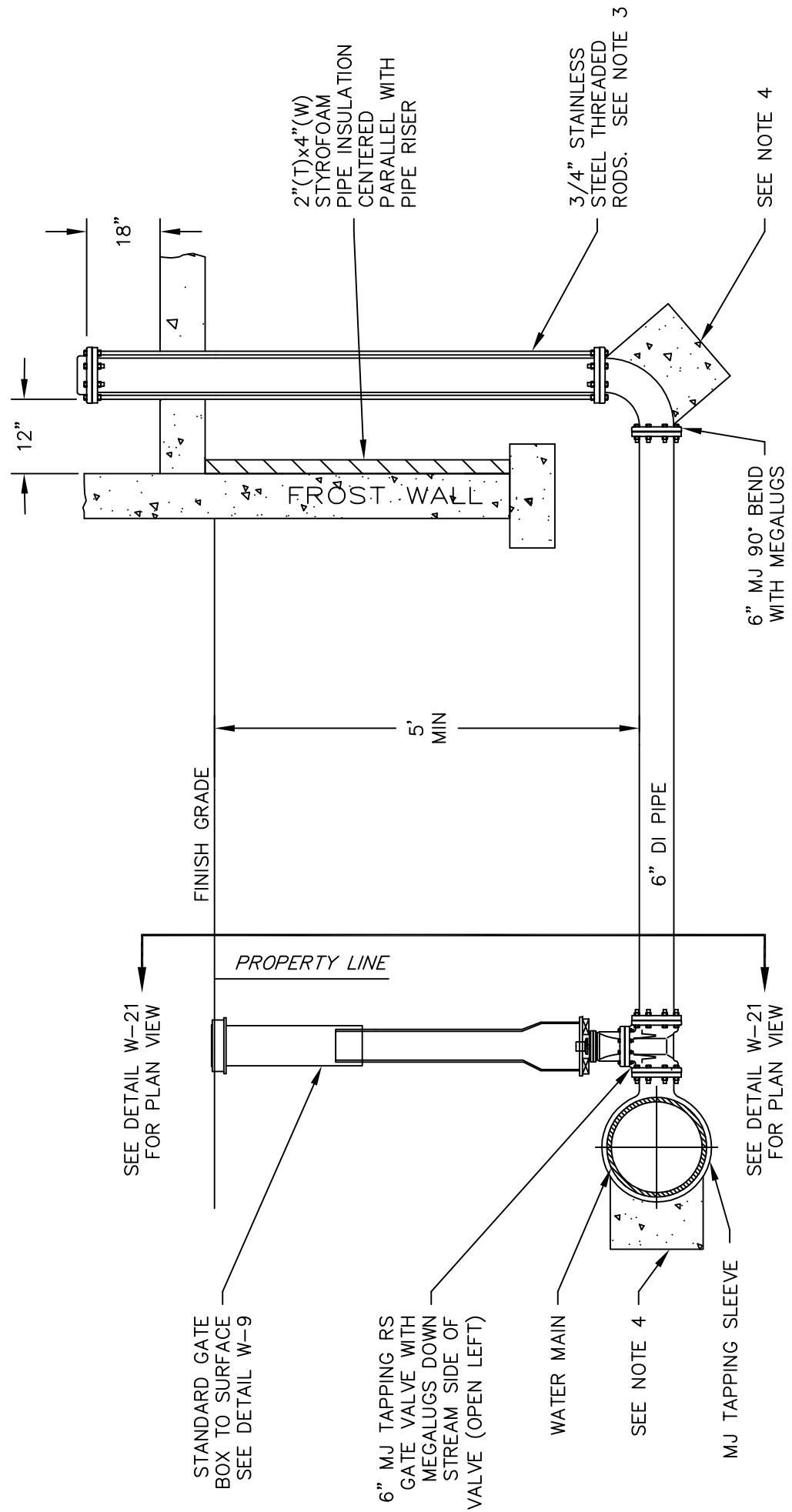


TOWN OF HUDSON
 12 SCHOOL STREET
 HUDSON, NH 03051

DETAIL W-22
 FIRE SERVICE INSTALLATION
 WITH STANDARD FOUNDATIONS

REV: 2019

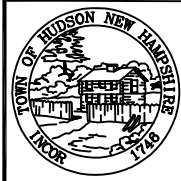
SCALE: NTS



NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
3. ALL THREADED RODS AND NUTS MUST BE STAINLESS STEEL.
4. MIN 2'x2'x4' PRECAST CONCRETE THRUST BLOCK MAY BE USED WITH P.W.W. APPROVAL OR CONCRETE THRUST BLOCK POURED AGAINST UNDISTURBED EARTH - SIZE TO BE BASED ON SIZE OF FITTING AND PRESSURE IN WATER MAIN. SEE DETAIL W-7.
5. SEE DETAIL W-22 FOR FIRE SERVICE INSTALLATION WITH STANDARD FOUNDATIONS.

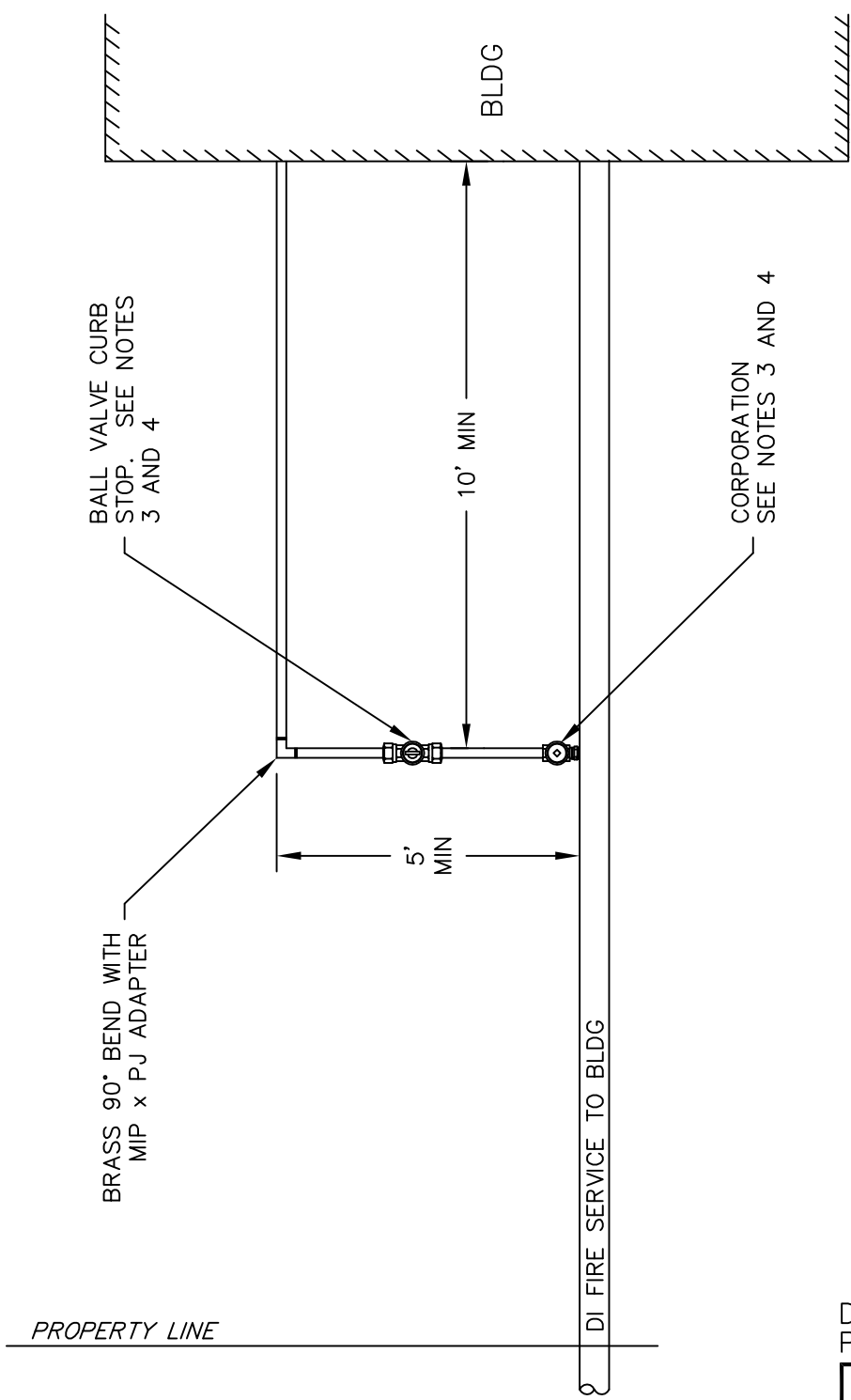
DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

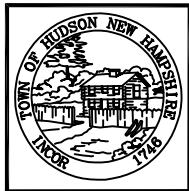
DETAIL W-23
FIRE SERVICE INSTALLATION
WITH SLAB FOUNDATIONS

REV: 2019 SCALE: NTS



- NOTES:**
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO P.W.W. TECHNICAL SPECIFICATIONS.
 2. ALL PIPE SHOULD HAVE A MINIMUM DEPTH OF 5' FROM TOP OF PIPE TO FINISH GRADE.
 3. SEE DETAIL W-20 FOR 1" SERVICE AND VALVE BOX INSTALLATION DETAIL.
 4. SEE DETAIL W-12 FOR 1 1/4" - 2" SERVICE AND VALVE BOX INSTALLATION DETAIL.
 5. SEE DETAIL W-11 FOR OUTSIDE SERVICE ENTRANCE PLAN VIEW.

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



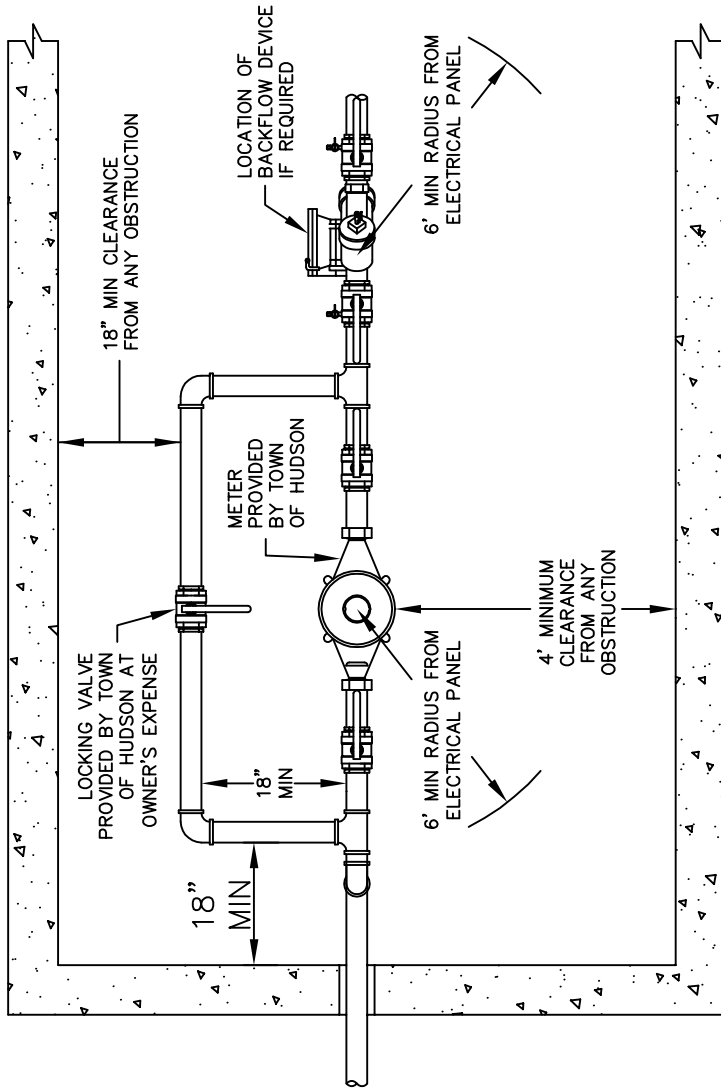
TOWN OF HUDSON
 12 SCHOOL STREET
 HUDSON, NH 03051

DETAIL W-24
 DOMESTIC WATER SERVICE
 TAPPED OFF FIRE SERVICE

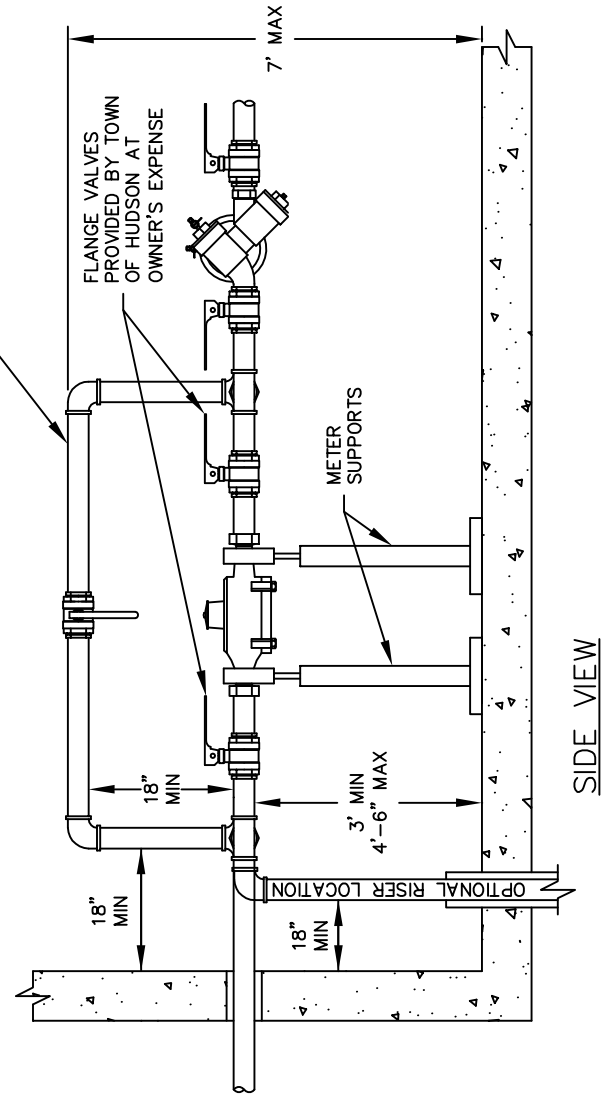
REV: 2019 SCALE: NTS

NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. PRV WHEN NECESSARY WILL BE INSTALLED AND PURCHASED BY OWNER OR CONTRACTOR.
3. 1 1/2" METER = 13" LAYING LENGTH.
4. 2" METER = 17" LAYING LENGTH.
5. SEE DETAIL W-27 FOR COMBINED FIRE AND DOMESTIC SERVICE ENTRANCE DETAIL.
6. ANY ELECTRICAL PANEL MUST MAINTAIN A 6' MINIMUM RADIUS FROM METER AND BACKFLOW.



TOP VIEW



SIDE VIEW

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



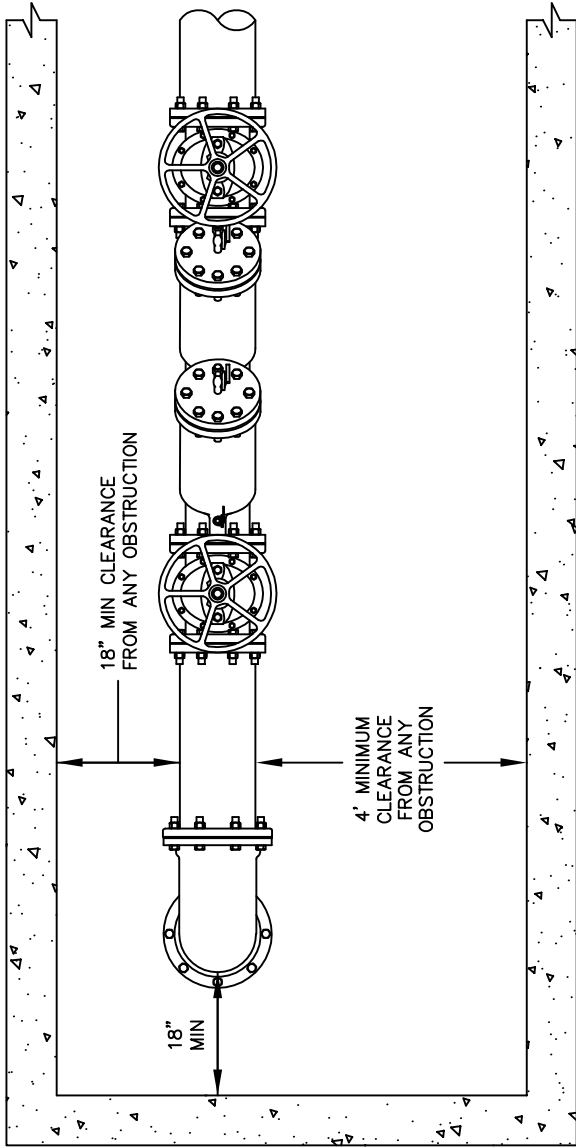
TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-25
1 1/2" THRU 2" WATER
SERVICE ENTRANCE

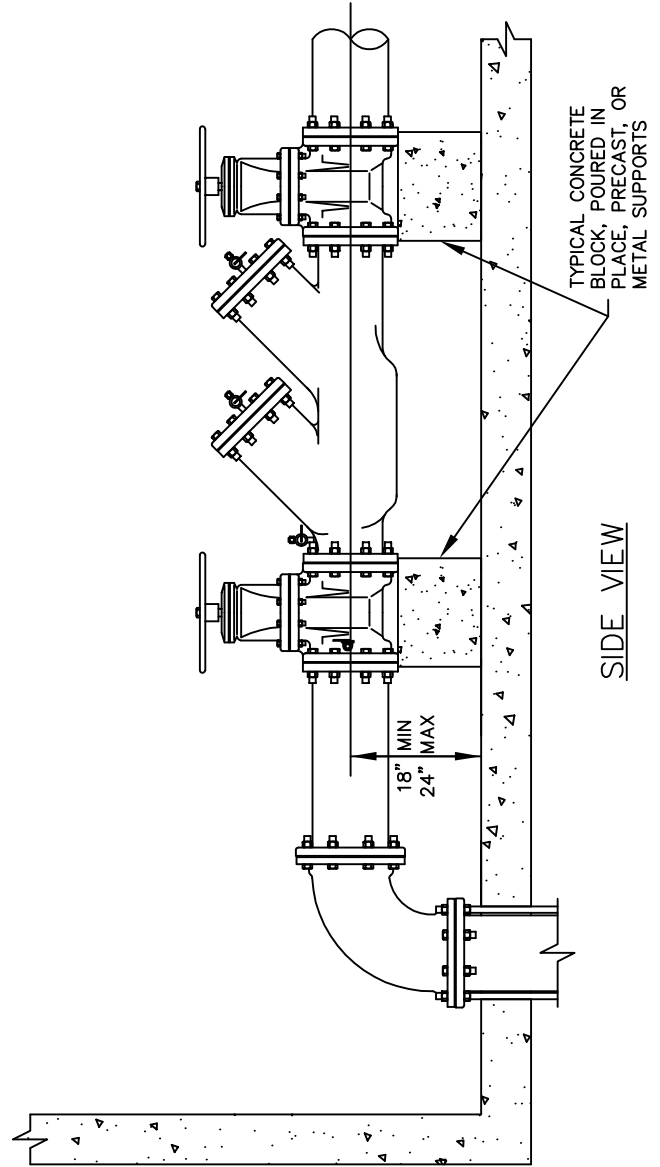
REV: 2019

SCALE: NTS

- NOTES:**
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
 2. BACKFLOW PREVENTOR REQUIRED ON ALL FIRE SERVICES. TYPE AND LOCATION SUBJECT TO P.W.W. APPROVAL.
 3. SEE DETAIL W-27 FOR COMBINED FIRE AND DOMESTIC SERVICE ENTRANCE DETAIL.

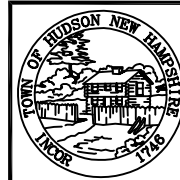


TOP VIEW



SIDE VIEW

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



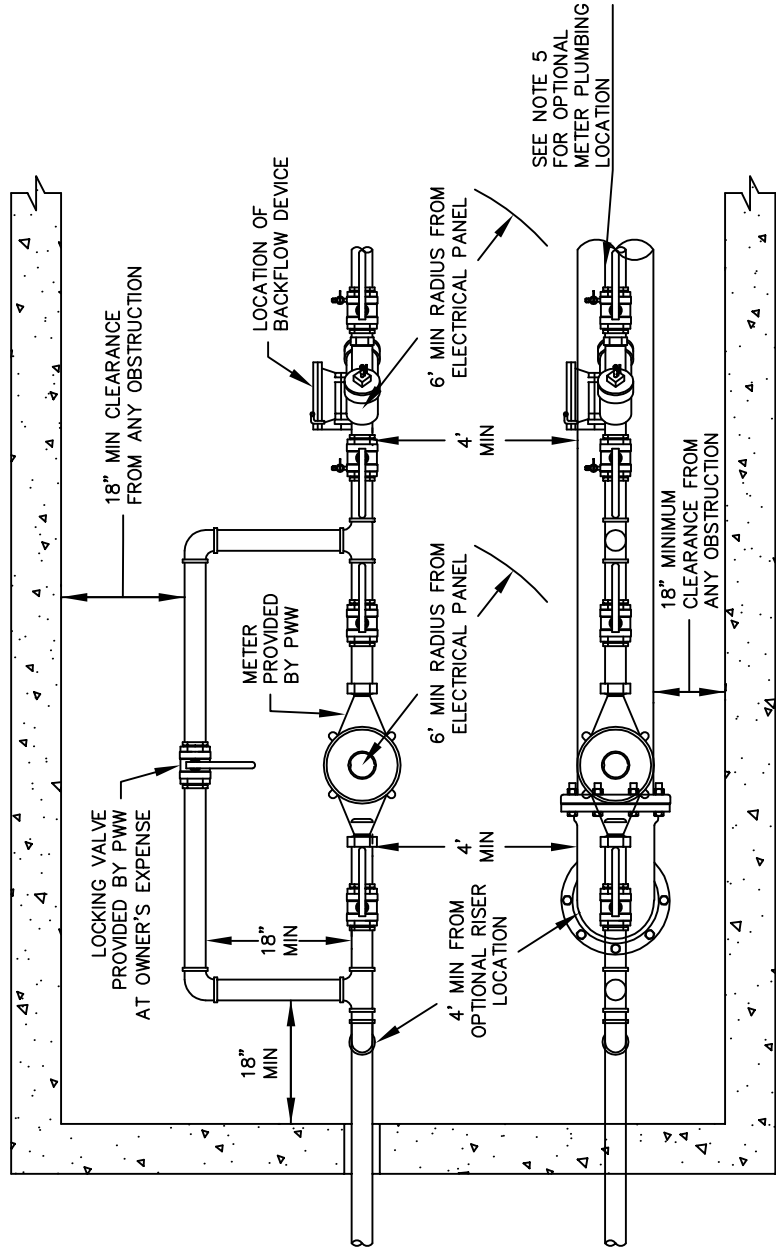
TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-26
FIRE SERVICE ENTRANCE

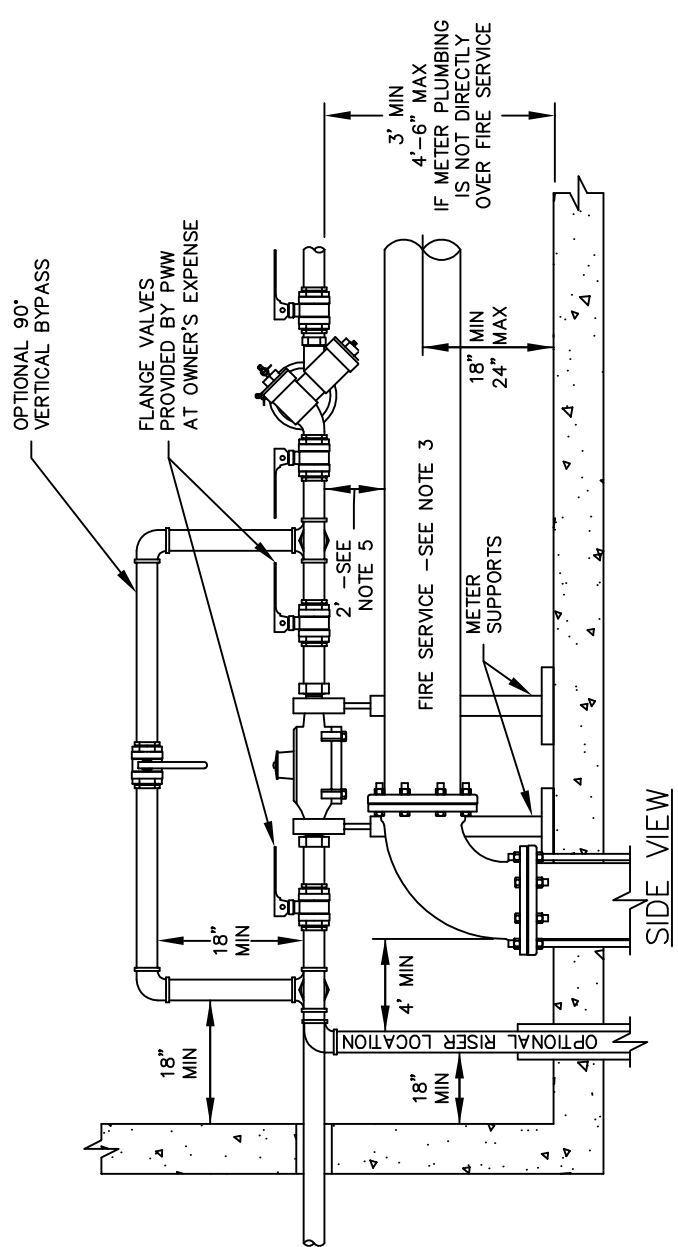
REV: 2019

SCALE: NTS

- NOTES:
1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
 2. PRV WHEN NECESSARY WILL BE INSTALLED AND PURCHASED BY OWNER OR CONTRACTOR.
 3. BACKFLOW PREVENTOR REQUIRED ON ALL FIRE SERVICES. TYPE AND LOCATION SUBJECT TO P.W.W. APPROVAL. SEE DETAIL W-26.
 4. ANY ELECTRICAL PANEL MUST MAINTAIN A 6' MINIMUM RADIUS FROM METER AND BACKFLOW.
 5. METER PLUMBING MAY BE INSTALLED DIRECTLY OVER THE FIRE SERVICE PROVIDED THAT 2' CLEARANCE IS MAINTAINED AND 4' MINIMUM CLEARANCE FROM ANY OBSTRUCTION IS ALSO MAINTAINED.
 6. 1 1/2" METER = 13" LAYING LENGTH.
 7. 2" METER = 17" LAYING LENGTH.

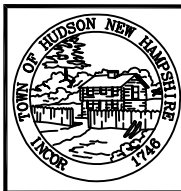


TOP VIEW



SIDE VIEW

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.

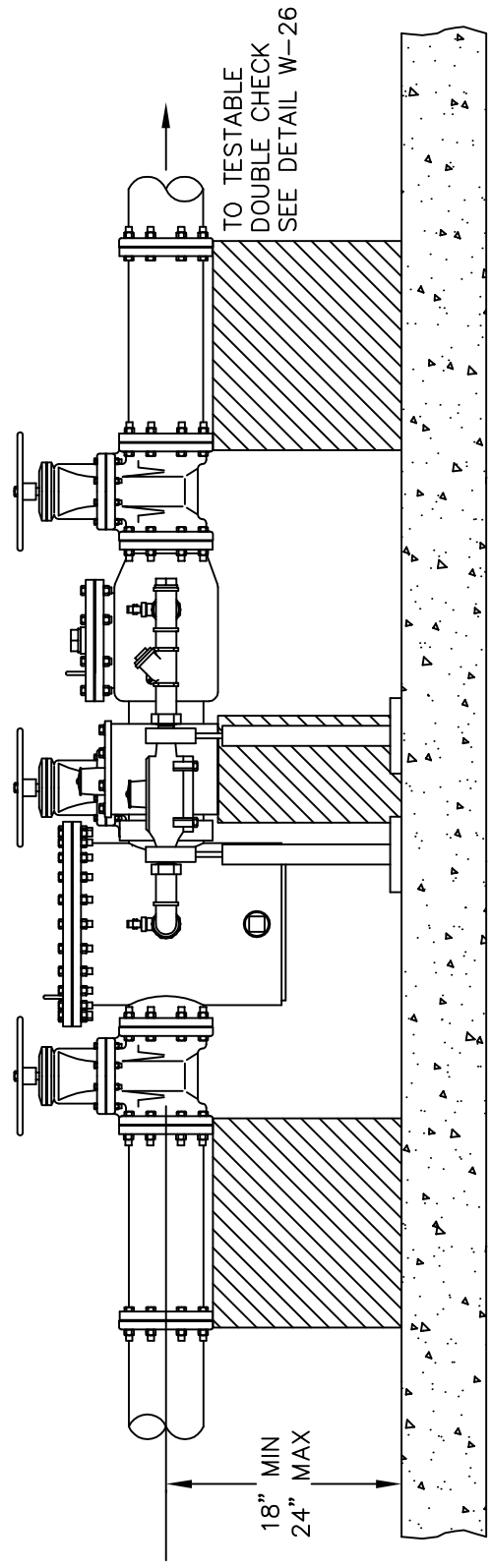
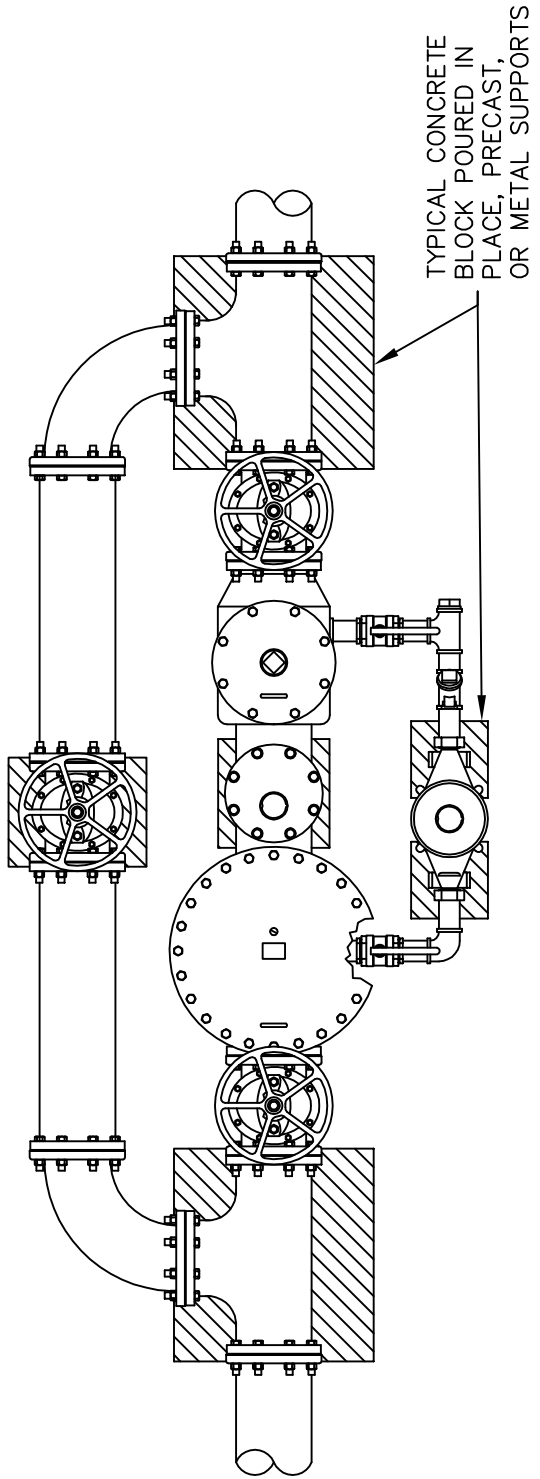


TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-27
COMBINED FIRE DOMESTIC
WATER SERVICE ENTRANCE

REV: 2019

SCALE: NTS



NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO TOWN OF HUDSON TECHNICAL SPECIFICATIONS.

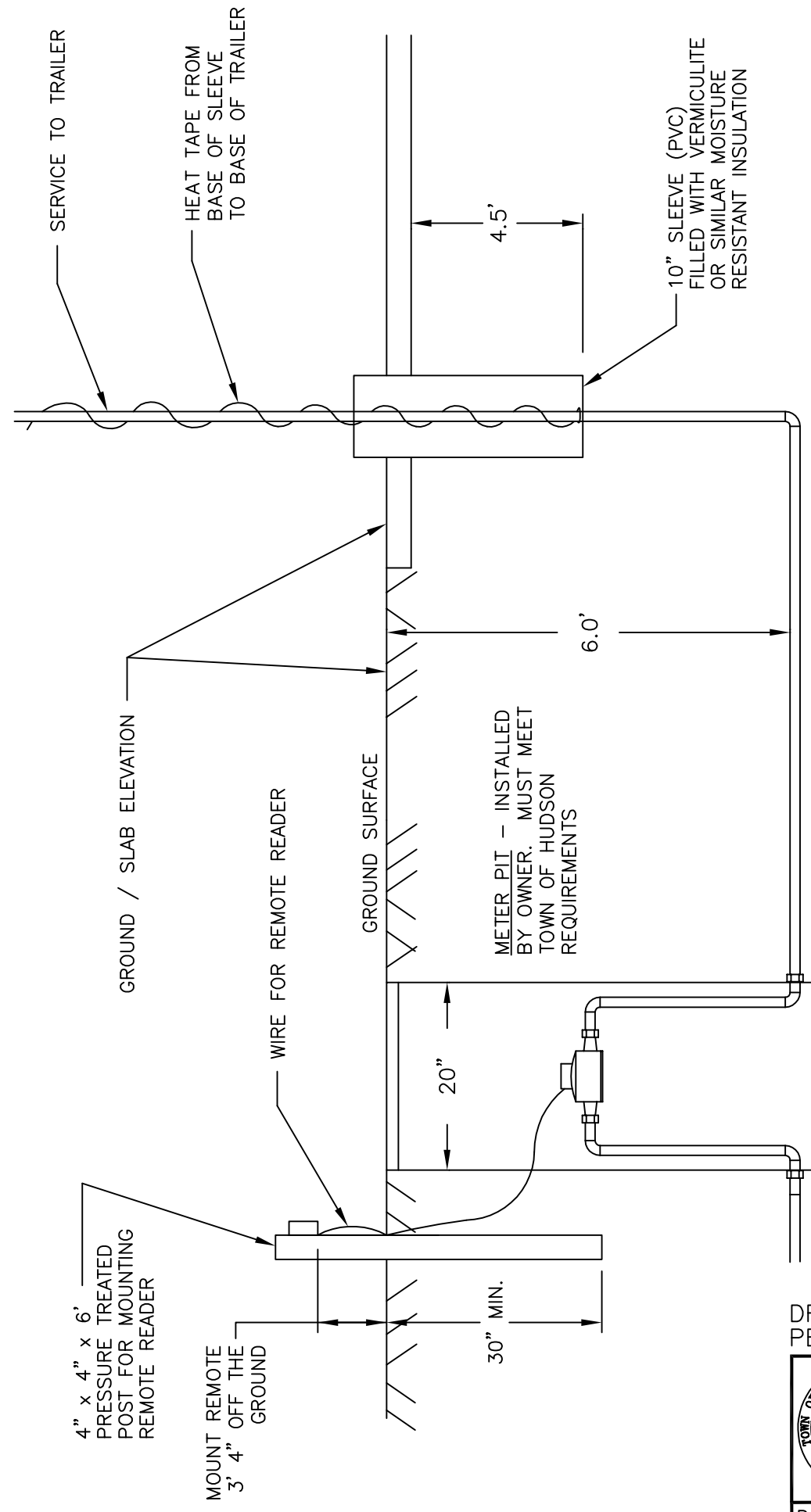
DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



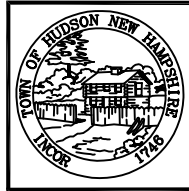
TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-28
FIRE SERVICE
WITH YARD HYDRANTS
REV: 2019

SCALE: NTS



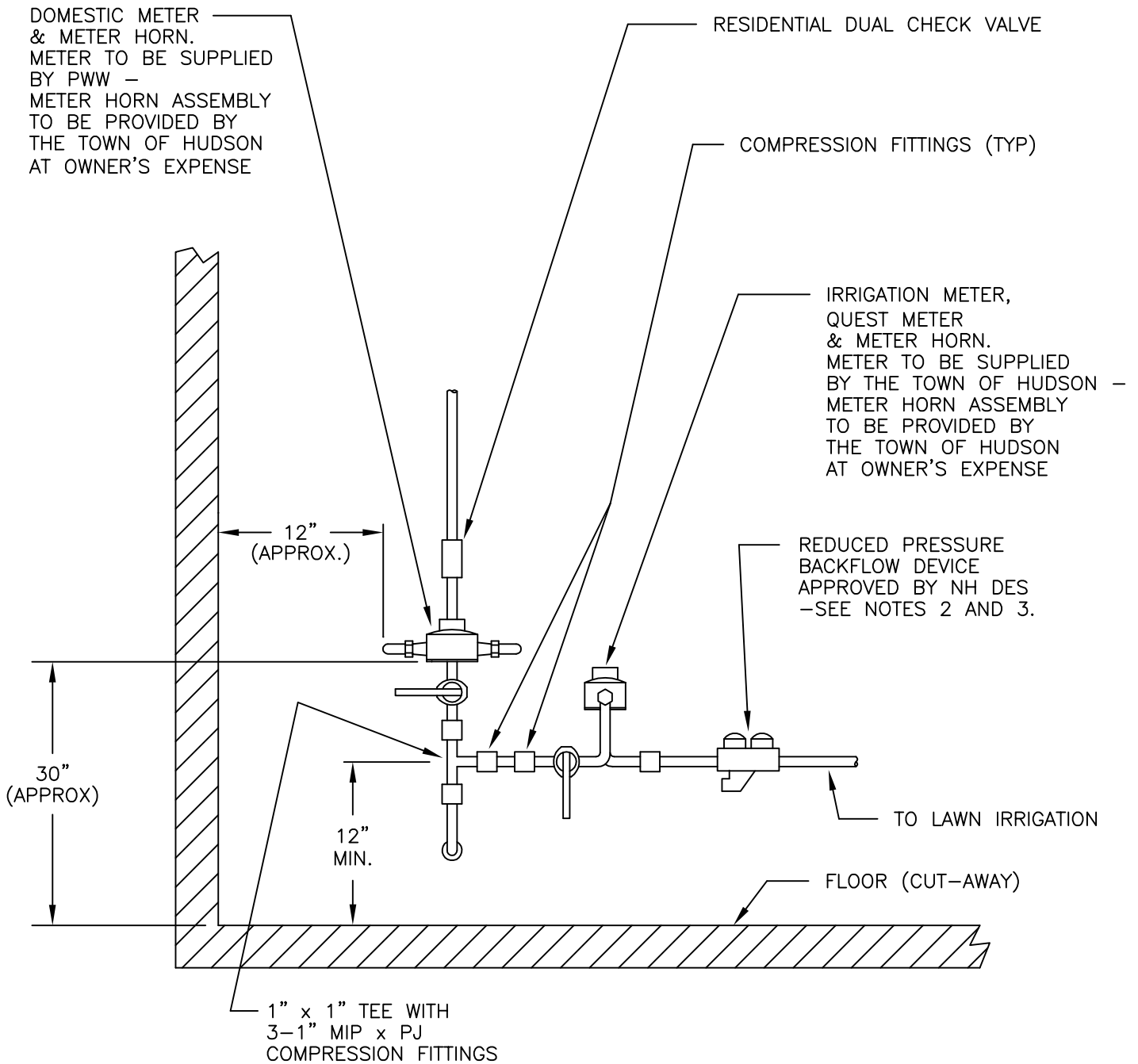
DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-29
MOBILE HOME OR SLAB
WATER SERVICE ENTRANCE
REV: 2019 SCALE: NTS

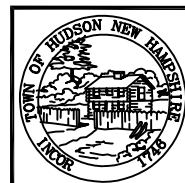
DRAWING: \\HD-FILES\RYTH\ENGINEERING\WATER\0-WATER RULES AND REGULATIONS\NEW\ENGINEERING WATER DETAILS.DWG [MODEL]



NOTES:

1. ALL MATERIALS AND INSTALLATION PROCEDURES WILL CONFORM TO THE TOWN OF HUDSON TECHNICAL SPECIFICATIONS.
2. REDUCED PRESSURE BACKFLOW DEVICE MUST BE INSTALLED OUTSIDE WHERE SERVICE EXITS HOUSE, OR A POSITIVE DRAIN BE INSTALLED IN BASEMENT.
3. A PRESSURE VACUUM BREAKER CAN BE INSTALLED INSTEAD OF A REDUCED PRESSURE BACKFLOW DEVICE, PROVIDED THE PRESSURE VACUUM BREAKER IS INSTALLED A MINIMUM OF 18" HIGHER THAN THE HIGHEST SPRINKLER HEAD.

DRAWINGS COURTESY OF PENNICHUCK WATER WORKS.



TOWN OF HUDSON
12 SCHOOL STREET
HUDSON, NH 03051

DETAIL W-30

*DOMESTIC IRRIGATION WATER
SERVICE METER INSTALLATION*

REV: 2019

SCALE: NTS