

# CONSTRUCTION STANDARDS AND DETAILS



CITY OF CONCORD  
NEW HAMPSHIRE  
2020

(This page intentionally left blank)

## FORWARD

This document was developed by the Engineering Services Division of the Community Development Department in coordination with the General Services Department in accordance with City Code 30-2-20 (e) to define the minimum standards necessary for the design, layout, documentation, and construction of municipal infrastructure including facilities proposed to be constructed by parties other than the City, but which are to subsequently become public facilities, and in accordance with the City's Site Plan and Subdivision Regulations as they pertain to private developments.

(this page intentionally left blank)

TABLE OF CONTENTS

**SECTION 1: REFERENCES ..... 1**

**SECTION 2: GENERAL REQUIREMENTS ..... 3**

01. Site Conditions ..... 3

02. Dig Safe..... 3

03. Control of the Work ..... 3

04. Materials..... 7

05. Backfill and Compaction ..... 8

06. Maintenance of Traffic ..... 8

07. Preparing Sites for Winter ..... 10

08. Inspection Requirements..... 11

**SECTION 3: STREETS AND SIDEWALKS..... 13**

01. Description..... 13

02. Materials..... 13

    A. Base Materials ..... 13

    B. Pavements..... 14

    C. Curb ..... 15

    D. Sidewalks ..... 15

    E. Street Lights ..... 15

    F. Guardrail ..... 16

    G. Signs..... 16

    H. Right-of-Way Bounds..... 16

03. Construction Requirements ..... 16

    A. Clearing and Grubbing..... 16

    B. Blasting Operations..... 16

    C. Unsuitable Material ..... 17

    D. Backfilling..... 17

    E. Subbase Application ..... 17

    F. Bituminous Concrete Pavement Application..... 17

    G. Bituminous Concrete Pavement Full Width Overlay ..... 19

    H. Bituminous Concrete Pavement Repair..... 19

    I. Portland Cement Concrete Pavement Repair..... 19

    J. Vertical Granite Curb..... 19

    K. Slope Granite Curb..... 20

    L. Mortar ..... 20

    M. Sidewalks..... 20

    N. Bituminous Concrete Pavement Sidewalk..... 21

    O. Portland Cement Concrete Sidewalk ..... 21

    P. Guardrail ..... 21

    Q. Street Signs..... 22

    R. Right-of-Way Bounds..... 22

04. Inspection Requirements..... 22

05. Testing Requirements ..... 22

    A. Density testing..... 22

    B. Contaminated material ..... 22

TABLE OF CONTENTS

**SECTION 4: SANITARY SEWER SYSTEMS ..... 23**

- 01. Description..... 23
- 02. Materials..... 23
  - A. Storage and Handling of Materials ..... 23
  - B. Gravity Sewer Mains ..... 23
  - C. Gravity Sewer Service Laterals ..... 24
  - D. Force Main Sewer: ..... 24
  - E. Pressure Sewer Services:..... 25
  - F. Tracer Wire ..... 26
  - G. Fittings..... 26
  - H. Repair Couplings ..... 26
  - I. Main and Service Lining ..... 26
  - J. Manholes and Appurtenances ..... 27
  - K. Exterior Grease Interceptors..... 28
  - L. Sand Bedding / Blanket..... 28
  - M. Crushed Stone Bedding ..... 28
- 03. Construction Requirements ..... 28
  - A. General..... 28
  - B. Laying Sewer Pipe ..... 29
  - C. Installing Sewer Manholes ..... 31
  - D. Cleanouts: ..... 32
  - E. Exterior Grease Interceptors..... 32
  - F. Excavation ..... 33
  - G. Crushed Stone Bedding ..... 33
  - H. Mortar ..... 33
  - I. Brick Masonry and Casting Adjustments ..... 34
  - J. Inverts..... 34
  - K. Discontinued Services..... 35
  - L. Main and Service Lining ..... 35
  - M. Privately Owned Force Mains/Pressure Sewers ..... 35
- 04. Inspection Requirements..... 36
  - A. Visual Inspections ..... 36
  - B. Video Inspection ..... 36
  - C. Video Inspection of Cured In-Place Pipe Liner (CIPP) ..... 37
- 05. Testing Requirements ..... 38
  - A. Gravity Sewer Main Testing ..... 38
  - B. Gravity Sewer Service Testing..... 39
  - C. Sewer Force Main and Pressure Sewer Testing ..... 39
  - D. Sewer Manhole Testing ..... 40

**SECTION 5: WATER SYSTEMS ..... 41**

- 01. Description..... 41
- 02. Materials..... 41
  - A. Storage and Handling of Materials ..... 41
  - B. Connection Hardware ..... 41
  - C. Water Mains ..... 42
  - D. Water Services ..... 44
  - E. Hydrants ..... 46
  - F. Sand Bedding / Blanket..... 47
- 03. Construction Requirements ..... 47

- A. Water Mains ..... 47
- B. Mechanical Fittings and Accessories ..... 49
- C. Hydrants ..... 50
- D. Water Services ..... 50
- E. Fire Suppression Lines ..... 52
- F. Irrigation Lines ..... 52
- G. Back-Flow Prevention Devices ..... 52
- H. Metering ..... 53
- 04. Inspection Requirements ..... 54
- 05. Testing Requirements ..... 54
  - A. Flow Test ..... 54
  - B. Water Line Testing ..... 55
  - C. Pressure and Leak Testing ..... 55
  - D. Bacterial Testing / Disinfection ..... 55
- SECTION 6: STORM DRAINAGE SYSTEMS ..... 57**
  - 01. Description ..... 57
  - 02. Materials ..... 57
    - A. Storage and Handling of Materials ..... 57
    - B. Pipe ..... 57
    - C. Catch Basins ..... 59
    - D. Drain Manholes ..... 60
    - E. Frames, Grates and Covers ..... 60
    - F. Underdrain ..... 60
    - G. Perimeter Drain Laterals ..... 60
    - H. Stone Fill ..... 60
    - I. Masonry ..... 61
    - J. Sand Bedding / Blanket ..... 61
    - K. Crushed Stone Bedding ..... 61
  - 03. Construction Requirements ..... 61
    - A. Excavation ..... 62
    - B. Crushed Stone Bedding ..... 62
    - C. Mortar ..... 62
    - D. Brick Masonry ..... 62
    - E. Inverts ..... 63
    - F. Storm Drain Systems ..... 63
    - G. Underdrain ..... 64
    - H. Drain Laterals ..... 65
    - I. Slope Stabilization ..... 65
    - J. Stone Fill Requirements ..... 65
    - K. Storm Water Basin Safety Barriers ..... 66
  - 04. Inspection Requirements ..... 66
    - A. Visual Inspections ..... 66
    - B. Video Inspection ..... 66
  - 05. Testing Requirements ..... 68
    - A. Deflection Test ..... 68
    - B. HDPE Testing ..... 68
- SECTION 7: LANDSCAPING ..... 69**
  - 01. Description ..... 69
  - 02. Materials ..... 69

TABLE OF CONTENTS

- A. Loam, Seed, & Slope Stabilization ..... 69
- B. Recommended Street Trees ..... 70
- 03. Construction Requirements ..... 71
  - A. Loam, Seeding and Slope Stabilization..... 71
  - B. Street Trees ..... 72
- 04. Inspection Requirements..... 73
- SECTION 8: EROSION PREVENTION AND SEDIMENT CONTROL..... 75**
  - 01. Description..... 75
  - 02. Materials..... 75
    - A. Mulch ..... 75
    - B. Soil Stabilization..... 75
  - 03. Construction Requirements ..... 76
  - 04. Inspection Requirements..... 76
- SECTION 9: SITE WORK..... 77**
  - 01. Requirements ..... 77
    - A. Driveways ..... 77
    - B. Dumpster Pads ..... 77
    - C. Monitoring Wells ..... 78
    - D. Retaining Walls ..... 78
- SECTION 10: PRIVATE UTILITIES ..... 79**
  - 01. General ..... 79
  - 02. Electric..... 79
  - 03. Municipal Cables..... 80
  - 04. Telephone and Cable TV ..... 80
  - 05. Fiber Optic Cable ..... 80
  - 06. Natural Gas ..... 80
  - 07. Utility Conflicts ..... 81
- SECTION 11: TRAFFIC SIGNAL SYSTEMS ..... 83**
  - 01. Reference ..... 83
- APPENDIX A: DETAILS ..... A-1**
  - 01. Use of Details.....A-1
  - 02. Index of Details.....A-1
- APPENDIX B: BACKFLOW PREVENTION DEVICES ..... B-1**
  - 01. Approved Backflow Devices & Assemblies .....B-1

## SECTION 1: REFERENCES

All work performed in the City of Concord, New Hampshire shall, as a minimum, conform to the requirements of the latest edition of this manual and the following standards. Conflicts between this manual and the referenced standards the more stringent criteria shall apply.

For addendums to the standards and other information, please visit the website at <http://www.concordnh.gov/405/engineering>.

- A. Standard Specifications and drawings for Road and Bridge Construction of the New Hampshire Department of Transportation, current edition, as most recently adopted.
- B. Administrative Rules: Env-Wq 700 Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities, as most recently adopted.
- C. Administrative Rules: Env-Wq 1500 Alteration of Terrain, as most recently adopted.
- D. Policy Relating to Driveways and Access to the State Highway System, NHDOT, Bureau of Highway Maintenance.
- E. Manual on Uniform Traffic Control Devices for Streets and Highways, published by the United States Department of Transportation, Federal Highway Administration; current edition.
- F. Requirements of the City of Concord's Driveway, Encumbrance, Monitoring Wells, Street Excavation, and Utility Connection Permits.
- G. Subdivision and Site Plan Regulations and the Municipal Code of Ordinances of the City of Concord, New Hampshire.
- H. City of Concord's Building and Plumbing Codes, and the International Plumbing Code, as currently adopted.
- I. A Policy on Geometric Design of Highways and Streets, AASHTO, current edition.
- J. Roadside Design Guide, AASHTO, current edition

SECTION 1: REFERENCES

(This page intentionally left blank)

## SECTION 2: GENERAL REQUIREMENTS

### 01. SITE CONDITIONS

The Contractor shall promptly notify the City Engineer or representative in writing of any unusual conditions such as:

- A. Subsurface or latent physical conditions at the site differing materially from those indicated on the approved plans;
- B. Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent to work of the character provided for in the approved plans.
- C. Encounters with a utility, whether damaged or simply unearthed, should that utility be mislocated or missing on the approved plans or should that utility be found in an unusual or deteriorated condition.

### 02. DIG SAFE

The Contractor shall be responsible for contacting Dig Safe (811) at least 72 hours prior to commencement of work. The City is a member of Dig-Safe, however the Contractor shall also coordinate their work with the following City Departments: Fire, Police, Community Development Department and the General Services Department. The location of all utility facilities shall be determined sufficiently ahead of excavation work to avoid damage and permit their relocation if necessary.

### 03. CONTROL OF THE WORK

#### A. Responsibility of Contractor

1. The Contractor is responsible for the construction of all improvements as shown on the approved plans. The Contractor shall employ a competent construction supervisor capable of establishing and maintaining all horizontal and vertical layout control, bench marks and structure locations to assure that all improvements will conform to the locations, lines, levels, and grades as indicated on the approved plans. Should site conditions warrant modifications to the approved plans, such changes shall be approved by the appropriate City Department, in writing, prior to commencement of the work

#### B. Permits: The following permits are issued by the Engineering Services Division.

1. Driveway Permit: A Driveway Permit is required to repair, widen, reconstruct, or construct a driveway on residential or commercial property to ensure conformance with the City of Concord's zoning laws.
2. Excavation Permit: A Street Excavation Permit is required for all work within the City of Concord's Right-Of-Way or on City Property.

## SECTION 2: GENERAL REQUIREMENTS

- a. Refer to Street Excavation Permit Regulations, General Permit Conditions and Construction Requirements, City of Concord, New Hampshire (latest edition) for Excavation Permit requirements.
3. Encumbrance Permit: An Encumbrance Permit is required for all temporary construction work that will encumber a street, alley, sidewalk, or other public places.
4. Monitoring Well Permit: A Monitoring Well Permit and License is required for all monitoring wells installed within City streets and property.
  - a. Refer to Monitoring Well Regulations, General Permit Conditions and Construction Requirements, City of Concord, New Hampshire (latest edition) for Monitoring Well Permit requirements.
5. Utility Connection Permit: A Utility Connection Permit is required for all new connections to the municipal storm drain, sewer, or water systems; or modifications to existing connections.
6. The Contractor shall complete the work in a manner that will cause the least inconvenience to the general public. Contact the Engineering Services Division for the current fee schedule and application forms.

### C. Compliance to Requirements

1. The Contractor shall provide City staff safe access to the work for the purpose of confirming that the work is in accordance with City requirements.

### D. Compliance with City Ordinances and Policies

The Contractor shall abide by all city ordinances and policies, as most recently adopted, as they apply to construction.

#### 1. Fugitive Dust (City Ordinance 11-3-1)

- a. The following is deemed and declared to be a public nuisance and is not allowed:
  - i. Any airborne particulate matter generated from a construction site or by a construction activity that is visibly passing outside of the property lines where the source activity is occurring, or adversely affects any person, their property, or their reasonable enjoyment of their property. Any person responsible for any of the following activities shall take all reasonable actions to prevent particulate matter from becoming airborne:
    - (a) Clearing of land;
    - (b) Preparatory site work;
    - (c) Earth materials removal;
    - (d) Stockpiling of earth or construction materials;
    - (e) Construction or demolition of buildings or structures;
    - (f) Construction, grading, paving, and maintenance of, or within, roads, and streets.

- ii. Depositing or dropping of particulate matter, dirt, or other material, that could become airborne, on any publicly owned street or right-of-way by vehicles leaving the source activity site.
- b. Appropriate materials including, but not limited to, water, City of Concord approved dust palliatives, asphalt, seed, or physical covers shall be used to prevent particulate matter from becoming airborne. Oil may not be used as a dust palliative.
- c. The requirements of this article do not apply to fugitive particulate matter emissions arising from the production of agricultural commodities in their unmanufactured state on the premises of the farm operation or emergency work as defined in Article 13-6-2
- d. An enforcement officer may order the immediate cessation of such operations or activities deemed and declared a public nuisance. If any person shall fail to immediately comply with the order, the enforcing officer shall as soon as practicable file a complaint with a court of competent jurisdiction charging said person with violation of this ordinance.

The control of fugitive dust (City Ordinance Article 11-3) , throughout the duration of the construction project, shall be performed in an approved manner, generally by use of water or calcium chloride application and shall be continued on a regular basis whenever necessary or as ordered by the City Engineer or representative. The Contractor shall be responsible for the control of dust during work suspension periods as well. Work suspension periods include, but are not limited to weekends, holidays, etc.

## 2. Construction Noise (City Ordinance 13-6-9)

- a. Construction Noise. The generation of any noise from construction activity as defined in Section 13-6-2 or from a construction site that is clearly audible at a dwelling in any district is prohibited, except for noise generated:
  - i. Between 7:00 a.m. and 7:00 p.m. on weekdays; or
  - ii. Between 9:00 a.m. and 7:00 p.m. on Saturdays; or
  - iii. Between 9:00 a.m. and 7:00 p.m. on Sundays, and on the following holidays: January 1, Memorial Day or on a date to coincide with the federal observance if it is held on a different day, July 4, Labor Day, Thanksgiving Day, or Christmas Day from work done by a resident at the resident's dwelling; or
  - iv. Between 9:00 a.m. and 7:00 p.m. on a holiday as defined by RSA 288:1 as the third Monday in January, known as Martin Luther King Jr. Civil Rights' Day; the third Monday in February, known as Washington's Birthday; the second Monday in October, known as Columbus Day; the day on which the biennial election is held; and November 11, known as Veterans' Day.
- b. Exceptions.
  - i. Sections 13-6-8 and 13-6-9 shall not apply to routine or emergency City work including solid waste collection, street sweeping, street and sidewalk plowing, snow

## SECTION 2: GENERAL REQUIREMENTS

removal, and other periodic work necessary for the City to maintain its public streets and infrastructure.

- ii. Emergency work as defined in Section 13-6-2 is exempt from hours of operations' restrictions.

The Code Administrator may, in writing, grant exceptions to these provisions when the work, in the Code Administrator's sole discretion, is of an urgent or otherwise necessary for or in the interest of public or private safety and convenience.

### E. Construction Vibration

1. The City has adopted the New Hampshire Department of Transportation specification regarding the maximum peak particle velocity (PPV) of ground vibration. This specification covers, but is not limited to blasting, pavement reclamation, driving and extracting sheeting, pile driving, trench and rock excavation, compaction associated with trench backfilling and paving operations.
2. In advance of construction, it is the Contractor's responsibility to review all properties, infrastructure, and underlying soil conditions in the project area and determine if vibration monitoring will be required. As a minimum, a sensitive structure will be defined as any building, wall or other vertical element susceptible to vibration impacts and may include older buildings, brick/masonry structures, buildings that are close to a significant construction operation, buildings that have plaster on wood lath construction and any other type of structure that may be subject to vibration damages. In areas where there are unusual concerns (i.e. historic structure, structure in disrepair, unusual masonry construction, and any other building elements susceptible to vibration damages) and even minimal vibrations could cause damages, the City Engineer has the authority to reduce the PPV limits as needed to protect the area of concern. Furthermore, where management of vibration causing activities produces complaints from abutters, the City Engineer will modify and reduce vibration-causing activities and consider requiring vibration monitoring and/or preconstruction surveys to reduce abutting property impacts. Independent of the Contractor's evaluation, the City Engineer may require vibration monitoring be performed at any time during the project. All monitoring shall be performed by a qualified testing firm, approved by the City Engineer.

### F. Election Day Construction Policy

1. The public's ability to access the polls in our community is imperative. Although our staff does an outstanding job in managing the City's construction projects, it is extremely challenging to ensure that work in the public right-of-way will not result in restricted travel lanes, closed roads or impeded sidewalks that could discourage would-be voters on election days, all City contracts that entail any element of construction in the public right-of-way shall prohibit work during the hours in which Concord is holding a primary, general or special election as determined by the Concord City Clerk.
2. Should the City Engineer believe the work that would otherwise be accomplished during voting hours is essential and can be carried out without any of the unacceptable conditions outlined below, they may seek a waiver from this policy.

3. Unacceptable Conditions
  - a. Road closures;
  - b. Travel lane restrictions (including temporary lane reductions or one-lane usage);
  - c. Detours;
  - d. Sidewalk closures;
4. Waiver requests shall be addressed to the City Manager and include the following:
  - a. Written explanation as to the critical nature of the work; and a
  - b. Detailed written description of the construction indicating how unrestricted access will be maintained during the entirety of the work day.
  - c. All requests for a waiver to this policy must be received by the City Manager's office, at least, 10 business days prior to the date for which relief is sought.
5. This policy does not preclude the City's leaf-collection efforts nor work in the public right-of-way to address unforeseen emergency situations that threaten public health or safety including, but not limited to, ruptured water/sewer lines, sink holes or downed trees.

#### **04. MATERIALS**

- A. All materials shall be subject to rejection at any time due to failure to meet any of the specification requirements. All fittings shall be of compatible construction materials and shall be used exclusively for the intended purpose of the manufacturer. All fittings used for repairs must first be approved by the Engineering Services Division prior to installation.
- B. Prior to the start of the work, Certificates of Compliance shall be submitted by the Contractor for each material that is to be permanently incorporated into the work to the City Engineer or representative for review and approval. A Certificate of Compliance is defined as a document certifying that material incorporated in the work complies with Federal, State, Industry and City Standards. These Certificates are to contain at a minimum;
  1. Date of certification.
  2. Description of material being supplied.
  3. Product Trade Name.
  4. Name of manufacturer and/or supplier.
  5. Name of the Contractor to whom the material is being supplied.
  6. Project name and number (if applicable) to which the material is consigned.
  7. Contract item number and item name.

## SECTION 2: GENERAL REQUIREMENTS

8. That the materials are AWWA compliant (for potable water items).
  9. A statement that the material of assemblies provided fully meets the requirements for the pertinent Contract Specification.
  10. Signature of person having legal authority to bind the originator to the certificate.
- C. Warrantee for all materials shall commence after installation at time of approval/acceptance by the City.

### **05. BACKFILL AND COMPACTION**

- A. All backfill material adjacent to pipes and structures shall be compacted in layers not exceeding 12-inches of compacted thickness, by pneumatic tampers, vibratory plate compactors or rolling compactors. Care shall be exercised to thoroughly compact the backfill under haunches of pipe and to assure that the backfill soil is in intimate contact around structures. Material in the trench backfill shall be compacted to not less than 95 percent of American Association of State Highway and Transportation Officials (AASHTO) T180, Modified Proctor. Nuclear density testing methods will be governed by ASTM D2922.
- B. Backfill and fill material used in roads, travel ways and shoulders shall be natural material excavated from the trench during construction excluding unsuitable materials: all debris, pieces of pavement, organic material, all wet or soft muck, peat or clay, all excavated ledge material, or rocks over 6 inches in largest dimension, or any material not approved by the City Engineer or representative. Materials shall be backfilled from the blanketing material over pipe to the base of the roadway structural box and compacted in layers not to exceed 12 inches in compacted thickness by mechanical compaction means described above. Compaction testing shall be ordered at the expense of the Contractor if deemed necessary by the City Engineer or representative. Water jetting or ponding methods of compaction shall not be allowed.
- C. Deep excavations or excavations through areas of unsuitable material: The Contractor may be required to perform extraordinary construction methods when encountering deep excavations or unsuitable materials. Alternate materials may be required to prevent long-term deflection in these areas; yet pipe materials shall remain continuous between structures. Compaction testing of the backfill material may be required at the discretion of the City Engineer or representative. This testing shall be performed at a minimum of 100-foot intervals unless otherwise directed by a City of Concord representative to assure proper compaction in roadway sections. Any required testing shall be performed at the expense of the Contractor unless other arrangements have been established with the Engineering Services Division.

### **06. MAINTENANCE OF TRAFFIC**

This work shall consist of providing and maintaining safe and passable traffic accommodations for public travel, furnishing, erecting and maintaining construction signs, barricades, delineator lights, flashers and other warning devices as shown on the plans or as required by the City Engineer or representative within the public Right-of-Way.

- A. A Temporary Traffic Control Plan (TTCP) shall be required for maintaining vehicle and pedestrian traffic for work that requires closures of sidewalks, travel lanes, streets, and work immediately adjacent to travel lanes.
1. Plans shall be prepared in accordance with MUTCD (Part 6 – Temporary Traffic Control).
  2. The City Engineer or representative may require that the TTCP be designed, submitted and signed by a traffic engineer licensed in the State of New Hampshire.
  3. Plans shall be submitted as part of the Excavation and/or Encumbrance Permit Application(s) for review by the Engineering Services Division. Depending on the scope of the project, up to two (2) weeks review time may be required.
  4. Plans shall be clear and legible, drawn to scale and show the type and locations of all proposed traffic control devices.
- B. Road closures in excess of 24 hours require approval from the City Manager or designee. Requests for road closures shall be submitted to the City Engineer or representative for review and recommendation to the City Manager or designee.
- C. Pedestrian and vehicular traffic shall be maintained to all private properties in the work zone. The Contractor's activities shall not shut down or close any business. The Contractor may be required to supply and post temporary business access signs and shall meet in advance with the merchants affected by the work.
- D. When required by the City Engineer or representative, a flagger detail shall be provided to maintain traffic control and public safety. Flaggers shall be American Traffic Safety Services Association (ATSSA) Certified or equivalent. A police detail may be required instead of or in addition to a flagger detail if the work constitutes a compromise to public safety, or a potential for significant traffic delays.
- E. When required by the City Engineer or representative, the Contractor and/or Subcontractor shall designate a Flagger Manager who will oversee the day to day supervision and activities of the flagging crew to ensure traffic control is performing in accordance with the approved Traffic Control Plan and/or as directed by the City Engineer, the Contractor or their designees. The Flagger Manager shall be American Traffic Safety Services Association (ATSSA) Certified or equivalent. The Flagger Manager shall be required to attend the pre-construction meeting.
- F. Sidewalks
1. Sidewalks shall remain open to the public during construction. Should a sidewalk need to be closed for any duration, an alternate pedestrian route shall be provided. To the maximum extent feasible, the alternate circulation path shall be provided on the same side of the street as the disrupted route. Where it is not feasible to provide a same-side alternate circulation path and pedestrians will be detoured, the alternate path shall provide a similar level of accessibility to that of the existing disrupted route.
  2. Where the alternate circulation path is exposed to adjacent construction, excavation drop-offs, traffic, or other hazards, it shall be protected with a pedestrian barricade or channelizing device. When it is necessary to block travel at the departure curb to close a

## SECTION 2: GENERAL REQUIREMENTS

crosswalk that is disrupted by excavation, construction, or construction activity, care must be taken to preserve curb ramp access to the perpendicular crosswalk.

### G. Traffic Control Devices

1. All traffic control devices used on street and highway construction, maintenance, utility or incident management operations shall conform to the requirements of the Manual on Uniform Traffic Control Devices (MUTCD).
2. All construction signs, barricades and warning devices shall be installed prior to the commencement of work activities and shall be free of chipping or damage that may render the device unsatisfactory or detract from reflectiveness.
3. All construction signs shall be erected on posts, barricades or easels so that all text is horizontal. At any time during the life of the project, at the discretion of the City Engineer or representative, any sign, barricade or warning device that is damaged, disfigured or found not to be in serviceable condition shall be required to be replaced at the cost of the Contractor.
4. Barricades and delineators shall be placed wherever necessary for the protection of public travel. Such hazards as pits and open trenches, drop offs, exceptionally rough stretches of roadway and all obstructions shall be barricaded in an acceptable manner. The Contractor shall make all necessary arrangements for nighttime shutdown, to ensure that there are not any hazards to the traveling public or pedestrians.
5. Lighting devices shall be placed so they are clearly visible. Adequate artificial lighting shall be provided on construction projects to clearly reveal all hazards during night hours. Flagger stations and all hazards shall be lighted from sunset to sunrise should night work be approved.

## **07. PREPARING SITES FOR WINTER**

This work shall consist of preparing the site for winter (November 1 to April 15) to prevent erosion and control sediment. Additional measures not specifically referenced and as noted in the Erosion Prevention and Sediment Control (EPSC) section of this document shall be used as necessary. Where differences between the Construction Standards and the project specific Stormwater Pollution Prevention Plan, the more stringent document shall govern.

### A. General

1. EPSC measures shall be checked, cleaned and reset as needed prior to November 1. EPSC measures may need to be replaced to ensure function throughout the period.
2. All proposed vegetated areas which are at final grade and which do not exhibit a minimum of 85% vegetative growth by November 1, shall be stabilized by seeding and installing erosion control blankets on slopes greater than 3:1, and seeding and placing 3 to 4 tons of mulch per acre, secured with anchored netting, elsewhere. The installation of erosion control blankets or mulch and netting shall not occur over accumulated snow or on frozen ground and shall be completed in advance of thaw or spring melt events.

3. All ditches or swales which do not exhibit a minimum of 85% vegetative growth by November 1, shall be stabilized temporarily with stone or erosion control blankets appropriate for the design flow conditions.
- B. Off-site construction activities which occur after November 1 shall be stabilized as noted below.
1. All areas shall be stabilized.
  2. All excavations within the roadway or sidewalk shall be brought to grade with subbase and surfaced with bituminous concrete pavement.
  3. All slopes shall exhibit a minimum 85% vegetated growth, have a minimum of 3” of non-erosive material such stone or riprap installed, or have erosion control blankets installed per manufacturer’s recommendation. The installation of erosion control blankets or mulch and netting shall not occur over snow greater than 1” in depth or on frozen ground.
- C. On-site construction activities which occur after November 1 shall be stabilized as noted below.
1. All areas shall be stabilized.
  2. Base course gravels have been installed in areas to be paved and not open to the public.
  3. All slopes shall exhibit a minimum 85% vegetated growth, have a minimum of 3” of non-erosive material such stone or riprap installed, or have erosion control blankets installed per manufacturer’s recommendation. The installation of erosion control blankets or mulch and netting shall not occur over snow greater than 1” in depth or on frozen ground.

## **08. INSPECTION REQUIREMENTS**

- A. The contractor, developer, owner shall be responsible for all costs incurred during required testing, and will be billed for all inspections and testing performed by the City.
- B. The City Engineer or representative reserves the right to require a sample for evaluation of any item supplied. Alternate items must receive prior approval of the City Engineer.
- C. Several City Divisions are involved in the inspection of a project once construction is underway. The following table outlines each division's inspection responsibilities. The Community Development Department is the lead agency concerning construction of public and private improvements. Therefore, an applicant or Contractor should first contact the Community Development Department if they have general questions regarding the construction inspection process. Specific questions should be addressed to the appropriate division listed in this section.

SECTION 2: GENERAL REQUIREMENTS

<b>Department/Division</b>	<b>Construction Item</b>
Code Administration Code Administrator 603-225-8580	Building construction inspection: electrical, mechanical, & plumbing Fire protection systems and life safety code Health & food service licenses Housing code Sign & yard sale permits Zoning Ordinance
Engineering Services Division City Engineer 603-225-8520	Bridge information Driveway permits Sanitary sewer systems Storm drain systems Street encumbrances Street excavations Street construction Street records Traffic counting Utility connections Water service systems
Fire Alarm & Traffic Division Fire Alarm Superintendent 603-225-8667	Municipal fire alarm cable Traffic signal systems
General Services (Public Works) Highway & Utility Superintendent 603-228-2737	Sewer maintenance Roadway maintenance Storm drain maintenance Water maintenance
General Services (Public Works) Utility Billing 603-225-8693	Automated meter reading Backflow prevention Water metering Water and Sewer Investment Fees
Planning Division City Planner 603-225-8515	Landscaping Site compliance Subdivision regulation

## SECTION 3: STREETS AND SIDEWALKS

### 01. DESCRIPTION

This work shall consist of furnishing and placing subgrade, base course, binder and wearing courses as shown on the plans or as ordered. These specifications include general requirements that are applicable to all types of roads and sidewalks within the City of Concord.

### 02. MATERIALS

#### A. Base Materials

1. Sand: Sand shall meet the following gradation requirements (NHDOT Item #304.1):

<u>Sieve Size</u>	<u>% Passing</u>
6 Inch	100
No. 4	70-100
No. 200*	0 - 12

\* Fraction passing the #4 sieve

The maximum size of any stone or fragment shall not exceed three-fourths of the compacted depth of the layer being placed but in no case larger than 6 inches.

2. Gravel: Gravel shall meet the following gradation requirements (NHDOT Item #304.2):

<u>Sieve Size</u>	<u>% Passing</u>
6 Inch	100
No. 4	25 - 70
No. 200*	0 - 12

\* Fraction passing the #4 sieve

The maximum stone size shall be 6-inches in any dimension for a 12-inch compacted lift. Large stones removed from the gravel box may be used for slope fill when properly placed.

SECTION 3: STREETS/SIDEWALKS

3. Crushed Gravel: Crushed gravel shall meet the following gradation requirements (NHDOT Item #304.3):

<u>Sieve Size</u>	<u>% Passing</u>
3 Inch	100
2-1/2 Inch	95 – 100
1 Inch	55 – 85
No. 4	27 - 52
No. 200*	0 - 12

\* Fraction passing the #4 sieve

At least 50% of the material retained on the 1-inch sieve shall have a fractured face.

4. Crushed Stone (Fine Gradation): Crushed stone (fine gradation) shall meet the following gradation requirements (NHDOT Item #304.4):

<u>Sieve Size</u>	<u>% Passing</u>
2 Inch	100
1-1/2 Inch	85 – 100
3/4 Inch	45 – 75
No. 4	10 – 45
No. 200*	0 – 5

\* in total sample

5. Crushed Stone (Coarse Gradation): Crushed Stone (coarse gradation) shall meet the following gradation requirements (NHDOT Item #304.5):

<u>Sieve Size</u>	<u>% Passing</u>
3-1/2 Inch	100
3 Inch	85 – 100
1-1/2 Inch	60-90
3/4 Inch	40-70
No. 4	15-40
No. 200*	0 - 5

\* in total sample

B. Pavements

1. 1-1/2" Bituminous Concrete Base Course: Base course materials shall conform to the specifications in Section 401 of the NHDOT Standard Specifications for 1-1/2" inch aggregate pavement.
2. 3/4" Bituminous Concrete Base Course: Base course materials shall conform to the specifications in Section 401 of the NHDOT Standard Specifications for 3/4 inch aggregate pavement.

3. 1/2" Bituminous Concrete Wearing Course: Wearing course material shall conform to the specifications in Section 401 of the NHDOT Standard Specifications for 1/2 inch aggregate pavement.
4. 3/8" Bituminous Concrete Wearing Course: Wearing course materials shall conform to the specifications in Section 401 of the NHDOT Standard Specifications for 3/8 inch aggregate pavement.

#### C. Curb

1. Vertical Granite Curb: Shall be 5-inches wide and 16 to 18 inches deep. Granite shall be hard, durable, reasonably uniform in appearance and color and free from weakening seams.
2. Slope Granite Curb: Shall be 6 to 8-inches wide and 12-inches deep. Granite shall be hard, durable, reasonably uniform in appearance and color and free from weakening seams.
3. Cement: Cement shall be straight Portland Cement, Type I, II, or a Type I/II.
4. Mortar Sand: Mortar sand shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>% Passing</u>
No. 8	100
No. 16	60-100
No. 50	15-35
No. 100	2-15
No. 200	0-5

#### D. Sidewalks

1. Bituminous Concrete: All bituminous sidewalks (base and wearing course) will be constructed with State of NH Sidewalk mix – Section 608, Table 1 – Composition of Mixtures.
2. Portland Cement Concrete: Portland cement reinforced concrete sidewalks shall be a minimum of 4-inch thickness (except at drives and curb ramps). Concrete shall be NHDOT Class A (3000 psi), with a maximum slump of 3-inches. Maximum aggregate size shall be 1-inch. Reinforcing shall be 6"x6" W2.9xW2.9 woven wire fabric.
3. Portland cement reinforced concrete sidewalks at drives and curb ramps shall be a minimum 6-inch thickness. Concrete shall be NHDOT Class AA (4000 psi), with a maximum slump of 3-inches. Maximum aggregate size shall be 1-inch. Reinforcing shall be 6"x6" W2.9xW2.9 woven wire fabric.
4. Detectable Warning Panels: Detectable Warning Panels shall be untreated cast iron. Dimensions and placement shall be as shown in the City of Concord's Construction Details.

#### E. Street Lights

1. Light poles shall be treated timber poles or tapered steel or aluminum. All poles shall demonstrate similar appearance and durability. All light poles, lights and their installation

## SECTION 3: STREETS/SIDEWALKS

shall meet the requirements of Unitil Energy Systems located at #1 McGuire Street, Concord, NH.

### F. Guardrail

1. Where guardrail or terminal units are required or shown on the approved plans, the items shall conform to Section 606 of the NHDOT Standard Specifications for Steel Beam Guard Rail. .
2. Posts shall be W6x8.5 shaped structural steel. Blockouts to be synthetic offset type, wood is not an acceptable offset block material.

### G. Signs

1. Street Signs: Street signs shall be fabricated and installed in accordance with the Manual on Uniform Traffic Control Devices. Street sign letters will be 6-inches tall on a 9-inch aluminum backing
2. Pedestrian and School Crossing Signs: Pedestrian and school crossing signs shall have a diamond grade florescent yellow-green background with black legend and border.
3. Sign Posts: Sign Posts shall be green enamel 2.5#/ft minimum flanged channel steel.

### H. Right-of-Way Bounds

1. Right-of-way bounds shall be reinforced concrete or granite and measure 4"x4"x36" minimum.

## **03. CONSTRUCTION REQUIREMENTS**

Unauthorized use of hydrants is strictly prohibited. Should a Contractor desire to use City water for dust control, sewer testing and flushing operations, etc. the City will furnish a temporary meter. A deposit is required and the Contractor will be charged for the water used. Only qualified City of Concord personnel are authorized to manipulate hydrants. Unauthorized usage of City water is subject to a minimum \$1,000.00 fine.

### A. Clearing and Grubbing

1. The entire width of disturbance between slope lines shall be cleared of all stumps, brush, roots, boulders, unstable material and trees not intended for preservation.

### B. Blasting Operations

1. Slopes: When blasting is required, the required slopes or configuration shown on the plans shall be produced in a safe and stable condition.
2. Authority to prohibit blasting: The City Engineer or representative shall at all times have the authority to prohibit or halt the Contractor's blasting operations if it is apparent that: through the methods being employed the required slopes are not being attained; or the safety or convenience of the public is being jeopardized.

3. A pre-blast survey, subject to Engineering Services review, will be required for all buildings within a 500-foot radius of the blast site. No blasting is to take place without an approved pre-blast survey.
4. Seismic monitoring for frequency and acceleration will be required should adjacent structures be threatened.
5. The Contractor shall also comply with the NHDOT Standard Specifications for Road and Bridge Construction - Section #203 and #211.

#### C. Unsuitable Material

1. Removal of unsuitable material: Where excavation to the designed elevation results in a subgrade or slope of clay, peat, muck or other unstable material, the Contractor shall remove the unstable material to the depth necessary to attain a solid foundation.

#### D. Backfilling

1. Backfilling shall be done with approved materials and shall meet the requirements for: sand, gravel, broken rock or any combination thereof.
2. Rock fragments in fill shall be placed in layers not in excess of 2 feet. The lifts shall be placed in such a manner as to close all voids. Earth shall be placed in layers to the full width of the roadway, generally parallel to the finish grade. The layers shall not exceed 12-inches of loose depth. Each layer shall be spread to a uniform thickness and compacted to the required density. Continuous grading or shaping shall be carried out concurrently with the compactive effort to assure uniform density throughout each layer of material.

#### E. Subbase Application

1. Prior to the placement of any road base material, all underground utility crossings shall be accomplished, with trenches properly compacted. Gravel and crushed gravel shall not be placed until an independent testing laboratory has performed density testing on the underlying material and the material has met the density specification. Gravel and crushed gravel shall be placed in lifts not to exceed 12-inches in depth. "Drive through dumping" of material shall not be allowed. It shall be shaped true to the grade and cross-section as shown on the typical section.
2. Compaction: Compacting of subgrade, gravel and or crushed gravel shall be accomplished with an approved vibratory roller. The materials shall be compacted and rolled until the density requirements are met. When vibratory equipment is being operated, the amplitude of vibrations may be adjusted as necessary to avoid causing damage to adjacent buildings and property.

#### F. Bituminous Concrete Pavement Application

1. Placement of base course: Placement of the base course shall be in close conformity with the lines and grades, thickness and typical cross-sections as shown on the approved plans. Where curbing is to be installed, the base course of pavement may be paved a maximum of two feet (2') narrower on each side to allow for the installation of the curb.

### SECTION 3: STREETS/SIDEWALKS

2. Placement of the final wearing course: Placement of the wearing course shall be in close conformity with the lines and finish grades as shown on the approved plans. It shall be applied on a previously placed base course. All manhole covers, catch basin grates and curbing shall be in place and set to the proper grade before the wearing course is applied.
3. Wearing course shall be 1/2" bituminous concrete. 3/8" wearing course may be permitted for thicknesses less than 1-1/2", hand work or with City of Concord Engineering approval
4. Environmental conditions: Mixtures shall be placed only when the underlying surface is dry, frost free, and the surface temperature is above 40 F for courses greater than or equal to 1-1/4" in compacted depth and above 50 F for courses less than 1-1/4" in compacted depth. Any material delivered to the spreader having a temperature lower than 250° Fahrenheit shall not be used. The Engineer may permit, in case of sudden rain, the placing of mixture then in transit from the plant, if laid on a base free from pools of water, provided motorist visibility is not impaired and all other specifications are met. No load shall be sent out so late in the day that spreading and compaction cannot be completed during the daylight. If rapid surface cooling of the laid down mix is occurring due to wind, the Engineer may suspend operations for the day.
5. Waiver of environmental conditions: In special instances when the City Engineer or representative determines that it is in the best interest of the City of Concord, the above requirements may be waived.
6. Thickness of pavement: Unless otherwise noted, thickness of pavement as shown on the approved plans and/or the Typical Roadway Section shall be the compacted thickness after rolling.
7. Removal of existing pavement: At the beginning and end of the project or project section, the existing pavement shall be removed to a sufficient depth to allow for the placing of the new pavement and construction of a transverse joint. The underlying course shall be clean and free of any foreign materials and loose bituminous patches and must present a dry and unyielding surface. Sawcutting or the use of a jackhammer is required before excavating pavement in the City right-of-way. The use of heavy equipment to "rip" pavement is not allowed.
8. Requirements for tack coat: A tack coat of emulsified asphalt shall be applied to all lifts of pavement immediately prior to placement unless waived by the City Engineer or representative. The rate of application shall be between 0.02 and 0.05 gal/SY, as determined by the City Engineer or representative. Prior to the application of the tack coat, the asphalt binder surface shall be cleaned to the satisfaction of the City Engineer or representative. The use of a street sweeper may be required depending on the cleanliness of the surface.
9. Removal of unsatisfactory material: If any imperfect places are found in any course, the Contractor shall remove the unsatisfactory material and replace it after coating the exposed edges with a suitable bituminous emulsion.
10. Requirements for cold planing at bituminous joints: Surfaces that are to be overlaid with new bituminous pavement will require cold planing at the overlay joint. The existing bituminous surface shall be removed by a planing or milling machine capable of removing the

bituminous pavement to the depth specified at the limits of the overlay, and to provide a smooth transition between the new and existing pavements.

11. Compaction: Compaction shall be completed in accordance with NHDOT specifications.

#### G. Bituminous Concrete Pavement Full Width Overlay

1. General Requirements: The Contractor shall provide a full width permanent pavement overlay following extensive trench excavations within a public way. The Contractor shall furnish all labor and materials to install the bituminous pavement overlay over the full width of the roadway curb-to-curb or shoulder-to-shoulder throughout the entire project limits at the depth specified by the City Engineer or representative. A leveling or shim course of pavement may be required by the City Engineer or representative, to produce a uniform roadway section.
2. Placement of the pavement overlay: All existing pavement areas and base course trench patched areas are to be brought to a smooth level grade with a hot bituminous leveling shim course. All manhole covers, catch basin frames, water and utility valve boxes and curbing shall be reset to grade prior to overlay placement. The entire area shall be swept and cleaned of all debris.

#### H. Bituminous Concrete Pavement Repair

1. Bituminous Concrete Pavement shall be replaced in-kind. Repairs shall be performed as shown on the City of Concord's Construction Details. Depths of pavement, crushed gravel and gravel will match the existing depths unless otherwise determined by the City Engineer or representative.

#### I. Portland Cement Concrete Pavement Repair

1. Portland Cement Concrete Pavement shall be replaced in-kind. Repairs shall be performed as shown in the City of Concord's Construction Details. Traffic will not be allowed to travel on the repair for a minimum 28 days or until the concrete has reached 4000 psi compressive strength.

#### J. Vertical Granite Curb

1. Vertical granite curbing shall be set with a 7-inch reveal above finish pavement. Tip downs at driveway locations shall be at least 7 feet in length. "Curved Curb" shall be used at all curbed roundings when the radius of the rounding is 30-feet or less.
2. Placement: Vertical granite curb is to be placed after the asphalt base course of pavement has been applied. Installation of curbing shall be so that the front line conforms to the line and grade required. Joints shall be pointed with Portland Cement mortar and the exposed portions finished with a jointer.
3. Backfilling: Backfilling shall be done immediately after the curb is set and jointed. Backfill shall be crushed gravel placed and thoroughly compacted on both sides (24" street side, 24" back side minimum, as measured from face of curb) of the curbing until the density

## SECTION 3: STREETS/SIDEWALKS

requirements are met with the use of a vibratory plate compactor or a “Jumping” jack compactor. The use of hand compaction (i.e., tamping) is not permitted.

4. Damaged or unsuitable curbing: Any curbing that is damaged or found unsuitable prior to finish pavement being applied shall be replaced with new curbing.

### K. Slope Granite Curb

1. Slope granite curb shall be placed at locations as noted on the plans with a 5-inch reveal above the finish pavement, 6-inch reveal along splitter and refuge islands. A transition piece of granite curb, 6-feet in length, shall be used between the sloped granite curb and the vertical granite curb. Radial joints shall be used at all curbed roundings when the radius is less than 16'. Curved curb shall be used at all curbed roundings with the radius is 2- feet or less. Solid curved granite slope curb noses shall be used for all islands.
2. Placement: Slope granite curb is to be placed after the asphalt base course of pavement has been applied. Installation of curbing shall be so that the front line conforms to the line and grade required. Joints shall be pointed with Portland Cement mortar and the exposed portions finished with a jointer.
3. Backfilling: Backfilling shall be done immediately after the curb is set and jointed. Backfill shall be crushed gravel placed and thoroughly compacted on both sides (24” street side, 24” back side minimum, as measured from the face of curb) of the curbing until the density requirements are met with the use of a vibratory plate compactor or a “Jumping” jack compactor. The use of hand compaction (i.e., tamping) is not permitted.
4. Damaged or unsuitable curbing: Any curbing that is damaged or found unsuitable prior to finish pavement being applied shall be replaced with new curbing.

### L. Mortar

1. Mortar shall consist of two parts mortar sand to one part Portland Cement. To obtain the proper ratio, one bag of Type I or Type II Portland Cement should be mixed with two-five gallon buckets of mortar sand. The mix shall be thoroughly blended only in such quantity as may be required for immediate use, and shall be used before the initial set has taken place. The mix shall be constantly worked over with hoe or shovel to keep it workable. Adding water after mixing to bring a hardened mix "back to life" will not be allowed.

### M. Sidewalks

1. Sidewalk: Sidewalks within the public right-of-way shall comply to the most recently adopted State of New Hampshire Code for Barrier Free Design and the most recent guidance in the Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG) provided by the U.S. Access Board. Sidewalks shall be a minimum of 5-feet in width, exclusive of any curb, and shall have a maximum transverse slope of 2%, sloping towards the street, driveway or parking area. All measurements shall be taken from the top of the granite curbing.
2. Curb Ramps: 6” reinforced concrete sidewalk with detectable warning panels shall be constructed at all intersections and at commercial driveways which are provided with traffic

control devices or otherwise are permitted to operate like public streets. Curb ramps shall comply to the most recently adopted guidance provided by the U.S. Access Board for Public Rights-of-Way.

3. Preparation of the base: Preparation of the base shall be accomplished by removing material to the minimum depth required below finished grade based on surface treatment. Any unsuitable material found will be removed and replaced with crushed gravel as directed.
4. Crushed Gravel: All sidewalks shall be founded on 6-inches (minimum) crushed gravel
5. Compaction: Prior to the placement of pavement or concrete, the crushed gravel subbase shall be thoroughly compacted with the use of a roller until the density requirements are met.

#### N. Bituminous Concrete Pavement Sidewalk

1. Placement: Pavement shall be a minimum 3" total thickness placed using a sidewalk or street paver in two lifts (1-1/2" base course, 1-1/2" wearing course).

#### O. Portland Cement Concrete Sidewalk

1. Placement: Before placing the concrete, all foreign materials shall be removed from the base. All forms shall be thoroughly cleaned, secured in position and coated with a form-release agent. Concrete shall be placed, struck off, consolidated, and finished to plan grade with a mechanical machine, vibrating screed or by hand finishing methods when approved.
2. Finishing: After concrete has been struck off and consolidated, a bull-float may be used to remove any high or low spots. The final finish shall be made with a clean fine bristled broom, lightly applied in an alternating grid pattern.
3. Curing: During curing, concrete shall be protected from loss of moisture, rapid temperature change and mechanical injury for a minimum of 7 days following the placement. Foot traffic will be allowed after 3 days, but the concrete must still be protected from moisture loss and rapid temperature change for the full 7 days. Following the curing period, an approved concrete sealer shall be applied at the rate recommended by the manufacturer.
4. Joints: Joint pattern shall be detailed on the construction plans and shall not be altered without prior approval of the City Engineer or representative. Control or contraction joints shall be formed by sawing or by use of a pre-molded filler and shall be a minimum depth of one-fourth the slab thickness. Sawing shall begin when the concrete has hardened sufficiently to permit sawing without excessive raveling. Joints shall be continuous across the slab, be 5/16" inch to 1/4 inch in width and be completed before uncontrolled shrinkage cracks have occurred.

#### P. Guardrail

1. Placement: Guardrail shall be installed in accordance with Section 606 of the NHDOT standard specifications and NHDOT highway details.

## SECTION 3: STREETS/SIDEWALKS

### Q. Street Signs

1. For new streets the Contractor shall be required to provide City street name and traffic control signs. All street, warning, regulatory, etc. signs shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD).

### R. Right-of-Way Bounds

1. Right-of-Way bounds shall be set by a licensed Land Surveyor and 5/8" to 1" above the ground in residential areas, 4" to 6" above ground in wooded areas and slightly below grade when set in pavement. The bounds shall be set vertical. The surrounding soil shall be thoroughly compacted so that the bound will not move when struck.

## **04. INSPECTION REQUIREMENTS**

The Contractor, Developer, Owner shall be responsible for all costs incurred during required testing and will be billed for all inspections and testing performed by City forces.

## **05. TESTING REQUIREMENTS**

The City Engineer or representative reserves the right to request testing of any material from an independent testing company at any time to ensure that the desired specifications have been met. All testing required by the City Engineer or representative shall be completed by a qualified testing agency at the Contractor's, Developer's, Owner's expense. Submittal of the testing agency's qualifications may be required.

### A. Density testing

1. Testing Standards: Regardless of the application, the density of the subgrade material, gravel, and or crushed gravel shall be determined by AASHTO T191 (Sand Cone Method), or AASHTO T238 and T239 (Nuclear Methods). The density shall be not less than 95-percent (95%) of the minimum density determined in accordance with AASHTO T180 (Modified Proctor Density), and performed at a maximum of 100 feet between tests. Nuclear density methods will be governed by ASTM D2922.
2. Testing Frequency: As a minimum, density testing shall be performed prior to placement of any pavement. All test results shall be submitted to the City Engineer or representative AT LEAST 24-HOURS IN ADVANCE OF THE PAVING OPERATIONS.

### B. Contaminated material

Previously tested and accepted materials contaminated by earthen, organic or other foreign material or degraded by hauling equipment to such an extent that the material ceases to meet the requirements, shall be removed and replaced.

## SECTION 4: SANITARY SEWER SYSTEMS

### 01. DESCRIPTION

This work shall consist of furnishing and installing, or removing and relaying, pipes, structures and appurtenances at the locations shown or ordered, including the necessary joints, fittings, and connections as required.

### 02. MATERIALS

#### A. Storage and Handling of Materials

1. Preventing damage: All materials shall be handled in a manner to prevent warping, twisting, bending, breaking, chipping, rusting or any damage whatsoever. Pipe and structures shall be lifted and moved with the appropriate apparatus without being pushed, pulled or rolled by equipment.
2. Handling and storage of masonry products: Brick, block and similar masonry products shall be handled and stored in a manner to reduce breakage, chipping, cracking and spalling. Cement shall be stored under cover, off the ground, and shall be kept completely dry at all times.
3. Damaged materials: All materials that have become so damaged as to be unfit for the intended use shall be promptly removed from the work site.

#### B. Gravity Sewer Mains

1. Polyvinyl Chloride (PVC) pipe
  - a. Pipe for 4-inches through 15-inches shall meet or exceed ASTM D3034. Sizes greater than 15-inches shall meet or exceed ASTM F679.
  - b. Pipe is to be gasketed SDR-35 green sewer pipe with a resin compound meeting or exceeding ASTM D1784.
  - c. Gaskets shall be oil resistant rubber or flexible elastomeric seals meeting or exceeding ASTM F477.
  - d. Integral bell joints are to meet or exceed ASTM D3212.
2. Reinforced concrete pipe (RCP)
  - a. Pipe shall be a minimum class IV 3000D and meet or exceed ASTM C76.
  - b. Joints are to be gasketed meeting or exceeding ASTM C443.
  - c. Pipe markings to be clear and meet or exceed ASTM C76.

## SECTION 4: SANITARY SEWER SYSTEMS

- d. Pipe interior shall comprise a smooth, continuous concrete skin free from any irregularities.

### 3. Ductile iron (DI) pipe

- a. Ductile iron pipe shall be 4-inches or greater meeting or exceeding AWWA C150 and AWWA C151 with a pressure class of 350 or a minimum thickness class of 50.
- b. Push on joints shall meet or exceed AWWA C111.
- c. Double cement lining shall be provided meeting or exceeding AWWA-C104.
- d. An asphaltic coating shall be applied to both the outside and inside of pipe. Outside coating shall meet or exceed AWWA C151 and inside coating to meet or exceed AWWA C104.

## C. Gravity Sewer Service Laterals

### 1. Polyvinyl Chloride (PVC) pipe:

- a. Pipe for 4-inches through 15-inches shall meet or exceed ASTM D3034. Sizes greater than 15-inches to meet or exceed ASTM F679.
- b. Pipe is to be gasketed SDR-35 or SDR-26 green sewer pipe with a resin compound meeting or exceeding ASTM D1784.
- c. Gaskets shall be oil resistant rubber or flexible elastomeric seals meeting or exceeding ASTM F477.
- d. Integral bell joints are to meet or exceed ASTM D3212.

### 2. Ductile Iron Pipe:

- a. Ductile iron pipe shall be 4-inches or greater meeting or exceeding AWWA C150 and AWWA C151 with a pressure class of 350 or a minimum thickness class of 50.
- b. Push on joints shall meet or exceed AWWA C111.
- c. Double cement lining shall be provided meeting or exceeding AWWA-C104.
- d. An asphaltic coating shall be applied to both the outside and inside of pipe. Outside coating shall meet or exceed AWWA C151 and inside coating to meet or exceed AWWA C104.

## D. Force Main Sewer:

### 1. Ductile Iron Pipe

- a. Ductile Iron Pipe will have a diameter of 4-inches or greater with a thickness class of 52. Pipe shall meet or exceed current AWWA C151 specifications for ductile iron water pipe.

- b. Double cement inside lining shall meet or exceed AWWA C104.
- c. An asphaltic coating shall be applied to both the outside and inside of pipe. Outside coating shall meet or exceed AWWA C151 and inside coating to meet or exceed AWWA C104.
- d. Push-on joints shall conform to current AWWA C111.
- e. Maximum length shall be twenty and a half feet (20.5').

2. Polyvinyl Chloride (PVC) Pipe - (C900 PVC)

- a. Pipe shall be a minimum of 4-inches and shall meet or exceed specifications of AWWA C900.
- b. Pipe will be a minimum SDR-25 with a minimum pressure rating of 165 psi.
- c. Resin compound shall meet or exceed ASTM D1784 with a cell class of 12454.
- d. Gaskets shall be oil resistant rubber or flexible elastomeric seals meeting or exceeding ASTM F477.
- e. Integral bell joints are to meet or exceed ASTM D3139.

E. Pressure Sewer Services:

1. Polyvinyl Chloride (PVC) pressure pipe:

- a. Pipe shall be a minimum of 1-1/2-inches meeting or exceeding ASTM D2241.
- b. Pipe will be a minimum SDR-26 with a minimum pressure rating of 160 psi.
- c. Resin compound shall meet or exceed ASTM D1784 with a cell class of 12454.
- d. Gaskets shall be oil resistant rubber or flexible elastomeric seals meeting or exceeding ASTM F477.
- e. Integral bell joints are to meet or exceed ASTM D3139.

2. High Density Polyethylene (HDPE) Tubing

- a. Piping and appurtenances shall meet or exceed the requirements of current ANSI/AWWA C901 or C906.
- b. Pipe shall be iron pipe size (IPS) and colored green per APWA color designations.
- c. Pipe will be a minimum of 1-1/2-inches meeting or exceeding ASTM D3035.
- d. Pipe will be a minimum SDR-13.5 with a minimum pressure rating of 160 psi.

## SECTION 4: SANITARY SEWER SYSTEMS

- e. Pipe shall meet or exceed current requirements of ASTM D3350. Constructed with a resin of PE 4710 and have a cell classification of PE 445574E.
- f. Markings per AWWA C901 shall be applied on pipe in intervals not more than 5 feet.

### F. Tracer Wire

1. Tracer wire shall be 12 AWG high strength solid core copper clad steel with a minimum break load of 250lbs. Coating shall be minimum 30 mil HDPE or HMWPE colored per APWA color designation. THHN coating material will not be allowed.
2. Ground rods shall be 18-inch long, 1.5 lb drive in magnesium anode ground rods. Copperhead ANO-12 or approved equal. Ground wire shall be a minimum 12 AWG solid core copper clad steel. Coating shall be minimum 30 mil HDPE or HMWPE colored red.
3. Wire connectors shall be moisture/corrosion displacement connectors and rated for direct bury.

### G. Fittings

1. Ductile and gray iron Fittings shall meet or exceed current AWWA C110 or AWWA C153 for compact fittings and carry the same inside and outside coatings and linings as the pipe.
2. Polyvinyl chloride (PVC) gravity fittings shall meet or exceed ASTM F1336 for gasketed fittings and be constructed of, and meet the same specifications for material, gasket and joints as the pipe.
3. Polyvinyl chloride (PVC) force main and pressure sewer fittings shall be gasketed fittings and be constructed of, and meet the same specifications for material, gasket and joints as the pipe.

### H. Repair Couplings

1. Rigid wrap-around stainless steel and PVC repair couplings or ductile iron couplings will be allowed on mainline repairs. The use of Fernco (or approved equal) couplings may be used when field conditions do not allow for other types of couplings. The use of Fernco (or approved equal) couplings must be approved by the City Engineer or representative.

### I. Main and Service Lining

1. Lining materials shall meet the requirements as outlined in the current Cured-in-Place Pipe General Specifications as prepared by the National Association of Sewer Service Companies (nassco.org).
2. Poly Vinyl Chloride (PVC): Poly Vinyl Chloride (PVC) as used for folded and formed methods. The PVC Alloy pipeliner will be manufactured from PVC Alloy compound, containing no fillers, and meet or exceed the following installation performance requirements: The pipeliner shall be capable of expanding without splitting or rupturing. After being expanded by Blow-Molding, the installed pipeliner will match the configuration of the host pipe.

3. Cured-in-Place (CIPP): Cured in Place Pipe (CIPP) Resin impregnated felt, as used for cured in place methods. Tube Method - The sewn tube shall consist of one or more layers of absorbent non-woven felt fabric and meet requirements of ASTM F1216. The tube shall be constructed to withstand inversion pressures, have sufficient strength to bridge a missing pipe, stretch to fit irregular pipe sections, and shall invert smoothly around bends. The resin shall be a corrosion resistant polyester, vinyl ester, or epoxy and catalyst that when properly cured within the tube composite meets the requirements of ASTM F1216.

#### J. Manholes and Appurtenances

1. Standard sanitary manholes: Manholes will be of precast concrete construction; precast concrete barrel sections and precast manhole bases shall conform to ASTM Designation C478. The wall thickness shall not be less than 5 inches for 48 inch inside diameter structures, or 6-inches for 60-inch and 7-inches for 72-inch inside diameter barrel sections. Lift holes are to be sealed with Portland cement mortar flush to the outside structure wall prior to backfilling.
2. All precast sections and bases shall be coated on the exterior with a bituminous damp-proofing coating.
3. Reinforcing steel shall conform to the requirements of NHDOT 544. Fibers shall only be used in structures with 4 feet or less inside diameter and shall be as shown on the NHDOT Qualified Products List.
4. Concentric or eccentric cone sections with 30-inch openings are required, except where the cover over the top of the pipe is less than 4-feet for 48-inch diameter manholes, or 7-feet for 60-inch and 72-inch diameter manholes, in which case, precast concrete top slabs designed for H-20 loading may be allowed.
5. The use of water plug is permitted for special applications where the City Engineer or representative deems appropriate.
6. Frames and Covers: Only North American castings are allowed.. All castings shall be designed for H-20 Loading. Covers shall have the word "SEWER" in 3 inch letters cast into the top surface.
7. Masonry Brick: Brick shall be solid, sound, hard, and have plain or smooth surfaces on both ends and on the face side, and be satisfactory to the City Engineer or representative. Brick shall comply with A.S.T.M. Standard Specifications for Sewer Brick, Designation C32, for Grade SS, Hard Red Brick. Brick samples will be required for approval prior to incorporation in the work.
8. Cement: Cement shall be straight Portland Cement, Type I, II, or a Type I/II. Lime mortar or Masonry cement is not to be used on structures.

SECTION 4: SANITARY SEWER SYSTEMS

9. Mortar Sand: Mortar sand shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>% Passing</u>
No. 8	100
No. 16	60-100
No. 50	15-35
No. 100	2-15
No. 200	0-5

K. Exterior Grease Interceptors

1. Tanks shall be made of durable corrosion resistant materials, designed to handle H-20 loading, and have a waterproofed exterior coating.
2. Manhole frames and covers shall be installed in accordance with City standards for sewer manholes.
3. All pipe and fittings shall be SDR 35 and be installed in accordance with City standards.
4. All additional materials (fasteners, brackets, etc.) required for installation shall be corrosion resistant.

L. Sand Bedding / Blanket

1. Sand bedding and blanket material required for the installation of the sewer mains, services and appurtenances shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>% Passing</u>
1/2 Inch	100
No. 200*	0-12

\*Fraction passing the #4 sieve

M. Crushed Stone Bedding

1. Crushed stone shall be 3/4 inch (ASTM #67) stone and meet the following gradation requirements:

<u>Sieve Size</u>	<u>% Passing</u>
1"	100
3/4"	90-100
3/8"	20-55
#4	0-10
#8	0-5

**03. CONSTRUCTION REQUIREMENTS**

A. General

1. Unauthorized use of hydrants is strictly prohibited. Should a Contractor desire to use City water for dust control, sewer testing and flushing operations, etc. the City will furnish a temporary meter. A deposit is required and the Contractor will be charged for the water used. Only qualified City of Concord personnel are authorized to manipulate hydrants. Unauthorized usage of City water is subject to a minimum \$1,000.00 fine.

#### B. Laying Sewer Pipe

1. In accordance with NHDES rules, mains are defined as any sewer pipe which connects two manholes. A gravity sewer may be smaller than 8 inches in nominal diameter only if the sewer:
  - a. Is wholly contained within private property;
  - b. Is constructed on a dead-end or cul-de-sac street;
  - c. Serves, or is planned to serve, no more than 10 residences;
  - d. Has a total estimated flow no greater than 2,000 gpd; and
  - e. Has a nominal diameter of 6 inches and a minimum slope of 0.01 feet per foot.
2. State regulations require water mains to be separated from sanitary sewer mains by a minimum of 10-feet (horizontally)
3. In accordance with the 2009 IPC, water service pipe and the sewer service shall be separated by 5' of undisturbed or compacted earth, except as follows.
  - a. The required separation distance shall not apply where the bottom of the water service pipe within 5 feet of the sewer service is a minimum of 12 inches above the top of the highest point of the sewer pipe.
  - b. Water service pipe is permitted to be located in the same trench with the sewer service, provided the sewer is constructed with listed force main sewer materials.
  - c. The required separation distance shall not apply where a water service pipe crosses a sewer pipe, provided that water service pipe is sleeved to at least 5 feet horizontally from the sewer pipe centerline on both sides of such crossing.
4. Should construction operations reveal or expose a water main running under, approximately parallel to (less than 10-feet from a proposed sewer installation), and where it is not practical to relocate the sewer, the sewer shall be reconstructed with listed force main sewer materials until the minimum 10-foot separation can be achieved.
5. Whenever sewers (mains or services) must cross over water mains or where the vertical separation of the sewer main and water main is less than 18 in., the sewer or water shall be relocated; if the sewer or water cannot be relocated, the sewer shall be constructed with listed force main sewer materials for a minimum distance of 9 feet each side of the crossing.
6. In conflicts requiring the relocation of utilities, preference shall be given:

## SECTION 4: SANITARY SEWER SYSTEMS

- a. To utilities with grade restrictions.
  - b. To existing utilities already in service.
7. Should any pipe line be found unsatisfactory due to nonconformance to line or grade requirements or due to conflicts with other utilities and an adjustment in place will not correct the situation thus requiring the pipe to be physically removed; then the pipe may not be considered for reuse unless inspected and approved by the City Engineer or representative.
  8. Pipe and pipe fittings between manholes are to be of the same size, material and manufacturer unless otherwise specified by the City Engineer or representative.
  9. Solvent fittings are not permitted for any type of sewer construction
  10. All pipe utilizing Bell and Spigot joints shall be laid with the spigot end downstream. Bells will not be permitted in structures.
  11. Green "sewer" warning tape shall be installed in the sewer trench twelve (12) inches above the utility.
  12. Tracer wire shall be installed in conjunction with any force main or pressure sewers not constructed with ductile iron material.
  13. Sewer service lateral sizing shall be as follows:
    - a. Single residential unit = 4-inch minimum.
    - b. Commercial, Industrial or multifamily = 6-inch minimum.
  14. Sewer service laterals shall be constructed with the following minimum slopes, yet not to exceed a 10% slope:
    - a. 4 inch service = 1/4 inch per foot = 2%
    - b. 6 inch service = 1/8 inch per foot = 1%
  15. Each individual unit will have its own service connection and shall be accompanied by its own individual cleanout.
  16. Whenever feasible, all service connections shall be tied into a sanitary sewer manhole, if this is not feasible or impractical, as determined by the City Engineer, then sanitary sewer service connections shall be accomplished by using an approved sanitary tee fitting.
  17. Service laterals shall outlet into manholes at the top of the brick shelf. Where grades prohibit such a connection, service laterals shall connect to the manhole 2" above the inlet of the main where it enters the manhole. Refer to the City of Concord's Construction Details for additional information.

18. Should an existing sanitary sewer service lateral need to be replaced, it shall conform to the standards described here within.
19. An eccentric fitting shall be used when connecting dissimilar size services (small to large) to ensure that the flow line of the service is continuous and uninterrupted.
20. Service laterals greater than six (6) inches in diameter must terminate in a sanitary sewer manhole.
21. Ninety degree (90°) bends are not permitted for sanitary sewer service connections.
22. Where plumbing fixtures are installed on a floor with a finished floor elevation below the elevation of the street, such fixtures shall be protected by a backwater valve installed in the building drain, or horizontal branch serving such fixtures.
23. Sewer service laterals shall be designed for a minimum of four (4) feet of cover at the building foundation. Insulation will be required should the sanitary sewer lateral be less than the required four feet deep. Under no circumstances will the use of insulation be permitted without the authorization of the City Engineer or representative.
24. No trench shall be left open at the end of the workday. Contractor shall take all the necessary precautions to “button-up” the work zone for the general public during the night. Precautions include but not limited to, placing steel plates over the trench, barricades, lighting, signs, etc. Contractor shall contact the City Engineer or representative before leaving the site at the end of the day, to ensure that work zone has been adequately closed up for the safety of the public.
25. Driveways should be avoided when determining the path of the service lateral.

#### C. Installing Sewer Manholes

1. Sewer manholes are required at every change in vertical grade, horizontal pipe alignment, pipe size change, and every 300’.
2. Sewer manholes shall be installed at the end of all dead end mains.
3. A 60-inch minimum inside diameter manhole will be required; if more than 4 service laterals are proposed for one manhole.
4. For new installations, a 60-inch minimum inside diameter manhole will be required if there is one or more 8-inch or larger internal drop pipe(s). If an existing 48-inch diameter manhole has no drop connections, a single 8-inch internal drop may be allowed by the City Engineer or representative. Inside drop service connection details must be submitted to the Engineering Services Division for approval prior to construction.
5. The use of sanitary sewer “doghouses” are not permitted unless approval has been granted by the City Engineer or representative.
6. The concentric or eccentric cone should line up over the downstream invert or turned so as not to be in the vehicular wheel path, bicycle shoulder, or sidewalk.

## SECTION 4: SANITARY SEWER SYSTEMS

### D. Cleanouts:

1. Cleanouts shall be constructed on 4 and 6 inch service laterals as directed by the City's inspector and shall be located as follows:
  - a. Cleanouts shall be the same diameter as the carrying pipe.
  - b. A 6" cleanout shall be installed if and where a service transitions from 4" to 6".
  - c. One cleanout shall be installed just upstream of any horizontal and/or vertical change in direction greater than 45°. Only one cleanout is necessary when two 45° bends are used to make up a 90° turn. A minimum of 2-feet of exposed pipe is required between bends. A cleanout is not required if the change in direction occurs within 25' of the building if there is a cleanout inside the building.
  - d. If a service changes direction more than once, a cleanout will be required 5' from the right-of-way for every two elbows regardless of the angle of change. (i.e. 1-22.5° & 1-45° requires one cleanout).
  - e. Cleanouts will be constructed using wyes (either 4x4x4 or 6x6x6 inch) and incorporating a 45° elbow to bring the stack vertical.
  - f. A cast iron cleanout box with cover marked "SEWER" is required over 4" & 6" sewer service cleanouts.
  - g. Cleanouts will be required at or near the property line for testing purposes should the installation not be completed to a building or a manhole.
  - h. Cleanouts shall be located outside of the City of Concord's right of way, typically 5' from the backside of sidewalk or property line.
  - i. Cleanouts shall be located one per 100' with no greater than 100-foot separation unless otherwise directed by the International Plumbing Code.

### E. Exterior Grease Interceptors

1. General Requirements
  - a. Per City Ordinance 9-6-14 (c) Excessive Discharge Prohibited, effluent concentrations into the sewer system of fats, waxes, grease, or oils shall not exceed 100mg/L.
  - b. Exterior grease interceptors are required for any dwelling where food handling and preparation is undertaken for any business purpose. Exterior grease interceptors will not be required if the City determines sufficient grease collection is available inside the facility.
  - c. Sanitary waste shall not flow to grease interceptors.

## 2. Design Requirements

- a. Grease interceptor tanks shall be sized per the Uniform Plumbing Code, most recent edition. Tanks shall be designed and tested per ASTM C1613-10 except as noted below.
- b. The minimum tank size shall be 1,000 gallons and have a minimum hydraulic detention time or 36 hours. All tanks must have at least two chambers separated by a baffle that prevent solids and grease moving between chambers. The baffle must extend to the floor of the tank. Multiple tanks can be used in place of a single tank with chambers.
- c. Inlet pipes shall extend down into the tank, and terminate a distance equal to 50% of the maximum water depth from the bottom of the tank. Outlet pipes shall extend down into the tank, and terminate a distance equal to 25% of the maximum water depth from the bottom of the tank. The centerline of the baffle orifice shall be located a distance equal to 50% of the maximum water depth from the bottom of the tank. Inlet and outlet pipe risers shall extend to the top of the interceptor tank and be accessible through a manhole.
- d. Cleanouts shall be provided upstream of the interceptor and within 10' of the downstream end of the interceptor. Cleanouts shall comply with City of standards for sewer service laterals.

## 3. Maintenance

- a. Interceptors shall be cleaned when 25% of the liquid level of the interceptor is grease or oil. At a minimum, interceptors shall be cleaned quarterly. More frequent cleanings should be scheduled when the rate of grease production is high.

## F. Excavation

1. Excavation shall be accomplished by methods that preserve the undisturbed state of the subgrade soils. A trench may be excavated by machinery to the designated subgrade, provided that the bottom of the trench remains in the undisturbed state and provides the proper foundation for the pipe bedding. Equipment may have to be modified by welding a blade to the bucket teeth to achieve the required shape to fit the lower 1/3 of the pipe exterior for pipe 36" in diameter and larger.

## G. Crushed Stone Bedding

1. Contractor shall place 3/4" crushed stone (ASTM #67); for bedding, to the haunch of the pipe and a minimum 6" beneath the pipe throughout the bottom of the excavated trench. PVC sanitary sewers and laterals shall be installed in accordance with ASTM D2321. The pipe bedding shall be stable prior to pipe installation.

## H. Mortar

1. Mortar shall consist of two parts mortar sand to one part Portland Cement. To obtain the proper ratio, one 94 pound bag of Type I or Type II Portland Cement should be mixed with two-five gallon buckets of mortar sand. The mix shall be thoroughly blended only in such quantity as may be required for immediate use, and shall be used before the initial set has

## SECTION 4: SANITARY SEWER SYSTEMS

taken place. The mix shall be constantly worked over with hoe or shovel to keep it workable. Adding water after mixing to bring a hardened mix "back to life" will not be allowed.

### I. Brick Masonry and Casting Adjustments

1. Brick masonry shall be protected from too rapid drying by approved means and shall be protected from weather and frost, as required. Bricks shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling. Joints between bricks shall not exceed 3/8 inch and shall be tooled flush to the brick surface.
2. Brick masonry during winter conditions must be protected from freezing. A suitable heated shelter will be required to assure all materials remain above freezing for 3 days.
3. All brickwork used to adjust manhole and catch basin frames to grade shall be sealed on the outside of the structure with mortar.
4. Frames shall be centered over the manhole opening and are to be set no less than 1/8-inch lower than finish pavement. A minimum of 2 courses of brick are required under the structure frame, yet the adjusting course shall not exceed approximately one foot of brick - (normally 5 course maximum). The final course of brick may be laid on edge. Brick and mortar is the only masonry material to be used between the precast structure and the cast iron frame. The use of barrel blocks and concrete grade rings is not permitted.
5. All brickwork used to adjust manholes and catch basins to grade shall be laid in a header course pattern - (end showing) as opposed to a batter course - (edge showing).
6. Masonry Repairs: All work on existing facilities shall be performed by or under the direction of City forces. Only sound masonry materials shall be incorporated into the work, and any necessary repairs must first be approved by the City Engineer or representative, and observed prior to backfilling.

### J. Inverts

1. Manhole inverts shall be constructed to provide an uninterrupted flow channel and shall correspond in shape to the lower half of the pipe. Brick shall be laid on edge.
2. Mortar joints shall be tooled flush to the face of the brick to prevent minor depressions. Shelves shall be constructed to the midpoint of the pipe size ranging from 8-inches to 15-inches and to the highest pipe crown on larger pipe diameters. The brick shelf shall be pitched to drain toward the through channel with one inch of difference from the structure wall to the channel edge. Puddles or undue turbulence through the manhole trough will necessitate reconstruction.
3. The use of fiberglass inverts may be allowed per the authorization of the City Engineer. The Contractor shall submit the manufacturer's shop drawings and other pertinent information as needed to the City Engineer or representative for review and approval.
4. Only solid masonry construction will be accepted under the brick shelf.

## K. Discontinued Services

1. A Contractor installing a new or larger sewer service shall be responsible for properly discontinuing the abandoned service connections. The Contractor shall not disconnect any service connections without the proper authorization from Engineering Services.
2. Discontinued service connections shall be retired at the right-of-way and manhole, as applicable.
  - a. The service shall be cut at the right-of-way and plugged with brick and mortar or a flexible cap secured with a stainless steel strap and hardware.
  - b. If the service is connected to a manhole, the pipe shall be cut flush with the face of the manhole and plugged with brick and mortar, a flexible cap secured with a stainless steel strap and hardware, or a gripper/wing nut plug with stainless hardware
  - c. If determined by the Engineering Services Division that a service connected to a manhole is to be discontinued and may be reused in future development the service may be sealed inside the manhole as it exists. The service is to be sealed with a flexible cap secured with a stainless steel strap and hardware or a gripper/wing nut plug with stainless hardware.
3. Discontinued or dry laterals intended to be connected to or reused for new construction will be subject to a complete video inspection to assure all parts of the lateral conform to current City Standards and to assure structural and hydraulic integrity of the lateral. Owner or contractor will be responsible for replacement of lateral if any deficiencies are identified by the Engineering Services Division.

## L. Main and Service Lining

1. Pre Video Camera Inspections: All pipelines shall be subject to the scrutiny of a video inspection, as outlined below, prior to rehabilitation and acceptance to assure flow characteristics. All pipelines shall be cleaned of all debris prior to the video camera inspection, the presence of debris will necessitate re-inspection following correction.
2. Piggyback Connections: Where possible, all piggyback connections should be eliminated. If it physically cannot be eliminated, it shall be the Contractor's responsibility to re-instate any piggyback connection located within the lined pipeline by using a remote controlled cutting device method or excavating at location to make a point repair to the piggyback connection.
3. Cleanout Connection: It shall be the Contractor's responsibility to maintain and reinstate all existing cleanout connections to service lines.
4. Limits of Service Lining: Services shall be lined full length from the building to the main at the Owner's expense.

## M. Privately Owned Force Mains/Pressure Sewers

1. A license is required from the City Council to install any force main or pressure sewer in a municipally controlled right-of-way.

## **04. INSPECTION REQUIREMENTS**

The Engineering Services Division's representative shall perform full time inspections to assure that all sanitary sewer work conforms to City standards. The Contractor, Developer, Owner shall be responsible for all costs incurred during the required testing and will be billed for all inspections and testing performed by the City.

### **A. Visual Inspections**

1. Visual inspections are normally required to confirm the hydraulic integrity of sanitary sewer systems. Pipelines are required to be true to alignment and at a uniform slope between structures. "Ponding" based on City of Concord limits of sag detail or deviations in alignment will be cause for rejection. The Engineering Services Division shall determine if the ponding or deviations in alignment are cause for rejection.

### **B. Video Inspection**

1. All pipelines will be subject to the scrutiny of a video inspection prior to acceptance to assure proper jointing and flow characteristics. The Engineering Services Division shall determine if the ponding or deviations in alignment are cause for rejection. All video inspections shall be performed by the City of Concord General Services Department, unless otherwise determined by the City Engineer or representative.
2. Camera inspections will not be scheduled until construction of other utilities in the same area are completed and the pipeline under consideration has been backfilled and compacted to subgrade elevation for at least thirty days prior to the scheduled inspection. The Contractor shall contact General Services to schedule the inspection.
3. Cleaning of sewer mains and services, equipment, inspection and data reporting shall be done in accordance with the Pipeline Assessment and Certification Program (PACP).
4. All structures are to be accessible to the video inspection vehicle and all pipelines shall be cleaned of all debris by the contractor prior to General Services arrival for the inspection. The presence of debris or insufficient flushing water will necessitate re-inspection following correction. Any debris in the pipe shall be removed at the next structure and will not be allowed to continue downstream in the system.
5. Video camera inspections will be performed after flushing the sanitary sewer main or lateral with water containing a visible dye and allowed to drain. Excessive ponding or alignment deviation deemed by the City Engineer or representative is cause for rejection.
6. Only tractor-type units will be utilized for mainline inspections, push cameras will only be allowed for lateral inspections.
7. The camera shall have pan and tilt capabilities.
8. The camera shall be approved by the manufacturer for the pipe size being inspected (typical camera is rated for 8"-24", without additional accessories).

9. Optional: The camera should be equipped with an inclinometer (these only show the general trend of the pipe slope, not to be viewed alone as acceptance criteria).
10. The camera footage shall be shown on-screen.
11. The beginning of the inspection shall consist of a title screen that indicates the following information; date, time, location, company doing the inspection, contractor that laid the pipe, type of structure, pipe size and material, and if manhole numbers or line segments are not specifically labeled on the approved plans; than station numbers complete with right or left offsets shall be used to identify line segments.
12. When a lateral line is encountered during the inspection; the camera operator shall stop the camera unit and, using the pan and tilt function, inspect the lateral opening to the best of the camera's ability (dye should be introduced into the lateral, if feasible, to view flow characteristics).
13. When a questionable pipe joint is encountered during the inspection; the camera operator shall stop the camera unit and using the pan and tilt function, inspect the joint to the best of the camera's ability. (Operator should also traverse the joint with the camera unit to observe the amount of drop/rise the camera experiences over questionable joints).
14. When a sag is encountered during the inspection; the camera operator shall record the beginning and end of said sag, if of questionable depth, then the operator shall drag a 1/2" tall non-buoyant object through the sag with the camera unit to observe and record actual depth.
15. All defects observed shall be logged into some sort of data management software (PACP compliant) and compiled into a video report to be submitted with the video inspection.
16. All video inspection submittals shall be in digital format on a flash drive, DVD, or as otherwise approved by the Engineering Services Division.
17. Any submittal not meeting these requirements will be rejected.
18. All costs associated with the video inspection shall be the responsibility of the Contractor, Developer, and/or Owner unless otherwise determined by the City Engineer. Contact the General Services Department for the current fee schedule.

#### C. Video Inspection of Cured In-Place Pipe Liner (CIPP)

1. All pipelines shall be subject to the scrutiny of a video inspection prior to acceptance to assure flow characteristics. All pipelines shall be cleaned of all debris prior to the video camera inspection, the presence of debris will necessitate re-inspection following correction.
2. The lining of a service will require cleaning and video of the receiving main to ensure that the liner does not extend into the main.
3. The beginning of the inspection shall consist of a title screen that indicates the following information; date, time, location, company doing the inspection. The camera footage shall be shown on-screen, also the unit should be able to provide accurate footage, (1'±) and all

## SECTION 4: SANITARY SEWER SYSTEMS

measurements shall be taken from point of entry. All video inspection submittals shall be digital format on a flash drive, DVD, or as otherwise approved by the Engineering Services Division.

4. Inspection of pipelines shall be performed by a Contractor trained in locating breaks, and/or obstacles on pipelines by closed circuit television. The interior of the pipeline shall be carefully inspected to determine location of any conditions which may prevent proper installation of the liner into the pipelines, and it shall be noted so these conditions can be corrected.
5. Following installation of the CIPP, the Contractor shall conduct a post-rehabilitation video inspection of the completed work to verify that the liner installation is acceptable as defined in the technical specifications. The post-rehabilitation video inspection shall be performed at the point of entry of the liner and shall be such that the sewer lining can be clearly seen. The pipe shall be dry during all post-rehabilitation so that the bottom of the pipe can be seen. The Contractor shall submit a copy of the post-rehabilitation video inspection to the City of Concord Engineering Services Division after the liner is installed for review and approval.

### **05. TESTING REQUIREMENTS**

#### A. Gravity Sewer Main Testing

##### 1. Low Pressure Air Testing

- a. Low pressure air testing has proven to be an efficient means of testing sewer lines for leaks. This test may be performed by an independent testing agency after notice to the City Engineer or representative. Should the Contractor conduct their own test, an Engineering Services inspector must be present to witness the results.
- b. Test Requirements: The sanitary sewer main between structures, including laterals and all connections, regardless of length, must hold a positive pressure of 4 PSI over a period of 5 minutes with a maximum pressure loss of 1 psi.

##### 2. Gravity Main Deflection Testing

- a. Deflection tests are required for all flexible pipe (ductile iron and concrete pipe are not considered flexible). Deflection tests will be conducted a minimum of 30 days after installation of pipe and after the road has been constructed to subgrade and is ready for select materials. Deflection tests shall be performed on the entire length of the sewer main line on a manhole-to-manhole basis. The go, no-go mandrel test method shall be used and not performed before all utilities have been installed. Maximum deflection shall not exceed 5% of the pipe's internal diameter.

##### 3. Sag Testing

- a. All newly installed sewer mains and services shall be sag tested.
- b. Refer to Detail SM-7 (Limit of Sags in PVC Sanitary Sewer Pipe) for allowable sag limits.

- c. Sag testing guidelines shall be as follows:
- i. Pipe shall be cleaned prior to testing.
  - ii. Pipe shall be flooded with clean water and dye, and allowed to drain completely. There shall be no water flowing through the pipe.
  - iii. A pipe camera shall be placed in the upstream manhole and travel to the downstream manhole. At the downstream manhole a string shall be attached to the sag gauge and camera. The string must be an acceptable length to allow clear viewing of the gauge.
  - iv. The sag gauge shall be videoed by the camera as it is pulled slowly back through the pipe to the upstream manhole. The camera must have sufficient resolution to view the sag gauge clearly. The video must display operator name, date, street, main ID, from and to manhole ID's, pipe size, pipe material, and distance traveled.
  - v. When in a sag, the camera shall stop and allow water to calm.
  - vi. Sag Gauge shall be a stainless steel pipe with a 0.5" outside diameter, rounded end, and have an eyelet. Swivels shall be used on the tow string to keep gauge freely sliding through the pipe.
  - vii. Sag Acceptance Criteria:
    - (a) If any portion of the gauge is above the water, except as described in note 7c below, the sag is acceptable.
    - (b) If the gauge is submerged, even slightly, the sag is rejected.
    - (c) Sags between ¼" and ½" will be rejected when criteria for allowable length of sag and/or minimum allowable distance between sags are not met. See detail SM-7 for criteria.
    - (d) Rejected sags shall be repaired as directed by the CITY ENGINEER.

#### B. Gravity Sewer Service Testing

1. Test requirements: The service lateral shall be tested at the point of connection with the public sewer to a point within the foundation as provided by the plumber. A water test under a head of 10 feet for 15 minutes or an air test of 4 psi for 5 minutes will be accepted.
2. Testing of minor sewer service repairs may be accomplished by visual inspection where "air" and "hydraulic" methods would be impractical.

#### C. Sewer Force Main and Pressure Sewer Testing

1. All sanitary sewer force mains and pressure sewers shall be tested for air and water tightness. As with low-pressure air testing, sanitary force main and pressure sewer testing may be performed by an independent testing agency. All test results shall be submitted by the independent testing agency to The City Engineer or representative for review.

## SECTION 4: SANITARY SEWER SYSTEMS

2. Test requirements: The sanitary sewer between structures, including laterals and all connections, regardless of length, must hold a positive pressure. Hydrostatic pressure for testing force mains should be equal to or greater than the total dynamic head x 1.5 or a minimum of 100 psi. The pressure must hold for one hour to be acceptable. A low pressure air test will also be acceptable. Low pressure testing will be set between 30-psi and 50-psi for 15 minutes with no loss for acceptance.

### D. Sewer Manhole Testing

#### 1. Vacuum Test

- a. The vacuum test method is the preferred method to insure manhole integrity; however, water exfiltration testing is an acceptable alternative.
- b. All sanitary sewer manholes will be vacuum tested. The initial test pressure is to be negative 10-inches of mercury. Minimum allowable test time for a 1-inch loss in pressure from negative 10-inches of mercury to negative 9-inches of mercury is 120 seconds for a structure up to ten (10) feet deep (as measured from the floor of the structure to the top of the precast unit). For structures measuring over 10 feet and up to 15 feet deep 150 seconds are allowed. Structures over 15 feet and up to 20 feet deep require up to 180 seconds for acceptance. Structures over 20 feet and up to 25 feet deep require 210 seconds without a 1-inch total loss of vacuum.

## SECTION 5: WATER SYSTEMS

### 01. DESCRIPTION

This work shall consist of furnishing and installing, or removing and relaying, pipes, and appurtenances at the locations shown or ordered, including the necessary joints, fittings, and connections as required.

### 02. MATERIALS

#### A. Storage and Handling of Materials

1. All materials shall be handled in a manner to prevent warping, twisting, bending, breaking, chipping, rusting or any damage whatsoever. Pipe and structures shall be lifted and moved with the appropriate apparatus without being pushed, pulled or rolled by equipment.
2. All materials that have become so damaged as to be unfit for the intended use shall be promptly removed from the work site.
3. Prior to the storing of water pipe on the job site, the City Engineer or representative shall be notified at least 24 hours in advance as to when pipe and fittings will arrive. Upon arrival, Engineering Services will visually inspect the pipe for adherence to specifications, newness, deficiencies and evidence of mishandling or damage.
4. After approval of the pipe and fittings, the Contractor shall be required to provide a watertight seal at both ends of the pipe, with a minimum of 1.5 mil polyethylene plastic wrap. This shall be accomplished using sheet plastic or bags secured with duct tape.
5. All pipes shall be stacked on 4" x 4" timbers in tiers with chocks nailed at each end to prevent movement of the pipe.
6. Loader forks are allowed for the unloading and stacking of pipe provided it is done with care. If pipe hooks are used in the ends of pipe for unloading purposes, they should be of special shape and padded so as to fit either the plain or bell end without damaging the pipe lining. Lifting chains will not be allowed in place of pipe hooks due to safety precautions.
7. Moving the pipe from the stacked pile to the trench by loader using forks or approved hooks is acceptable provided it is done with care. The pipe may not be strung along the ditch line until Engineering Services has reviewed and approved the locations.
8. Fittings, valves and fire hydrants must be stored off the ground so they will not collect moisture or be damaged.

#### B. Connection Hardware

1. Threaded rods (and associated nuts and washers) shall be a minimum 304 stainless steel.
2. Clamps and retaining rings shall be ductile iron.

## SECTION 5: WATER SYSTEMS

### C. Water Mains

#### 1. General

- a. All materials coming in physical contact with drinking water must be certified to meet the ANSI/NSF Standard 61 by either the Underwriters Laboratories (UL) or the National Sanitation Foundation (NSF).

#### 2. Ductile Iron Pipe

- a. Ductile Iron Pipe will have a diameter of 4-inches or greater with a thickness class of 52. Pipe shall meet, or exceed, current AWWA C151 specifications for ductile iron water pipe.
- b. Interior lining shall be double cement with an asphaltic top coat. Both shall conform to or exceed AWWA C104.
- c. A zinc and asphaltic coating shall be applied to the outside of the pipe. The zinc coating shall meet the requirements of ISO 8179-1. The zinc coating shall be electro-deposited metallic zinc with a purity of 99.99%, and be applied at a minimum thickness of 6 ounces per square yard. The asphaltic coating shall conform to AWWA C151.
- d. Each segment of zinc-coated pipe shall be clearly identified as such by the manufacturer.
- e. Push-on joints shall conform to current AWWA 111.
- f. Pipe to be furnished complete with gaskets and lubricant.
- g. Maximum length shall be twenty and a half feet (20.5').

#### 3. Gate Valves

- a. All valves to be mechanical joint.
- b. For sizes 4-inch through 12-inch, gate valves shall be required. Gate valves will be resilient seat with non-rising stem and conform to, or exceed, current AWWA specification C509 or C515. Valves are to be supplied with all accessories.
- c. Direction to open – RIGHT (coded red)
- d. Acceptable makes and models:
  - i. Clow - (F series)
  - ii. Kennedy - (Ken-Seal)
  - iii. Mueller G.V. (A-2362)
  - iv. M & H (style 4067)
  - v. AFC-2500

- e. Post indicator gate valves will be resilient seat and shall open to the LEFT (coded black).
4. Large Valves
- a. All Valves to be mechanical joint.
  - b. Unless otherwise approved by the City of Concord representative, valves larger than 12-inches shall be horizontal operating resilient wedge gate valves with non-rising stems. Valves must conform to or exceed current AWWA C515 specifications. Valves are to be supplied with all accessories.
  - c. Direction to open – RIGHT (coded red)
  - d. Acceptable makes and models:
    - i. Clow 2638
    - ii. M & H 7000
    - iii. Mueller 2361
    - iv. AFC-2500
5. Insertion Valves:
- a. Insertion valves will have non-rising stem and conform to, or exceed, current AWWA specification C509 or C515. Valves are to be supplied with all accessories.
  - b. Direction to open – RIGHT (coded red)
  - c. Acceptable makes and models or approved equal:
    - i. Hydra-Stop Insta-Valve 250 Patriot
    - ii. TEAM Insertion Valve
6. Line Stops:
- a. Line stops shall conform to, or exceed, current AWWA specification C509 or C515. Line stops are to be supplied with all accessories.
  - b. Acceptable makes and models or approved equal:
    - i. Hydra-Stop HSF 250 Patriot
    - ii. J.C.M. Line Stop Sleeves 440
7. Fittings
- a. Fittings shall include ductile iron bends, solid sleeves, caps, tees, glands, and any other fittings required to join or restrain sections of pipe.

## SECTION 5: WATER SYSTEMS

- b. Fittings shall be gray cast iron or ductile iron with mechanical joints. Fittings and accessories shall conform to or exceed current AWWA C110. Compact ductile iron fittings meeting or exceeding AWWA C153 are acceptable.
- c. Fittings shall have the following coatings, listed in order of preference:
  - i. Fusion Bonded Epoxy
    - (a) Fusion-bonded epoxy shall be used to coat exterior and interior surfaces and shall be applied at a minimum thickness of 8 mils. Fusion-bonded epoxy shall meet the requirements of AWWA C116/A21.16-15 and AWWA C550-17.
    - (b) Fusion-bonded epoxy coatings shall be applied without defects.
  - ii. Zinc
    - (a) The exterior of the pipe shall be petroleum asphaltic-coated with a minimum of 4 mils dry film thickness over zinc-rich primer coating. The petroleum asphaltic coating shall be continuous, smooth, neither brittle when cold nor sticky when exposed to the sun, and strongly adherent to the fitting.
    - (b) The zinc coating shall meet the requirements of ISO 8179-2. The asphaltic-coating shall meet the requirements of AWWA C110 or AWWA C153.
    - (c) Interior lining shall be double cement with an asphaltic top coat. Both shall conform to or exceed AWWA C104.
- d. Mechanical joints and accessories shall meet AWWA C111.
- e. Restrained joints shall use Romac "Grip Ring" / "Megalug" or approved equal.
- f. Fasteners for joint restraints and fittings shall be Cor-Blue or approved equal.

### 8. Valve Boxes

- a. Base: 36-inch or longer to suit grade. No stacking of base sections is permitted.
- b. Top: 5 1/4" x 24" or 26" with top flange - (Screw type is not acceptable).
- c. Cover: marked "Water" supplied.
- d. Two piece boxes are required.
- e. Only North American Made valve boxes are acceptable.

## D. Water Services

### 1. Backflow Prevention Devices

- a. All domestic backflows installed after January 4, 2014 must be lead free compliant with the EPA Reduction of Lead in Drinking Water Act. An approved list of backflow prevention devices can be found in Appendix B.

## 2. Curb Boxes

- a. 5'-6" curb box (complete) with cover, stainless 3/8" rod (single piece) and stainless steel or brass connecting pin.
- b. Perma Rod Box with arch pattern base. Number 3 cover with pentagon brass plug and quick-release thread.
- c. Opens LEFT – 1/4 turn.

## 3. Copper Tubing

- a. Tubing shall conform to or exceed current ASTM specification B-88.
- b. Sizes 3/4" and 1" American made type "K" soft in 60 or 100 foot coils.
- c. 1-1/2" & 2" - American made type "K" soft in straight lengths or coils.
- d. No 1 1/4" services

## 4. High Density Polyethylene (HDPE) Tubing

- a. Tubing and appurtenances shall meet or exceed the requirements of current ANSI/AWWA C901.
- b. Tubing shall be copper tubing sized (CTS), SDR 9 with a pressure class of 250 psi and shall be colored per APWA color designation.
- c. Tubing shall meet or exceed current requirements of ASTM 2737. Only tubing sizes of 3/4", 1", 1-1/2", or 2" shall be permitted.
- d. Tubing shall meet or exceed current requirements of NSF-61 and NSF-14
- e. Tubing shall meet or exceed current requirements of ASTM D3350. Constructed with a resin of PE 4710 and have a cell classification of PE 445574E CC2 or PE 445574E CC3.
- f. Markings per AWWA C901 shall be applied on pipe in intervals not more than 5 feet and colored blue per APWA color designations.
- g. Stainless steel inserts shall meet or exceed NSF-61 and AWWA C901 requirements.
- h. Tracer wire shall be 12 AWG high strength solid core copper clad steel with a minimum break load of 250lbs. Coating shall be minimum 30 mil HDPE or HMWPE colored per APWA color designation. THHN coating material will not be allowed.
- i. Ground rods shall be 18-inch long, 1.5 lb drive in magnesium anode ground rods. Copperhead ANO-12 or approved equal. Ground wire shall be a minimum 12 AWG solid core copper clad steel. Coating shall be minimum 30 mil HDPE or HMWPE colored red.

## SECTION 5: WATER SYSTEMS

- j. Wire connectors shall be moisture/corrosion displacement connectors and rated for direct bury.

### 5. Brass Fittings - (For Underground Use)

- a. Only NSF-61 which is lead free brass is acceptable.
- b. Acceptable makes of fittings: ball valve, curb stops and plug type or ball valve type corporation stops with conductive compression connections:
  - i. Ford
  - ii. Mueller
  - iii. McDonald
  - iv. Hays
- c. "Stop and Waste valves" are not allowed.

### 6. Meter Settings

- a. 5/8" x 3/4" meter horn with backflow prevention device.
- b. 1" meter horn with backflow prevention device.
- c. Meter horns shall be isolated with full open valves per the City of Concord's Building and Plumbing Code Regulations and the current International Plumbing Code.
- d. Backflow prevention device (#7 Watts or acceptable dual-check) shall be installed on the downstream side of the meter horn.
- e. Laying length of meters: Refer to Construction Detail W-9.

## E. Hydrants

- 1. Acceptable makes and models: American Darling Hydrants are preferred.
  - a. American Darling B-62-B-5 – 20" Ground Line to Nozzle
  - b. Clow Eddy F-2641
- 2. Features
  - a. Direction to open – LEFT
  - b. Breakable flange (Traffic model).
  - c. Valve opening 5-1/4".
  - d. Two 2-1/2" NST hose nozzles.

- e. One 4-1/2" NST pumper nozzle.
- f. Operating nut and nozzle caps - NS pentagon 1-1/2" flat to point.
- g. Depth of trench - 6 foot.
- h. Six inch mechanical joint connection with accessories for 7.10" O.D. ductile iron pipe.
- i. Drain hole shall be plugged.
- j. Marker flag with retro-reflective marker plate.
- k. All hydrants shall be bagged until placed in service.

#### F. Sand Bedding / Blanket

1. Sand bedding and blanket material required for the installation of the water mains, services and appurtenances shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>% Passing</u>
1/2 Inch	100
No. 200*	0-12

\*Fraction passing the #4 sieve

### **03. CONSTRUCTION REQUIREMENTS**

Unauthorized use of hydrants is strictly prohibited. Should a Contractor desire to use City water for dust control, sewer testing and flushing operations, etc. the City will furnish a temporary meter. A deposit is required and the Contractor will be charged for the water used. Only qualified City of Concord personnel are authorized to manipulate hydrants. Unauthorized usage of City water is subject to a minimum \$1,000.00 fine.

#### A. Water Mains

1. Water mains and services must be bedded on a 6-inch sand cushion and covered with a minimum 12-inch layer of compacted sand – no stones. Where unsuitable/unstable material is encountered below pipe grade it will be removed and replaced with crushed stone or suitable gravel fill below the sand bedding as directed.
2. The minimum laying depth shall be 5 feet 6 inches (5.5-feet) measured from the top of the pipe to the finished grade of the proposed roadway. Where extra depth may be required at utility crossings the pipe must return to the specified laying depth by the use of fittings as directed by the Engineering Services Division. In no case will the pipe depth be allowed in excess of 6-feet at water main valves.
3. Insulation shall be provided for pipe installed less than 5 feet 6 inches (5.5 ft).

## SECTION 5: WATER SYSTEMS

4. Joint deflection of ductile iron pipe is not acceptable unless approved by the City Engineer or representative. Should the use of deflection be allowed, the Contractor shall provide manufacturer literature specifying the allowable deflection
5. Water mains must be separated from storm drain systems for frost protection. Should the separation be less than 3 feet from a storm drain manhole, catch basin, or pipeline; 2" rigid polystyrene thermal insulation with a minimum "R" value of 10 will be required two-feet each side of the utility and a distance to be specified by the City Engineer or representative, (a minimum of 8' is required). The City Engineer or representative shall be contacted prior to the installation of the insulation.
6. State regulations require water mains to be separated from sanitary sewer mains by a minimum of 10-feet (horizontally)
7. In accordance with the 2009 IPC, water service pipe and the sewer service shall be separated by 5' of undisturbed or compacted earth, except as follows.
  - a. The required separation distance shall not apply where the bottom of the water service pipe within 5 feet of the sewer service is a minimum of 12 inches above the top of the highest point of the sewer pipe.
  - b. Water service pipe is permitted to be located in the same trench with the sewer service, provided the sewer is constructed with listed force main sewer materials.
  - c. The required separation distance shall not apply where a water service pipe crosses a sewer pipe, provided that water service pipe is sleeved to at least 5 feet horizontally from the sewer pipe centerline on both sides of such crossing.
8. Should construction operations reveal or expose a water main running under, approximately parallel to (less than 10-feet from a proposed sewer installation), and where it is not practical to relocate the sewer, the sewer shall be reconstructed with listed force main sewer materials until the minimum 10-foot separation can be achieved.
9. Whenever sewers (mains or services) must cross over water mains or where the vertical separation of the sewer main and water main is less than 18 in., the sewer or water shall be relocated; If the sewer or water cannot be relocated, the sewer shall be constructed with listed force main sewer materials for a minimum distance of 9 feet each side of the crossing.
10. When utilities cross under a cast iron water main and the vertical distance between the bottom of water main and the top of the other utility is four feet or greater; the water main shall be cut out and replaced with ductile iron pipe. The new ductile iron pipe section shall span the excavation back into original ground. This procedure will require approval and inspection by the City Engineer or representative.
11. In conflicts requiring the relocation of utilities, preference shall be given:
  - a. To utilities with grade restrictions.
  - b. To existing utilities already in service.

12. No trench shall be left open at the end of the workday. Contractor shall take all the necessary precautions to “button-up” the work zone for the general public during the night. Precautions include but not limited to, placing steel plates over the trench, barricades, lighting, signs, etc. Contractor shall contact the City Engineer or representative before leaving the site at the end of the day, to ensure that work zone has been adequately closed up for the safety of the public.
13. A "watertight plug" must be inserted as each length or fitting is installed. This “end plug” will be left in place at the end of the workday.
14. Blue “water” warning tape shall be installed twelve (12) inches above the utility
15. A hydrant shall be installed at the end of all dead end mains.

#### B. Mechanical Fittings and Accessories

1. Retaining glands, tie rods or a combination of poured concrete (2000 psi minimum) thrust blocks and retainers must be used on all mechanical fittings. A durable flat surfaced rock may be substituted should it possess adequate bearing area against undisturbed earth. If tie rods are used, they shall be coated with an approved rust proofing agent.
2. A torque wrench must be used on all fittings to insure manufacture’s recommended torque.
  - a. Generally Accepted Torques:
    - i. 70 lbs. on set screws
    - ii. 75-90 lbs. on glands with 3/4" – (19 mm) bolts
    - iii. 60 lbs. on glands with 5/8" – (16 mm) bolts
3. Assembly Instructions For Ductile Iron Pipe: Clean bell and spigot end and lubricate gasket with approved pipe lubricant. Set gasket into position to assure even seating in the bell. When gland is in position, insert bolts and tighten with fingers. Tighten bolts to the normal range of bolt torque while maintaining approximately the same distance between the gland and the face of the socket. A proper joint is accomplished by: 1) partially tightening the bottom bolt, 2) the top bolt; 3) the bolts at both sides; and 4) the remaining bolts. Repeat this process until all bolts are within the appropriate torque range.
4. All main line valves at pipe intersections (including hydrant valves) are to be placed within 2-feet of the tees.
5. Large valves (10-inches or greater) must be supported with blocking to prevent the pipe from supporting the valve's weight during installation.
6. Install valve boxes with a cushion of sand between the valve and the valve box. A Gate Box Aligner shall be required under the operating nut. In wet areas, washed stone is to be placed around the valve box with a layer of hay or a geotextile fabric to prevent fine soil from mixing with stone during initial backfill.

## SECTION 5: WATER SYSTEMS

7. Exercise each valve in the presence of the inspector. The number of turns must be recorded before the valve is installed.
8. Stainless steel tapping sleeves are acceptable up to one pipe size smaller than the existing pipe size. A tee or a full body ductile iron tapping sleeve will be used for sizes equal to the existing diameter of the pipe.
9. No Contractor will operate City valves or curb stops without the explicit permission of the City. The owner or owner's representative of a privately owned valve may operate the valve provided that the operation is witnessed by a qualified City representative.

### C. Hydrants

1. Hydrants are to be installed at the proper depth and a concrete slab or large flat rock is to be used to support the hydrant's weight. Use of a level to assure proper alignment is required. Hydrant extension kits will be required for height adjustments to assure the proper break point, visibility, and accessibility of the hydrant.
2. The hydrant pumper nozzle is to be set at a minimum of 18-inches above grade measured from center of nozzle to ground line.
3. The hydrant break away flange is to be set above grade to a maximum distance of 4-inches.
4. The Contractor shall be responsible for hydrant painting. Requirements for hydrant painting are included in the City of Concord Construction Details.
5. Hydrants located further than 20-feet from the water main will require an 8-inch feed.
6. Contractor is responsible for the installation of the "marker flag" as show on the hydrant detail.
7. All hydrants shall be bagged until the hydrants are operational and then removed by City of Concord personnel.

### D. Water Services

1. Corporations will be installed at either the two o'clock or the ten o'clock position on the pipe circumference.
2. An (S) loop must be provided in the tubing nearest the corporation, and set no higher than the water main.
3. Services within the Right-Of-Way and up to the curb stop shall be constructed with a minimum of 1" copper tubing.
4. Polyethylene tubing shall be laid with slack in line to allow for thermal expansion.
5. Stainless steel inserts shall be used with compression fittings on HDPE tubing.

6. Tracer wire will be installed with the use of HDPE tubing and laid as a single continuous wire with access at both ends. Cut ends will be secured with an approved connecting cap. Methods of twisting and wrapping, or wire-nut connectors will not be allowed underground.
7. Tracer wire must be properly grounded at all system ends and outside of buildings. Grounding anodes will be driven into virgin soils and grounding wire shall be connected directly to the trace wire.
8. Tracer wire shall never be attached to an existing conductive utility pipe, fitting or wrapped around a curb or gate box.
9. Stainless steel (304 minimum) single strap saddles are required for service taps on 6" diameter mains  $\frac{3}{4}$ " and smaller; and double strapped saddles with a AWWA taper thread (CC Thread) is required for service taps over 1" on mains larger than 6" diameter.
10. Curb valves will be set on the right-of-way of City Streets. If curb box extensions are needed, no more than one - 12" galvanized or black iron nipple with coupling will be allowed. The maximum depth for curb valves is 6 feet while the minimum depth is 5 feet-6 inches.
11. Curb boxes shall not be set in driveways or walkways unless field conditions do not permit the installation. The City Engineer or representative shall be contacted if the requirement cannot be met prior to the installation.
12. In accordance with the 2009 IPC, water service pipe and the sewer service shall be separated by 5' of undisturbed or compacted earth, except as follows.
  - a. The required separation distance shall not apply where the bottom of the water service pipe within 5 feet of the sewer service is a minimum of 12 inches above the top of the highest point of the sewer pipe.
  - b. Water service pipe is permitted to be located in the same trench with the sewer service, provided the sewer is constructed of materials as noted elsewhere in the Standards.
  - c. The required separation distance shall not apply where a water service pipe crosses a sewer pipe, provided that water service pipe is sleeved to at least 5 feet horizontally from the sewer pipe centerline on both sides of such crossing.
13. Adjacent curb boxes must be set at least 4-feet apart.
14. Minimum distances for service lines:
  - a. From an underground utility shall be: 5-feet
  - b. From a septic tank shall be: 10-feet
  - c. From a leach bed or dry well shall be: 25-feet
15. The minimum depth of the water service shall be 5-1/2-feet. Should the water service line be less than 5-1/2-feet deep, 2" rigid polystyrene thermal insulation with a minimum "R" value of 10 will be required two-feet each side of the utility and a distance to be specified by the

## SECTION 5: WATER SYSTEMS

City Engineer or representative, (a minimum of 8' is required). The City Engineer or representative shall be contacted prior to the installation of the insulation.

16. Blue “water” warning tape shall be installed twelve (12) inches above the utility.
17. A Contractor installing a new or larger water service shall be responsible for properly discontinuing the abandoned service connection(s). The Contractor shall not discontinue any service connections without the proper authorization from Engineering Services.

Discontinued service connections are normally retired at the water main. A copper service can be cut and capped at the property line should circumstances exist where access to the water main is impracticable. Discontinued service connections of lead or iron piping shall be abandoned at the water main.

### E. Fire Suppression Lines

1. Should the fire suppression and domestic service originate from a single tap off of the main, fire suppression lines shall remain exclusive for that purpose after the fire/domestic split.

### F. Irrigation Lines

1. Irrigation lines shall be split from the domestic service after the shut-off for the domestic water service.

### G. Back-Flow Prevention Devices

1. For cases of single family and attached townhouse residential units, dual-check devices or setters with dual-checks are required.
2. Non-residential or lawn irrigation system installations shall require either a testable double-check (DCVA) or a reduced pressure principle (RP) device. The Contractor is to contact General Services Department, Utility Billing, to arrange for a sanitary survey and/or site analysis for confirmation.
3. All water piping and fittings to the backflow device are to be copper, brass, or cement lined ductile iron pipe.
4. Per Env-Dw 505 Backflow-Prevention Devices shall not be installed in a location where it will:
  - a. Be subject to corrosive fumes, grit, or sticky or abrasive liquids;
  - b. Be subject to flooding or mechanical abuse;
  - c. Not be easily accessible for testing and repair
  - d. Be in a pit or built into or close to walls or other obstructions; or
  - e. Be in a vertical position unless the backflow prevention device was certified for that orientation.

## H. Metering

1. Temporary meters shall be required for City water use during construction. The Contractor must agree to adhere to City operational procedures. Seasonal requirements may apply such as a hydrant being pumped after each use in winter conditions. The Contractor can be fined a minimum of \$1,000.00 without the proper authorization from the City of Concord.
2. It is the responsibility of the Owner/Developer/Contractor to install meter setter horns or flanges in which the City will place the permanent meter. The meter is supplied and owned by the General Services Department.
3. The General Services Department's policy concerning the number of City meters at any building is as follows:
  - a. Single units (residential or otherwise), and each unit within multiple attached units (such as townhouses or duplexes) that have their own cellar or first floor space shall have its own individual water service and City water meter.
  - b. Single family residential units with an accessory dwelling unit shall have a single City water meter for the domestic water service.
  - c. For apartment or condominium type units within shared buildings (which are either new or conversions) and when there is no common first floor space meters will be set as follows:
    - i. Service each unit on individual water lines. A City meter will be set for each unit, and an account will be established for those meters.
    - ii. Service multiple units from one water line. One or more City meters can be set. If one City meter is set then one account will be established for that complex.
  - d. The Owner is not precluded from installing their own private meters downstream (after the City meter), for the purpose of splitting the usage to tenants; but the City of Concord, General Services Department will not provide individual billing.
  - e. Irrigation/Non-Sewered Consumption
    - i. Multiple billing accounts can be established for each unit for irrigation/non-sewered consumption. A monthly fee will be levied on each additional account after the first City meter.
    - ii. Secondary City meters used to determine the usage for a specific purpose such as irrigation or other non-sewered consumption shall only be allowed for "closed" systems that do not have threaded fittings for hose connections. Secondary meters shall be installed in parallel, and will be charged an additional monthly fee.
4. Meters shall be placed where they will be easily accessible for reading and maintenance. The General Services Department will install and seal the meter.
5. Prior to having the meter installed the following must occur:

## SECTION 5: WATER SYSTEMS

- a. Application for service made at the General Services Department Utility Billing Office - 311 North State Street.
  - b. All fees and charges including Special Investment Fees if applicable are paid.
    - i. Water Investment Fee (WIF)
    - ii. Sewer Investment Fee (SIF)
  - c. Final Inspection of the project by the Engineering Services Division: No water meter will be installed until all outstanding project related issues, if any, are addressed.
6. Engineering Services will not “sign-off” for a certificate of occupancy permit until the water meter is installed.

### **04. INSPECTION REQUIREMENTS**

- A. The Engineering Services Division’s or representative shall perform full time inspection of all public and private work and operation associated with the water distribution system. Including, but not limited to construction, repairs, valve and hydrant operation. The Contractor, Developer, Owner shall be responsible for all costs incurred during the required testing and will be billed for all inspections and testing performed by the City.
- B. Visual Inspections: Visual inspections of water main installation will be performed to assure compliance with construction standards. Pipelines are to be true to grade and alignment. Pipe must be sound and flawless. Cracked, chipped or deformed pipe, fittings or accessories must be replaced.

### **05. TESTING REQUIREMENTS**

#### A. Flow Test

Projects which require a flow test shall follow the following procedure.

1. The contractor should call General Services at 228-2737 to schedule a flow test and ask for the Water Systems Supervisor or Water Distribution Supervisor.
2. The City conducts flow tests early in the morning, due to the disturbance of the water mains, because allowing the water to flow at a heavy rate can stir up the water and create dirty water calls. The City will not conduct flow-tests during the winter months because of the freezing temperatures and the icing that it would cause on the roads.
3. The contractor supplies their own gauges and a witness for the test. The City will turn the hydrants on and off.
4. The City will fax the results to the contractor.
5. Contact the General Services Department for the current fee schedule.

### B. Water Line Testing

1. Testing shall be scheduled with and performed in the presence of a City of Concord Representative.
2. The Contractor shall provide all materials necessary for water line testing. Materials used for chlorination or sampling will be made of approved service materials.
3. Fire hydrants shall be used as “blow-off valves”, venting, etc. When field conditions do not allow the use of a fire hydrant, use of a blow-off valve (type and location) shall be determined by the City of Concord Representative; the Contractor shall not install a blow-off valve without the proper authorization.

### C. Pressure and Leak Testing

All water mains and services shall be subject to a successful pressure and leak test prior to acceptance. Testing shall be achieved by hydrostatic means with water obtained from the distribution system. Pneumatic testing (air) shall only be used if testing with water is impossible or impractical and should be done with extreme caution. Mains will not be tested during disinfection.

1. Mains and services greater than 2-inches shall be tested as follows.
  - a. Hydrostatically tested to a testing pressure of 150-psi (min) or 1.5 times the systems static pressure not to exceed 200-psi. Test pressure must hold for one hour for acceptance.
2. Services 2-inches and smaller shall be tested by one of the following methods.
  - a. Hydrostatically tested to a testing pressure of 80-psi (min) or 1.5 times the systems static pressure not to exceed 200-psi. Test pressure must hold for 15 minutes for acceptance.
  - b. Visual hydrostatic testing using the pressure from the adjacent water mains system pressure. The line will be flushed out and the valve from the water source left open and valve at end of segment closed. The trench will be left open with the entire line accessible in its entirety with appropriate safety measures. No signs of leakage shall be observed for a minimum of 15 minutes for acceptance.
  - c. Pneumatically tested with air to a pressure of 50-psi (min). Test pressure must hold for 15 minutes for acceptance. Pneumatic testing will not be conducted on plastic services
3. Tests will be performed by the Contractor or a reputable testing firm. A City of Concord Representative shall be present to witness the test. The test results shall be forwarded to Engineering Services or their consultant for review and acceptance.

### D. Bacterial Testing / Disinfection

All water lines greater than two inches in diameter must be disinfected. Disinfection and bacteria sampling shall adhere to current AWWA C651 (Disinfecting Water Mains). The Contractor will use a liquid disinfectant to disinfect the pipeline. With Engineering Services approval, dry granular calcium hypochlorite containing a minimum of 65% available chlorine by weight inserted directly into the pipe may be used if the total length of water line is less than

## SECTION 5: WATER SYSTEMS

100-feet. Engineering Services recommends a chlorine concentration of 50 ppm. An Engineering Services Inspector must be present to witness the disinfection and operate all City valves. The Contractor will take water samples for bacterial analysis to a State certified testing laboratory. The reports shall be directed to the Community Development Department – Engineering Services Division.

## SECTION 6: STORM DRAINAGE SYSTEMS

### 01. DESCRIPTION

This work shall consist of furnishing, constructing and/or reconstructing catch basins, manholes; with frames, grates, or manhole covers; as shown on the plans. This work shall also consist of furnishing and installing, or removing and relaying, pipes, pipe end sections, and pipe sleeves at the locations shown or ordered, including the necessary joints, fittings and connections as required.

### 02. MATERIALS

#### A. Storage and Handling of Materials

1. Preventing damage: All materials shall be handled in a manner to prevent warping, twisting, bending, breaking, chipping, rusting or any damage whatsoever. Pipe and structures shall be lifted and moved with the appropriate apparatus without being pushed, pulled or rolled by equipment.
2. Handling and storage of masonry products: Brick, block and similar masonry products shall be handled and stored in a manner to reduce breakage, chipping, cracking and spalling. Cement shall be stored under cover, off the ground, and shall be kept completely dry at all times.
3. Damaged materials: All materials that have become so damaged as to be unfit for the intended use shall be promptly removed from the work site.

#### B. Pipe

1. Reinforced Concrete Pipe (RCP):
  - a. Pipe shall be a minimum class IV 3000D and meet or exceed ASTM C76.
  - b. Joints are to be gasketed meeting or exceeding ASTM C443.
  - c. Pipe markings to be clear and meet or exceed ASTM C76.
  - d. Pipe interior shall comprise a smooth, continuous concrete skin free from any irregularities.
  - e. Fittings and accessories: Fittings and accessories must be approved by the Engineering Services Division prior to installation.
2. Polyvinyl Chloride (PVC) Pipe and fittings:
  - a. Pipe for 4-inches through 15-inches shall meet or exceed ASTM D3034. Sizes greater than 15-inches shall meet or exceed ASTM F679.

## SECTION 6: STORM DRAINAGE SYSTEMS

- b. Pipe is to be gasketed SDR-35 or SDR-26 green sewer pipe with a resin compound meeting or exceeding ASTM D1784.
  - c. Joint compression rings shall be of an oil resistant rubber type, elastomeric seal or flexible elastomeric seal meeting or exceeding ASTM F477.
  - d. Integral bell joints are to meet or exceed ASTM D3212.
  - e. Fittings and accessories shall match pipe specifications unless otherwise approved by Engineering Services Representative.
3. Polypropylene (PP) Pipe
- a. Use of PP: PP shall only be used on private sites and must meet all the City's current concrete pipe standards for water tightness and sanitary sewer standards for roundness. Where a private drain line may cross the City of Concord's Right-of-Way, there shall not be a combination of two different products such as the use of concrete and PP. The entire drain line shall be constructed of either RCP or PVC.
  - b. Conformance to standard specifications: Pipe and fittings shall meet ASTM F2736, F2881. Connections shall meet ASTM D3212, ASTM F477
4. High Density Polyethylene Pipe (HDPE)
- a. Use of HDPE: HDPE pipe shall only be used on private sites and must meet all the City's current concrete pipe standards for water tightness and sanitary sewer standards for roundness. Where a private drain line may cross the City of Concord's Right-of-Way, there shall not be a combination of two different products such as the use of concrete and HDPE. The entire drain line shall be constructed of either RCP or PVC.
  - b. Conformance to standard specifications: This product must be designed for the intended application and should it be proposed for traffic load conditions it must meet H-20 live load requirements. The manufacturer must recommend the product for closed mainline storm drain systems.
  - c. For use in culvert installations concrete headwalls are required.
  - d. Gasketed pipe joints: A watertight joint must meet or exceed concrete pipe standards ASTM C924, C969, and C1103. The pipe system must utilize a bell and spigot type joint design or a solid collar system to eliminate displacement and deformation at the joint. Joint integrity must meet ASTM D-3212.
  - e. Compatibility: Concentric corrugations or a smooth exterior is necessary to mate the pipe to concrete structures utilizing neoprene boot systems that maintain a watertight seal.
  - f. Fittings: Manufacturers fittings for lateral services must meet the City's current water tightness standards.

## 5. Ductile Iron (DI) Pipe

- a. Ductile iron pipe shall be 4-inches or greater meeting or exceeding AWWA C150 and AWWA C151 with a pressure class of 350 or a minimum thickness class of 50.
- b. Push on joints shall meet or exceed AWWA C111.
- c. Double cement lining shall be provided meeting or exceeding AWWA-C104.
- d. An asphaltic coating shall be applied to both the outside and inside of pipe. Outside coating shall meet or exceed AWWA C151 and inside coating to meet or exceed AWWA C104.

## C. Catch Basins

1. Eight inch (8-inch) walled, reinforced concrete structures are recommended when tying into existing pipes and five inch (5-inch) minimum wall reinforced concrete structures are required for new construction. The structures shall be designed to handle H2O Loading.
2. Reinforcing shall be steel or structural fibers. Steel shall conform to the requirements of NHDOT 544. Fibers shall only be used in structures with 4 feet or less inside diameter and shall be as shown on the NHDOT Qualified Products List.
3. For five-inch thick, reinforced structures, a neoprene boot to securely seal the pipe stub in the opening is preferred. If booting cannot be done due to trench constraints, a sand stub may be utilized to provide a secure seal.
4. Eccentric or Concentric conical top sections are allowed as illustrated on the standard details. Slab top sections shall be used only when the distance from top of grate to top of pipe is less than 48-inches.
5. Every catch basin is required to have a 3-foot sump as measured from the outlet pipe invert to the floor of the structure. The sump shall be a solid precast unit. Should a center hole be cast in the base, it must be plugged with mortar.
6. Catch basins with an oil/debris trap (Snout/Eliminator for example) shall be a minimum 5' diameter and maintain a minimum 42" clear space inside the basin for maintenance. The basin shall be positioned such that the grate/cover is not directly over the trap.
7. The use of barrel blocks or concrete grade rings is not permitted for new construction.
8. Catch basins shall be accurately located one (1) foot off the curb line for 4-foot I.D. structures to ensure that the frame will be flush to the curb and centered over the structure. In no case should the frame and grate not be flush against the face of the curb. Shall the frame and grate not be flush against the face of curb; the Contractor/Developer will be responsible for re-setting the frame/grate and or the entire structure to achieve the proper placement.
9. Although catch basins may not be required to be tested for water tightness, infiltration is not acceptable.

## SECTION 6: STORM DRAINAGE SYSTEMS

10. Should site conditions require modifications to structure openings, only methods approved in advance by the Engineering Services Division such as core drilling or sawing will be accepted.
11. All PVC pipe connections to structures (such as under-drain and footing drains) must be cored and booted to assure a secure seal.

### D. Drain Manholes

1. Drain manholes shall be of similar construction to catch basins with the exceptions that a 30-inch opening for a top section is required and the 3' sump is replaced with a brick invert as noted in the Construction Requirements.

### E. Frames, Grates and Covers

1. 8" cast iron catch basin frames and grates shall be NHDOT Type B grate for roadway slopes less than 3%, as shown on the detail of the New Hampshire Standard Plans for Road and Bridge Construction, Standard DR-1, Plate 2. Where roadway slopes are equal to or greater than 3%, NHDOT Type-F, "Bicycle Safe" frames and grates shall be installed as shown on the detail of the New Hampshire Standard Plans for Road and Bridge Construction, Standard DR-2, Plate 1. Where existing catch basins are located within a crosswalk or pedestrian route, a grate which meets current ADA guidelines shall be used (Neeah R-3210-Q or approved equal). Only North American castings are allowed. All castings shall be designed for H-20 Loading.
2. 6" manhole frames and covers shall be NHDOT Standard Manhole cover and frame as shown in the New Hampshire Standard Plans for Road and Bridge Construction, Standard DR-2, Plate 2. All castings shall be designed to handle H20 Loading. Covers shall have the word "DRAIN" in 3 inch letters cast into the top surface.

### F. Underdrain

1. Underdrain shall be a minimum 6" diameter PVC pipe meeting SDR-35 requirements or other straight pipe designated for roadway. Coiled slotted house foundation underdrain or corrugated metal underdrain is not permitted for roadway construction.

### G. Perimeter Drain Laterals

1. Perimeter drain laterals within the right-of-way shall be a minimum 6" diameter PVC pipe meeting SDR-35 requirements or other straight pipe designated for roadway. Coiled slotted house foundation underdrain or corrugated metal underdrain is not permitted within the right-of-way.

### H. Stone Fill

1. Where indicated or required to stabilize a particular slope or water course, stone fill shall consist of: approved quarry stone, or broken rock of a hard, sound, and durable quality, reasonably free of thin or elongated pieces.

## I. Masonry

1. Brick: Brick shall be solid, sound, hard, and have plain or smooth surfaces on both ends and on the face side, and be satisfactory to the City Engineer or representative. Brick shall comply with A.S.T.M. Standard Specifications for Sewer Brick, Designation C32, for Grade SS, Hard Red Brick. Brick samples will be required for approval prior to incorporation in the work.
2. Cement: Cement shall be straight Portland Cement, Type I, II, or a Type I/II. Lime mortar or Masonry cement is not to be used on structures.
3. Mortar Sand: Mortar sand shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>% Passing</u>
No. 8	100
No. 16	60-100
No. 50	15-35
No. 100	2-15
No. 200	0-5

## J. Sand Bedding / Blanket

1. Sand bedding and blanket material required for the installation of the sewer mains, services and appurtenances shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>% Passing</u>
1/2 Inch	100
No. 200*	0-12

\*Fraction passing the #4 sieve

## K. Crushed Stone Bedding

1. Crushed stone shall be 3/4 inch (ASTM #67) stone and meet the following gradation requirements:

<u>Sieve Size</u>	<u>% Passing</u>
1"	100
3/4"	90-100
3/8"	20-55
#4	0-10
#8	0-5

**03. CONSTRUCTION REQUIREMENTS**

Unauthorized use of hydrants is strictly prohibited. Should a Contractor desire to use City water for dust control, sewer testing and flushing operations, etc. the City will furnish a temporary meter. A deposit is required and the Contractor will be charged for the water used. Only qualified City of

## SECTION 6: STORM DRAINAGE SYSTEMS

Concord personnel are authorized to manipulate hydrants. Unauthorized usage of City water is subject to a minimum \$1,000.00 fine.

### A. Excavation

1. Excavation shall be accomplished by methods that preserve the undisturbed state of the subgrade soils. A trench may be excavated by machinery to the designated subgrade, provided that the bottom of the trench remains in the undisturbed state and provides the proper foundation for the pipe bedding. Equipment may have to be modified by welding a blade to the bucket teeth to achieve the required shape to fit the lower 1/3 of the pipe exterior for pipe 36" in diameter and larger.

### B. Crushed Stone Bedding

1. Contractor shall place 3/4" crushed stone (ASTM #67): for bedding, to the haunch of the pipe and a minimum 6" beneath the pipe throughout the bottom of the excavated trench. After placing the pipe, 3/4" crushed stone shall be placed to 1/2 the outside diameter for pipe less than 24" inside diameter. 3/4" crushed stone shall be placed to the top of pipe for diameters greater than or equal to 24". The pipe bedding shall be stable prior to pipe installation.

### C. Mortar

1. Mortar shall consist of two parts mortar sand to one part Portland Cement. To obtain the proper ratio, one bag of Type I or Type II Portland Cement should be mixed with two-five gallon buckets of mortar sand. The mix shall be thoroughly blended only in such quantity as may be required for immediate use, and shall be used before the initial set has taken place. The mix shall be constantly worked over with hoe or shovel to keep it workable. Adding water after mixing to bring a hardened mix "back to life" will not be allowed.

### D. Brick Masonry

1. Brick masonry shall be protected from too rapid drying by approved means and shall be protected from weather and frost, as required. Bricks shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling. Joints between bricks shall not exceed  $\frac{3}{8}$  inch and shall be tooled flush to the brick surface.
2. Brick masonry during winter conditions must be protected from freezing. A suitable heated shelter will be required to assure all materials remain above freezing for 3 days.
3. All brickwork used to adjust manhole and catch basin frames to grade shall be sealed on the outside of the structure with mortar.
4. Frames shall be centered over the manhole opening and are to be set no less than 1/8-inch lower than finish pavement. Catch basin frames shall be set no less than 1/8" lower than the finish pavement or no more than 1/2 inch lower than finish pavement. A minimum of 2 courses of brick are required under the structure frame, yet the adjusting course shall not exceed approximately one foot of brick - (normally 5 course maximum). The final course of brick may be laid on edge. Brick and mortar is the only masonry material to be used between the precast structure and the cast iron frame. The use of barrel blocks and concrete grade rings is not permitted.

5. All brickwork used to adjust manholes and catch basins to grade shall be laid in a header course pattern - (end showing) as opposed to a batter course – (edge showing).
6. Masonry Repairs: All work on existing facilities shall be performed by or under the direction of City forces. Only sound masonry materials shall be incorporated into the work, and any necessary repairs must first be approved by the City Engineer or representative, and observed prior to backfilling.

#### E. Inverts

1. Manhole inverts shall be constructed to provide a smooth, uninterrupted flow channel and shall correspond in shape to the pipe. Puddles or undue turbulence through the manhole channel will necessitate reconstruction.
2. Brick Masonry Invert construction:
  - i. Bricks used in the channel shall be laid on edge with the smooth struck side of brick exposed.
  - ii. Shelves shall be constructed to half the diameter of pipe. For pipe diameters greater than 15-inches the brick shelf will be constructed to the top of the pipe.
  - iii. The brick shelf shall be pitched to drain toward the through channel with one inch of difference from the structure wall to the channel edge. Only solid brick masonry construction will be accepted under the shelf.
  - iv. If varying pipe sizes exist, all shelves shall be constructed to match the height of the largest pipe requirements for shelf construction.
  - v. Mortar joints shall be tooled flush to the face of the brick to prevent minor depressions.
3. Concrete Invert Construction
  - i. Concrete invert construction shall only be permitted in private manholes outside of the City Right-Of-Way.
  - ii. Concrete used in the invert shall be a minimum 3000 psi concrete mix.
  - iii. Shelves shall be constructed to a quarter of the pipe diameter.
  - iv. The concrete shelf shall be pitched to drain toward the through channel with 1-inch per foot slope from the channel edge to the structure wall.

#### F. Storm Drain Systems

1. The minimum pipe inside diameter for cross culverts and closed storm drain systems accepting roadway runoff shall be 15-inches. The minimum pipe inside diameter for driveway culverts shall be 12 inches. The use of pipe smaller in diameter than 12-inches is not permitted.

## SECTION 6: STORM DRAINAGE SYSTEMS

2. A minimum 4' of cover shall be provided over all storm drains. Should conditions result in storm drains with less than 36-inches of cover; 2" rigid polystyrene thermal insulation with a minimum "R" value of 10 shall be required and a distance to be specified by the City Engineer or representative. Under no circumstances will the use of insulation be permitted without the authorization of the City Engineer or representative.
3. Should storm drain pipelines or structures approach water lines or appurtenances with less than 36-inches of separation; 2" rigid polystyrene thermal insulation with a minimum "R" value of 10 shall be required two-feet each side of the utility and a distance to be specified by the City Engineer or representative, (a minimum of 8' is required).
4. Proper catch basin location is essential to assure compatibility with finished roadway curb and structure installations.
5. A minimum 12" of compacted sand blanket is required above top of pipe.
6. Should unsuitable soils be encountered in the excavated trench all material will be removed and replaced with granular fill to the limits as directed by the City Engineer or representative.
7. Manholes or catch basins shall be required at every change in vertical grade, horizontal pipe alignment, pipe size change, and every 300'.
8. Manholes shall be installed at the end of all dead end pipes that are placed with the expectation of future connection. Capping/plugging and burying the pipes will not be allowed.
9. A minimum 8" of 3/4" crushed stone bedding is required under all catch basins and manholes.
10. Headwalls shall be placed outside of the "clear zone" as defined in the Roadside Design Guide.
11. High density polyethylene and PVC pipe used in conjunction with concrete structures may require special treatment to assure a watertight seal. Manufacturer's recommendations must be followed to assure long-term performance.

### G. Underdrain

1. Underdrain, if not detailed on the approved plans, may be required should site conditions warrant, as determined by the City Engineer. Seasonal high water table must be kept to a minimum of 2-feet below subgrade across the roadway section. Should the water table be encountered during subgrade preparation, an appropriate engineering solution must be submitted for approval to the City Engineer.
2. Underdrain shall be bedded in crushed stone wrapped in the appropriate geotextile fabric. All daylighted underdrain shall have either a pre-cast concrete headwall or a masonry headwall along with a rodent proof end grate installed at the outlet.

#### H. Drain Laterals

1. Storm drain service connections will only be allowed in storm manholes or catch basins unless approved by the City Engineer (e.g. foundation drain laterals).
2. Perimeter drain laterals shall be bedded in 3/4-inch crushed stone from the top of the pipe to 6-inches below the invert.
3. Drain cleanouts for house service connections shall be installed at the building foundation or as directed by the City Engineer or representative. Cleanouts will be installed on the downstream side of a backflow preventer and outside the City Right-Of-Way, typically 5' from the backside of the sidewalk or property line.
4. Building foundation drains that discharge to daylight shall have a rodent proof end grate installed at the out-flow end of the pipe along with a pre-cast concrete headwall or a masonry headwall.
5. Should a building foundation perimeter drain discharge near a pond, stream bed, or an area subject to flooding then a check valve shall be installed before the outlet.
6. A backflow preventer shall be required for all foundation drain connections to the municipal storm sewer system and shall be installed on private property and the owners responsibility to maintain.
7. Shallow drains (less than 4-feet of cover) may require frost protection should they cross under paved areas. In no case, shall insulation be placed without the permission of the City Engineer or representative.
8. For sump pump installations: 1-1/2-inches or 2-inches - polyethylene pressure pipe can be used to carry ground water from the foundation drain.
9. A cast iron cleanout box with a cover marked "DRAIN" is required over all cleanouts.

#### I. Slope Stabilization

1. Maximum slopes for earthen structures intended for vegetation shall be 3:1. The use of slope stabilization products for slopes equal to or greater than 3:1 such as Geotextile fabrics or other approved alternatives are strongly encouraged in lieu of stone fill where conditions permit.
2. Should the Contractor request the use of stabilization products in lieu of stone fill as shown on the approved design plans, the Contractor shall obtain a written description of the proposed geotextiles and the stability of the slope using the proposed product from the design engineer and submit same to the City Engineer or representative for review.

#### J. Stone Fill Requirements

1. Where indicated or required to stabilize a particular slope or water course, stone fill shall be graded as shown on the approved design plans.

## SECTION 6: STORM DRAINAGE SYSTEMS

2. If the approved design plans do not indicate the type of stone, the size, etc. for the slope or pipe outfall to be stabilized, the Contractor shall contact the design engineer to determine the proper material and size to be used. The information shall be supported by type of design storm, design method, piping system, etc. All information shall be submitted to the City Engineer or representative for review prior to the placement of the material.

<u>Stone Fill</u>	<u>Minimum Depth</u>
Class A	24"
Class B	18"
Class C	12"

### K. Storm Water Basin Safety Barriers

1. Should perimeter fencing be required as shown on the approved design plans where hazardous conditions are identified, a 6-foot minimum height fence with a 14-foot access gate shall be constructed, using standard chain link fabric.

## 04. INSPECTION REQUIREMENTS

### A. Visual Inspections

1. Visual inspections of drain pipe will be performed to assure compliance with Construction Standards. Visual inspections are normally required to confirm the hydraulic integrity of Storm drains. Pipe must be structurally sound. Cracked, chipped or deformed pipe must be replaced. Pipelines are required to be true to alignment and at a uniform slope between structures. "Ponding" or deviations in alignment will be cause for rejection. The Engineering Services Division shall determine if the ponding or deviations in alignment are cause for rejection during the review of the Storm drain video prepared by the Contractor.
2. Infiltration
  - a. Storm drain systems are inspected for infiltration visually and by video camera. Should infiltration be observed, other than minor signs of moisture, repair or replacement will be required.
3. Observation for Uniformity of Flow
  - a. Water used to flush lines will be observed for uniformity of flow through each pipeline from structure to structure.

### B. Video Inspection

1. All pipelines will be subject to the scrutiny of a video inspection prior to acceptance to assure proper jointing and flow characteristics. The Engineering Services Division shall determine if the ponding or deviations in alignment are cause for rejection. All video inspections shall be performed by the City of Concord General Services Department, unless otherwise determined by the City Engineer or representative.

2. Camera inspections will not be scheduled until construction of other utilities in the same area are completed and the pipeline under consideration has been backfilled and compacted to subgrade elevation for at least thirty days prior to the scheduled inspection. The Contractor shall contact General Services to schedule the inspection.
3. Cleaning of the system, equipment, inspections and data reporting shall be done in accordance with the Pipeline Assessment and Certification Program (PACP).
4. All structures are to be accessible to the video inspection vehicle and all pipelines shall be cleaned of all debris by the contractor prior to General Services arrival for the inspection. The presence of debris or insufficient flushing water will necessitate re-inspection following correction. Any debris in the pipe shall be removed at the next structure and will not be allowed to continue downstream in the system.
5. Video camera inspections will be performed after flushing the storm drain system with water containing a visible dye and allowed to drain. Excessive ponding or alignment deviation deemed by the City Engineer or representative is cause for rejection.
6. Only tractor-type units will be utilized for mainline inspections, push cameras will only be allowed for lateral inspections.
7. The camera shall have pan and tilt capabilities.
8. The camera shall be approved by the manufacturer for the pipe size being inspected (typical camera is rated for 8"-24", without additional accessories).
9. Optional: The camera should be equipped with an inclinometer (these only show the general trend of the pipe slope, not to be viewed alone as acceptance criteria).
10. The camera footage shall be shown on-screen.
11. The beginning of the inspection shall consist of a title screen that indicates the following information; date, time, location, company doing the inspection, Contractor that laid the pipe, type of structure, pipe size and material, and if structure numbers or line segments are not specifically labeled on the approved plans; than station numbers complete with right or left offsets shall be used to identify line segments.
12. When a lateral line is encountered during the inspection; the camera operator shall stop the camera unit and, using the pan and tilt function, inspect the lateral opening to the best of the camera's ability (dye should be introduced into the lateral, if feasible, to view flow characteristics).
13. When a questionable pipe joint is encountered during the inspection; the camera operator shall stop the camera unit and using the pan and tilt function, inspect the joint to the best of the camera's ability. (Operator should also traverse the joint with the camera unit to observe the amount of drop/rise the camera experiences over questionable joints).
14. When a sag is encountered during the inspection; the camera operator shall record the beginning and end of said sag, if of questionable depth, then the operator shall drag a 1/2"

## SECTION 6: STORM DRAINAGE SYSTEMS

tall non-buoyant object through the sag with the camera unit to observe and record actual depth.

15. All defects observed shall be logged into some sort of data management software (PACP compliant) and compiled into a video report to be submitted with the video inspection.
16. All video inspection submittals shall be in digital format on a flash drive or DVD. VHS will not be accepted.
17. Any submittal not meeting these requirements will be rejected.
18. All costs associated with the video inspection shall be the responsibility of the Contractor, Developer, Owner unless otherwise determined by the City Engineer or representative. Contact the General Services Department for the current fee schedule.

### **05. TESTING REQUIREMENTS**

#### A. Deflection Test

1. Deflection test will be required on all flexible pipes. Concrete and Ductile Iron are considered to be rigid pipe.

#### B. HDPE Testing

1. Deformation testing will be required and must not exceed five per cent (5%) of the inside pipe diameter in any axis.

## SECTION 7: LANDSCAPING

### 01. DESCRIPTION

- A. This work shall consist of preparing the soil and furnishing and applying seed of the type or types specified, fertilizer, limestone, and mulch if required, on all areas designated for turf establishment as shown on the plans or ordered.
- B. This work also includes furnishing and installing landscaping materials, including all layout, fertilizing, soil conditioning, staking, guying, watering, excavating, weeding, herbicides, fungicides, pesticides, refertilizing as necessary, replanting as needed, and stake and guy removal after the establishment period, as shown on the plans or as ordered.
- C. The installer shall be able to demonstrate that they have successful experience planting trees of similar scope to each particular project. This would include handling and planting large specimen trees in urban areas.

### 02. MATERIALS

#### A. Loam, Seed, & Slope Stabilization

- 1. Loam / Screened Loam: Loam shall meet the requirements of the NHDOT Standard Specifications, Section 641. In addition, loam shall be fertile, natural soil, typical of the locality, free from large stones, roots, sticks, clay, peat, weeds, and sod, and obtained from a naturally well drained area. It shall not be excessively acid or alkaline nor contain toxic material harmful to plant growth. The loam shall contain no particles over two (2) inches in diameter. When possible, topsoil from the proposed development shall be redistributed so as to provide the required cover. Screened loam to be used in lawn areas shall meet the above specification and shall contain no particles over three eighths ( $\frac{3}{8}$ ) inch in diameter.
- 2. Seed: Seed shall meet the requirements of the NHDOT Standard Specifications, Section 644. Generally, Park Seed Type 15 shall be used on lawn areas and Slope Seed Type 44 shall be used for all slope work.
- 3. Slope Stabilization Products: Maximum slopes for intended for vegetation shall be 3:1. The use of slope stabilization products for slopes equal to or greater than 3:1 such as Geotextile fabrics or other approved alternatives are strongly encouraged in lieu of stone fill where conditions permit.
- 4. Should the Contractor request the use of stabilization products in lieu of stone fill as shown on the approved design plans, the Contractor shall contact the design engineer for the project and a written letter describing the proposed geotextiles and the stability of the slope using the proposed product shall be submitted to the City Engineer or representative for review and approval.

## SECTION 7: LANDSCAPING

### B. Recommended Street Trees

1. Street tree species should be native or non-invasive species appropriate for an urban environment, soil conditions, and climate. Proposed trees species should be selected to encourage biological diversity and high wildlife habitat value. In order to improve the diversity of trees in the City's streetscape, we request that certain overplanted species be used sparingly, as noted below.
2. If a tree is not chosen from this list it has to be approved by the City Representative before installation.
  - a. Ornamental Trees (suitable for under utility wires)
    - i. Paperbark Maple (*Acer griseum*)
    - ii. \*Serviceberry (*Amelanchier* sp.)
    - iii. Eastern Redbud (*Cercis canadensis*)
    - iv. Amur maackia (*Maackia amurensis*)
    - v. Crab apple (*Malus* sp.), fruitless varieties resistant to fire blight and apple scab, such as 'Adams' or 'Adirondack' (use sparingly, overplanted)
    - vi. Sourwood (*Oxydendrum arboretum*)
    - vii. Persian Ironwood (*Parrotia persica*)
    - viii. Sargent Cherry (*Prunus sargentii*), "Columnaris" or "Pink Flair"
    - ix. Higan Cherry (*Prunus subhirtella*) "Autumnalis"
    - x. Kwanzan Flowering Cherry (*Prunus serrulata*)
    - xi. Japanese Lilac (*Syringa reticulata*) (use sparingly, overplanted)
    - xii. City Sprite Japanese Zelkova (*Zelkova serrata* 'City Sprite') – Only this variety of Zelkova is suitable for under power lines.
  - b. Shade Trees
    - i. White Fir (*Abies concolor*)
    - ii. Armstrong Maple (*Acer x freemanii* 'Armstrong') (use sparingly, overplanted)
    - iii. \*Red Maple varieties (*Acer rubrum*) (use sparingly, overplanted)
    - iv. \*Sugar Maple (*Acer saccharum*) (low salt tolerance, use only in lawn areas or away from salt-treated areas)

- v. Horsechestnut (*Aesculus carnea*), “Fort McNair”
- vi. \*American Hornbeam (*Carpinus caroliniana*)
- vii. Katsuratree (*Cercidiphyllum japonicum*)
- viii. Yellowwood (*Cladrastis kentukea*)
- ix. \*American Beech (*Fagus grandifolia*)
- x. Thornless Honey Locust (*Gleditsia triacanthos inermis*) “Shademaster”, “Skyline,” or “Halka” - avoid “Sunburst” variety (use sparingly, overplanted)
- xi. Kentucky Coffeetree (*Gymnocladus dioica*) “Espresso” or other seedless varieties only
- xii. Sweetgum (*Liquidambar styraciflua*) ‘Rotundifolia’ or other fruitless varieties
- xiii. Tulip Tree (*Liriodendron tulipifera*)
- xiv. Dawn redwood (*Metasequoia glyptostroboides*)
- xv. \*Tupelo (*Nyssa sylvatica*)
- xvi. \*Sycamore (*Platanus occidentalis*) “Liberty” or “Bloodgood”
- xvii. \*Northern Red Oak (*Quercus rubra*)
- xviii. \*White Oak (*Quercus alba*)
- xix. Swamp White Oak (*Quercus bicolor*)
- xx. Pin Oak (*Quercus palustris*)
- xxi. \*American Linden (*Tilia americana*)
- xxii. \*American Elm (*Ulmus americana*) “Princeton” or other DED resistant varieties only
- xxiii. Japanese Zelkova (*Zelkova serata*)

\*Native to the Northeast

### **03. CONSTRUCTION REQUIREMENTS**

#### **A. Loam, Seeding and Slope Stabilization**

1. Loam: All disturbed land shall be covered with loam with a rolled minimum compacted depth of at least six (6) inches. When possible, topsoil from the proposed development shall be redistributed so as to provide the required cover.

## SECTION 7: LANDSCAPING

2. Seeding and initial fertilizing: Seeding and initial fertilizing shall be done between April 1 and June 1, or between August 15 and October 15.
3. Windy weather or frozen ground requirements: Seeding shall not be done during windy weather or when the ground is frozen, excessively wet or otherwise untillable.
4. Preparation for seeding: All areas to be seeded shall be prepared to provide a reasonably firm but friable seed bed. All areas shall meet the specified grades and shall be free from weed growth and debris.
5. Protection and care: The Contractor shall be responsible for protecting and caring for the seeded area until final acceptance of the work.
6. Watering: The seeded areas shall be carefully and suitably watered as necessary to produce a satisfactory growth.
7. Re-seeding requirements: Any part of the seeded areas that fail to show a uniform stand shall be re-seeded until all areas are covered with grass.

### B. Street Trees

1. Trees benefit the City as a whole both functionally and aesthetically and shall be preserved in the development of building sites.
2. All trees and plants including the root ball dimensions or trunk size caliper ratio shall conform to ANSI Z60.1 "American Standard for Nursery Stock" latest edition.
3. Trees shall have a caliper no less than one and one-half (1-1/2) to two (2) inches at the time of planting. The caliper of a tree is the diameter of the tree measured at six (6) inches from the ground for trees four (4) inches and under in caliper and measured at twelve (12) inches from the ground for trees measuring over four (4) inches in caliper.
4. The Contractor shall provide healthy stock, grown in a nursery and reasonably free of die-back, disease, insects, eggs, bores and larvae. At the time of planting all plants shall have a root system, stem and branch form that will not restrict normal growth, stability and health for the expected life of the plant. Refer to all Landscaping Details for acceptable crown observations for high and low branched trees as well as acceptable root observations.
5. Tree planting shall be performed during those periods when weather and soil conditions are suitable for planting, typically May through October.
6. Plantings shall not be placed in locations that inhibit sight distance per AASHTO Policy, Geometric Design of Highways and Streets.
7. Only City approved trees will be planted under aerial utilities.
8. Trees planted with City funds must be planted within 10-feet of the right-of-way so as to benefit the public.
9. Trees to be located to avoid conflicts with underground utility services.

10. All wire and burlap material shall be completely removed from the root ball before planting.
11. Place 2 to 4 inches of mulch around the tree, mulch shall not touch the trunk of the tree.
12. The Contractor agrees to replace defective work and defective trees for two years after the date they were planted. If a tree has to be replaced the contractor agrees to warranty this replacement tree for two years.
13. The Contractor agrees to remove all tree wrap, ties and guying unless agreed to by the City's representative to remain in place at the end of the two year warranty period.

#### **04. INSPECTION REQUIREMENTS**

- A. Visual Inspections: The City's representative shall visually inspect all landscaping items prior to and after placement for any new subdivisions or City projects.

(this page intentionally left blank)

## SECTION 8: EROSION PREVENTION AND SEDIMENT CONTROL

### 01. DESCRIPTION

- A. Permanent control: This work shall consist of furnishing and placing hay mulch, bark mulch, wood, straw or coconut fiber mat, synthetic mat, paper mat, jute mesh or other material as a soil stabilization product for erosion prevention and sediment control on slopes or ditches for protection to hold the ground and/or cover material (loam, sod, seed, etc.) in place, at locations shown on the plans or where ordered.
- B. Temporary control: This work shall consist of furnishing, stockpiling, placing, installing, sowing, maintaining, and removing temporary erosion prevention and sediment control devices at locations shown on the plans, or where ordered. Erosion prevention and sediment control device examples include: temporary seeding, silt fence, temporary mulch, stone check dams, and erosion stone.

### 02. MATERIALS

#### A. Mulch

1. Hay mulch shall consist of cured hay, free from noxious weeds and rough or woody materials.
2. Bark mulch shall be bark chippings graded to approximately  $\frac{3}{8}$ " to 2" width. The chippings shall not have been stored so long and under such conditions that the material has decomposed sufficiently so that it has lost its fibrous texture. Bark mulch must be approved as to grading and condition prior to its use.
3. Temporary mulches may be hay, straw, fiber mats, netting, wood cellulose, bark, chips or other acceptable material and shall be reasonably clean and free of noxious and materials toxic to plant growth.

#### B. Soil Stabilization

1. The soil stabilization materials furnished shall be of sufficient construction and strength to hold the processed ground and/or cover material (loam, sod, seed, etc.) in place until an acceptable growth of natural or planted material is established.
2. Grass Seed for erosion control shall be one of the following:
  - a. Seed for temporary control shall be a quick growing species suitable to the area, such as annual or perennial ryegrass, providing a temporary cover which will not compete with the grasses subsequently sown for permanent cover.
  - b. Seed for a more permanent control shall be of the type specified in the plans or as set forth in NHDOT 644.
3. Geotextile filter fabric for silt fence shall be made from polypropylene, polyester, or other approved polymeric chemically stable material and be resistant to ultra violet radiation

## SECTION 8: EROSION PREVENTION & SEDIMENT CONTROL

degradation for at least 12 months. Silt retention capacity shall be no less than 75 percent of silt and suspended solids.

4. Posts for silt fence shall be either wood or steel. Wood posts shall be sound quality hardwood with a minimum cross sectional area of 1.6 square inches. Steel posts shall be stand T or U section weighing not less than 1 pound per linear foot with projections for fastening wire to the fence. Maximum post spacing shall be 10 ft.
5. Staples for soil stabilization material matting shall be those specified by the manufacturer.

### **03. CONSTRUCTION REQUIREMENTS**

- A. Permanent and Temporary erosion prevention and sediment control measure shall be incorporated into the project at the earliest practicable time, as specified on the plans. Temporary measures shall be installed prior to the start of construction, maintained during construction, and removed after final site stabilization has been obtained. An area shall be considered “stabilized” when it is in a condition in which the soils on the site will not erode under the conditions of a 10-year storm. Temporary measures shall also be used to correct conditions that develop during construction to temporarily control erosion not associated with permanent control features.
- B. All areas of disturbance must have temporary or permanent stabilization within 21 days of initial disturbance. After this time, any disturbance in the area must be stabilized at the end of each work day. The following exceptions apply:
  1. Stabilization is not required if earthwork is to continue in the area within the next 24 hours and there is no precipitation forecast for the next 24 hours.
  2. Stabilization is not required if the work is occurring in a self-contained excavation (i.e. no outlet) with a depth of 2 feet or greater (e.g. house foundation excavation, utility trenches).
- C. All areas of disturbance must have permanent stabilization within 48 hours of reaching final grade.

### **04. INSPECTION REQUIREMENTS**

- A. Personnel shall visually inspect all erosion control measures and cleared and graded areas of the construction site at least once every 7 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater, during the construction season.
- B. The inspection will verify that any erosion control measures are in good condition. Discharge locations will be inspected to verify that pollutants are not entering the stormwater conveyance systems. Vehicle access points will be inspected for evidence of off-site sediment tracking. Any off-site accumulations of sediment will be immediately removed, and the area will be restored to pre-construction conditions.

## SECTION 9: SITE WORK

### 01. REQUIREMENTS

#### A. Driveways

1. Drive entries: All drive entries shall be located as shown on the approved plans or as directed by the City Engineer or representative.
2. Locating driveways not shown on the approved plans: In those areas where the driveways are not located on the approved plans or the proposed driveway location is in question, the Developer/Owner/Contractor shall contact their design engineer and a written letter verifying the sight distance and a plan sheet showing the proposed location of the driveway shall be submitted to the City Engineer or representative for review. No Driveway Permits will be authorized when the driveway is not shown or is in question. The City of Concord is not responsible for the layout of any commercial or residential driveway.
3. Physical dimensions: Drives shall be located at a minimum of 5-feet from property lines. Placement of the drive is dependent upon the location (Urban or Rural) within the City of Concord.
4. Drive aprons: In subdivisions where sidewalks are required the drive aprons shall be paved to the back of sidewalk. In those areas where there is no sidewalk, the drive aprons shall be paved for a minimum of 10-feet from the gutter.
5. Drive openings: Drive openings on residential streets shall be a maximum of 28-feet wide at the right-of-way. Should the driveway lie within a vertical curbed section, the curbs on each side of the drive opening shall be tipped down with curb at least 7-feet long.
6. Construction requirements: Minimum construction requirements for driveways shall be as follows:
  - a. 6-inches crushed gravel
  - b. 3-inches hot bituminous pavement (1-1/2" of aggregate base course and 1-1/2" of aggregate wearing course)
7. Grades: Driveway grades shall adhere to the City of Concord's Construction Details.

#### B. Dumpster Pads

Dumpster pads and associated screening shall be placed where the refuse bins can be accessed with a single turning movement with a 35' front loading truck. The width of the gate should be taken into account when reviewing turning movements. Dumpster pads shall be located a minimum 25-feet from any drainage structure, inlet, or stormwater facility. See the City of Concord's Construction Details for additional information.

## SECTION 9: SITE WORK

### C. Monitoring Wells

1. No less than 12" of horizontal separation shall be maintained between the monitoring well and any existing underground utility.
2. The well box shall be structurally sound and strong enough to support vehicular traffic. It shall be traffic rated as tested by an official testing laboratory to meet AASHTO standard for H-20 truck loadings.
3. The top of the well shall be permanently marked with large letters "MONITORING WELL"
4. The well cover shall be bolted down, or equivalent, to provide protection against unauthorized access.
5. The well cover shall be water-tight to protect against entry of surface water.
6. The top of the well shall be set 1.0" to 1.5" above surrounding grade to provide for drainage away from the cover, except for wells installed in sidewalk or paved areas where top of the concrete pad shall be installed flush and match existing conditions.
7. A concrete pad with a minimum thickness of 6" shall be constructed around the well box. The pad shall extend laterally a minimum of 12" from outside of the well box. The pad shall be constructed to be free of cracks or other defects likely to affect water tightness.
8. A locking watertight well cap shall be installed at the top of the well casing so that surface water that may enter the vault will not enter the well.

### D. Retaining Walls

1. Any retaining wall proposed on any site (private or public) having a height of greater than 4-feet, requires a Building Permit from Code Administration and must be approved by the Engineering Services Division. Detailed design plans and shop drawings, stamped and signed by a licensed engineer registered in the State of New Hampshire, shall be submitted as part of the Building Permit Application and to Engineering Services (at least 3 weeks prior to the construction of the proposed wall).

## SECTION 10: PRIVATE UTILITIES

### 01. GENERAL

- A. All underground utilities are to be placed immediately after preparation of the roadway to subgrade, yet prior to placement of select roadway materials in streets under construction. ALL underground utilities shall have warning tape installed in the trench twelve (12) inches above the utility. Tracer wires shall be placed, as a minimum, along all non-traceable utilities within the right-of-way.
- B. When underground utilities are encountered, the Contractor shall notify the appropriate agency to assure proper construction procedure in that area. Any damage to a utility is to be reported to and repaired by that utility prior to backfilling.
- C. Any poles, structures, conduits, cables or wires, the location of which have already been approved by the local land use board as part of a subdivision, site plan, or other development approval, shall, if such location becomes a public highway, be deemed legally permitted or licensed without further proceedings under RSA 231:160-a provided, that copies of the appropriate utilities' easements, work plans, or other data showing locations of such structures, are submitted to the municipality for recording purposes.
- D. Any poles, structures, conduits, cables or wires, the location of which have not been approved pursuant to RSA 231:160-a, shall, pursuant to Concord Code of Ordinance Article 5-4, be subject to the approval of the City's Poles and Wires Committee through the Engineering Services Division.
- E. Abandoned or unused utilities that are required to be discontinued, sealed, or removed within the scope of a project shall be completed prior to placement of selects or finished materials such as gravel, pavement, and landscaping.
- F. Prior to any directional boring/drilling and or jacking, all utilities (communication, electric, gas, sewer, water, storm drain, etc.) in close proximity, shall be exposed to verify location. A fully detailed plan showing the proposed construction activity shall be submitted to the City Engineer or representative for review and approval at least two (2) weeks prior to the commencement of the construction activity. The proposed sleeve shall consist of either steel or HDPE with a traceable wire placed over the utility.

### 02. ELECTRIC

- A. All underground electric conductors to be contained within rigid conduits at all road crossings. Crossings shall be perpendicular to the roadway whenever possible.
- B. Conduit Required: These requirements apply to all primary and secondary electric service installations within the paved area of the street and extending to a point at least 3-feet, measured perpendicular to the traveled way, beyond the edge of pavement.
  - 1. 5-inch (min) diameter Schedule 80 PVC or 5-inch (min) diameter rigid steel conduit (Contractor's option).

## SECTION 10: PRIVATE UTILITIES

2. Encasement with low strength concrete (Flowable Fill, NHDOT Class F, Item 520.421) may be allowed for thin walled communication conduit installations.
3. Electrical Site Work must be performed by Licensed Electrical Contractors only - not General Contractors.

### **03. MUNICIPAL CABLES**

- A. Municipal fire alarm cable and traffic signal installations are under the jurisdiction of the Fire Department's Alarm / Traffic Division – (225-8667). This division is to be notified prior to any street alterations especially at signal controlled intersections.

### **04. TELEPHONE AND CABLE TV**

- A. These underground utility service installations shall cross streets perpendicular to the traveled way in a straight trench, and at a uniform depth at least 12 inches below subgrade. These utilities will be protected under paved areas in conduit and in the manner prescribed by that utility.

### **05. FIBER OPTIC CABLE**

- A. Fiber optic cables shall be installed according to the approved design plans. Where the utility crosses City streets, steel, PVC or HDPE casing pipes shall be used. Tracer wires shall be placed above the conduit in the trench for all fiber optic cable installations. Additional conduit for expansion, replacement, or use by other utilities should be included in the installation.

### **06. NATURAL GAS**

#### A. Gas Mains

1. Mains shall generally be installed in a straight line within a straight trench.
2. Mains shall be installed with a minimum cover of 40 inches.
3. The minimum cover can be reduced to 32 inches with the approval of the City Engineer or representative in locations where there are conflicts with other utilities or structures.

#### B. Gas Services

1. Service installations shall generally cross streets perpendicular to the traveled way in a straight trench.
2. Service lines shall be installed with a minimum cover of 36 inches.
3. The minimum cover can be reduced to 30 inches with the approval of the City Engineer or representative in locations where there are conflicts with other utilities or structures.

C. Protective Devices

1. Protective devices (e.g. steel plating or concrete padding) may be required over the gas line in situations where 30 minimum cover cannot be provided. Installations less than 32 inches (mains) and 30 inches (services) require the approval of the City Engineer.

**07. UTILITY CONFLICTS**

- A. Utility service lines (municipal and private) are to be laid out and installed to avoid crossings whenever possible. Overhead utilities and landscaping should be considered obstructions when proposing a new service location.

(this page intentionally left blank)

## SECTION 11: TRAFFIC SIGNAL SYSTEMS

### 01. REFERENCE

- A. The Traffic Signal Systems Standards are included in these standards by reference and are provided under separate cover.
- B. Refer to Traffic Signal System Standards, City of Concord, New Hampshire (latest edition) for construction standards for traffic signals systems.

(This page intentionally left blank)

## APPENDIX A: DETAILS

### 01. USE OF DETAILS

These are typical engineering drawings and are not intended for a specific application. The City makes no representation or guarantee of their suitability for use. Users, other than the City, do so at their own risk.

### 02. INDEX OF DETAILS

#### A. Curbing

- C-1 Vertical Granite Curb
- C-2 Sloped Granite Curb
- C-3 Slope to Vertical Granite Curb Transition
- C-4 Slope Granite Curb Transition
- C-5 Curved Granite Slope Curb Nose
- C-6 Median Sloped Granite Curb

#### B. Curb Ramps

- CR-1 Detectable Warning Panel Details
- CR-2 Sidewalk Ramp General Notes
- CR-3 Sidewalk Ramp Type 1
- CR-4 Sidewalk Ramp Type 2
- CR-5 Sidewalk Ramp Type 3
- CR-6 Sidewalk Ramp Type 4
- CR-7 Sidewalk Ramp Type 5
- CR-8 Sidewalk Ramp Type 6, Examples 1 & 2
- CR-9 Sidewalk Ramp Type 6, Examples 3 & 4
- CR-10 Sidewalk Ramp Type 6, Examples 5 and Type 6 Sections
- CR-11 Railroad Crossing
- CR-12 Median Island Cut Through
- CR-13 Ramps at Wide Median Islands

#### C. Driveways

- D-1 Urban Drive with Vertical Granite Curb, Grass Panel Width <5'
- D-2 Urban Drive with Vertical Granite Curb, Grass Panel Between 5' and 8' Wide
- D-3 Urban Drive with Vertical Granite Curb, Grass Panel Width  $\geq$ 8'
- D-4 Urban Drive with Vertical Granite Curb, w/o Sidewalk
- D-5 Urban Drive with Sloped Granite Curb, Grass Panel Width <6'
- D-6 Urban Drive with Sloped Granite Curb, Grass Panel  $\geq$ 6'
- D-7 Urban Drive with Sloped Granite Curb, w/o Sidewalk
- D-8 Major Commercial Drive >20,000 SF Floor Area
- D-9 Rural Residential Drive
- D-10 Private Common Drive Two Dwelling Units

## APPENDIX A: DETAILS

- D-11 Private Common Drive Three to Eight Dwelling Units
- D-12 Private Common Drive Greater than Eight Dwelling Units

### D. Erosion & Sediment Control

- E-1 Construction Entrance
- E-2 Stone & Block Grate Inlet Protection
- E-3 Stone Check Dam

### E. Landscape

- L-1 Deciduous Tree Planting
- L-2 Deciduous Tree – Guying & Staking
- L-3 Evergreen Planting
- L-4 Shrub Planting
- L-5 Groundcover Planting
- L-6 Tree Planting on Slope
- L-7 Crown Observations – High Branched
- L-8 Crown Observations – Low Branched
- L-9 Root Observations – Balled and Burlapped

### F. Miscellaneous

- M-1 Road Sign Post and Sleeve – Urban
- M-2 Road Sign Post and Sleeve - Rural
- M-3 Pavement Markings
- M-4 Parking Space Layout
- M-5 Accessible Parking Space Pavement Marking
- M-6 Right-of-Way Bound
- M-7 Trail Construction
- M-8 Single Dumpster Pad
- M-9 Multiple Dumpster Pad
- M-10 Monitoring Well
- M-11 Single Mailbox Support
- M-12 Bicycle Parking
- M-13 Typical Light Pole and Foundation

### G. Roadway

- R-1 Residential Low Density Rural Street
- R-2 Residential Rural Cluster Street
- R-3 Residential Urban Street
- R-4 Non-Residential Mixed Use Local Street
- R-5 Rural Collector Street
- R-6 Non-Residential Arterial Collector Street
- R-7 Urban Intersection
- R-8 Rural Intersection
- R-9 Roadway Termination: Cul-De-Sac
- R-10 Temporary Roadway Termination: Hammerhead

- R-11 Pavement Overlay Transition
- R-12 Sawcut Requirements
- R-13 Concrete Trench Patch
- R-14 Underdrain Trench Sections
- R-15 Trench Restoration

#### H. Storm Drain

- SD-1 Storm Drain Trench
- SD-2 Storm Drain Manhole
- SD-3 Storm Drain Manhole (Private)
- SD-4 Storm Drain Brick Shelf Construction
- SD-5 Adjusting Frames to Grade
- SD-6 Catch Basin / Drop Inlet
- SD-7 Hydraulic Flow Chart
- SD-8 Double Frame and Grate Catch Basin
- SD-9 Standard Headwall
- SD-10 Mortar/Rubble/Masonry (MRM) Headwall
- SD-11 Drywell
- SD-12 Underdrain Cleanout

#### I. Sanitary Sewer

- SM-1 Sanitary Sewer Main/Service Trench
- SM-2 Sewer Manhole
- SM-3 Sanitary Brick Shelf Construction
- SM-4 Adjusting Frames to Grade
- SM-5 Sewer Main Inside Drop Manhole
- SM-6 Hydraulic Flow Chart
- SM-7 Limit of Sags in Sanitary Sewer Pipe
- SS-1 Sewer Service Connection at Main
- SS-2 Sewer Service Connection / Inside Drop Manhole
- SS-3 Cleanouts on Service Laterals
- SS-4 Cleanout Covers, 4" or 6"
- SS-5 Force Main Connection
- SS-6 Force Main Testing Requirements
- SS-7 Water and Sewer Service Trench
- SS-8 Typical External Grease Interceptor

#### J. Underground Utilities

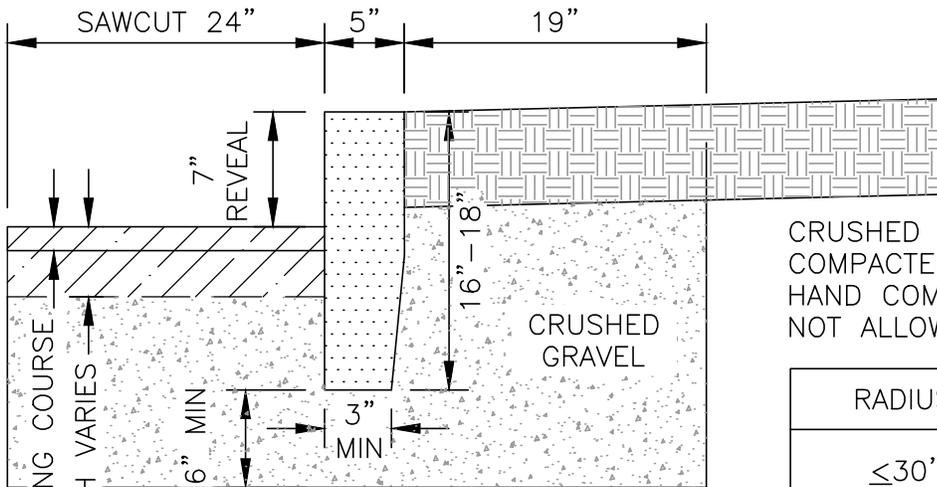
- U-1 Typical Utility Conduit Installation
- U-2 Tracer Wire Installation

#### K. Water

- W-1 Water Main/Service Trench
- W-2 Fire Hydrant
- W-3 Hydrant Painting and Marker Flags

## APPENDIX A: DETAILS

- W-4 Single Family Meter Installation
- W-5 Residential Meter Installation with Irrigation
- W-6 Meter Installation with Irrigation and Fire Suppression
- W-7 New Condominium Dual Residential Meter Installation
- W-8 Condo Conversion Dual Residential Meter Installation
- W-9 Water Meter Installation
- W-10 Water Service Through Foundation
- W-11 Air Release Valve (for testing purposes only)
- W-12 Water Service Tie Over
- W-13 Curb Stop in Pavement
- W-14 Water Service Installation
- W-15 Private HDPE Water Service with Tracer Wire



CRUSHED GRAVEL TO BE COMPACTED TO 95% MIN HAND COMPACTION IS NOT ALLOWED

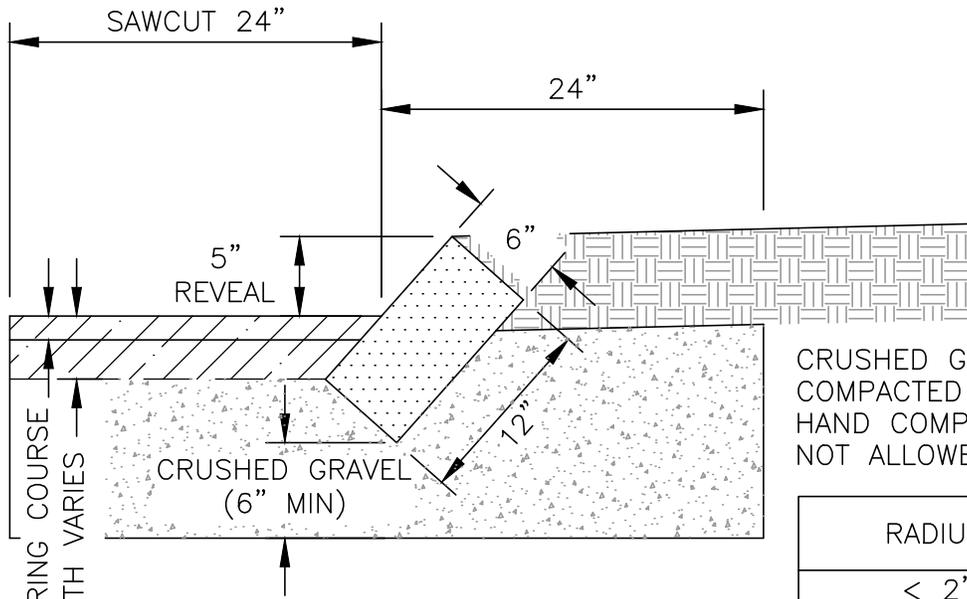
RADIUS	MAX LENGTH
≤30'	CURVED CURB
31' - 35'	5'
36' - 42'	6'
43' - 49'	7'
50' - 56'	8'
57' - 60'	9'
OVER 60'	10'

1 1/2" WEARING COURSE  
PAVEMENT DEPTH VARIES  
6" MIN  
7" REVEAL  
5"  
19"  
3" MIN  
16" - 18"  
CRUSHED GRAVEL  
MIN LENGTH OF CURB STONES 3'  
MAX LENGTH OF CURB STONES 10'  
MAX LENGTH OF STRAIGHT CURB STONES LAID ON CURVES - SEE CHART  
ADJOINING STONES SHALL HAVE THE SAME OR APPROXIMATE LENGTH.

FINISH SURFACE AND TOLERANCES FOR VERTICAL GRANITE CURB

AREA	FINISH SURFACE	TOLERANCE
<u>TOP</u>	5" WIDE OR AS OTHERWISE SHOWN, SAWN TRUE PLANE. FRONT AND BACK ARRIS LINES PITCHED STRAIGHT AND PARALLEL.	+1/8" TO +1/8" +1/8" TO +1/8"
<u>FRONT FACE</u>	RIGHT ANGLE TO TOP, APPROXIMATELY TRUE PLANE. NO DRILL HOLES SHOWING IN TOP 10"	+1" TO -1/2"
<u>BACK FACE EXPOSED</u>	PLANE PARALLEL WITH FRONT FACE. STRAIGHT SPLIT TO 1 1/2" BELOW EXPOSED SURFACE. NO LARGER THAN 1/4" SEGMENT OF DRILL HOLES SHOWING IN ARRIS LINES.	+1" TO -1"
CONCEALED	BELOW 1 1/2" FROM EXPOSED SURFACE.	+1 1/2" TO -1 1/2"
BOTTOM	APPROXIMATELY PARALLEL TO TOP. MINIMUM WIDTH: 3"	SEE PLANS
<u>ENDS EXPOSED PORTION</u>	SQUARE WITH PLANES OF TOP AND FACE	
<u>JOINTS EXPOSED</u>	OPTIMUM WIDTH: 1"	
CONCEALED	TO BREAK BACK NO MORE THAN 4"	+3/4" TO -3/4"

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE/STREET	
1	DRAFTING	12.15	<b>VERTICAL GRANITE CURB</b>	DRAWING NO.	C-1	
2	SAWCUT	5.19		DATE:	12/08	PAGE: 1
-	-	-				
-	-	-				



CRUSHED GRAVEL TO BE COMPACTED TO 95% MIN HAND COMPACTION IS NOT ALLOWED

1 1/2" WEARING COURSE  
PAVEMENT DEPTH VARIES

MIN LENGTH OF STRAIGHT CURB STONES 18"  
MAX LENGTH OF STRAIGHT CURB STONES 8'  
MAX LENGTH OF STRAIGHT CURB STONES LAID ON CURVES - SEE CHART

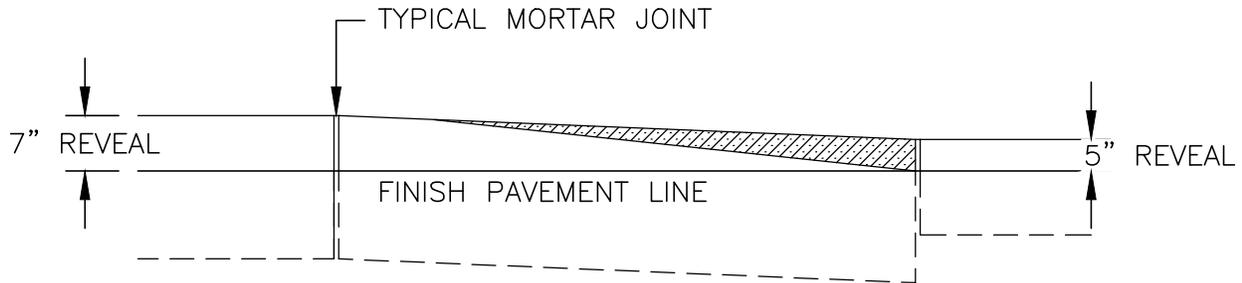
RADIUS	MAX LENGTH
≤ 2'	CURVED CURB
>2' - 15'	RADIAL JOINTS
16' - 28'	18"
29' - 41'	2'
42' - 55'	3'
56' - 68'	4'
69' - 82'	5'
83' - 96'	6'
97' - 110'	7'
OVER 110'	8'

ADJOINING STONES SHALL HAVE THE SAME OR APPROXIMATE LENGTH.

FINISH SURFACE AND TOLERANCES FOR SLOPED GRANITE CURB

AREA	FINISH SURFACE	TOLERANCE
<u>ARRIS LINES</u>	STRAIGHT AND TRUE ON TOP, FRONT AND ENDS. DRILL HOLES NOT DEEPER THAN 1/4" ALLOWED IN ARRIS LINES.	+1/4" TO -1/4"
<u>FACES</u>		
EXPOSED PART	PLANES; NO DRILL HOLES IN FACES LONGER THAN 8" OR DEEPER THAN 1/4".	+1" TO -1"
CONCEALED PART	DRILL HOLES NOT OBJECTIONABLE.	
<u>ENDS</u>	SQUARE WITH FACE EXCEPT AS INDICATED.	
<u>JOINTS</u>		
	ON TANGENT, MAXIMUM WIDTH: 1".	+1/2" TO -1/2"
	ON CURVES OVER 15' RADIUS, WIDEN TOP OR BOTTOM FROM 1" AS NECESSARY.	+1/2" TO -1/2"
	ON CURVES WITH 15' RADIUS AND UNDER, USE RADIAL JOINTS OR CURVED CURB AS INDICATED. OPTIMUM WIDTH: 1"	+1/2" TO -1/2"

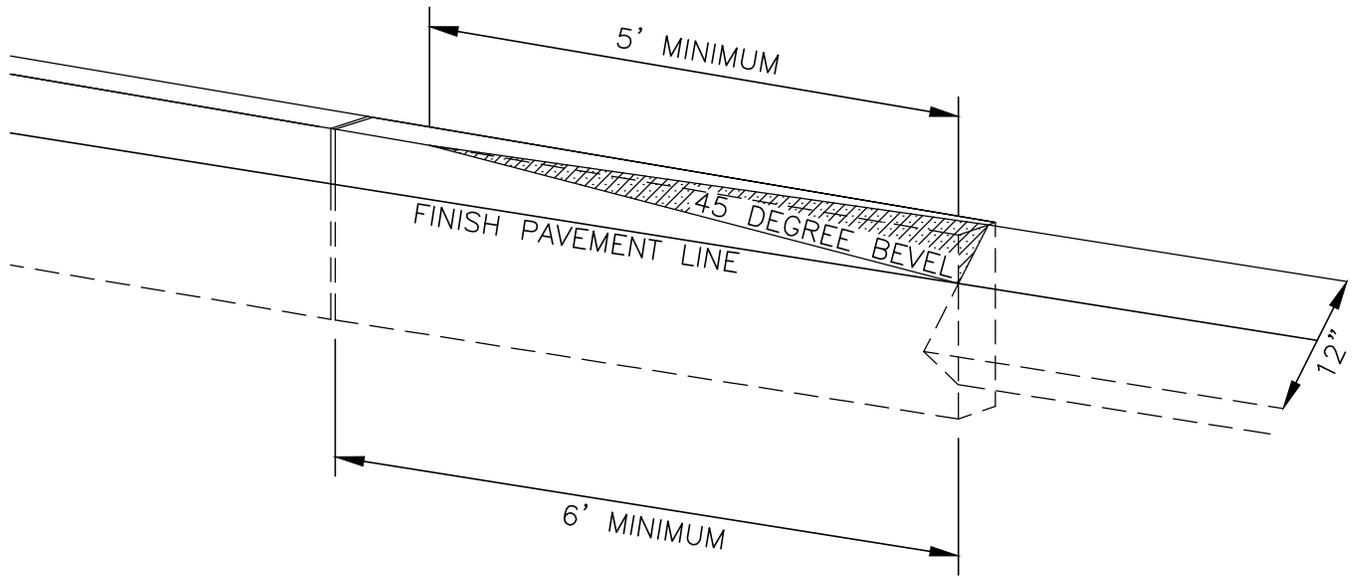
NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION:	SITE/STREET	
1	DRAFTING	11.11		<b>SLOPED GRANITE CURB</b>	DRAWING NO.	C-2
2	REMOVED FF	12.15			DATE:	12/08
3	SAWCUT	5.19			PAGE:	1
-	-	-				



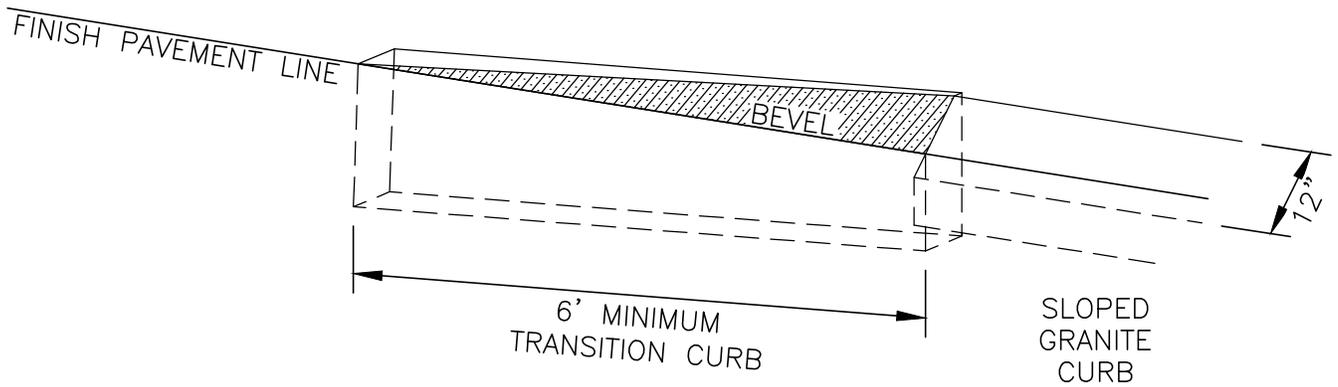
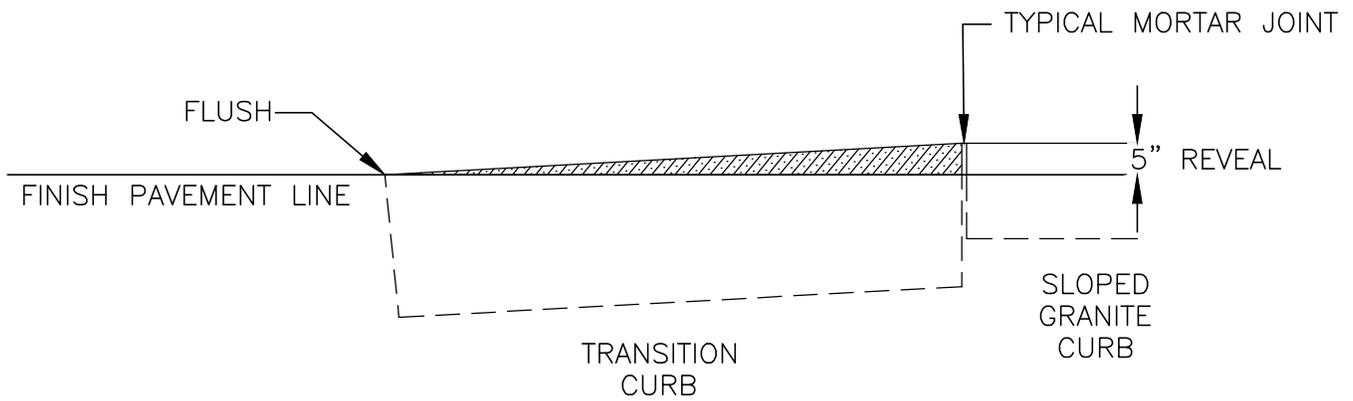
TYPICAL  
VERTICAL  
GRANITE  
CURB  
SECTION

TRANSITION  
CURB  
SECTION  
TIPPED DOWN

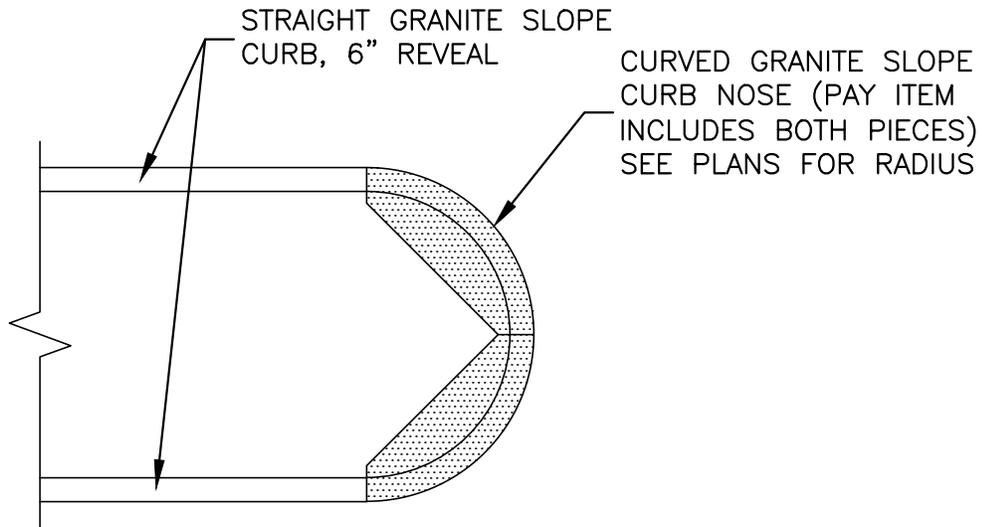
TYPICAL  
SLOPED  
GRANITE  
CURB  
SECTION



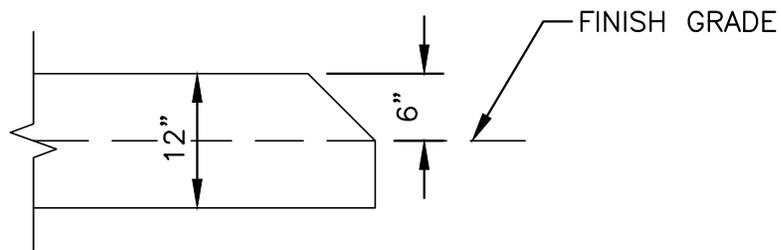
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SITE/STREET
-	-	-	<b>SLOPE TO VERTICAL GRANITE CURB TRANSITION</b>	DRAWING NO. C-3
-	-	DATE: 12/08		PAGE: 1
-	-			
-	-			



NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	ROADWAY		
-	-	-	<b>SLOPE GRANITE CURB TRANSITION</b>	DRAWING NO.	C-4		
-	-	-		DATE:	01/12	PAGE:	1
-	-	-		APPROVED BY:			
APPROVED BY:							

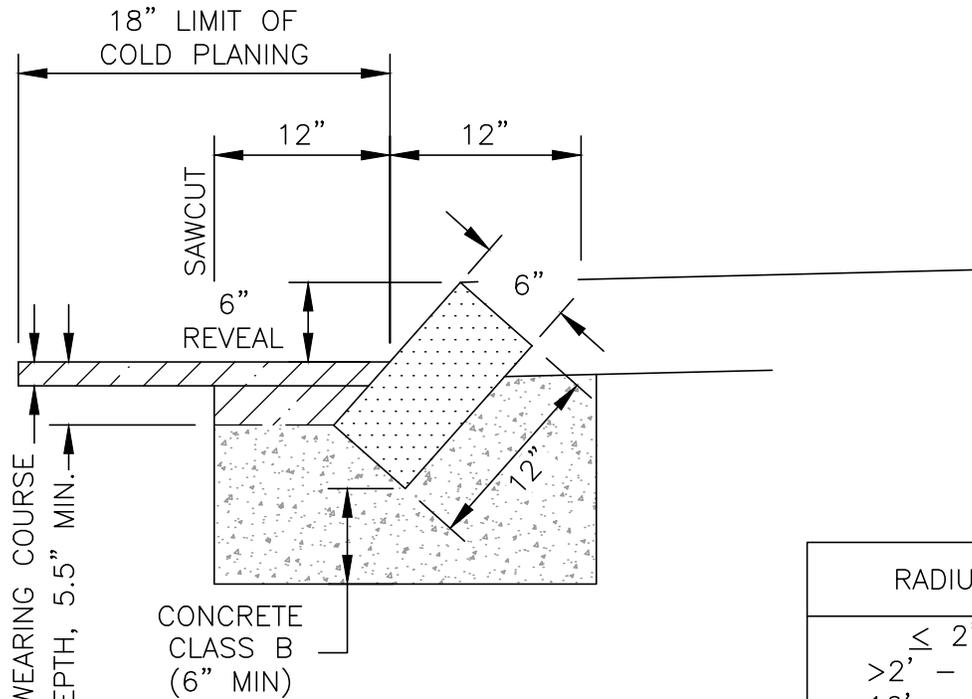


**PLAN**



**SECTION**

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SITE/STREET
-	-	-	<b>CURVED GRANITE SLOPE CURB NOSE</b>	DRAWING NO. C-5
-	-	-		DATE: 01/15
-	-	-		PAGE: 1
-	-	-		



1 1/2" WEARING COURSE  
PAVEMENT DEPTH, 5.5" MIN.

CONCRETE CLASS B (6" MIN)

MIN LENGTH OF STRAIGHT CURB STONES 18"  
MAX LENGTH OF STRAIGHT CURB STONES 8'  
MAX LENGTH OF STRAIGHT CURB STONES LAID ON CURVES - SEE CHART

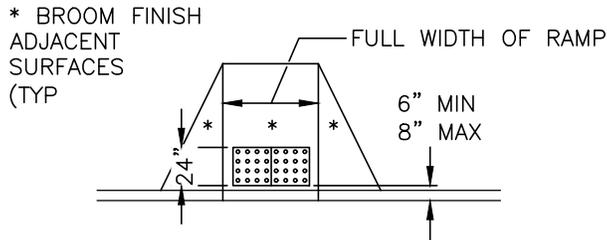
ADJOINING STONES SHALL HAVE THE SAME OR APPROXIMATE LENGTH.

RADIUS	MAX LENGTH
≤ 2'	CURVED CURB RADIAL JOINTS
>2' - 15'	18"
16' - 28'	2'
29' - 41'	3'
42' - 55'	4'
56' - 68'	5'
69' - 82'	6'
83' - 96'	7'
97' - 110'	8'
OVER 110'	8'

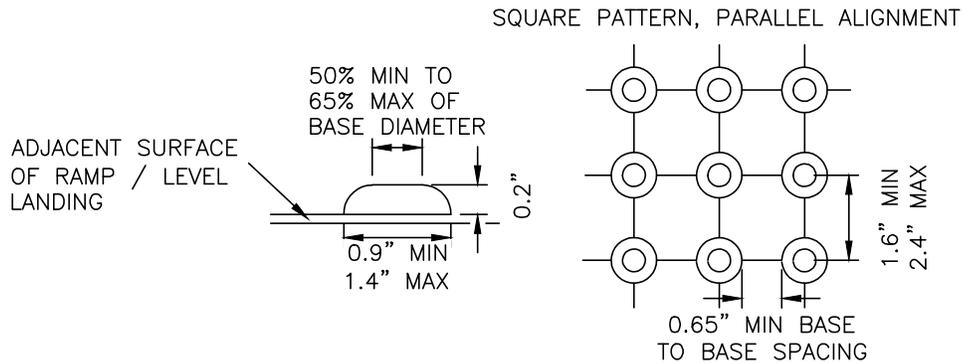
FINISH SURFACE AND TOLERANCES FOR SLOPED GRANITE CURB

AREA	FINISH SURFACE	TOLERANCE
<u>ARRIS LINES</u>	STRAIGHT AND TRUE ON TOP, FRONT AND ENDS. DRILL HOLES NOT DEEPER THAN 1/4" ALLOWED IN ARRIS LINES.	+1/4" TO -1/4"
<u>FACES</u>		
EXPOSED PART	PLANES; NO DRILL HOLES IN FACES LONGER THAN 8" OR DEEPER THAN 1/4".	+1" TO -1"
CONCEALED PART	DRILL HOLES NOT OBJECTIONABLE.	
<u>ENDS</u>	SQUARE WITH FACE EXCEPT AS INDICATED.	
<u>JOINTS</u>	ON TANGENT, MAXIMUM WIDTH: 1".	+1/2" TO -1/2"
	ON CURVES OVER 15' RADIUS, WIDEN TOP OR BOTTOM FROM 1" AS NECESSARY.	+1/2" TO -1/2"
	ON CURVES WITH 15' RADIUS AND UNDER, USE RADIAL JOINTS OR CURVED CURB AS INDICATED. OPTIMUM WIDTH: 1"	+1/2" TO -1/2"

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>  <b>MEDIAN SLOPED GRANITE CURB</b>	SECTION:	SITE/STREET
-	-	-		DRAWING NO.	C-6
-	-	-		DATE:	5/2019
-	-	-		PAGE:	1



**DETECTABLE WARNING PLACEMENT**



**DETECTABLE WARNING DETAILS**

NOTES:

1. DETECTABLE WARNING SURFACES SHALL BE CAST IRON WITHIN THE CITY R.O.W.
2. CONCRETE ADJACENT TO ALL DETECTABLE WARNINGS SHALL HAVE A BROOM FINISH.
3. THE COLOR OF THE DETECTABLE WARNING SHALL PROVIDE A VISUAL CONTRAST TO THE SURROUNDING SURFACE AND SHALL BE AS SPECIFIED ON THE PLANS.
4. WHERE A RAMP OR LEVEL LANDING MEETS A CURB RADIUS, ALIGN THE EDGE OF THE DETECTABLE WARNING AREA PARALLEL TO THE CURB TO THE MAXIMUM EXTENT FEASIBLE.

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>  <b>DETECTABLE WARNING PANEL DETAILS</b>	SECTION:	SITE/STREET
1	REV STYLE	11-09		DRAWING NO.	CR-1
-	-	-		DATE:	12/08
-	-	-		PAGE:	1
APPROVED BY:					

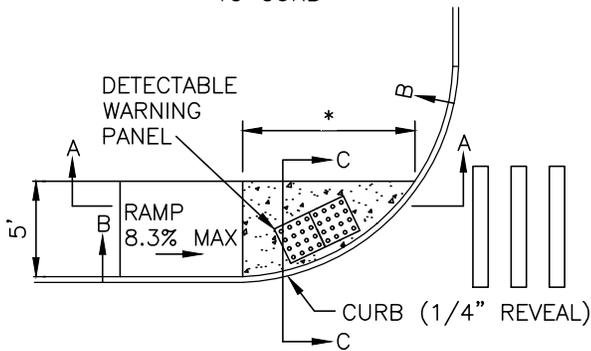
GENERAL NOTES:

1. THE DIMENSIONS AND GRADES SHOWN ON THIS STANDARD WILL BE ADHERED TO IN THE DESIGN AND THE CONSTRUCTION OF SIDEWALK RAMPS. WHERE SIDEWALKS RUN ADJACENT TO ROADWAYS ON STEEP (5% OR GREATER) GRADES, RAMP GRADES WILL BE AS FLAT AS POSSIBLE. (ON LOW SIDE OF DRIVES AND INTERSECTING SIDE STREETS, RAMPS SHALL SLOPE TOWARDS DRIVE OR SIDE STREET AT 2%)
2. NOMINAL RAMP DIMENSIONS AND GRADES:  
 RAMP WIDTH – 5’ MINIMUM  
 RAMP SLOPE – 8.3% MAXIMUM  
 FLARE SLOPE – 10% MAXIMUM  
 RAMP CROSS SLOPE – 2% MAXIMUM
3. CURB RAMPS SHALL BE CONSTRUCTED OF 6” PORTLAND CEMENT CONCRETE (CLASS AA, 4000 PSI) WITH 6”X6” W2.9XW2.9 WOVEN WIRE FABRIC REINFORCING PLACED 2½” FROM THE TOP OF THE SLAB WITH 6” CRUSHED GRAVEL SUBBASE
4. ALL SIDEWALKS AND LANDINGS SHALL HAVE A CROSS SLOPE OF 2% DRAINING TOWARD THE STREET, DRIVE, OR PARKING AREA
5. A LEVEL LANDING (NO GREATER THAN 2% SLOPE IN ANY DIRECTION) SHALL BE PROVIDED AT THE TOP OF SIDEWALK RAMPS TO ALLOW FOR STOPPING AND MANEUVERING OF WHEELCHAIRS
6. LEVEL LANDINGS (NO GREATER THAN 2% SLOPE IN ANY DIRECTION) AT THE BOTTOM OF PERPENDICULAR RAMPS SHALL BE WHOLLY CONTAINED WITHIN MARKED CROSSWALKS
7. DUMMY JOINTS SHALL BE PROVIDED AT TRANSITIONS (GRADE CHANGES) AT TOPS AND BOTTOMS OF RAMPS AND FLARES
8. VERTICAL DROP-OFF EDGES TO RAMPS WILL NOT BE BUILT UNLESS THE RAMP ABUTS AN AREA WHICH WILL NOT BE USED BY PEDESTRIANS
9. A ¼” CURB REVEAL WILL BE PROVIDED WHERE THE RAMP ADJOINS THE ROADWAY
10. AT MARKED CROSSWALKS, THE FULL WIDTH OF THE RAMP OR LANDING SHALL BE CONTAINED WITHIN THE PAVEMENT MARKINGS
11. RAMP FLARES SHOULD BE LOCATED OUTSIDE THE DIRECT LINE OF TRAVEL MOST LIKELY TO BE FOLLOWED BY THE VISUALLY IMPAIRED
12. SIGNS, POLES, PLANTERS, MAILBOXES, ETC., SHALL NOT BE LOCATED WHERE THEY WILL INTERFERE WITH THE USE OF SIDEWALK RAMPS
13. SIDEWALK RAMPS SHALL NOT BE LOCATED WHERE USERS MUST CROSS DROP INLET GRATES, MANHOLE COVERS, OR OTHER ACCESS LIDS. IF THIS CANNOT BE AVOIDED THEN GRATE DESIGN AND PLACEMENT SHALL CONFORM TO ADA REQUIREMENTS
14. CURB DRAINAGE SHOULD BE CONSTRUCTED SO AS TO PRECLUDE THE FLOW OF WATER PAST THE SIDEWALK RAMP
15. WHEREVER FEASIBLE, TWO SIDEWALK RAMPS ARE RECOMMENDED IN PREFERENCE TO A SINGLE RAMP
16. SIDEWALKS THAT ARE LESS THAN 5’ WIDE REQUIRE 5’ WIDE BY 5’ LONG PASSING AREAS (NO GREATER THAN 2% CROSS SLOPE) AT INTERVALS NOT TO EXCEED 200’
17. E.O.P. = EDGE OF PAVEMENT
18. THE PUBLIC SIDEWALK CURB RAMP STANDARDS DEPICTED HERE MAY NOT BE APPROPRIATE FOR ALL LOCATIONS. FIELD CONDITIONS AT INDIVIDUAL LOCATIONS MAY REQUIRE SPECIFIC DESIGNS. DESIGNS MUST BE CONSISTENT WITH THE PROVISIONS OF THIS SHEET TO THE MAXIMUM EXTENT FEASIBLE ON ALTERATION PROJECTS AND WHEN STRUCTURALLY PRACTICABLE ON NEW CONSTRUCTION PROJECTS AS REQUIRED BY THE U.S. ACCESS BOARD FOR PUBLIC RIGHTS-OF-WAY.

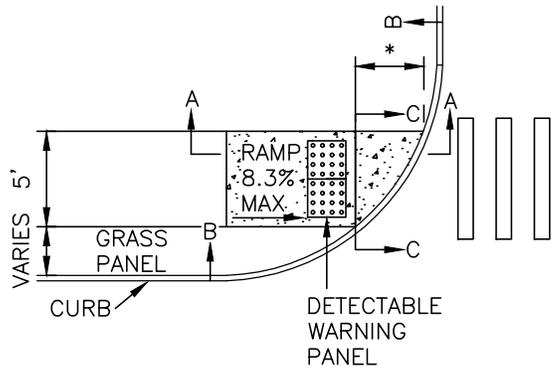
NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>  <b>SIDEWALK RAMP GENERAL NOTES</b>	SECTION:	SITE/STREET		
1	REV STYLE	11-09		DRAWING NO.	CR-2		
2	NOTE 18	5.19		DATE:	12/08	PAGE:	1
-	-	-		APPROVED BY:			

## SINGLE WALK STRAIGHT APPROACH TO PARALLEL RAMP

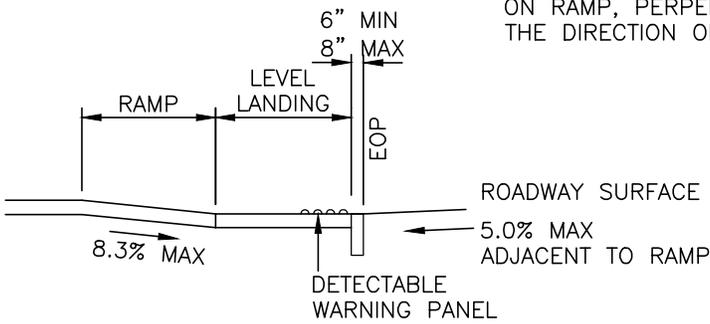
EXAMPLE 1: SIDEWALK ADJACENT TO CURB



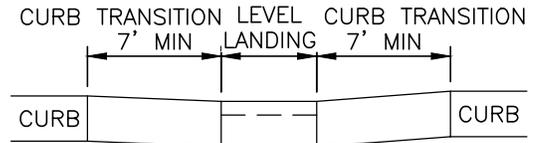
EXAMPLE 2: SIDEWALK AND CURB SEPARATED BY GRASS PANEL



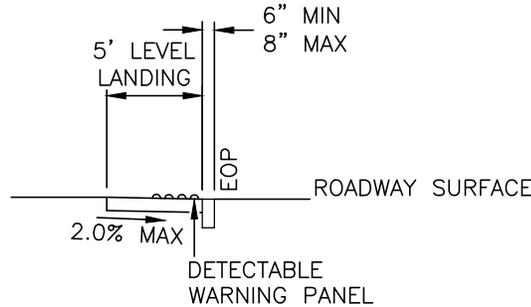
\* IF LESS THEN 5', DETECTABLE WARNING PANEL MAY BE PLACED ON RAMP, PERPENDICULAR TO THE DIRECTION OF TRAVEL



**SECTION A-A**



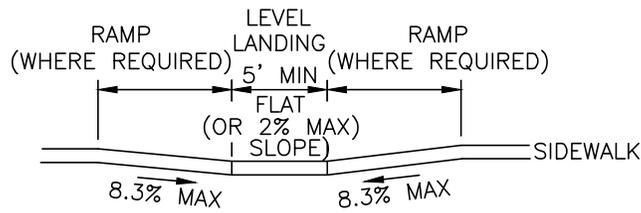
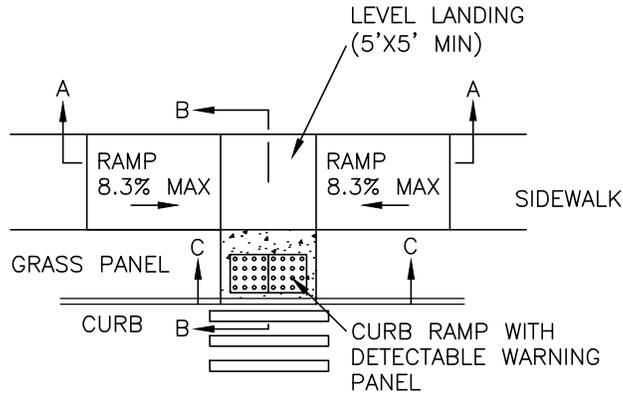
**SECTION B-B**



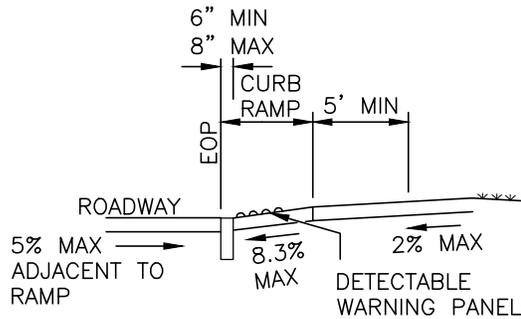
**SECTION C-C**

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION: SITE/STREET
1	REV STYLE	11-09	<b>SIDEWALK RAMP TYPE 1</b>	DRAWING NO. CR-3
2	SECT C-C	11-09		DATE: 12/08
-	-	-		PAGE: 1
APPROVED BY:				

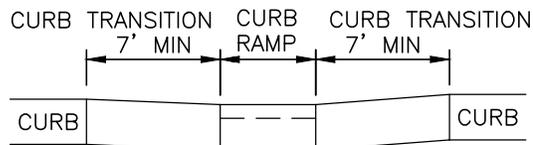
# SINGLE PERPENDICULAR RAMP FROM LEVEL LANDING TANGENT SECTION



**SECTION A-A**



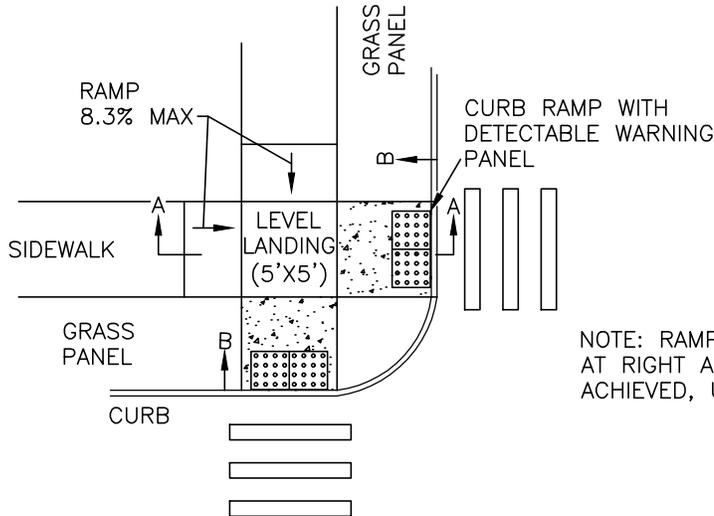
**SECTION B-B**



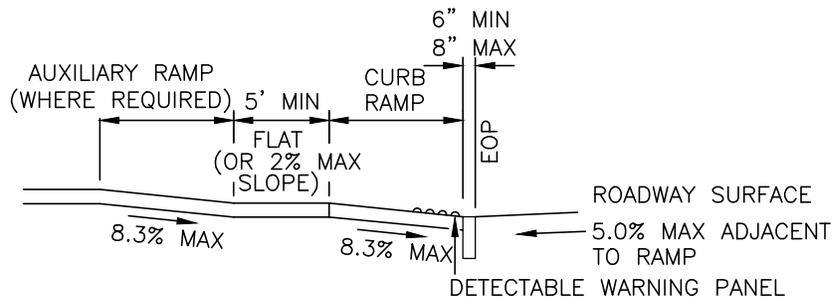
**SECTION C-C**

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION:	SITE/STREET
1	REV STYLE	11-09		DRAWING NO.	CR-4
-	-	-		DATE:	12/08
-	-	-		PAGE:	1
APPROVED BY:			<b>SIDEWALK RAMP TYPE 2</b>		

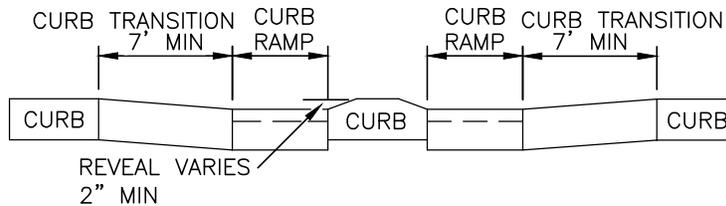
## TWO PERPENDICULAR RAMPS FROM LEVEL LANDING



NOTE: RAMPS MUST INTERSECT CURB AT RIGHT ANGLE. IF THIS CANNOT BE ACHIEVED, USE RAMP TYPE 6



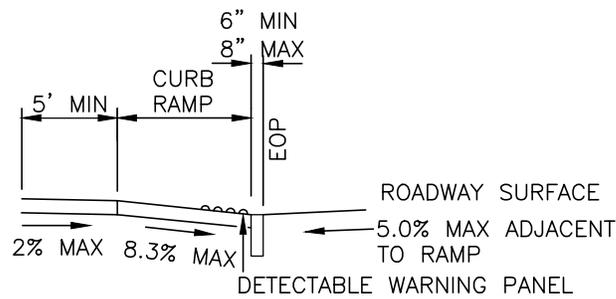
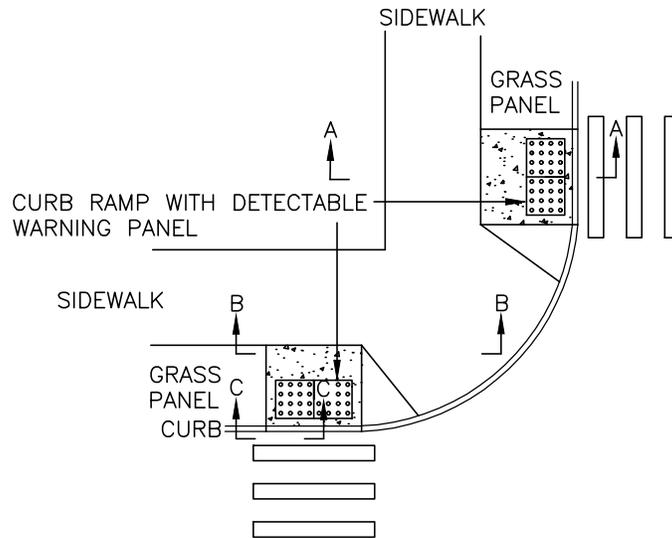
**SECTION A-A**



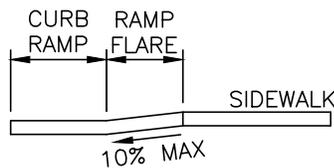
**SECTION B-B**

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION: SITE/STREET	
1	REV STYLE	11-09	<h1 style="margin: 0;">SIDEWALK RAMP TYPE 3</h1>	DRAWING NO. CR-5	
-	-	-		DATE: 12/08	PAGE: 1
-	-	-			
APPROVED BY:					

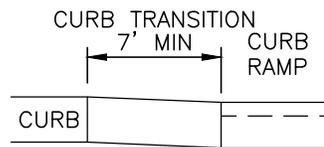
# RAMP OFFSET FROM DIRECT LINE OF PEDESTRIAN TRAVEL



**SECTION A-A**



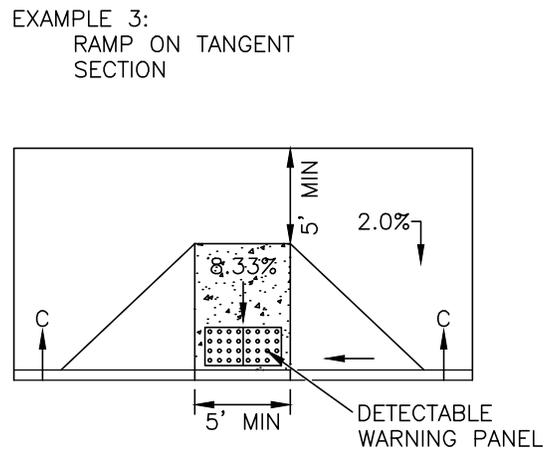
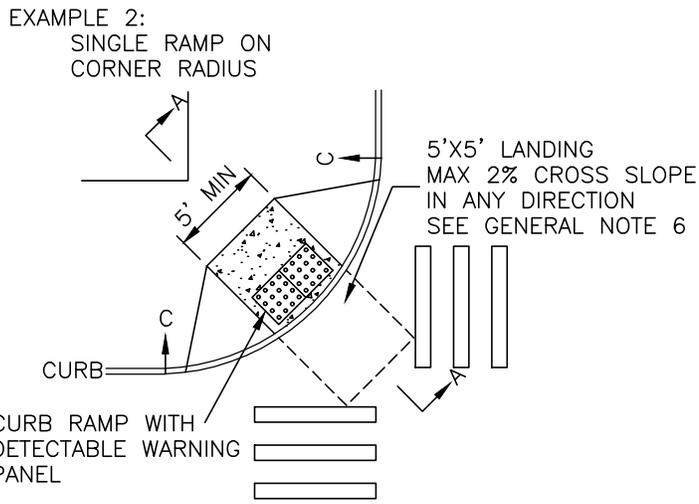
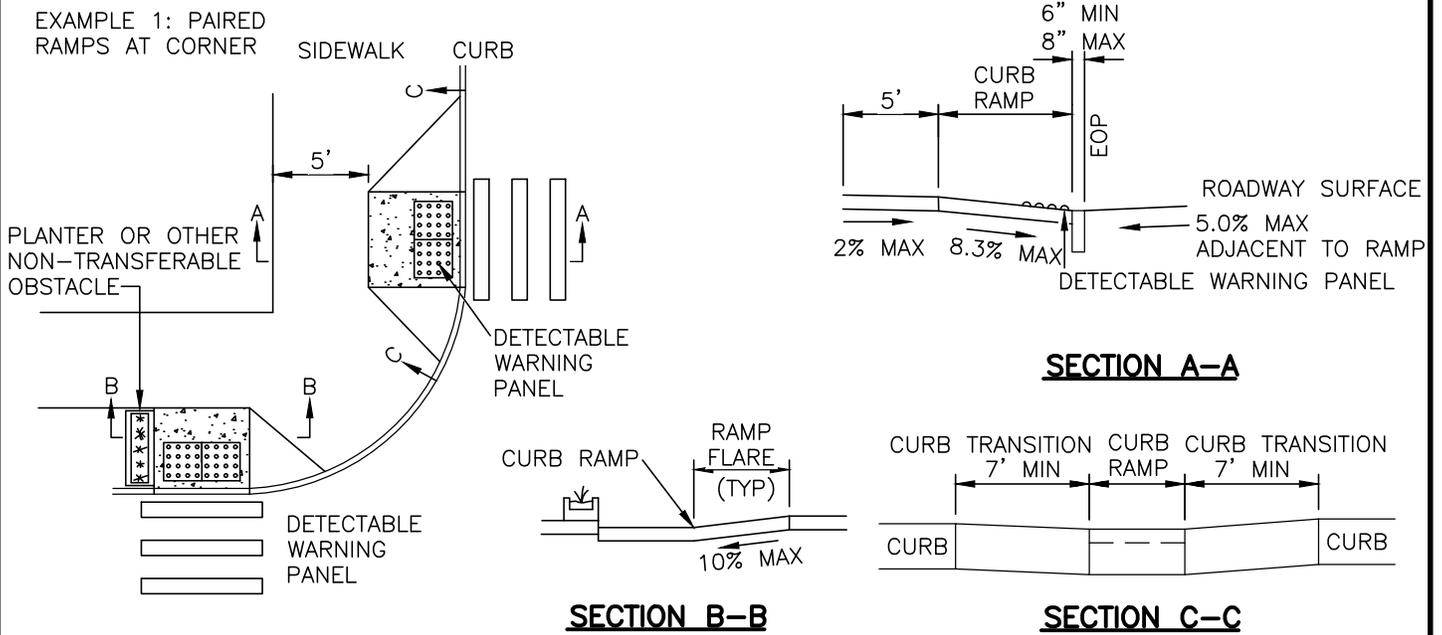
**SECTION B-B**



**SECTION C-C**

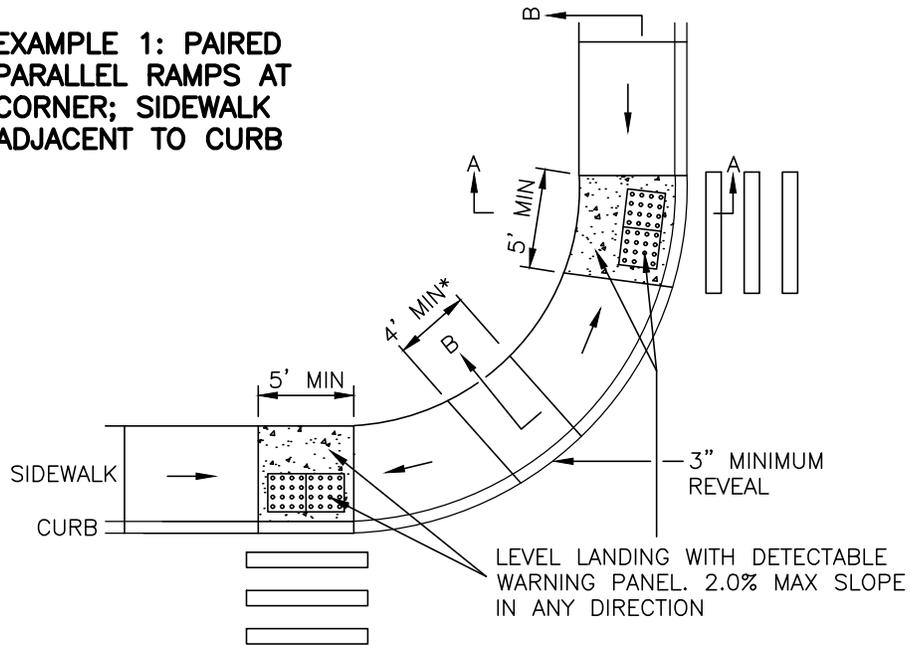
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE/STREET
1	REV STYLE	11-09		DRAWING NO.	CR-6
-	-	-		DATE:	12/08
-	-	-		PAGE:	1
APPROVED BY:			<b>SIDEWALK RAMP TYPE 4</b>		

# PERPENDICULAR RAMP IN URBAN SETTING – WIDE SIDEWALK



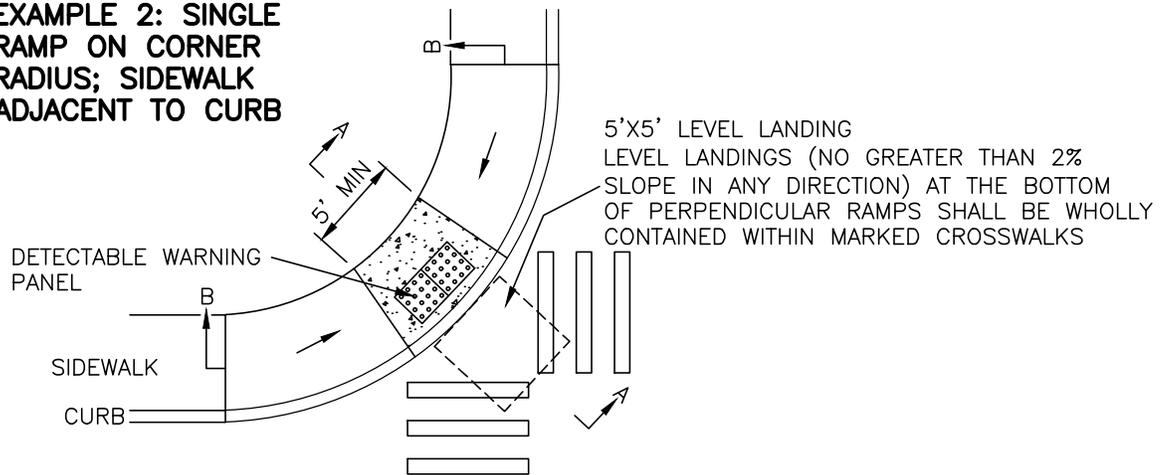
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE/STREET	
1	REV STYLE	11-09		<b>SIDEWALK RAMP TYPE 5</b>	DRAWING NO.	CR-7
-	-	-	DATE:		12/08	PAGE: 1
-	-	-	APPROVED BY:			

**EXAMPLE 1: PAIRED PARALLEL RAMPS AT CORNER; SIDEWALK ADJACENT TO CURB**



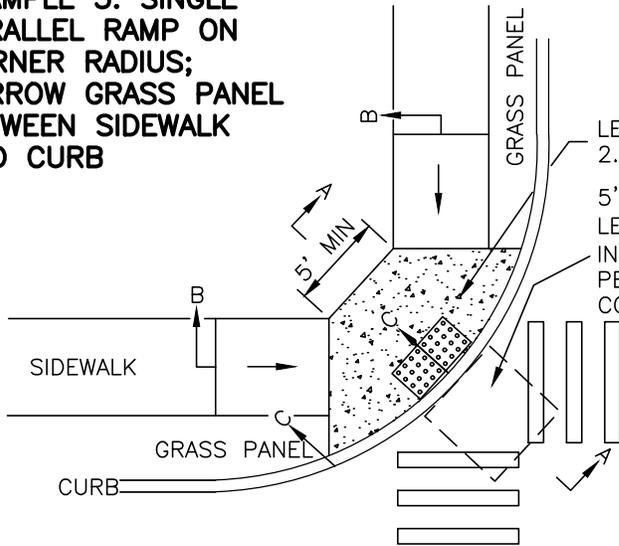
\* WHERE A 4' MINIMUM SEPARATION BETWEEN RAMPS CANNOT BE ATTAINED, THE SIDEWALK SHOULD REMAIN AT THE SAME ELEVATION AS ADJOINING LEVEL LANDINGS

**EXAMPLE 2: SINGLE RAMP ON CORNER RADIUS; SIDEWALK ADJACENT TO CURB**



NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION:	SITE/STREET			
1	DRAFTING	12.15		<b>SIDEWALK RAMP TYPE 6, EXAMPLES 1 &amp; 2</b>	DRAWING NO.	CR-8		
-	-	-			DATE:	12/08	PAGE:	1
-	-	-						
APPROVED BY:								

**EXAMPLE 3: SINGLE PARALLEL RAMP ON CORNER RADIUS; NARROW GRASS PANEL BETWEEN SIDEWALK AND CURB**

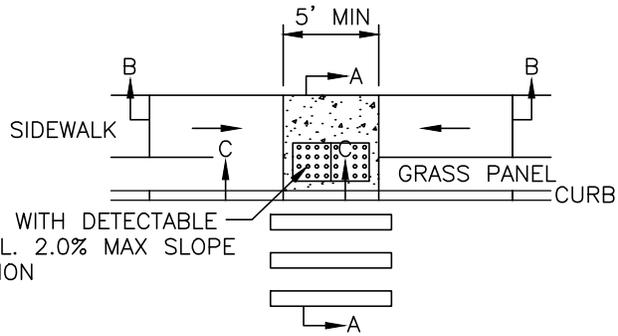


LEVEL LANDING WITH DETECTABLE WARNING PANEL. 2.0% MAX SLOPE IN ANY DIRECTION

5'X5' LEVEL LANDING

LEVEL LANDINGS (NO GREATER THAN 2% SLOPE IN ANY DIRECTION) AT THE BOTTOM OF PERPENDICULAR RAMPS SHALL BE WHOLLY CONTAINED WITHIN MARKED CROSSWALKS

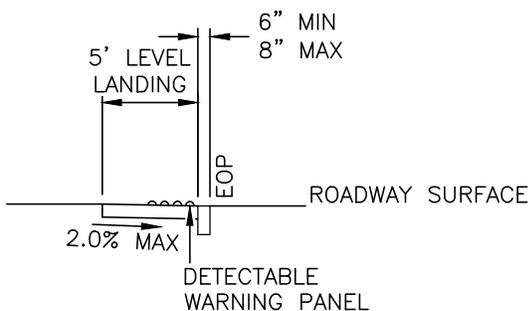
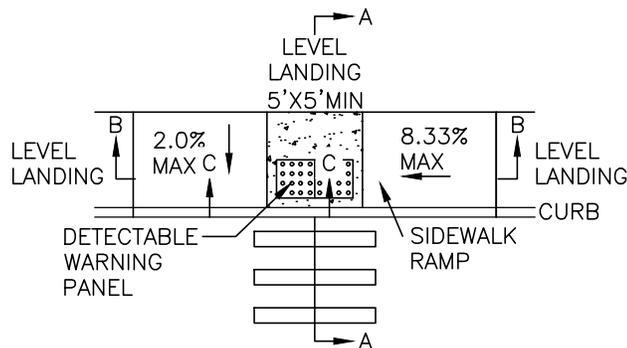
**EXAMPLE 4: SINGLE RAMP ON TANGENT; NARROW GRASS PANEL**



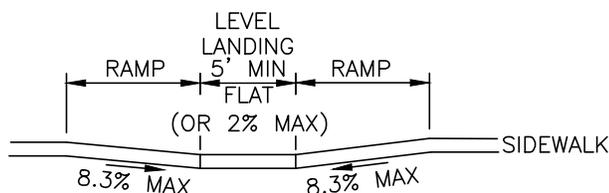
LEVEL LANDING WITH DETECTABLE WARNING PANEL. 2.0% MAX SLOPE IN ANY DIRECTION

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION:	SITE/STREET		
1	DRAFTING	12.15		<b>SIDEWALK RAMP TYPE 6, EXAMPLES 3 &amp; 4</b>	DRAWING NO.	CR-9	
-	-	-			DATE:	12/08	PAGE: 1
-	-	-			APPROVED BY:		
APPROVED BY:							

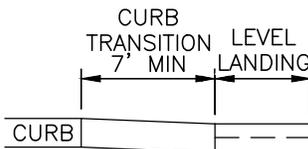
**EXAMPLE 5: SINGLE RAMP ON TANGENT:  
SIDEWALK ADJACENT TO CURB**



**SECTION A-A**



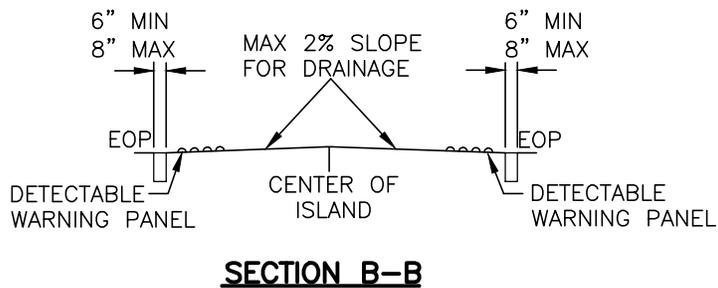
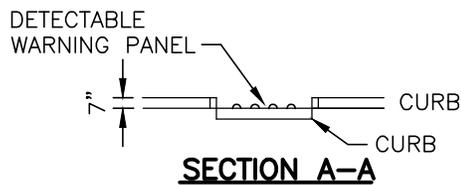
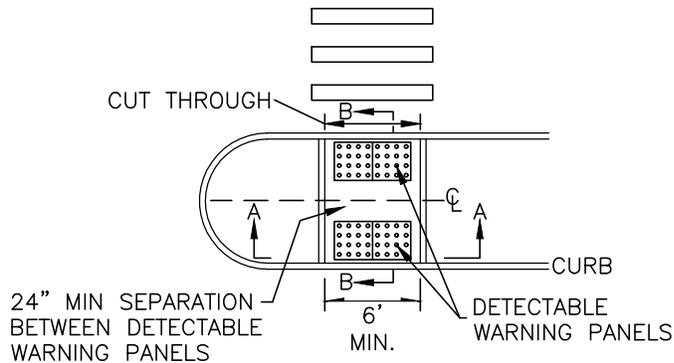
**SECTION B-B**



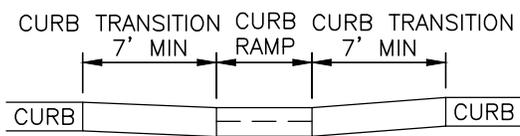
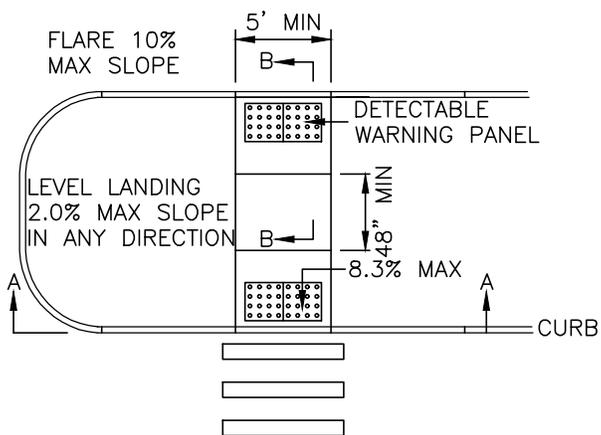
**SECTION C-C**

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE/STREET		
1	REV STYLE	11-11	<b>SIDEWALK RAMP TYPE 6, EXAMPLE 5 AND TYPE 6 SECTIONS</b>	DRAWING NO.	CR-10		
2	SECT A-A	11-11		DATE:	12/08	PAGE:	1
-	-	-		APPROVED BY:			

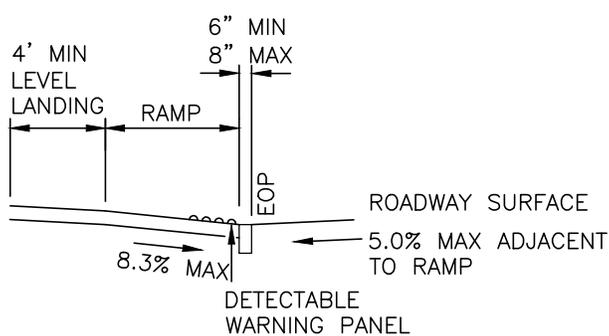




NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SITE/STREET
1	REV STYLE	11.09	<b>MEDIAN ISLAND CUT THROUGH</b>	DRAWING NO. CR-12
2	SECTION AA	5.19		DATE: 12/08
-	-	-		PAGE: 1
-	-	-		



**SECTION A-A**



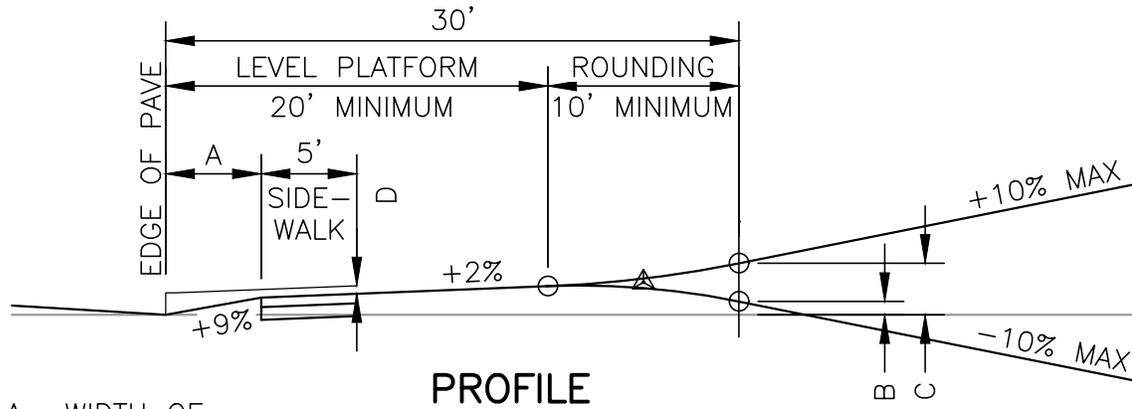
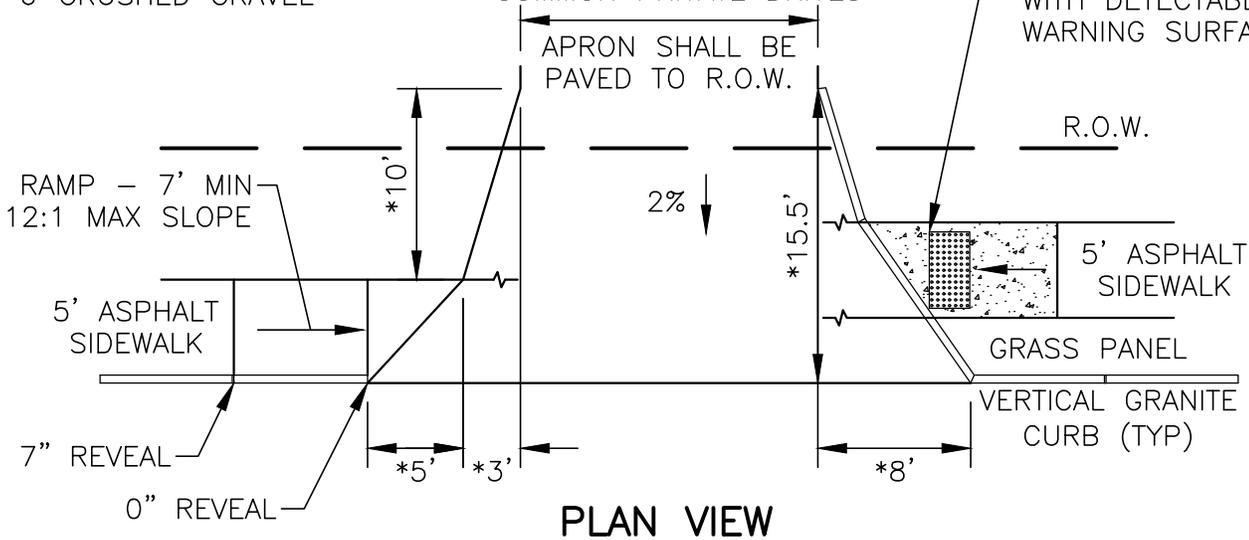
**SECTION B-B**

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION:	SITE/STREET	
1	REV STYLE	11-09		<b>RAMPS AT WIDE MEDIAN ISLANDS</b>	DRAWING NO.	CR-13
-	-	-			DATE:	12/08
-	-	-			PAGE:	1
APPROVED BY:						

MINIMUM MATERIAL VALUES  
 1½" WEAR COURSE PAVEMENT  
 1½" BASE COURSE PAVEMENT  
 6" CRUSHED GRAVEL

MEASURED AT R.O.W.  
 12' MIN/28' MAX  
 18' MIN FOR RESIDENTIAL  
 COMMON PRIVATE DRIVES

COMMERCIAL DRIVES IF  
 REQUIRED: CONSTRUCT  
 CONCRETE CURB RAMP  
 WITH DETECTABLE  
 WARNING SURFACE



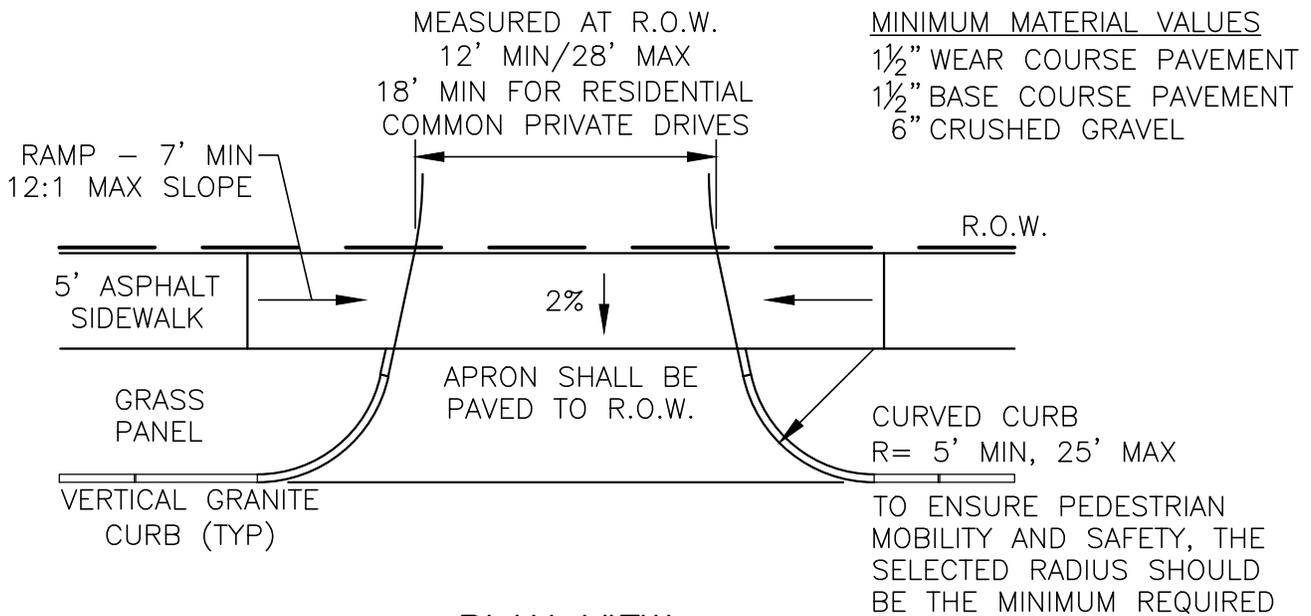
- A - WIDTH OF GRASS PANEL
- B - VERTICAL OFFSET AT 30' FOR DRIVES IN FILL
- C - VERTICAL OFFSET AT 30' FOR DRIVES IN CUT
- D - VERTICAL DROP OF SIDEWALK

VERTICAL CURB			
A	B	C	D
0	0	1'-0"	7"
1'	¾"	1'-¾"	6"
2'	1¾"	1'-1¾"	5¼"
3'	2½"	1'-2½"	4¼"
4'	¾"	1'-¾"	3½"

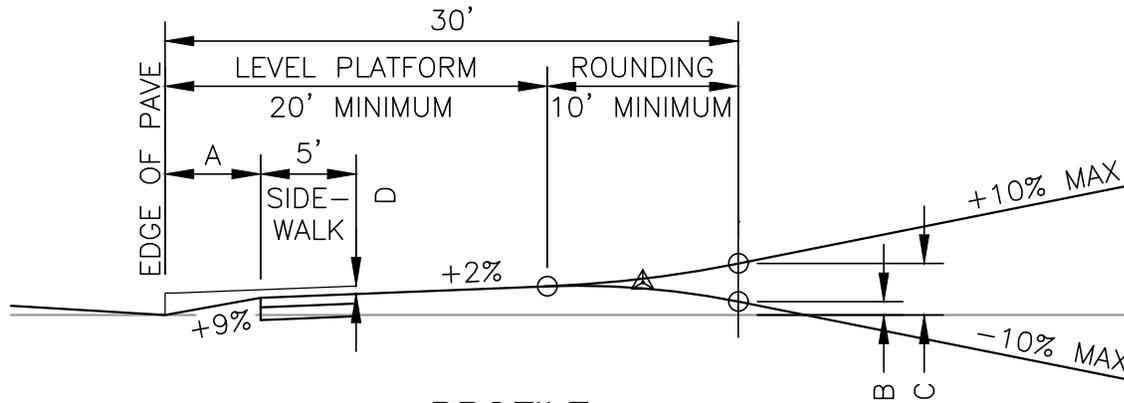
**NOTE:**

1. THE DRIVE WIDTHS AND PROFILE PERTAIN TO ALL URBAN DRIVES, REGARDLESS OF R.O.W. WIDTH OR SIDEWALK LOCATION
  2. IF REQUIRED FOR COMMERCIAL DRIVES, DETECTABLE WARNING PANELS SHALL BE PLACED PERPENDICULAR TO THE SIDEWALK WITH THE NEAREST EDGE 6" TO 8" FROM THE DRIVE.
- \* DIMENSIONS ARE MAXIMUMS AND ARE TO BE USED IF NECESSARY TO ACCOMMODATE TURNING VEHICLES.

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SITE/STREET
1	DRAFTING	11-11	DRIVE WITH VERTICAL GRANITE CURB, GRASS PANEL WIDTH <5'	DRAWING NO. D-1
1	MIN WIDTH	11-11		DATE: 12/08
-	-	-		PAGE: 1
-	-	-		



**PLAN VIEW**



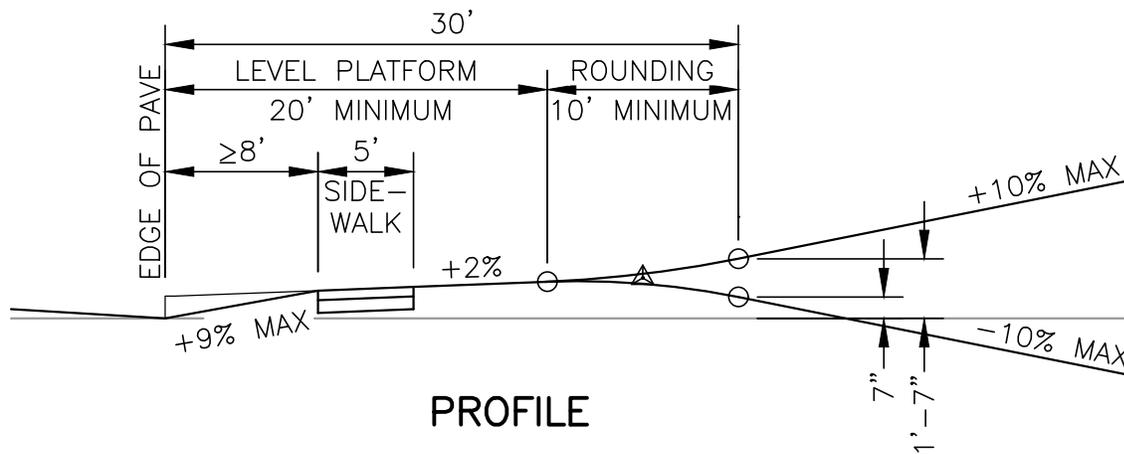
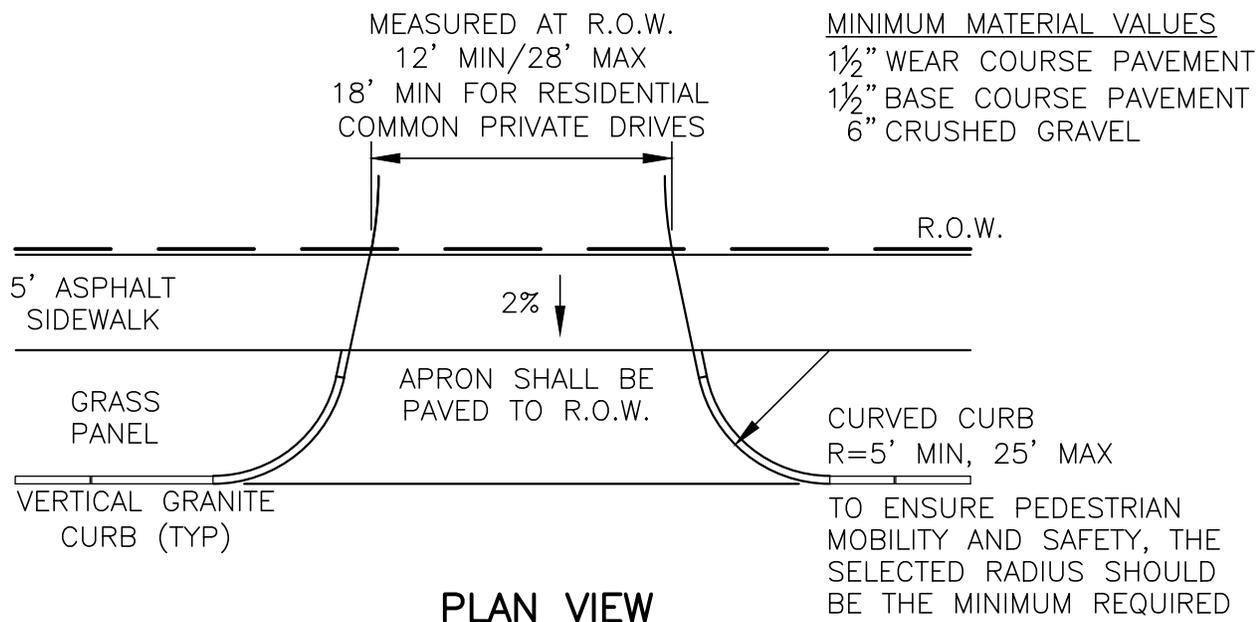
**PROFILE**

- A - WIDTH OF GRASS PANEL
- B - VERTICAL OFFSET AT 30' FOR DRIVES IN FILL
- C - VERTICAL OFFSET AT 30' FOR DRIVES IN CUT
- D - VERTICAL DROP OF SIDEWALK

VERTICAL CURB			
A	B	C	D
5'	4¼"	1'-4¼"	2¾"
6'	5"	1'-5"	1¾"
7'	6"	1'-6"	1"

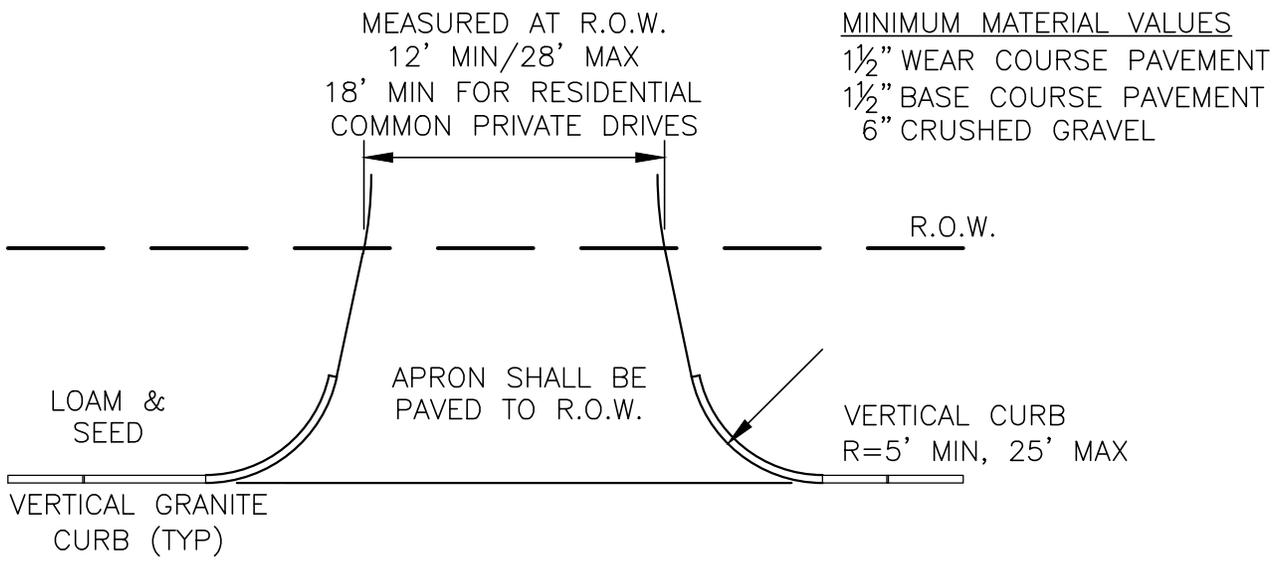
NOTE: THE DRIVE WIDTHS AND PROFILE PERTAIN TO ALL URBAN DRIVES, REGARDLESS OF R.O.W. WIDTH OR SIDEWALK LOCATION

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SITE/STREET
1	MIN WIDTH	11-11	DRIVE WITH VERTICAL GRANITE CURB, AND GRASS PANEL BETWEEN 5' AND 8' WIDE	DRAWING NO. D-2
-	-	-		DATE: 12/08
-	-	-		PAGE: 1
-	-	-		

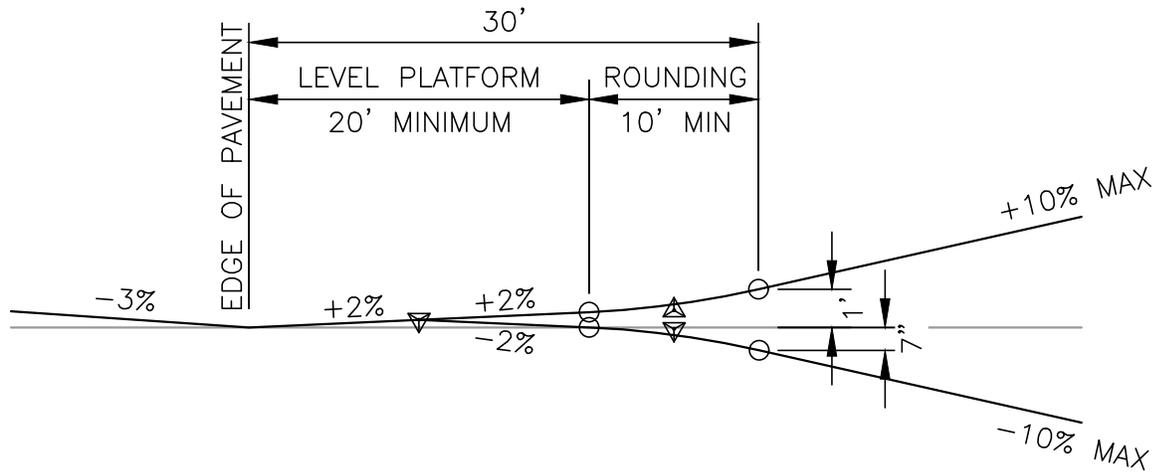


**NOTE:** THE DRIVE WIDTHS AND PROFILE PERTAIN TO ALL URBAN DRIVES, REGARDLESS OF R.O.W. WIDTH OR SIDEWALK LOCATION

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SITE/STREET
1	MIN WIDTH	11-11	DRIVE WITH VERTICAL GRANITE CURB, GRASS PANEL WIDTH ≥8'	DRAWING NO. D-3
-	-	-		DATE: 12/08
-	-	-		PAGE: 1
-	-	-		



**PLAN VIEW**



**PROFILE**

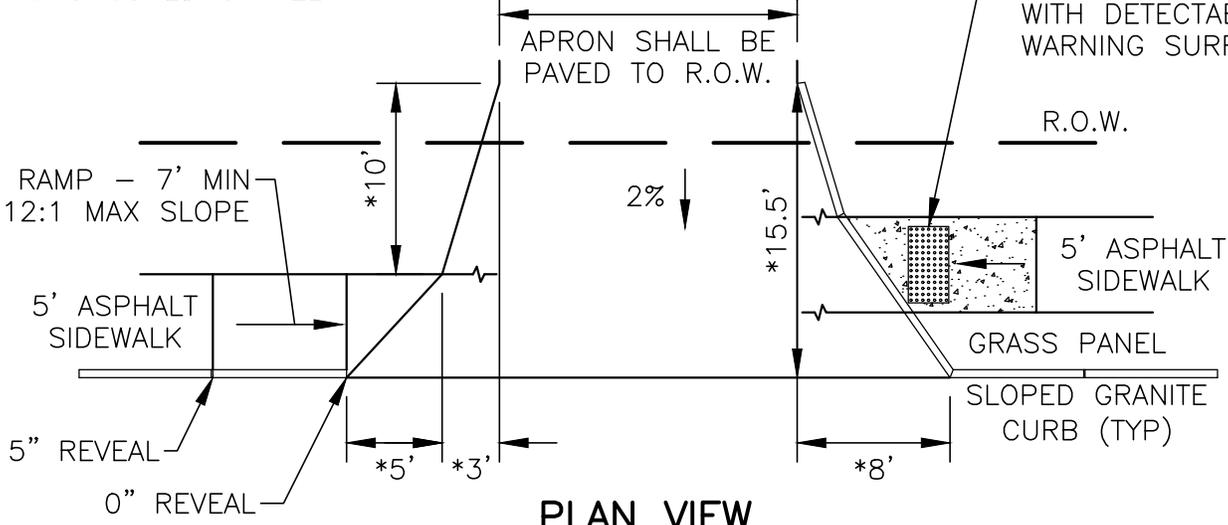
NOTE: THE DRIVE WIDTHS AND PROFILE PERTAIN TO ALL URBAN DRIVES, REGARDLESS OF R.O.W. WIDTH

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SITE/STREET	
1	MIN WIDTH	11-11	DRIVE WITH VERTICAL GRANITE CURB, W/O SIDEWALK	DRAWING NO. D-4	
-	-	-		DATE: 12/08	PAGE: 1
-	-	-			
-	-	-			

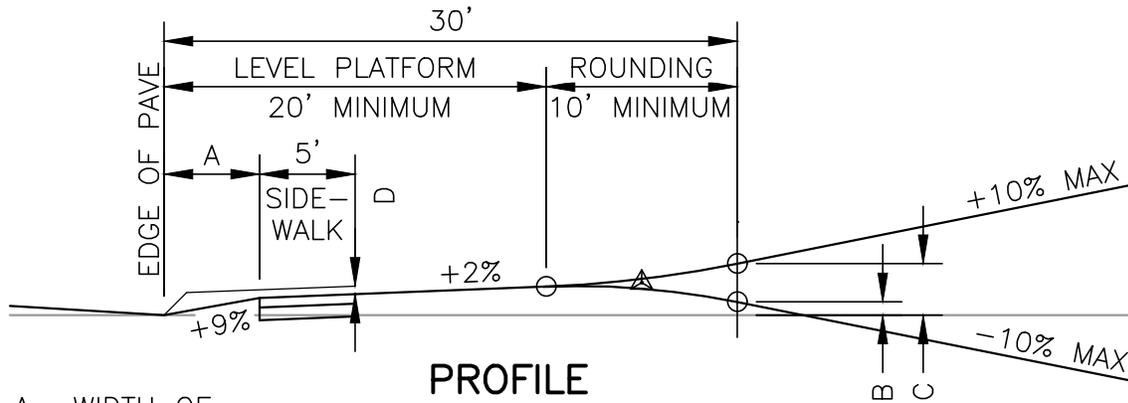
MINIMUM MATERIAL VALUES  
 1½" WEAR COURSE PAVEMENT  
 1½" BASE COURSE PAVEMENT  
 6" CRUSHED GRAVEL

MEASURED AT R.O.W.  
 12' MIN/28' MAX  
 18' MIN FOR RESIDENTIAL  
 COMMON PRIVATE DRIVES

COMMERCIAL DRIVES IF  
 REQUIRED: WHERE "A" IS  
 <5', CONSTRUCT  
 CONCRETE CURB RAMP  
 WITH DETECTABLE  
 WARNING SURFACE



**PLAN VIEW**



**PROFILE**

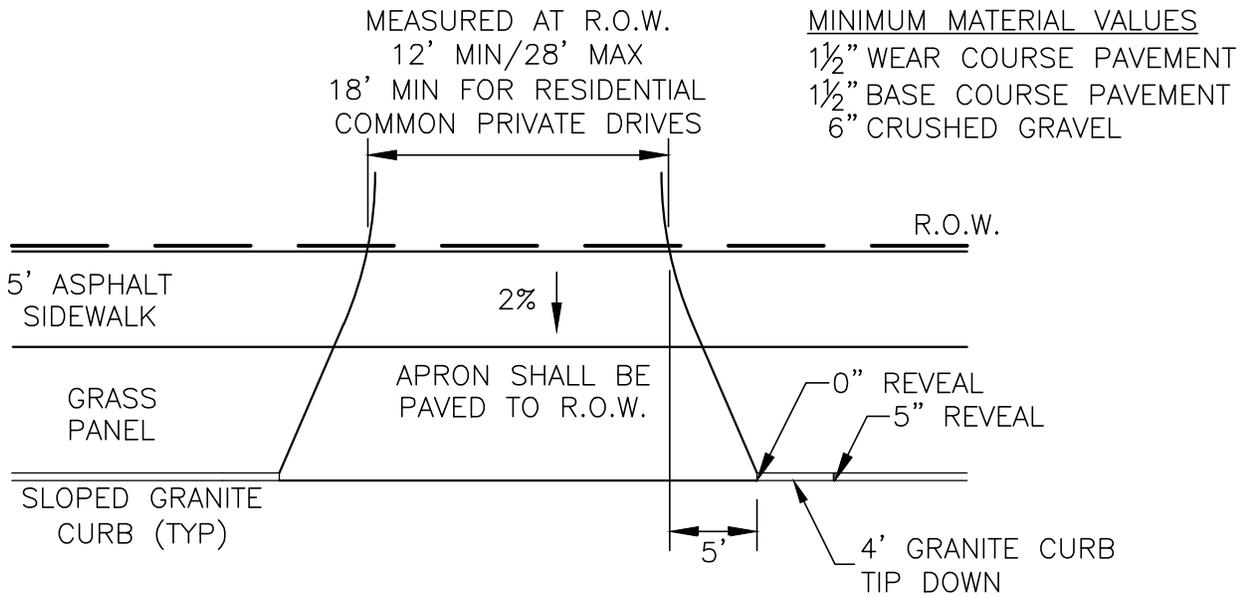
- A - WIDTH OF GRASS PANEL
- B - VERTICAL OFFSET AT 30' FOR DRIVES IN FILL
- C - VERTICAL OFFSET AT 30' FOR DRIVES IN CUT
- D - VERTICAL DROP OF SIDEWALK

SLOPED CURB			
A	B	C	D
0	0	1'-0"	5"
1'	¾"	1'-¾"	4"
2'	1¾"	1'-1¾"	3¼"
3'	2½"	1'-2½"	2¼"
4'	¾"	1'-¾"	1½"
5'	5"	1'-4¼"	¾"

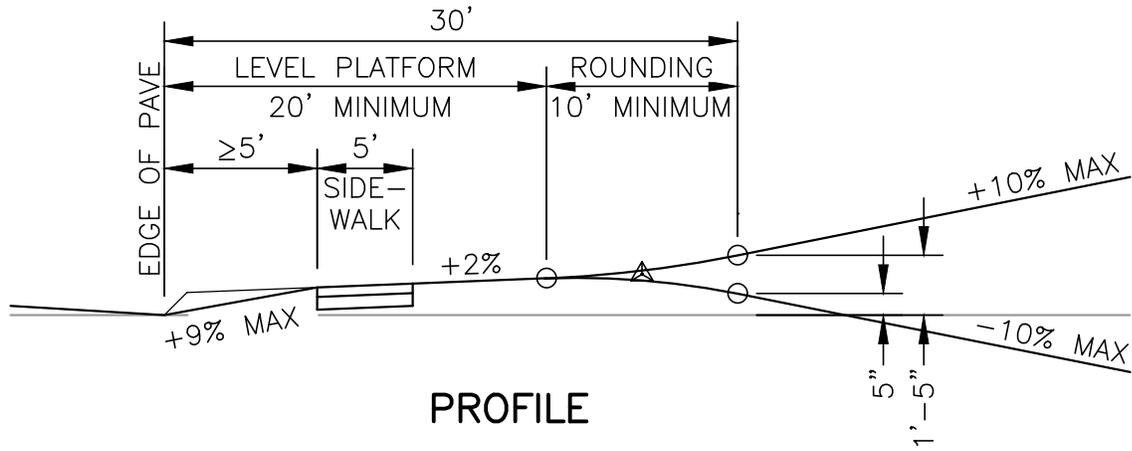
**NOTE:**

1. THE DRIVE WIDTHS AND PROFILE PERTAIN TO ALL URBAN DRIVES, REGARDLESS OF R.O.W. WIDTH OR SIDEWALK LOCATION
  2. IF REQUIRED FOR COMMERCIAL DRIVES, DETECTABLE WARNING PANELS SHALL BE PLACED PERPENDICULAR TO THE SIDEWALK WITH THE NEAREST EDGE 6" TO 8" FROM THE DRIVE.
- \* DIMENSIONS ARE MAXIMUMS AND ARE TO BE USED IF NECESSARY TO ACCOMMODATE TURNING VEHICLES.

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE/STREET
1	DRAFTING	11-11	<b>DRIVE WITH SLOPED GRANITE CURB,            GRASS PANEL WIDTH &lt;6'</b>	DRAWING NO.	D-5
1	MIN WIDTH	11-11		DATE:	12/08
-	-	-		PAGE:	1
-	-	-			



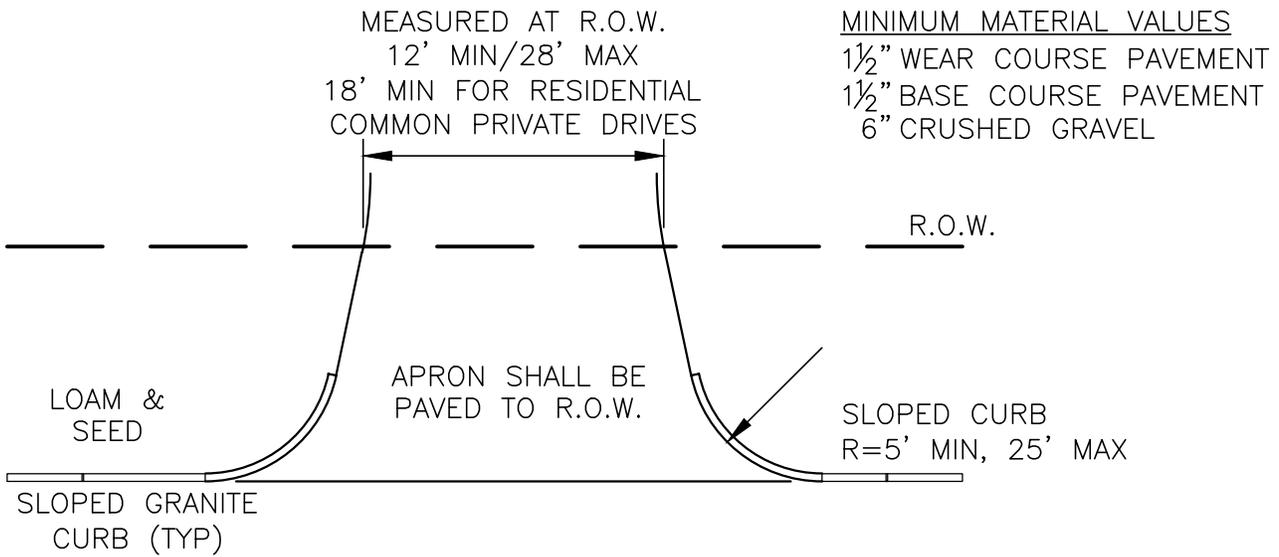
**PLAN VIEW**



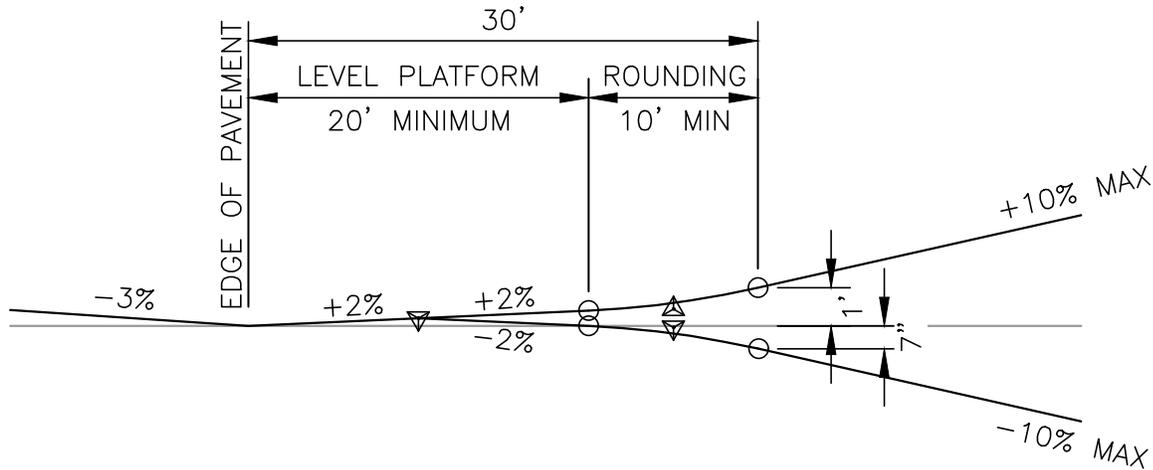
**PROFILE**

**NOTE:** THE DRIVE WIDTHS AND PROFILE PERTAIN TO ALL URBAN DRIVES, REGARDLESS OF R.O.W. WIDTH OR SIDEWALK LOCATION

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:
1	MIN WIDTH	11-11	DRIVE WITH SLOPED GRANITE CURB, GRASS PANEL WIDTH ≥6'	SITE/STREET
-	-	-		DRAWING NO. D-6
-	-	-		DATE: 12/08
-	-	-		PAGE: 1



**PLAN VIEW**



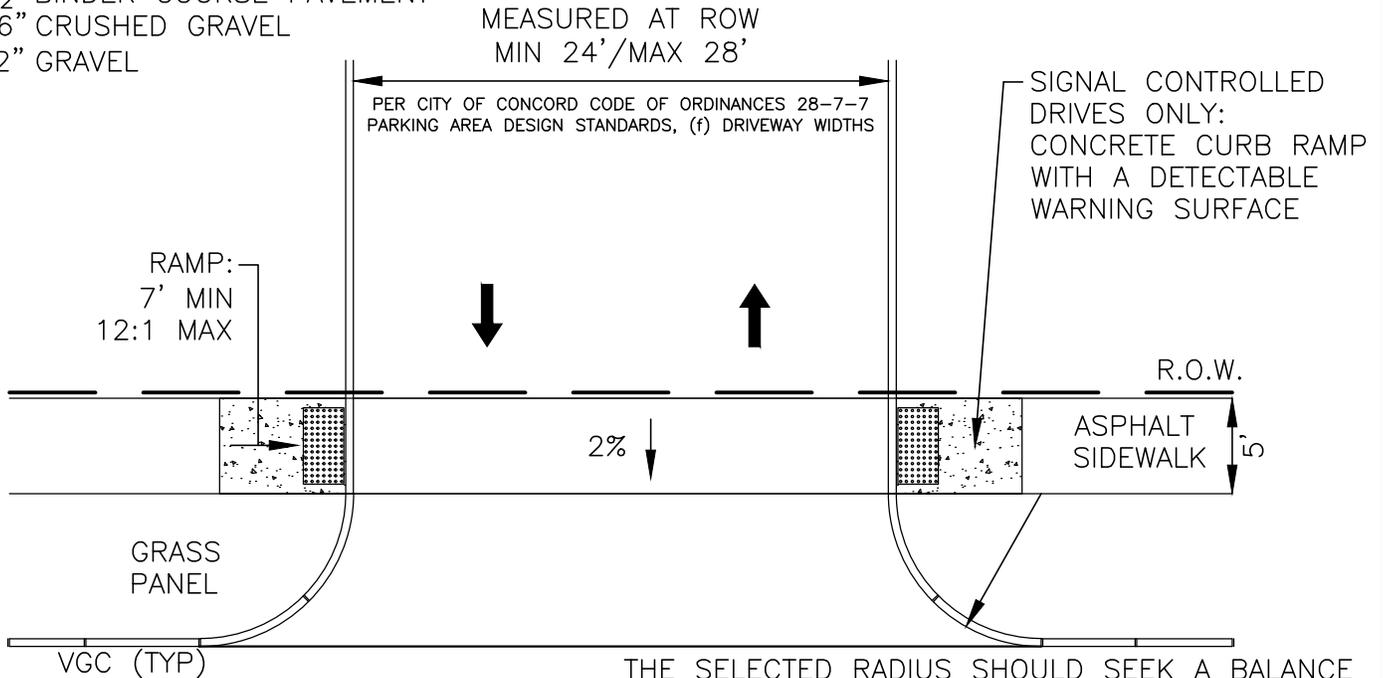
**PROFILE**

NOTE: THE DRIVE WIDTHS AND PROFILE PERTAIN TO ALL URBAN DRIVES, REGARDLESS OF R.O.W. WIDTH

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SITE/STREET
1	DRAFTING	11-11	DRIVE WITH SLOPED GRANITE CURB, W/O SIDEWALK	DRAWING NO. D-7
1	MIN WIDTH	11-11		DATE: 12/08
-	-	-		PAGE: 1
-	-	-		

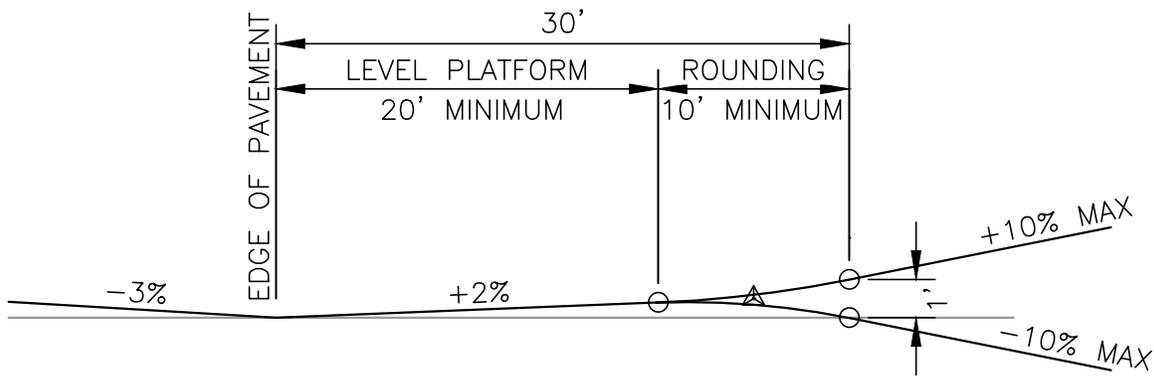
MINIMUM MATERIAL VALUES

- 1½" WEAR COURSE PAVEMENT
- 1½" BINDER COURSE PAVEMENT
- 6" CRUSHED GRAVEL
- 12" GRAVEL



THE SELECTED RADIUS SHOULD SEEK A BALANCE BETWEEN ACCOMMODATING TURNING VEHICLES AND ENSURING PEDESTRIAN MOBILITY AND SAFETY. A WIDER DRIVEWAY WIDTH WITH A SMALLER RADIUS MAY BE A BETTER CHOICE TO ACCOMPLISH THIS GOAL.

**PLAN VIEW**



**PROFILE**

NOTE: THIS DETAIL IS TO BE USED FOR SITES WHERE THE DRIVEWAY REQUIRES TRAFFIC SIGNALS AND/OR ACTS AS A STREET.

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:
1	SET SF AREA	11-11	<b>MAJOR COMMERCIAL DRIVE &gt;20,000 SF FLOOR AREA</b>	SITE/STREET
-	-	-		DRAWING NO. D-8
-	-	-		DATE: 12/08
-	-	-		PAGE: 1

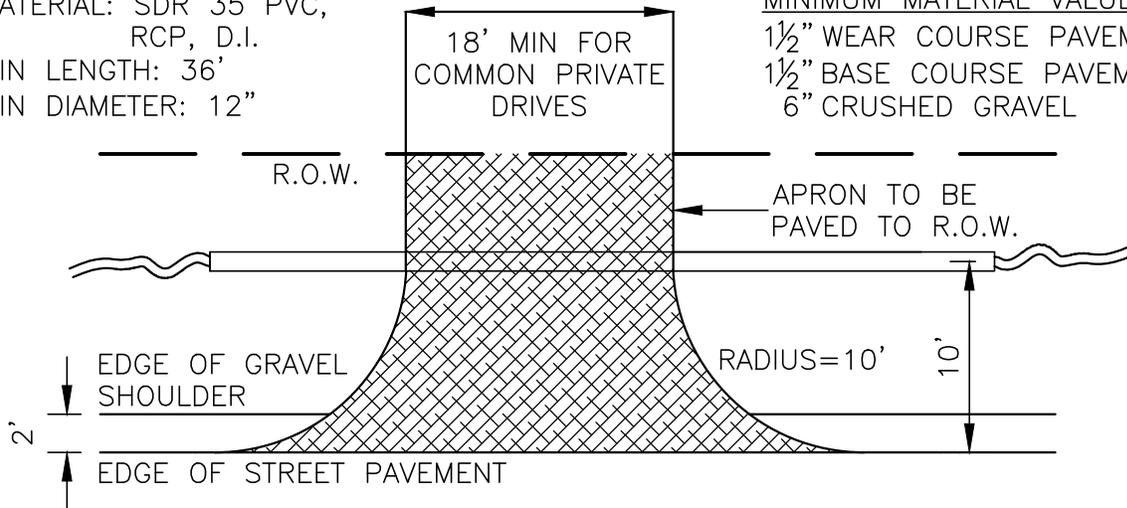
**DRIVEWAY CULVERT**

MATERIAL: SDR 35 PVC,  
RCP, D.I.  
MIN LENGTH: 36'  
MIN DIAMETER: 12"

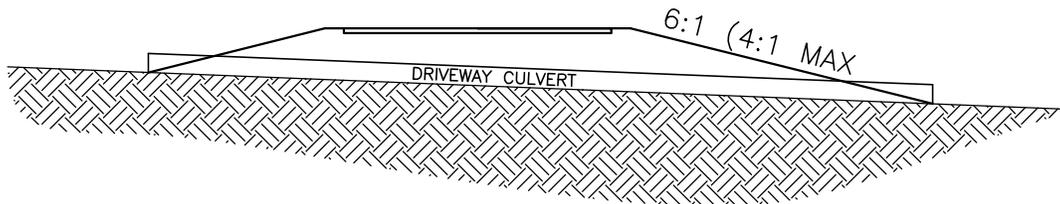
MEASURED AT ROW  
12' MIN/18' MAX

**MINIMUM MATERIAL VALUES**

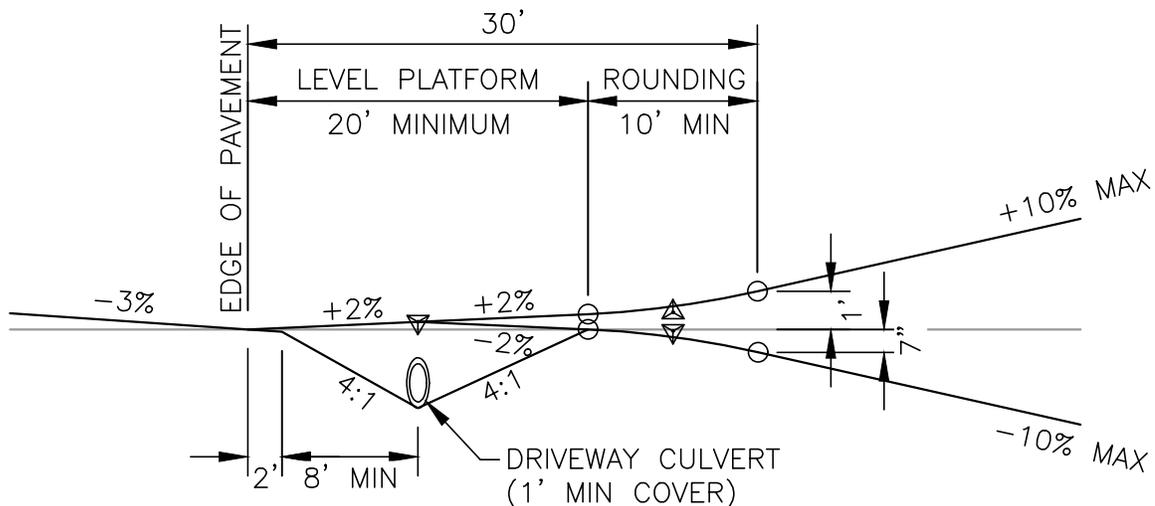
1 1/2" WEAR COURSE PAVEMENT  
1 1/2" BASE COURSE PAVEMENT  
6" CRUSHED GRAVEL



**PLAN VIEW**

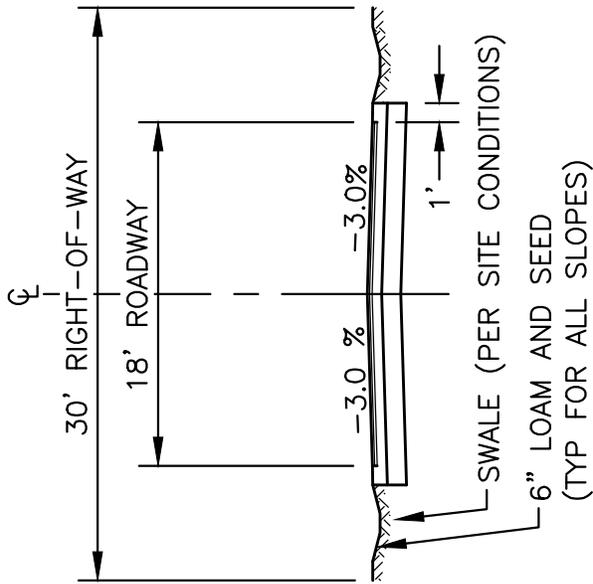


**SECTION VIEW**



**PROFILE**

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE/STREET	
1	MIN WIDTH	11-11	<b>RURAL RESIDENTIAL DRIVE</b>	DRAWING NO.	D-9	
-	-	-		DATE:	12/08	PAGE: 1
-	-	-				
-	-	-				

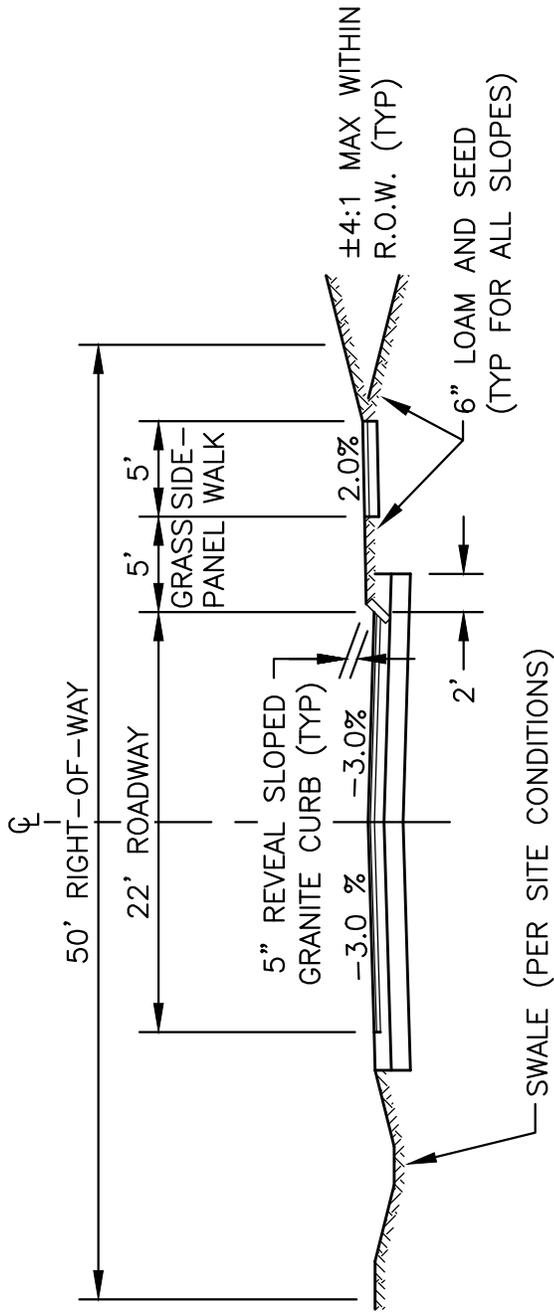


PRIVATE COMMON DRIVE TWO DWELLING UNITS

- ROADWAY MATERIALS
- 3" HOT BITUMINOUS PAVEMENT
  - 1½" WEARING COURSE
  - 1½" BASE COURSE
  - 6" CRUSHED GRAVEL
  - 12" GRAVEL

- THIS DETAIL IS NOT INTENDED TO SHOW THE FINAL CONFIGURATION OF THE STREET OR DRIVE AND IS MEANT ONLY TO SHOW TYPICALS THAT MAY APPLY

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	ROADWAY		
-	-	-	<b>PRIVATE COMMON DRIVE TWO DWELLING UNITS</b>	DRAWING NO.	D-10		
-	-	-		DATE:	01/12	PAGE:	1
-	-	-					
-	-	-					

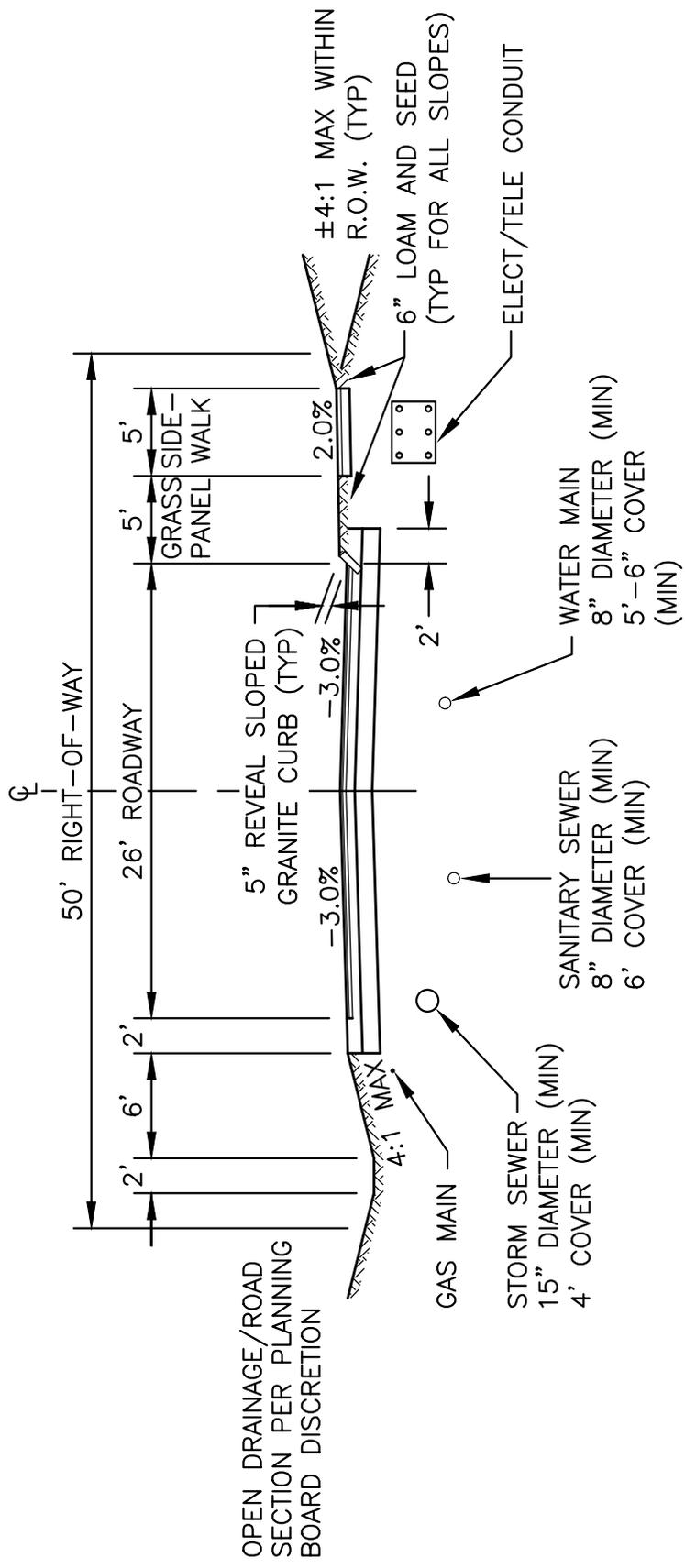


**PRIVATE COMMON DRIVE THREE TO EIGHT DWELLING UNITS**

<u>ROADWAY MATERIALS</u>	<u>SIDEWALK MATERIALS</u>
4" HOT BITUMINOUS PAVEMENT	3" HOT BITUMINOUS PAVEMENT
1 1/2" WEARING COURSE	1 1/2" WEARING COURSE
2 1/2" BASE COURSE	1 1/2" BASE COURSE
6" CRUSHED GRAVEL	6" CRUSHED GRAVEL
12" GRAVEL	

- SEE SUBDIVISION REGULATION SECTION 20-13 FOR CURB REQUIREMENTS
- THIS DETAIL IS NOT INTENDED TO SHOW THE FINAL CONFIGURATION OF THE STREET OR DRIVE AND IS MEANT ONLY TO SHOW TYPICALS THAT MAY APPLY

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	ROADWAY
-	-	-	<b>PRIVATE COMMON DRIVE THREE TO EIGHT DWELLING UNITS</b>	DRAWING NO.	D-11
-	-	-		DATE:	01/12
-	-	-		PAGE:	1
-	-	-			

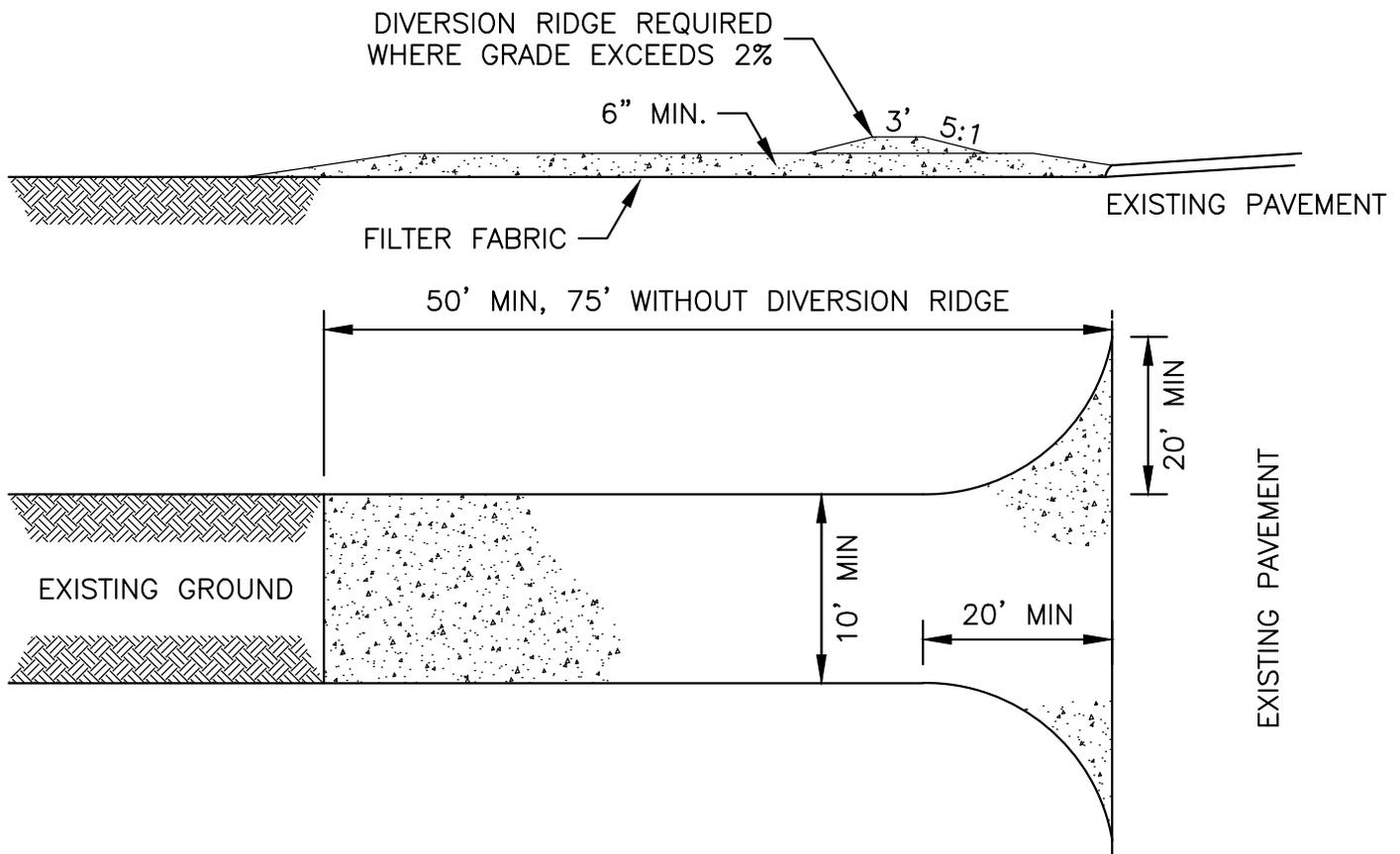


**PRIVATE COMMON DRIVE  
GREATER THAN EIGHT DWELLING UNITS**

- |                            |                            |
|----------------------------|----------------------------|
| <u>ROADWAY MATERIALS</u>   | <u>SIDEWALK MATERIALS</u>  |
| 4" HOT BITUMINOUS PAVEMENT | 3" HOT BITUMINOUS PAVEMENT |
| 1 1/2" WEARING COURSE      | 1 1/2" WEARING COURSE      |
| 2 1/2" BASE COURSE         | 1 1/2" BASE COURSE         |
| 6" CRUSHED GRAVEL          | 6" CRUSHED GRAVEL          |
| 12" GRAVEL                 |                            |

- SEE SUBDIVISION REGULATION SECTION 20-13 FOR CURB REQUIREMENTS
- THIS DETAIL IS NOT INTENDED TO SHOW THE FINAL CONFIGURATION OF THE STREET OR DRIVE AND IS MEANT ONLY TO SHOW TYPICALS THAT MAY APPLY

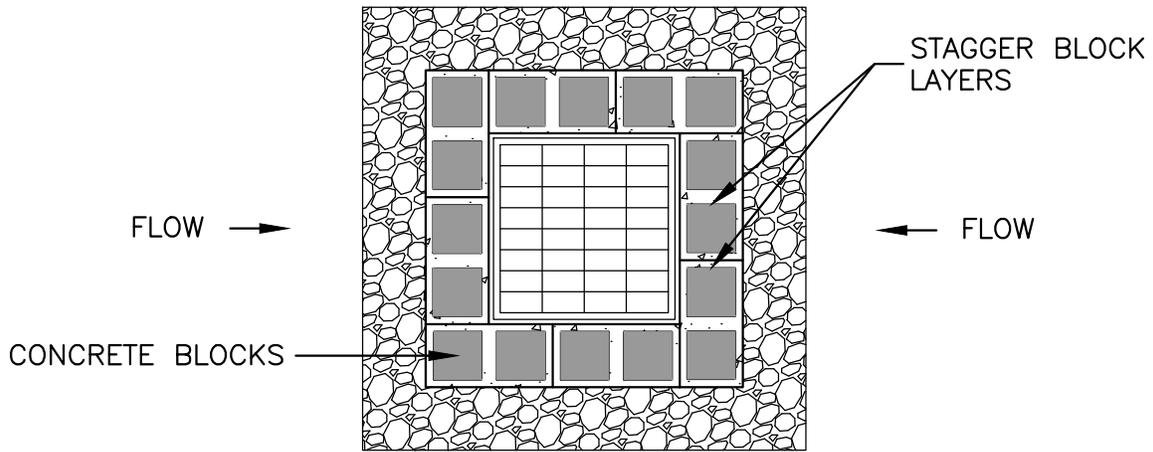
NO.	REVISION	DATE	City of Concord Engineering Services Division <b>PRIVATE COMMON DRIVE GREATER THAN EIGHT DWELLING UNITS</b>	SECTION:	ROADWAY
1	PRV UTIL DEPTH	11/19		DRAWING NO.	D-12
-	-	-		DATE:	01/12
-	-	-		PAGE:	1
-	-	-			



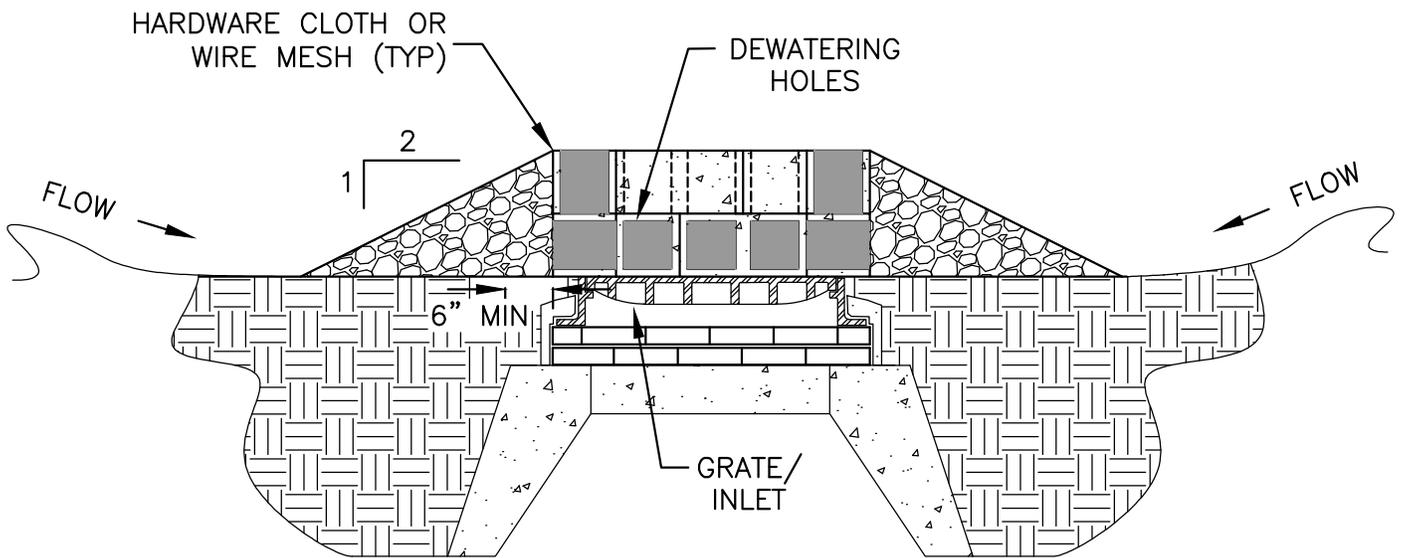
### CONSTRUCTION REQUIREMENTS

1. STONE SIZE – 3" COARSE AGGREGATE.
2. THICKNESS – 6" MIN
5. FILTER CLOTH – WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. LENGTH – NOT LESS THAN 50'. EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30' MIN LENGTH WOULD APPLY.
7. WIDTH – 10' MIN, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
8. SURFACE WATER – ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE.
9. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
10. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
11. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	EPSC
-	-	-	<b>CONSTRUCTION ENTRANCE DETAIL</b>	DRAWING NO.	E-1
-	-	-		DATE:	01/08
-	-	-		PAGE:	1
-	-	-			



PLAN



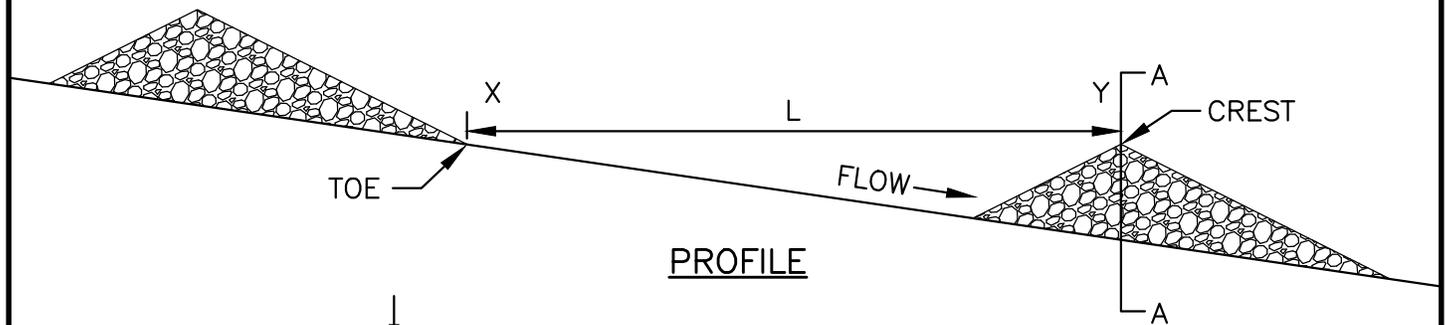
SECTION

CONSTRUCTION REQUIREMENTS

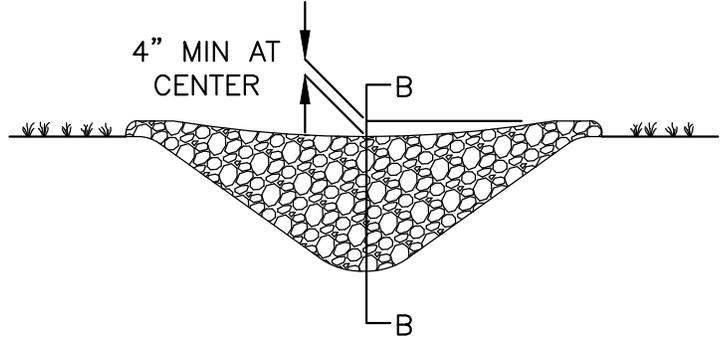
1. LAY FIRST COURSE OF BLOCK ON ITS SIDE FOR DEWATERING. PLACE BLOCKS AGAINST FRAME FOR SUPPORT.
2. PLACE HARDWARE CLOTH OR WIRE MESH OVER BLOCK OPENINGS TO SUPPORT STONE.
3. PLACE STONE ON A 2:1 OR FLATTER SLOPE UP TO THE TOP OF BLOCK.
4. REMOVE STONE AND BLOCKS, AS DIRECTED, WHEN NO LONGER NEEDED. BEFORE STONE AND BLOCKS ARE REMOVED, STABILIZE ANY SEDIMENT WHICH IS PERMITTED TO STAY IN PLACE WITH VEGETATION.

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	EPSC	
-	-	-	<b>STONE &amp; BLOCK GRATE INLET PROTECTION DETAILS</b>	DRAWING NO.	E-2	
-	-	-		DATE:	01/09	PAGE:
-	-	-				1
-	-	-				

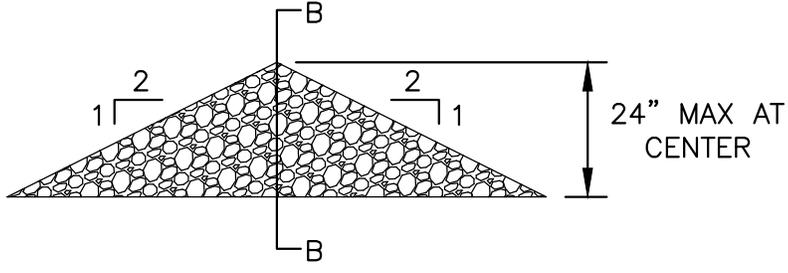
L = THE DISTANCE SUCH THAT POINTS X AND Y ARE OF EQUAL ELEVATION



PROFILE



SECTION A-A

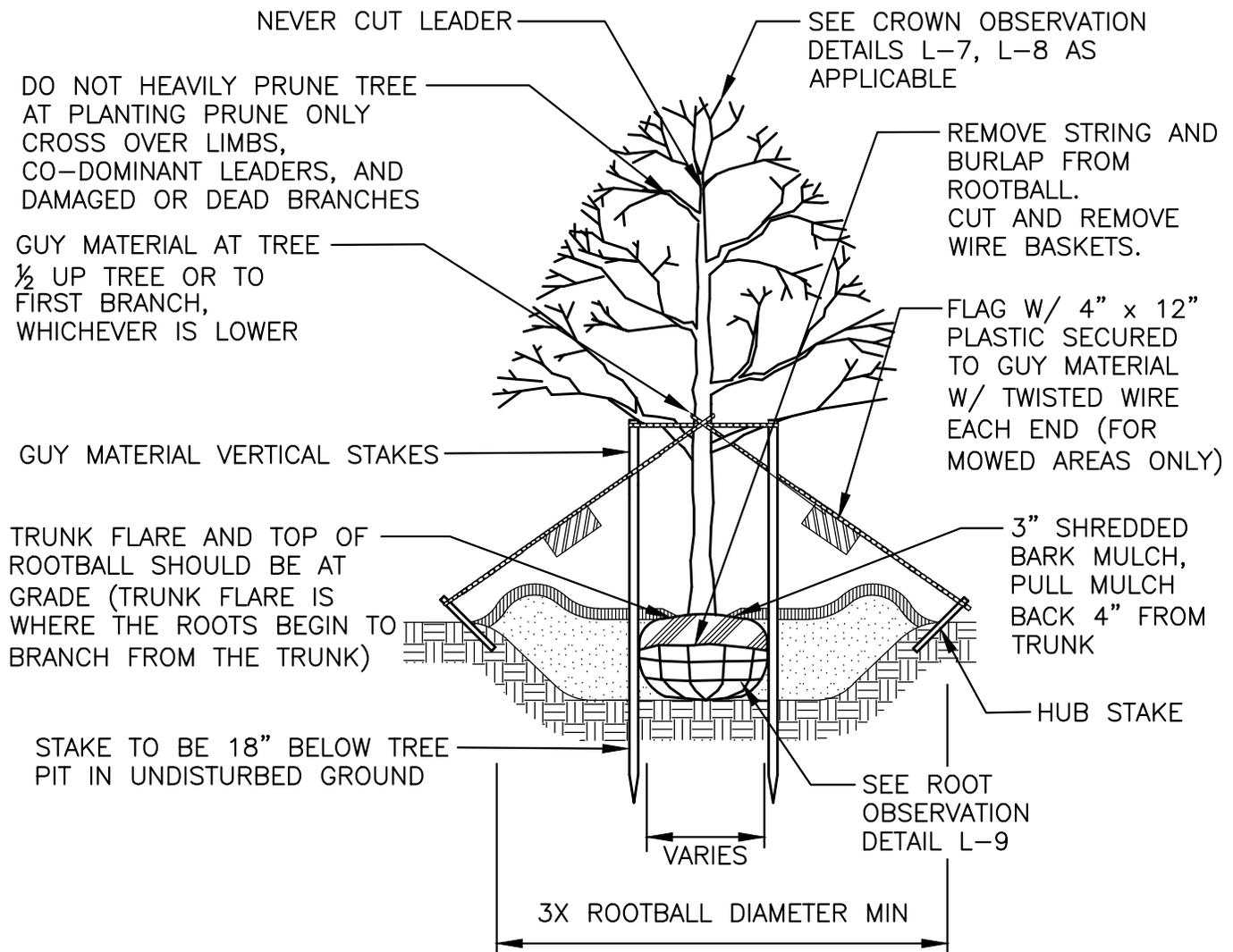


SECTION B-B

CONSTRUCTION REQUIREMENTS

1. PLACE STONE TO THE LINES, GRADES AND LOCATIONS AS SHOWN ON THE PLAN OR AS DIRECTED.
2. SET SPACING OF STONE CHECK DAMS SO THAT THE ELEVATION OF THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION AS THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE TO A POINT BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS NEEDED OR DIRECTED.
5. REMOVE STONE, AS DIRECTED, WHEN NO LONGER NEEDED. AFTER BARRIER IS REMOVED, STABILIZE ANY SEDIMENT WHICH IS PERMITTED TO STAY IN PLACE WITH VEGETATION.

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	EPSC		
-	-	-	<b>STONE CHECK DAM DETAILS</b>	DRAWING NO.	E-3		
-	-	-		DATE:	01/09	PAGE:	1
-	-	-					
-	-	-					



**NOTES:**

1. GUYING AND STAKING TO BE DETERMINED IN THE FIELD BY THE LANDSCAPE ARCHITECT. LOCAL FIELD CONDITIONS AS WELL AS PLANT CHARACTERISTICS WILL DETERMINE THE NECESSITY OF GUYING AND STAKING.
2. TYPICALLY ONLY TREES WITH A 3" OR GREATER CALIPER NEED TO BE STAKED. TREES WITH LESS THAN A 3" CALIPER NEED TO BE STAKED ONLY AS REQUIRED BY LANDSCAPE ARCHITECT.
3. ONLY WRAP TREE TRUNKS AS REQUIRED BY LANDSCAPE ARCHITECT.
4. TREE SHALL BE SET PLUMB, AFTER SETTLEMENT.
5. LOAM FOR BACKFILLING SHALL BE AMENDED AS REQUIRED BY LANDSCAPE ARCHITECT.
6. CITY TREES PLANTED ON PRIVATE PROPERTY, ADJACENT TO A PUBLIC RIGHT-OF-WAY, NEED TO BE PLANTED A MINIMUM OF 10 FEET FROM THE EDGE OF THE CITY SIDEWALK.
7. ALL NURSERY TAGS, TAPE, AND SIMILAR MATERIALS SHALL BE REMOVED.

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>  <b>DECIDUOUS TREE PLANTING</b>	SECTION: LANDSCAPE	
1	NOTES	4.15		DRAWING NO.	L-1
-	-	-		DATE:	12/08
-	-	-		PAGE:	1
-	-	-			

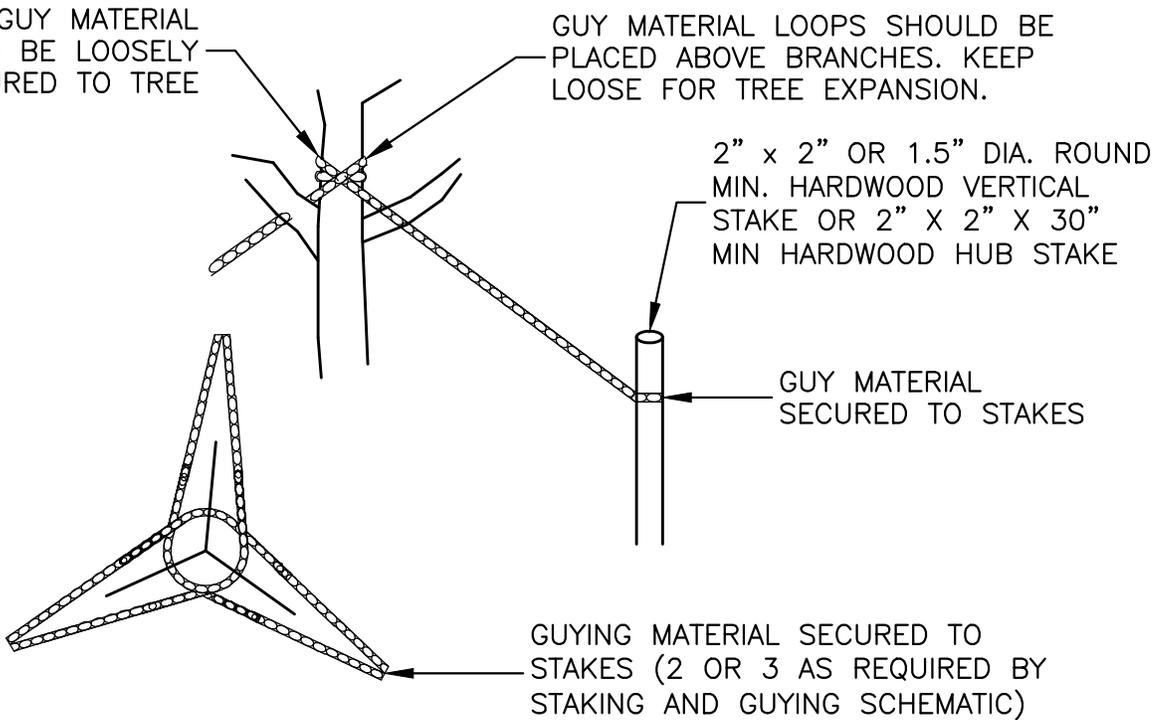
GUY MATERIAL SHOULD BE LOOSELY SECURED TO TREE

GUY MATERIAL LOOPS SHOULD BE PLACED ABOVE BRANCHES. KEEP LOOSE FOR TREE EXPANSION.

2" x 2" OR 1.5" DIA. ROUND MIN. HARDWOOD VERTICAL STAKE OR 2" X 2" X 30" MIN HARDWOOD HUB STAKE

GUY MATERIAL SECURED TO STAKES

GUYING MATERIAL SECURED TO STAKES (2 OR 3 AS REQUIRED BY STAKING AND GUYING SCHEMATIC)



**NOTE:**

ONLY USE PLASTIC CHAINLOCK (LANDSCAPE QUALITY AND SUITABLE FOR GUYING TREES) OR EQUIVALENT GUYING MATERIAL.

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	LANDSCAPE	
-	-	-	<b>DECIDUOUS TREE – GUYING &amp; STAKING</b>	DRAWING NO.	L-2	
-	-	-		DATE:	12/08	PAGE: 1
-	-	-				
-	-	-				

SEE CROWN OBSERVATION  
DETAILS L-7, L-8 AS  
APPLICABLE

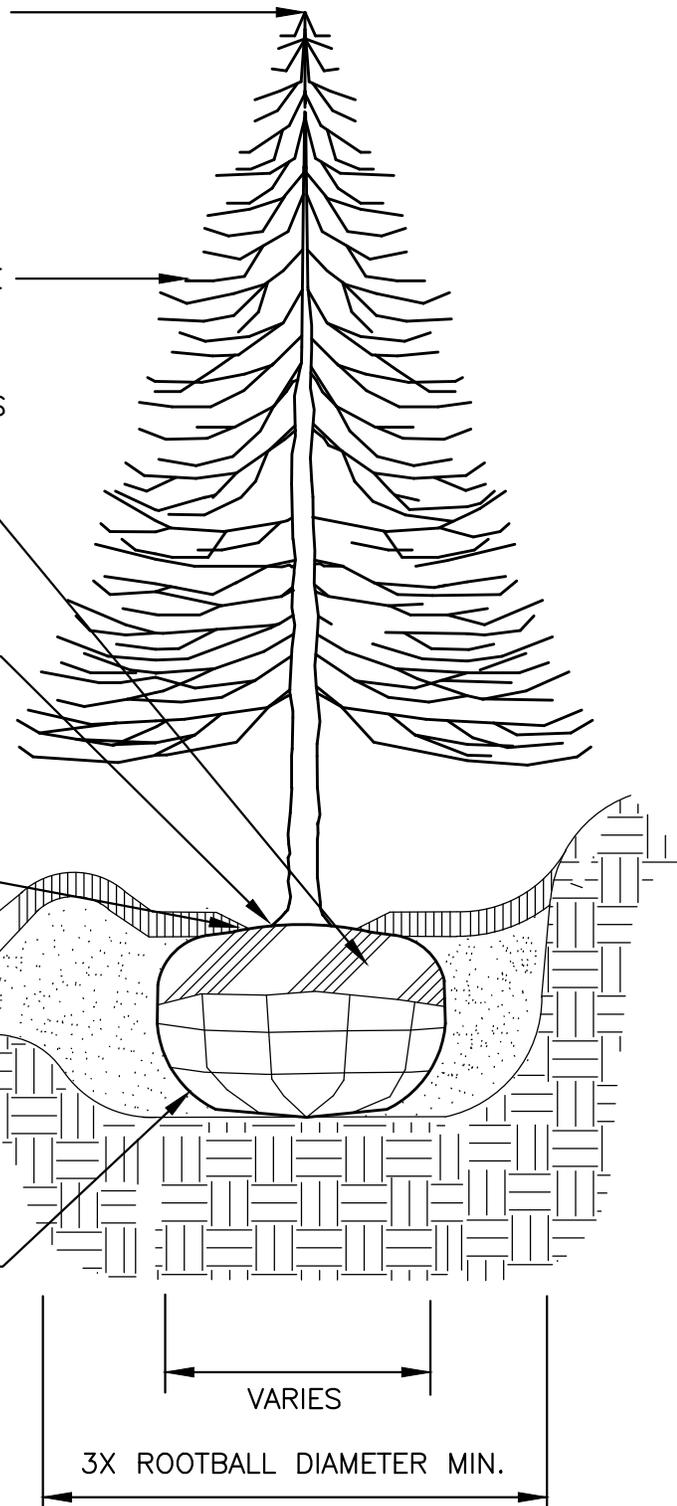
DO NOT HEAVILY PRUNE TREE  
AT PLANTING. PRUNE ONLY  
CROSS OVER LIMBS,  
CO-DOMINANT LEADERS, AND  
DAMAGED OR DEAD BRANCHES

REMOVE STRING AND  
BURLAP FROM  
ROOTBALL. CUT AND  
REMOVE WIRE BASKETS.

TRUNK FLARE AND TOP OF  
ROOTBALL SHOULD BE AT  
GRADE (TRUNK FLARE IS  
WHERE THE ROOTS BEGIN  
TO BRANCH FROM THE  
TRUNK)

3" SHREDDED BARK  
MULCH, PULL MULCH  
BACK 4" FROM TRUNK

SEE ROOT  
OBSERVATION  
DETAIL L-9



**NOTES:**

1. DO NOT STAKE EVERGREEN TREES.
2. LOAM FOR BACKFILLING SHALL BE AMENDED AS REQUIRED BY LANDSCAPE ARCHITECT.
3. TAMP BACKFILL SOIL AROUND ROOTBALL FIRMLY TO MINIMIZE ROOTBALL SHIFT.
4. TREE TO BE SET PLUMB, AFTER SETTLEMENT
5. ALL NURSERY TAGS, TAPE, AND SIMILAR MATERIALS SHALL BE REMOVED.

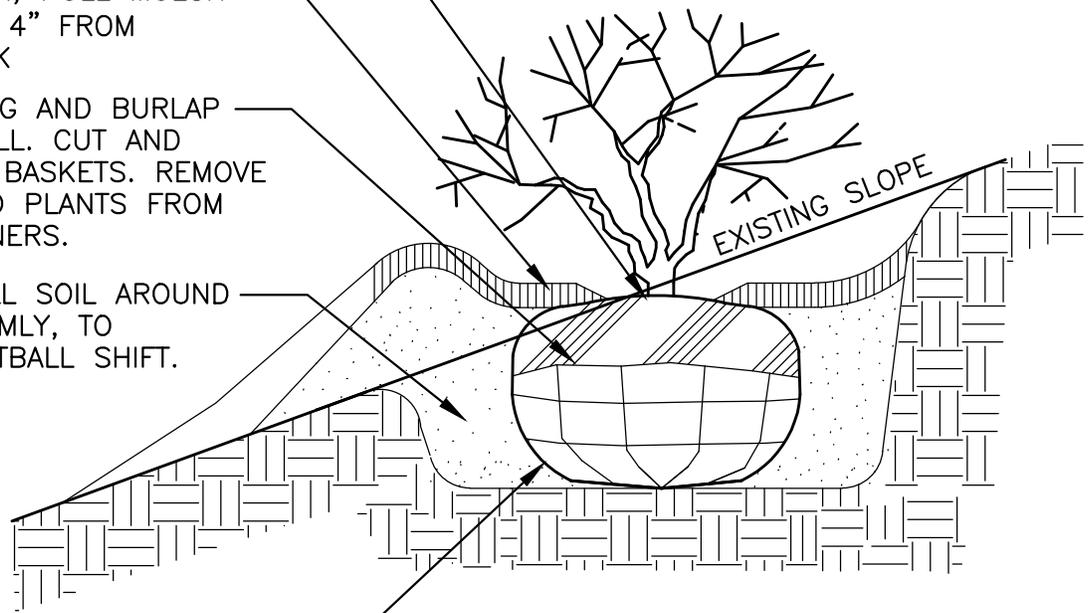
NO.	REVISION	DATE	<b>EVERGREEN PLANTING</b>	SECTION:	LANDSCAPE
1	NOTES	4.15		DRAWING NO.	L-3
-	-	-		DATE:	12/08
-	-	-		PAGE:	1
-	-	-			

TRUNK FLARE AND TOP OF ROOTBALL SHOULD BE AT GRADE (TRUNK FLARE IS WHERE THE ROOTS BEGIN TO BRANCH FROM THE TRUNK)

3" SHREDDED BARK MULCH, PULL MULCH BACK 4" FROM TRUNK

REMOVE STRING AND BURLAP FROM ROOTBALL. CUT AND REMOVE WIRE BASKETS. REMOVE CONTAINERIZED PLANTS FROM THEIR CONTAINERS.

TAMP BACKFILL SOIL AROUND ROOTBALL FIRMLY, TO MINIMIZE ROOTBALL SHIFT.

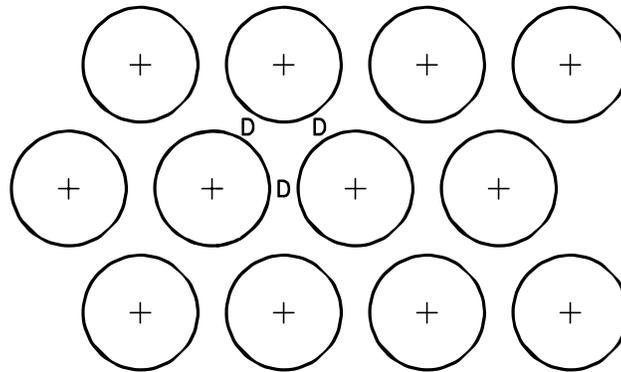


SEE ROOT OBSERVATION DETAIL L-9

**NOTES:**

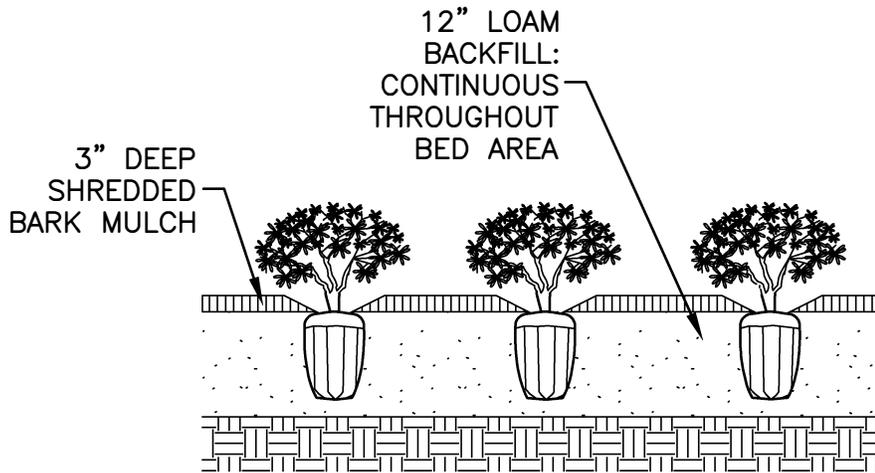
1. DO NOT HEAVILY PRUNE SHRUB AT PLANTING, PRUNE ONLY CROSSOVER LIMBS AND DAMAGED OR DEAD BRANCHES.
2. BACKFILL WITH LOAM, AMEND AS REQUIRED BY LANDSCAPE ARCHITECT.
3. SHRUBS & GROUNDCOVER PLANTED ADJACENT TO CITY SIDEWALKS NEED TO BE PLACED SO THE PLANTS, AT THEIR MATURE HEIGHT & WIDTH, WILL NOT ENCROACH INTO THE CITY'S SIDEWALK.
4. TREE TO BE SET PLUMB, AFTER SETTLEMENT.
5. ALL NURSERY TAGS, TAPE, AND SIMILAR MATERIALS SHALL BE REMOVED.

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>  <b>SHRUB PLANTING</b>	SECTION:	LANDSCAPE		
1	NOTES	4.15		DRAWING NO.	L-4		
-	-	-		DATE:	12/08	PAGE:	1
-	-	-					
-	-	-					



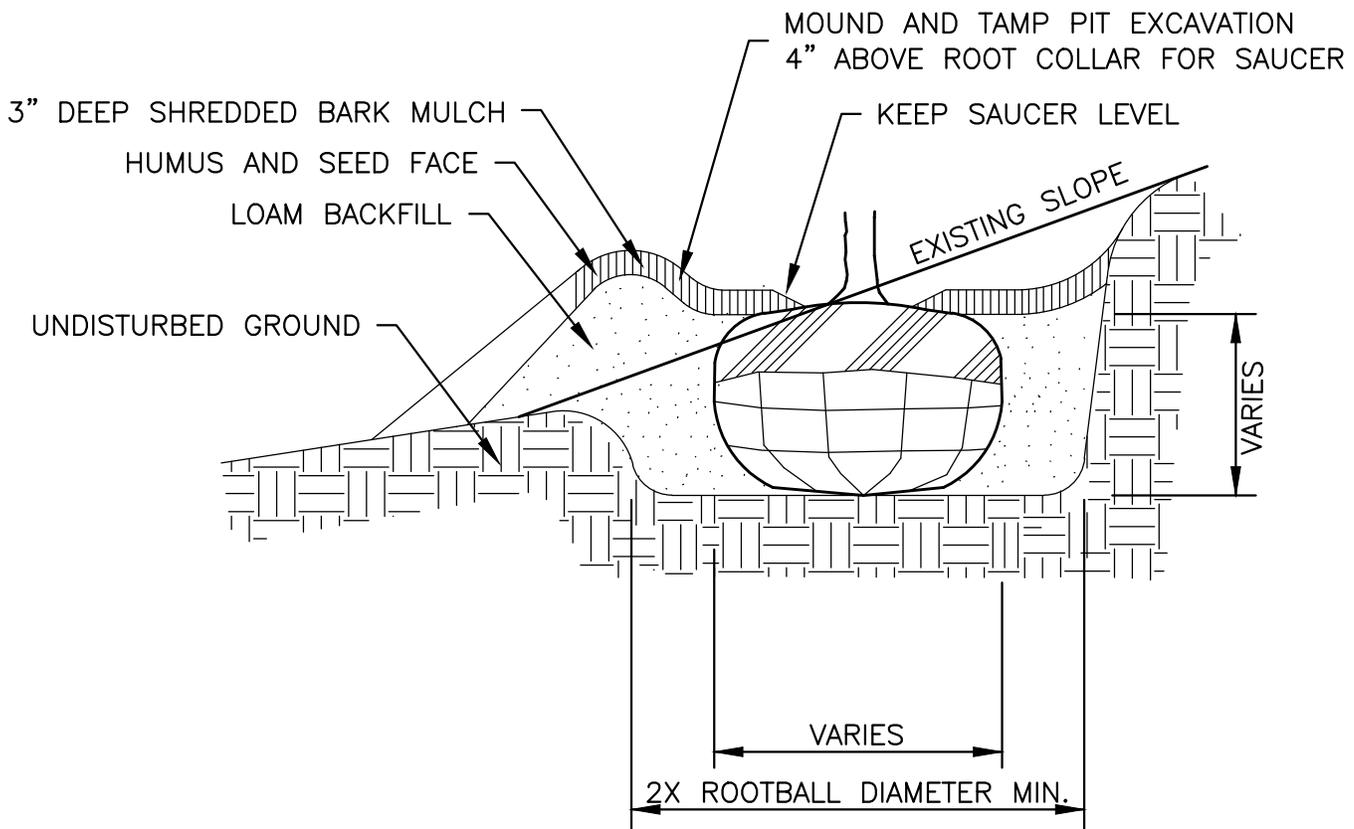
**TYPICAL BED PLANT SPACING**

D = DIMENSION OF PLANT SPACING  
(SHRUB OR GROUNDCOVER AS  
INDICATED ON PLANS)



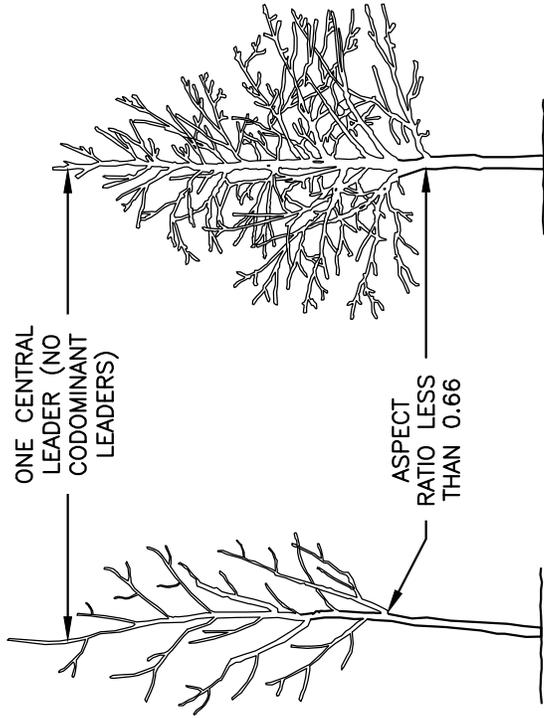
**GROUNDCOVER BED PLANTING**

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	LANDSCAPE
-	-	-	<b>GROUNDCOVER PLANTING</b>	DRAWING NO.	L-5
-	-	-		DATE:	12/08
-	-	-		PAGE:	1
-	-	-			



TYPICAL PLANTING PIT ON SLOPE  
4:1 OR GREATER

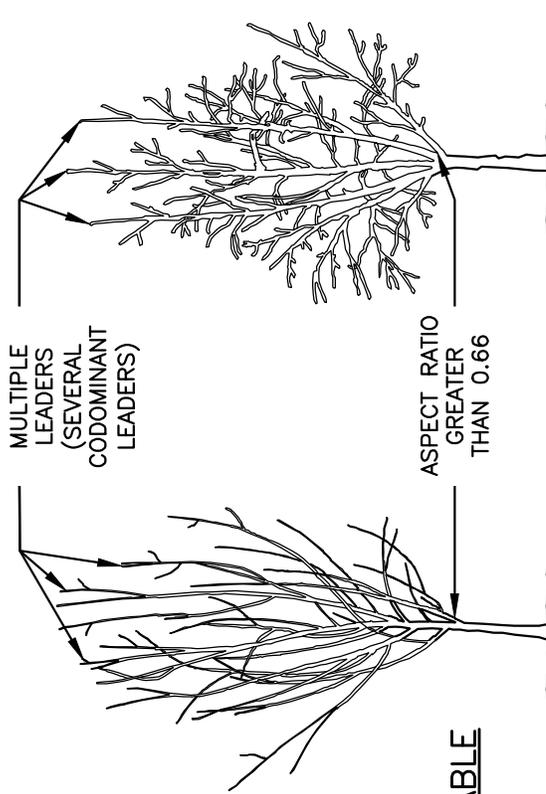
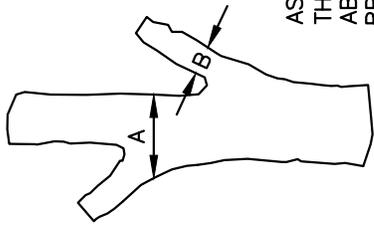
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	LANDSCAPE	
-	-	-	<b>TREE PLANTING ON SLOPE</b>	DRAWING NO.	L-6	
-	-	DATE:		12/08	PAGE:	1
-	-					
-	-					



**ACCEPTABLE**

EXAMPLE		ASPECT RATIO
A	B	
1.5"	0.5"	0.33
2.5"	0.9"	0.36
2.0"	1.0"	0.50
2.5"	1.6"	0.64

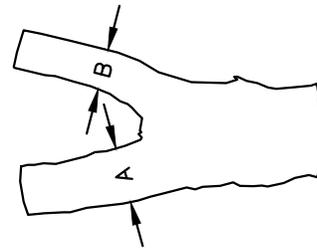
ASPECT RATIO OF B:A LESS THAN 0.66 AS MEASURED 1" ABOVE THE TOP OF THE BRANCH UNION.



**REJECTABLE**

EXAMPLE		ASPECT RATIO
A	B	
2.5"	1.8"	0.72
2.0"	2.0"	1.0
2.5"	2.0"	0.80
4.0"	3.0"	0.75

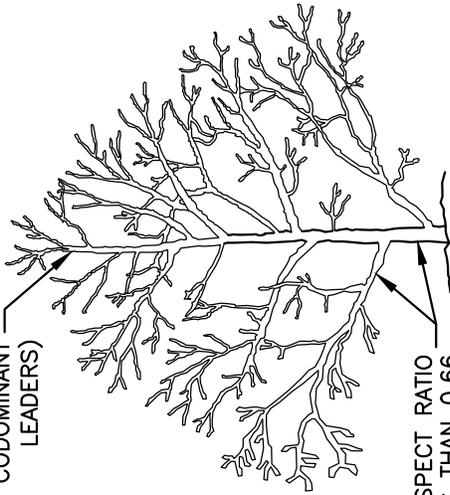
ASPECT RATIO OF B:A GREATER THAN OR EQUAL TO 0.66 AS MEASURED 1" ABOVE THE TOP OF THE BRANCH UNION.



- NOTES:
- ASPECT RATIO SHALL BE LESS THAN 0.66 ON ALL BRANCH UNIONS. ASPECT RATIO IS THE DIAMETER OF BRANCH (B) DIVIDED BY THE DIAMETER OF THE TRUNK (A) AS MEASURED 1" ABOVE THE TOP OF THE BRANCH UNION.
  - ANY TREE NOT MEETING THE CROWN OBSERVATIONS DETAIL MAY BE REJECTED.
  - DETAIL DEVELOPED BY THE URBAN TREE FOUNDATION AND IS OPEN SOURCE AND FREE TO USE BY OTHERS.

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	LANDSCAPE
-	-	-	<b>CROWN OBSERVATIONS HIGH BRANCHED</b>	DRAWING NO.	L-7
-	-	-		DATE:	04/15
-	-	-		PAGE:	1
-	-	-			

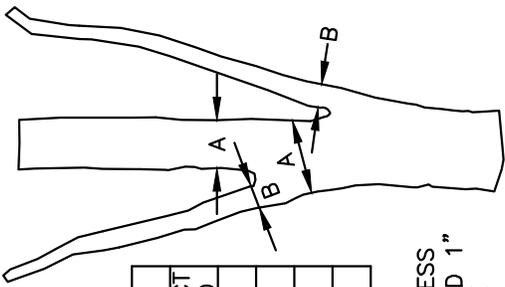
ONE CENTRAL LEADER  
(NO CODOMINANT LEADERS)



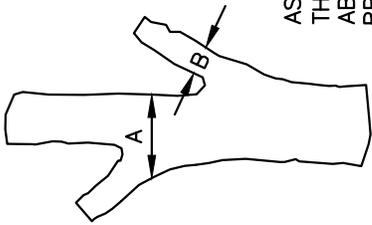
ASPECT RATIO  
LESS THAN 0.66

**ACCEPTABLE**

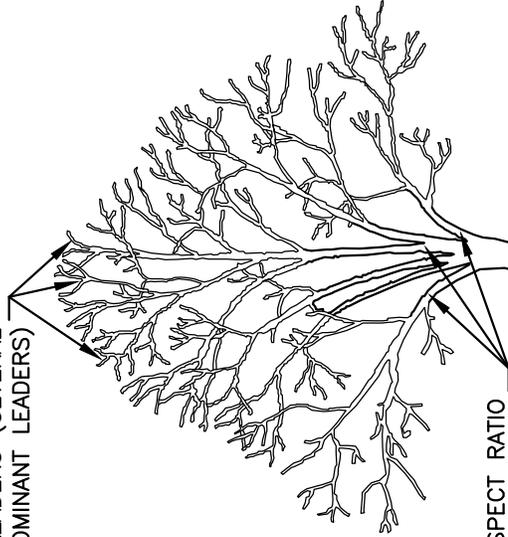
EXAMPLE		ASPECT RATIO
A	B	
1.5"	0.5"	0.33
2.5"	0.9"	0.36
2.0"	1.0"	0.50
2.5"	1.6"	0.64



ASPECT RATIO OF B:A LESS THAN 0.66 AS MEASURED 1" ABOVE THE TOP OF THE BRANCH UNION.



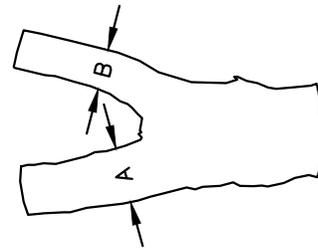
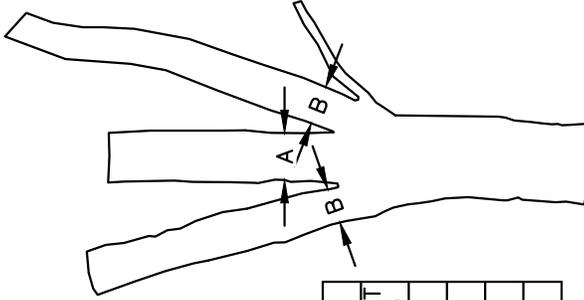
MULTIPLE LEADERS (SEVERAL CODOMINANT LEADERS)



ASPECT RATIO  
GREATER THAN 0.66

**REJECTABLE**

EXAMPLE		ASPECT RATIO
A	B	
2.5"	1.8"	0.72
2.0"	2.0"	1.0
2.5"	2.0"	0.80
4.0"	3.0"	0.75



ASPECT RATIO OF B:A GREATER THAN OR EQUAL TO 0.66 AS MEASURED 1" ABOVE THE TOP OF THE BRANCH UNION.

NOTES:

- ASPECT RATIO SHALL BE LESS THAN 0.66 ON ALL BRANCH UNIONS. ASPECT RATIO IS THE DIAMETER OF BRANCH (B) DIVIDED BY THE DIAMETER OF THE TRUNK (A) AS MEASURED 1" ABOVE THE TOP OF THE BRANCH UNION.
- ANY TREE NOT MEETING THE CROWN OBSERVATIONS DETAIL MAY BE REJECTED.
- DETAIL DEVELOPED BY THE URBAN TREE FOUNDATION AND IS OPEN SOURCE AND FREE TO USE BY OTHERS.

NO.	REVISION	DATE
-	-	-
-	-	-
-	-	-
-	-	-

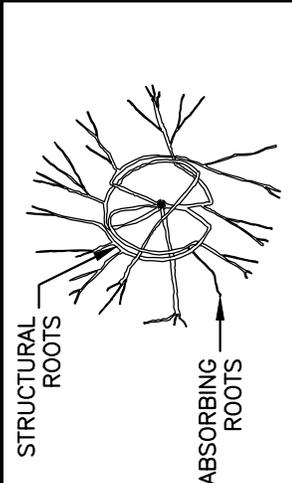
City of Concord Engineering Services Division

**CROWN OBSERVATIONS  
LOW BRANCHED**

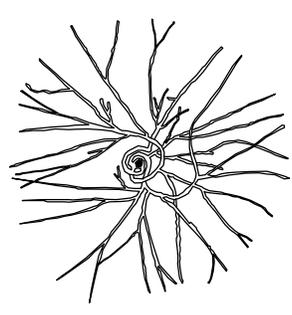
SECTION: LANDSCAPE

DRAWING NO. L-8

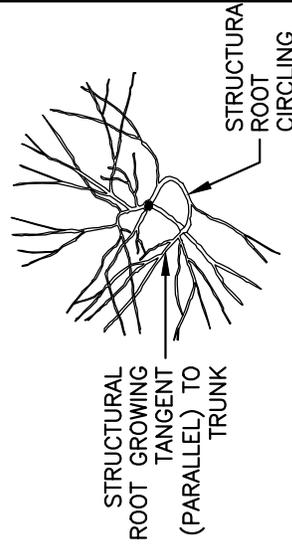
DATE: 04/15 PAGE: 1



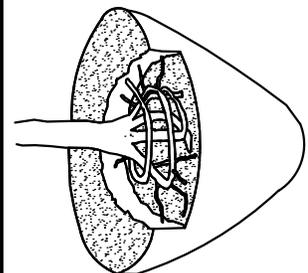
ONLY ABSORBING ROOTS REACH THE PERIPHERY NEAR THE TOP OF THE ROOT BALL. STRUCTURAL ROOTS MOSTLY WRAP OR ARE DEFLECTED ON THE ROOT BALL INTERIOR.



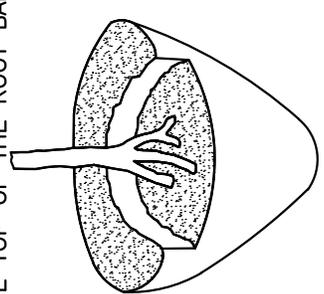
STRUCTURAL ROOTS CIRCLE AND DO NOT RADIATE FROM THE TRUNK.



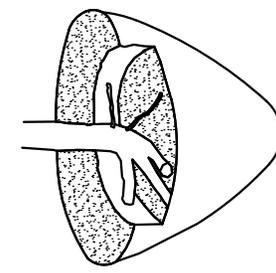
STRUCTURAL ROOTS MISSING FROM ONE SIDE, AND/OR GROW TANGENT TO TRUNK



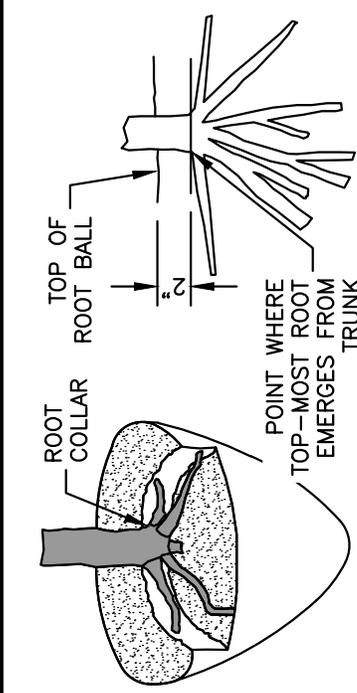
STRUCTURAL ROOTS CIRCLE INTERIOR OF ROOT BALL. NO STRUCTURAL ROOTS ARE HORIZONTAL AND REACH THE ROOT BALL PERIPHERY NEAR THE TOP OF THE ROOT BALL.



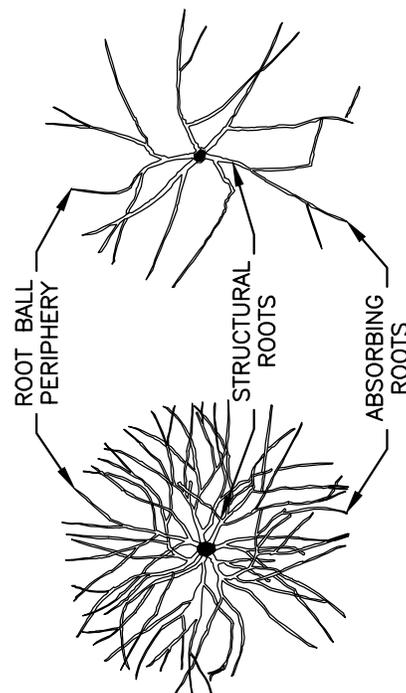
STRUCTURAL ROOTS DESCEND INTO ROOT BALL INTERIOR. NO STRUCTURAL ROOTS ARE HORIZONTAL AND REACH THE ROOT BALL PERIPHERY NEAR THE TOP OF THE ROOT BALL.



STRUCTURAL ROOTS PRIMARILY GROW TO ONE SIDE



THE POINT WHERE TOP-MOST ROOT(S) EMERGES FROM THE TRUNK (ROOT COLLAR) SHOULD BE WITHIN THE TOP 2" OF SUBSTRATE. THE ROOT COLLAR AND THE ROOT BALL INTERIOR SHOULD BE FREE OF DEFECTS INCLUDING CIRCLING, KINKED, ASCENDING, AND STEM GIRDLING ROOTS. STRUCTURAL ROOTS SHALL REACH THE PERIPHERY NEAR THE TOP OF THE ROOT BALL.



ROOTS RADIATE FROM TRUNK AND REACH SIDE OF ROOT BALL WITHOUT DEFECTING DOWN OR AROUND.

**ACCEPTABLE**

- NOTES:
- OBSERVATIONS OF ROOTS SHALL OCCUR PRIOR TO ACCEPTANCE. ROOTS AND SOIL MAY BE REMOVED DURING THE OBSERVATION PROCESS; SUBSTRATE/SOIL SHALL BE REPLACED AFTER THE OBSERVATIONS HAVE BEEN COMPLETED. SEE SPECIFICATIONS FOR OBSERVATION PROCESS AND REQUIREMENTS.
  - IS OPEN SOURCE AND FREE TO USE BY OTHERS.

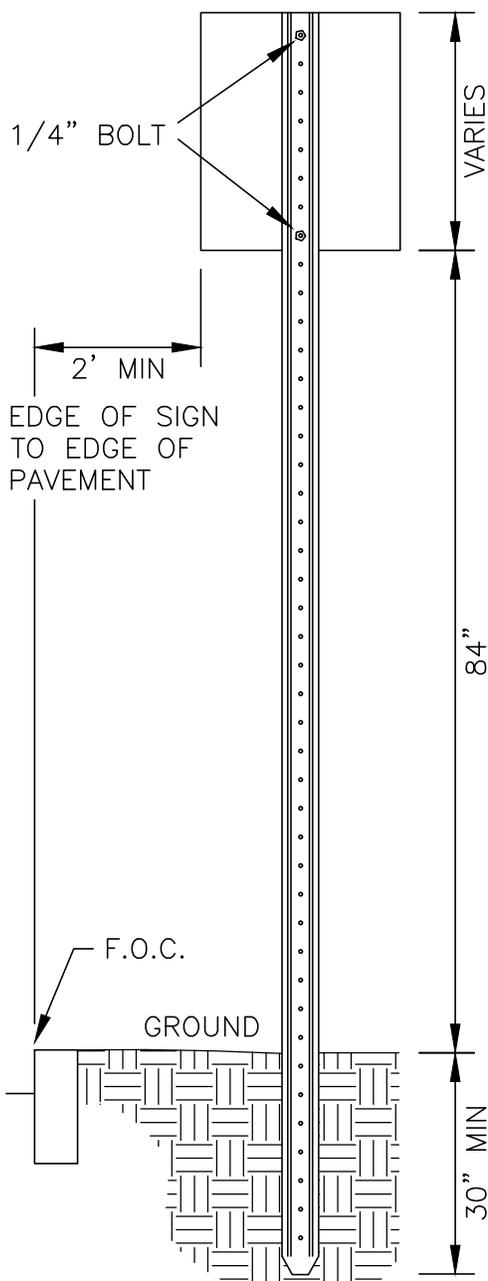
**REJECTABLE**

NO.	REVISION	DATE
-	-	-
-	-	-
-	-	-
-	-	-

City of Concord Engineering Services Division

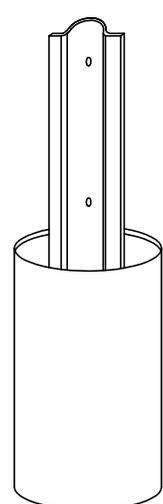
**ROOT OBSERVATIONS  
BALLED AND BURLAPPED**

SECTION:	LANDSCAPE
DRAWING NO.	L-9
DATE:	04/15
PAGE:	1



NOTES:

1. POSTS SHALL BE PLUMB. ANY POST BENT OR OTHERWISE DAMAGED SHALL BE REMOVED AND REPLACED. CUTTING THE DAMAGED PORTION OUT AND SPLICING THE POST TOGETHER IS NOT ACCEPTABLE.
2. WHEN POSTS ARE SET, THE HOLES SHALL BE DUG TO THE PROPER DEPTH. AFTER INSERTING POSTS, THE HOLES SHALL BE BACK FILLED WITH SUITABLE MATERIAL IN LAYERS NOT EXCEEDING 6" DEEP WHEN COMPACTED; CARE BEING TAKEN TO PRESERVE THE ALIGNMENT OF THE POST.
3. WHEN POSTS ARE DRIVEN, A SUITABLE DRIVING CAP SHALL BE USED. AFTER DRIVING, THE TOP OF THE POST SHALL HAVE THE SAME CROSS-SECTIONAL DIMENSION AS THE BODY OF THE POST. BATTERED HEADS WILL NOT BE ACCEPTED.
4. POSTS SHALL NOT BE DRIVEN WITH THE SIGN ATTACHED TO THE POST.
5. SIGNS SHALL BE ERECTED IN CONFORMANCE WITH THE REQUIREMENTS OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES"
6. WHEN SIGN IS IN PLACE, NO PART OF THE POST SHALL EXTEND ABOVE SIGN.

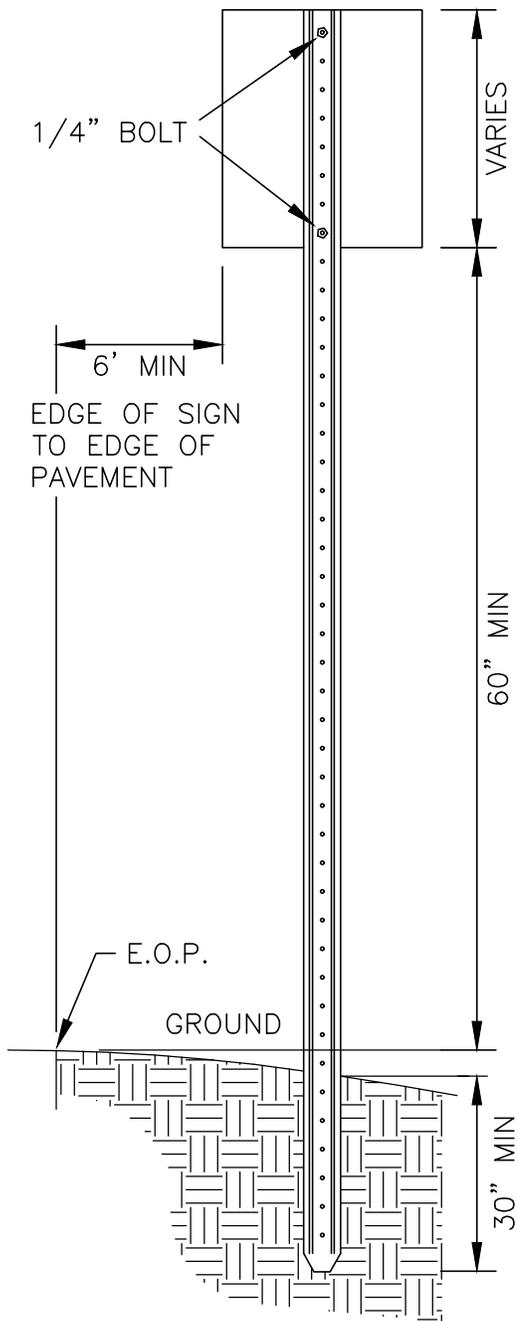


GREEN ENAMEL, 2.5#/FT  
MINIMUM FLANGED  
CHANNEL STEEL POST

PVC OR STEEL SLEEVE  
REQUIRED IN PAVED OR  
CONCRETE LOCATIONS

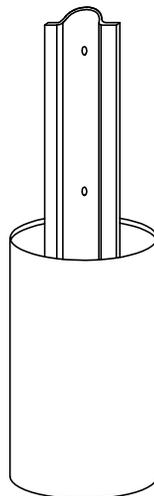
SLEEVE WILL BE LARGE  
ENOUGH TO ALLOW FOR  
REPLACEMENT POST

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE/STREET		
1	DRAFTING	11/11		<b>ROAD SIGN POST and SLEEVE – URBAN</b>	DRAWING NO.	M-1	
2	POST #/FT	8/13	DATE:		12/08	PAGE:	1
-	-	-					
-	-	-					



NOTES:

1. POSTS SHALL BE PLUMB. ANY POST BENT OR OTHERWISE DAMAGED SHALL BE REMOVED AND REPLACED. CUTTING THE DAMAGED PORTION OUT AND SPLICING THE POST TOGETHER IS NOT ACCEPTABLE.
2. WHEN POSTS ARE SET, THE HOLES SHALL BE DUG TO THE PROPER DEPTH. AFTER INSERTING POSTS, THE HOLES SHALL BE BACK FILLED WITH SUITABLE MATERIAL IN LAYERS NOT EXCEEDING 6" DEEP WHEN COMPACTED; CARE BEING TAKEN TO PRESERVE THE ALIGNMENT OF THE POST.
3. WHEN POSTS ARE DRIVEN, A SUITABLE DRIVING CAP SHALL BE USED. AFTER DRIVING, THE TOP OF THE POST SHALL HAVE THE SAME CROSS-SECTIONAL DIMENSION AS THE BODY OF THE POST. BATTERED HEADS WILL NOT BE ACCEPTED.
4. POSTS SHALL NOT BE DRIVEN WITH THE SIGN ATTACHED TO THE POST.
5. SIGNS SHALL BE ERECTED IN CONFORMANCE WITH THE REQUIREMENTS OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES"
6. WHEN SIGN IS IN PLACE, NO PART OF THE POST SHALL EXTEND ABOVE SIGN.



GREEN ENAMEL, 2.5#/FT  
MINIMUM FLANGED  
CHANNEL STEEL POST

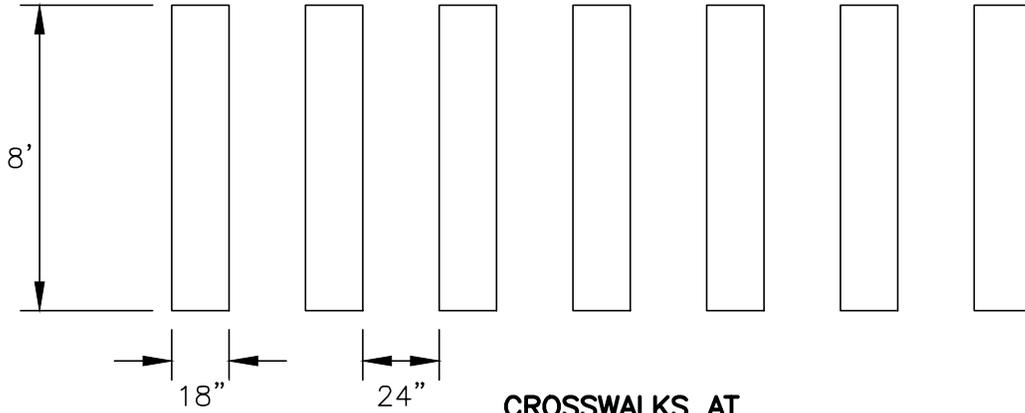
PVC OR STEEL SLEEVE  
REQUIRED IN PAVED OR  
CONCRETE LOCATIONS

SLEEVE WILL BE LARGE  
ENOUGH TO ALLOW FOR  
REPLACEMENT POST

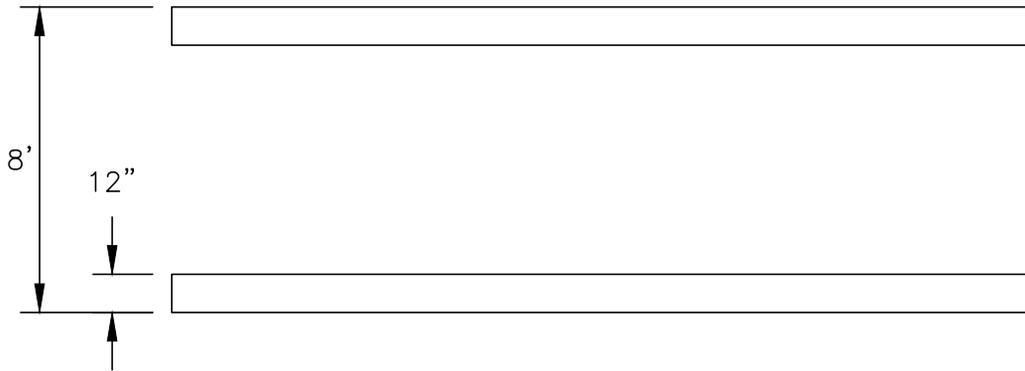
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	
1	POST #/FT	8/13	<b>ROAD SIGN POST and SLEEVE – RURAL</b>	SITE/STREET	
-	-	-		DRAWING NO.	M-2
-	-	-		DATE:	12/08
-	-	-		PAGE:	1



**STOP BAR  
(THERMOPLASTIC)**



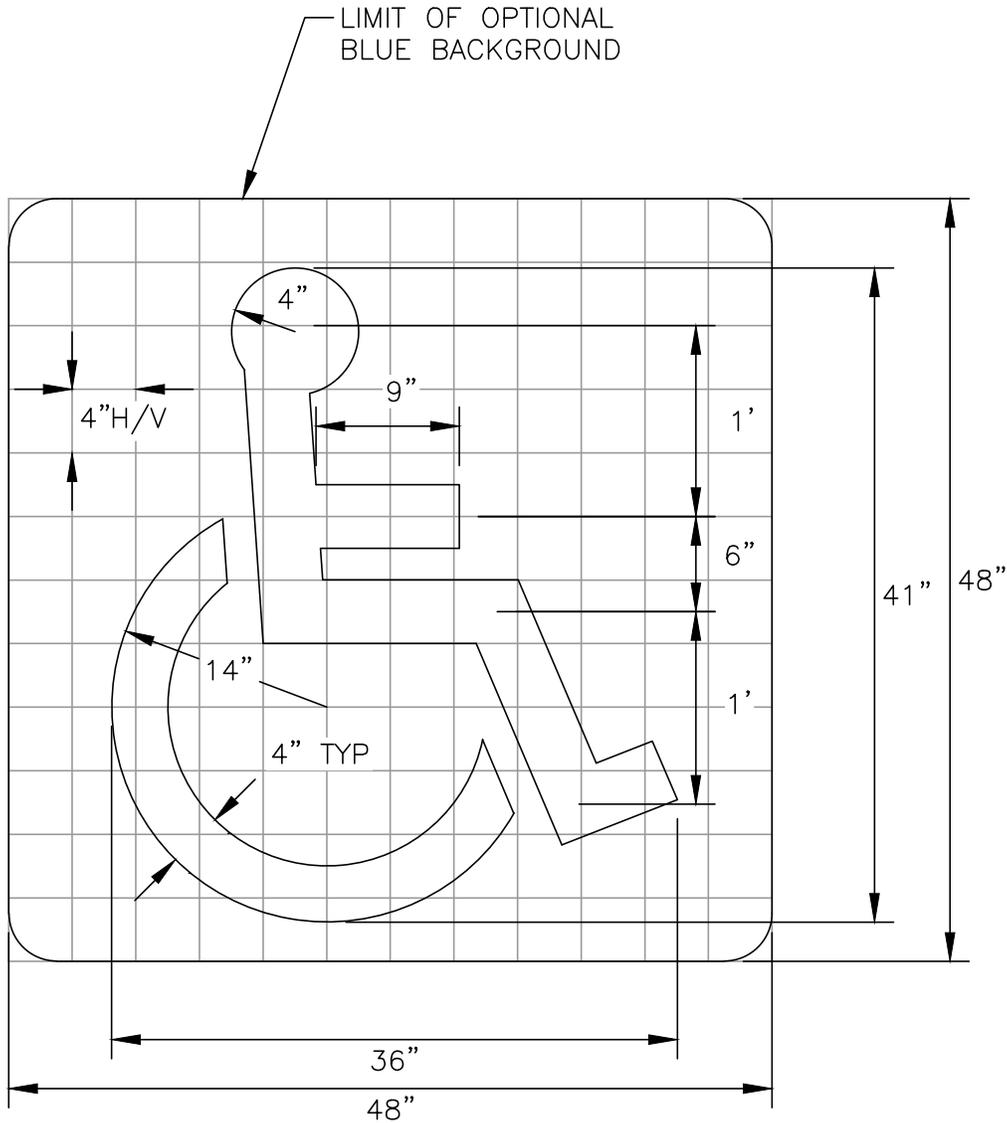
**CROSSWALKS AT  
UNSIGNALIZED LOCATIONS  
(THERMOPLASTIC)**



**CROSSWALKS AT  
SIGNALIZED LOCATIONS  
(THERMOPLASTIC)**

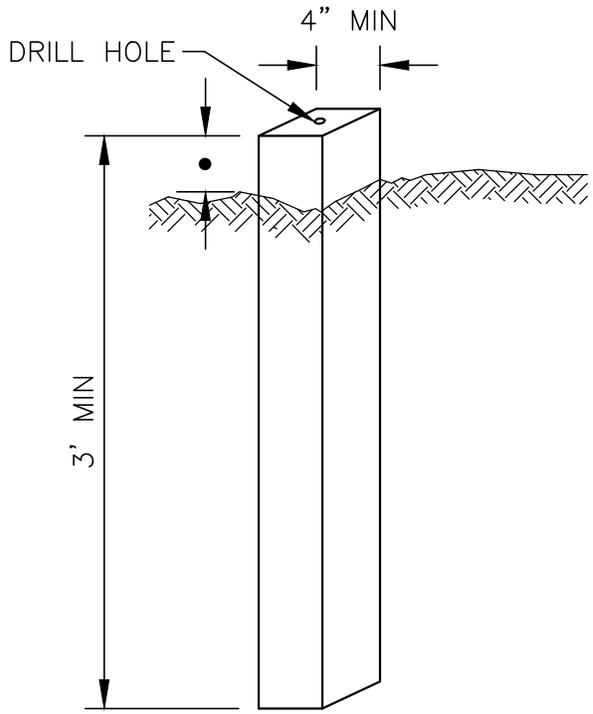
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SITE/STREET
-	-	-	<b>PAVEMENT MARKINGS</b>	DRAWING NO. M-3
-	-	-		DATE: 12/08
-	-	-		PAGE: 1
-	-	-		





SYMBOL SHALL BE WHITE WITH AN  
OPTIONAL BLUE BACKGROUND

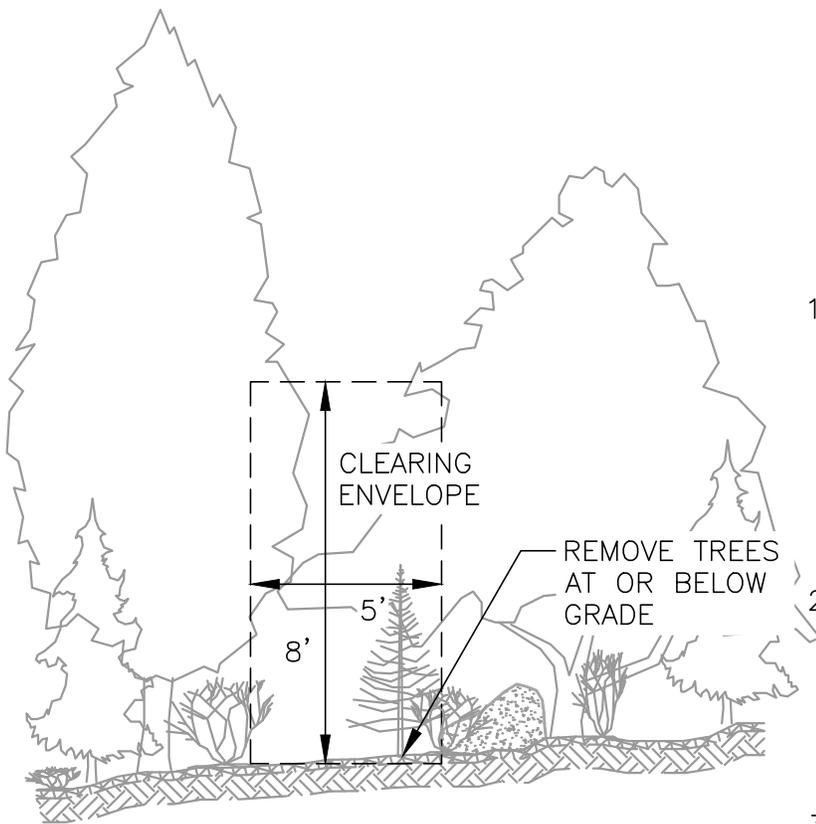
NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION: SITE/STREET
-	-	-	<b>ACCESSIBLE PARKING SPACE PAVEMENT MARKING</b>	DRAWING NO. M-5
-	-	-		DATE: 12/08
-	-	-		PAGE: 1
-	-	-		



NOTES:

1. BOUND TO BE VERTICAL AND SOIL COMPACTED WHEN SET
  2. RIGHT-OF-WAY BOUNDS SHALL BE REINFORCED CONCRETE OR GRANITE, 4"X4"X3' MINIMUM IN SIZE.
  3. RIGHT-OF-WAY BOUNDS SHALL BE INSPECTED BY THE CITY OF CONCORD ENGINEERING SERVICES DIVISION.
- RIGHT-OF WAY BOUNDS SHALL BE SET 5/8" TO 1" ABOVE GROUND IN RESIDENTIAL AREAS, 4" TO 6" ABOVE GROUND IN WOODED AREAS AND SLIGHTLY BELOW GRADE WHEN SET IN PAVEMENT.

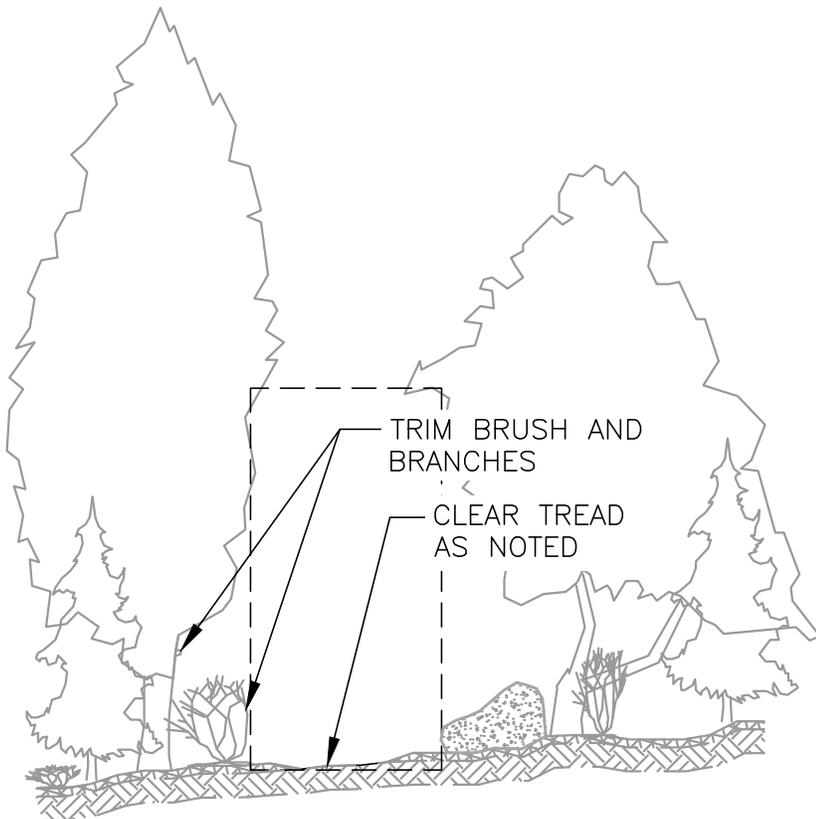
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE/STREET
-	-	-	<b>RIGHT-OF-WAY BOUND DETAIL</b>	DRAWING NO.	M-6
-	-	-		DATE:	12/08
-	-	-		PAGE:	1
-	-	-			



1. CLEARING FOR THE TRAIL SHOULD BE 5' WIDE AND 8' HIGH. CUT LIMBS FLUSH TO THE TREE TRUNK. CUT SMALL TREES BLOCKING THE PATH AT OR BELOW THE GROUND. REMOVE ALL CUTTING WELL OFF THE TRAIL.

2. A 3' WIDE TREAD SHALL BE ESTABLISHED. THE TREAD SHALL BE FREE OF ANY LOOSE STONES, DOWNED BRANCHES, VEGETATION AND LEAF LITTER.

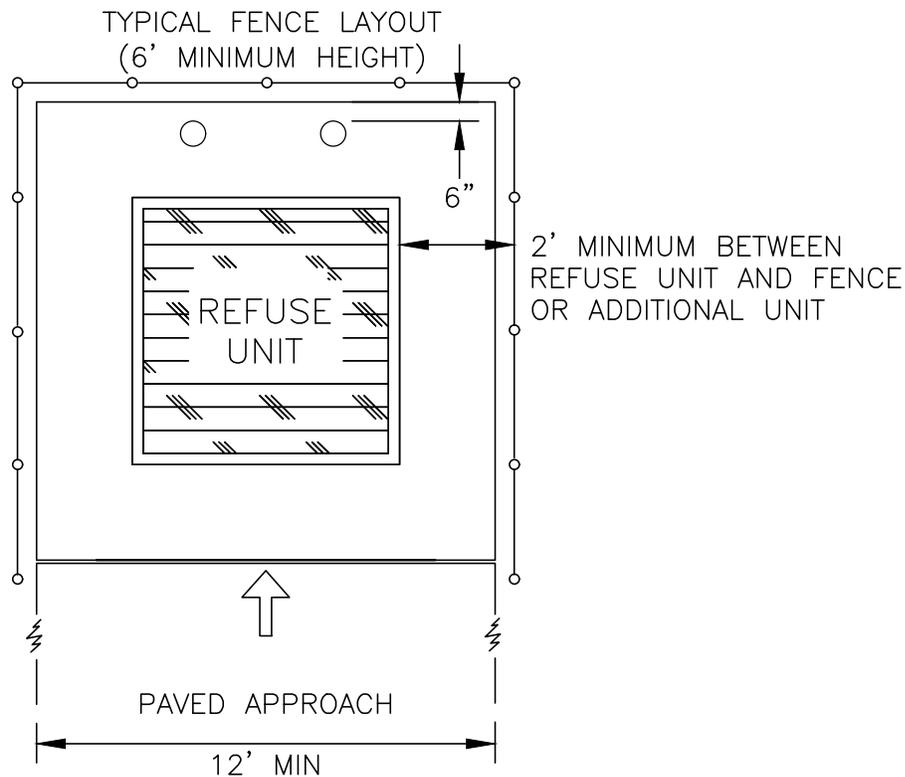
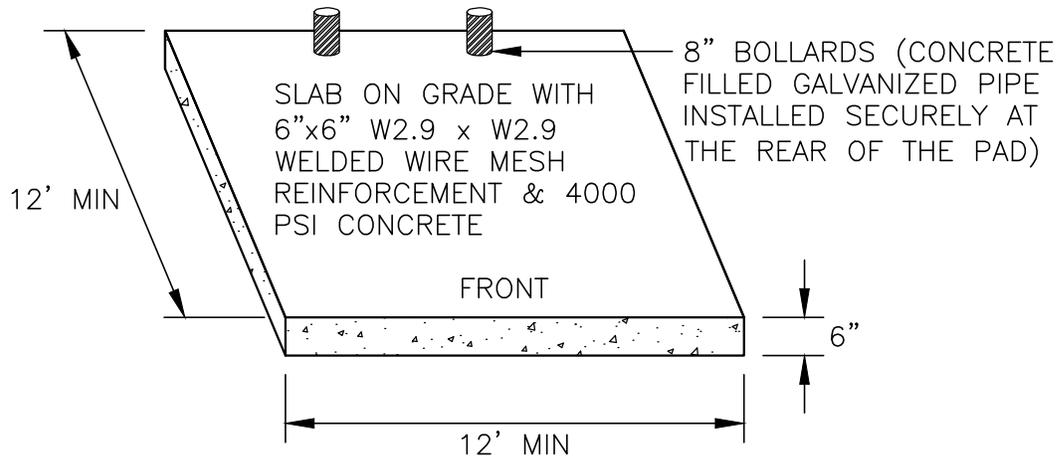
3. TRAILS SHALL BE MARKED WITH 2½" BY 6" PAINTED BLAZES. BLAZES SHOULD BE PAINTED IN ORANGE, RED OR YELLOW PAINT. DO NOT USE WHITE, GREEN, OR GRAY PAINT. BLAZES SHOULD BE PLACED AS HIGH AS POSSIBLE. EACH BLAZE SHOULD BE VISIBLE FROM THE NEXT.



TRIM BRUSH AND BRANCHES

CLEAR TREAD AS NOTED

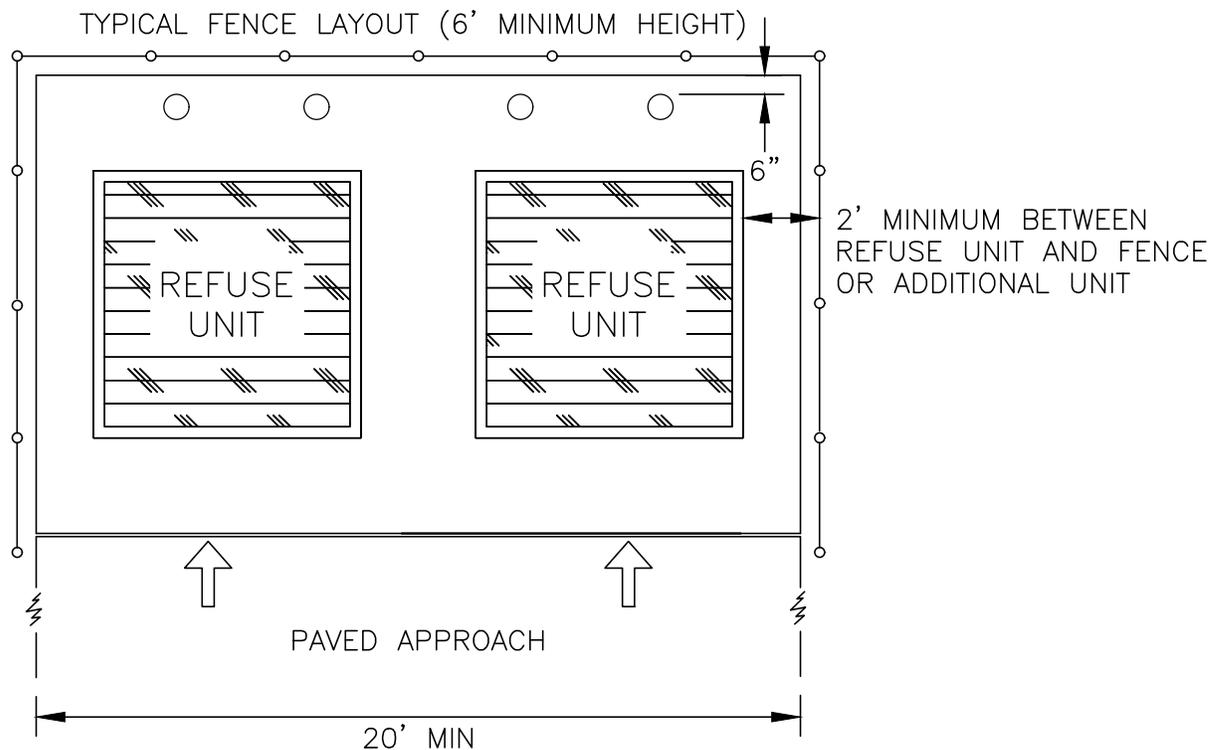
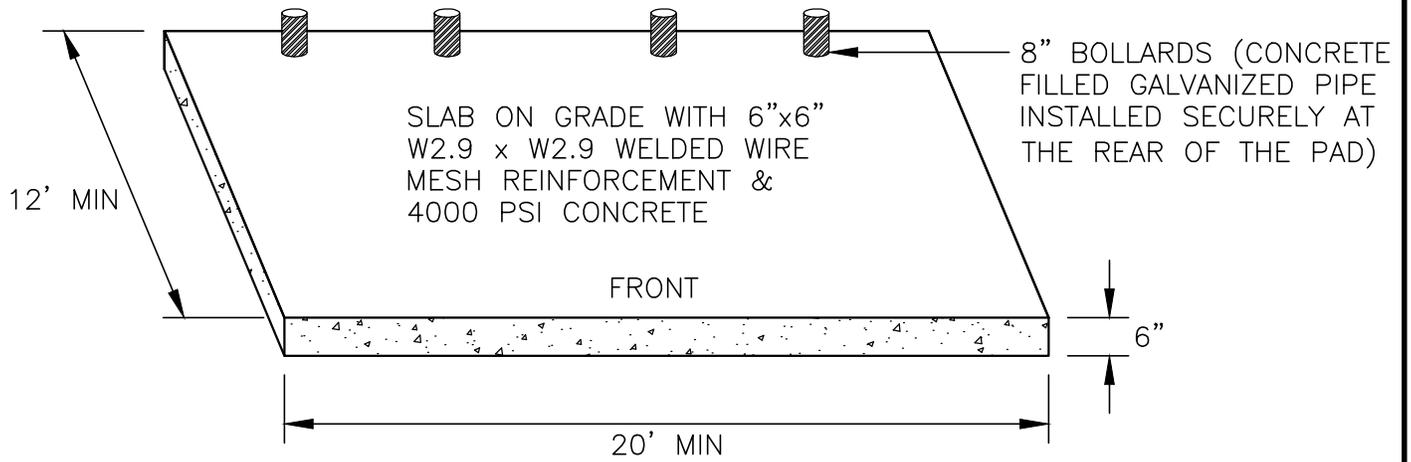
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE	
-	-	-	<b>TRAIL CONSTRUCTION</b>	DRAWING NO.	M-7	
-	-	DATE:		12/08	PAGE:	1
-	-	-				
-	-	-				



NOTES:

1. DUMPSTER PADS AND ASSOCIATED SCREENING SHALL BE PLACED WHERE THE REFUSE BINS CAN BE UNLOADED WITH A SINGLE TURNING MOVEMENT WITH A 35' FRONT LOADING TRUCK. THE WIDTH OF THE GATE SHOULD BE TAKEN INTO ACCOUNT WHEN REVIEWING TURNING MOVEMENTS.
2. GATES SHALL BE PROVIDED UNLESS THE DUMPSTER IS BLOCKED FROM VIEW FROM THE PUBLIC RIGHT-OF-WAY AND ABUTTING PROPERTIES BY BUILDINGS OR WALLS.
3. TRASH CONTAINERS SHALL BE LOCATED A MINIMUM DISTANCE OF 25' FROM ANY DRAINAGE STRUCTURE, INLET OR STORMWATER FACILITY.

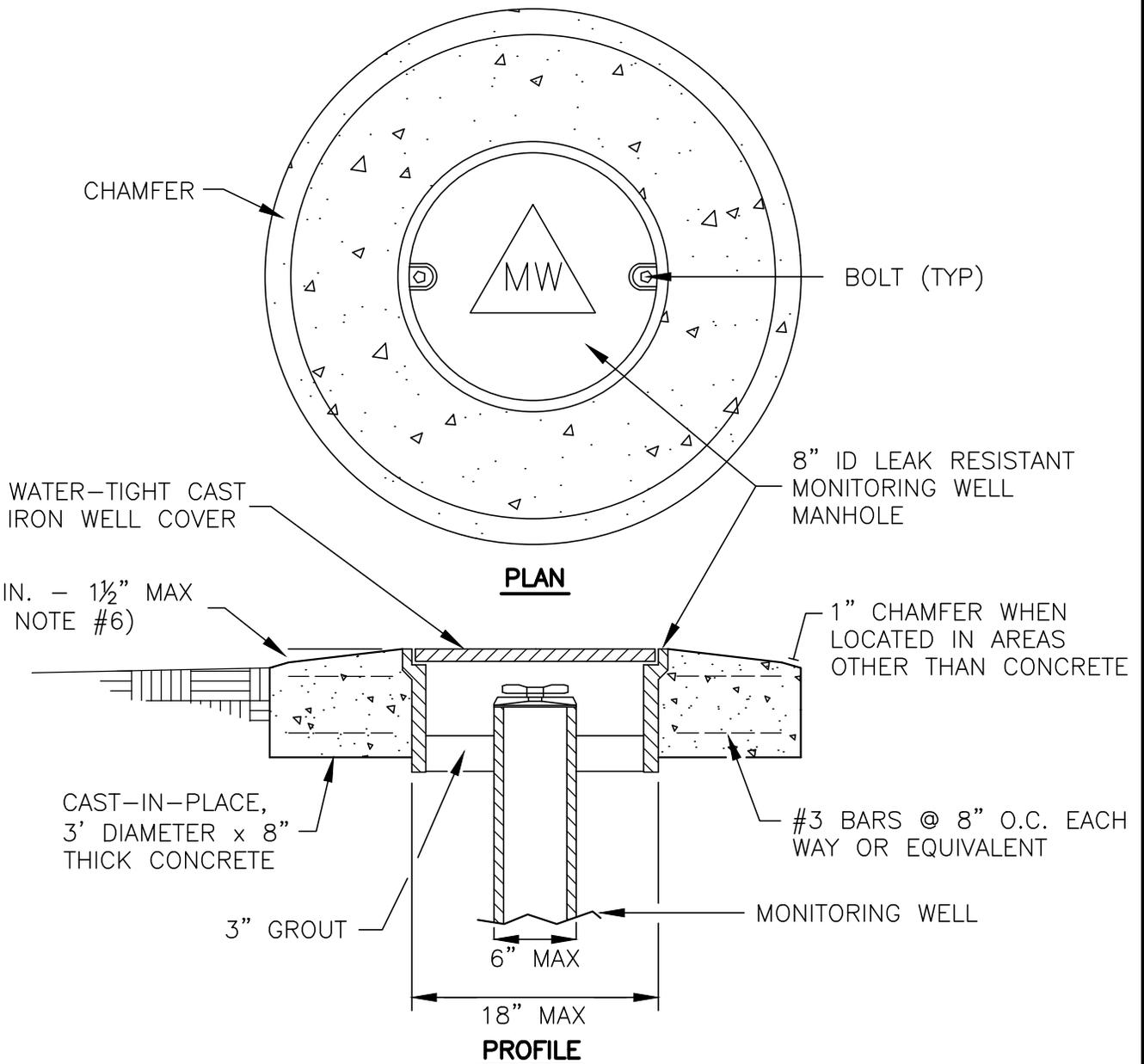
NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION:	SITE		
1	NOTE 2	01.15		<b>SINGLE DUMPSTER PAD</b>	DRAWING NO.	M-8	
-	-	-			DATE:	12/08	PAGE: 1
-	-	-					
-	-	-					



NOTES:

1. DUMPSTER PADS AND ASSOCIATED SCREENING SHALL BE PLACED WHERE THE REFUSE BINS CAN BE UNLOADED WITH A SINGLE TURNING MOVEMENT WITH A 35' FRONT LOADING TRUCK. THE WIDTH OF THE GATE SHOULD BE TAKEN INTO ACCOUNT WHEN REVIEWING TURNING MOVEMENTS.
2. GATES SHALL BE PROVIDED UNLESS THE DUMPSTER IS BLOCKED FROM VIEW FROM THE PUBLIC RIGHT-OF-WAY AND ABUTTING PROPERTIES BY BUILDINGS OR WALLS.
3. TRASH CONTAINERS SHALL BE LOCATED A MINIMUM DISTANCE OF 25' FROM ANY DRAINAGE STRUCTURE, INLET OR STORMWATER FACILITY.

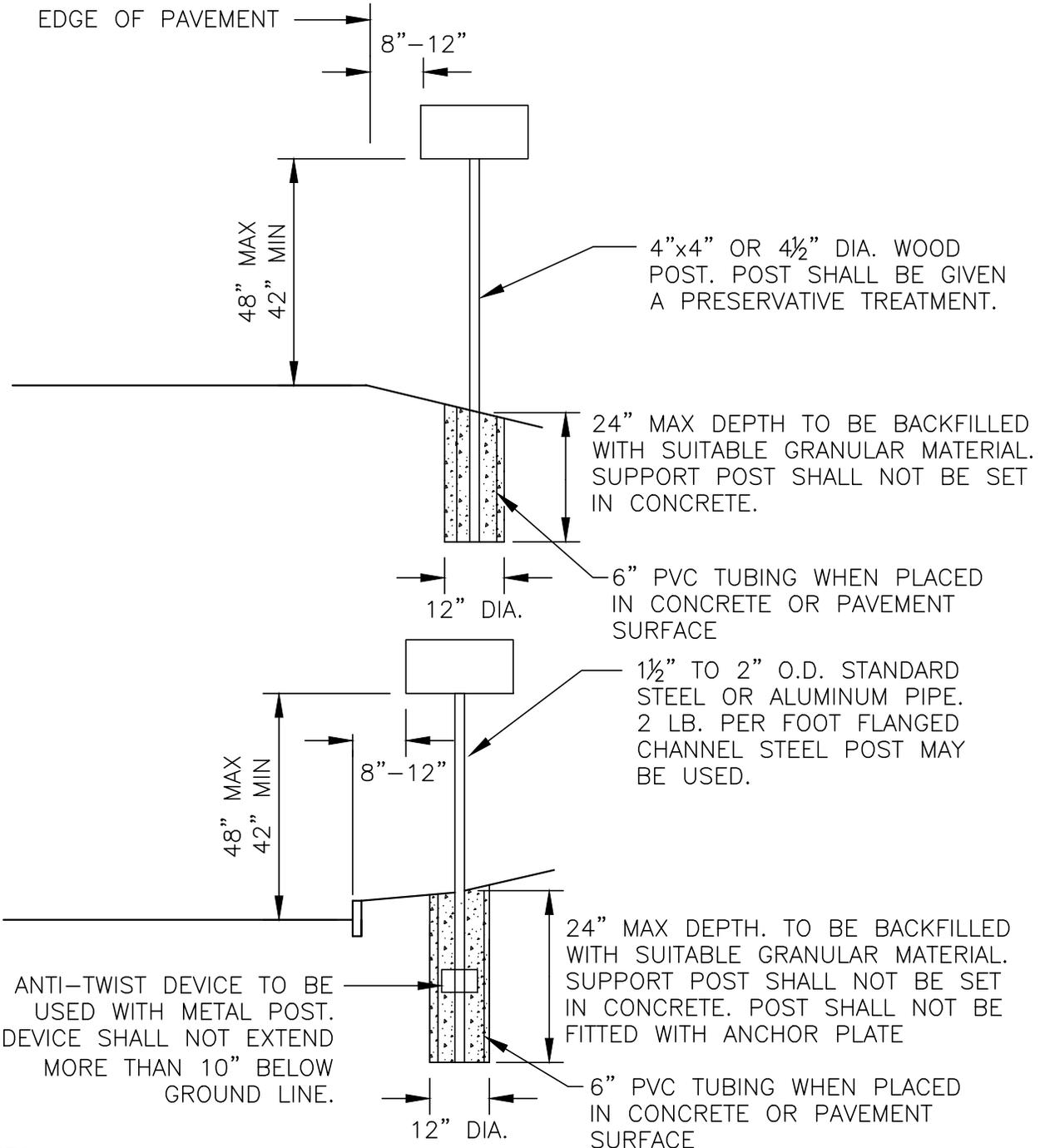
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE	
1	NOTE 2	01.15	<b>MULTIPLE DUMPSTER PAD</b>	DRAWING NO.	M-9	
-	-	-		DATE:	12/08	PAGE: 1
-	-	-				
-	-	-				



**NOTES:**

1. NO LESS THAN 12" OF HORIZONTAL SEPARATION SHALL BE MAINTAINED BETWEEN THE MONITORING WELL AND ANY EXISTING UNDERGROUND UTILITY.
2. THE WELL BOX SHALL BE STRUCTURALLY SOUND AND STRONG ENOUGH TO SUPPORT VEHICULAR TRAFFIC. IT SHALL BE TRAFFIC RATED AS TESTED BY AN OFFICIAL TESTING LABORATORY TO MEET AASHTO STANDARD FOR "H-20" TRUCK LOADINGS.
3. THE TOP OF THE WELL SHALL BE PERMANENTLY MARKED WITH LARGE LETTERS "MW"
4. THE WELL COVER SHALL BE BOLTED DOWN OR EQUIVALENT TO PROVIDE PROTECTION AGAINST UNAUTHORIZED ACCESS.
5. THE WELL COVER SHALL BE WATER-TIGHT TO PROTECT AGAINST ENTRY OF SURFACE WATER.
6. THE TOP OF THE WELL SHALL BE SET 1" TO 1½" ABOVE SURROUNDING GRADE TO PROVIDE FOR DRAINAGE AWAY FROM THE COVER, EXCEPT FOR WELLS INSTALLED IN SIDEWALK OR PAVED AREAS WHERE TOP OF THE CONCRETE PAD SHALL BE INSTALLED FLUSH AND MATCH EXISTING CONDITIONS.
7. A CONCRETE PAD WITH A MINIMUM THICKNESS OF 6" SHALL BE CONSTRUCTED AROUND THE WELL BOX. THE PAD SHALL EXTEND Laterally A MINIMUM OF 12" FROM OUTSIDE OF THE WELL BOX. THE PAD SHALL BE CONSTRUCTED TO BE FREE OF CRACKS OR OTHER DEFECTS LIKELY TO AFFECT WATER TIGHTNESS.
8. A LOCKING WATERTIGHT WELL CAP SHALL BE INSTALLED AT THE TOP OF THE WELL CASING SO THAT SURFACE WATER THAT MAY ENTER THE VAULT WILL NOT ENTER THE WELL.

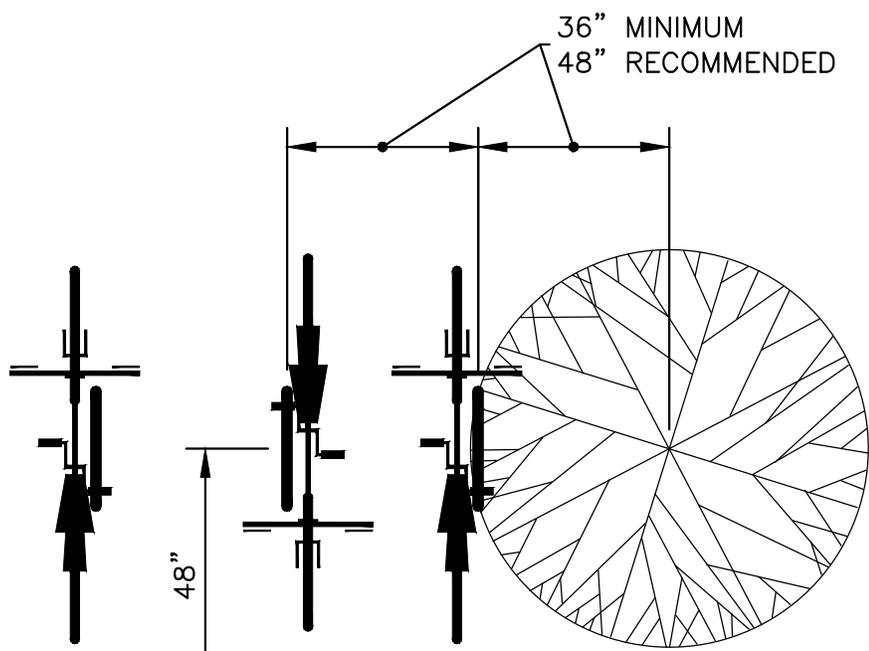
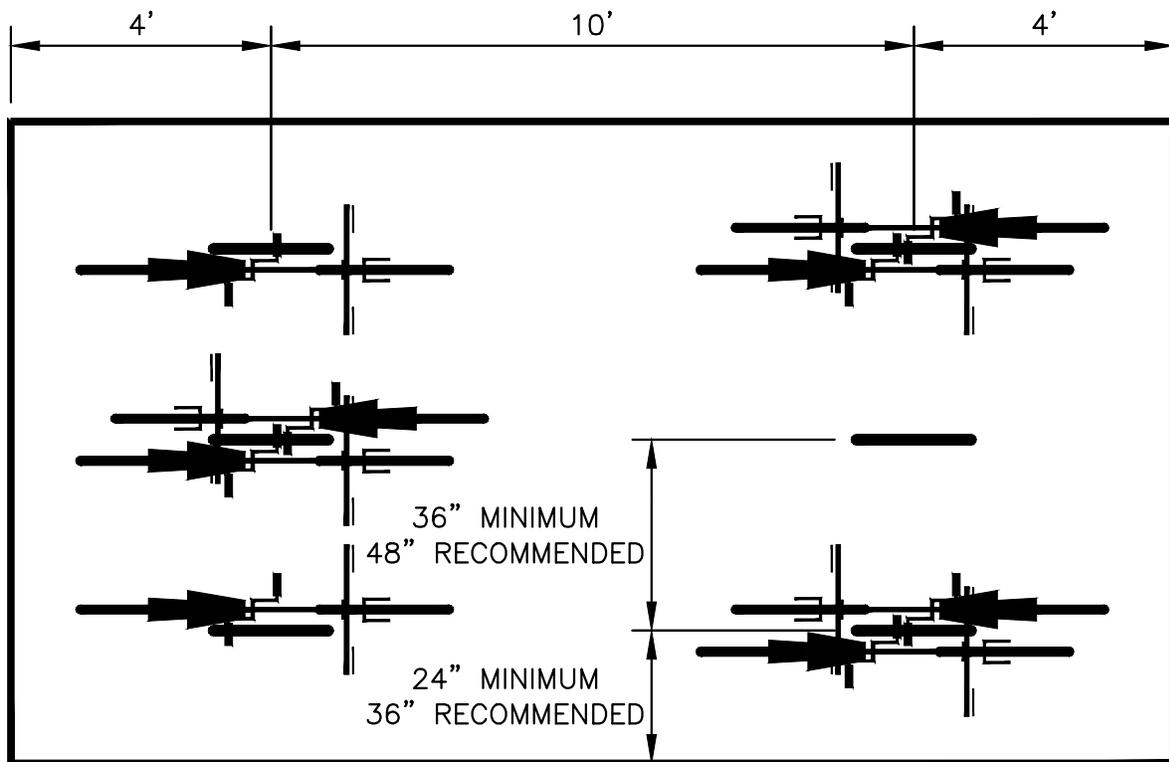
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE
-	-	-	<b>MONITORING WELL CONSTRUCTION DETAIL</b>	DRAWING NO.	M-10
-	-	-		DATE:	12/08
-	-	-		PAGE:	1
-	-	-			



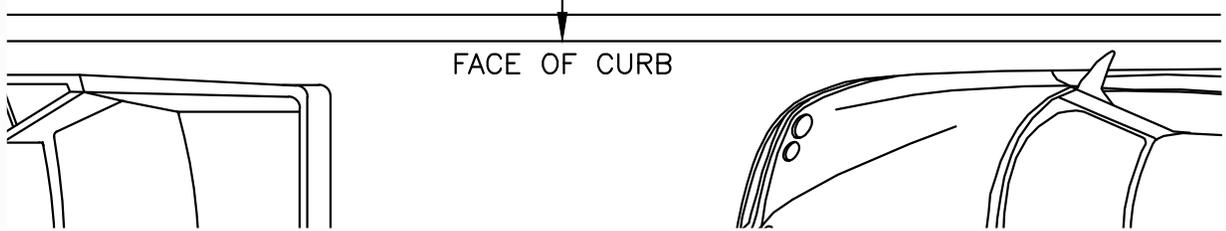
**NOTES**

1. ONLY LIGHTWEIGHT MAILBOXES MADE OF LIGHT SHEET METAL OR PLASTIC SHALL BE USED. MAILBOXES SHALL MEET REQUIREMENTS AND APPROVAL OF THE U.S. POSTAL SERVICE.
2. AN ALTERNATE MAILBOX SUPPORT STRUCTURE DESIGN AND CONSTRUCTION MAY BE USED AS LONG AS PROVEN CRASHWORTHY AND MEETS GUIDELINES AS SET OUT IN AASHTO'S "GUIDE FOR ERECTING MAILBOXES ON HIGHWAYS". SUPPORT STRUCTURE SHALL ALSO MEET REQUIREMENTS OF THE U.S. POSTAL SERVICE. GRANITE POSTS SHOULD NOT BE USED. GRANITE OR OTHER DECORATIVE POSTS DAMAGED BY CITY STAFF DURING WINTER MAINTENANCE OPERATIONS WILL BE REPLACED WITH A 4"x4" WOOD POST.

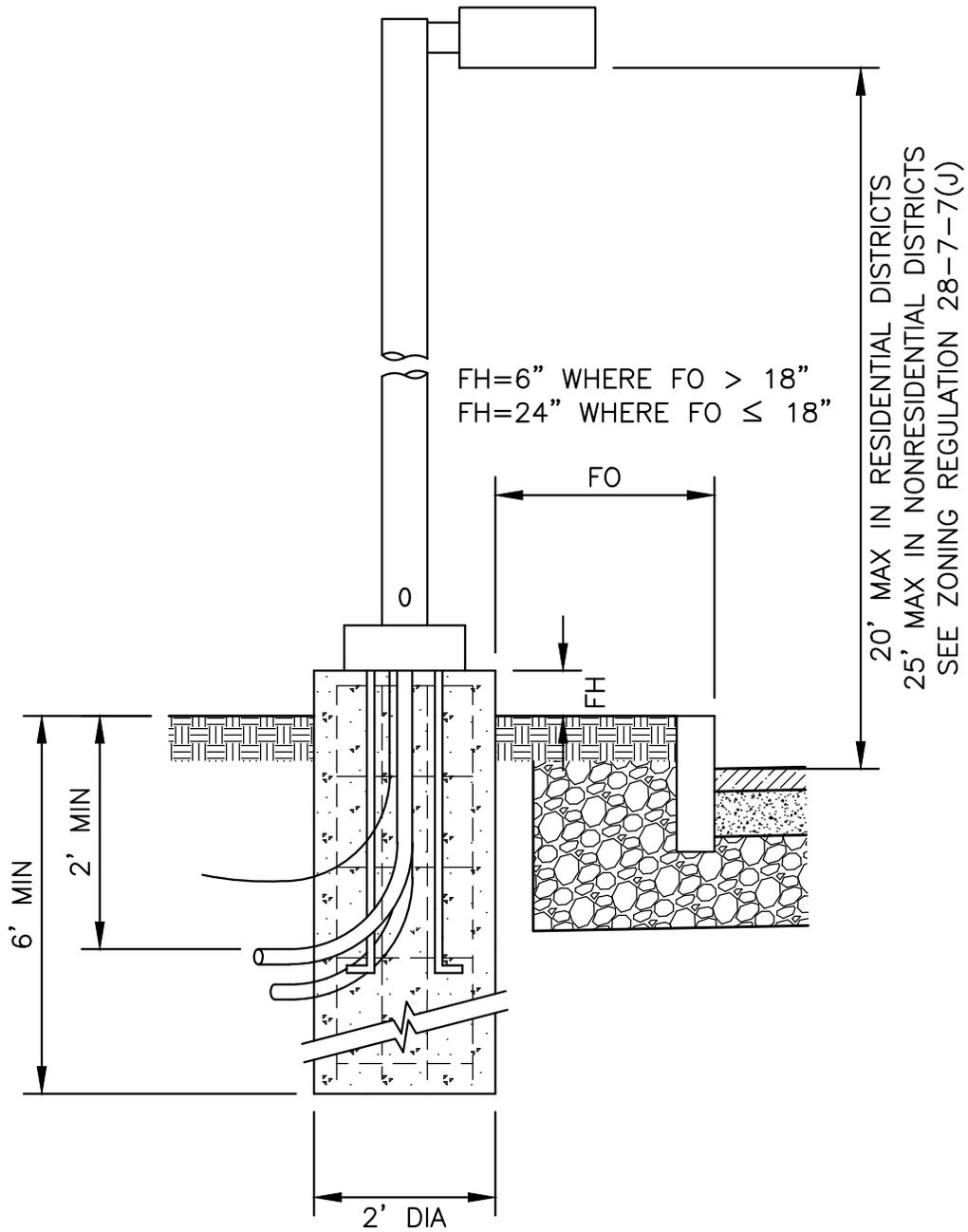
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE/STREET	
-	-	-	<b>SINGLE MAILBOX SUPPORT</b>	DRAWING NO.	M-11	
-	-	-		DATE:	12/08	PAGE: 1
-	-	-				
-	-	-				



LOCATE RACKS BETWEEN  
PARKING SPACES TO  
AVOID CONFLICTS WITH  
OPENING CAR DOORS



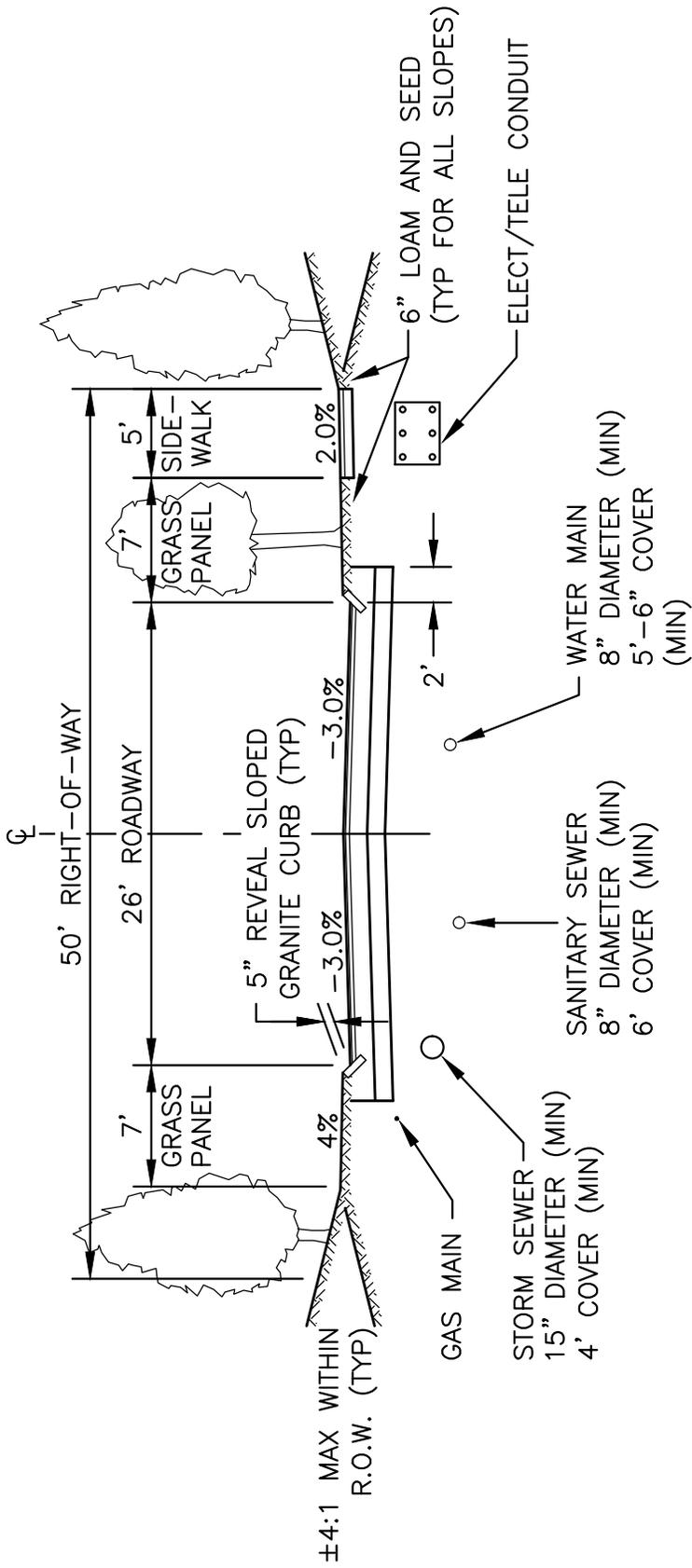
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE
-	-	-		DRAWING NO.	M-12
-	-	-		DATE:	08/13
-	-	-		PAGE:	1
			<b>BICYCLE PARKING</b>		



THIS INFORMATION MAY NOT CONTAIN ALL DETAILS REQUIRED FOR CONSTRUCTION. APPROPRIATE MODIFICATION MAY BE REQUIRED TO ENSURE SUITABILITY OF THESE DRAWINGS FOR THE SPECIFIC APPLICATION. IT IS THE USERS RESPONSIBILITY TO ENSURE INSTALLATION OF THE EQUIPMENT/SYSTEM IN ACCORDANCE WITH BUILDING/PROJECT SPECIFICATIONS, APPLICABLE CODES AND STANDARDS.

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	ROADWAY	
-	-	-	<b>TYPICAL LIGHT POLE AND FOUNDATION</b>	DRAWING NO.	M-13	
-	-	-		DATE:	01/14	PAGE: 1
-	-	-				
-	-	-				



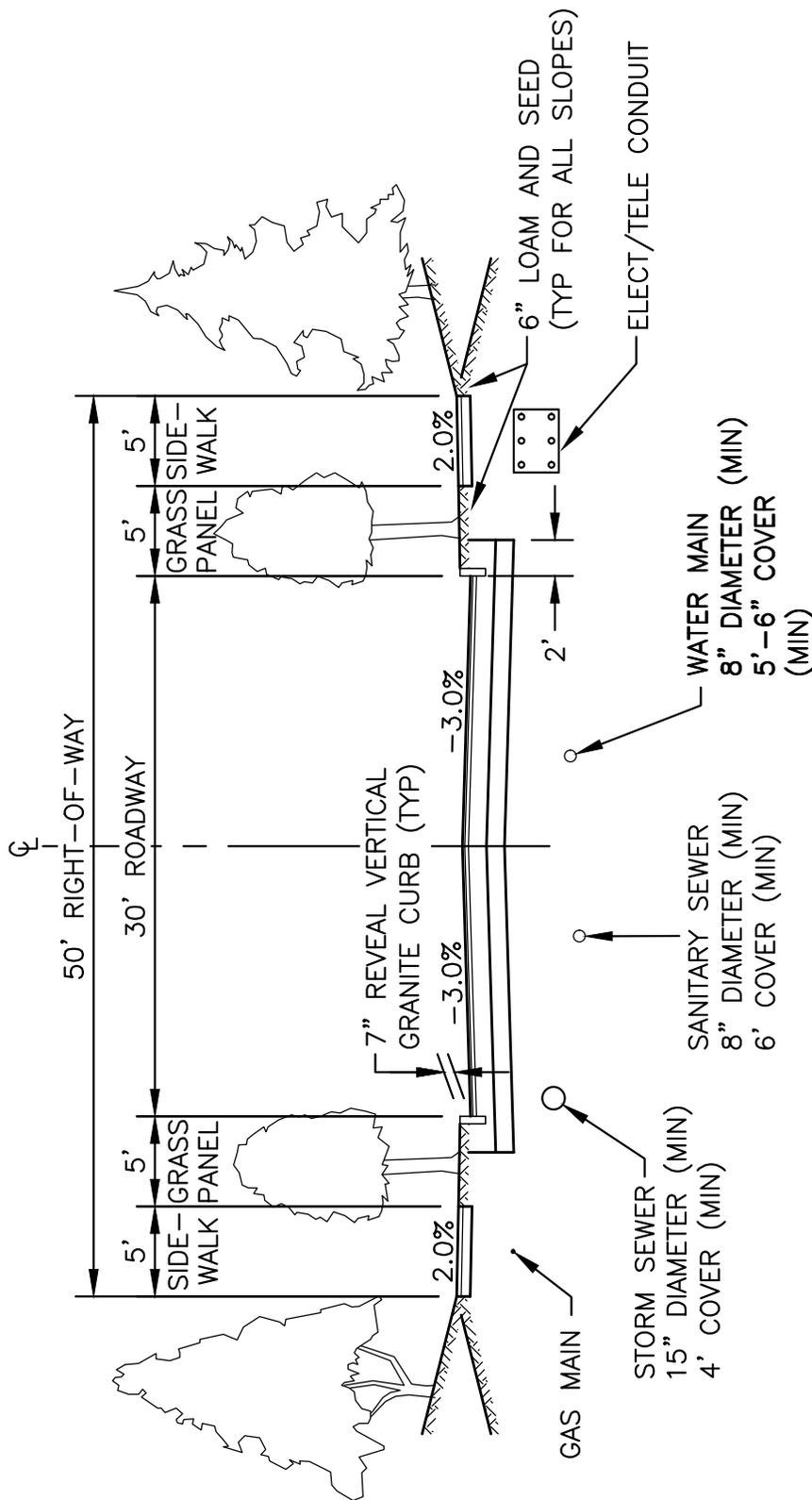


## RESIDENTIAL RURAL CLUSTER STREET

<u>ROADWAY MATERIALS</u>	<u>SIDEWALK MATERIALS</u>
4" HOT BITUMINOUS PAVEMENT	3" HOT BITUMINOUS PAVEMENT
1 1/2" WEARING COURSE	1 1/2" WEARING COURSE
2 1/2" BASE COURSE	1 1/2" BASE COURSE
12" CRUSHED GRAVEL	6" CRUSHED GRAVEL
12" GRAVEL	

- VERTICAL GRANITE CURB (7" REVEAL) MAY BE SUBSTITUTED FOR SLOPED GRANITE CURB
- THIS DETAIL IS NOT INTENDED TO SHOW THE FINAL CONFIGURATION OF THE STREET OR DRIVE AND IS MEANT ONLY TO SHOW TYPICALS THAT MAY APPLY

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	ROADWAY	
1	UTILITY DEPTH	11/19	<b>RESIDENTIAL RURAL CLUSTER STREET</b>	DRAWING NO.	R-2	
-	-	-		DATE:	01/12	PAGE:
-	-	-				1
-	-	-				



**RESIDENTIAL URBAN STREET**

ROADWAY MATERIALS

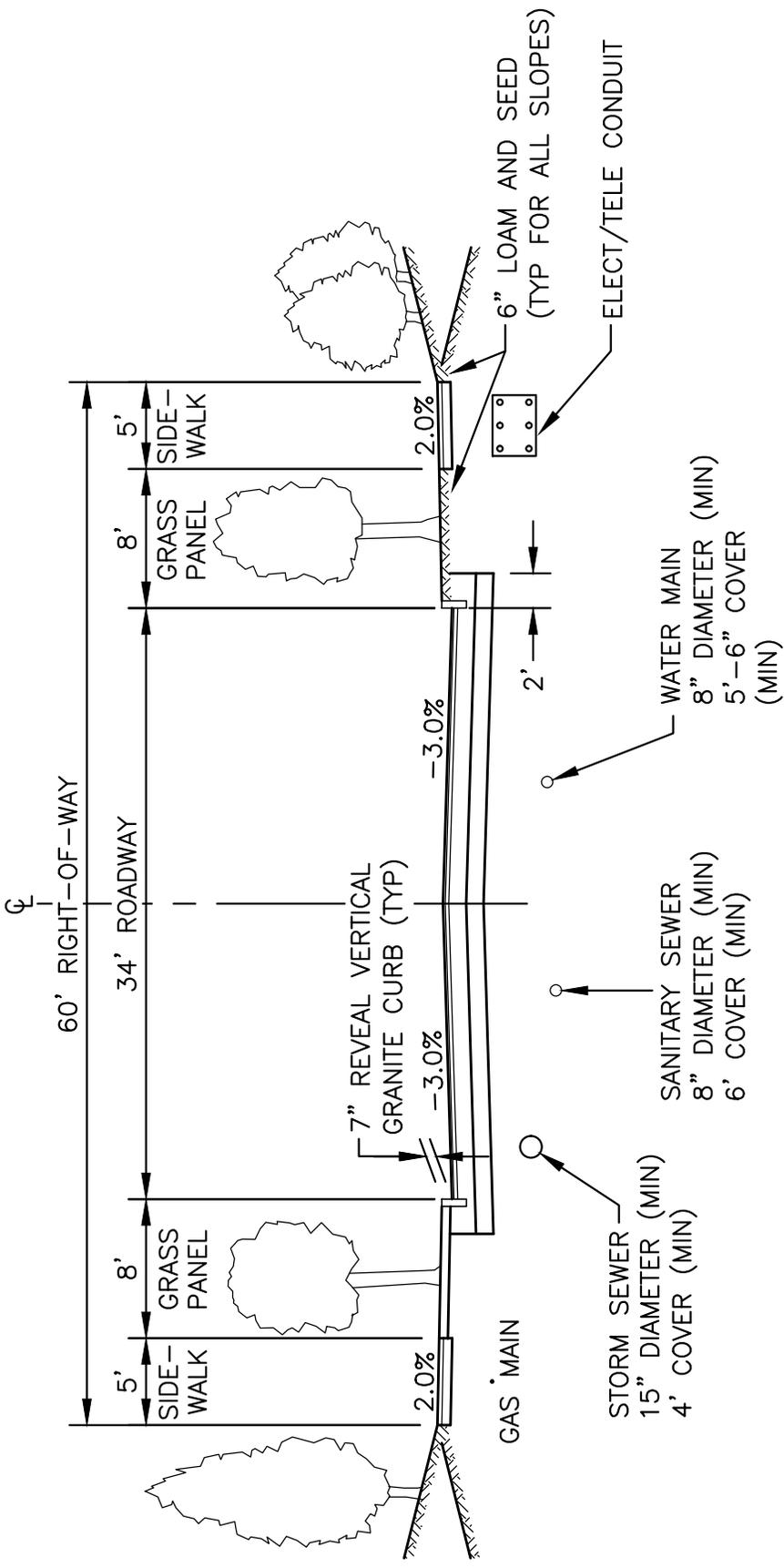
- 4" HOT BITUMINOUS PAVEMENT
- 1 1/2" WEARING COURSE
- 2 1/2" BASE COURSE
- 12" CRUSHED GRAVEL
- 12" GRAVEL

SIDEWALK MATERIALS

- 3" HOT BITUMINOUS PAVEMENT
- 1 1/2" WEARING COURSE
- 1 1/2" BASE COURSE
- 6" CRUSHED GRAVEL

• THIS DETAIL IS NOT INTENDED TO SHOW THE FINAL CONFIGURATION OF THE STREET OR DRIVE AND IS MEANT ONLY TO SHOW TYPICALS THAT MAY APPLY

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	ROADWAY	
1	UTILITY DEPTH	11/19	<b>RESIDENTIAL URBAN STREET</b>	DRAWING NO.	R-3	
-	-	-		DATE:	01/12	PAGE:
-	-	-				1
-	-	-				

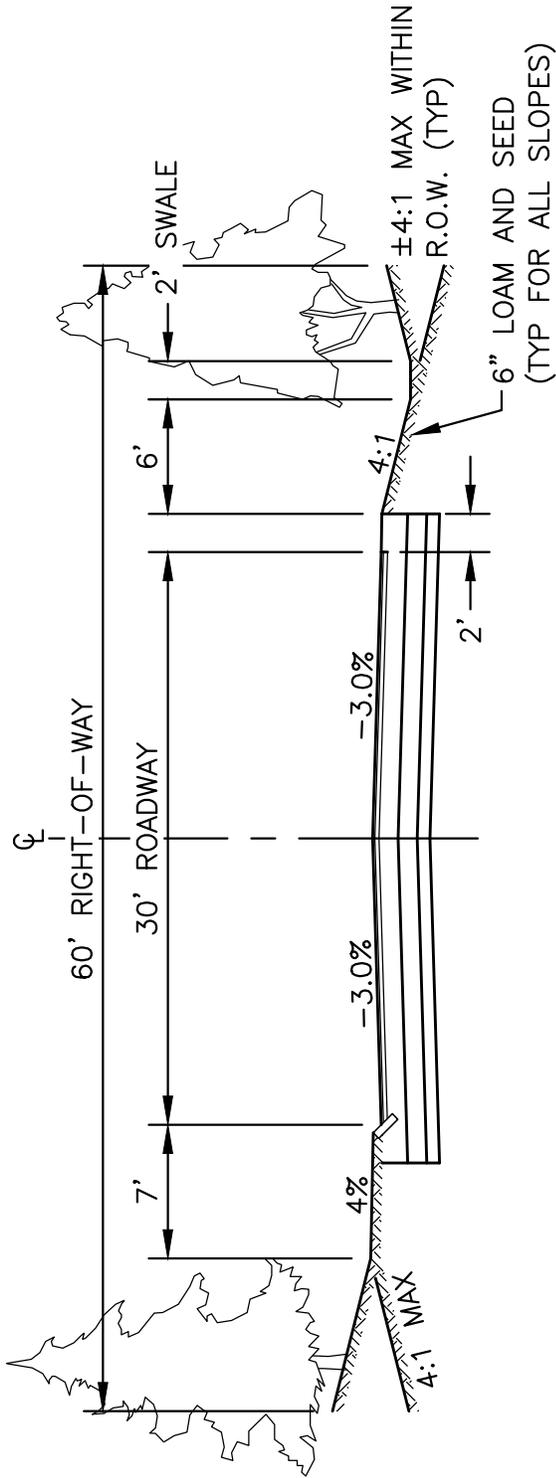


**NON-RESIDENTIAL MIXED USE LOCAL STREET**

- |                            |                            |
|----------------------------|----------------------------|
| <u>ROADWAY MATERIALS</u>   | <u>SIDEWALK MATERIALS</u>  |
| 4" HOT BITUMINOUS PAVEMENT | 3" HOT BITUMINOUS PAVEMENT |
| 1 1/2" WEARING COURSE      | 1 1/2" WEARING COURSE      |
| 2 1/2" BASE COURSE         | 1 1/2" BASE COURSE         |
| 12" CRUSHED GRAVEL         | 6" CRUSHED GRAVEL          |
| 12" GRAVEL                 |                            |

- THIS DETAIL IS NOT INTENDED TO SHOW THE FINAL CONFIGURATION OF THE STREET OR DRIVE AND IS MEANT ONLY TO SHOW TYPICALS THAT MAY APPLY

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	ROADWAY	
1	UTILITY DEPTH	11/19	<b>NON-RESIDENTIAL MIXED USE LOCAL STREET</b>	DRAWING NO.	R-4	
-	-	-		DATE:	01/12	PAGE:
-	-	-				1
-	-	-				



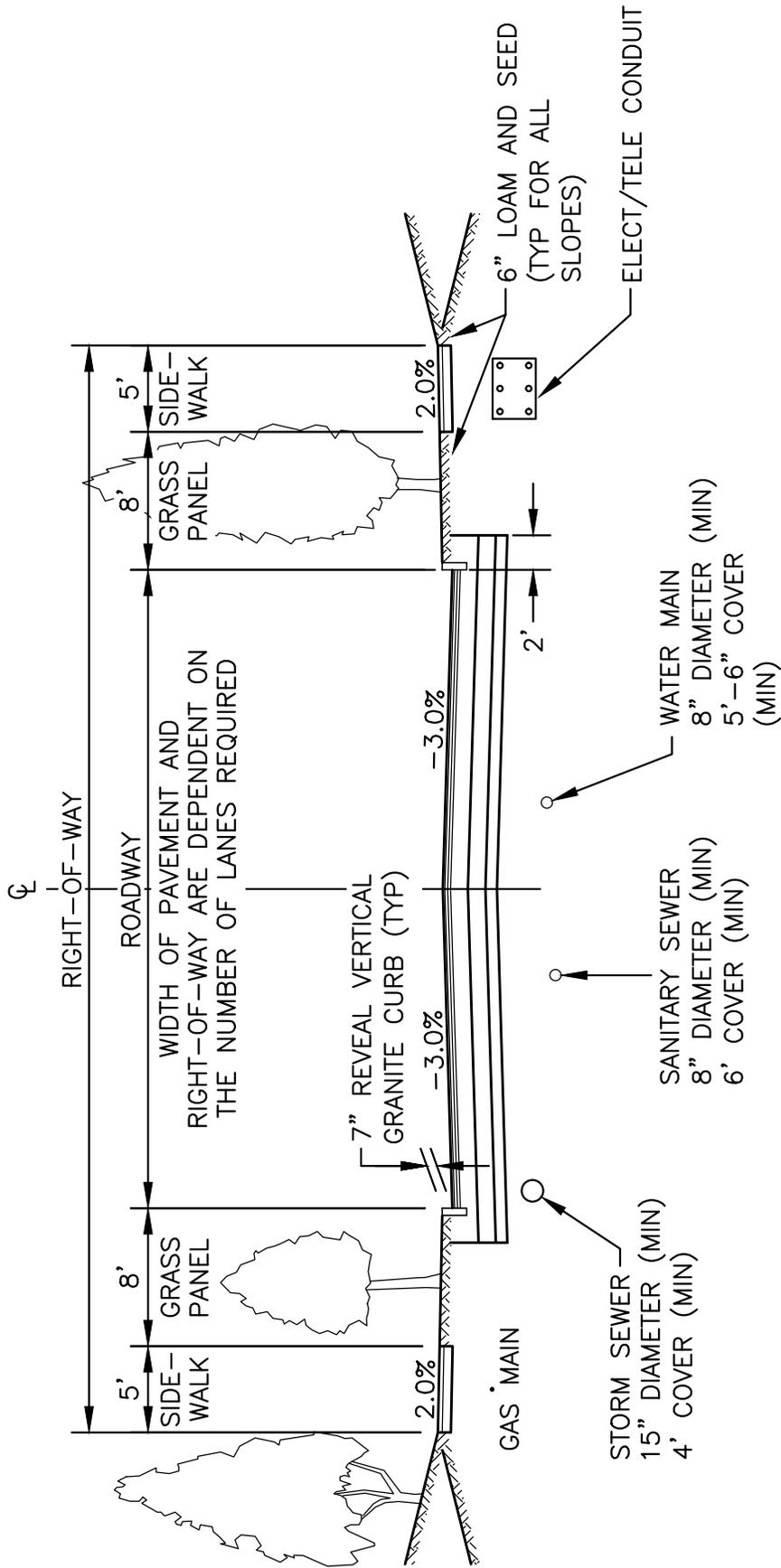
## RURAL COLLECTOR STREET

### ROADWAY MATERIALS

- 4" HOT BITUMINOUS PAVEMENT
- 1½" WEARING COURSE
- 2½" BASE COURSE
- 12" CRUSHED GRAVEL
- 12" GRAVEL
- 8" SAND

- SLOPED GRANITE CURB REQUIRED ON ALL STREETS WITH SLOPES ≥6%, AND AT INTERSECTIONS
- VERTICAL GRANITE CURB (7" REVEAL) MAY BE SUBSTITUTED FOR SLOPED GRANITE CURB
- THIS DETAIL IS NOT INTENDED TO SHOW THE FINAL CONFIGURATION OF THE STREET OR DRIVE AND IS MEANT ONLY TO SHOW TYPICALS THAT MAY APPLY

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	ROADWAY
-	-	-	<h1 style="margin: 0;">RURAL COLLECTOR STREET</h1>	DRAWING NO.	R-5
-	-	-		DATE:	01/12
-	-	-		PAGE:	1
-	-	-			

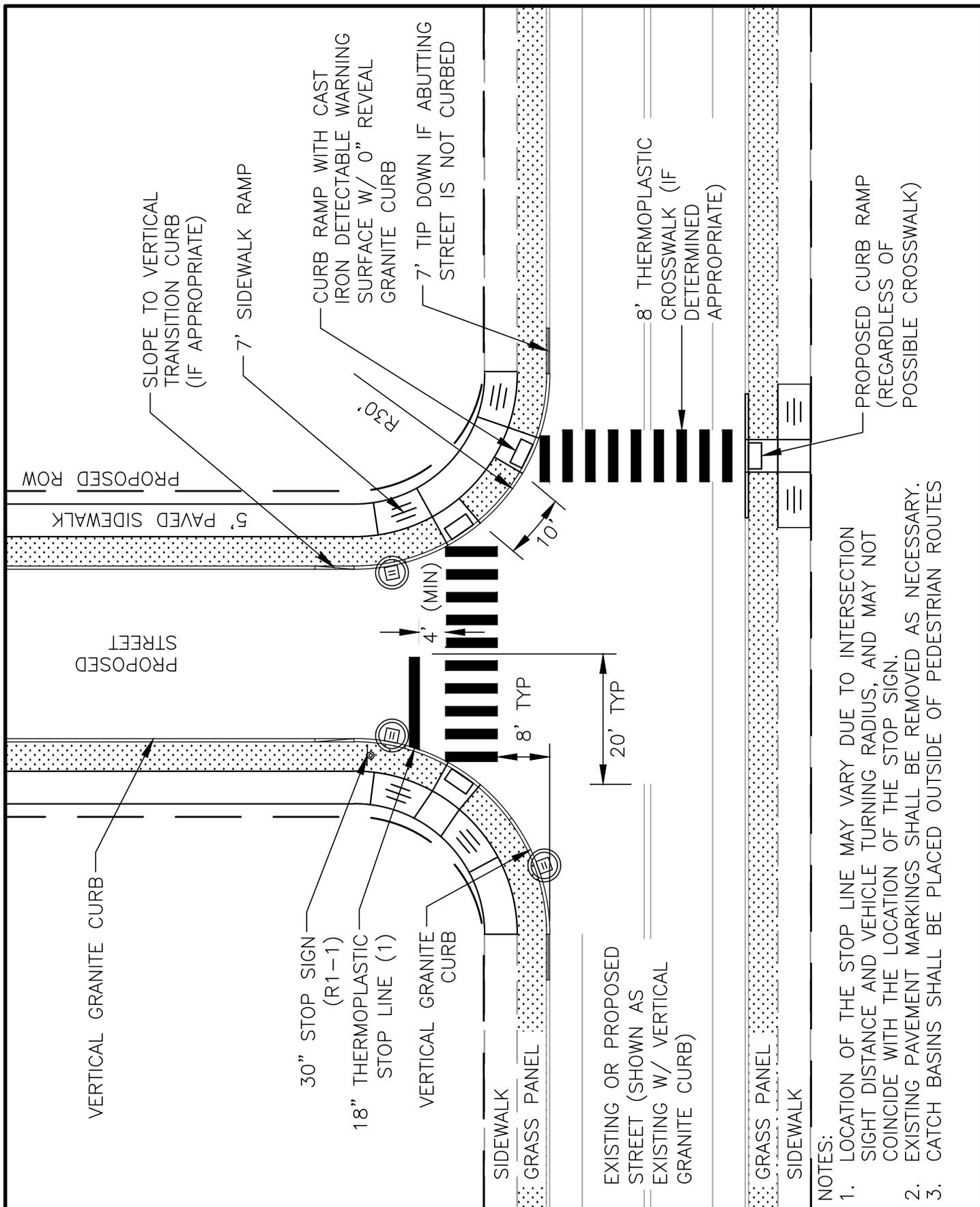


**NON-RESIDENTIAL ARTERIAL COLLECTOR STREET**

ROADWAY MATERIALS	SIDEWALK MATERIALS
5½" HOT BITUMINOUS PAVEMENT	3" HOT BITUMINOUS PAVEMENT
1½" WEARING COURSE	1½" WEARING COURSE
2" BINDER COURSE	1½" BASE COURSE
2" BASE COURSE	6" CRUSHED GRAVEL
12" CRUSHED GRAVEL	
12" GRAVEL	
8" SAND	

• THIS DETAIL IS NOT INTENDED TO SHOW THE FINAL CONFIGURATION OF THE STREET OR DRIVE AND IS MEANT ONLY TO SHOW TYPICALS THAT MAY APPLY

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	ROADWAY	
1	UTILITY DEPTH	11/19	<b>NON-RESIDENTIAL ARTERIAL COLLECTOR STREET</b>	DRAWING NO.	R-6	
-	-	-		DATE:	01/12	PAGE: 1
-	-	-				
-	-	-				



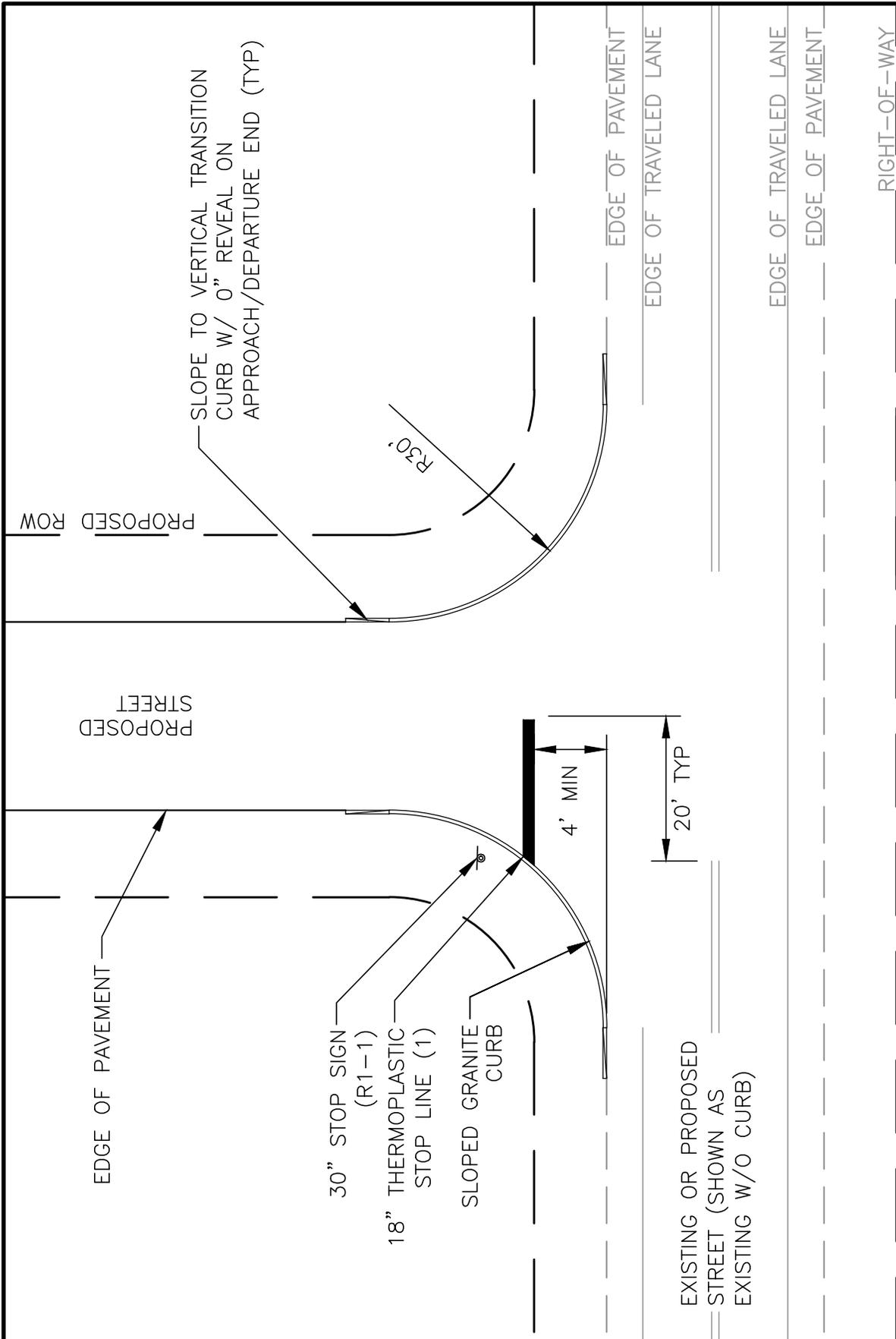
- NOTES:
1. LOCATION OF THE STOP LINE MAY VARY DUE TO INTERSECTION SIGHT DISTANCE AND VEHICLE TURNING RADIUS, AND MAY NOT COINCIDE WITH THE LOCATION OF THE STOP SIGN.
  2. EXISTING PAVEMENT MARKINGS SHALL BE REMOVED AS NECESSARY.
  3. CATCH BASINS SHALL BE PLACED OUTSIDE OF PEDESTRIAN ROUTES

NO.	REVISION	DATE
1	DRAWING NO.	11-11
-	-	-
-	-	-
-	-	-

**City of Concord Engineering Services Division**

**URBAN INTERSECTION**

SECTION: SITE/STREET	
DRAWING NO. R-7	PAGE: -
DATE: 12/08	



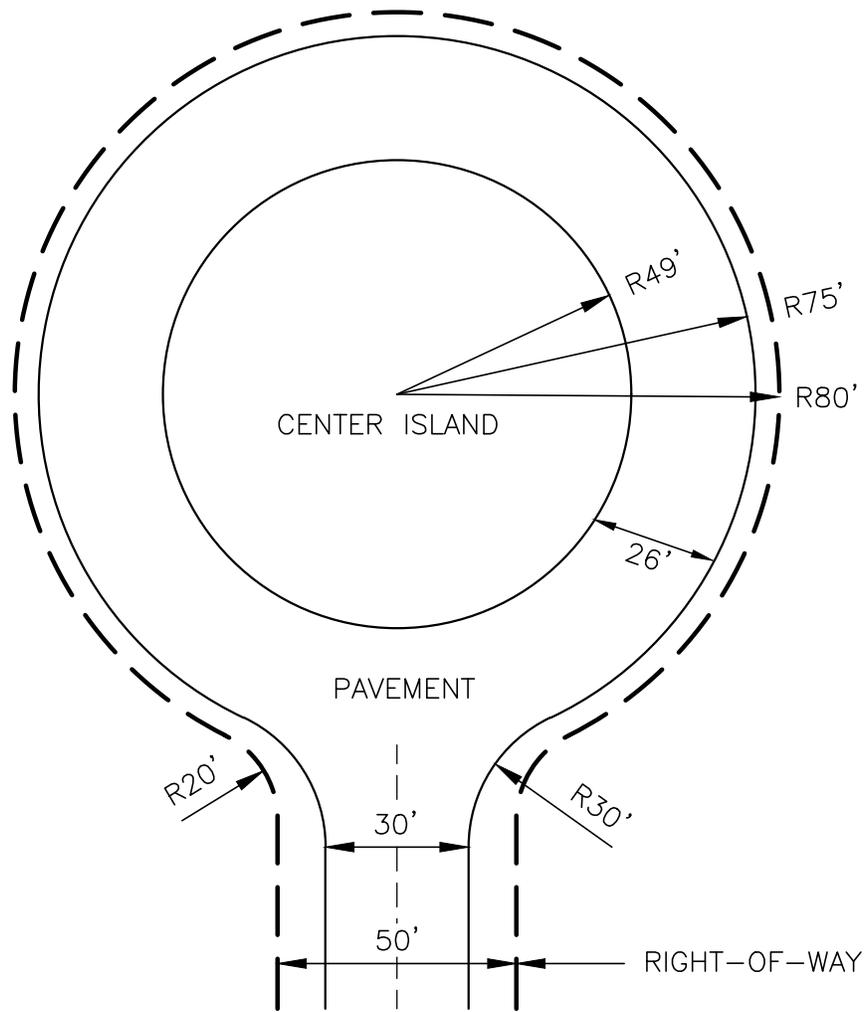
- NOTES:
1. LOCATION OF THE STOP LINE MAY VARY DUE TO INTERSECTION SIGHT DISTANCE AND VEHICLE TURNING RADIUS, AND MAY NOT COINCIDE WITH THE LOCATION OF THE STOP SIGN.
  2. EXISTING PAVEMENT MARKINGS SHALL BE COMPLETELY REMOVED AS NECESSARY.

NO.	REVISION	DATE
1	DRAWING NO.	11-11
-	-	-
-	-	-
-	-	-

**City of Concord Engineering Services Division**

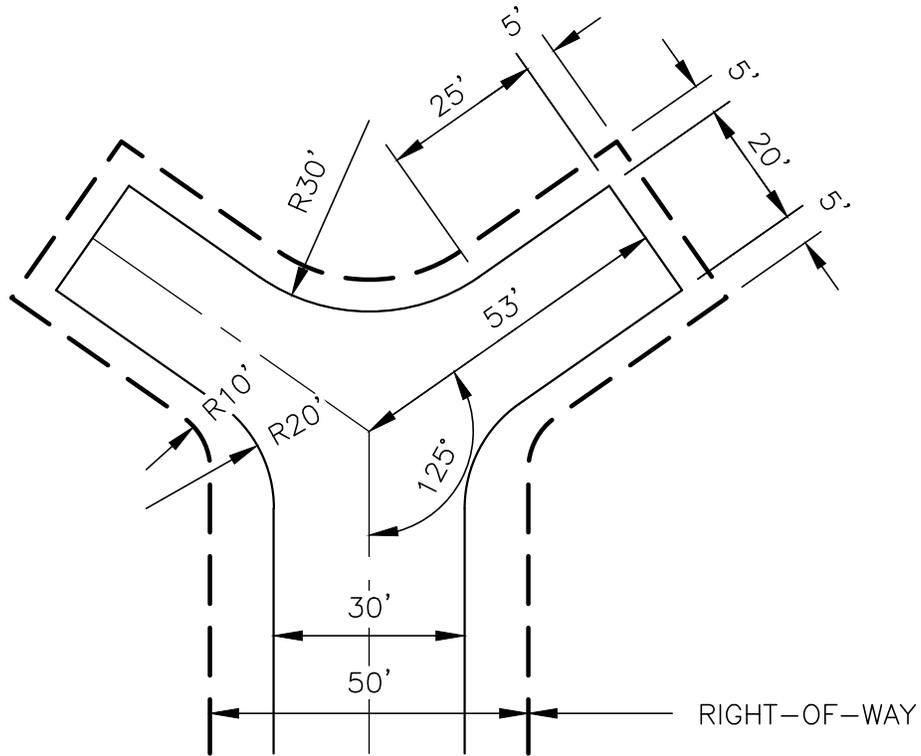
**RURAL INTERSECTION**

SECTION: SITE/STREET	
DRAWING NO. R-8	PAGE: -
DATE: 12/08	

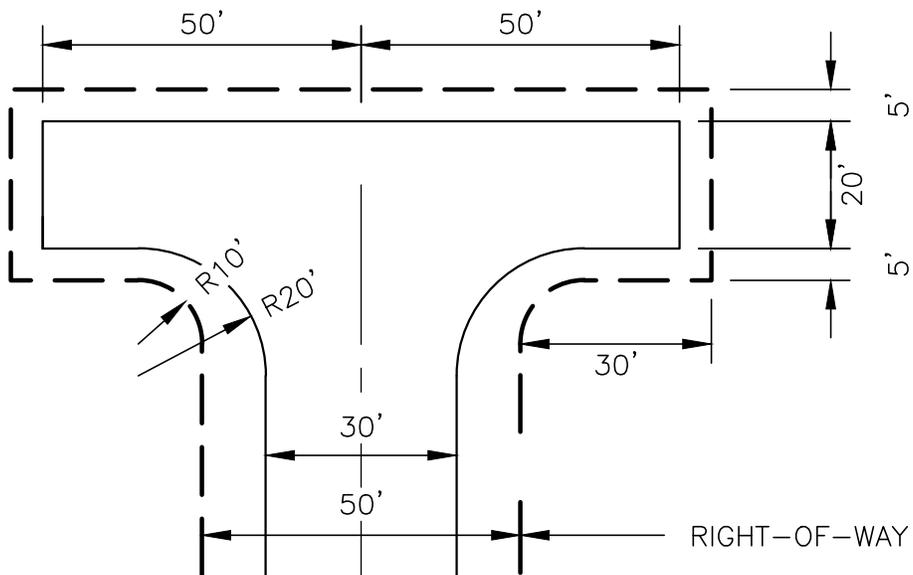


### CUL-DE-SAC

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SITE/STREET
1	DRAWING NO.	11-11	<b>ROADWAY TERMINATION CUL-DE-SAC</b>	DRAWING NO. R-9
-	-	-		DATE: 12/08
-	-	-		PAGE: 1
-	-	-		



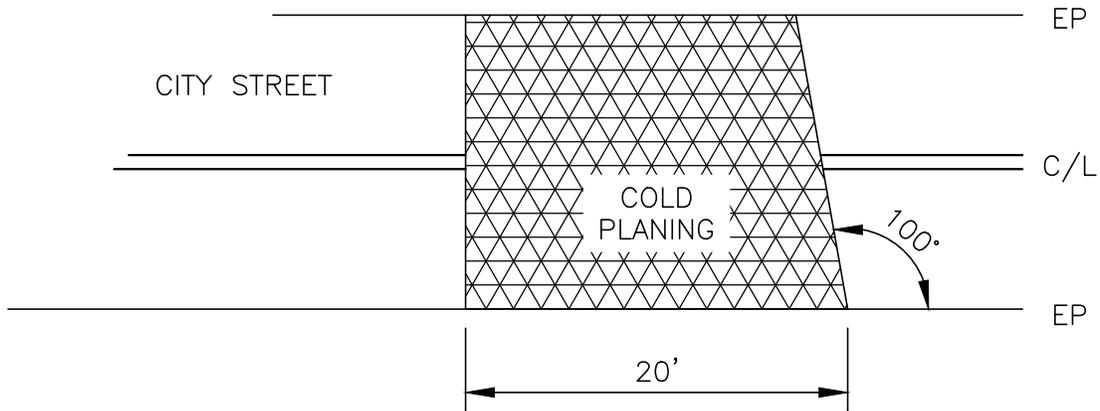
**"Y" HAMMERHEAD**



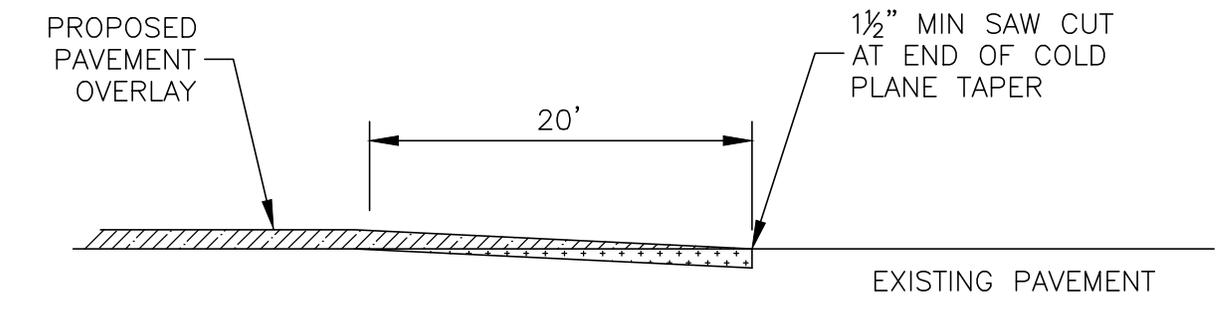
**"T" HAMMERHEAD**

NOTE:  
 DRIVEWAYS SHALL NOT BE LOCATED AT THE  
 20' WIDE ENDS OF THE HAMMERHEADS

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE/STREET	
1	DRAWING NO.	11-11	<b>TEMPORARY ROADWAY TERMINATION</b>	DRAWING NO.	R-10	
-	-	-		DATE:	12/08	PAGE: 1
-	-	-				
-	-	-				



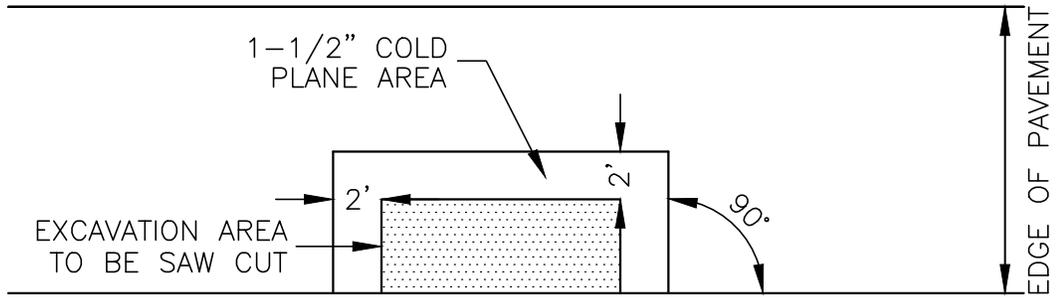
PLAN



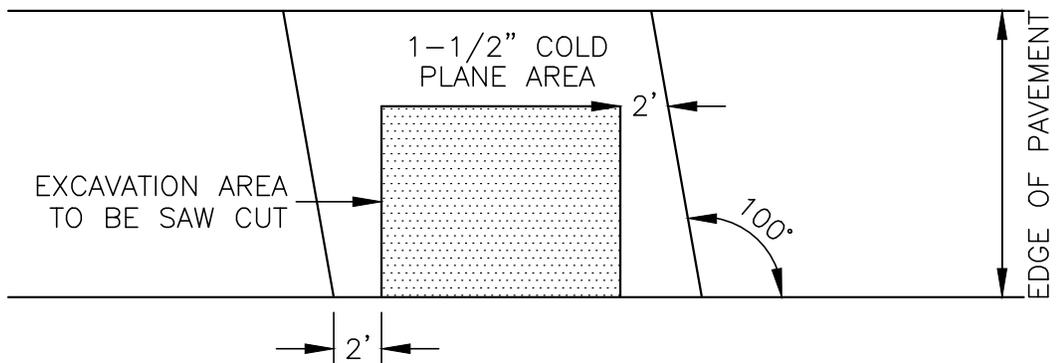
EXISTING PAVEMENT SHALL BE COLD PLANED FOR A LENGTH OF 20' TAPERING FROM 0" TO 1½" MINIMUM DEPTH, THROUGHOUT THE ENTIRE WIDTH OF THE ROADWAY TO BE OVERLAID.

PROFILE

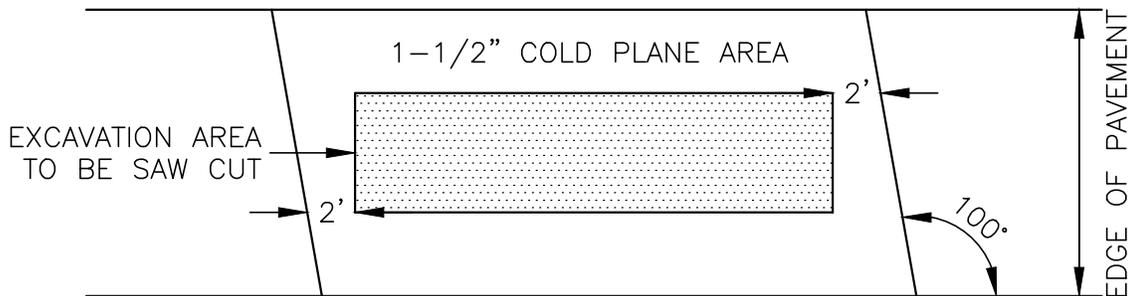
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:
1	DRAWING NO.	11.11	<b>PAVEMENT OVERLAY TRANSITION</b>	SITE/STREET
2	ANGLE	4.15		DRAWING NO. R-11
-	-	-		DATE: 12/08
-	-	-		PAGE: 1



TRANSVERSE PATCH LESS THAN HALF PAVEMENT WIDTH



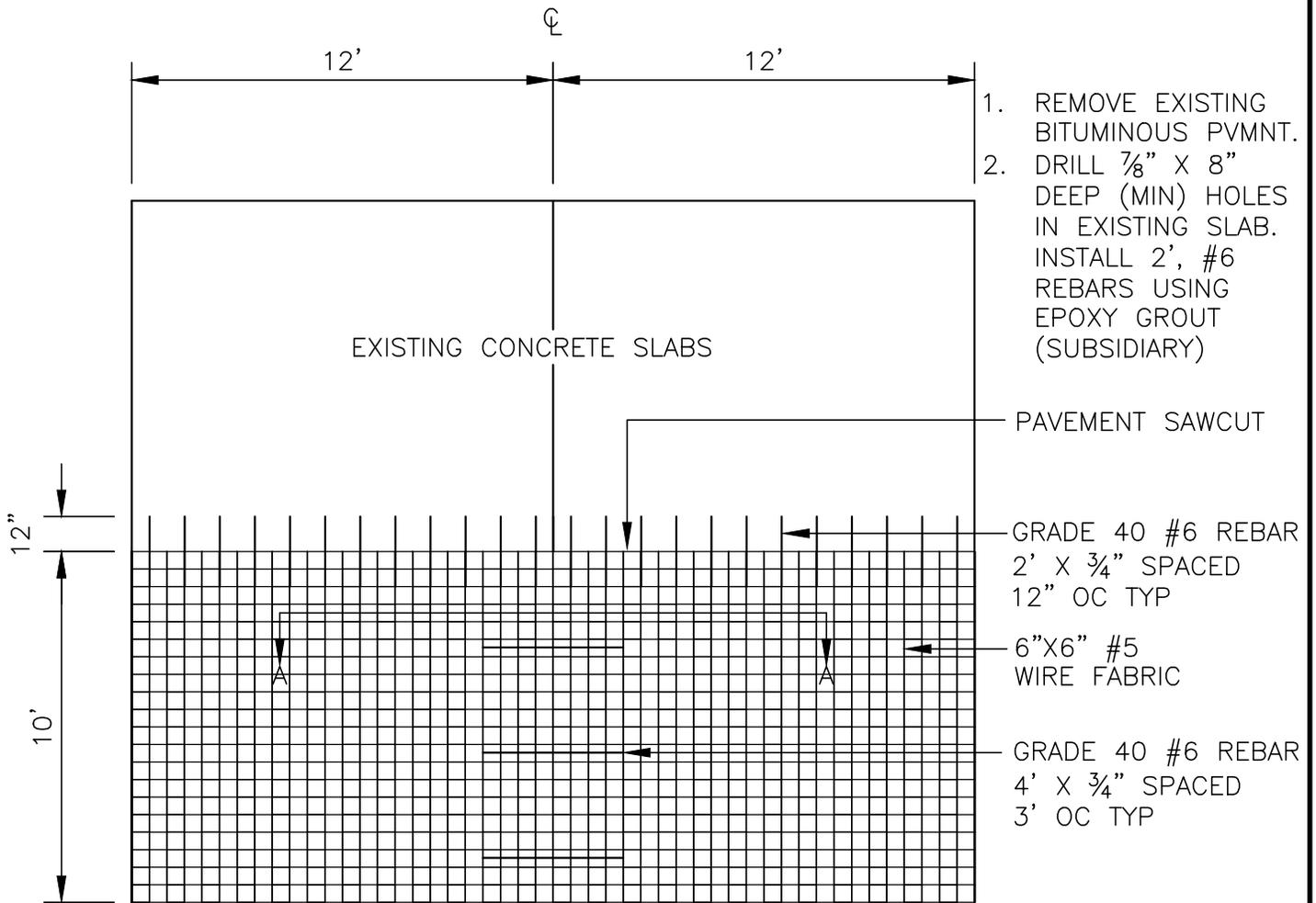
TRANSVERSE AREA GREATER THAN HALF PAVEMENT WIDTH



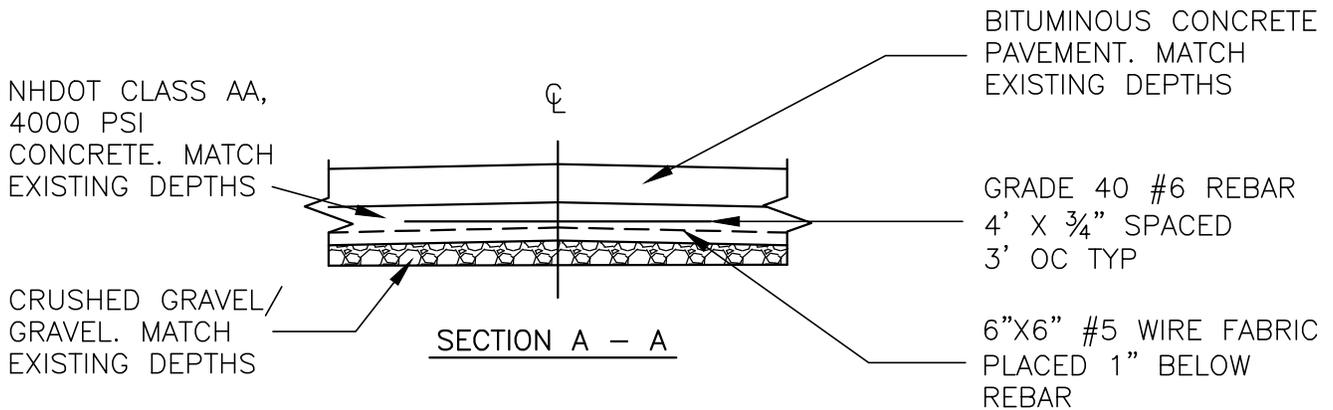
TRANSVERSE PATCH WITHIN CENTER OF PAVEMENT

NOTE: WHERE LIMITS OF ADJACENT COLD PLANED AREAS ARE LESS THAN OR EQUAL TO 20', THE AREA BETWEEN SHALL BE COLD PLANED AND RESURFACED

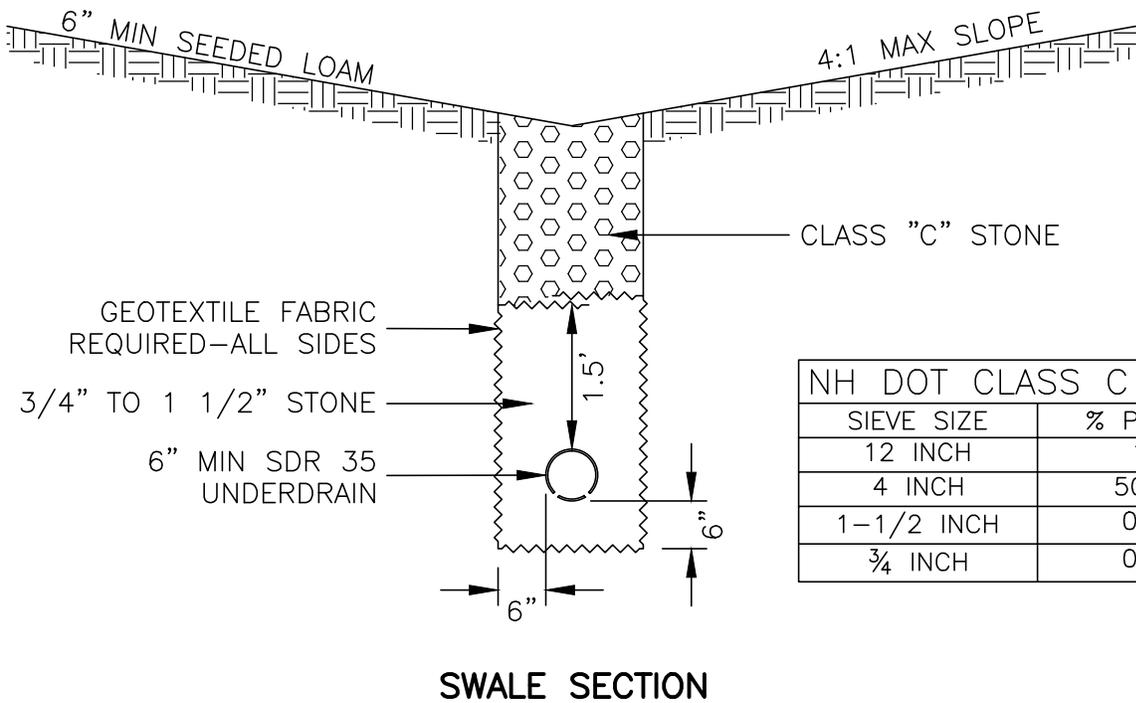
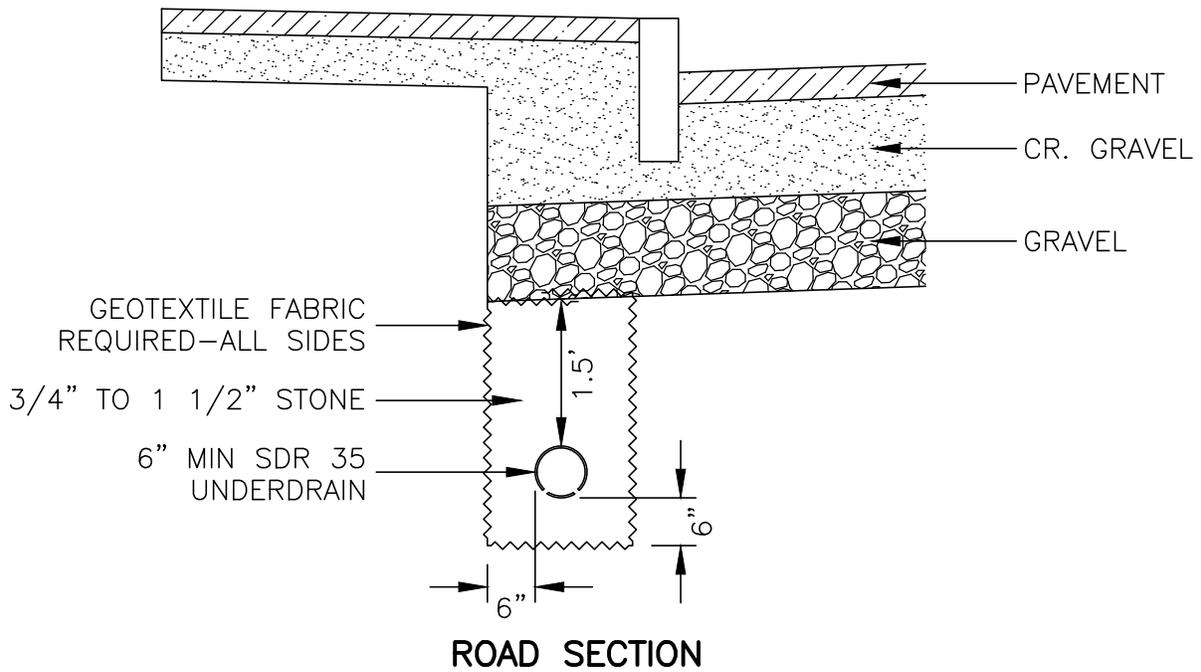
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE/STREET		
1	DRAWING NO.	11.11	<b>SAWCUT REQUIREMENTS</b>	DRAWING NO.	R-12		
2	MULTIPLE	12.15		DATE:	12/08	PAGE:	1
-	-	-					
-	-	-					



1. REMOVE EXISTING BITUMINOUS PVMNT.
2. DRILL 7/8" X 8" DEEP (MIN) HOLES IN EXISTING SLAB. INSTALL 2', #6 REBARS USING EPOXY GROUT (SUBSIDIARY)

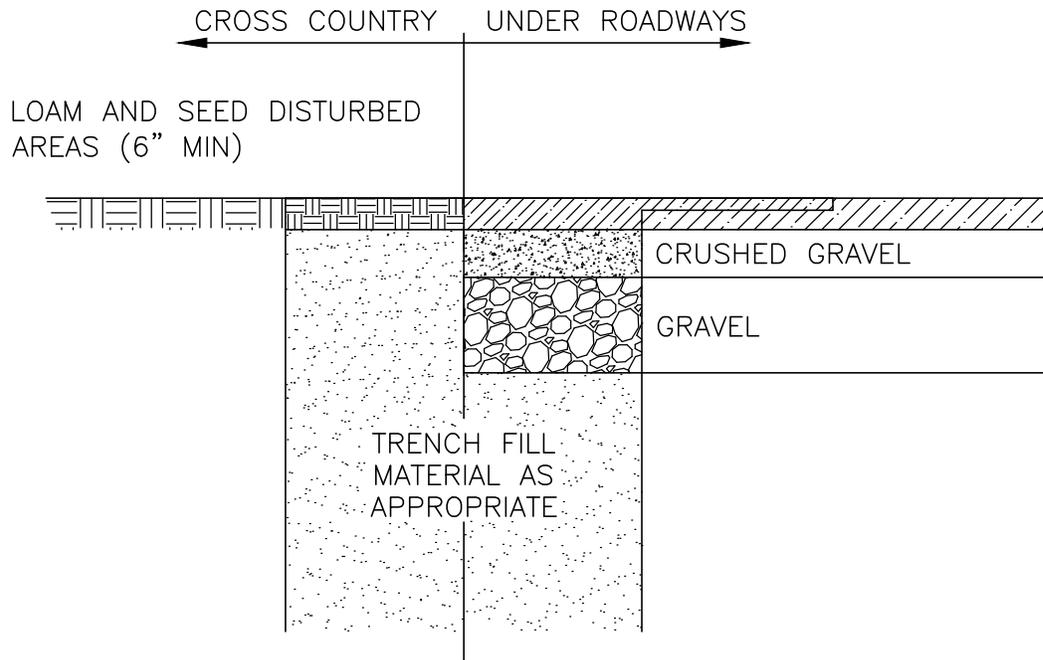


NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SITE/STREET
1	DRAWING NO.	11-11	<h2 style="margin: 0;">CONCRETE TRENCH PATCH</h2>	DRAWING NO. R-13
-	-	-		DATE: 12/08
-	-	-		PAGE: 1
-	-	-		



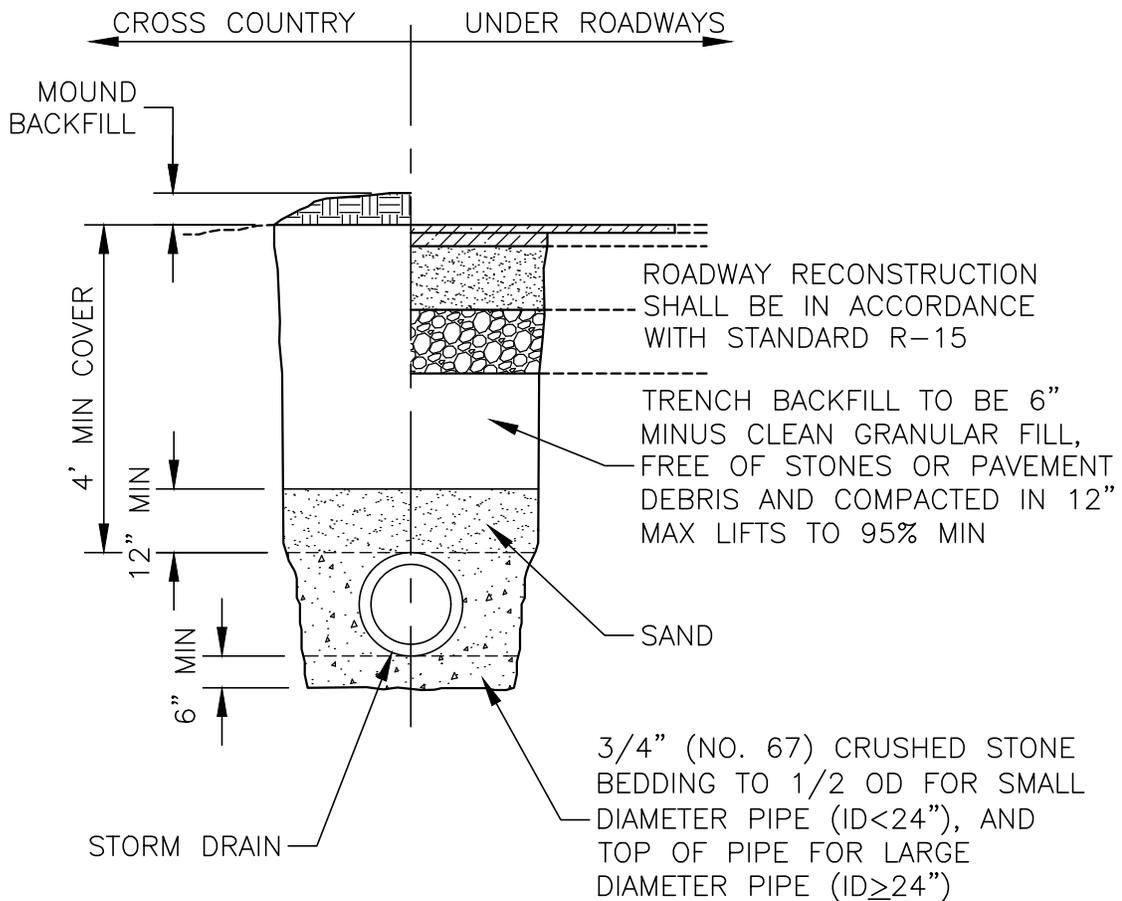
NH DOT CLASS C STONE	
SIEVE SIZE	% PASSING
12 INCH	100
4 INCH	50-90
1-1/2 INCH	0-30
3/4 INCH	0-10

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE/STREET		
1	DRAWING NO.	11.11		<b>UNDERDRAIN TRENCH SECTIONS</b>	DRAWING NO.	R-14	
2	ROAD SECTION	4.15	DATE:		12/08	PAGE:	1
-	-	-					
-	-	-					

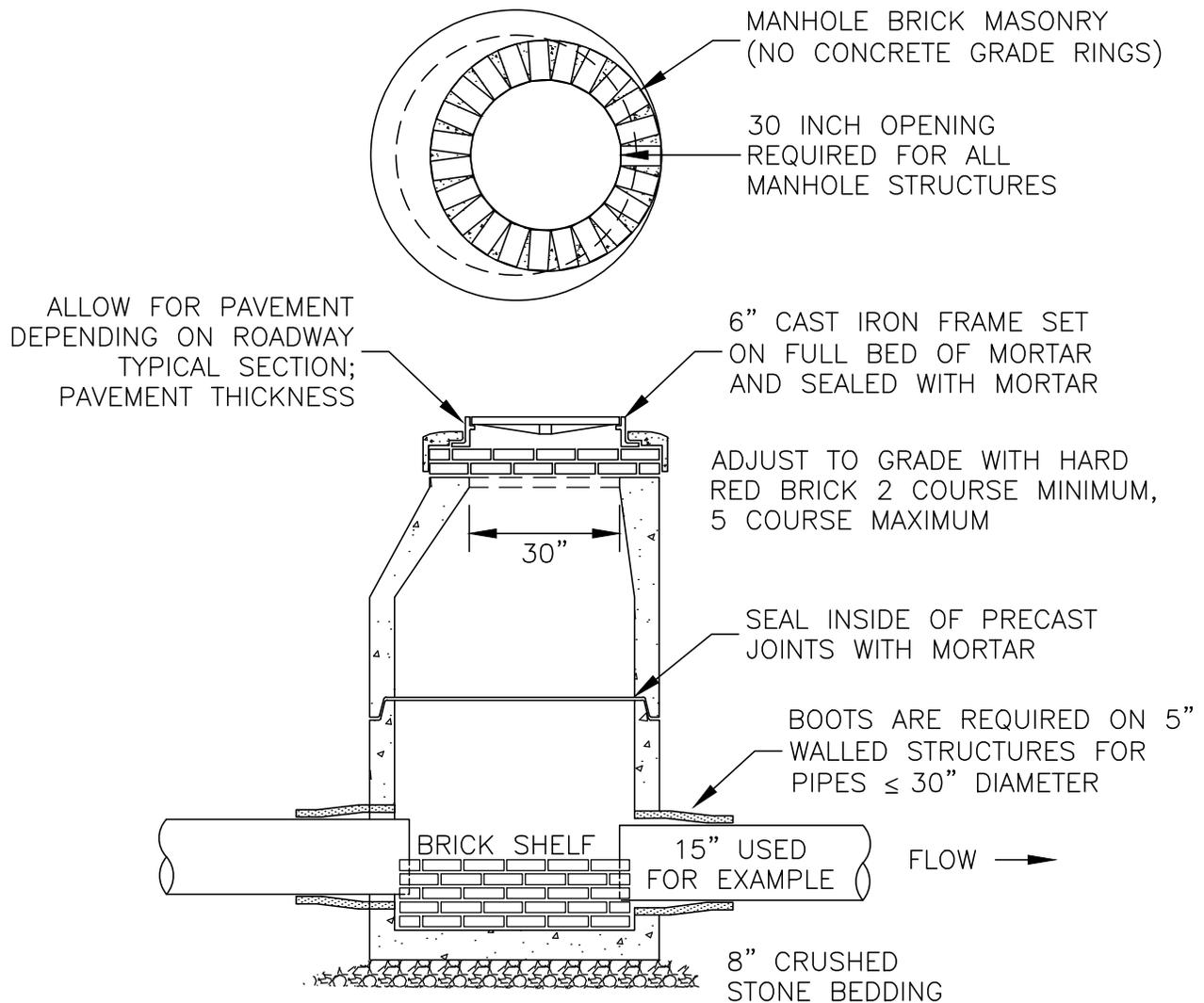


1. NEW ROADWAY CONSTRUCTION SHALL CONFORM TO THE CITY OF CONCORD CONSTRUCTION STANDARDS AND DETAILS.
2. FOR RECONSTRUCTION OF EXISTING PAVED AREAS, PAVEMENT AND SUB-BASE DEPTHS SHALL MATCH THE EXISTING CONDITIONS WITH NEW MATERIALS AS DETERMINED BY THE CITY ENGINEER OR REPRESENTATIVE.
3. THIS DETAIL IS NOT INTENDED TO SHOW THE TRANSITION BETWEEN PAVED AND UNPAVED AT THE EDGE OF ROADWAY.
4. MINIMUM PAVEMENT DEPTHS FOR NEW OR RECONSTRUCTED ROADWAYS SHALL BE AS FOLLOWS:
  - MINOR STREET
  - 4" (MIN) HOT BITUMINOUS PAVEMENT
  - 1½" WEARING COURSE
  - 2½" BASE COURSE
  
  - COLLECTOR STREET
  - 5" (MIN) HOT BITUMINOUS PAVEMENT
  - 1½" WEARING COURSE
  - 3½" BASE COURSE

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION:	SITE/STREET		
1	Edit Note 2	01.19		<b>TRENCH RESTORATION</b>	DRAWING NO.	R-15	
-	-	-			DATE:	12/15	PAGE: 1
-	-	-					
-	-	-					
-	-	-					



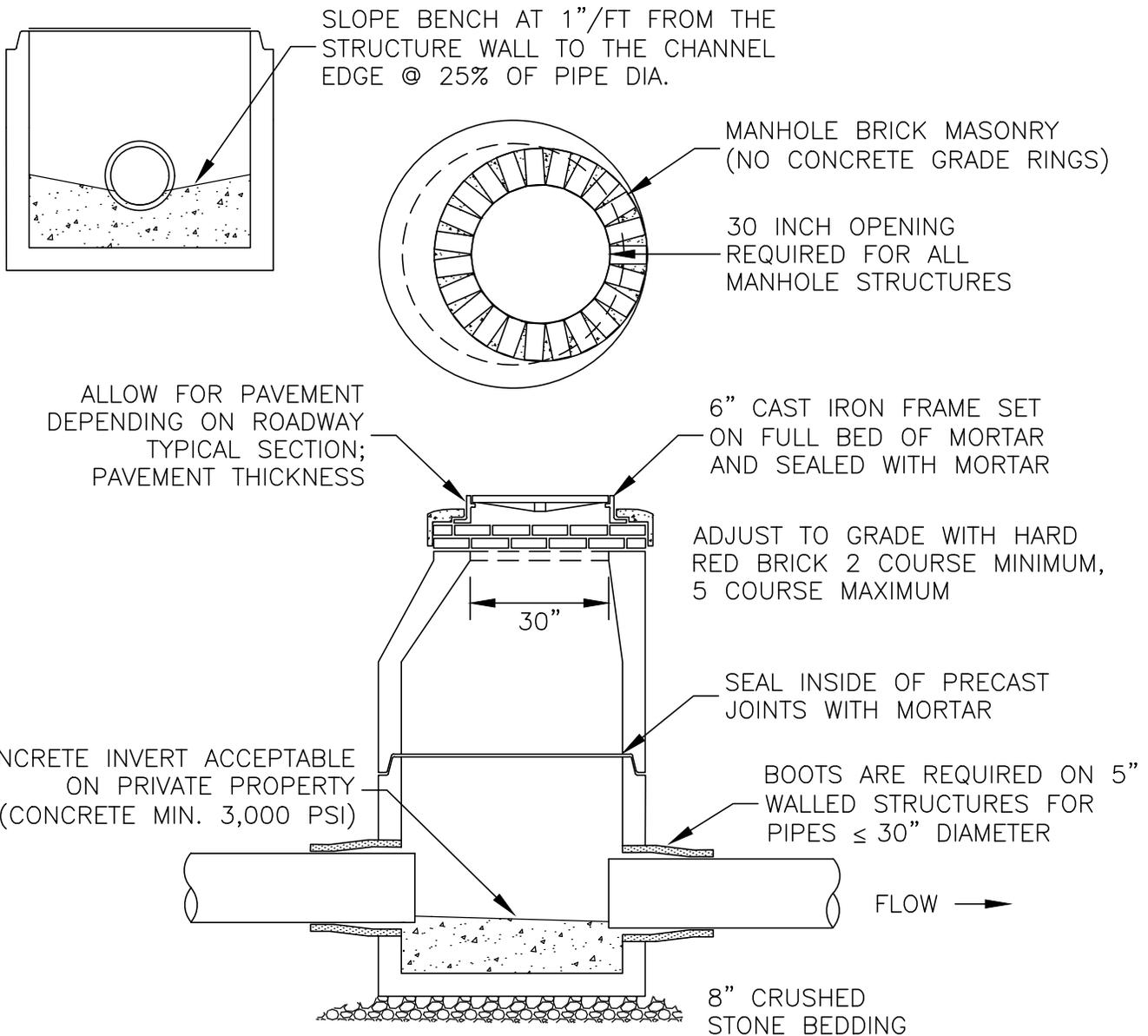
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	STORM		
1	Standard Reference	01.19		STORM DRAIN TRENCH	DRAWING NO.	SD-1	
-	-	-			DATE:	04/15	PAGE: 1
-	-	-					
-	-	-					



NOTES:

1. CONCRETE: 4,000 PSI AFTER 28 DAYS
2. H-20 LOADING REQUIRED
3. 5" MINIMUM WALL THICKNESS IF REINFORCED, 8" IF UN-REINFORCED
4. SEAL ALL PRECAST JOINTS WITH BITUMASTIC SEAL
5. LIFT HOLES AND BOOT RECESSES ARE TO BE SEALED WITH MORTAR FLUSH TO THE OUTSIDE STRUCTURE WALL PRIOR TO BACKFILLING
6. ALL STRUCTURES WITH MULTIPLE PIPES SHALL HAVE A MINIMUM OF 12" OF INSIDE SURFACE BETWEEN HOLES. NO MORE THAN 75% OF A HORIZONTAL CROSS-SECTION SHALL BE HOLES, AND THERE SHALL BE NO HOLES CLOSER THAN 3" TO JOINTS
7. MANHOLES AND TRAFFIC SIGNAL LOOPS SHALL BE SEPARATED BY A MINIMUM OF 2' TO ALLOW FOR MAINTENANCE OF STRUCTURE

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION: STORM DRAIN		
1	DRAFTING	11.11		<b>STORM DRAIN MANHOLE</b>	DRAWING NO.	SD-2
2	ADDED INLET	12.15			DATE: 12/08	PAGE: 1
-	-	-				
-	-	-				



NOTES:

1. CONCRETE: 4,000 PSI AFTER 28 DAYS
2. H-20 LOADING REQUIRED
3. 5" MINIMUM WALL THICKNESS IF REINFORCED, 8" IF UN-REINFORCED
4. SEAL ALL PRECAST JOINTS WITH BITUMASTIC SEAL
5. LIFT HOLES AND BOOT RECESSES ARE TO BE SEALED WITH MORTAR FLUSH TO THE OUTSIDE STRUCTURE WALL PRIOR TO BACKFILLING
6. ALL STRUCTURES WITH MULTIPLE PIPES SHALL HAVE A MINIMUM OF 12" OF INSIDE SURFACE BETWEEN HOLES. NO MORE THAN 75% OF A HORIZONTAL CROSS-SECTION SHALL BE HOLES, AND THERE SHALL BE NO HOLES CLOSER THAN 3" TO JOINTS
7. MANHOLES AND TRAFFIC SIGNAL LOOPS SHALL BE SEPARATED BY A MINIMUM OF 2' TO ALLOW FOR MAINTENANCE OF STRUCTURE

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: STORM DRAIN
-	-	-	<b>STORM DRAIN MANHOLE (PRIVATE)</b>	DRAWING NO. SD-3
-	-	-		DATE: 02/19
-	-	-		PAGE: 1
-	-	-		

BRICK MASONRY WITH FLAT  
TOOLED JOINTS 3/8" MAX

15" LATERAL

5" WALL  
PRECAST MH  
4' I.D. (TYP)

18" MAIN, RCP  
USED AS EXAMPLE

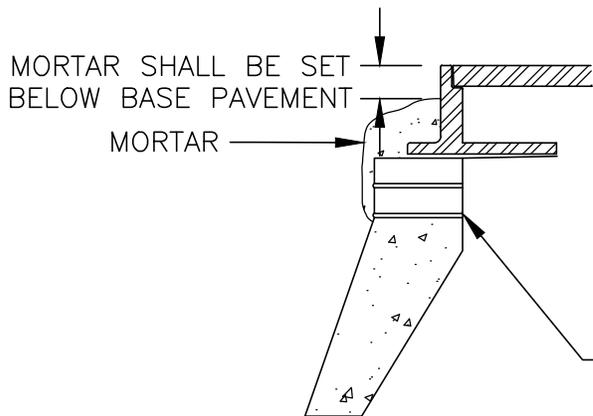
BRICK MASONRY WITH  
FLAT TOOLED JOINTS  
3/8" MAXIMUM

BRICK MASONRY  
UNDER SHELF

NOTES:

1. FOR 12" TO 15", CONSTRUCT INVERT THROUGH LOWER HALF OF PIPE  
     12" PIPE - 9 BRICK MINIMUM  
     15" PIPE - 11 BRICK MINIMUM
2. FOR MAINS GREATER THAN 15", CONSTRUCT INVERT TO TOP OF PIPE
3. MAINTAIN TROUGH WIDTH THROUGH STRUCTURE
4. TYPICAL BRICK, ASTM DESIGNATION: C321-93

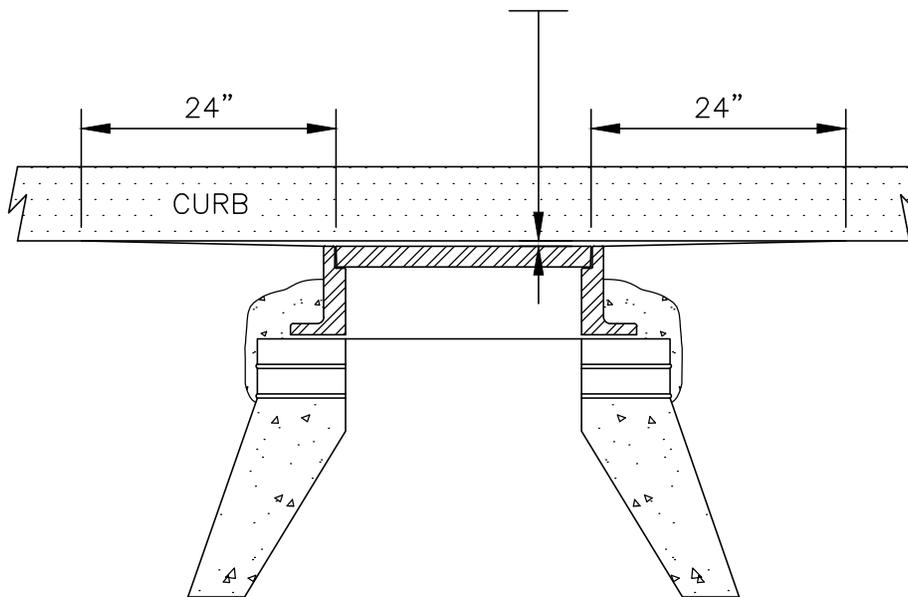
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	STORM	
-	-	-	<b>STORM DRAIN BRICK SHELF CONSTRUCTION</b>	DRAWING NO.	SD-4	
-	-	DATE:		03/15	PAGE:	1
-	-	-				
-	-	-				



- 8" FRAME AND GRATE FOR CB
- 6" FRAME AND COVER FOR MH

ONLY SOLID BRICK MASONRY ALLOWED. TWO TO FIVE COURSE MAXIMUM. TOP MOST COURSE MAY BE SET ON EDGE. CONCRETE COLLARS AND BARREL BLOCKS ARE NOT TO BE USED TO ADJUST FRAMES TO GRADE.

CATCH BASINS TO BE 1/2" MAX BELOW FINISHED GRADE.  
 MANHOLES TO BE 1/8" MAX BELOW FINISHED GRADE.



REINFORCED CONCRETE DROP INLET TOP WITH VERTICAL CURB

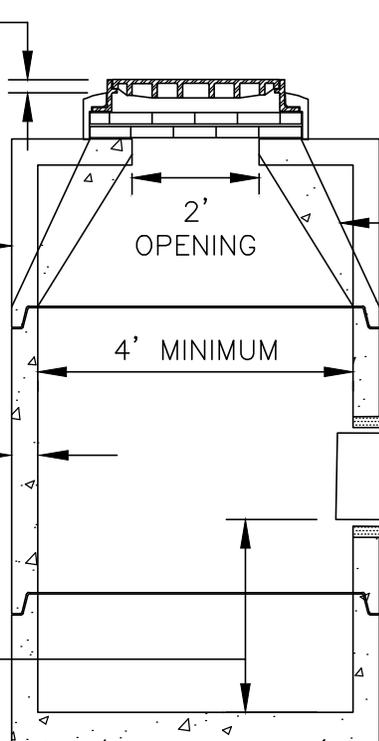
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SEWER/STORM
1	DRAFTING	4.15	<b>ADJUSTING FRAMES TO GRADE</b>	DRAWING NO. SD-5
-	-	-		DATE: 12/08
-	-	-		PAGE: 1
-	-	-		

8" CAST IRON FRAME SET ON FULL BED OF MORTAR AND SEALED WITH MORTAR. MORTAR SHALL BE KEPT BELOW THE BASE COURSE OF PAVEMENT

FLAT SLAB TOP REQUIRED WHEN THE DEPTH FROM THE TOP OF THE PIPE TO THE GRATE IS <48"

5" IF REINFORCED  
8" IF UN-REINFORCED

CATCH BASIN: 3' SUMP  
DROP INLET: 6" SUMP



8" CRUSHED STONE BEDDING

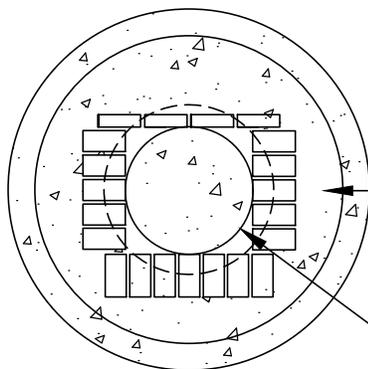
ADJUST TO GRADE WITH HARD RED BRICK 2 COURSE MINIMUM, 5 COURSE MAXIMUM

H-20 LOADING REQUIRED

BOOTS ARE REQUIRED ON 5" WALLED STRUCTURES FOR PIPES ≤30" DIAMETER

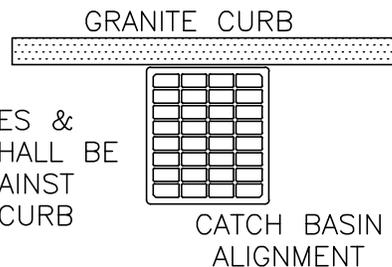
FLOW →

SEAL ALL PRECAST JOINTS WITH MORTAR



CONE OR FLAT TOP SLAB SECTION ON CATCH BASIN

2' DIAMETER OPENING



ALL FRAMES & GRATES SHALL BE FLUSH AGAINST FACE OF CURB

CATCH BASIN ALIGNMENT

NOTES:

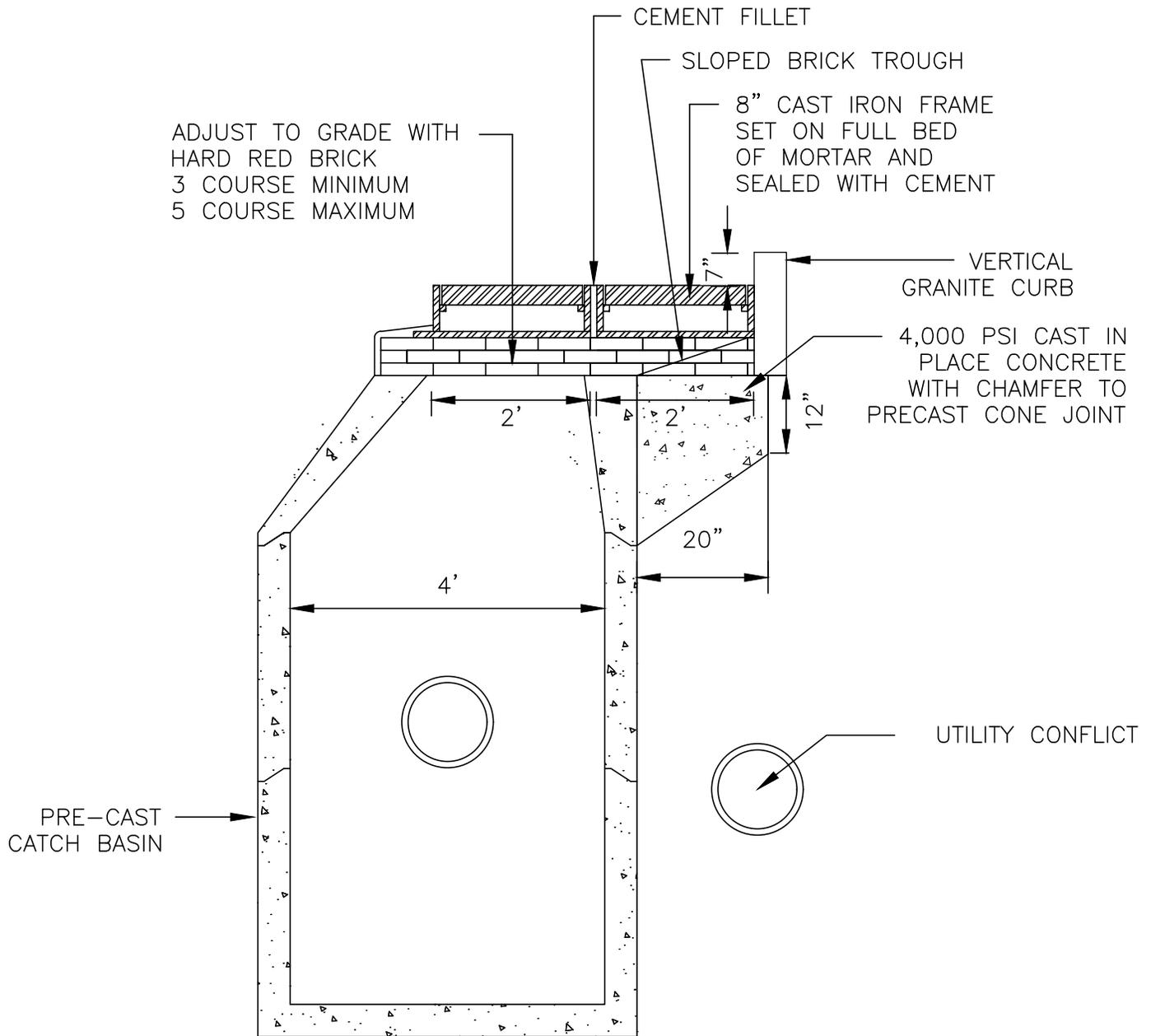
1. CONCRETE SHALL BE 4,000 PSI AFTER 28 DAYS.
2. SEAL ALL PRECAST JOINTS WITH BITUMASTIC SEAL.
3. LIFT HOLES AND BOOT RECESSES ARE TO BE SEALED WITH MORTAR FLUSH TO THE OUTSIDE STRUCTURE WALL PRIOR TO BACKFILLING.
4. MINIMUM DEPTH FROM RIM TO INVERT OF THE HIGHEST PIPE SHALL BE:  
12"φ=3.7', 15"φ=3.9', 18"φ=4.2', 24"φ=4.8', 30"φ=5.3', 36"φ=5.8'
5. ALL STRUCTURES WITH MULTIPLE PIPES SHALL HAVE A MINIMUM OF 12" OF INSIDE SURFACE BETWEEN HOLES. NO MORE THAN 75% OF A HORIZONTAL CROSS-SECTION SHALL BE HOLES AND THERE SHALL BE NO HOLES CLOSER THAN 3" TO JOINTS.
6. MANHOLES AND TRAFFIC SIGNAL LOOPS SHALL BE SEPARATED BY A MINIMUM OF 2' TO ALLOW FOR MAINTENANCE OF STRUCTURE.
7. THREE FLANGED FRAMES SHALL BE USED FOR INSTALLATIONS ADJACENT TO VERTICAL GRANITE CURB.
8. NHDOT TYPE "F" GRATE REQUIRED FOR ROADWAYS HAVING SLOPES EQUAL TO OR GREATER THAN 3%. TYPE "F" SHALL BE BICYCLE SAFE.
9. BRICK WORK SHALL BE RECTANGULAR AND CONFORM TO THE DIMENSIONS OF THE GRATE BEING USED. TYPE "B" GRATES SHALL BE ALIGNED WITH THE 22" DIMENSION AGAINST THE CURB.

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: STORM DRAIN
1	DRAFTING	11/11	<b>CATCH BASIN / DROP INLET</b>	DRAWING NO. SD-6
2	SUMP DIM.	3/19		DATE: 12/08
-	-	-		PAGE: 1
-	-	-		

	MINIMUM SLOPE VALUES (FT/FT)*	
PIPE SIZE	SANITARY APPLICATIONS	STORM DRAINS
8"	0.0060	N/A
10"	0.0028	N/A
12"	0.0022	0.0030
15"	0.0015	0.0023
18"	0.0012	0.0018
21"	0.0010	N/A
24"	0.0008	0.0012
27"	0.0007	N/A
30"	0.0006	0.0009
36"	0.0005	0.0007

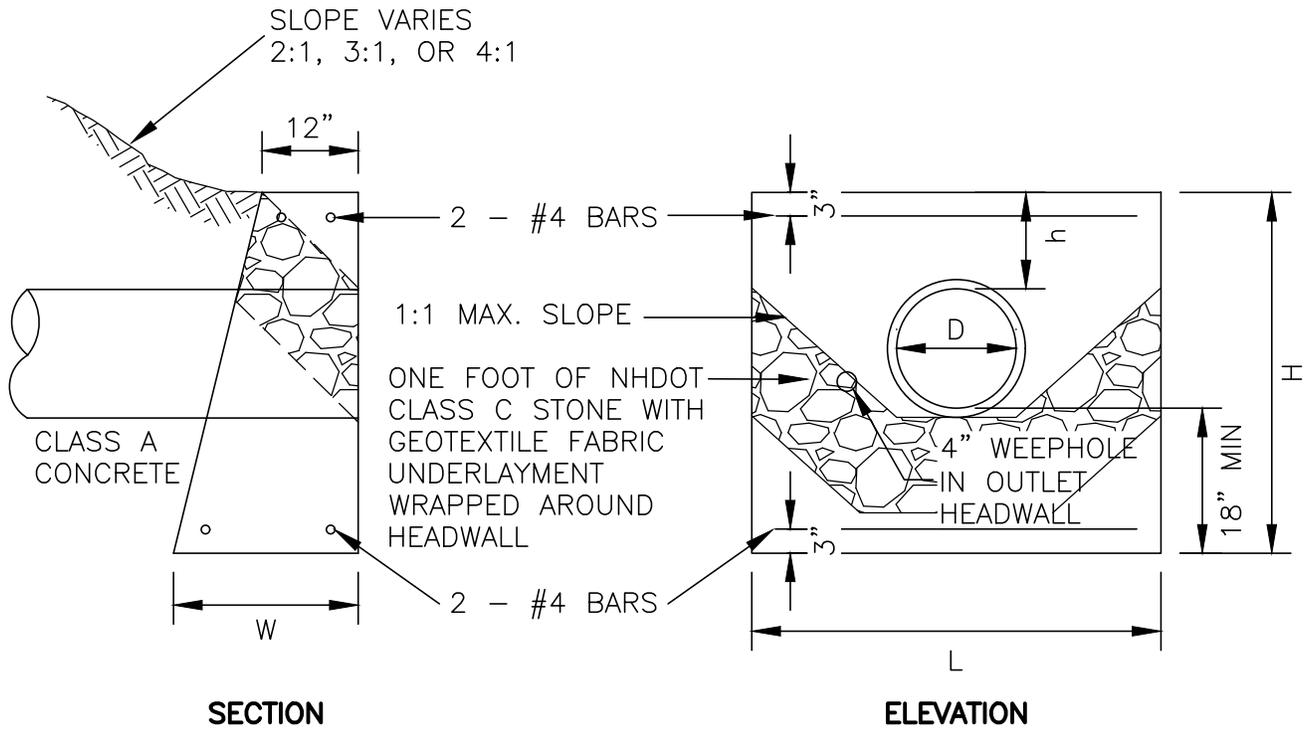
\* THESE VALUES ARE BASED ON MINIMUM VELOCITIES OF 2 FEET PER SECOND ON SANITARY SEWERS AND 2.5 FEET PER SECOND FOR STORM DRAINS WHILE FLOWING FULL. THIS VALUE SET BY THE CITY ENGINEER.

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>  <b>HYDRAULIC FLOW CHART</b>	SECTION: SEWER/STORM	
1	REMOVE 10"	11-11		DRAWING NO.	SD-7
-	-	-		DATE:	12/08
-	-	-		PAGE:	1
-	-	-			



NOTE: DETAIL TO BE USED WHEN TYING INTO EXISTING STORM DRAIN SYSTEM OR MATCHING TO EXISTING CURB. DETAIL SHOULD NOT BE USED FOR NEW CONSTRUCTION

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>  <b>DOUBLE FRAME AND GRATE CATCH BASIN</b>	SECTION: STORM DRAIN	
1	MORE CONC.	5/19		DRAWING NO.	SD-8
-	-	-		DATE:	7/18
-	-	-		PAGE:	1
-	-	-			

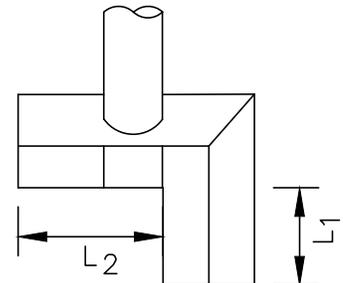


DIAMETER D INCHES	L	H	W	h
12	4'-6"	4'-0"	1'-11"	1'-6"
15	6'-0"	4'-6"	2'-0"	1'-9"
18	7'-0"	4'-6"	2'-0"	1'-6"
24	9'-0"	5'-0"	2'-2"	1'-6"
30	11'-0"	5'-6"	2'-4"	1'-6"
36	13'-0"	6'-0"	2'-6"	1'-6"
42	16'-0"	7'-0"	2'-8"	1'-9"
48	17'-9"	8'-0"	2'-8"	2'-0"
54	17'-6"	8'-0"	2'-8"	1'-9"
60	21'-9"	8'-3"	3'-1"	1'-9"
66	23'-0"	8'-9"	3'-0"	1'-9"
72	25'-9"	9'-4"	3'-4"	1'-10"

$$L_1 + L_2 = L$$

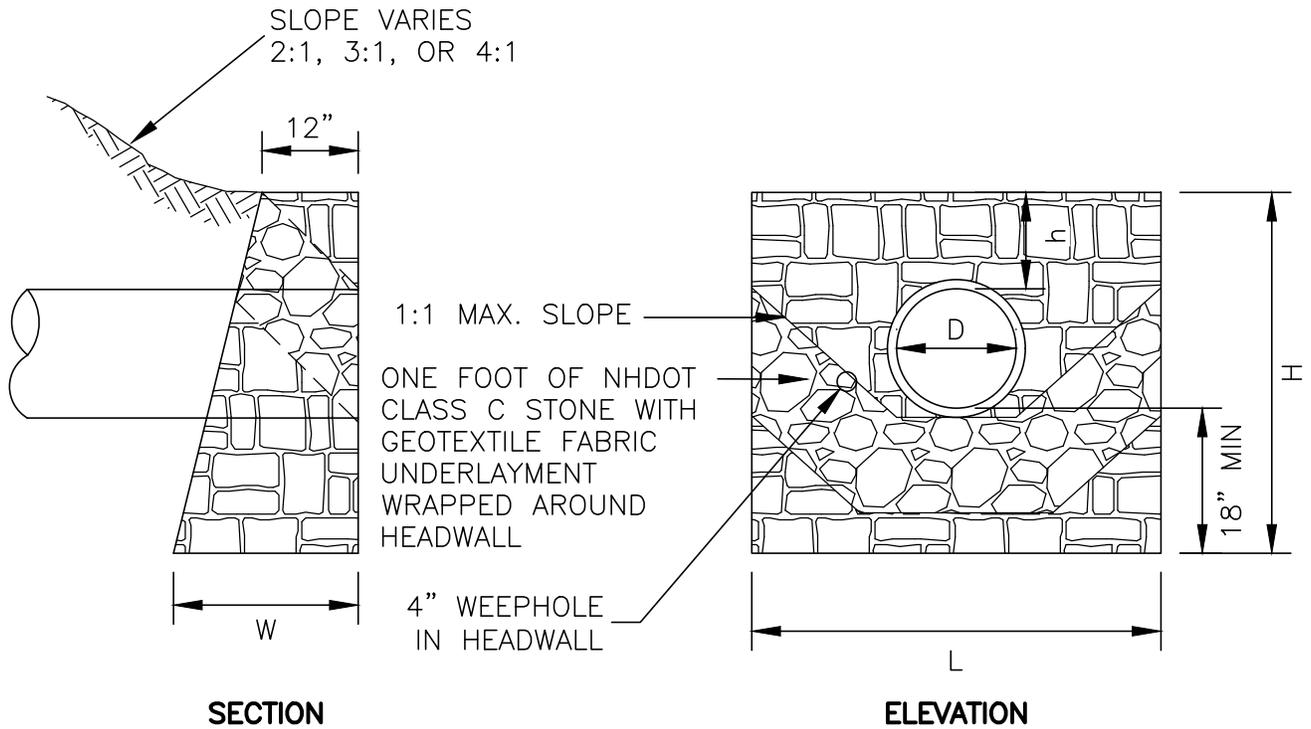
$$L_1 = \frac{L-D}{2}$$

$$L_2 = \frac{L+D}{2}$$



ALTERNATE "L" HEADWALL

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: STORM DRAIN	
1	Slopes/Dimensions	03.19	<b>STANDARD HEADWALL</b>	DRAWING NO. SD-9	
-	-	-		DATE: 12/08	PAGE: 1
-	-	-			
-	-	-			

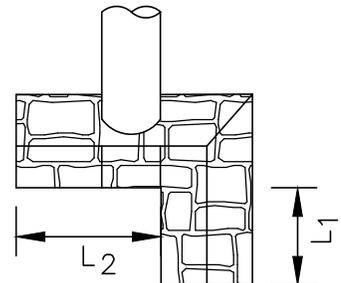


DIAMETER D INCHES	L	H	W	h
12	4'-6"	4'-0"	1'-11"	1'-6"
15	6'-0"	4'-6"	2'-0"	1'-9"
18	7'-0"	4'-6"	2'-0"	1'-6"
24	9'-0"	5'-0"	2'-2"	1'-6"
30	11'-0"	5'-6"	2'-4"	1'-6"
36	13'-0"	6'-0"	2'-6"	1'-6"
42	16'-0"	7'-0"	2'-8"	1'-9"
48	17'-9"	8'-0"	2'-8"	2'-0"
54	17'-6"	8'-0"	2'-8"	1'-9"
60	21'-9"	8'-3"	3'-1"	1'-9"
66	23'-0"	8'-9"	3'-0"	1'-9"
72	25'-9"	9'-4"	3'-4"	1'-10"

$$L_1 + L_2 = L$$

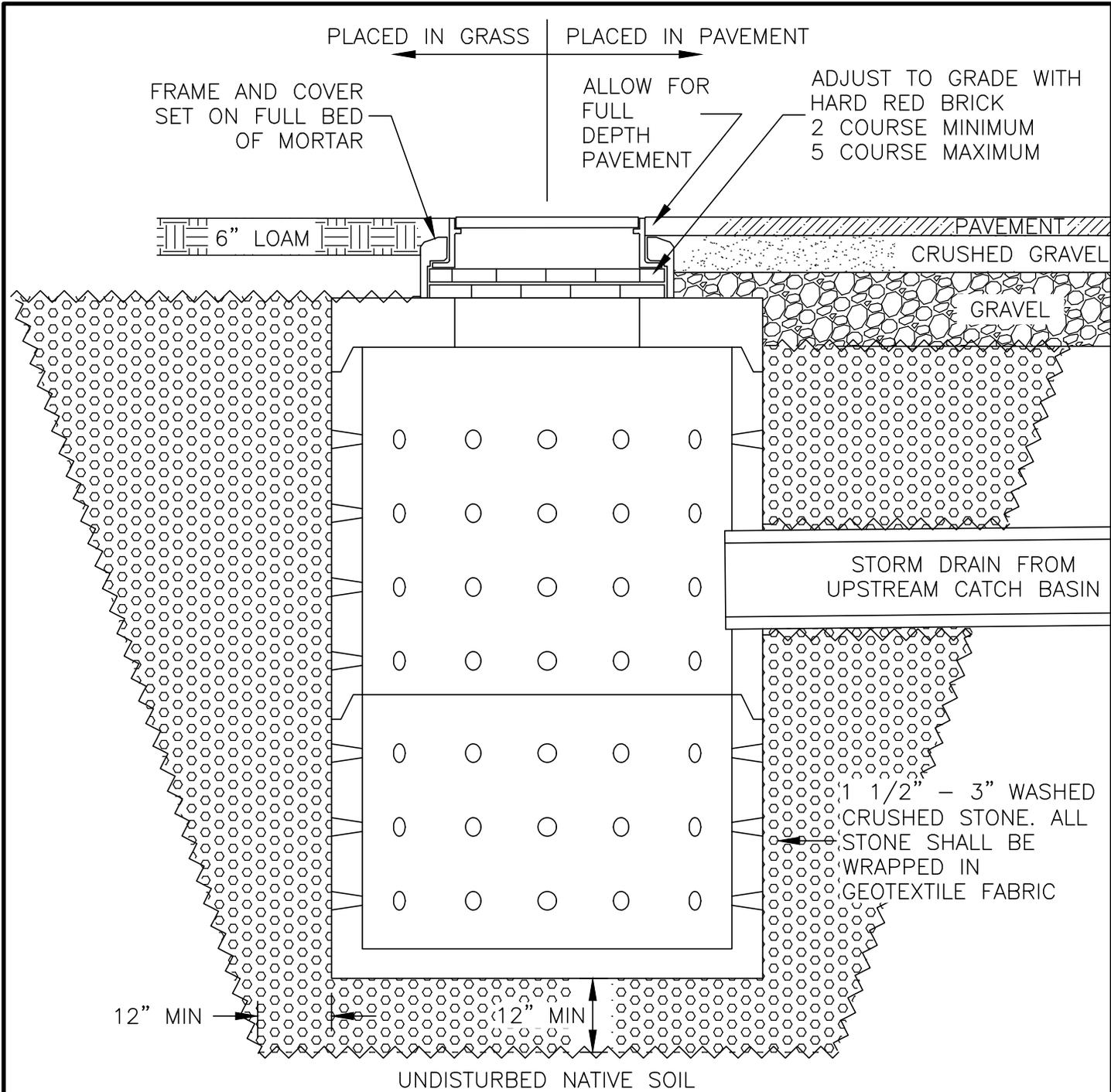
$$L_1 = \frac{L-D}{2}$$

$$L_2 = \frac{L+D}{2}$$



ALTERNATE "L" HEADWALL

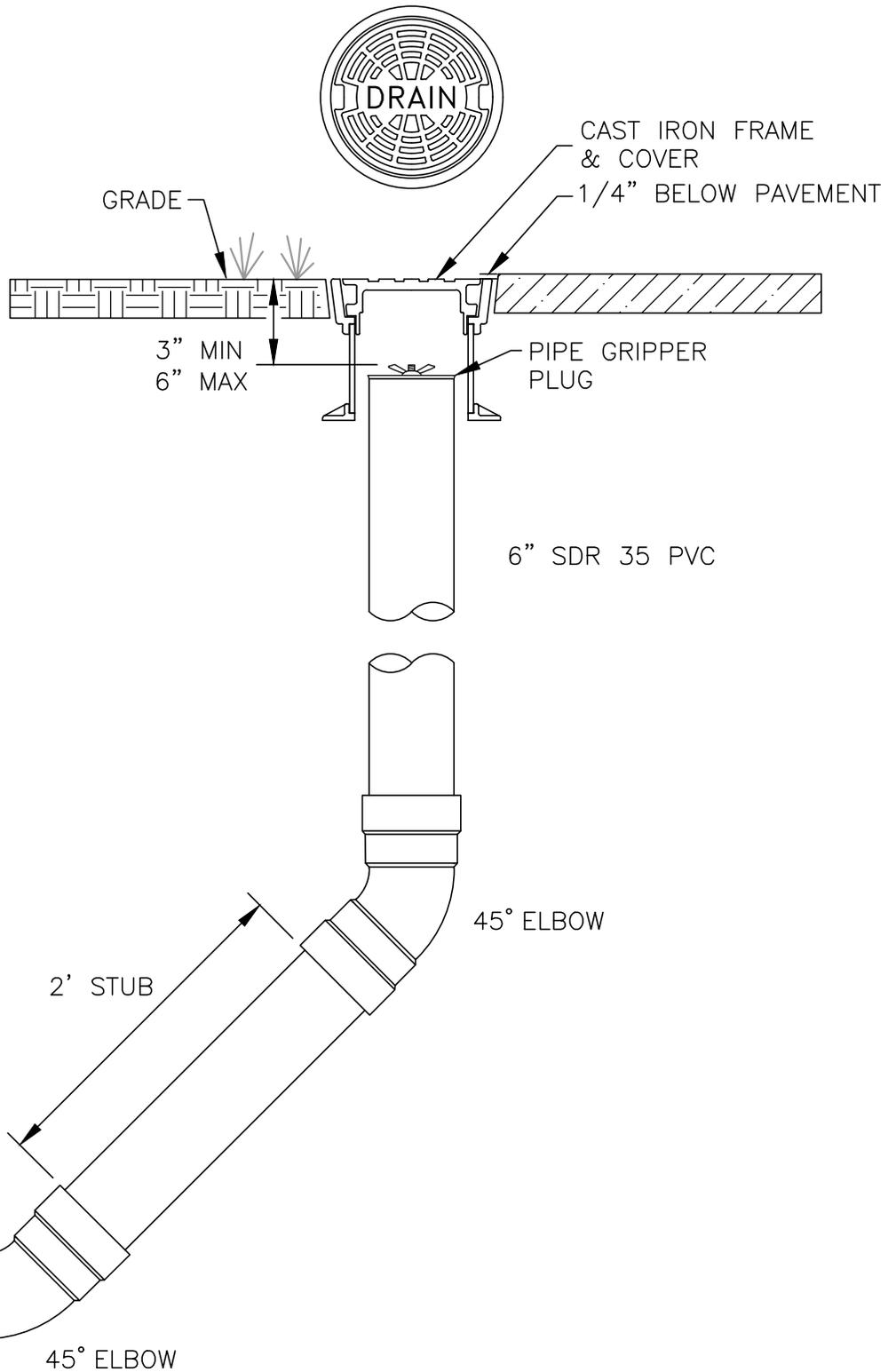
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: STORM DRAIN
-	-	-	<b>MORTAR RUBBLE MASONRY (MRM) HEADWALL</b>	DRAWING NO. SD-10
-	-	-		DATE: 3/19
-	-	-		PAGE: 1
-	-	-		



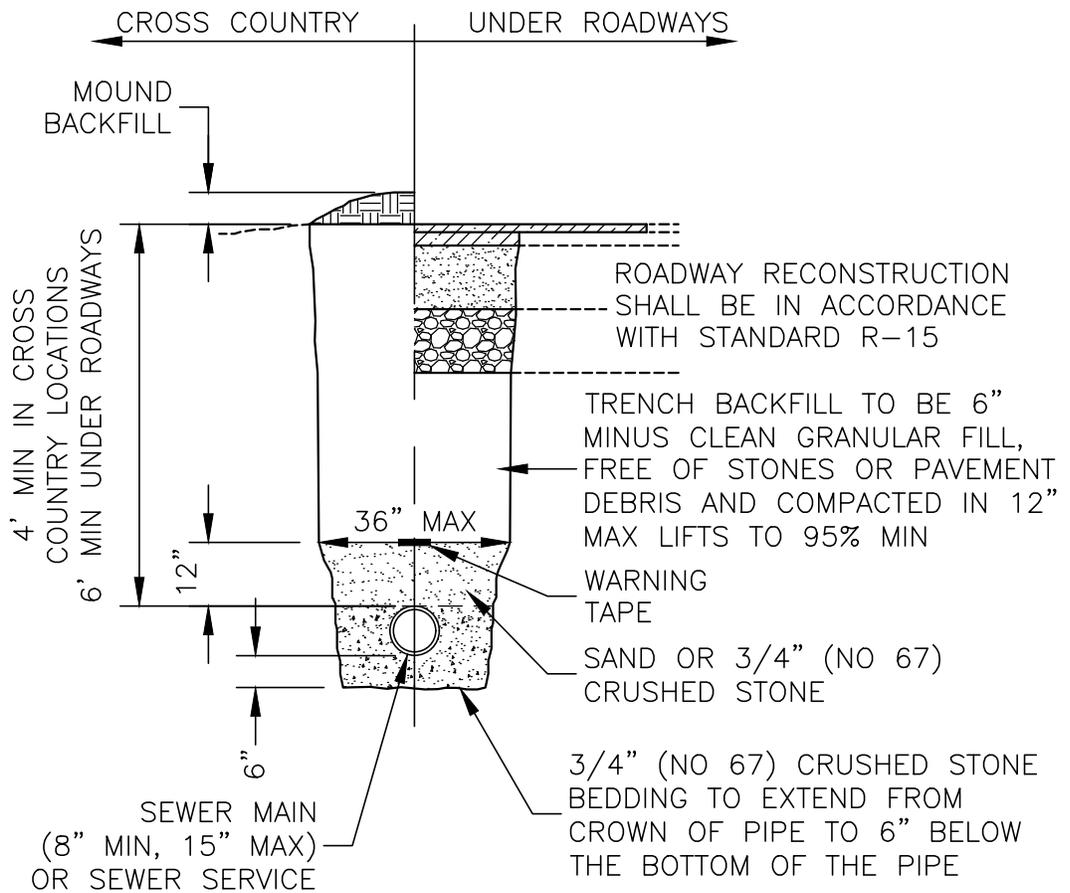
NOTES:

1. DRY WELLS SHALL BE PAIRED WITH AN UPSTREAM CATCH BASIN WITH 3' SUMP AND OIL/SEDIMENT CONTROL BARRIER TO ADDRESS THE CITY'S PRETREATMENT REQUIREMENTS
2. CONCRETE: 4,000 PSI AFTER 28 DAYS
3. ALL PRECAST COMPONENTS SHALL BE DESIGNED FOR H-20 LOADING
4. DEPTHS AND WIDTHS OF STRUCTURE AND CRUSHED STONE VARIES PER STORMWATER CALCULATIONS
5. SHALL BE INSTALLED IN GRANULAR WELL DRAINED SOILS.

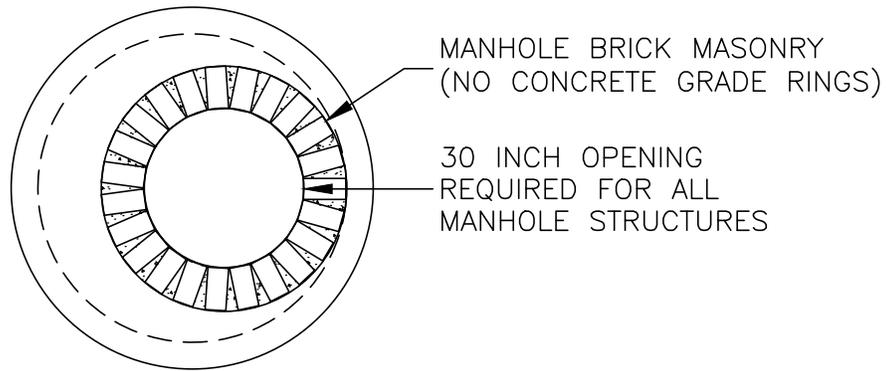
NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>  <b>DRYWELL</b>	SECTION: STORM DRAIN	
1	NOTES/SLOPES	3/19		DRAWING NO.	SD-11
-	-	-		DATE:	3/15
-	-	-		PAGE:	1
-	-	-			



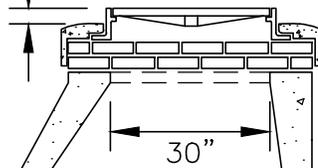
NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>  <b>UNDERDRAIN CLEANOUT</b>	SECTION: STORM DRAIN		
-	-	-		DRAWING NO. SD-12		
-	-	-		DATE: 01/12	PAGE: 1	
-	-	-				
-	-	-				



NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SEWER	
1	STANDARD REF.	3/19	<b>SANITARY SEWER MAIN/SERVICE TRENCH</b>	DRAWING NO.	SM-1	
-	-	-		DATE:	08/13	PAGE: 1
-	-	-				
-	-	-				



6" CAST IRON FRAME SET ON FULL BED OF MORTAR AND SEALED WITH MORTAR. MORTAR SHOULD BE KEPT BELOW THE BASE COURSE OF PAVEMENT

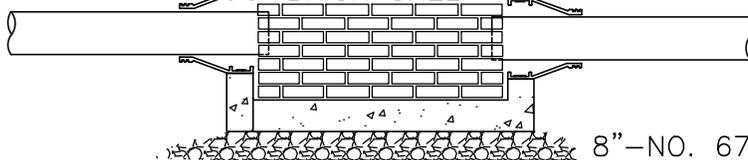


ADJUST TO GRADE WITH HARD RED BRICK 2 COURSE MINIMUM, 5 COURSE MAXIMUM

HORIZONTAL JOINTS BETWEEN PRECAST SECTIONS SHALL BE OVERLAPPING TYPE, SEALED FOR WATERTIGHTNESS USING A DOUBLE ROW OF AN ELASTOMERIC OR MASTIC-LIKE SEALANT PER Env-Wq 704.10(f)

BOOT REQUIRED ON 5" WALLED STRUCTURES

FLOW →

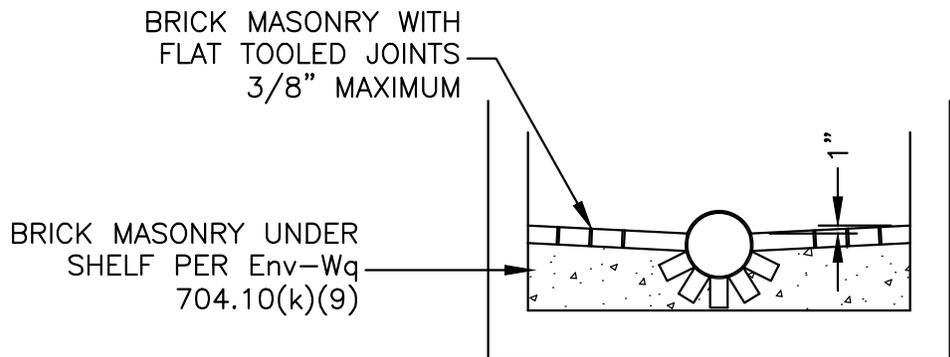
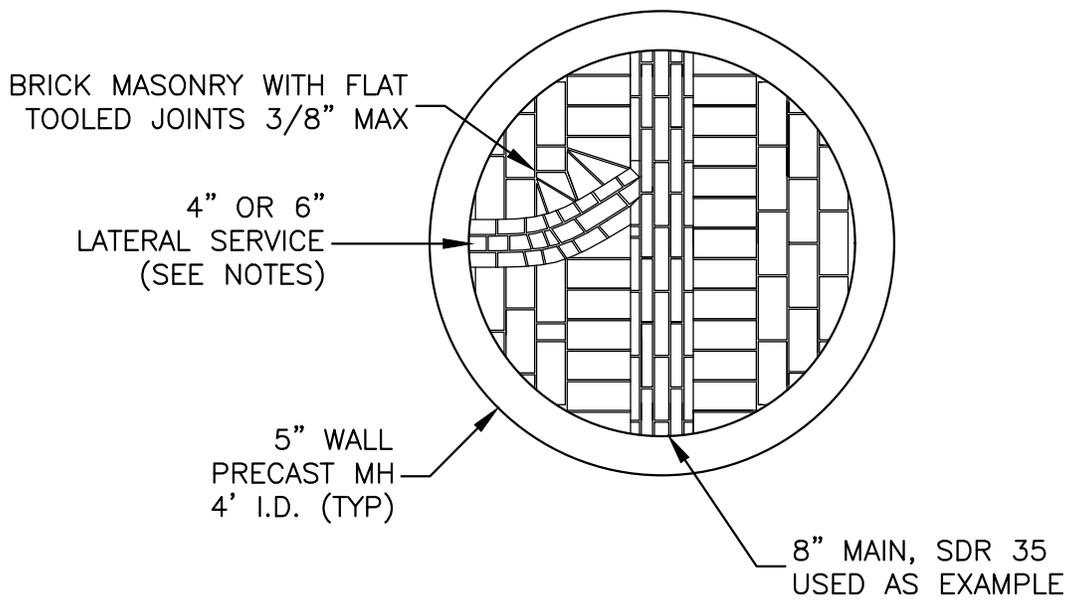


8"-NO. 67 CRUSHED STONE BEDDING

NOTES:

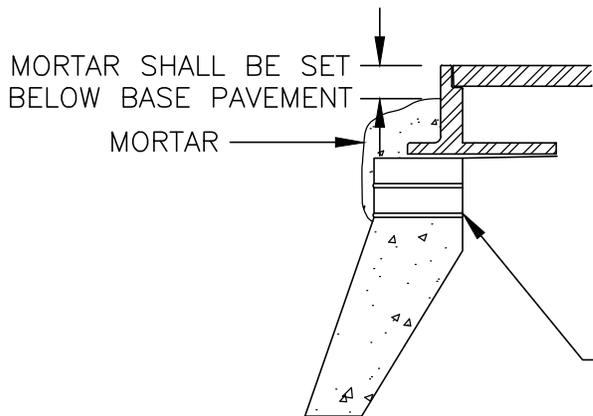
1. CONCRETE: 4,000 PSI AFTER 28 DAYS
2. H-20 LOADING REQUIRED
3. 5" THICK REINFORCED CONCRETE WALLS PER EnV-Wq 704.10(d)
4. ON INSIDE OF STRUCTURE, PRE-CAST JOINTS AND LADDER RUNG HOLES TO BE SEALED WITH PORTLAND CEMENT
5. LIFT HOLES ARE TO BE SEALED WITH MORTAR FLUSH TO THE OUTSIDE STRUCTURE WALL PRIOR TO BACKFILLING
6. ALL STRUCTURES WITH MULTIPLE PIPES SHALL HAVE A MINIMUM OF 12" OF INSIDE SURFACE BETWEEN HOLES. NO MORE THAN 75% OF A HORIZONTAL CROSS-SECTION SHALL BE HOLES, AND THERE SHALL BE NO HOLES CLOSER THAN 3" TO JOINTS
7. MANHOLES AND TRAFFIC SIGNAL LOOPS SHALL BE SEPARATED BY A MINIMUM OF 2' TO ALLOW FOR MAINTENANCE OF STRUCTURE

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION:	SEWER
1	DRAFTING	11.11		DRAWING NO.	SM-2
-	-	-		DATE:	12/08
-	-	-		PAGE:	1
<b>SEWER MANHOLE</b>					



- NOTES:
- FOR MAINS 8" TO 15", CONSTRUCT INVERT THROUGH THE LOWER HALF OF THE PIPE (MINIMUM)
    - 8" PIPE - 7 BRICK MINIMUM (JUST ABOVE THE MIDPOINT)
    - 10" PIPE - 7 BRICK MINIMUM
    - 12" PIPE - 9 BRICK MINIMUM
    - 15" PIPE - 11 BRICK MINIMUM
  - FOR MAINS GREATER THAN 15", CONSTRUCT BRICK INVERT TO TOP OF PIPE
  - MAINTAIN TROUGH WIDTH THROUGH STRUCTURE
  - TYPICAL BRICK, ASTM DESIGNATION: C321-93
  - SERVICE CONNECTIONS SHOULD BE PER THE "SEWER SERVICE CONNECTION/ INSIDE DROP MANHOLE" DETAIL. WHERE GRADES PROHIBIT SUCH A CONNECTION THE CONNECTION SHOULD BE AS SHOWN WITH THE SERVICE INVERT 2" ABOVE THE INVERT OF THE MAIN WHERE IT ENTERS THE MANHOLE.

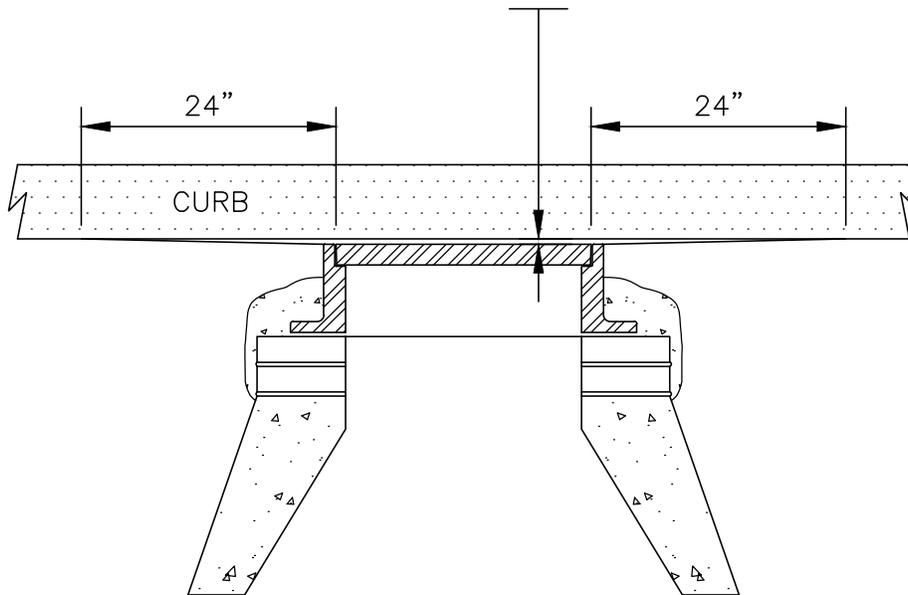
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SEWER
-	-	-	<b>SANITARY BRICK SHELF CONSTRUCTION</b>	DRAWING NO.	SM-3
-	-	-		DATE:	03/15
-	-	-		PAGE:	1
-	-	-			



- 8" FRAME AND GRATE FOR CB
- 6" FRAME AND COVER FOR MH

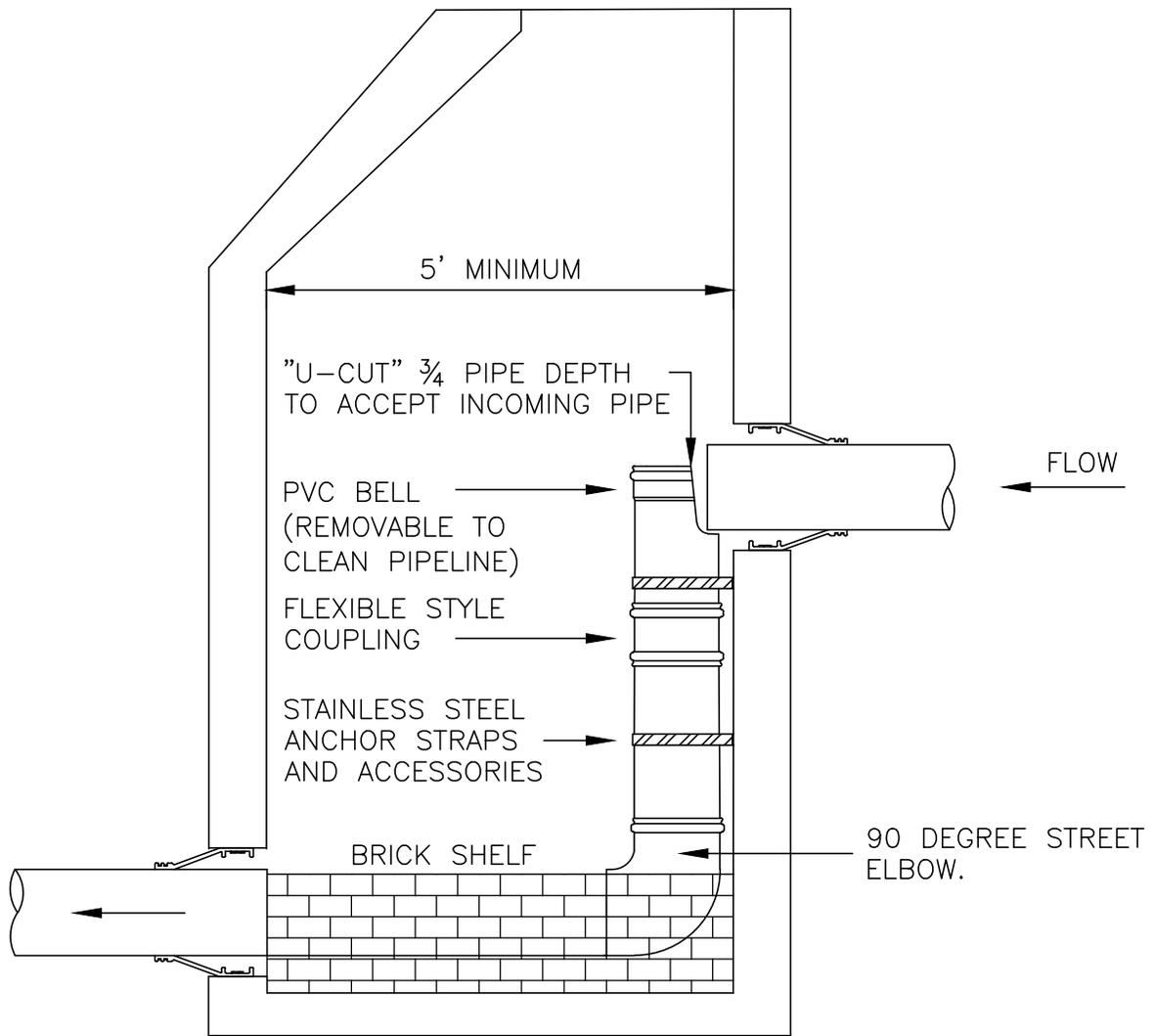
ONLY SOLID BRICK MASONRY ALLOWED. TWO TO FIVE COURSE MAXIMUM. TOP MOST COURSE MAY BE SET ON EDGE. CONCRETE COLLARS AND BARREL BLOCKS ARE NOT TO BE USED TO ADJUST FRAMES TO GRADE.

CATCH BASINS TO BE 1/2" MAX BELOW FINISHED GRADE.  
 MANHOLES TO BE 1/8" MAX BELOW FINISHED GRADE.



REINFORCED CONCRETE DROP INLET TOP WITH VERTICAL CURB

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SEWER/STORM
1	DRAFTING	4.15	<b>ADJUSTING FRAMES TO GRADE</b>	DRAWING NO. SM-4
-	-	-		DATE: 12/08
-	-	-		PAGE: 1
-	-	-		



NOTES:

1. MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE TO THE CITY OF CONCORD STANDARDS FOR SANITARY MANHOLE CONSTRUCTION
2. INSIDE DROP MANHOLES SHALL HAVE A MINIMUM 5' INSIDE DIAMETER
3. IF CONNECTING TO AN EXISTING MANHOLE THAT HAS NO OTHER DROP PIPING, A SINGLE 8" INSIDE DROP WILL BE ALLOWED
4. ANCHOR STRAPS (MINIMUM OF 2) AND BOLTS TO BE 304 OR 316 STAINLESS STEEL AND NOT MORE THAN 3' ON CENTER. SECURE AS DIRECTED: STRAPS - 1" WIDE, BOLTS - 3/8" X 2 1/2" LONG

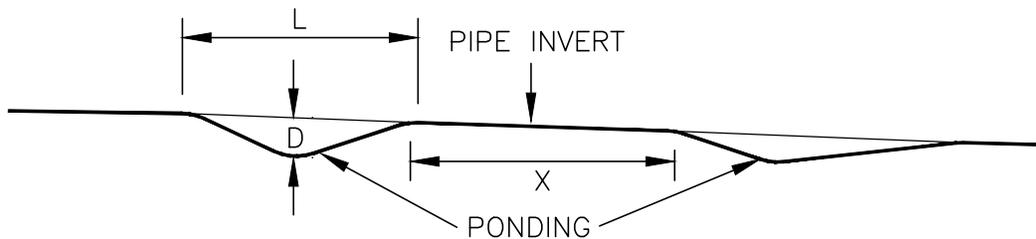
NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION:	SEWER			
1	NOTES/DIM.	3/19		<b>SEWER MAIN INSIDE DROP MANHOLE</b>	DRAWING NO.	SM-5		
-	-	-			DATE:	12/08	PAGE:	1
-	-	-						
-	-	-						
-	-	-						

	MINIMUM SLOPE VALUES (FT/FT)*	
PIPE SIZE	SANITARY APPLICATIONS	STORM DRAINS
8"	0.0060	N/A
10"	0.0028	N/A
12"	0.0022	0.0030
15"	0.0015	0.0023
18"	0.0012	0.0018
21"	0.0010	N/A
24"	0.0008	0.0012
27"	0.0007	N/A
30"	0.0006	0.0009
36"	0.0005	0.0007

\* THESE VALUES ARE BASED ON MINIMUM VELOCITIES OF 2 FEET PER SECOND ON SANITARY SEWERS AND 2.5 FEET PER SECOND FOR STORM DRAINS WHILE FLOWING FULL. THIS VALUE SET BY THE CITY ENGINEER.

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION: SEWER/STORM			
1	REMOVE 10"	11-11		<b>HYDRAULIC FLOW CHART</b>	DRAWING NO.	SM-6	
-	-	-			DATE:	12/08	PAGE: 1
-	-	-					
-	-	-					

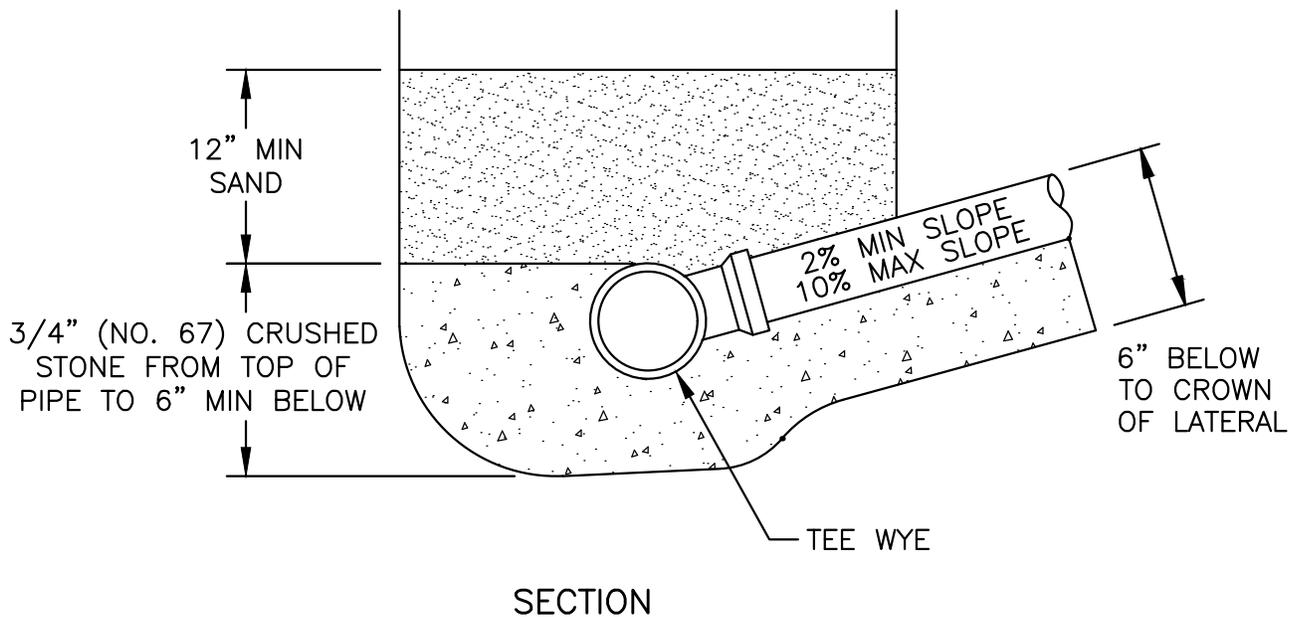
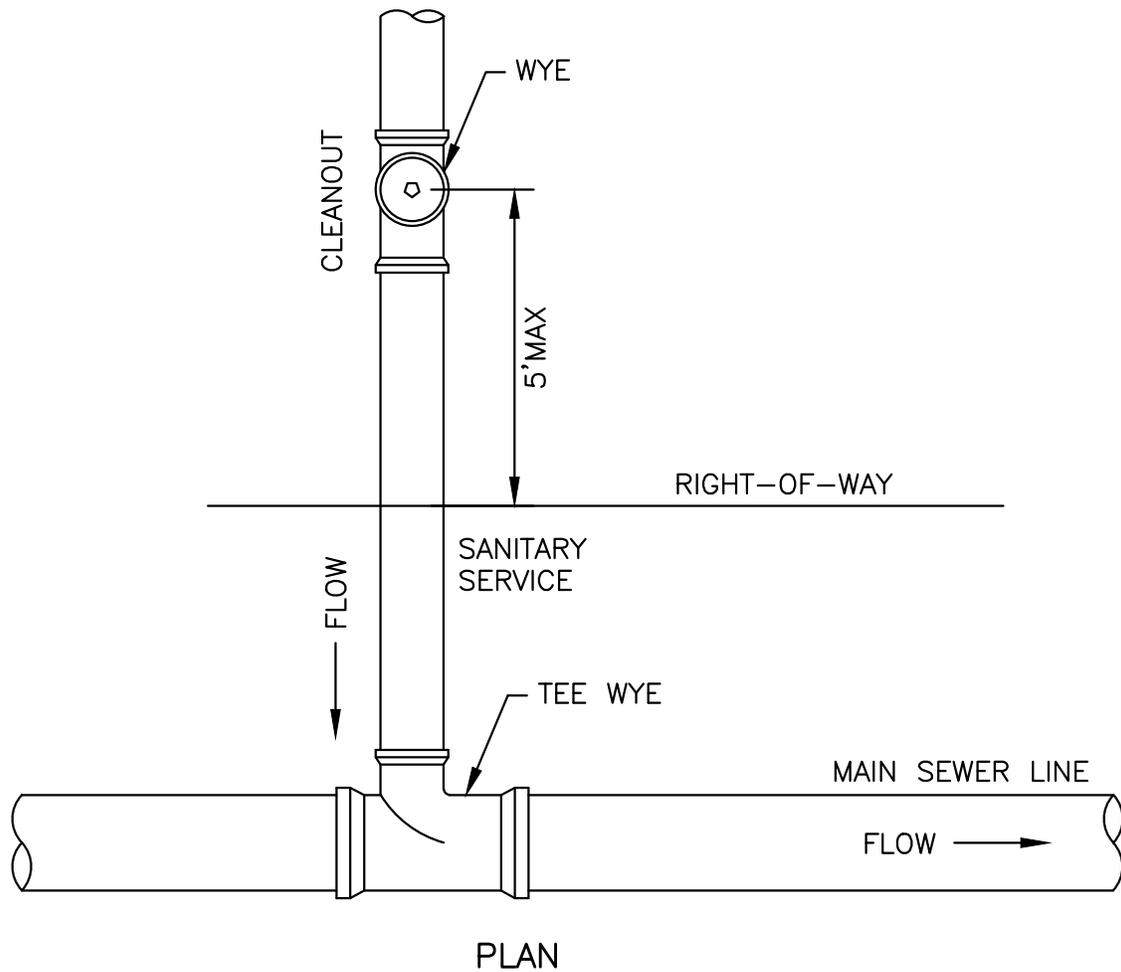
PIPE DIAMETER	ACCEPTABLE DEPTH (D) OF SAG	MAXIMUM SAG REQUIREMENTS		
		MAXIMUM ALLOWABLE DEPTH (D) OF SAG	MAXIMUM ALLOWABLE LENGTH (L) OF SAG	MINIMUM ALLOWABLE DISTANCE (X) BETWEEN SAGS
4"	NONE	NONE	NONE	NONE
6"	NONE	NONE	NONE	NONE
8"	1/4"	1/2"	4 FT	40 FT
10"	1/4"	1/2"	6 FT	60 FT
12" & LARGER	1/4"	1/2"	8 FT	80 FT



NOTES:

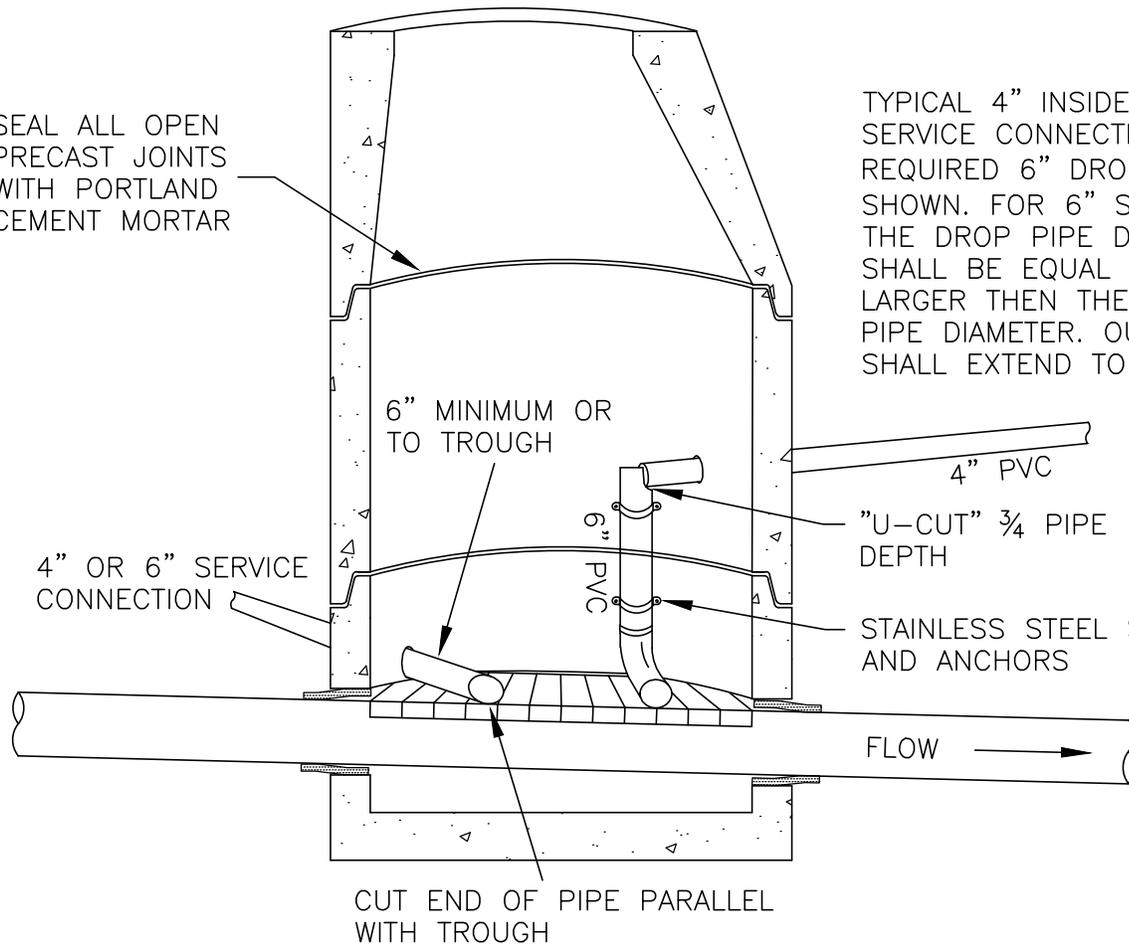
1. 4" AND 6" LINES ARE FOR SERVICE CONNECTIONS ONLY AND ARE LAID AT A MINIMUM OF 2% AND 1% RESPECTIVELY TO ELIMINATE SAGS.
2. SAGS BETWEEN 1/4" AND 1/2" WILL BE REJECTED WHEN CRITERIA FOR MAXIMUM ALLOWABLE LENGTH OF SAG AND/OR MINIMUM ALLOWABLE DISTANCE BETWEEN SAGS ARE NOT MET.

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>  <b>LIMIT OF SAGS IN PVC SANITARY SEWER PIPE</b>	SECTION:	SEWER
1	REV. NOTE #1	11.11		DRAWING NO.	SM-7
2	TABLE, NOTES	11.19		DATE:	11/19
-	-	-		PAGE:	1
-	-	-			



NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION:	SEWER	
1	STONE & DIMS.	3/19		<b>SEWER SERVICE CONNECTION AT MAIN</b>	DRAWING NO.	SS-1
-	-	-			DATE:	12/08
-	-	-			PAGE:	1
-	-	-				

SEAL ALL OPEN  
PRECAST JOINTS  
WITH PORTLAND  
CEMENT MORTAR



TYPICAL 4" INSIDE DROP  
SERVICE CONNECTION WITH  
REQUIRED 6" DROP PIPING  
SHOWN. FOR 6" SERVICES,  
THE DROP PIPE DIAMETER  
SHALL BE EQUAL TO OR  
LARGER THEN THE SERVICE  
PIPE DIAMETER. OUTLET PIPE  
SHALL EXTEND TO TROUGH

6" MINIMUM OR  
TO TROUGH

4" OR 6" SERVICE  
CONNECTION

4" PVC

"U-CUT"  $\frac{3}{4}$  PIPE  
DEPTH

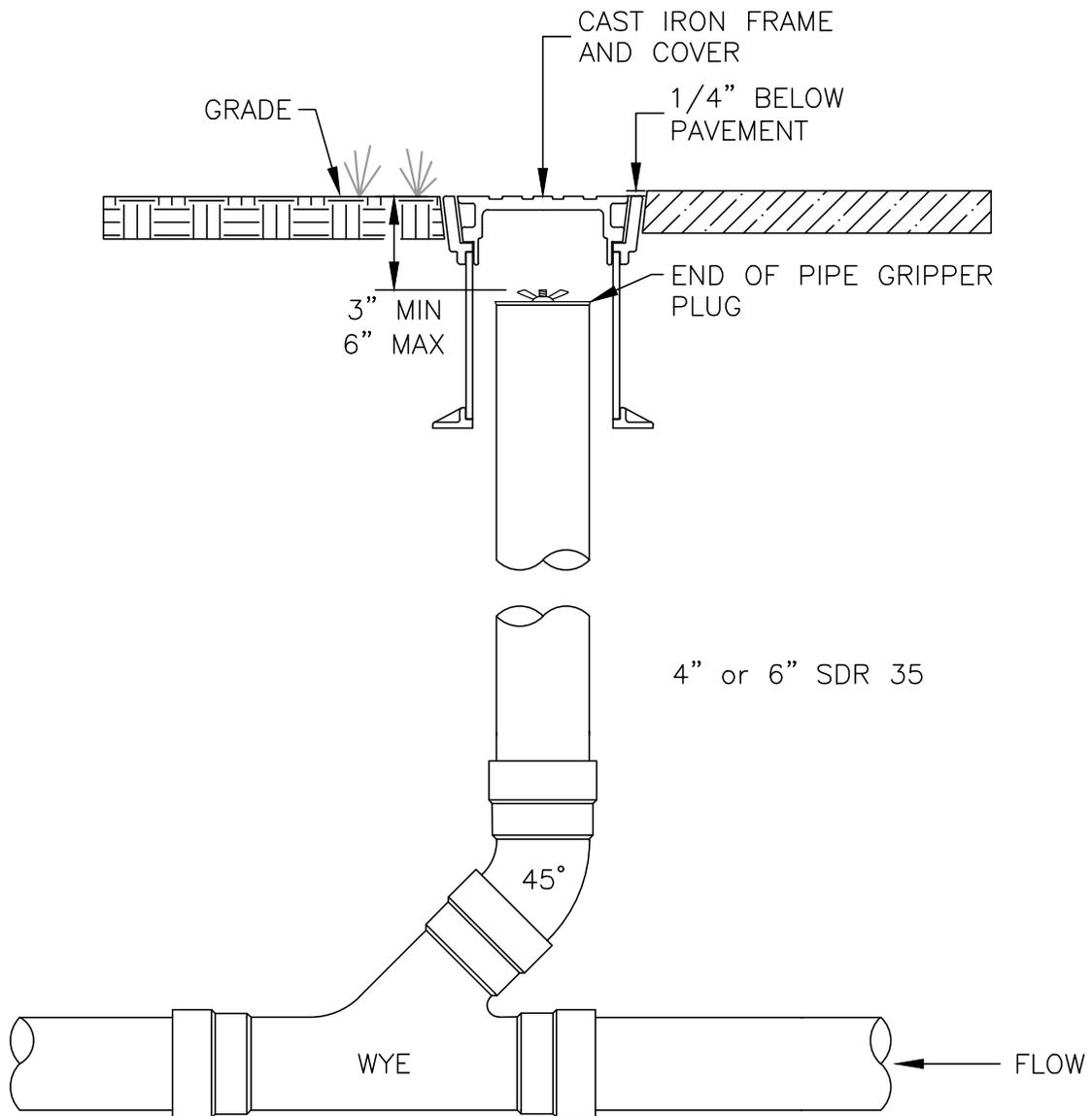
STAINLESS STEEL STRAPS  
AND ANCHORS

FLOW →

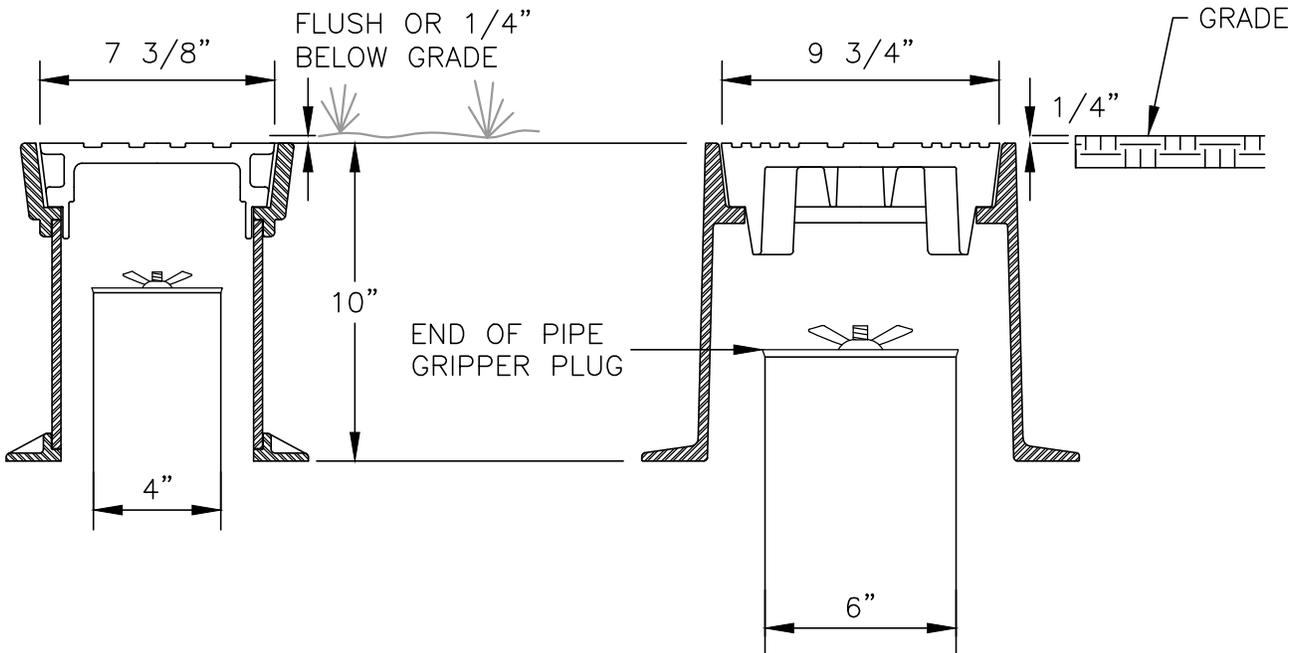
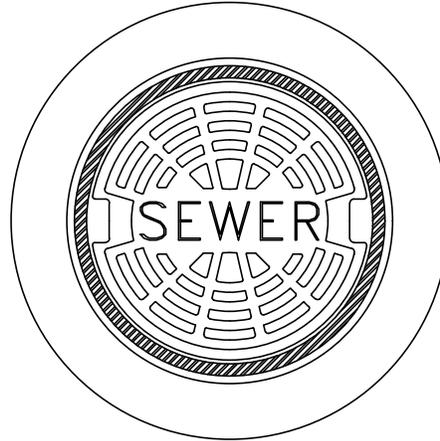
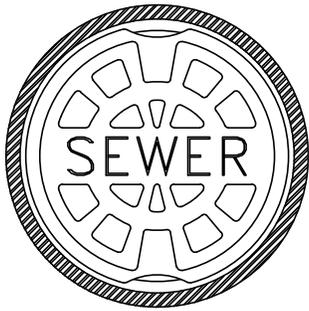
CUT END OF PIPE PARALLEL  
WITH TROUGH

SHOULD THE SERVICE CONNECTION ENTER A STRUCTURE MORE THAN 24"  
ABOVE THE INVERT A DROP CONNECTION WILL BE NECESSARY

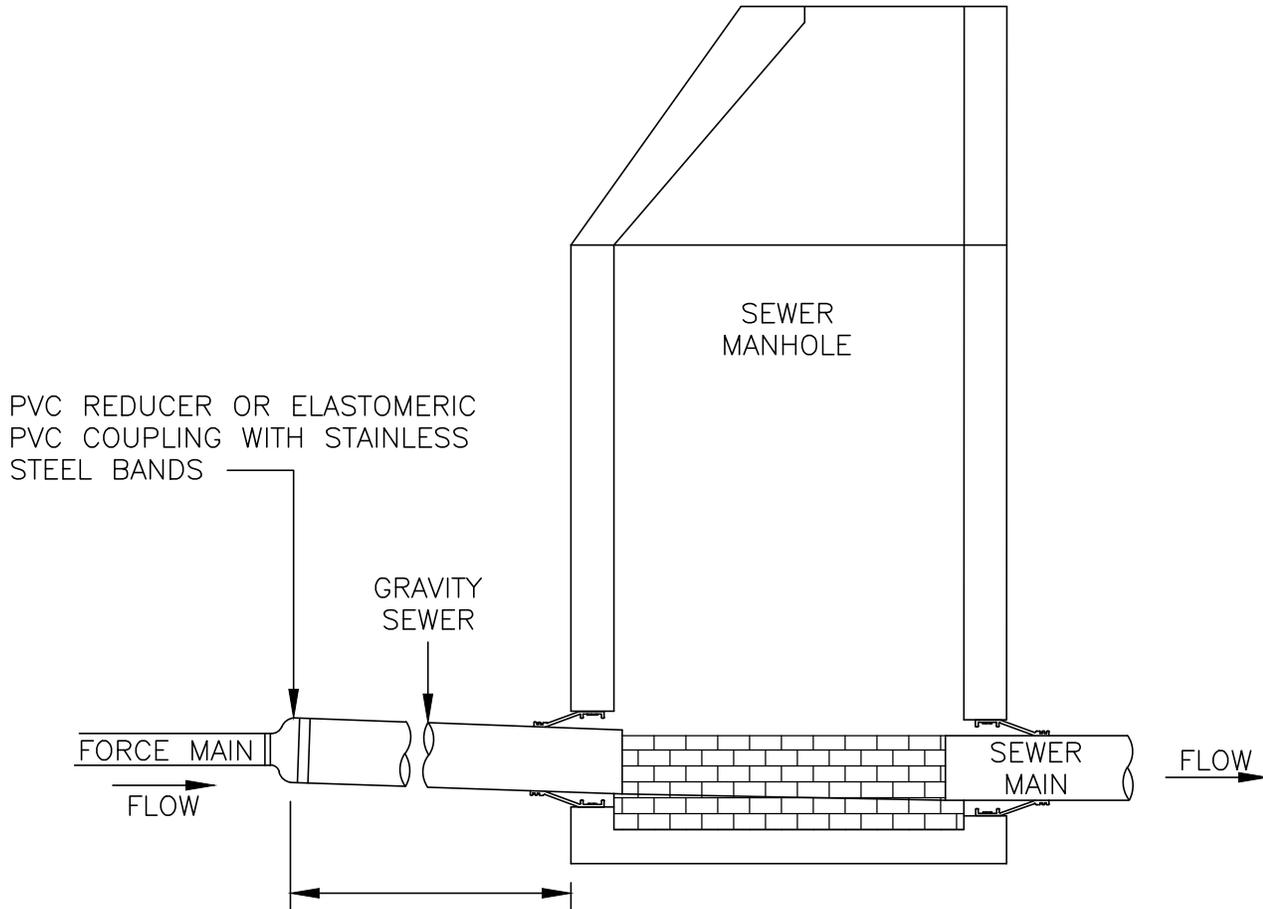
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SEWER	
1	REVISED NOTE	11.11	<b>SEWER SERVICE CONNECTION / INSIDE DROP MANHOLE</b>	DRAWING NO.	SS-2	
-	-	-		DATE:	12/08	PAGE: 1
-	-	-				
-	-	-				



NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SEWER	
-	-	-	<b>CLEANOUTS ON SERVICE LATERALS</b>	DRAWING NO.	SS-3	
-	-	-		DATE:	12/08	PAGE: 1
-	-	-				
-	-	-				



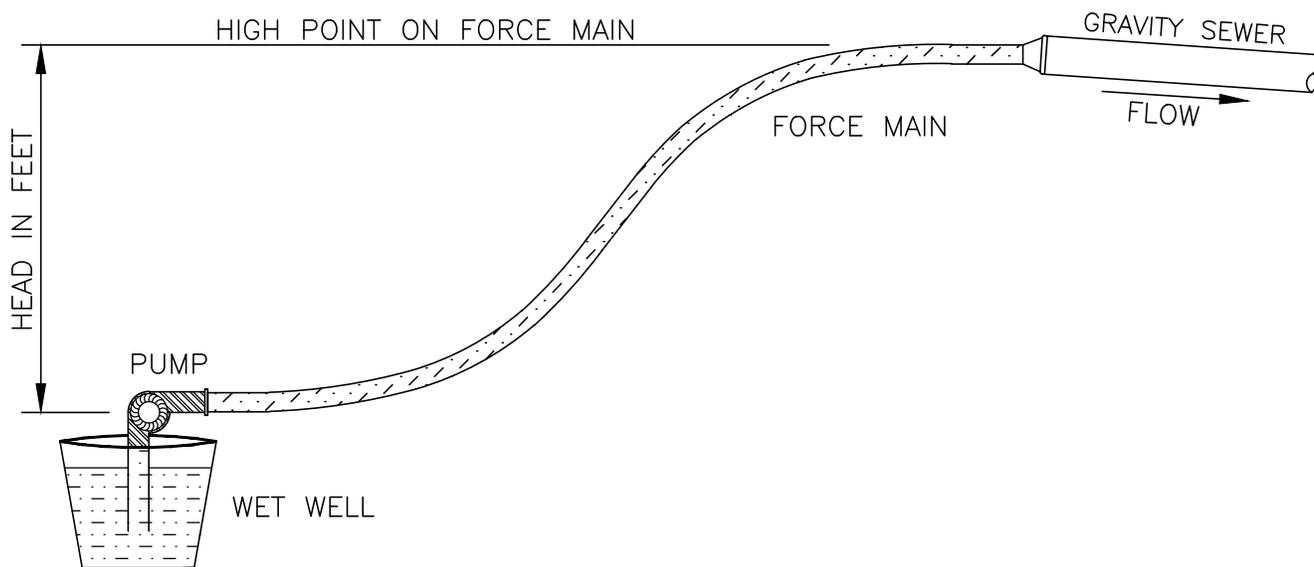
NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SEWER		
-	-	-	<b>CLEANOUT COVERS</b> <b>4" OR 6"</b>	DRAWING NO.	SS-4		
-	-	-		DATE:	12/08	PAGE:	1
-	-	-					
-	-	-					



TRANSITION FROM FORCE MAIN TO GRAVITY SEWER SHOULD OCCUR A MINIMUM OF 10' FROM A MANHOLE FOR SEWER MAINS AND AT THE RIGHT-OF-WAY LINE FOR SEWER SERVICES.

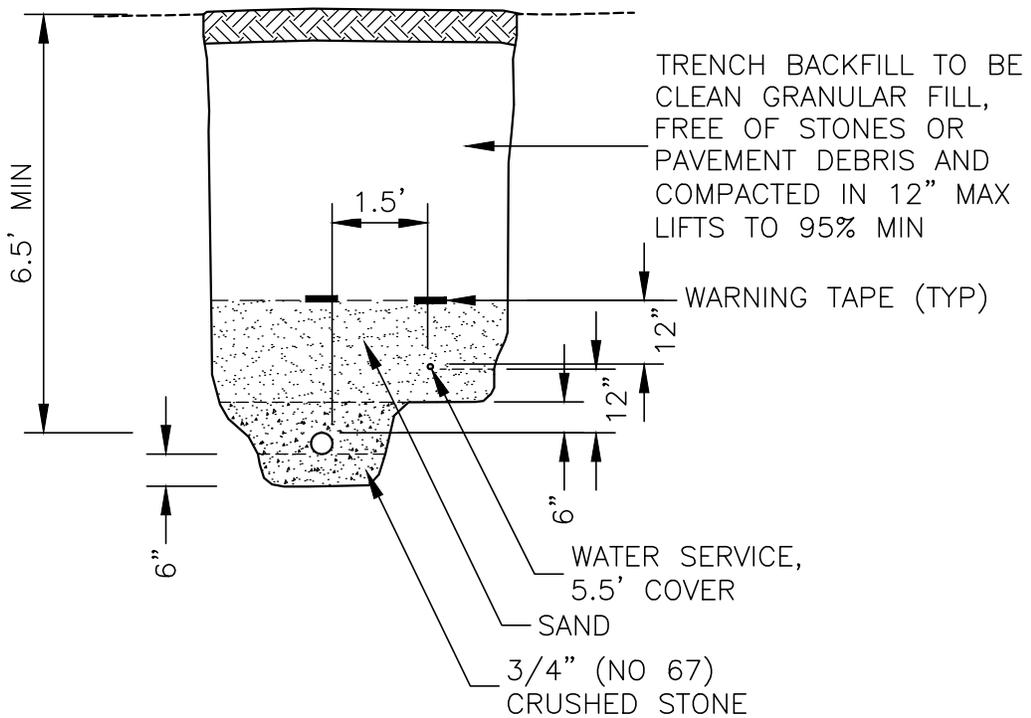
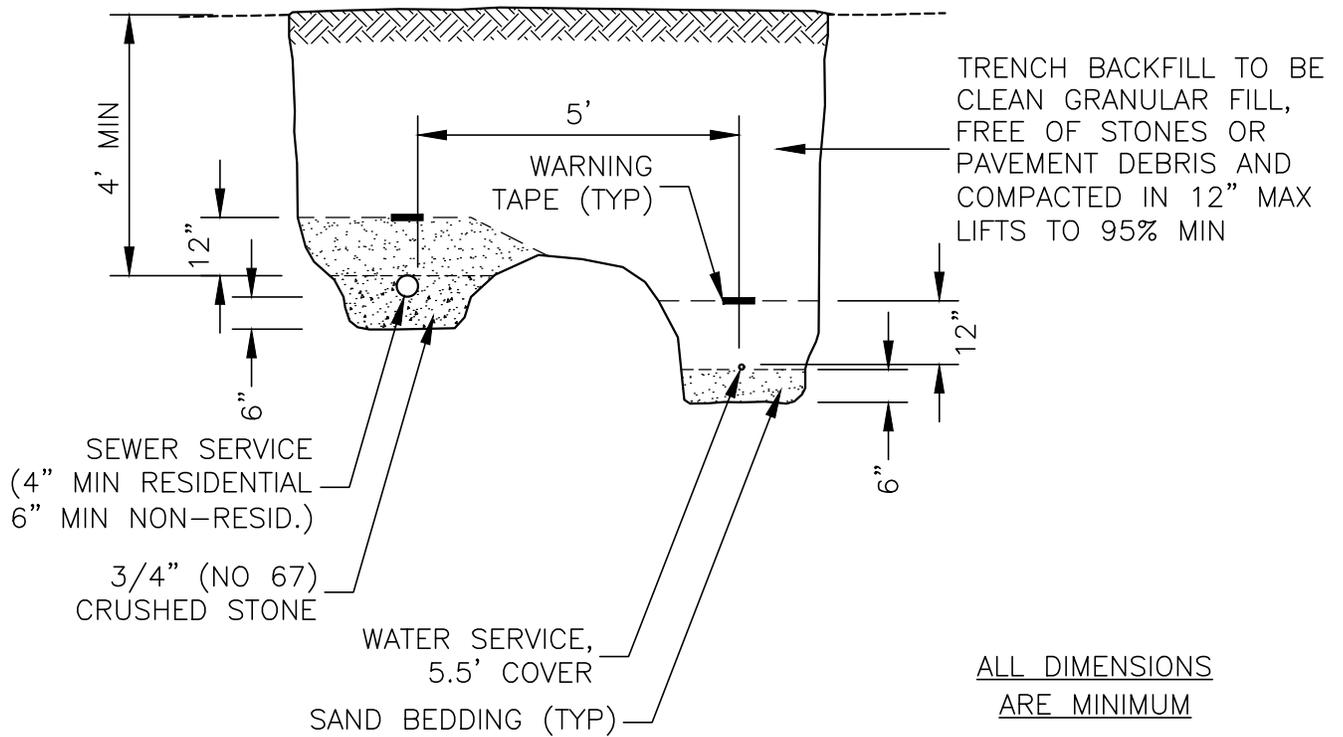
FOR BRICK SHELF CONSTRUCTION REFER TO SANITARY BRICK SHELF CONSTRUCTION DETAIL.

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SEWER	
-	-	-	<b>FORCE MAIN CONNECTION</b>	DRAWING NO.	SS-5	
-	-	DATE:		12/08	PAGE:	1
-	-	-				
-	-	-				

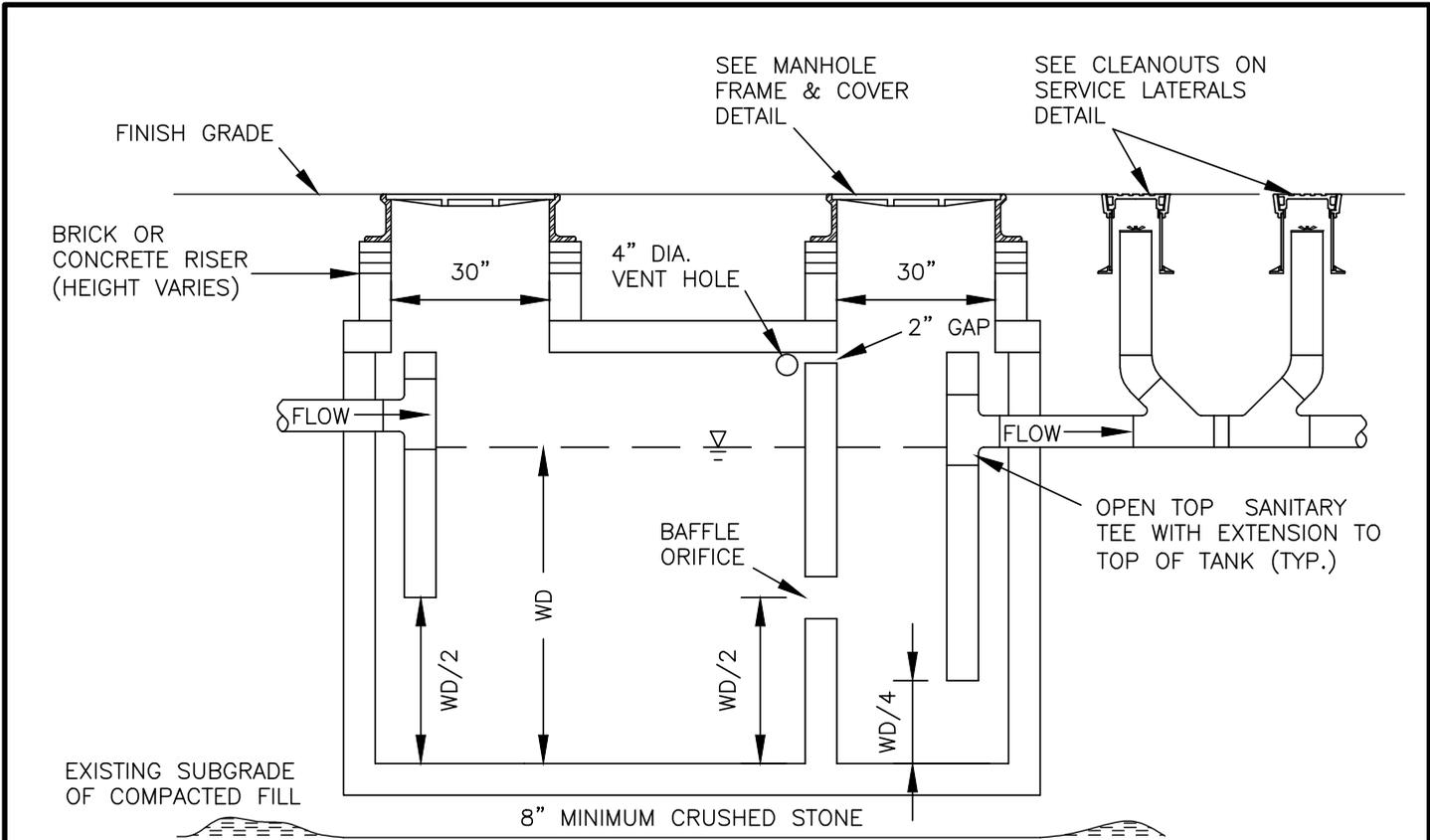


PRESSURE TEST REQUIREMENTS (IN ACCORDANCE WITH NHDES CODE OF ADMINISTRATIVE RULES ENV-WQ 704.09)

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>  <b>FORCE MAIN TESTING REQUIREMENTS</b>	SECTION:	SEWER
1	REVISED NOTE	11.11		DRAWING NO.	SS-6
-	-	-		DATE:	12/08
-	-	-		PAGE:	1
-	-	-			

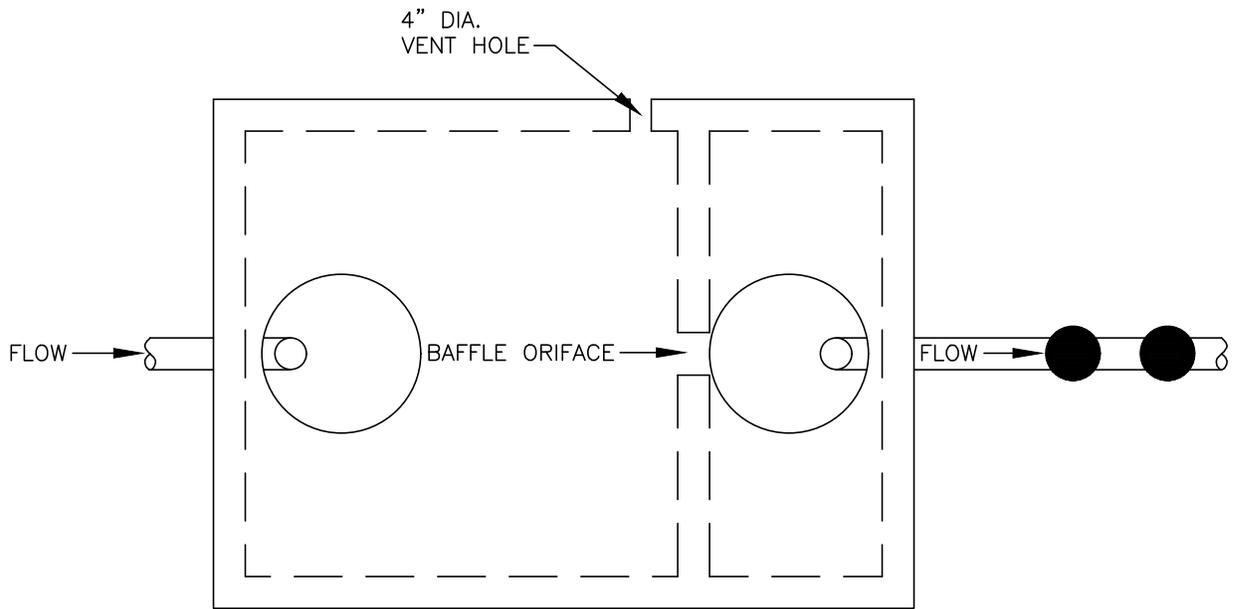


NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: SEWR-WATR
-	-	-	<b>WATER AND SEWER SERVICE TRENCH</b>	DRAWING NO. SS-7
-	-	-		DATE: 03/15
-	-	-		PAGE: 1
-	-	-		



SECTION

\* GREASE INTERCEPTOR SHALL BE DESIGNED TO H-20 LOADING REQUIREMENTS



PLAN

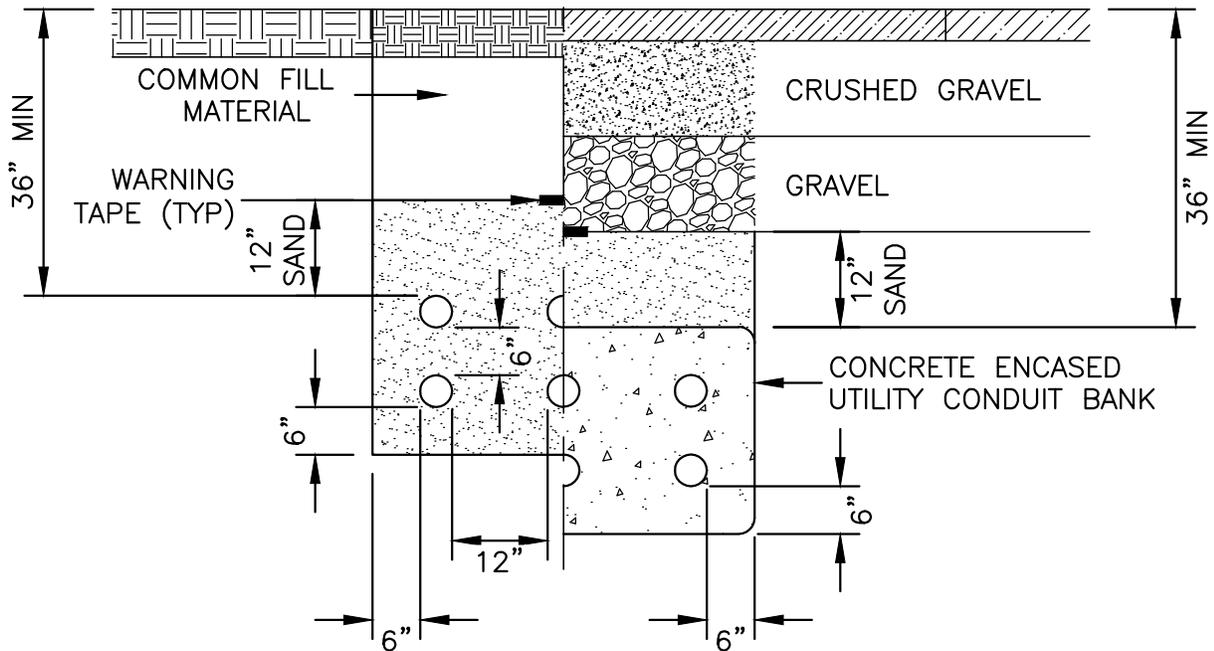
NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION:	SEWER
-	-	-		DRAWING NO.	SS-8
-	-	-		DATE:	2/2020
-	-	-		PAGE:	1
APPROVED BY:			<b>TYPICAL EXTERNAL GREASE INTERCEPTOR</b>		

CROSS COUNTRY      PAVED

LOAM AND SEED  
DISTURBED AREAS  
(MINIMUM 6")

NEW ROADWAY CONSTRUCTION SHALL  
CONFORM TO THE CITY OF CONCORD  
CONSTRUCTION STANDARDS AND DETAILS

FOR RECONSTRUCTION OF EXISTING PAVED  
AREAS, PAVEMENT AND SUB-BASE DEPTHS  
SHALL EQUAL THE EXISTING MATERIAL  
DEPTHS



UNDERGROUND CONDUIT INSTALLATIONS SHALL BE COORDINATED WITH ALL LOCAL UTILITIES INCLUDING ELECTRIC, TELEPHONE, GAS, CABLE, STEAM, AND CITY OF CONCORD FIRE ALARM/SIGNAL AND ENGINEERING SERVICES DIVISIONS.

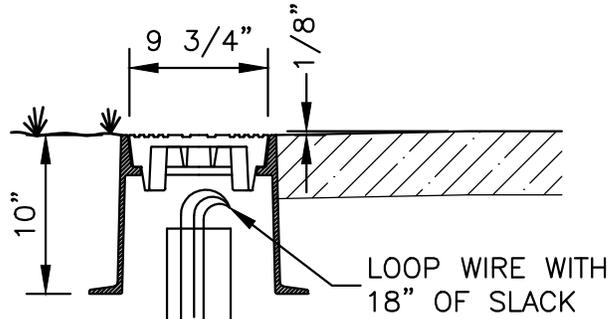
CONDUIT CROSSINGS SHALL BE SWEEPS AT RIGHT ANGLES TO THE STREET. 90° BENDS ARE NOT ACCEPTABLE

PROPOSED CONDUITS WITHIN PAVED SECTIONS OF STREETS SHALL BE RIGID METAL OR SCH 80 PVC CONDUIT. WHEN THE PROPER DEPTH CANNOT BE ACHIEVED, SCH 40 PVC CONDUIT ENCASED IN CONCRETE SHALL BE USED.

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	SITE/STREET	
-	-	-	<b>TYPICAL UTILITY CONDUIT INSTALLATION</b>	DRAWING NO.	U-1	
-	-	-		DATE:	03/15	PAGE: 1
-	-	-				
-	-	-				

LOCATOR BOX:

1. LOCATOR BOX AND COVER SHALL BE CAST IRON
2. LOCATOR BOX SHALL BE SET OVER THE UTILITY.
3. LOCATOR BOXES SHALL BE SET AT 500' INTERVALS AND AT BENDS.
4. PROVIDE 18" WIRE LOOP INSIDE THE LOCATOR BOX
5. LOCATOR BOXES SHALL BE SET AT GRADE IN CROSS COUNTRY LOCATIONS AND 1/8" BELOW PAVEMENT, TAPERED OVER 2'

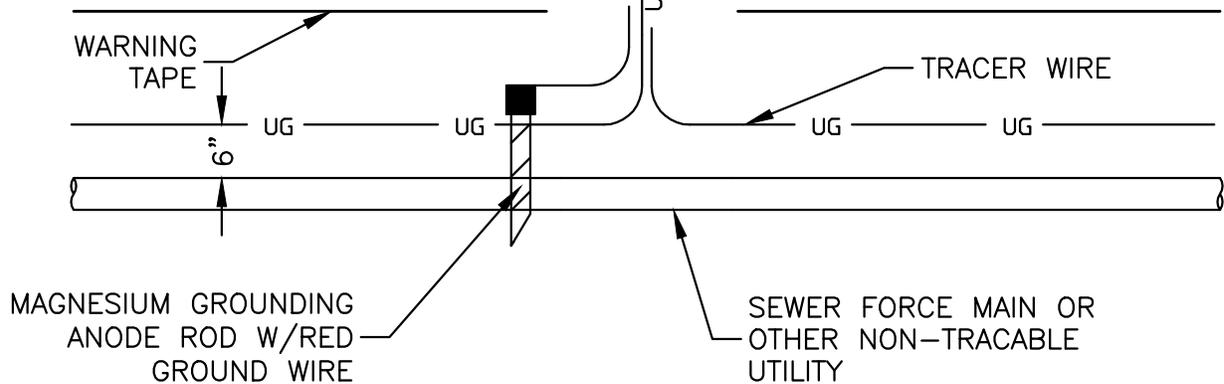


TRACER WIRE:

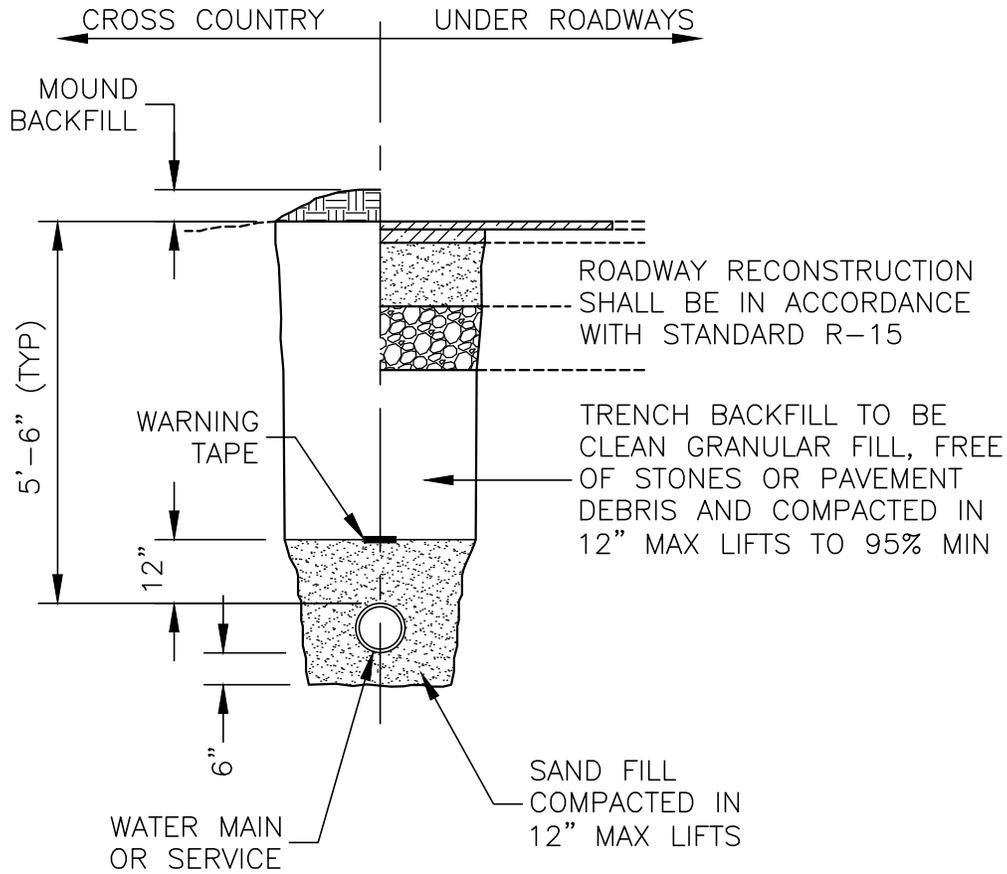
1. CONTINUOUS, DIRECT BURIAL RATED
2. 12 AWG HIGH STRENGTH SOLID CORE COPPER CLAD STEEL
3. COATING COLOR SHALL CONFORM TO THE APWA UNIFORM COLOR CODE

REPAIRS:

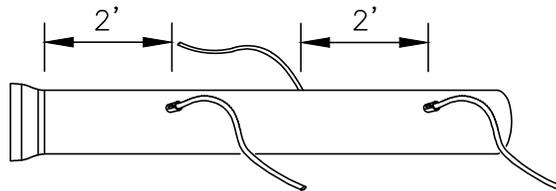
1. SPLICES SHALL BE MADE WITH CORROSION PROOF WIRE CONNECTORS



NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	UTILITIES		
-	-	-	<b>TRACER WIRE INSTALLATION</b>	DRAWING NO.	U-2		
-	-	-		DATE:	03/19	PAGE:	1
-	-	-					
-	-	-					

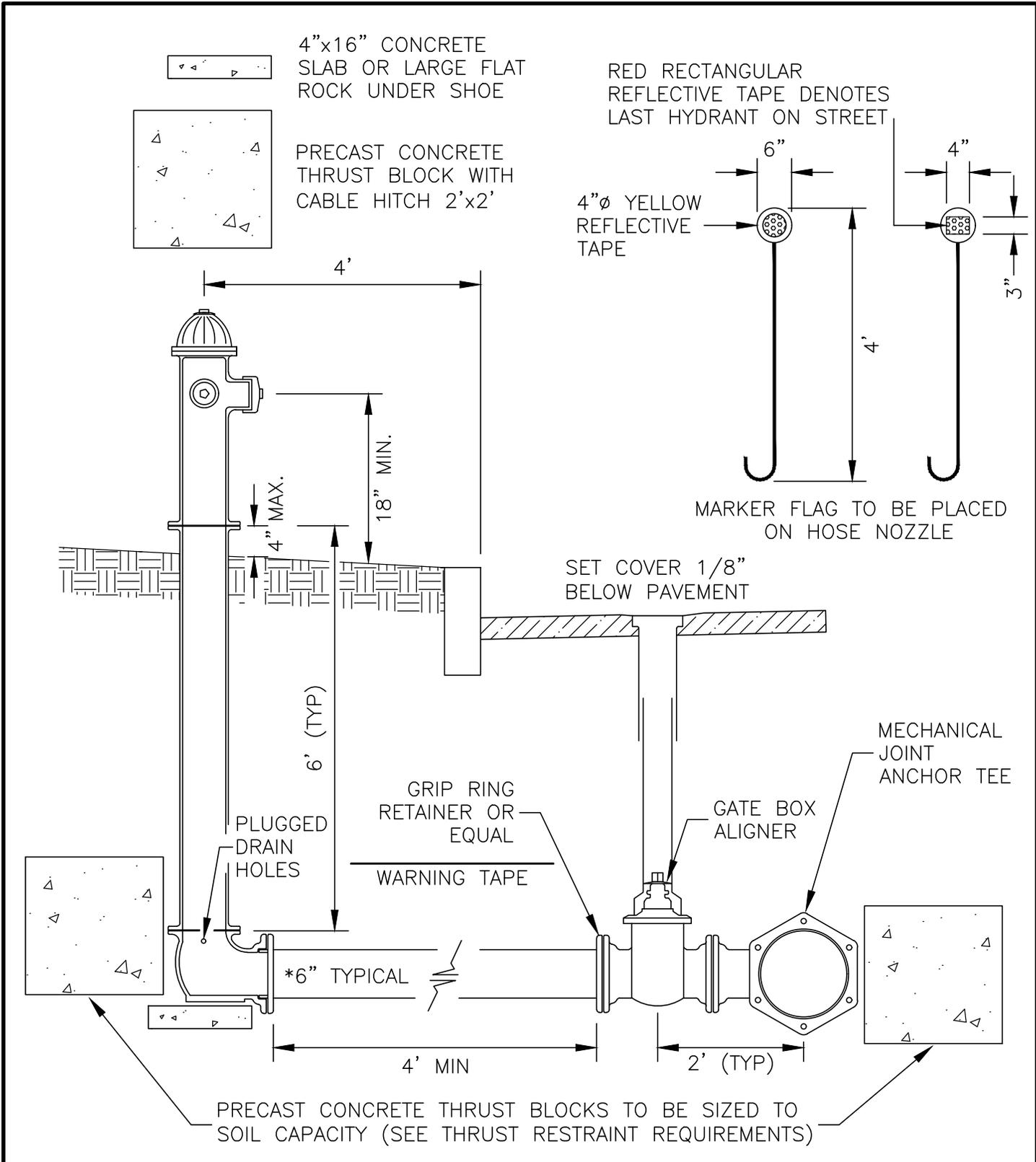


24" MINIMUM SEPARATION BETWEEN SERVICE TAPS OR FROM A BELL



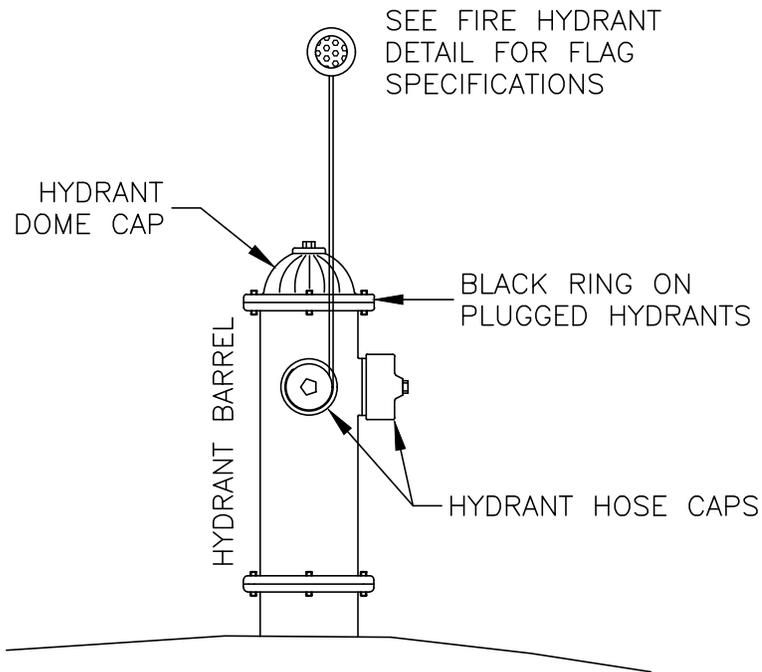
DETECTABLE TAPE SHALL BE PLACED OVER ALL SERVICES

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	WATER		
1	NEW FORMAT	4.15	<b>WATER MAIN/SERVICE TRENCH</b>	DRAWING NO.	W-1		
2	STANDARD REFERENCE	01.19		DATE:	12/08	PAGE:	1
-	-	-					
-	-	-					



\* SHOULD THE HYDRANT BE MORE THAN 20' FROM THE MAIN, THE HYDRANT SERVICE SHALL BE 8" TO A POINT IMMEDIATELY ADJACENT TO THE HYDRANT WHERE THE SERVICE WILL BE REDUCED TO 6"

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION:	WATER		
1	FLANGE HEIGHT	11.11		DRAWING NO.	W-2		
2	DRAFTING	11.11		DATE:	12/08	PAGE:	1
3	Nozzle Height	02.19					
			<b>FIRE HYDRANT</b>				



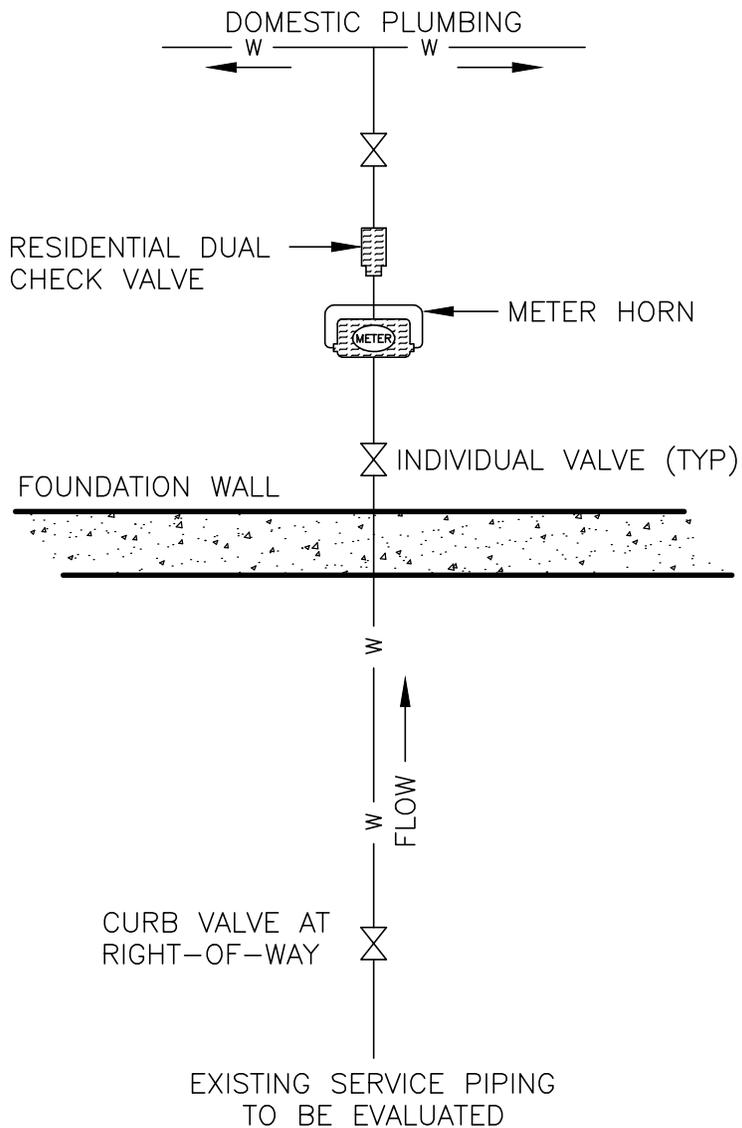
### HYDRANT PAINTING

SERVICE PRESSURE	HYDRANT BARREL	HYDRANT DOME CAP	HYDRANT HOSE CAPS
HIGH PRESSURE:			
PUBLIC	OSHA ORANGE	CHROME ALUMINUM	OSHA ORANGE
PRIVATE	GLOSS YELLOW	CHROME ALUMINUM	GLOSS YELLOW
EXTRA HIGH PRESSURE:			
PUBLIC	OSHA ORANGE	CHROME ALUMINUM	CHROME ALUMINUM
PRIVATE	GLOSS YELLOW	CHROME ALUMINUM	CHROME ALUMINUM
NON-POTABLE WATER SUPPLIES:			
PUBLIC	OSHA ORANGE	GLOSS GREEN	GLOSS GREEN
PRIVATE	GLOSS YELLOW	GLOSS GREEN	GLOSS GREEN

**NOTES:**

1. THE CONTRACTOR/DEVELOPER SHALL BE RESPONSIBLE FOR THE PAINTING OF THE HYDRANTS.
2. AT THE CONTRACTORS OPTION, IF REQUESTED, GENERAL SERVICES WILL PAINT THE HYDRANTS AT A NOMINAL CHARGE

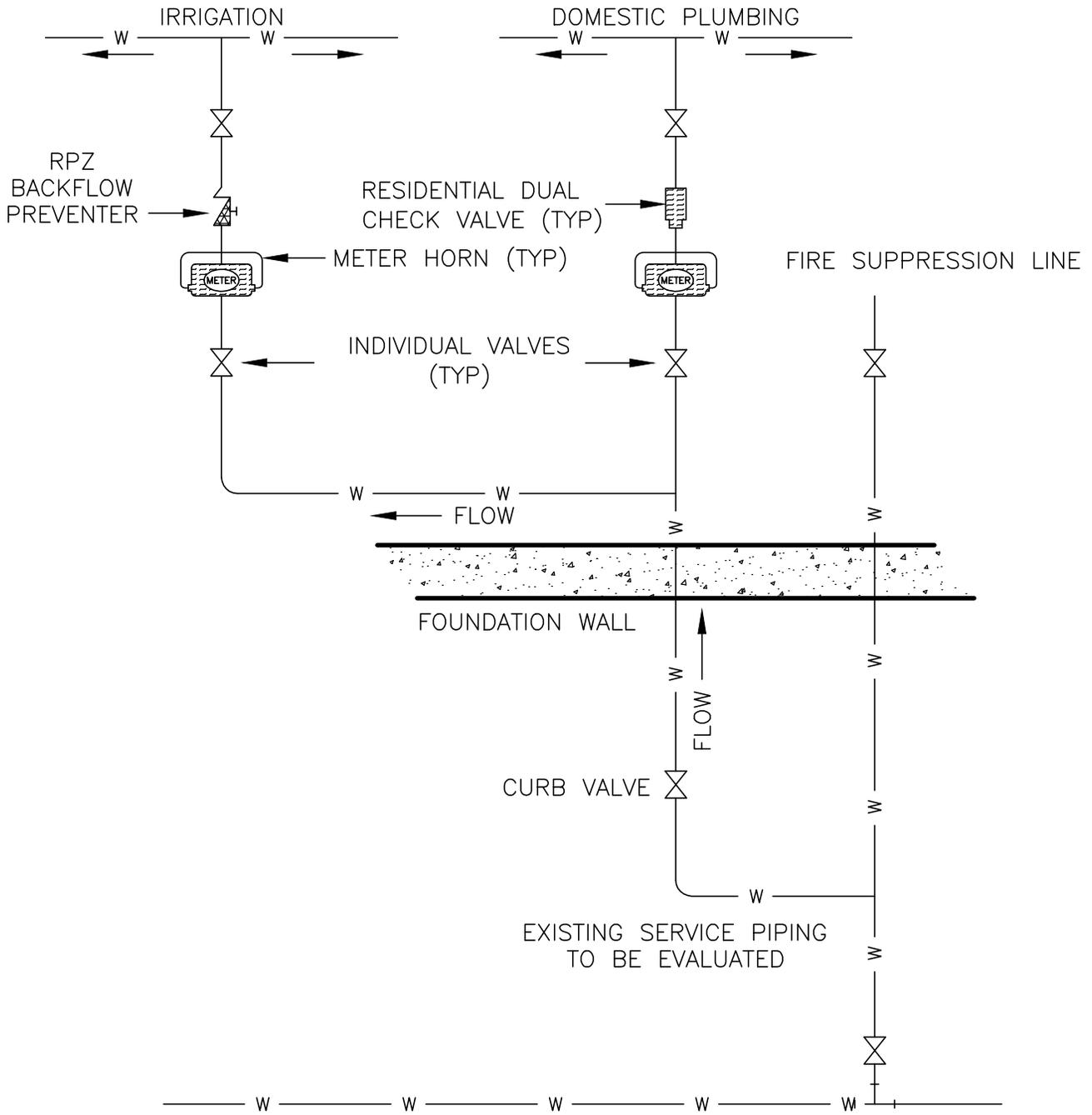
NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>  <b>HYDRANT PAINTING &amp; MARKER FLAGS</b>	SECTION:	WATER		
1	DRAFTING	4.15		DRAWING NO.	W-3		
1	COLORS	4.15		DATE:	12/08	PAGE:	1
-	-	-					
-	-	-					



NOTE: ALL METERS SUPPLIED BY CITY OF  
CONCORD GENERAL SERVICES DEPARTMENT

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	WATER
-	-	-	<b>SINGLE FAMILY METER INSTALLATION</b>	DRAWING NO.	W-4
-	-	DATE: 12/08		PAGE: 1	
-	-				
-	-				

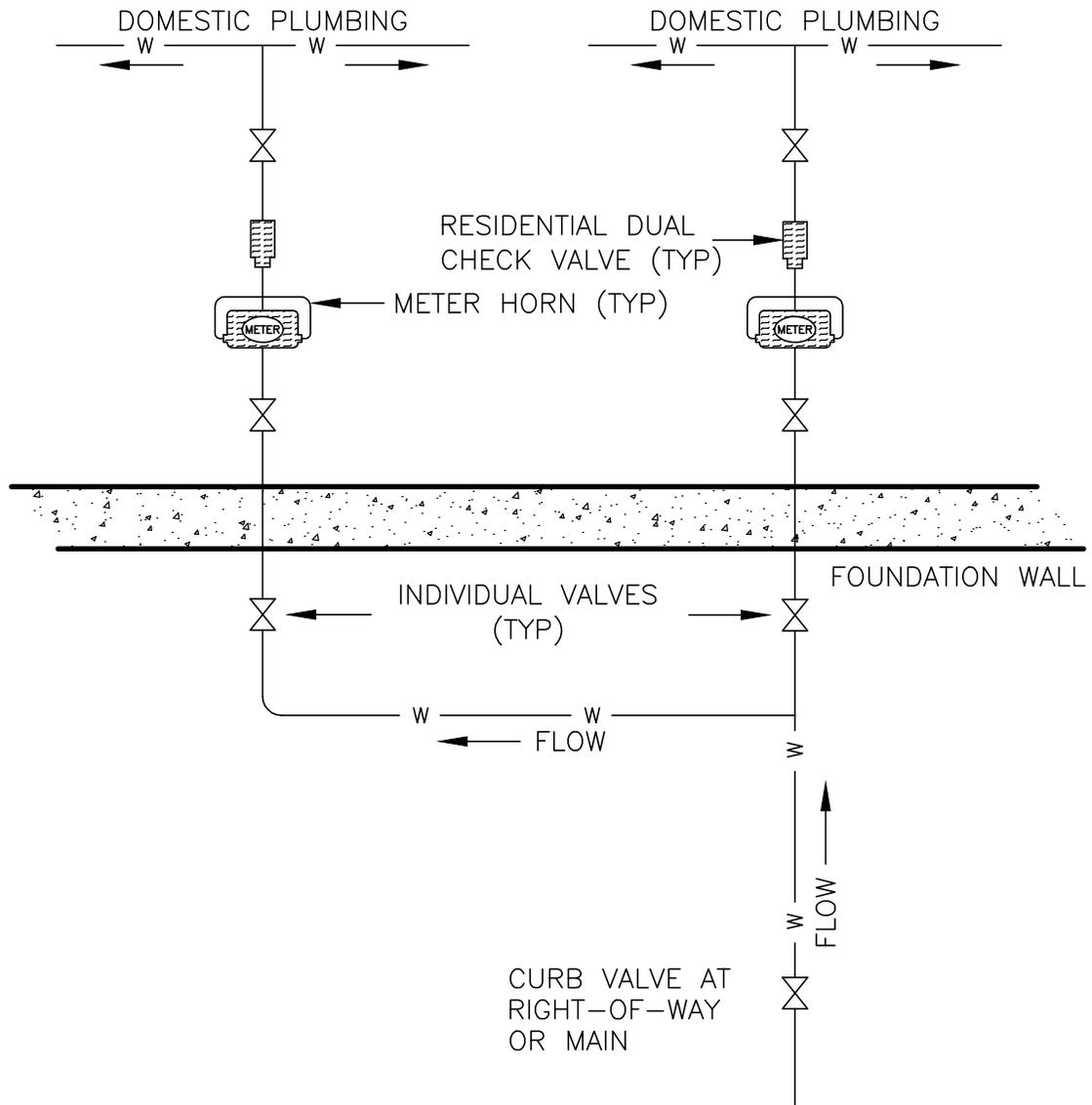




FOR SERVICES  $\geq 4"$ ,  
VALVES SHALL BE PLACED  
IMMEDIATELY ADJACENT TO  
THE MAIN

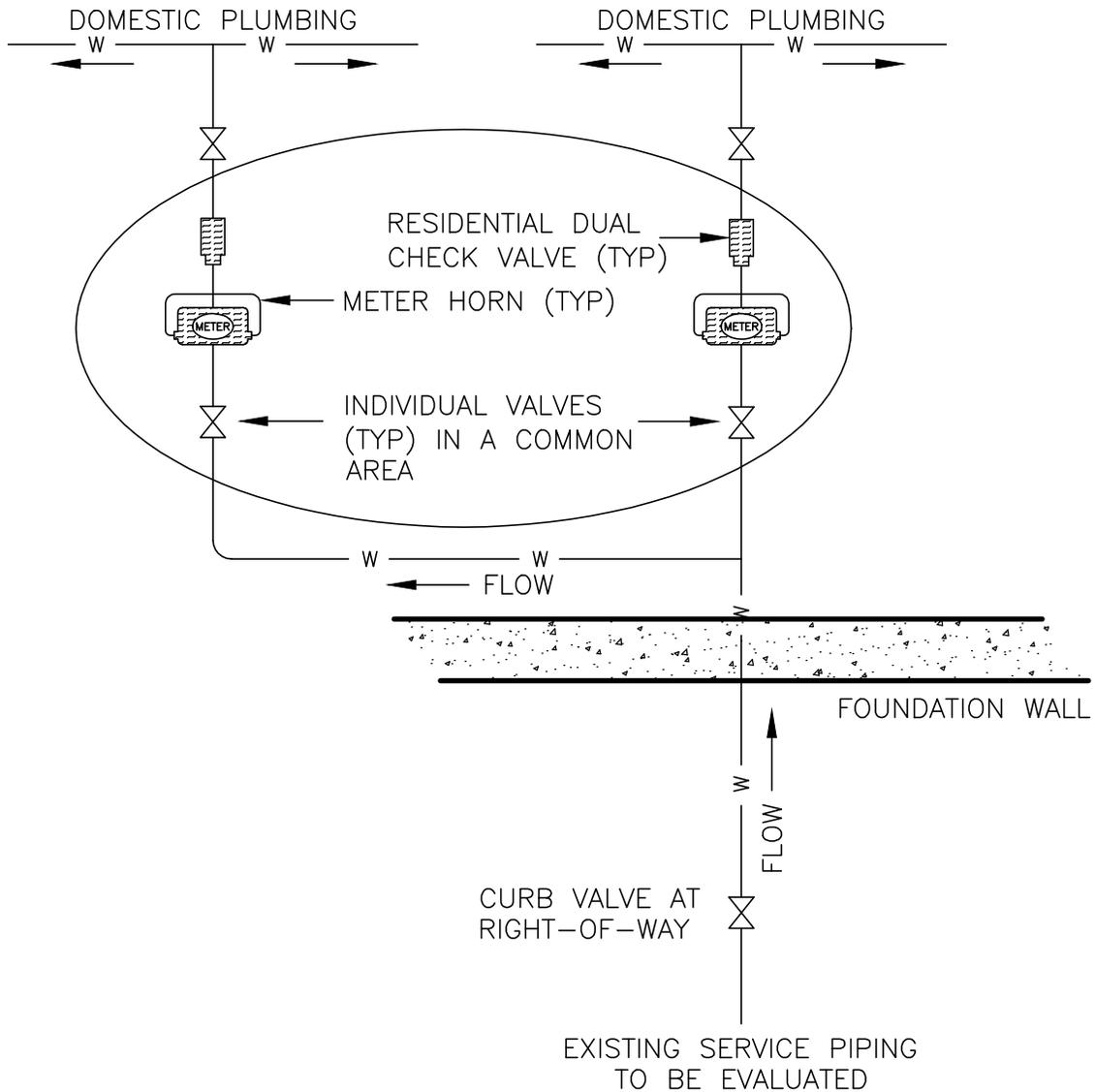
NOTE: ALL METERS SUPPLIED BY CITY OF  
CONCORD GENERAL SERVICES DEPARTMENT

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b> <b>METER INSTALLATION WITH</b> <b>IRRIGATION AND FIRE</b> <b>SUPPRESSION</b>	SECTION:	WATER		
1	R FIRE VALVE	4.15		DRAWING NO.	W-6		
-	-	-		DATE:	12/08	PAGE:	1
-	-	-					
-	-	-					



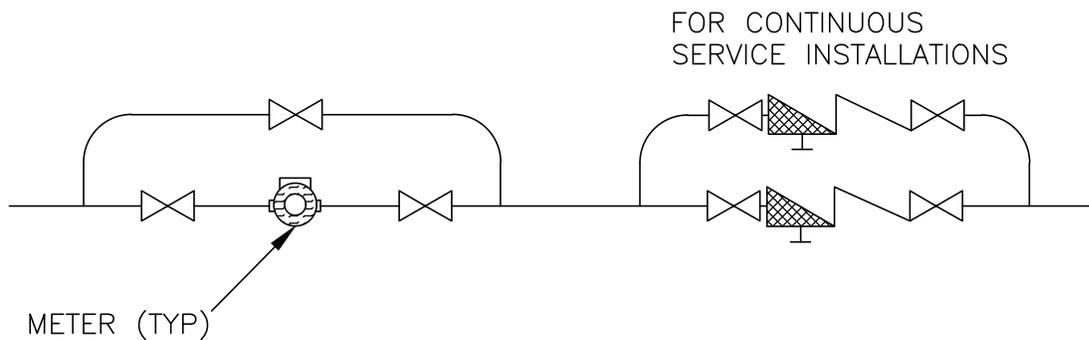
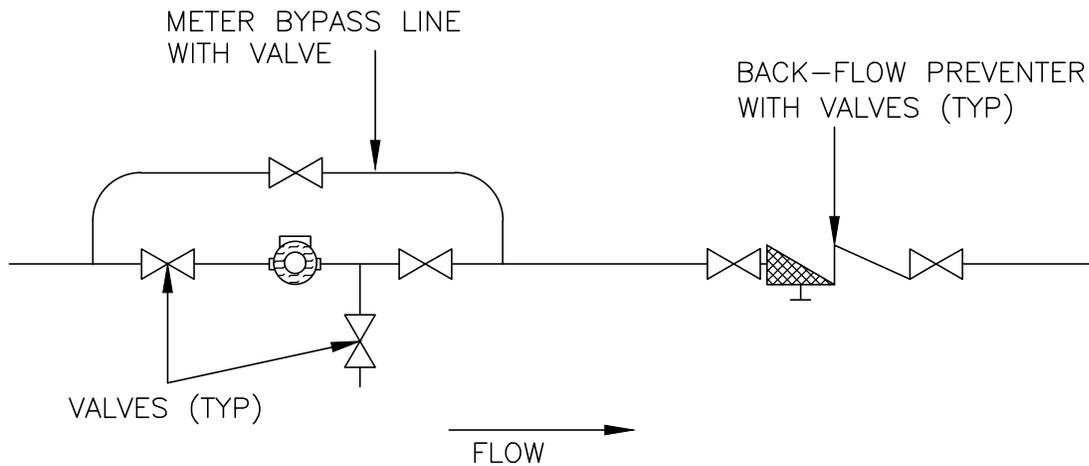
NOTE: ALL METERS SUPPLIED BY CITY OF CONCORD GENERAL SERVICES DEPARTMENT

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b> <b>NEW CONDOMINIUM</b> <b>DUAL RESIDENTIAL METER</b> <b>INSTALLATION</b>	SECTION:	WATER
-	-	-		DRAWING NO.	W-7
-	-	-		DATE:	12/08
-	-	-		PAGE:	1
-	-	-			



NOTE: ALL METERS SUPPLIED BY CITY OF CONCORD GENERAL SERVICES DEPARTMENT

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b> <b>CONDO CONVERSION</b> <b>DUAL RESIDENTIAL METER</b> <b>INSTALLATION</b>	SECTION:	WATER
-	-	-		DRAWING NO.	W-8
-	-	-		DATE:	12/08
-	-	-		PAGE:	1
-	-	-			



ON ALL WATER SERVICES WITH A METER SIZE OF 1½" OR LARGER, A BYPASS LINE WITH A 2" TEST OUTLET IS REQUIRED.

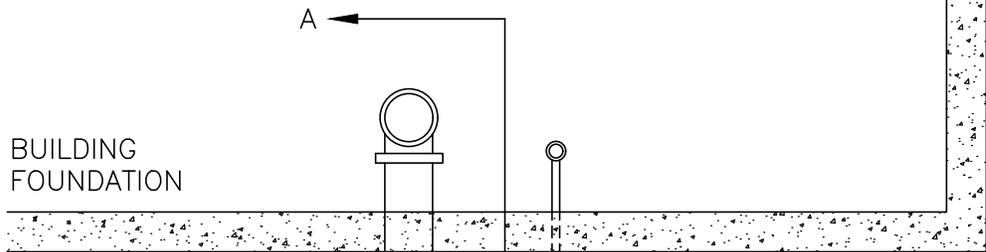
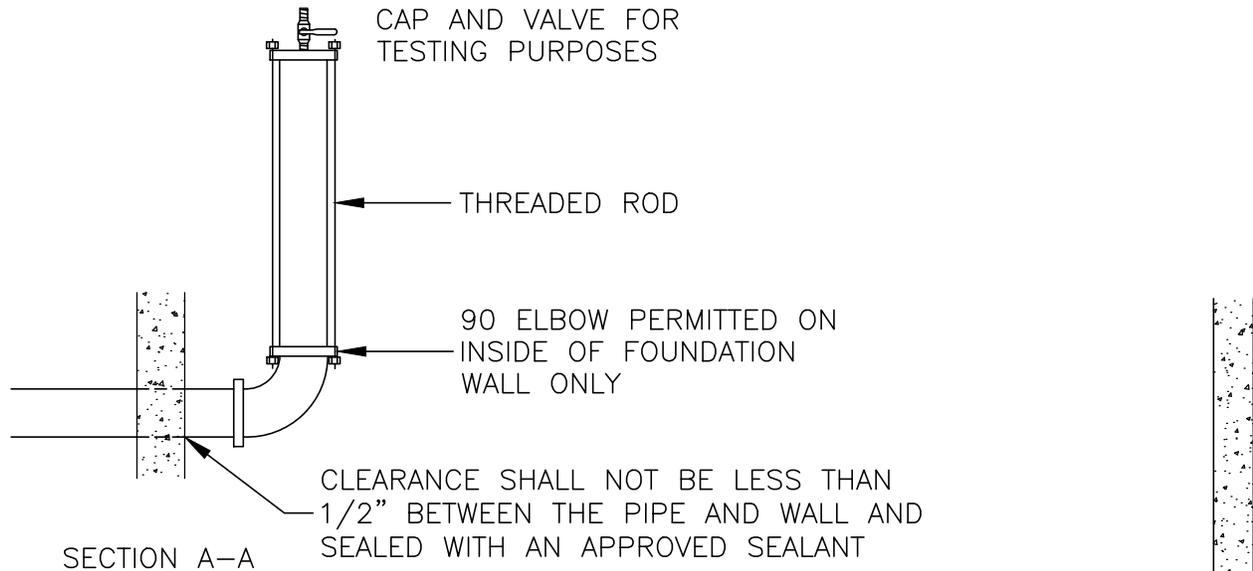
AN IDLER OR METER SPACER WITH GASKETS AND BOLTS CAN BE OBTAINED FROM THE CITY UTILITY BILLING OFFICE TO ASSIST WITH METER PLUMBING.

NO OBSTRUCTIONS ARE ALLOWED:

- BEFORE THE METER 5 x D
  - BEFORE A METER WITH STRAINER 3 x D
  - AFTER THE METER 2 x D
- WHERE D = PIPE DIAMTER

LAYING LENGTH OF METERS:		
5/8" x 3/4"	=	7½"
1" x _____	=	10¾"
1½" x _____	=	13"
2" x _____	=	17"
3" TURBO x _____	=	16"
TURBO x _____	=	14"

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	WATER	
1	REM 2" TEST	4.15	<b>WATER METER INSTALLATION</b>	DRAWING NO.	W-9	
-	-	-		DATE:	12/08	PAGE: 1
-	-	-				
-	-	-				



BUILDING FOUNDATION

FIRE SERVICE

2' MINIMUM ON BOTH SIDES OF SERVICE TAP

SADDLES ARE REQUIRED FOR SERVICE TAPS OVER  $\frac{3}{4}$ " ON 6" DIAMETER MAINS AND SMALLER, AND DOUBLE STRAPPED SADDLES FOR SERVICE TAPS OVER 1" ON MAINS LARGER THAN 6" DIAMETER

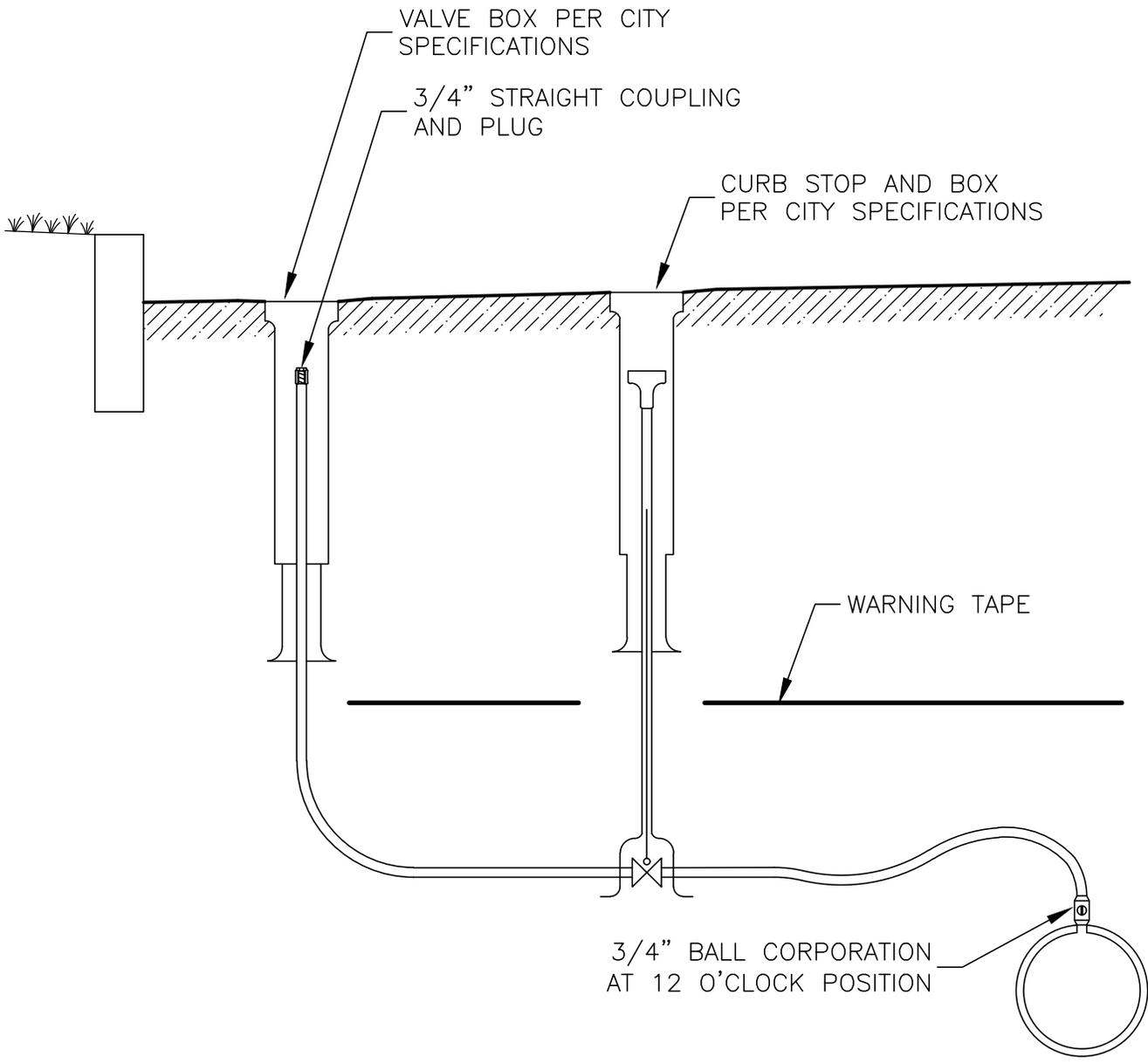
BALL VALVE SHUT-OFF FOR DOMESTIC WATER SERVICE

CORPORATIONS WILL BE INSTALLED AT EITHER THE TEN O'CLOCK OR TWO O'CLOCK POSITION ON THE PIPE CIRCUMFERENCE

90° BENDS ARE NOT ALLOWED ON WATER SERVICE LINES. IF A 90° TURN IS NECESSARY IT WILL BE DONE WITH TWO 45° DEGREE ELBOWS WITH A 2' MIN STUB BETWEEN.

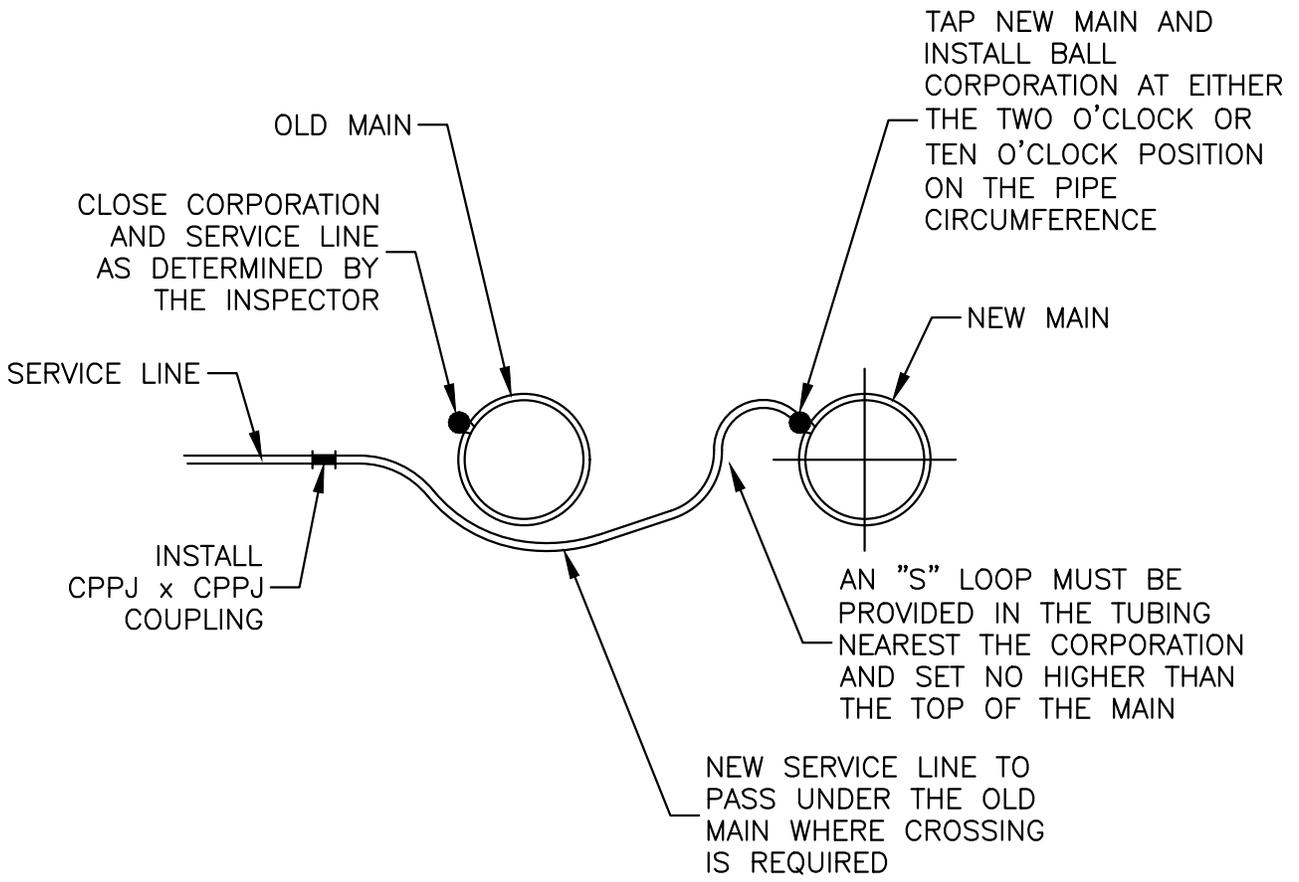
2' MIN

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>  <b>WATER SERVICE THROUGH FOUNDATION</b>	SECTION:	WATER		
1	R FIRE VALVE	4.15		DRAWING NO.	W-10		
-	-	-		DATE:	12/08	PAGE:	1
-	-	-					
-	-	-					



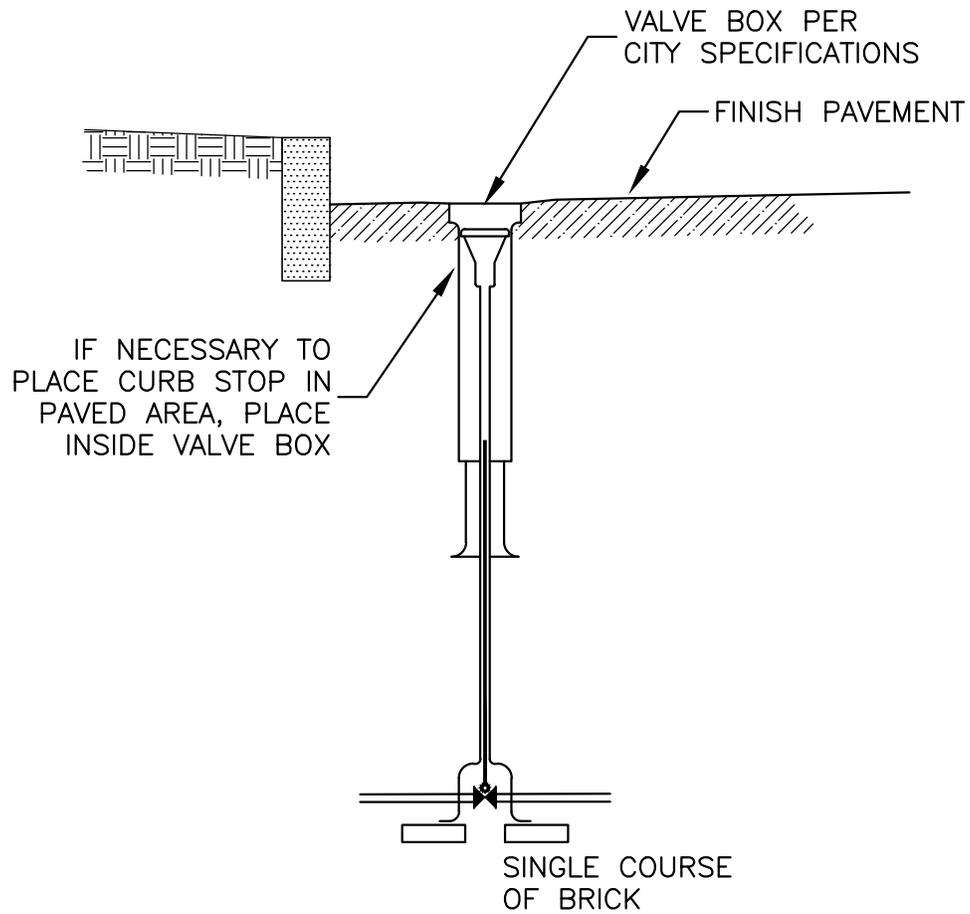
NOTE: ALL HARDWARE SHALL BE REMOVED AND A BRASS PLUG INSERTED INTO PIPE

NO.	REVISION	DATE	<b>City of Concord Engineering Services Division</b>	SECTION:	WATER
1	TAPE LOCATION	11.11		DRAWING NO.	W-11
2	DRAFTING	11.11	<b>AIR RELEASE VALVE (FOR TESTING PURPOSES ONLY)</b>	DATE:	12/08
-	-	-		PAGE:	1
-	-	-			

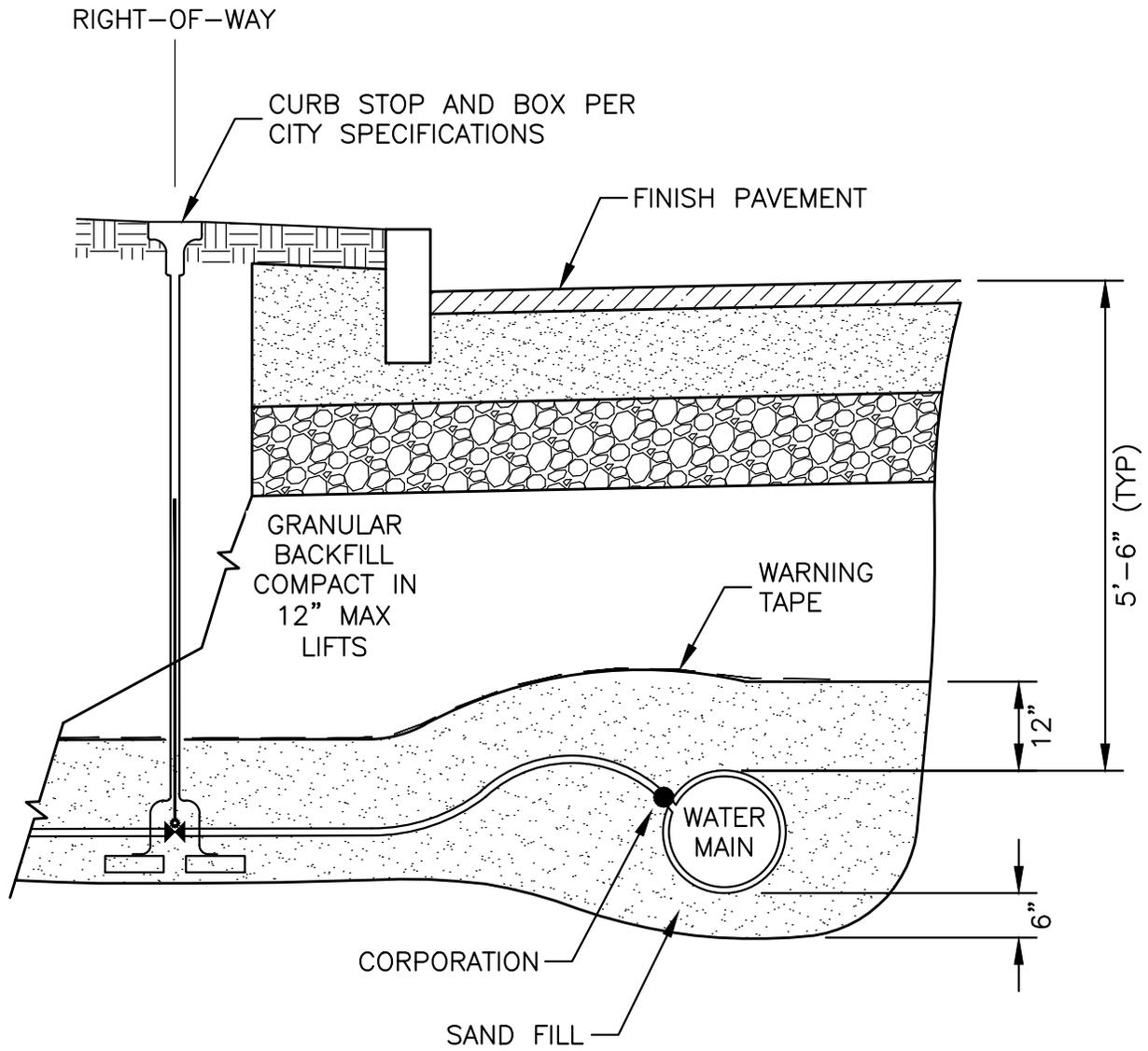


NOTE: DO NOT TIE OVER UNUSED OR ABANDONED SERVICES

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	WATER
-	-	-	<b>WATER SERVICE TIE OVER</b>	DRAWING NO.	W-12
-	-	-		DATE:	3/13
-	-	-		PAGE:	1
-	-	-			

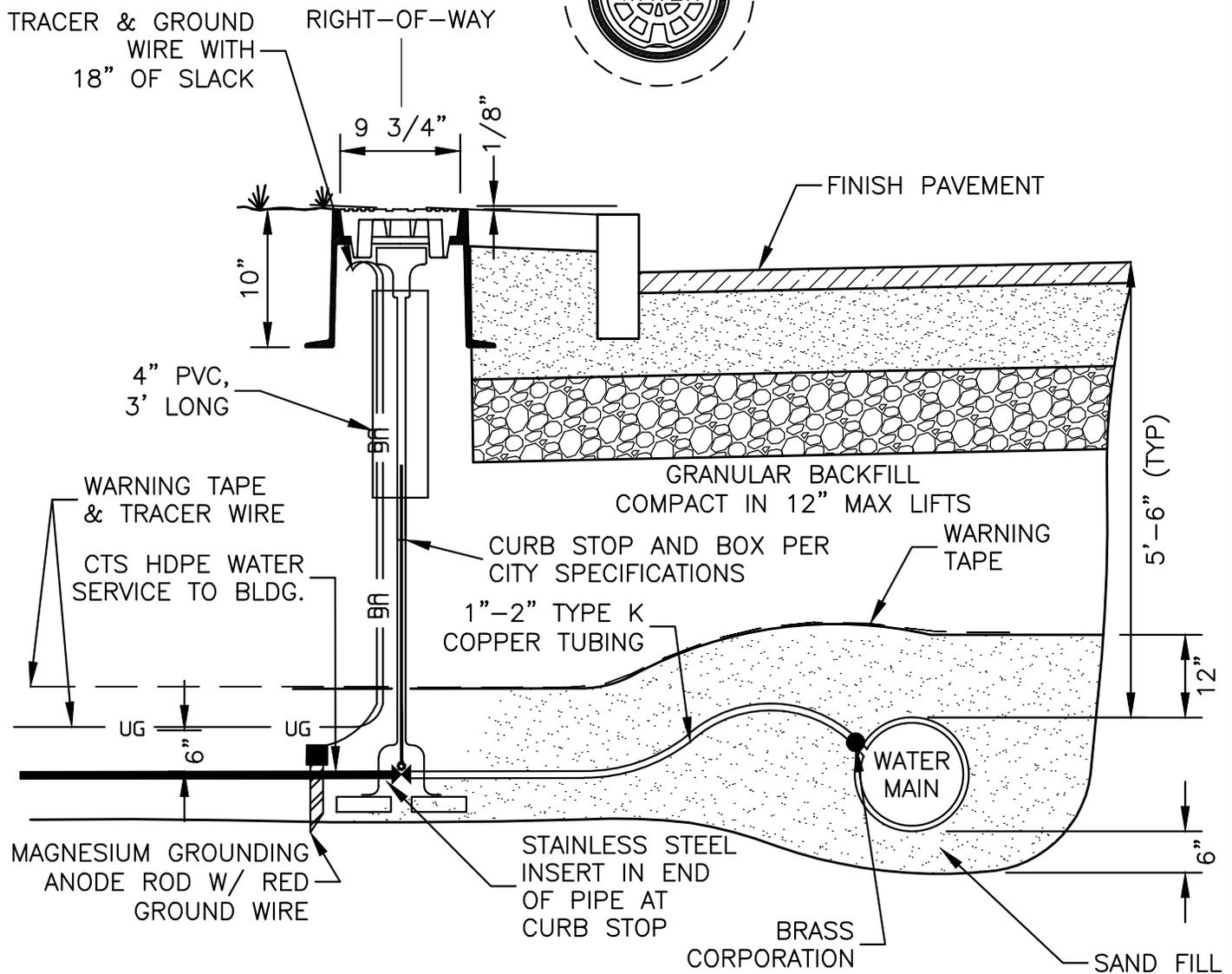


NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	WATER
-	-	-	<b>CURB STOP IN PAVEMENT</b>	DRAWING NO.	W-13
-	-	-		DATE:	3/13
-	-	-		PAGE:	1
-	-	-			



TAP MAIN AND LAY COPPER TUBING PER THE WATER SERVICE TIE OVER DETAIL

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION:	WATER	
1	MARKING TAPE	12/13	<b>WATER SERVICE INSTALLATION</b>	DRAWING NO.	W-14	
-	-	-		DATE:	11/11	PAGE:
-	-	-				1
-	-	-				



**LOCATOR BOX:**

1. LOCATOR BOX AND COVER SHALL BE CAST IRON
2. LOCATOR BOXES SHALL BE SET AT 500' INTERVALS AND AT BENDS.
3. PROVIDE 18" WIRE LOOP INSIDE THE LOCATOR BOX
4. LOCATOR BOXES SHALL BE SET AT GRADE IN CROSS COUNTRY LOCATIONS AND 1/8" BELOW PAVEMENT, TAPERED OVER 2'

**TRACER WIRE:**

1. CONTINUOUS, DIRECT BURIAL RATED
2. 12 AWG HIGH STRENGTH SOLID CORE COPPER CLAD STEEL
3. COATING COLOR SHALL CONFORM TO THE APWA UNIFORM COLOR CODE

**REPAIRS:**

1. SPLICES SHALL BE MADE WITH CORROSION PROOF, LOCKABLE WIRE CONNECTORS

NO.	REVISION	DATE	City of Concord Engineering Services Division	SECTION: UTILITIES
-	-	-	<b>WATER SERVICE TRACER WIRE INSTALLATION</b>	DRAWING NO. W-15
-	-	-		DATE: 05/18
-	-	-		PAGE: 1
-	-	-		

(this page intentionally left blank)

## APPENDIX B: BACKFLOW PREVENTION DEVICES

### 01. APPROVED BACKFLOW DEVICES & ASSEMBLIES

The City of Concord requires all customers to follow the New Hampshire Code for Backflow Prevention ([Env-Dw 505](#)) to prevent contamination of the water distribution system. All domestic backflows installed after January 4, 2014 must be lead free compliant with the [EPA Reduction of Lead in Drinking Water Act](#). The degree of hazard will be determined by Concord General Services' Cross-Connection Program. Devices not found on this list may be approved if they are compliant with NH Env-Dw 505 and USC/ASSE.

#### A. Residential Domestic Dual Check (DC)

MANUFACTURER	MODEL	SIZE(S)
Watts	LF7RU2-2	½", ¾", 1"
Wilkins	700XL	½", ¾", 1"

#### B. Irrigation Pressure Vacuum Breaker (PVB)

MANUFACTURER	MODEL	SIZE(S)
Febco	765	½", ¾", 1", 1 ½", 2"
Watts	008	½", ¾", 1"
Watts	800	½", ¾", 1", 1 ½", 2"
Wilkins	420	½", ¾", 1"
Wilkins	460	½", ¾", 1"
Wilkins	720A	½", ¾", 1", 1 ½", 2"

#### C. Low hazard industrial/commercial /double check valve assembly (DCVA)

MANUFACTURER	MODEL	SIZE(S)
Ames	Colt Series	2 ½" – 10"
Ames	Maxim Series	2 ½" – 10"
Ames	Silver Bullet	2 ½" – 12"
Conbraco/Apollo	4A	¾", 1", 1 ½", 2"
Febco	850	½" – 10"
Febco	870V	2 ½" – 8"
Watts	007	½" – 3"
Watts	709	2 ½" – 10"
Watts	719	¾" – 2"
Watts	757	3" – 10"
Watts	774	2 ½" – 10"
Wilkins	350XL	¾", 1", 1 ½", 2"
Wilkins	950 XLT2	¾", 1", 1 ½", 2"
Wilkins	350	2 ½" - 10"
Wilkins	450	2 ½" - 10"

APPENDIX B: BACKFLOW PREVENTION DEVICES

D. High hazard industrial/commercial/ irrigation/reduced pressure zone (RPZ)

MANUFACTURER	MODEL	SIZE(S)
Conbraco/Apollo	4A	½", ¾", 1", 1 ½", 2"
Febco	825Y	¾", 1", 1 ½", 2"
Febco	860	½" – 10"
Watts	009	½" – 3"
Watts	909	¾" – 10"
Watts	919	¾", 1", 1 ½", 2"
Watts	957	2 ½" – 10"
Watts	994	2 ½" – 10"
Wilkins	375 XL	½", ¾", 1", 1 ½", 2"
Wilkins	975 XL	½", ¾", 1", 1 ½", 2"
Wilkins	375	2 ½" – 10"
Wilkins	475	2 ½" – 10"

Please call (603) 225-8693 if you have any questions regarding backflow prevention or accepted devices.

See a [full list](#) of approved backflow prevention assemblies from the USC.