2009
CONSTRUCTION STANDARDS AND DETAILS

CITY OF CONCORD
NEW HAMPSHIRE

Index of Sheets

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:

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

A. Standard Specifications and drawings for Road and Bridge Construction of the New Hampshire Department of Transportation, 2006 Edition, as most recently adopted.

B. Administrative Rules: Env-Wq 700 Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities.

C. Administrative Rules: Env-Ws 415 Permits for RSA 485-A:17 Activities (Alteration of Terrain)

D. Administrative Rules: Env-Wq 1500 Alteration of Terrain (when adopted)

E. Policy Relating to Driveways and Access to the State Highway System, NHDOT, Bureau of Highway Maintenance.

F. Manual on Uniform Traffic Control Devices for Streets and Highways, published by the United States Department of Transportation, Federal Highway Administration; 2003 Edition.

G. Requirements of the Community Development Department Street Excavation, Driveway and Encumbrance Permits.

H. Subdivision and Site Plan Regulations and the Municipal Code of Ordinances of the City of Concord, New Hampshire.

I. City of Concord's Building and Plumbing Codes, and the International Plumbing Code, 2003 Edition.

J. Occupational and Safety Health Administration and The City of Concord Confined Space Entry Policy, latest edition.

K. Construction Observation Manual (COM), City of Concord, 2004 Edition.

L. A Policy on Geometric Design of Highways and Streets, AASHTO, 2004 Edition.

M. Roadside Design Guide, AASHTO, 3rd Edition 2006, with updated Chapter 6

Inspection Requirements

THE CONTRACTOR/DEVELOPER/OWNER SHALL BE RESPONSIBLE FOR ALL COSTS INVOLVED IN REQUIRED TESTING, AND WILL BE BILLED FOR ALL INSPECTIONS AND TESTING PERFORMED BY CITY FORCES.

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.

Construction Item	Division	Contact Person
Bridge information **D**riveway permits **S**anitary sewer systems **S**torm drain systems **S**treet encumbrances **S**treet excavations **S**treet construction **S**treet records **T**raffic counting **W**ater service systems	**E**ngineering **S**ervices	City Engineer (603) 225-8520
Building construction inspection: electrical, mechanical, & plumbing **F**ire protection systems and life safety code **H**ealth & food service licenses **H**ousing code **S**ign & yard sale permits **Z**oning Ordinance	**B**uilding and **C**ode **S**ervices	**C**ode **A**dministrator (603) 225-8580
Landscaping **S**ite compliance **S**ubdivision regulation	**C**ommunity **P**lanning	**C**ity **P**lanner (603) 225-8515
Municipal fire alarm cable **T**raffic signal systems	**F**ire **A**larm/ **T**raffic **S**ignals	**F**ire **A**larm **S**uperintendent (603) 225-8667

General Services Department		
Automated meter reading **B**ackflow prevention **W**ater metering **W**ater and **S**ewer Investment Fees	**A**dministration	**W**ater **S**upervisor (603) 225-8693
Sewer maintenance **W**ater maintenance **R**oadway maintenance **S**torm drain maintenance	**H**ighways and **U**tilities	**H**ighway & **U**tility **S**uperintendent (603) 228-2737

General Requirements

A. Site Conditions

The Contractor shall promptly notify the City Engineer of any unusual conditions such as:

1. Subsurface or latent physical conditions at the site differing materially from those indicated on the approved plans;

2. 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.

3. 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.

B. DIG SAFE

The contractor shall be responsible for contacting Dig Safe 1-888-344-7233 (**1-888-DIG-SAFE**) <u>at least 72 hours prior to commencement of work</u>. The City is a member of Dig-Safe, yet the Contractor shall 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.

C. Control Of The Work

Responsibility of Contractor:

The contractor is responsible for the construction of all improvements as shown on the approved plans. The contractor shall employ a competent construction supervisor or management team 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 prior to commencement of the work.

Permits:

A **Street Excavation Permit** and possibly an **Encumbrance Permit**, available from the Engineering Services Division will be required for all work within the City of Concord's Right-Of-Way. The DIG-SAFE Request Number is required on the Street Excavation Permit. 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.

Prior to the issuance of the Street Excavation Permit, the Contractor shall furnish an original copy of a $1,000,000.00 Liability Insurance and a bond in the amount requested by the Engineering Services Division. The proof of insurance and bond amount must be submitted at the time of the permit request. It should be noted that, the bond amount will be held for a two (2) year period in case any workmanship deficiencies arise within the City of Concord's Right-of-Way.

The permits are a formal agreement for which the contractor assumes all responsibility and liability resulting from their activities within the public right-of-way.

Compliance to Requirements:

The contractor shall provide all City staff safe access to the work for the purpose of ascertaining that the work is in accordance with City requirements, even to the extent of uncovering or taking down portions of finished work.

Dust & Noise Control:

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. 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.

City Ordinance Article 13-6-8 (Public Nuisance) has deemed any noise generated from construction activities that are clearly audible other than between 7:00 a.m. and 7:00 p.m. on weekdays to be a public nuisance. Contractors can only work from 9:00 a.m. to 7:00 p.m. on Saturdays and no work shall be performed on Sunday unless it is an emergency and a waiver has been approved by the City of Concord Code Administrator. Refer to the article for further information regarding Holiday work restrictions.

The contractor shall also comply with the **2004 Policy on Construction Practices in the City of Concord to Minimize Disturbance and Damages.** In summary, this policy describes that the City Engineer has the authorization to instruct the contractor to monitor vibrations not only during blasting operations but also during intensive construction projects (i.e., deep roadway cuts but not limited to, in close proximity to homes, etc.) to minimize disturbances to the surrounding neighborhood. The City Engineer will enforce the guidelines from NHDOT Standard Specifications for Road and Bridge Construction - Section #203 and #211.

D. Backfill and Compaction

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.

Backfill and fill material used in roads, travel ways and shoulders shall be natural material excavated from the trench during construction excluding: 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. 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. Water jetting or ponding methods of compaction shall not be allowed.

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 their agent. 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.

E. Confined Space Entry

Definition:

Confined spaces normally include tanks, vessels of any type, underground pump stations, manholes and catch basins, vaults, meter pits, chemical storage areas, pipe chases, etc. Under certain conditions, such as the presence of soil contamination or organic deposits, open construction trenches may be determined confined spaces.

Policy Requirements:

Should any Contractor, Skilled Trade Worker, or Private Individual find it necessary to enter a confined space owned, maintained or operated by the City of Concord they must comply with the City of Concord's Confined Space Entry Policy.

Should a City employee be required on a private site; the Contractor shall comply with the Occupational Safety and Health Administration requirements and the City of Concord's Confined Space Entry Policy.

F. Maintenance of Traffic

This work shall consist of providing and maintaining safe and passable traffic accommodations for public travel, preventing dust nuisance, 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 their designee. All traffic control devices used on street and highway construction, maintenance, utility or incident management operations shall conform to the Manual on Uniform Traffic Control Devices (MUTCD).

One Lane / Shoulder Closure:

The Contractor shall provide and maintain a sufficient surface for at least one lane of traffic, (minimum 12-feet width), controlled by the use of flaggers, 2-way radios or pilot vehicles. Construction materials or equipment shall not be left within the public right-of-way during work suspensions.

A Temporary Traffic Control Plan (TTCP) will be required for maintaining vehicle and pedestrian traffic for most sites. The traffic control plan must be designed, submitted and signed by a qualified traffic control engineer. The TTCP shall be submitted to the City Engineer for review <u>at least two (2) weeks prior to the Mandatory Preconstruction Meeting</u>. <u>Under no circumstances will a "marked-up, hand copy" be deemed as a TTCP</u>.

Road Closure:

Should a road closure be necessary, the contractor is responsible for submitting a TTCP, in accordance the *Manual on Uniform Traffic Control Devices* (MUTCD) and a written request for the proposed closure <u>at least two (2) weeks prior to the closure to the City Engineer for review.</u> The traffic control plan must be designed, submitted and signed by a qualified traffic control engineer. <u>Under no circumstances will a "marked-up, hand copy" be deemed as a TTCP</u>.

The City Engineer will review and then provide his/her recommendation to the City Manager for the approval of the proposed road closure. <u>No roadway closure can occur without the approval from the City Manager.</u>

Sidewalk:

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.

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 crosswalk that is disrupted by excavation, construction, or construction activity, care must be taken to preserve curb ramp access to the perpendicular crosswalk. This may require additional pedestrian channelization if only a single diagonal curb ramp serves the corner. Pedestrian barricades and channelizing devices shall be continuous, stable, and non-flexible and shall consist of a wall, fence, or enclosures specified in section 6F-58, 6F-63, and 6F-66

of the MUTCD. A continuous bottom edge shall be provided 6" maximum above the ground or walkway surface. Devices shall provide a continuous surface or upper rail at 3' minimum above the ground or walkway surface. Support members shall not protrude into the alternate circulation path.

Construction Signs:

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.

All construction signs as shown on the plans or as ordered by the City Engineer or their designee 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, 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.

Barricades:

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.

Lighting:

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.

G. 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.

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.

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.

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 <u>not open to the public</u>.
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.

Streets/Sidewalks

A. 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.

B. Materials

Certificates of Compliance shall be submitted by the Contractor for each material to the City of Concord's Representative for review and approval.

The materials shall be subject to rejection at any time due to failure to meet any of the specification requirements.

Base Materials

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

Sieve Size	% Passing
3 Inch	100
2½ 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.

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

Sieve Size	% Passing
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.

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

Sieve Size	% Passing
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.

Pavements

Bituminous Concrete Base Course: Base course materials shall conform to the specifications in Section 401 of the NHDOT Standard Specifications for ¾ inch aggregate pavement.

Bituminous Concrete Wearing Course: Wearing course material shall conform to the specifications in Section 401 of the NHDOT Standard Specifications for ½ inch aggregate pavement.

Pavement Overlay: The pavement overlay material shall conform to the specifications in Section 401 of the NHDOT Standard Specifications for ½ inch pavements.

Portland Cement Concrete: Concrete shall be NHDOT Class AA, 4000 psi, reinforced as shown in the City of Concord's Construction Details.

Curb

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.

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.

Cement: Cement shall be straight Portland Cement, Type I, II, or a Type I/II.

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

Sieve Size	% Passing
No. 8	100
No. 16	60-100
No. 50	15-35
No. 100	2-15
No. 200	0–5

Sidewalks

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.

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.

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.

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.

Street Lights

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

Guardrail

Where guardrail and terminal end 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 and Terminal Units. If the owner/developer/contractor wishes to deviate from the requirement, a written request shall be sent to the City Engineer for review and approval/disapproval.

Certificates of Compliance shall be submitted by the Contractor for each material to the City of Concord's Representative for review and approval.

Posts with hollow knots, plugged holes, or season checks exceeding ¼ inch in width will be rejected.

Signs

Street Signs: Street signs shall be fabricated in accordance with the Manual on Uniform Traffic Control Devices. Street sign letters will be 6-inches tall on a 9-inch aluminum backing

Pedestrian and School Crossing Signs: Pedestrian and school crossing signs shall have a florescent yellow-green background with black legend and border.

Sign Posts: Sign Posts shall be green enamel 3#/ft flanged channel steel.

Right-of-Way Bounds

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

C. Construction Requirements

The Community Development Department in conjunction with the General Services Department will oversee all work related to these utilities. 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.

Clearing and Grubbing

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.

Blasting Operations

Slopes: When blasting is required, the required slopes or configuration shown on the plans shall be produced in a safe and stable condition.

Authority to prohibit blasting: The City Engineer or their agent 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.

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.

Seismic monitoring for frequency and acceleration will be required should adjacent structures be threatened.

The contractor shall also comply with the **2004 Policy on Construction Practices in the City of Concord to Minimize Disturbance and Damages.** In summary, this policy describes that the City Engineer has the authorization to instruct the contractor to monitor vibrations not only during blasting operations but also during intensive construction projects (i.e., deep roadway cuts in close proximity to homes, etc.) to minimize disturbances to the surrounding neighborhood. The City Engineer will enforce the guidelines from NHDOT Standard Specifications for Road and Bridge Construction - Section #203 and #211.

Unsuitable Material

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.

Backfilling

Backfilling shall be done with approved materials and shall meet the requirements for: sand, gravel, broken rock or any combination thereof.

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.

Subbase Application

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.

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.

Bituminous Concrete Pavement Application

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 one foot (1') narrower on each side to allow for the installation of the curb.

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 previous 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.

Environmental conditions: The asphalt binder/base pavement shall be placed only when the underlying crushed gravel surface is dry, frost free and the surface temperature is 40° Fahrenheit and rising. For the placement of the final asphalt wearing course, the surface temperature of the binder material must be 50° Fahrenheit and rising.

Waiver of environmental conditions: In special instances when the City Engineer determines that it is in the best interest of the City of Concord, the above requirements may be waived for base course pavement only. Any material delivered to the spreader having a temperature lower than 250° Fahrenheit shall not be used.

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.

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.

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. The rate of application shall be between 0.02 and 0.05 gal/SY, as determined by the City Engineer. Prior to the application of the tack coat, the asphalt binder surface shall be cleaned to the satisfaction of the City of Concord's Representative. The use of a street sweeper may be required depending on the cleanliness of the surface.

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.

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.

Compaction: Immediately after the bituminous mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling. The initial rolling shall be done with a static or vibratory steel-drum roller. Intermediate rolling shall be done by a pneumatic-tired roller. Final rolling shall be done with a static steel-drum roller or a roller of the steel-drum three-axle type, locked. Rollers must be in good mechanical condition, free from excessive backlash, faulty steering mechanism, or worn parts.

Pneumatic-tire rollers shall be self-propelled and shall be equipped with smooth tires of equal size and diameter. The wheels shall be so spaced that one pass of a two-axle roller accomplishes one complete coverage. The wheels shall not wobble and shall be equipped with pads that keep the tires wet. The rollers shall provide an operating weight of not less than 2,000 lb per wheel. All tires shall be maintained at a uniform pressure between 55 and 90 psi with a 5 psi tolerance between tires. A suitable tire pressure gauge shall be readily available.

Unless otherwise directed, rolling shall begin at the sides and proceed longitudinally parallel to the roadway center line, gradually progressing to the crown of the roadway. The overlap shall be one-half the roller width for wheeled rollers and 6 in for vibrating rollers. No overlap is required for pneumatic-tired rollers. When paving in echelon or abutting a previously placed lane, the longitudinal joint shall be rolled first followed by the regular rolling procedure. On superelevated curves, the rolling shall begin at the low side and progress to the high side by overlapping of longitudinal passes parallel to the centerline.

Along forms, curbs, headers, and similar structures and other places not accessible to a normal full-sized roller, sidewalk rollers weighing at least 2,000 lb (900 kg) shall be used. Where rollers are impracticable, the mixture shall be thoroughly compacted with heated or lightly oiled hand tamps or vibrating plate compactors.

Bituminous Concrete Pavement Full Width Overlay

General Requirements: It shall be the responsibility of the contractor to 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. A leveling or shim course of pavement may be required by the City Engineer, to produce a uniform roadway section.

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.

Portland Cement Concrete Pavement Repair

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.

Vertical Granite Curb

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.

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.

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 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.** Concrete or flowable fill shall not be placed along the face of curb.

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

Slope Granite Curb

Slope granite curb shall be placed at locations as noted on the plans with a 5-inch reveal above the finish pavement. 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 of less.

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.

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 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.**

NHDOT Item 520.421 – Class "F", Excavatable Flowable Fill may be used as backfill BEHIND the curb. Concrete or flowable fill shall not be placed along the face of curb.

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

Mortar

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.

Sidewalks

Sidewalk: Sidewalks shall comply in all respects to the most recently adopted State of New Hampshire Code for Barrier Free Design and the most recent guidance 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 transverse slope of 2%, sloping towards the street, driveway or parking area. All measurements shall be taken from the top of the granite curbing.

Curb Ramps: 6" reinforced concrete sidewalk with detectable warning panels shall be constructed at all intersections and at commercial driveways which (per the Revised Draft Guidelines for Accessible Public Right-of-Way, November 23, 2005, Advisory R221) are provided with traffic control devices or otherwise are permitted to operate like public streets.

Preparation of the base: Preparation of the base shall be accomplished by removing material to a depth of 7-inches below finish grade, except at drive locations where it shall be excavated 9-inches below finished grade. Any unsuitable material found will be removed and replaced with crushed gravel as directed.

Crushed Gravel: The excavated area shall be filled with 4-inches of crushed gravel except at driveways where 6-inches of crushed gravel shall be used.

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.

Bituminous Concrete Pavement Sidewalk

Placement: Pavement shall be a minimum 3" total thickness placed using a sidewalk or street paver in two lifts (1½" base course, 1½" wearing course).

Portland Cement Concrete Sidewalk

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.

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.

Curing: During curing, concrete shall be protected from loss of moisture, rapid temperature change and mechanical injury for a minimum of three days following the placement. Following the curing period, an approved concrete sealer shall be applied at the rate recommended by the manufacturer.

Joints: Joint pattern shall be detailed on the construction plans and shall not be altered without prior approval of the City Engineer. 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.

Guardrail

Placement: Wood posts shall be set plumb. All wood posts shall be retreated after drilling or sawing. The wood block-outs shall be "toe nailed" to the rectangular wood posts.

Street Signs

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).

Right-of-Way Bounds

Right-of-Way bounds shall be set 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.

D. Inspection Requirements

The City of Concord will provide full time inspection during all preparation and paving operations at the Contractor's expense.

E. Testing Requirements

The City of Concord's 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 shall be completed by an approved testing agency at the contractor's expense.

Density testing

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 minimum of 100 ft between tests. Nuclear density methods will be governed by ASTM D2922.

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 of Concord's Representative AT LEAST 24-HOURS IN ADVANCE OF THE PAVING OPERATIONS.

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.

Street Lights

All street lighting and traffic signal installations shall be in place and operational before final acceptance and reduction of financial guarantees.

Sanitary Sewer Systems

A. 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.

B. Materials

Certificates of Compliance shall be submitted by the Contractor for each material to the City of Concord's Representative for review and approval.

The 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. Only new materials will be accepted for installation.

THE COMMUNITY DEVELOPMENT DEPARTMENT, ENGINEERING SERVICES DIVISION, RESERVES THE RIGHT TO REQUIRE A SAMPLE FOR EVALUATION OF ANY ITEM SUPPLIED. ALTERNATE ITEMS MUST RECEIVE PRIOR APPROVAL OF THE CITY ENGINEER.

Storage and Handling of Materials

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.

Storage of cement: Cement shall be stored under cover, off the ground, and shall be kept completely dry at all times.

Storage of reinforcing steel: All reinforcing steel shall be stored off the ground, or otherwise to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water to minimize rusting.

Precast concrete handling: Precast concrete units shall be handled in a manner to prevent chipping or cracking.

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.

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.

Sewer Mains

Polyvinyl Chloride (PVC) pipe:

Gravity pipe and fittings shall conform to ASTM D-3034 and shall be SDR 35. Pipe and pipe fittings between manholes are to be of the same manufacturer. Joint compression rings shall be of an oil resistant rubber type or flexible elastomeric seals conforming to ASTM D-3212. Manufacturer's certificate of compliance shall be furnished to the City prior to installation.

Pressure pipe and fittings shall conform to ASTM D2241 and shall be SDR 26 or approved equal.

Reinforced concrete pipe (RCP):
Pipe shall conform to the standard specifications for reinforced concrete sewer pipe, ASTM Designation C76; pipe shall be Class V.

The pipe interior shall comprise a continuous internal concrete skin and shall be smooth and even, free from roughness, projections, indentations, offsets, corrugations, exposed reinforcing or, other irregularities.

The pipe shall be clearly marked as required by ASTM C76, and shall not be shipped until 5 days after manufacture. Pipes that have been damaged during or after delivery will be rejected, and if such pipe has already been laid it shall be acceptably repaired (if permitted), or removed and replaced.

Ductile iron (DI) pipe:
Ductile iron pipe shall conform to ANSI/AWWA C150/A21.50 (pressure class pipe) with size as shown on the drawings. Pipe shall have either the rubber ring type, push on joint, or standard mechanical joint. Rubber gasket joints shall conform to ANSI A21.11 for mechanical and push on type joints. All pipe and fittings shall have a cement mortar lining and bituminous seal coat on the inside, and a coal tar enamel coat on the outside.

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 of Concord's Representative.

Repair Couplings

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 of Concord's Representative.

Structures and Appurtenances

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.

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.

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.

The use of water plug is permitted for special applications where the City Engineer deems appropriate.

Frames and Covers: North American and India castings are allowed, provided the India castings are from SIGMA Corporation or approved equal. All castings shall be designed for H-20 Loading.

Sewer Service Laterals

Building service connections are to be SDR 35 or SDR 26 PVC pipe. Cast iron pipe and ductile iron pipe may be used should conditions warrant.

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. 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.

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.

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

Sieve Size	% Passing
No. 8	100
No. 16	60-100
No. 50	15-35
No. 100	2-15
No. 200	0–5

Sand Bedding / Blanket

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

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

*Fraction passing the #4 sieve

Crushed Stone Bedding

Crushed stone shall be ¾ inch (ASTM #67) stone and meet the following gradation requirements:

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

C. Construction Requirements

The Community Development Department in conjunction with the General Services Department will oversee all work related to these utilities. 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.

Work under the control of the General Services Department

The contractor may make the tap onto a sewer main and install service laterals to the property line, or request the General Services Department's utility forces to install services should they be available. In the former, the contractor will be required to deposit the funds estimated to cover the cost of the City's Inspector assigned to the project. In the latter case, the applicant will be required to deposit separate funds estimated to cover the cost of the General Services Department's utility forces (not to be confused with the Engineering Services Division inspection fees).

Laying Sewer Pipe

1. Sewer manholes are required at every change in vertical grade or horizontal pipe alignment along a main. Cleanouts are required along sewer services as noted below.

2. 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 of ductile iron pressure class pipe until the minimum 10-foot separation can be achieved.

   Whenever sewers must cross over water mains, the sewer shall be constructed of ductile iron pressure class pipe for a minimum distance of 9 feet each side of the crossing. Joints shall be water pressure rated with zero leakage when tested at 25 pounds per square inch for gravity sewers and 1½ times working pressure for force mains, and joints shall not be located within 9 feet of the crossing point.

   Should the vertical separation of the sewer and water main be less than 18", the water main or the sewer main must be relocated to achieve the required separation.

   In conflicts requiring the relocation of utilities, preference shall be given:
   a. to utilities with grade restrictions.
   b. to existing utilities already in service.

3. Sewer service lateral sizing shall be as follows:
   a. Single residential unit = 4-inch minimum.
   b. Commercial, Industrial or multifamily = 6-inch minimum.

4. 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%

5. All pipe utilizing Bell and Spigot joints shall be laid with the spigot end downstream. Bells will not be permitted in structures.

6. Green detectable "sewer" tape shall be installed in the sewer trench on top of the 12-inch sand blanket on all sanitary sewer mains and services.

7. Whenever feasible, all service connections shall be tied into a sanitary sewer manhole, if this is not possible then sanitary sewer service connections shall be accomplished by using an approved <u>sanitary tee</u> fitting, as described in the City of Concord's Building and Plumbing Code Regulations, at the sanitary sewer main in the City street. The connection shall be made in accordance with the City of Concord's Building and Plumbing Code Regulations, and the International Plumbing Code.

8. 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.

9. Should an existing sanitary sewer service lateral need to be replaced, it shall conform to the standards described here within.

10. Service laterals greater than six (6) inches in diameter <u>must</u> terminate in a sanitary sewer manhole structure.

11. Ninety degree (90°) bends are **not** permitted for sanitary sewer service connections.

12. A backflow valve shall be installed where plumbing fixtures are subject to backflow from the public sewer (BOCA Plumbing Code P-1003.2). Generally where the first floor elevation is lower than the street this will be required.

13. 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 of Concord's Representative.

14. 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 of Concord's 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.

15. Prior to 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 for review 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.

16. **Driveways should be avoided when determining the path of the service lateral.**

Installing Sewer Manholes, Frames and Grates

1. Should more than 4 service laterals be proposed for one manhole, then a 60-inch minimum inside diameter structure will be required.

2. Inside drop structures for mainline sewer construction require a minimum 60-inch inside diameter manhole. Manholes with service connections greater than 6-inches in diameter also require a 60-inch minimum manhole diameter. Inside or outside drop service connection details must be submitted to the Engineering Services Division for approval prior to construction. Larger structures are preferred over outside drop structures for new construction.

3. Inside drop house service connections are preferred over outside drop service connections.

4. The use of sanitary sewer "doghouses" are not permitted unless approval has been granted by the City Engineer.

5. All cast iron manhole frames and covers are to be set no less than 1/8-inch lower or no more than 1/4 inch lower than finish pavement.

6. 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).

Cleanouts

Cleanouts shall be constructed on service laterals as directed by the City's inspector and shall be located as follows:

1. 4 inch and 6 inch service: One cleanout is required prior to any horizontal and/or vertical directional change greater than 45°. 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.).

2. Cleanouts will be constructed using wyes (either 4x4x4 or 6x6x6 inch) and incorporating a 45° elbow to bring the stack vertical.

3. A cast iron cleanout box with cover marked "sewer" is required over 4" & 6" sewer service cleanouts.

4. 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 structure.

5. Each individual unit will have its own service connection and shall be accompanied by its own individual cleanout.

6. Cleanouts shall be located outside of the City of Concord's R.O.W.

7. Cleanouts shall be located one per 100' with no greater than 100-feet separation unless otherwise directed by the BOCA Plumbing Code.

8. Cleanouts shall be the same diameter as the carrying pipe, except for cleanouts on service laterals greater than six (6) inches, where a six (6) inch cleanout is acceptable.

9. Cleanouts shall be installed just upstream of bends (manufactured fittings). Only one cleanout is necessary when two 45º bends are used to make up a 90º turn. A minimum of 2-feet of exposed pipe is required between bends.

10. A cleanout is required should a service lateral diameter be reduced between the building and the sewer main.

Excavation

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.

Crushed Stone Bedding

Contractor shall place ¾" crushed stone: 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 D2321-89.

Mortar

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.

Brick Masonry

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.

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.

All brickwork used to adjust manhole and catch basin frames to grade shall be sealed on the outside of the structure with mortar.

Inverts: 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.

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.

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 for review and approval.

Only solid masonry construction will be accepted under the brick shelf.

Adjusting Frames To Grade: Frames shall be centered over the manhole opening and are to be set no less than 1/8-inch lower or no more than 1/4 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.

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 of Concord's Representative, and observed prior to backfilling.

Discontinued Services: 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.

Discontinued service connections are normally retired at the right-of-way. The service shall be cut and plugged with brick and mortar. If the service is connected to a manhole, the pipe should also be plugged with brick and mortar where it enters the manhole.

D. Inspection Requirements

The Engineering Services Division's representative shall perform full time inspections to assure that all sanitary sewer work conforms to City standards.

Visual Inspections

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" 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 sanitary sewer video prepared by the General Services Division.

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. **All video inspections shall be performed by the City of Concord General Services Division**.

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. All structures are to be accessible to the video inspection vehicle and all pipelines shall be cleaned of all debris prior to the inspection. The presence of debris or insufficient flushing water will necessitate re-inspection following correction.

4. 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 of Concord's representative is cause for rejection.

5. Only tractor-type units will be utilized for mainline inspections, push cameras will only be allowed for lateral inspections.

6. The camera shall have pan and tilt capabilities.

7. The camera shall be approved by the manufacturer for the pipe size being inspected (typical camera is rated for 8"-24", without additional accessories).

8. 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).

9. The camera footage shall be shown on-screen.

10. The unit should be able to provide accurate footage, (1'±) and all measurements shall be taken from the center of manhole structures.

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 compete 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 ½" 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 or WRC compliant) and compiled into a video report to be submitted with the video inspection.

16. All video inspection submittals shall be DVD format, no VHS will 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. Contact the General Service Division for the current fee schedule.**

E. Testing Requirements

Sewer Main Low Pressure Air Testing

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 their designee. Should the contractor conduct their own test, an Engineering Services inspector must be present to witness the results.

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.

Testing of minor sewer service repairs may be accomplished by visual inspection where "air" and "hydraulic" methods would be impractical.

Deflection Testing

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.

Sewer Force Main High Pressure Air Testing

All sanitary sewer force mains shall be tested for air and water tightness. As with low-pressure air testing, sanitary force main pressure testing may be performed by an independent testing agency. All test results shall be submitted by the independent testing agency to The City of Concord's Representative for review.

Test requirements: The sanitary sewer main between structures, including laterals and all connections, regardless of length, must hold a positive pressure. Pressure for testing force mains should be a minimum of 100 PSI or higher as calculated according to the following formula: HEAD x 1.5 (safety factor) / 2.31 ft/lb = pressure. The static pressure must hold for one hour to be acceptable.

Sewer Service Testing

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.

Sewer Manhole Testing

Vacuum Test

The vacuum test method is the preferred method to insure manhole integrity; however, water exfiltration testing is an acceptable alternative.

All sanitary sewer manholes will be vacuum tested prior to backfilling around the structure. If the structure is struck by equipment during backfilling operations, the contractor shall be responsible for re-testing of the manhole. The initial test pressure is to be negative 10-inches of mercury. Maximum 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 l5 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.

Water Exfiltration Test

Water exfiltration test procedures for 4'-0" or 5'-0" diameter manhole structures are as follows:

The manhole pipelines shall be plugged and the structure filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage on the outside of the structure, the manhole structure shall be considered satisfactorily watertight. If the test as described above is unsatisfactory, as determined by the City of Concord's Representative, or if the manhole structure has been backfilled, the test shall continue.

A period of time shall be required for absorption. After absorption, the manhole shall be refilled to the top of the cone section and a measuring time of 8 hours begun. At the end of the test time, the manhole shall be refilled to the top of the cone section, being careful to measure the volume of water added. This amount shall be converted to the 24 hour rate per vertical foot of depth.

The rate is not to exceed 1 gallon per vertical foot for a 24 hour period. If the test fails this requirement, repairs by approved methods or total reconstruction of the manhole structure may be ordered by the inspector to bring the leakage within the allowable limits.

8-hour exfiltration test for 4'-0" diameter or 5'-0" diameter manholes

STRUCTURE HEIGHT	GALLONS ALLOWABLE LEAKAGE	MAXIMUM WATER DROP ALLOWED IN 30 INCH OPENING	
		FEET	INCHES
4’	1.3	0.0354	3/8
5’	1.7	0.0463	1/2
6’	2.0	0.0545	5/8
7’	2.3	0.0626	3/4
8’	2.7	0.0735	7/8
9’	3.0	0.0817	1
10’	3.3	0.0899	1-1/8
11’	3.7	0.1008	1-1/4
12’	4.0	0.1089	1-3/8
13’	4.3	0.1171	1-1/2
14’	4.7	0.1280	1-5/8
15’	5.0	0.1362	1-3/4
16’	5.3	0.1444	1-3/4
17’	5.7	0.1553	1-7/8
18’	6.0	0.1634	2
19’	6.3	0.1716	2-1/8
20’	6.7	0.1825	2-1/4

Water Systems

A. 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.

B. Materials

Certificates of Compliance shall be submitted by the Contractor for each material to the City of Concord's Representative for review and approval.

The 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. Only new materials will be accepted for installation.

THE COMMUNITY DEVELOPMENT DEPARTMENT, ENGINEERING SERVICES DIVISION, RESERVES THE RIGHT TO REQUIRE A SAMPLE FOR EVALUATION OF ANY ITEM SUPPLIED. ALTERNATE ITEMS MUST RECEIVE PRIOR APPROVAL OF THE CITY ENGINEER.

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 of Concord's 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 class rating and evidence of mishandling.

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. A maximum allowance for stacking height is included in the detail section according to pipe size

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.

Water Mains

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

Ductile Iron Pipe:

1. Ductile Iron Pipe 3" to 10" diameter shall be Pressure Class 350. Diameters greater than 10" shall be Thickness Class 52. Pipe shall meet, or exceed, current AWWA C151 specifications for ductile iron water pipe.

2. Maximum length is twenty and a half feet (20.5'). Double cement lining, seal coating inside and bituminous outside coating shall meet, or exceed, AWWA C104.

3. Push-on joints shall conform to current AWWA 111.

4. Pipe to be furnished complete with gaskets and lubricant.

Gate Valves:

1. All valves to be **mechanical joint**.

2. For sizes 3-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. Valves are to be supplied with all accessories.

3. Direction to open – **RIGHT (coded red)**

4. Acceptable makes and models:
   a. Clow - (F series)
   b. Kennedy - (Ken-Seal)
   c. Mueller G.V. (A-2360)
   d. M & H (style 4067)
   e. AFC-2500

5. Post indicator gate valves will be resilient seat and shall open to the **LEFT (coded black).**

Large Valves:

1. For valves larger than 12-inch, butterfly valves (valves shall have the same number of turns as a standard valve) or horizontal operating resilient wedge valves are required and must conform to or exceed current AWWA C504 unless otherwise approved by the City of Concord Representative. Valves are to be supplied with all accessories.

2. Direction to open – **RIGHT (coded red)**

3. Acceptable makes and models:
   a. Clow 4500
   b. Henry Pratt Co. "Groundhog"
   c. M & H 4500
   d. Mueller Lineseal III
   e. AFC-2500 series (horizontal operating)

Fittings:

1. Fittings shall be gray cast iron or ductile iron with mechanical joints. Fittings and accessories shall conform to or exceed current AWWA C153. Compact ductile iron fittings meeting AWWA C153 are acceptable. Fittings to be new, unused, free from rust, coated, and cement lined.

2. Ductile iron - Class 350.

3. Mechanical joints and accessories shall meet AWWA C111.

4. Double cement lining, inside seal coating and bituminous outside coating shall meet AWWA C104 for all fittings.

5. Restrained joints shall use Romac "Grip Ring / Meg-A-Lug" or approved equal.

Valve Boxes:

1. Base: 36-inch or longer to suit grade. No stacking of base sections is permitted.

2. Top: 5 1/4" x 24" or 26" with top flange - (Screw type is not acceptable).

3. Cover: marked "Water" supplied.

4. Two piece boxes are required.

5. Only North American Made valve boxes are acceptable.

Water Services

Backflow Prevention Devices:

Approved non-testable double-check backflow prevention devices will be required for residential use. Any American Water Works Association (AWWA) or University of Southern California (U.S.C.) approved dual-check is acceptable. Example: Watts #7, Hersey (BSG), Febco 810, Ford (Style H.H.A. or H.H.S.).

Curb Boxes:

1. 5½' curb box complete with 36" rod (single piece) and cover.

2. Perma Rod Box with arch pattern base. Number 3 cover with pentagon brass plug and quick-release thread.

3. Opens **LEFT** – 1/4 turn.

Copper Tubing:

1. Tubing shall conform to or exceed current ASTM specification B-88.

2. Sizes ¾" and 1" American made type "K" soft in 60 or 100 foot coils.

3. 1½" & 2" - American made type "K" soft in straight lengths or coils.

4. **No 1¼" services.**

5. 3" Cement Lined Ductile Iron may be substituted for 2" copper tubing.

Brass Fittings - (For Underground Use):

1. Acceptable makes of fittings: ball valve, curb stops and plug type or ball valve type corporation stops with conductive compression connections:
   a. Ford
   b. Mueller
   c. McDonald
   d. Hays
2. **"Stop and Waste valves" are not allowed.**

Meter Settings:

1. 5/8" x 3/4" meter horn with backflow prevention device.

2. 1" meter horn with backflow prevention device.

3. Meter horns shall be isolated with full open valves per the City of Concord's Building and Plumbing Code Regulations and the International Plumbing Code, 2003 Edition.

4. Backflow prevention device (#7 Watts or acceptable dual-check) shall be installed on the downstream side of the meter horn.

5. Laying length of meters:

5/8" x 3/4"	= 7-1/2"	2" x ----	= 17"
1" x ----	= 10-3/4"	3" turbo x -	= 12"4"
1-1/2"x -	= 13"	turbo x -	= 14"

Hydrants

Acceptable makes and models:

1. Clow Eddy F2641
2. Darling B62B
3. Mueller Centurion 200

Features:

1. Direction to open – **LEFT**
2. Breakable flange (Traffic model).
3. Valve opening 5-1/4".
4. Two 2½" NST hose nozzles.
5. One 4½" NST pumper nozzle.
6. Operating nut and nozzle caps - NS pentagon 1½" flat to point.
7. Depth of trench - 6 foot.
8. Six inch mechanical joint connection with accessories for 7.10" O.D. ductile iron pipe.
9. Drain hole shall be plugged.
10. Marker flag with retro-reflective marker plate.
11. All hydrants shall be bagged until placed in service.

Sand Bedding / Blanket

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

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

*Fraction passing the #4 sieve

C. Construction Requirements

The Community Development Department in conjunction with the General Services Department will oversee all work related to these utilities. 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.

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. Laying depth must be 5 feet 6 inches (5.5-feet) compacted 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. The use of insulation installed over the top of the pipe when the required depth cannot be achieved, will not be permitted without the approval of the City of Concord Representative.

4. Joint deflection of ductile iron pipe is NOT acceptable.

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 of Concord's Representative, (a minimum of 8' is required). The City of Concord's 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). Sanitary sewer services shall also be separated a minimum of 10 feet from water services unless otherwise directed by a City of Concord representative. This applies for new construction and renovations to existing structures.

7. 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 of ductile iron pressure class pipe until the minimum 10-foot separation can be achieved.

8. Whenever sewers must cross over water mains, the sewer shall be constructed of (replaced with) ductile iron pressure class pipe for a minimum distance of 9 feet each side of the crossing. Joints shall be water pressure rated with zero leakage when tested at 25 pounds per square inch for gravity sewers and 1½ times working pressure for force mains, and joints shall not be located within 9 feet of the crossing point.

9. Should the vertical separation of the sewer and water main be less than 18", the water main or the sewer main must be relocated to achieve the required separation.

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 of Concord's 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 of Concord's 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. Detectable "Water" marking tape shall be installed 12-inches above the crown of the pipe.

15. Prior to 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 for review <u>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.</u>

<u>Mechanical Fittings and Accessories</u>

1. Retaining glands, tie rods or a combination of poured concrete 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.

   <u>Generally Accepted Torques</u>:
   70 lbs. on set screws
   75-90 lbs. on glands with 3/4" - (19)mm bolts
   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.

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.

9. No contractor will operate City valves or curbstops without the explicit permission of the City.

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 Contractor shall be responsible for hydrant painting. Requirements for hydrant painting are included in the City of Concord Construction Details.

3. Hydrants located further than 20-feet from the water main will require an 8-inch feed.

4. Contractor is responsible for the installation of the "marker flag" as show on the hydrant detail.

5. All hydrants shall be bagged until the hydrants are operational and then removed by City of Concord personnel.

Water Service Lines

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. Any service longer than sixty feet from the main to the curbstop must be a minimum of one-inch diameter to provide for adequate flow.

4. Saddles are required for service taps over 3/4" on 6" diameter mains 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.

5. Curb valves will be set on the Street Line in 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.

6. Curb boxes shall not be set in driveways or walkways unless field conditions do not permit the installation. The City of Concord's Representative shall be contacted if the requirement cannot be met prior to the installation.

7. State regulations require water mains to be separated from sanitary sewer mains by a minimum of 10-feet (horizontally). Sanitary sewer services shall also be separated a minimum of 10 feet from water services unless otherwise directed by a City of Concord representative. This applies for new construction and renovations to existing structures.

8. Adjacent curb boxes must be set at least 4-feet apart.

9. 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

10. The minimum depth of the water service shall be 5½-feet. Should the water service line be less than 5½-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 City of Concord's Representative, (a minimum of 8' is required). The City of Concord's Representative shall be contacted prior to the installation of the insulation.

11. Detectable "Water" marking tape shall be installed 12-inches above the crown of the service.

10. A contractor installing a new or larger water 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.

    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.

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 Engineering Services, 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.

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. For apartment or condominium type units within shared buildings, (which are either new or conversions), and when there is no common first floor space: the owner can choose to: 1) service each unit on an individual water line, or 2) service multiple units from one water line. In the former a City meter will be set for each unit, and an account will be established for those meters. In the latter one or more City meters can be set according to the owner's wishes. If one City meter is desired then one account will be established for that complex.

   c. 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 Division will not provide individual billing.

   d. Multiple billing accounts can be established for each unit. A monthly fee will be levied on each additional account after the first City meter.

   e. 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:
   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. <u>No water meter will be installed until all outstanding project related issues, if any, are addressed</u>.

ENGINEERING SERVICES <u>WILL NOT</u> "SIGN-OFF" FOR A CERTIFICATE OF OCCUPANCY PERMIT UNTIL THE WATER METER IS INSTALLED AND ALL OUTSTANDING PROJECT RELATED (ONSITE AND OFFSITE) ISSUES ARE ADDRESSED.

D. Inspection Requirements

The Engineering Services Division's representative shall perform full time inspections to assure that all water work conforms to City standards.

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.

E. Testing Requirements

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 including; corporations, ball valves, blow-offs, etc. for main line testing.

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.

Pressure Testing

All water mains and services shall be pressure tested. A pressure test is required before any water supply main will be accepted. Water mains will not be tested during disinfection.

1. Services and mains 2-inches in diameter or greater must be pressure tested as follows. Pressurize the water line to 150 psi (min) or 1.5 times the static pressure in excess of 100 psi **- not to exceed 200 psi**. The static pressure must hold for one hour to be acceptable.

2. Services less than 2" shall be tested by one of two methods.
   a. Pressurize the water line from the meter horn back to a closed valve to a pressure of 100 psi. The pressure must hold for 15 minutes to be acceptable.
   b. Static test using the pressure from the adjacent water main. With, 1) the valve open, 2) the service bled and shut off inside the building or crimped at the building, and 3) the trench open and accessible to the inspector with appropriate safety measures available (trench box, etc.), the service shall not show any signs of leaking for a minimum of 15 minutes.

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.

Bacterial Testing / Disinfection

All water lines greater than two inches in diameter must be disinfected. Disinfection shall be in accordance with the American Water Works Association (**AWWA**) standard **C651-86** (Disinfecting Water Mains). The contractor will use a liquid disinfectant to clean the pipeline. Engineering Services recommends a chlorine concentration of 100 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.

Storm Drainage Systems

A. 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.

B. Materials

Certificates of Compliance shall be submitted by the Contractor, for each material or structure, to the City of Concord's Representative for review and approval.

Storage and Handling of Materials

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.

Storage of cement: Cement shall be stored under cover, off the ground, and shall be kept completely dry at all times.

Storage of reinforcing steel: All reinforcing steel shall be stored off the ground, or otherwise to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water to minimize rusting.

Precast concrete handling: Precast concrete units shall be handled in a manner to prevent chipping or cracking.

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.

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.

Pipe

Reinforced Concrete Pipe:

1. **Conformance to standard specifications:** Pipe shall conform to the standard specifications for reinforced concrete culvert and storm drain. Pipe shall be Class IV 3000D typically or Class V 3750D when required due to extra depth or loading.

2. **Gasketed pipe joints:** Gasketed pipe joints are required for all City installations and shall conform to ASTM C443 Standard Specifications for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

3. **Fittings and accessories:** Fittings and accessories must be approved by the Engineering Services Division prior to installation.

Polyvinyl Chloride (PVC) Pipe:

1. **Conformance to standard specifications:** Pipe and fittings shall conform to ASTM D-3034 and shall be SDR-35 or SDR-26.

2. **Gasketed pipe joints:** Joint compression rings shall be of an oil resistant rubber type, elastomeric seals conforming to ASTM D-3212, or flexible elastomeric seals conforming to ASTM 3212.

High Density Polyethylene Pipe (HDPE)

1. **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 <u>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.</u>

2. **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.

3. For use in culvert installations concrete headwalls are required.

4. **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.

5. **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.

6. **Fittings:** Manufacturers fittings for lateral services must meet the City's current water tightness standards.

Ductile iron (DI) pipe:

1. **Conformance to standard specifications:** Ductile iron pipe shall conform to ANSI/AWWA C150/A21.50 (pressure class pipe) with size as shown on the drawings.

2. **Gasketed pipe joints:** Pipe shall have either the rubber ring type, push on joint, or standard mechanical joint. Rubber gasket joints shall conform to ANSI A21.11 for mechanical and push on type joints. All pipe and fittings shall have a cement mortar lining and bituminous seal coat on the inside, and a coal tar enamel coat on the outside.

<u>Catch Basins</u>

Eight inch (8-inch) walled, reinforced concrete structures are recommended when tying into existing structures and five inch (5-inch) minimum wall reinforced concrete structures are required for new construction. The structures shall be designed to handle H20 Loading.

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.

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.

Eccentric or Concentric conical top sections are required 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.

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.

THE USE OF BARREL BLOCKS OR CONCRETE GRADE RINGS IS NOT PERMITTED FOR NEW CONSTRUCTION.

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.

Although catch basins may not be required to be tested for water tightness, infiltration is not acceptable.

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.

All PVC pipe connections to structures (such as under-drain and footing drains) must be cored and booted to assure a secure seal.

Drain Manholes

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.

Frames, Grates and Covers

8" cast iron catch basin frames (4" frames are not allowed) 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 (Neenah R-3210-Q or approved equal). North American and India

castings are allowed, provided the India castings are from SIGMA Corporation or approved equal. All castings shall be designed for H-20 Loading.

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

Underdrain

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.

Stone Fill

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.

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. 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.

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.

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

Sieve Size	% Passing
No. 8	100
No. 16	60-100
No. 50	15-35
No. 100	2-15
No. 200	0–5

Crushed Stone Bedding

Crushed stone shall be ¾ inch (ASTM #67) stone and meet the following gradation requirements:

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

C. Construction Requirements

The Community Development Department in conjunction with the General Services Department will oversee all work related to these utilities. 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.

Excavation

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.

Crushed Stone Bedding

Contractor shall place ¾" crushed stone: 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, ¾" crushed stone shall be placed to ½ the outside diameter for pipe less than 24" inside diameter. ¾" crushed stone shall be placed to the top of pipe for diameters greater than or equal to 24".

Mortar

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.

Brick Masonry

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.

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.

All brickwork used to adjust manhole and catch basin frames to grade shall be sealed on the outside of the structure with mortar.

Inverts: 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. Only solid masonry construction will be accepted under the brick shelf.

Mortar joints shall be tooled flush to the face of the brick to prevent minor depressions. Shelves shall be constructed to the crown of the pipe for diameters greater than 15 inches. 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.

Adjusting Frames To Grade: Frames shall be centered over the catch basin / manhole opening. Manhole frames shall be set no less than 1/8-inch lower than the finish pavement or no more than 1/4 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). One 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.

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 of Concord's Representative, and observed prior to backfilling.

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.

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 will be required two-feet each side of the utility and a distance to be specified by the City of Concord's Representative, (a minimum of 8' is required). The City of Concord's Representative shall be contacted prior to the installation of the insulation.

3. Proper catch basin location is essential to assure compatibility with finished roadway curb and structure installations.

4. A minimum 6" of ¾" crushed stone bedding is required under the load bearing section of all storm drain pipe from the undisturbed stable soil to the mid-diameter of the pipe.

5. A minimum 8" of ¾" crushed stone bedding is required under all catch basins and manholes.

6. Granular fill over the pipe may be required should the excavated material contain >50% cobbles and threaten to injure the pipe.

7. 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.

8. Manholes or catch basins shall be required at every change in vertical grade or horizontal pipe alignment.

9. 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 will be required two-feet each side of the utility and a distance to be specified by the City of Concord's Representative, (a minimum of 8' is required).

The City of Concord's Representative shall be contacted prior to the installation of the insulation.

10. Headwalls shall be placed outside of the "clear zone" as defined in the Roadside Design Guide.

11. Prior to 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 for review at least two (2) weeks prior to the commencement of the construction activity. The proposed sleeve shall consist of either steel or SDR 11 with a traceable wire shall be placed over the utility.

12. 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.

Underdrain

Underdrain, if not detailed on the approved plans, may be required should site conditions warrant. 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 correct the situation.

Underdrain shall be bedded in crushed stone wrapped in the appropriate geotextile fabric.

All daylighted underdrain shall have a either a pre-cast concrete headwall or a masonry headwall along with a rodent proof end grate installed at the outlet.

Drain Laterals

1. Storm drain service taps will be accomplished using a sanitary tee connection at the main in accordance with the City of Concord's Building and Plumbing Codes, and the International Plumbing Code, 2003 Edition.

2. Perimeter foundation drains shall be PVC SDR 35.

3. Perimeter drain laterals (6-inch PVC) shall be bedded in ¾-inch crushed stone from the top of the pipe to 6-inches below the invert.

4. Drain cleanouts for house service connections shall be installed at the building foundation or as directed by the City of Concord's Representative.

5. 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.

6. 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.

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 of Concord's 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 6-inch drain cleanouts.

Slope Stabilization

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.

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 for review.

Stone Fill Requirements

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

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 for review prior to the placement of the material.

Stone Fill	Minimum Depth
Class A	24"
Class B	18"
Class C	12"

Safety Barriers

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.

D. Inspection Requirements

Visual Inspections

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 sound and flawless. 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.

Infiltration:
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.

Observation for Uniformity of Flow:
Water used to flush lines will be observed for uniformity of flow through each pipeline from structure to structure.

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. **All video inspections shall be performed by the City of Concord General Services Division.**

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. All structures are to be accessible to the video inspection vehicle and all pipelines shall be cleaned of all debris prior to the inspection. The presence of debris or insufficient flushing water will necessitate re-inspection following correction.

4. 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 of Concord's representative is cause for rejection.

5. Only tractor-type units will be utilized for mainline inspections, push cameras will only be allowed for lateral inspections.

6. The camera shall have pan and tilt capabilities.

7. The camera shall be approved by the manufacturer for the pipe size being inspected (typical camera is rated for 8"-24", without additional accessories).

8. 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).

9. The camera footage shall be shown on-screen.

10. The unit should be able to provide accurate footage, (1'±) and all measurements shall be taken from the center of manhole structures.

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 compete 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 ½" 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 or WRC compliant) and compiled into a video report to be submitted with the video inspection.

16. All video inspection submittals shall be DVD format, no VHS will 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. Contact the General Service Division for the current fee schedule.**

E. Testing Requirements

Deflection Test

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

HDPE Testing

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

Landscaping

A. Description

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.

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.

B. Materials

Loam, Seed, & Slope Stabilization

1. Loam and grass seed shall meet the requirements of Sections 64l and 644 of the NHDOT Standard Specifications.

2. **Seed:** 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. Shall 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 for review and approval.

Acceptable Large Specimen Street Trees

Common Name	Generic and Specific Names
Green Ash	Fraxinus pennsulvanica
White Ash	Fraxinum Americana
American Beech	Fagus grandiflora
European Beech	Fagus sylvatica
American Elm	Ulmus Americana
Shagbark Hickory	Carya ovata
Sugar Maple	Acer saccharum
Red Maple	Acer rubrum
Northern Red Oak	Quercus rubra
White Oak	Quercus alba
Pin Oak	Quercus palustris
Sycamore (London Planetree)	Platanus occidentalis
Eastern Larch	Larix laricina

European Larch	Larix deciduas
Blue Spruce	Picea pungens
Norway Spruce	Picea abies
Red Pine	Pinus resinosa
Ginko	Ginko biloba
American Linden	Tilia Americana
Zelkova	Zelkova serrata

C. Construction Requirements

Loam, Seeding and Slope Stabilization

1. **Seeding and initial fertilizing:** Seeding and initial fertilizing shall be done between April l and June l, or between August 15 and October 15.

2. **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.

3. **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.

4. **Loam:** Loam shall be a minimum of 6" deep and free of debris, roots, stones, or other objectionable materials.

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.

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. No trees are to be planted within 30-feet of an intersection.

3. Plantings shall not be placed in locations that inhibit sight distance per AASHTO Policy, Geometric Design of Highways and Streets.

4. Only City approved trees will be planted under aerial utilities.

5. Trees planted with City funds must be planted within 10-feet of the right-of-way so as to benefit the public.

6. Trees to be located to avoid conflicts with underground utility services.

D. Inspection Requirements

Visual Inspections

The City of Concord reserves the right to perform visual inspection of landscaping items prior to placement.

Erosion Prevention and Sediment Control

A. Description

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 (sod, seed, etc.) in place, at locations shown on the plans or where ordered.

Temporary control:
This work shall consist of furnishing, stockpiling, 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.

B. Materials

Mulch

Hay mulch shall consist of cured hay, free from noxious weeds and rough or woody materials.

Bark mulch shall be bark chippings graded to approximately 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.

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.

Soil Stabilization

The soil stabilization materials furnished shall be of sufficient construction and strength to hold the processed ground and/or cover material (sod, seed, etc.) in place until an acceptable growth of natural or planted material is established.

Staples for soil stabilization material matting shall be those specified by the manufacturer.

Grass Seed for erosion control shall be one of the following:

1. 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.

2. Seed for a more permanent control shall be of the type specified in the plans or as set forth in NHDOT 644.2.3.

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

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 ft with projections for fastening wire to the fence. Maximum post spacing shall be 10 ft.

C. Construction Requirements

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 erosion prevention and sediment control measures shall be used to correct conditions that develop during construction to temporarily control erosion not associated with permanent control features.

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).

All areas of disturbance must have permanent stabilization within 48 hours of reaching final grade.

D. Inspection Requirements

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.

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.

Site Work

Driveways

1. **Drive entries:** All drive entries shall be located as shown on the approved plans or as directed by the City Engineer.
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 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 stones at least 7-feet long.
6. **Construction requirements:** Minimum construction requirements for driveways shall be as follows:

   6-inches crushed gravel
   3-inches hot bituminous pavement (1½" of ¾" aggregate base course and 1 ½" of ½" aggregate wearing course)
7. **Grades:** Driveway grades shall adhere to the City of Concord's Construction Details.

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.

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.

Retaining Walls

Any retaining wall proposed on any site (private or public) having a minimum height 4-feet or greater, must be approved by the Engineering Services Division. Detailed shop drawings, stamped and signed by a licensed structural engineer registered in the State of New Hampshire, shall be submitted to Engineering Services at least **3 weeks** prior to the construction of the proposed wall. Shop drawings submittals not bearing the stamp and signature of the structural design engineer shall be rejected.

Retaining walls constructed without an approved set of plans by a registered structural engineer and the City Engineer are subjected to removal and the wall will be reconstructed.

The Engineering Services Division has the right to refuse to sign-off on a Certificate of Occupancy Permit if a retaining wall located on any site has not been approved by a registered structural engineer and the City Engineer, and the workmanship is in question.

Private Utilities

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 detectable tape or tracer wire placed 12" over the crown of the utility.

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.

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 231:61-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.

Any poles, structures, conduits, cables or wires, the location of which **have not been approved** shall be subjected to the approval of the Poles and Wires Committee through the Engineering Services Division.

Abandoned or unused utilities that are required to be discontinued, sealed, or removed within the scope of a project shall be taken care of prior to placement of select or finished materials such as gravel, pavement, and landscaping.

Electric

The Engineering Division requires all underground electric conductors to be contained within rigid conduits at all road crossings. Crossings shall be perpendicular to the roadway whenever possible.

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).
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.***

Municipal Cables

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

Gas, Telephone and Cable TV

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.

Fiber Optic Cable

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.

Utility Conflicts

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.

Traffic Signal Systems

A. Description

This work shall consist of the furnishing and complete installation of all equipment and materials in accordance with the City of Concord Construction Standards and Details to provide a complete operating intersection traffic signal including: traffic signal controller (Econolite brand only), controller cabinet (aluminum and painted black) and ancillary equipment, power service, mast arms and poles (galvanized and painted black), foundations, electrical and signal cable, LED vehicular and pedestrian indications, LED blank out signs, emergency vehicle preemption, video vehicle detection, communication equipment, and other items shown on the plan sheets and described in the List of Major Materials.

General

Work shall conform to the provisions of Section 616 of the NHDOT Standard Specifications, latest edition with amendments, except as modified or changed herein.

1. All work shall conform to the requirements of the New Hampshire Department of Transportation, Standard Drawings and Specifications, the Manual of Uniform Traffic Control Devices, and the City of Concord Construction Standards and Details.

2. The Contractor shall be responsible for signal maintenance during the contract. The Contractor shall furnish the City Engineer and Police Department with names and telephone numbers of persons to be contacted in case of a malfunction.

3. The Contractor shall submit to the City of Concord at least three copies of catalog cuts and/or shop drawings of the proposed equipment for review and approval prior to construction. Structural analysis of proposed traffic signal mast arms, stamped by a professional engineer registered in New Hampshire, shall be included in the submission. Soil borings and related assessment shall also be provided that verifies the mast arm foundation design.

4. The Contractor shall notify the City of Concord Fire Alarm/Traffic Division Section no less than 3 days prior to the following:
   a. The date of preliminary review of construction.
   b. The date of final inspection.

5. The Contractor shall make arrangements for the power service connection and be responsible for all charges incurred. Payment shall be forwarded to the City of Concord, Finance Department, 41 Green Street, Concord, NH 03301

6. No part of the signal shall be rendered operational until the entire system has been installed and tested in conformance to the specification. The signals shall not be rendered operational without the approval of the City of Concord.

7. The Contractor shall guarantee all materials, equipment and workmanship for a period of two years or for the manufacturer's guarantee period, whichever is greater, from the final acceptance date. All finish coatings on galvanized painted traffic signal hardware

shall be inspected yearly and guaranteed not to chalk, peel, blister, or fade for a period of five (5) years from the final acceptance date.

Fire Preemption Operation

1. Upon release of fire pre-emption, the controller shall terminate the prempt phase with normal vehicle clearance intervals, followed by a return to the normal signal phasing sequence beginning with main street green.

2. The engineering, design, and integration of the fire pre-empt equipment and/or ancillary components shall be by the manufacturer of Opticom brand equipment in cooperation with the supplier of the signal controller and cabinet.

3. Optical detector location shall be verified in the field by the City of Concord Fire Alarm/Traffic Division Representative to assure optimum reception.

4. To assure proper conformance, the contractor shall contact the Fire Alarm Superintendent of the City of Concord's Fire Department, telephone number (603) 225-8667.

5. In cooperation with the Fire Department, the contractor shall make the necessary trial runs to ascertain proper timing and operation of the pre-emption system, to the satisfaction for the Fire Alarm Superintendent.

B. Materials

General

1. All vehicular signal lenses shall be 12 inches in size, and all pedestrian signal lenses shall have a countdown timer with minimum 9-inch digits and manufactured of polycarbonate or acrylic materials, unless noted otherwise. The signal head housing and visors shall be lightweight aluminum

2. All mast arm mounted signals and blank out signs shall be rigid mounted and shall have a 1/8 inch aircraft safety cable wrapped around the mast-arm and through the signal bracket and locked using a "U" cable clamp.

3. The exterior surface of all mast arms and posts, controller cabinets, signal heads, push buttons, video cameras, optical detectors, and other ancillary equipment exposed to public view, shall be painted semi-gloss black, unless noted otherwise.

4. The interior surface of signal visors, including louvers if used, shall be painted flat black.

5. All vehicular signals shall be equipped with 5± inch perforated flat-black back plates.

List of Major Materials

A list of the recommended materials required to install the traffic signal system shall be included as an amendment to this specification. A partial list of materials recommended by the City of Concord is presented below; quantities shown are for illustrative purposes and shall be amended in accordance with the plan requirements.

1 - Controller assembly, Model ASC/3-2100 as manufactured by Econolite Control Products, Inc. The controller shall be capable of operating in NEMA TS1, NEMA TS2 type 1, and NEMA TS2 Type 2 cabinets. The controller shall include a data key and Ethernet port, and 9 pin FSK Telemetry module.

The cabinet shall be a size 6 NEMA TS2 Type-1 Econolite Control Products Plug-N-Go with 15-inch extension base. The Contractor shall arrange to have the controller cabinet shipped directly from manufacturer to Concord Fire Department, Fire Alarm/Traffic maintenance shop, where Contractor shall set up cabinet to run under load for 72 hours. Upon completion of this burn-in period, Contractor shall perform a complete test of the cabinet with Concord Fire Dept. personnel prior to installation in the field.

The cabinet shall be painted semi-gloss black outside, and white inside.

The cabinet shall include the following:

1. Continuously welded exterior seams.
2. Two shelves.
3. Main panel with twelve load switch positions, and six flash transfer relay positions.
4. Power panel with surge protection.
5. Power distribution panel with minimum of six power connectors.
6. SDLC terminal block with a minimum of five SDLC connecting cables.
7. One detector rack and associated loop interface panel shall be provided in each cabinet. Detector rack shall be capable of supporting up to sixteen vehicle detection channels and four preemption channels. Loop interface panel shall be MOV protected.
8. Auxiliary panel with AUTO/FLASH, STOP TIME, and CONTROLLER ON/OFF switches.
9. Police panel with SIGNALS ON/OFF, AUTO/FLASH, and AUTO/MANUAL switches and manual cord.
10. A telemetry interface harness and interface panel shall be supplied with each cabinet assembly. An EDCO Model PC642C-008D shall be supplied for communication line transient protection.
11. Twelve diagnostic type load switches.
12. One flasher.
13. Six flash-transfer relays.
14. One 16-channel malfunction management unit (MMU).
15. One shelf mounted cabinet power supply.
16. Four bus-interface units.
17. All cabinet back-panel components to be identified by label.
18. Three sets of cabinet wiring diagrams.

19. Video detection system, Econolite brand Autoscope, to include the following:
    a. Mini-Hub TS2 Detector Port Master (to be installed in detector rack).
    b. ACIP4E Communications Interface Panel, Ethernet Option.
    c. Latest version of Autoscope Solo Pro software.
20. Cabinet spares to include the following:
    a. One EDCO Model PC642C-008D.
    b. One flasher.
    c. One flash transfer relay.
    d. One 9-pin FSK Telemetry module.
    e. One cabinet power supply.
21. One 4-channel video server, Vivotek Model VS 2403, or approved equal.
22. One SHDSL network extender kit, Zhone Model SNE2000G-KIT1US.
23. One EtherFast 10/100 5-port workgroup switch, Linksys Model EZXS55W, or approved equal.

Following an interruption of power, all eight phase controllers shall start up in a flashing mode of operation (with Phases 2 and 6 flashing yellow, and all other phases flashing red). Automatic operations will start up at the beginning of the green period for main-line through traffic, Phases 2 and 6.

- Galvanized steel, semi-gloss black painted, double mast arm signal pole and foundation, with XX' and YY' signal arms, with nut covers, Union Metal Manufacturing Company, Design 50914-Y26-P, Valmont Industries, Inc., Design F283A, or approved equal.

- Galvanized steel, semi-gloss black painted mast arm signal pole with foundation, with XX' signal arm, with nut covers, Union Metal Manufacturing Co., Design 50914-Y26-P, Valmont Industries, Inc., Design F283A, or approved equal.

- XX' pedestrian signal post with foundation, gloss black painted, :Pelco square aluminum base PB-5335 with optional collar set screws and grounding lugs, factory painted to option P33 gloss black, and Pelco PB-5102 spun aluminum pole, schedule 80, 4 1/2 inch OD, factory painted to P33 gloss black; or approved equal.

- One Way, 4 section, 12" adjustable mast arm mounted LED signal modules with tunnel visors and 5" louvered back plates, painted black, Dialight, GELcore brand or approved equal.

- One Way, 3 section, 12" adjustable mast arm mounted LED signal modules with tunnel visors and 5" louvered back plates, painted black, Dialight, GELcore brand or approved equal.

- One Way, 3 section, 12" adjustable pole mounted LED signal module with tunnel visor and 5" louvered black plates, painted black, Dialight, GELcore brand or approved equal.

- Pelco brand style "Astro Bracs" or approved equal.

- Red LED type traffic signal lamps, Dialight, GELcore, or approved equal.

- Yellow LED type traffic signal lamps, Dialight, GELcore, or approved equal.

- Green LED type traffic signal lamps, Dialight, GELcore, or approved equal.

- 16"x18" LED pedestrian signal head, painted black, pedestal top-mounted, single unit with solid hand symbol, solid walking symbol and 9" countdown timer digits, Dialight, GELcore brand or approved equal.

- 16"x18" LED pedestrian signal head, painted black, bracket-mounted, single unit with solid hand symbol, solid walking symbol and 9" countdown timer digits, Dialight, GELcore brand or approved equal.

- Pedestrian push button stations, mushroom type and weather proof, Pelco brand, 9"x12" Pedestrian Push button Station, SE-2013 (08), gloss black, 2" Mushroom Plunger, without LED, with 9"x12" Countdown Pedestrian Sign and arrow indicating direction to crosswalk, Pelco sign SF-1064 (left arrow) or SF-1065 (right arrow) as required, or approved equals.

- Pelco SE-6042 adaptor, double push button station for 4.5" diameter pedestal pole, or approved equal.

- Audible pedestrian signals, Indicator Controls, Inc., Design PS/A 10, or approved equal.

- Opticom Brand optical detector and ancillary equipment, Model 711 with mounting hardware, painted black.

- Opticom Fire Preempter Phase Selector, Model 752 only.

#- Strobe Light, 120 V.A.C. with lexan optic lens, Whelen Model IS 3220 with high red dome, or approved equal. Mast arm mounted with nipple of sufficient height to assure visibility from all approaches. Mounting hardware to be painted black.

- Mast Arm mounted R 3-1 "No Right Turn" symbol blankout signs, 24"x24",, M-Systems, Inc., Thin Light Blankout Sign, with white LED arrow outline and red outline, black powdercoat frame and clear lens, or approved equal.

- Video detection camera, painted black, Econolite brand Autoscope Solo Pro II Machine Vision Processor, or approved equal.

- Camera mountings for mast arm, painted black, Pelco brand Astro-Brac, band mount with pan tilt, or approved equal.

- ASC/2M-1000 System Master, factory installed, including all required interface equipment and associated wiring and cables, such as, but not limited to, RS-232 auto-dial/auto-answer modem for Master-to-Aries communications via commercial telephone network, AC outlet for RS-232 modem, RJ-11 jack for telephone line, Master Power On/Off switch, Telemetry interface board and two FSK 4-wire telemetry modules installed in the Master. Current version of Aries System Software with license and user manual shall also be provided unless waived in writing by the Fire Alarm Superintendent.

1 - Electrical service connection, including installation of cabinet-mount power meter, Milbank Model U3741-XL-100-BL single phase 100 amp meter socket with 50 amp main breaker and lever bypass.

- Aluminum sign, 24" by 30", R10-11a(M), "NO TURN ON RED ARROW", rigidly mounted on mast arm using an Astro Brac or other similar rigid sign bracket.

Coating System for City of Concord Signal Equipment

The coating system shall consist of hot-dip galvanizing and shop-applied paint for traffic signal hardware as shown on the plans or as directed. The requirements for the paint system, material properties, application, and handling shall conform to the provisions of NHDOT Specification Section 550 Structural Steel - Section 3.13 Shop Painting (coatings from paint system A or B may be selected), except as required herein, or approved otherwise.

Coating System: The coating system shall consist of the following generic type at the minimum coating thickness shown:

Coating	Description	Thickness (minimum)
Galvanized:	Hot-dip galvanizing	Per AASHTO
Pre-treatment	SP 1 Solvent Cleaning SP 8 Brush-off Blast Cleaning Phosphate cleaning (required when painting is more than 12 hours after galvanizing)	
Intermediate (force-cured)	708-NH 3.21,High Build Epoxy Polyamide	3 mils DFT
Finish (force-cured)	708-NH 3.81, Aliphatic Polyurethane	3 mils DFT

Hot-dip galvanizing: Hot-dip galvanizing shall conform to AASHTO M 111 (ASTM A 123) and AASHTO M232 (ASTM A 153) utilizing the dry kettle process in a bath of molten zinc containing nickel (0.05% to 0.09% by weight). Hardware may be mechanically galvanized in conformance with AASHTO M 298 (ASTM B 695) Class 50.

Phosphating: Phosphating, when required as described herein, shall conform to zinc phosphate coating (light) of galvanized steel, D.O.D. specification TT-C-490D, or approved equal, and shall be applied according to the manufacturer's recommendation.

Color: Each coat of paint shall be separately colored to contrast with other coats and to ensure complete coverage. The previous coat shall be hidden by a single application of each coat. The final color of the painted product shall be **BLACK** (semi-gloss) Federal Standard 595 Color #27038.

C. Construction Requirements

General

1. Minimum clearance to the bottom of overhead signal housings shall be sixteen (16) feet. Minimum clearance to the bottom of post-mounted vehicular signal housings shall be ten (10) feet. Minimum clearance to the bottom of pedestrian signal housings shall be eight (8) feet.

2. All wiring splices shall be waterproofed.

3. Pull wires/ropes of sufficient strength shall be placed in all conduits installed.

4. For the installation of all underground conduits, the road and sidewalk pavement shall be opened by an approved method. Care shall be taken to not lift adjacent pavement. If the contractor elects to saw pavement, no payment will be made for this work.

5. Traffic signal loops shall be placed a minimum 2' from manholes or catch basin frames to allow for the maintenance of the structure.

6. All controller cabinet foundations shall have a 3' x 4' concrete pad on the door side of the cabinet.

7. The contractor shall not be permitted to close down any traffic lanes during peak period hours without written approval from the City Engineer.

8. Any open area between the signal pole base and the foundation shall be grouted. Exposed edges of grout shall be neatly finished. A weep hole shall be placed in each grouted face of the foundation.

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Components: All steel components except for anchor plates and stainless steel studs, shall be galvanized, pre-treated, and shop painted except as noted. Hardware need not be painted after galvanizing, except that the portions exposed to view after installation, such as bolt heads, ends, nuts, and washers, which shall be field painted accordingly. Touch-up

and repairs shall be made using paint from the same batch run as used for the shop-applied coats and supplied by the shop applicator.

Pre-approval: Two 3-inch by 6-inch (approximate size) samples of material to be used in the work shall be galvanized and painted as specified herein and submitted to the City of Concord for approval or surface texture and color prior to full-production galvanizing and painting. The fabricator of the material shall provide the galvanizer with samples taken from the same material to be used in the work.

When phosphating is required, the phosphate applicator shall document in writing that the phosphating procedure is acceptable to the galvanizer and coating manufacturer prior to performing the work.

Contractor coordination: The fabricator shall send the drawings to the galvanizer for review to note considerations particular to the galvanizing process and to coordinate any proposed modifications to the fabricated material, prior to submission of shop drawings to the City for approval.

The fabricator shall notify the galvanizer if the chemical composition of the steel to be galvanized exceeds the following limits, in order to determine its suitability for processing: 0.26% carbon, 0.24% silicon, 0.05% phosphorous, and 1.35% manganese.

Pre-treatment and paint application: Paint coatings shall be shop applied to the galvanized product within 15 days of galvanizing. Paintings shall be performed inside a controlled environment meting applicable atmospheric requirements as recommended by the coating manufacturer. Prior to pre-treatment, rough areas of galvanizing shall be ground smooth to achieve a uniform galvanized surface to accept paint.

Pre-treatment:. Prior to painting, the galvanized surface shall receive pre-treatment consisting of SSPC-SP1, Solvent Cleaning, and SSPC-SP7, Brush-Off Blast Cleaning or abraded by approved mechanical means, to remove detrimental contaminants and to thoroughly roughen the entire surface and produce a uniform anchor profile of 1-2 mils. The required thickness of the zinc coating shall be maintained and checked prior to painting. The pre-treatment shall meet the paint manufacturer's requirements. An additional pre-treatment or tie coat may be considered if required by the paint manufacturer and approved by the City.

Blast cleaning: Blast cleaning shall be performed prior to the formation of "white rust" on the galvanized surface. If any "white rust" is detected by visual means, the galvanizing shall be stripped off and the steel re-galvanized in conformance with the specifications. "White rust" shall be as defined in the American Galvanizers Association, *Inspection of Products Hot Dip Galvanized After Fabrication,* Table IV.

Pre-treatment and Painting Methods: The galvanized steel product shall be pre-treated and painted by one of the following methods.

<u>Method 1 (under 12 hrs.)</u>. The galvanized steel shall be pre-treated as per 3.12.3.1. The first coat of paint shall be applied within 12 hours of galvanizing and within 8 hours of blast cleaning (or surface abrasion by approved mechanical means).

Method 2 (over 12 hrs). When the galvanized steel is to be painted more than 12 hours after galvanizing, the steel shall be pre-treated as per 3.12.3.1 followed by a treatment of zinc phosphate applied within 8 hours of blast cleaning (or surface abrasion by approved mechanical means). The first coat of paint shall be applied within 12 hours of phosphating.

Intermediate and Finish Coats: The intermediate and finish coats shall be shop applied under atmospheric conditions meeting the following minimum requirements: air and steel temperature of 50°F above the dew point. The finish coat shall be spray applied.

Force Cure: The intermediate and finish paint coats shall each be force cured in a heated booth maintained at a minimum temperature of 150°F for 2 to 4 hours.

Handling: The finish shop-coated material shall be handled with care using nylon slings, padded cables, etc., as required to protect the finish coating. The paint applicator shall be responsible for the condition of the finish coating until the material arrives at the job site.

Field Touch-up and Repairs: Damaged galvanized surfaces shall be repaired by applying an organic zinc repair paint conforming to ASTM A 780 and recommended by the galvanizer. Galvanizing repair paint shall be 65 percent zinc by weight, minimum, and shall be brush applied. The thickness of the repair shall not be less than the coating thickness required by AASHTO M 111 or M 232, but not less than 3 mils DFT. Repair touch up shall not be permitted using aerosol spray, silver paint, bright paint or aluminum paints.

Damaged shop applied paint shall be repaired in conformance with the solvent cleaning and abrasion pre-treatment requirements of 3.12.3.1 and the paint manufacturer's recommendations, to a minimum thickness of the original system. Touch-ups shall be such that the repair is not noticeably visible from a distance of 6 feet.

One-Year Inspection: The finish shall be inspected yearly and guaranteed not to chalk, peel, blister or fade for a period of five (5) years after acceptance of the project.

D. Inspection Requirements

Preliminary Review

Prior to final inspection, the contractor shall have a preliminary review of the system with the City Engineer and representative of the Concord Fire Alarm/Traffic Division, to review and comment on the system

Final Inspection

The contractor shall provide a qualified technician to be on hand to thoroughly inspect the system in the presence of the City Engineer and representative of the Concord Fire Alarm/Traffic Division. The intersection signal system shall be checked, reviewed, and confirmed that is satisfactory and operational as designed.

Appendices

Construction Details