Concord Public Works
Water and Sewer Division

Design and Installation Standard Specifications for Sewer Services in the Town of Concord, Massachusetts

April 2005

PART 1 - GENERAL

The sections that follow describe the Town of Concord's design and installation standards for sewer services. Any deviation from the procedures and materials described herein must be approved by the Superintendent before installation approval will be granted.

1.01 General Requirements

A. Sewer services requiring new sewer mains may only be installed if allowable by the Town of Concord's Sewer Rules and Regulations (April 2004 or most recent version). The standards described herein apply only to projects that are determined to be allowable by either the Water and Sewer Division Superintendent ("Superintendent") or the Public Works Commission ("PWC"), whichever is required by the Sewer Rules and Regulations. Any new sewer mains shall comply with the "*Design and Installation Standard Specifications for Sewer Mains in the Town of Concord, Massachusetts*."

B. All sewer service connections shall be made under the supervision of the Water and Sewer Division ("Division") and in accordance with its specifications, pursuant to submission of an application for service. The applicant for sewer service ("Applicant") must be the property owner or the owner's authorized representative. The Applicant shall notify the Division at least 48 hours prior to the installation to arrange for a Division employee to be present for inspection. If an inspection cannot be scheduled within 48 hours, the installation may not occur until an inspection is arranged, at the discretion of the Division's Supervisor.

C. The Applicant is responsible for procuring the services of a contractor. Any contractor installing a sewer service connection in Concord must be licensed as a Drain Layer by the Division. Licensed Drain Layer applications can be obtained from the Division at 135 Keyes Road, Concord, MA.

D. At his/her discretion, the Superintendent may require that any work done in the Town's right-of-way be performed by a Town employee or contractor employed by the Town, with the owner paying to the Town special service fees for the work performed.

E. If the Applicant's contractor is responsible for performing the work within the Town's right-of-way, a Right-of-Way Permit must be obtained by the Applicant. All fees or other requirements associated with the Right-of-Way Permit are the responsibility of the Applicant or his/her representative. Any area disturbed within the right-of-way must be replaced in-kind prior to the completion of construction. The Applicant is also responsible for any safety detail officers required to perform the work.

F. The Applicant shall also be responsible for obtaining all other permits required by federal, state, or local regulations, possibly including permits pursuant to the Wetlands Protection Act from the Natural Resources Commission and plumbing or other building permits from the Concord Building Division.

G. Reuse of an existing sewer service for a new building or an existing building with a new addition may be permitted, provided that the service is less than 50 years old, based on available documentation, and the integrity of the pipe is deemed acceptable by the Division. The Division may require the Applicant to perform a video or other inspection of the pipe to aid in this determination.

H. The size, slope, alignment, materials of construction of a service connection, and the methods to be used in excavating, placing of the pipe, jointing, testing and backfilling the trench shall conform to the requirements of the building and plumbing code, current specifications from the Division, other applicable rules, regulations and bylaws of the Town, and the requirements outlined below. In the absence of code provisions, or in amplification thereof, the materials and procedures set forth in the appropriate specification of the American Society for Testing and Materials (ASTM) and Water Pollution Control Federation (WPCF) Manual of Practice No. FD-5 shall apply.

1.02 Design Plans

A. A site plan must be submitted for all sewer service projects, showing the location of existing utilities and the location of proposed work.

B. Proposed sewer services may be drawn in plan-view only, however, they must show rates of grade, direction of flow, size of pipe, invert and finish surface elevations at cleanouts, manholes and grade breaks, location and elevation of all adjacent or crossing underground facilities, sufficient horizontal controls to permit the system to be located in the field, and any other information which may be required to adequately check, construct and inspect the system.

C. For a single-family residence proposing to install a sewer service connection that meets all of the design specifications described herein and for which a stub is present from the Town's sewer main to the property line of the property to be served, a sketch of the proposed work is

sufficient. This sketch may be prepared by the property owner's contractor or engineer and should include the information listed above.

D. For all projects that do not meet the requirements described above in Section 1.02, Item C, a more detailed plan may be required, prepared by a registered Professional Engineer, licensed in the State of Massachusetts.

E. For more complex projects, the Division may require a sequence of activities and a schedule drawn up in terms of days from the start of the project to key activities in progress toward completion. A list of materials to be used, including the type and manufacturer, may also be required.

1.03 As-Built Drawings

A. The installer of any service connection shall provide an as-built drawing to the Division at the time of final inspection or within 10 days of the completion of the service installation. This drawing shall be neat and legible and fit onto an 8 ½" by 11" piece of paper. More than one sheet may be used if necessary. The drawing shall show all lengths of pipe, connections, elevations, diameters and slopes. Three ties to permanent fixtures and depths below surface shall be shown for each change in line or grade and the beginning and end of each service connection. When plans are required by a Professional Engineer, the location and elevation of all benchmark information shall be provided.

B. Contractors will not be allowed to perform any further work within the Town of Concord until any outstanding as-built drawings have been submitted.

C. The Town may opt to prepare an as-built drawing during the inspection. Contractors will be duly notified if the Town's drawing is sufficient and the Contractor is not required to submit a drawing.

PART 2 – DESIGN STANDARDS FOR SEWER SERVICES

2.01 General Requirements

A. All indoor plumbing shall be consistent with Concord Building Division requirements and the applicable plumbing code. Approval of the sewer service does not eliminate the need to obtain plumbing permits for work within the plumbing code jurisdiction, as may be required by the Building Division.

B. In all buildings in which any building sewer is too low to permit gravity flow to the public sewer, sanitary sewage shall be lifted and discharged in accordance with the Concord Public Works Water and Sewer Division Guidelines and Standards for Grinder Pump Systems.

2.02 Materials

A. Sewer services, including inspection wyes, shall be water and air tight Polyvinyl Chloride (PVC), SDR 35 and shall conform to ASTM D3034 (Type PSM Polyvinyl Chloride Sewer Pipe and Fittings). All joints in PVC pipe shall be made using rubber rings furnished by the manufacturer of the pipe and installed in strict accordance with the manufacturer's recommendations.

B. Pipes that are bent or bowed shall not be used.

C. Appropriate adapters shall be used when changing from one kind of pipe to another. Bell and spigot (ball and socket, push on) adapters and/or clamp and oil resistant gaskets shall be used. Pipe joint lubricant shall be as provided by the pipe manufacturer.

D. PVC pipe shall conform to ASTM D3034-81 and shall be color-coded or labeled for in-ground identification as sewer pipe.

E. All pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured. Upon request, the Contractor shall furnish sworn certificates of such tests to the Division.

2.03 Size

A. The standard service connection to the sewer system is 6-inches diameter. Any deviation from this size must be approved by the Superintendent.

2.04 Depth

A. No building sewer shall have less than 4-feet of cover over the crown of the pipe unless approved by the Superintendent.

2.05 Alignment

A. When the vertical distance between the main line sewer and the building/house service at the location of the main line sewer is greater than 4-feet, a vertical pipe riser (chimney) connection shall be used to connect the building/house service to the sewer main.

B. Building sewer deflection may be permitted within the limitations of the pipe joint and shall in no case exceed 5 degrees.

C. No elbow shall be used which is greater than a 45 degree angle. Two 45 degree elbows may be used to make a 90 degree change in direction, provided a minimum 2-foot straight section is used between elbows.

D. No sewer service shall have a total change in direction of over 180 degrees without prior approval of the Superintendent.

E. No sewer service shall exceed 200-feet in length without prior approval of the Superintendent.

F. Town-owned sewer service stubs extend from, and are connected to, the wye branch connection or chimney connection, whichever the case may be, and terminate at the property line. If no stub is present in the street, design plans may be required, prepared by a professional engineer registered in Massachusetts, showing the proposed work in the right-of-way and connection to the existing sewer main.

G. Wherever possible, sewers shall be installed with a minimum of 10 feet horizontal separation from potable water lines. Encasement of the sewer or water line is required in the form of a 10-foot sleeve on either side of the adjacent structure in the following cases:

1) The minimum 10-foot horizontal separation from water services cannot be met;

2) the top of the sewer bell is less than 3-feet from bottom of the water line;

3) a storm drain is within 1.5 feet above the sewer line; or

4) a sewer main or connection is above water main or connection.

The sleeve shall consist of a larger pipe surrounding the utility pipe, with fill between the two pipes and cement at the ends.

H. Any person requesting to tie into an existing sewer service for the purposes of creating a common sewer, if allowed by the Sewer Rules and Regulations, may be required to investigate the integrity of the pipe to which they are proposing to connect. If applicable, this request will be made of the applicant when design plans are received by the Division.

2.06 Slope

A. Six inch service connections shall be designed with slopes between 1/8- and 1/4-inches per foot wherever possible. If needed, slopes up to 3/4-inches per foot may be considered by the Division, with prior approval of the Superintendent. In no case shall slopes exceed 3/4-inches per foot.

B. If larger service pipes are required and are approved by the Superintendent, a minimum 0.4% slope is required for 8-inch pipe and a minimum 0.28% slope is required for 10-inch pipe.

C. Sewers requiring greater changes in grade shall have manholes or cleanouts at all drops. Design of such systems shall be by a Professional Engineer registered in the State of Massachusetts.

D. Sewers shall be designed with uniform slope between manholes.

2.07 Manholes, Cleanouts, and Chimneys

A. Six-inch service connections to sewer mains shall not be to manholes within the Town's right-of-way wherever feasible. Connection to a manhole may be allowed with prior approval of the Superintendent.

B. Any permitted connections to Town manholes must be made by core drilling the manhole.

C. Chimney connections shall consist of the pipe, pipe bends, and encasement in concrete. PVC pipe and fittings for chimney connections shall include approved caps or stoppers to prevent infiltration.

D. A cleanout shall be installed at the property line with a cast iron ring and cover (Le Baron Sewer Cleanout Ring and Cover or equal) to within 4-inches below the final grade. Additional cleanouts or manholes may be required for runs of 100 feet or more from the property line to the building being served, at vertical drops, and at direction changes greater than 45 degrees, if allowed with prior approval of the Superintendent.

E. A cleanout is recommended on the building sewer so located as to provide accessibility in direct line to the building sewer outlet.

F. Every cleanout shall be installed so that the cleanout opens in the direction of the flow of the drainage line or at right angles thereto. Cleanouts shall be six (6) inches for 6-inch service piping. Cleanouts shall be installed so that there is a clearance of not less than eighteen (18) inches for the purpose of rodding.

G. Cleanout plugs shall not be covered with cement, plaster or any other permanent finishing material. Where it is necessary to conceal a cleanout plug, a covering plate or access door shall be provided which will permit ready access to the plug. Plugs shall remain in place except during periods of rodding.

H. Manholes shall be provided at intersecting pipes on common service connections, angle points, and changes in pipe size or grade.

I. Manholes shall be constructed of precast reinforced concrete or cast-in-place concrete. Precast barrel sections and manhole bases shall conform to ASTM C478 and cement manholes shall be domestic Portland cement conforming to ASTM C150, Type II.

J. The use of drop manholes must be approved by the Superintendent and should be avoided where feasible. An inside drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24-inches, the invert should be filleted to prevent solids deposition. For larger sewers where this would be impractical, the invert of the manhole shall be constructed so that there is a smooth transition of flow in the manhole. Every vertical drop shall consist of a drop and a cleanout, constructed inside of the manhole structure.

K. Manholes shall be 4-feet diameter with a 24 or 26-inch cover, unless otherwise approved.

L. Provide standard manhole frames and covers, with covers watertight when used in areas where the top of the manhole will be below FEMA flood levels or in areas known to be subject to flooding. Frames and cover castings shall be of good quality, strong, tough, even-grained, cast iron, smooth, free from scale, lumps, blisters, sand holes, and defects of any kind which render them unfit for the service for which they are intended. Manhole covers should indicate sewers with either an "S" or the word "sewer."

M. The flow channel through manholes shall be made to conform to the shape and slope of the sewers entering and leaving the manholes. The bench shall be constructed so that under peak design conditions, the flow will remain in the channel.

2.08 Other Design Considerations

A. A backwater valve is recommended in any branch of the building sewer which receives the discharge from a fixture or group of fixtures that is subject to reverse flow or backpressure. Such device, its installation and maintenance shall be the responsibility of the building owner. Backwater valves shall have all bearing parts of corrosion-resistant material. Backwater valves shall be constructed so a mechanical seal against backflow will be provided. Backwater valves, when fully opened, shall have an effective opening not less than that of the pipes in which they are installed. Backwater valves shall be installed so their working parts will be readily accessible for service and repairs.

PART 3 – EXECUTION

3.01 General Requirements

A. No connections to existing mains shall be started without prior written approval of the Division, and each connection with an existing main shall be made at a time and under conditions which will least interfere with service to customers affected thereby.

B. During excavation and other associated work, the sewer may not be used to dispose of any materials or substances or to dewater trenches. The cap on the end of the sewer stub, if applicable, shall not be removed until such time when final connection to the sewer main is needed to activate the service and a member of the Division is present.

C. The Contractor may be permitted to perform the actual tapping operation for the mains under the direction of the Division and with a Division Inspector present, after obtaining written permission from the Division.

D. The Contractor shall make any and all excavations and backfill as required and furnish all labor, equipment and material necessary to complete the connection.

E. Where new pipe is required to be installed, pipe and accessories shall be handled and stored in such a manner as to insure that pipe is installed in sound, undamaged condition. All pipes shall be thoroughly cleaned before being laid.

F. Any pipe showing a distinct crack with no evidence of incipient fracture beyond the limits of the visible crack, if approved, may have the cracked portion cut off by and at the expense of the Contractor, before the pipe is laid, so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.

G. If authorized, cutting of the pipe shall be done so that the cut is square and clean. Unless otherwise authorized by the Division's Inspector, all pipe cutting shall be done by means of an approved type of power cutter. The use of hammer and chisel, or any other method which results in rough edges, chips and damaged pipe, is prohibited. All cut edges shall be field beveled by use of a power grinder, as required, prior to installation.

H. Each pipe section shall be placed into position in the trench in such manner and by such means required to cause no damage to the pipe, person or property.

I. The Contractor shall furnish slings, straps, and/or approved devices to provide satisfactory support of the pipe when it is lifted. Transportation from delivery areas to the trench shall be restricted to operations which can cause no damage to the pipe units.

J. Pipe shall not be dropped from trucks onto the ground or into the trench. The Contractor shall have on the job site, with each laying crew, all the proper tools to handle and cut the pipe.

K. The Division reserves the right to have any or all pipe, fittings and special casting inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere.

L. Pipe and fittings shall be subjected to a careful inspection just before being laid or installed.

4.01 Excavation

A. All persons making excavations will make certain that all utilities have been visibly marked to the best of their knowledge (including the proper advance notice to DigSafe), all material, labor and equipment necessary to complete the work are at the job site, a competent person is present representing the contractor, and they are in compliance with any applicable standards of the Concord Public Works Commission and the Concord Engineering Division.

B. All excavations for service connection installation shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways and other public property disturbed in the course of the work shall be restored in a time and manner satisfactory to the Town, in compliance with all applicable Concord Public Works

regulations, as soon as possible after the completion of the installation of the sewer connection.

4.02 Preparation of Bed

A. The trench for the pipe shall be excavated to the required line and grade and be of sufficient width to permit thorough tamping of the fill under the haunches and around the pipe.

B. The bottom of the trench shall be shaped or channeled to conform to the curvature of the pipe. The trench bottom shall be straight, free of bumps or hollows and at the proper depth. Any irregularities in the trench bottom shall be leveled off or filled in with a selected gravel or sand thoroughly tamped. Where ledge or rock excavation is required, the trench shall be backfilled with sand.

C. As soon as excavation has been completed, the Contractor shall place and compact bedding material to the elevation necessary to bring the pipe to grade.

D. Pipe bedding shall be 6-inches of 3/4-inch crushed stone placed below the service pipe.

4.04 Installation of Sewers

A. If a tap tee or wye is not pre-installed, connections to 8-inch or larger mains will require the following, depending on the service size:

6-inch service – snap-in wye or saddle
8-inch service – manhole

B. All pipe shall be installed per the manufacturer's specifications. The pipe shall be laid on the trench bedding and the pipe pushed home by approved methods. Jointing shall be in accordance with the manufacturer's instructions. The Contractor shall have on hand for each pipe laying crew the necessary tools, gauges, pipe cutters, etc. to install the pipe in a workmanlike manner. Joint gaskets shall be installed and secured into place so that they cannot be dislodged during the joint assembly. The completed joint shall be watertight. After jointing the pipe, a metal feeler shall be used to make certain that the rubber gasket is located correctly.

C. Blocking under the pipe will not be permitted except where a concrete cradle is proposed, in which case precast concrete blocks shall be used.

D. At any time that work is not in progress, the end of the pipe shall have a temporary, water tight plug to prevent the entry of animals, earth, water, and debris.

E. If inspection of the pipe indicates that the pipe has been properly installed as determined by the Division's Inspector, the Contractor may then refill or backfill the remainder of the trench in accordance with the Specifications.

F. Bedding and backfill material shall be clean, hard, durable and free from dust, clay or organic matter. It shall be well compacted in place. Pipe bedding shall be used to cover the pipe to a height of 12-inches above the crown of the pipe. Material used to backfill above 12-inches above the crown of the pipe shall be subsoil material excavated onsite which is friable, natural soil composed of gravel, sand, or silty or clayey gravel and sand, free from debris or unsuitable materials. Materials unsuitable for backfilling include cut or broken pavement, debris, concrete or other rubble, organic materials, muck, peat, silty soils or clayey soil, rocks over 6-inches in maximum dimension, and any material which will not provide sufficient support to maintain the installed sewers or appurtenant construction in a stable condition.

G. All pipe shall be installed with the pipe label facing up, for easy viewing upon excavation. Metal tracer tape shall be laid in the trench above the pipe at a depth of 30 inches below grade.

H. At the conclusion of work, the Contractor shall thoroughly clean all pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered the sewer during the construction period. Debris cleaned from the lines shall be removed from the low end of the pipe. All obstructions shall be removed.

4.05 Control of Alignment and Grade

A. The Contractor shall use elevations and benchmarks to set line and use a surveyor's level or transit or a grade laser to set grade as required. The use of a hand level is also permitted, at the discretion of the Division's Inspector.

B. During construction, the Contractor shall provide the Division's Inspector, at the Inspector's request, all reasonable and necessary materials, opportunities, assistance for setting stakes and making measurements, and chain men, as needed, at intermittent times. The Contractor shall not proceed until he has made timely request of the Division for, and has received, such controls and instructions as may be necessary for the work to progress. The work shall then be done in strict conformity with such controls and instructions.

C. The Contractor shall carefully preserve benchmarks, reference points and stakes, and in case of willful or careless destruction by the Contractor's own employees, he will be charged with the resulting expense and shall be responsible for any mistakes or delay that may be caused by their unnecessary loss or disturbance.

4.06 Inspection and Testing

A. All installations must be inspected by Division personnel.

B. If the Division's Inspector deems testing to be necessary, based on visual observation of problems with the installation or on the complexity of a service connection, the following tests may be required prior to activation

of the service. If the Inspector has reason to believe that the installation is not water and air tight, testing will be required.

1) Dye testing of each pipe joint.
2) Infiltration testing: Infiltration shall not exceed 100 gallons per day per inch-diameter-mile of sewer, measured during maximum groundwater conditions. Manhole leakage shall not exceed 1/8-inch drop per hour, after absorption, during a 24 hour water drop test. Manhole testing shall be completed prior to construction of invert channels, where practicable.
3) Water Drop Test: Leakage tests by exfiltration shall be made on all pipe. The sewer shall be subjected to internal pressure by plugging the pipe at the lower end and then filling the sewers and the manhole or cleanout with clean water to a height of 8-feet above the top of the pipe. The leakage from the sewer will be measured for not less than one hour by the volume of water added to the manhole or cleanout to maintain the water level. Exfiltration shall not exceed 100 gallons per day per inch diameter mile of pipe. If any joint shows an appreciable amount of leakage, the joint shall be replaced or repaired to the satisfaction of the Inspector. If any pipe is defective, it shall be removed and replaced.
4) Air Testing: If low pressure air testing of the pipe lines is used, air is to be applied slowly until the pressure reaches 4 psi. Allow 2 minutes for temperature adjustment. The air pressure at the start of the test shall be 3.5 psi. Air pressure will be adjusted 0.433 psi for each foot below the groundwater table. The air pressure at the end of the test must be 2.5 psi or higher at the following times, depending on the pipe size:

6”	5 min. 40 sec.
8”	7 min. 36 sec.
10”	11 min. 52 sec.

5) Manhole Pressure Testing: Manholes in service connections will be subjected to the same testing requirements as required for sewer mains, as described in “*Design and Installation Standard Specifications for Sewer Mains in the Town of Concord, Massachusetts*.”

C. Should the sections undergoing testing fail to meet the requirements, the leak(s) shall be located and the repairs necessary to eliminate the leak(s) shall be accomplished. The sewer must then be tested again.