

**SEWER MAIN SPECIFICATIONS**

**DERRY, NEW HAMPSHIRE**

**APRIL 1993**

**INCLUDING AMENDMENTS AND REVISIONS FEBRUARY 1998  
INCLUDING AMENDMENTS AND REVISIONS JANUARY 2005**

**DEPARTMENT OF PUBLIC WORKS**

**MICHAEL FOWLER, P.E., DIRECTOR**

**THOMAS A. CARRIER, WATER/WASTEWATER  
SUPERINTENDENT**

## SECTION 100

### DEFINITION AND TERMS

#### 1.01 - MEANING OF TERMS

Wherever in these specifications the following terms or pronouns in place of them, are used, the intent and meaning shall be interpreted as follows:

**TOWN** - The Town of Derry, New Hampshire

**DEPARTMENT** - The Department of Public Works of the Town of Derry, New Hampshire acting for the Town.

**DIRECTOR** - The Director of the Department of Public Works acting directly or through an authorized representative, such representative acting within the scope of the particular duties entrusted to him.

**ENGINEER** - The Engineering Technician in charge of Construction inspections for the Town of Derry, New Hampshire or authorized agent or officer.

**CONTRACTOR** - Any individual, Firm or corporation employed by a developer to complete work in a subdivision or contracted by the Town of Derry, New Hampshire.

**MATERIAL** - Any substances proposed to be used in connection with the construction of any integral part and/or any appurtenant part and/or any incidental part of the proposed project.

**SPECIFICATION** - The directions, provisions and requirements contained herein, designated as the Sewer Main Specifications together with all written agreements made or to be made pertaining to the method and manner of performing the work, or the quantities and qualities of materials to be furnished under these provisions.

**WORKS** - All performance, including the furnishing of materials, labor, tools, equipment and incidentals, required of the Contractor under the terms of these provisions.

**THE WORDS** - "As directed", "as permitted", as "required", or words of like effect shall mean that the direction, permission, or requirement of the Director is intended, and similarly the words "approved", "acceptable", satisfactory", or words of like import shall mean approved by or acceptable or satisfactory to the Director unless otherwise provided herein. The words "necessary", "suitable", "equal" or words of like import shall mean necessary, suitable or equal in the opinion of the Director. The words "complete in place" shall mean the inclusion of the work, including incidentals, mentioned or implied in the Specifications and on the plans, or work that may reasonably be inferred as necessary to the proper execution of the item, unless payment for any portion of the work is otherwise specifically provided for.

**1.02 Abbreviations** - Whenever the following abbreviations are used in these specifications or on the plans, they are to be construed the same as the respective expressions represented:

**AAN** - American Association of Nurserymen

**AAR** - Association of American Railroads

**AASHTO** - American Association of State Highway and Transportation Officials

**ACI** - American Concrete Institute

**AGC** - Associated General Contractors of America

**AIA** - American Institute of Architects

**AISC** - American Institute of Steel Construction

**ANSI** - American National Standards Institute

**ARA** - American Railway Association

**AREA** - American Railway Engineering Association

**ASCE** - American Society of Civil Engineers

**ASLA** - American Society of Landscape Architects

**ASME** - American Society of Mechanical Engineers

**ASTM** - American Society for Testing and Materials

**AWPA** - American Wood - Preservers' Association

**AWWA** - American Water Works Association

**AWS** - American Welding Society

**DOT/FHWA** - Department of Transportation, Federal Highway Administration

**FSS** - Federal Specification and Standards, General Services Administration

**MUTCD** - Manual on Uniform Traffic Control Devices

**NEMA** - National Electrical Manufacturers Association

**NH/DOT** - The State of New Hampshire Department of Transportation

**RSA** - The New Hampshire Revised Statutes Annotated, 1955 together with all revisions amending same to date of invitation for bids

**SAE** - Society of Automotive Engineers

**SSPC** - Steel Structure Painting Council

## SECTION 200

### MAINTENANCE OF TRAFFIC

#### 2.01 General -

- A. This work shall include all operations necessary to maintain traffic flow, and to maintain access to all properties adjacent to the work. This work shall include, but not limited; to use of Uniform Traffic Control and Flaggers, furnishing, erecting, moving and dismantling barricades, signs and temporary lighting to inform the general public of hazards existing near the site of work.
- B. The **CONTRACTOR** shall facilitate the passage of school buses and provide safe access to all school bus stops, and notify the **Police Chief, and the School Superintendent** at least 72 hours in advance where the **CONTRACTOR** intends to work and the location of all detours.

#### 2.02 Materials -

- A. Road construction approach signs shall be built, erected, and located in accordance with New Hampshire Department of Public Works, and Highway Standards. Cost for all sign packages and barricades required shall be borne by the **CONTRACTOR**.
- B. Traffic paddles and flaggers equipment shall conform to those described in the MUTCD or New Hampshire Traffic Control hand book, as appropriate.
- C. Traffic Control personnel shall use two-way radio communication at all times when two (2) Traffic Control people are used.

#### 2.03 Personnel -

- A **1.** Uniformed officers shall be attired with regulation duty uniforms, headgear, reflective vests, and unexposed badge. Flaggers shall be attired with blaze orange caps and vests.
- 2.** Uniformed offices and flaggers shall possess the following qualifications: at least average intelligence and alertness, good sight and hearing, courteous but firm manner, neat and presentable appearance, pleasing personality, and a sense of responsibility.
- 3.** Uniformed officers and flaggers shall have been given specific instructions by the **CONTRACTOR** as to their duties and responsibilities, both to the public and to their fellow workers on the job. They shall direct traffic in accordance with section 618 of the NHDPW & H Standard Specifications entitled "Uniform Officers and Flagmen."
- 4.** Uniformed officers and flaggers shall **not be** paid under a separate pay item but shall be absorbed under various pay items.

## 2.04 - Execution

- A. At the preconstruction meeting, the **CONTRACTOR** shall submit a Traffic Control Plan to the Town for approval. The Traffic Control Plan shall be approved prior to any construction.
- B. Except where permitted by the TOWN as part of an approved detour plan, all streets where work is being performed shall be left in a passable condition at night.
- C. No open trenches shall be left open over night. Excavations shall be backfilled and compacted, as specified for temporary trench pavement, including all roadway base course gravel.
- D. The **CONTRACTOR** shall spread water or calcium chloride for dust control as directed by the **ENGINEER**. Cost for this procedure shall be absorbed under various pay items.
- E. The **CONTRACTOR** shall provide a field supervisor or equivalent to rectify problems within traveled ways, if they develop. The field supervisor or equivalent shall be available 24 hours per day, seven days per week during the time of the contract. The field supervisor or equivalent shall have the appropriate equipment, tools, and materials available to immediately rectify any problems which represent a safety hazard to the residents of the Town. The **CONTRACTOR** shall provide the Town a means of reaching the field supervisor during non-business hours. (Such as a paging service, etc.)
- F. The Director of Public Works and the Chief of Police shall retain the authority to suspend all or part of the **CONTRACTOR's** operation as he may deem necessary in the interest of public safety. The **CONTRACTOR** shall make no claims for additional compensation or time on account of such suspension.

## SECTION 300

### SANITARY SEWER AND APPURTENANCES

#### 3.01 - General

- A. Furnish all labor, materials, tools, and equipment necessary to lay and join all polyvinyl-chloride (PVC) pipe and fittings for gravity sanitary sewers as shown or as required to complete the work.

#### 3.02 - Materials

- A. Polyvinyl-chloride pipe and fittings shall conform to ASTM Designation D-3034, current edition (SDR-35) or ASTM accordance with ASTM D-1784 (class 12454-B). Pipe lengths shall be in the longest available.
- B. Minimum "pipe stiffness" (F/Y) measured in accordance with ASTM D-2412 shall be a minimum of 45 PSI and 5% deflection.
- C. Joint seal for PVC pipe (Type SDR-35) shall be oil-resistant, compression rings of elastomeric gasket joints material conforming to ASTM D-3212. Fittings shall have push-on, bell and spigot joints compatible with that type of pipe.
- D. All Sanitary Sewer Force Main shall conform to the standards outlined in the Derry Water Main Specifications.

#### 3.03 - Execution

- A. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Pipe or fittings shall not be dropped. Any damage to the pipe lining or coatings shall be cause for rejection of pipe. All rejected pipe shall be promptly removed from the site and replaced with sound pipe at the **CONTRACTOR's** expense. Handling and laying of pipe and fittings shall be in accordance with the manufacturer's instruction.
- B1. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when laid, shall conform to the lines and grades required. A firm, even bearing throughout the length of the pipe placed in not less than 3 separate lift shall be constructed by tamping selected material at the sides of the pipe up to 1 foot over the top of pipe. Blocking will not be permitted. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with sound pipe in satisfactory manner by the **CONTRACTOR** at his own expense.
- 2. Crushed stone as specified by section 6.05 herein shall be placed 6" below the bottom of the pipe within half the diameter of the pipe being laid through the entire width of the trench.
- 3. Sand as specified by Section 6.05 herein shall be placed 12" above the top of the pipe though the entire width of the trench.

- C. Prior to starting new installations, outlets to existing sewer manholes shall be properly sealed with a water tight plug. When laying is not in progress, the open end of the pipe shall be closed by water tight plugs or other approval means. Pipelines shall not be used as conductors for trench drainage during construction.
- D. Pipe and fittings shall be installed using laser-beam techniques or other approved methods. Care shall be taken to ensure true alignments and gradients as shown on the drawings.
- E. When pipe is cut in the field, the cut end shall be tapered back approximately 1/8 - inch at an angle of 30 degrees with the center line of the pipe with a coarse file or grinder to remove any rough edges which might injure the gasket.
- F. A Tee Wye service lateral shall be installed for each existing building or as directed by the **ENGINEER**. The services shall be extended to the edge of Town Right of Way and constructed to the standards specified, in section 500 herein (sewer services).
- G1. Gravity sewer lines shall span a maximum of 500 ft. between sewer manholes.
  - 2. Minimum pitch for all sanitary sewer mains shall be as indicated in Table 1.
  - 3. Any deviation in slopes of sewer mains from construction plans must be approved by the Town's Engineer prior to installation.
  - 4. Minimum cover for all sanitary sewer mains shall be 4 feet.

### 3.04 - Testing (Pipelines)

- A1. All gravity sewers shall be low pressure air tested in conformance with ASTM C - 828. The **ENGINEER** shall be present during the entire testing period for approval.
  - 2. The sewer line shall be sealed at each end, and one shall have an orifice through which to pass air into the pipe. The pressure gauge will range from 0 to 5 PSI with minimum divisions of 0.10 PSI. The pipeline under test shall be properly blocked to prevent displacement while the line is under pressure.
  - 3. The line will be allowed to stabilize at 4 PSI for a period of no less than five minutes. After the stabilization period, commence timing with a stop watch. Table 2 shall be used to determine a 1 PSI drop in pressure. If the actual time lapse is greater than that specified, the section undergoing the test shall have passed. If the line has not passed the test, the **CONTRACTOR**, at his own expense, shall make the necessary repairs or replacements required to permanently reduce the leakage to within the specified limits. Testing shall be repeated until the leakage requirements are met.
- B. All force main sewer shall be pressure tested in conformance with the Town of Derry Water Specifications.

C. All gravity sewer pipe shall also be subject to a mandrel deflection test 30 to 60 days after installation of the pipe or after adequate compaction is assured. If the mandrel does not pass through the pipeline, the entire section shall be excavated and relayed; and after backfilling and adequate compaction is assured, the pipeline shall be retested.

**TABLE 1**

**(2) Minimum slope to achieve minimum velocity shall be:**

<b><u>Sewer Size</u></b>	<b><u>Minimum Slope, Feet Per Foot</u></b>
<b>a. 8 inch</b>	.005
<b>b. 10 inch</b>	.0028
<b>c. 12 inch</b>	.0025
<b>d. 14 inch</b>	.0017
<b>e. 15 inch</b>	.0015
<b>f. 16 inch</b>	.0014
<b>g. 18 inch</b>	.0012
<b>h. 21 inch</b>	.0010
<b>i. 24 inch</b>	.0008
<b>j. 27 inch</b>	.0007
<b>k. 30 inch</b>	.0006
<b>l. 36 inch</b>	.0005

## SECTION 400

### SANITARY SEWER MANHOLES

#### 4.01 - General

- A. Furnish all labor, materials, equipment and incidentals necessary for the installation of sanitary sewer manholes and frames.

#### 4.02 - Materials

- A. The manholes shall be constructed of precast reinforced concrete manhole sections. The sections shall be a minimum of four feet in diameter and shall conform to the requirements of "Specifications for Precast Reinforced Concrete Manhole Sections", ASTM 0478.
- B. Manhole bases shall be constructed of precast reinforced concrete. Manhole bottoms shall have a bottom at least six 6 inches thick. The walls shall extend a minimum of six inches above the top of the highest in-flowing sewer. There shall be a minimum of 5 inches between the invert of lowest out falling sewer and floor of the precast base to provide for the construction for a brick invert and bench wall within the manhole.
- C. Openings in manhole bases of pipe connections shall utilize a flexible neoprene boot, mechanically clamped to the manhole and to the pipe to provide a water-tight seal which will accommodate pipe movements up to 2 inches radially or 22 degrees angularly, in any direction. Gaskets shall conform to requirements of ASTM C 443.
- D. The Top section shall be an eccentric conical section with thickened upper walls with the smallest inside diameter equal to 30 inches, to receive the manhole, frame and cover.
- E. O - ring gasket for joints between manhole sections shall conform to ASTM C443 or as specified in the drawings.
- F. The exterior surface of all sanitary manholes shall be given 2 coats of coal tar epoxy such as koppers 300 - M, Rust-Oleum 93-7908, or approved equal.
- G. All castings for manhole covers and frames shall be class 30 conforming to the ASTM Standard Specification for Gray Iron Castings, designation A48. Allowances shall be made in the patterns so that specified thickness shall not be reduced. All lids which "Rock" and do not lie solid after construction is finished, shall be rejected and shall be replaced by adequate lids. No plugging, burning-in, or fillings will be allowed. Covers shall fit the frames in any position.
- H. All frames and covers shall have an H-20 (8 Ton) loading rating. The total weight of each frame and cover shall be less than 400 pounds. The opening inside diameter shall be 30 inches and the minimum total height shall be six (6") inches.
- I. The cover shall have the letter "S" or the word "SEWER" in (3) inch letters cast into the top

surface.

- J.** The brick shall be sound, hard, and uniformly burned, consistent in shape and size, and of compact texture. Bricks shall comply with ASTM Serial Designation C32, Grade MS.
- K.** Cement mortar for manholes shall consist of one part of Portland Cement Type II and two parts of fine sand with water added to produce the proper consistency for the type of joint.
- L.** Non-shrinking mortar for pointing and sealing manholes shall be equal to “water-plug” as manufactured by Standard Drywall Products.

#### **4.03 - Execution**

- A.** All manholes shall be constructed at the locations and to the elevations and dimensions shown on the drawings, precast reinforced concrete sections shall be set vertical with sections in true alignment. Any deviations from plans must be approved by the Town’s Engineer prior to installation.
- B1.** Crushed stone shall be placed as specified in section 6.05 herein and shall be placed **12”** below the base of the structure.
  - 2.** The select material below the base shall be perfectly level through the limits of the structure prior to setting it. If the base is not level, it shall be removed from the trench and the material will be regraded and recompactd using equipment. Lifting one side of the base and manually placing material underneath it will not be permitted.
  - 3.** Any voids or over excavation underneath pipes leading to manholes resulting from significant elevation changes or “drop sewer manholes” shall be backfilled with crushed stone as specified in section 6.05 herein. This additional stone shall be included as part of typical installation of drop sewer manholes.
  - 4.**
- C.** Pipes entering precast sections of manholes shall be set securely in the precast opening at the correct line and grade.
- D.** The joints between concrete manhole sections shall be sealed with neoprene gaskets or by other approved means to ensure water tightness of the joints. In addition to the gaskets, both the inner and outer walls at the joints shall be mortared by an approved mortar mix.
- E.** During manhole construction, all groundwater shall be kept away from newly grouted pipe and rings or freshly laid brick work until cement has properly set and until a water tight job is obtained. Manholes which admit groundwater after completion shall not be accepted.
- F.** All manhole frames and grates shall be set flush to existing or proposed pavement as directed by the **ENGINEER**. Frames shall be set concentric with the top of the precast section on a maximum of 5 course of brick in a full bed of mortar so that the space between the top of the manhole section and bottom flange of the frame shall be completely filled and made water tight.

Place a ring of mortar extending to the outer edge of the concrete section as indicated on the drawings.

- G.** Manholes shall have a brick lined invert with shelves, constructed to conform to the size of the pipe and flow. At changes in direction, the invert shall be laid out in curves of the longest radius possible, tangent to the center line of the sewer pipes. Under layment of invert and shelf shall consist of brick masonry. Shelves shall be constructed to the elevation of the highest pipe crown and slope toward the flow channel at a minimum of one inch per foot.

**4.04 - Testing**

- A.** All sanitary sewer manholes shall be vacuum tested. Initial test pressure shall be 10" Hg. Table 3 contains the specified allowances for 4' and 6' diameter manholes. If the pressure drop exceeds 1" prior to the allowable time, the unit shall be repaired and retested.

**TABLE 3**

**Specification Time for 1" Hg Drop**

<u>Manhole Depth</u>	<u>Test Time</u>
0' to 10'	2 minutes
10' to 15'	2 1/2 minutes
Greater Than 15'	3 minutes

## SECTION 500

### SEWER SERVICES

#### 5.01 -General

- A. Furnish all labor, materials, tools, and equipment necessary to lay and join all polyvinyl-chloride (PVC) pipe and fittings for gravity sanitary sewer services as shown or as required to complete the work.

#### 5.02 - Materials

- A. Polyvinyl-chloride (PVC) sewer pipe shall conform to ASTM Specification D3034-SDR35. Each pipe section must be manufactured to provide a minimum pipe stiffness of 45 PSI. Pipe ends must be compatible with the joint coupling so as to provide confinement of the rubber gasket.
- B. All fittings such as elbows, sweeps, wyes, etc., shall be (PVC ) SDR35.

#### 503. - Execution

- A. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Pipe or fittings shall not be dropped. Any damage to the pipe linings or castings shall be promptly removed from the site and replaced with sound pipe at the **CONTRACTOR's** expense. Handling and laying of pipe and fittings shall be in accordance with the manufacturers instruction.
- B. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when laid, shall conform to the lines and grades required. A firm, even bearing throughout the length of the pipe placed in not less than 3 separate lifts shall be constructed by tamping selected material at the sides of the pipe up to 1 foot over the top of the pipe. Blocking will not be permitted. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner by the **CONTRACTOR** at his own expense.
- C. When laying is not in progress, the open ends of the pipe shall be closed by water tight plugs or other approved means. **Pipelines shall not be used as conductors for trench drainage.**
- D. When pipe is cut in the field, the cut end shall be tapered back approximately 1/8 - inch at an angle of 30 degrees with the center line of the pipe with a coarse file or grinder to remove any rough edges which might injure the gasket.

- E.** The minimum size pipe for sewer service connections shall be six (6") inches.
  
- F.** Sewer service pipe shall be laid at a continuous and constant grade of not less than 1/4 inch foot.
  
- G.** A 6 inch PVC Clean out shall be constructed within 10 feet of building foundation. The clean-out shall be capped by a threaded cover. Push on caps are prohibited. Figure 1 is a detailed illustration of a clean-out assembly.
  
- H.** All sewer services shall be laid on a 6 inch bedding of crushed stone. Stone shall also be placed to within half the diameter of the line being laid.
  
- I.** All sewer services shall be covered by 12 inches of sand as that stipulated by Section 6.05 herein unless otherwise requested by the Town's Engineer.
  
- J.** Minimum cover for all sanitary sewer mains shall be 4 feet.
  
- K.** Sewer and water services must have a minimum 10' horizontal separation and minimum 1.5 vertical separation.
  
- L.** Duplexes or other multi-unit dwellings shall have separate connections to the main line and be installed as outlined herein.

## SECTION 600

### TRENCH EXCAVATION AND BACKFILL

#### 6.01 - General

- A. Furnish all labor, materials, equipment and incidentals necessary for trenching of utilities and appurtenances, including backfill, test pits, and disposal of surplus materials.

#### 6.02 - Location of Utilities

- A. It shall be the **CONTRACTOR's** sole responsibility to contact Dig Safe prior to construction.
- B1. Prior to construction, the Town shall mark out locations of existing water , sewer and drainage utilities based on best available information. This shall not in any way relieve the **CONTRACTOR** from damages to the existing utilities.
- 2. The **CONTRACTOR** shall be responsible for maintaining and recording all utility locations during construction. The **CONTRACTOR** shall pay all expenses for any relocating of existing utilities performed by the **TOWN**.

#### 6.03 - Trench Excavating

- A1. The **CONTRACTOR** shall make excavations in such manner and to such widths as will give suitable room for laying, jointing, and bedding the pipe, furnish and place, sheeting as necessary, and for dewatering and maintaining the trench in a dry condition.
- 2. It is the **CONTRACTOR's** responsibility to satisfy all Federal State and local regulations such as those of OSHA.
- B1. In general, trenches shall be excavated to an elevation of one foot below the elevations specified on the drawings. Excavations for structures such as manholes shall be 1 foot below the base or as specified on the plans.
- 2. The allowable trench width shall be 2.0 feet greater than the normal pipe size or a minimum of 3 feet, whichever is greater. Excavations around structures shall extend enough to adequately compact using mechanical tampers.
- C1. All pavement is to be cut prior to excavation. The **CONTRACTOR** shall at all times exercise care not to excavate outside the trench limiting lines as shown on the drawings. No extra allowance will be given for backfilling, rock removal, paving, or other work resulting

from excavation beyond these lines.

2. If the **CONTRACTOR** excavates below grade through error for his own convenience, or through failure to properly de-water the trench, or disturbs the sub-grade before de-watering is sufficiently complete, he may be directed by the **ENGINEER** to excavate below grade, which case the work of excavating below grade and furnishing and placing the refill shall be formed at his own expense.
- D1.** If in the opinion of the **ENGINEER**, the material at or below the normal grade of the bottom of the trench is unsuitable for foundation, it shall be removed to the depth directed by the **ENGINEER** and replaced by an approved second gravel.
2. Surplus material excavated from trench and abandoned pipe and utilities, broken pavement, masonry, reinforced concrete, and other materials encountered in the excavation and not suitable for landfill, becomes the property of the **CONTRACTOR** and must be disposed of appropriately.
- E.** The **CONTRACTOR** shall furnish all labor, materials, equipment, and incidentals required to repair any existing utilities damaged during construction. Any assistance rendered to the **CONTRACTOR** by the **TOWN** in isolating or repairing damaged utilities, shall be appropriately deducted from the Contract Bid Price.

#### **6.04 - Trench Ledge Excavation and Disposal**

- A1.** Rock excavation shall consist of all solid rock which cannot be removed without blasting or ripping. It shall consist of boulders and parts of masonry structures when found to measure 1 cubic yard or more.
2. Material which can be loosened and removed such as loose or fractured rock, frozen materials, shale, hardpan, and the like and material which is outside of the limits of measurements allowed shall not be measured or classified as rock excavation.
3. Where rock is encountered, it shall be uncovered but not excavated until measurements have been made by the **ENGINEER**. All ledge within the trench limitations will be removed and disposed of off the site by the **CONTRACTOR**. All ledge excavated from the trench will be replaced with suitable material approved by the **ENGINEER**.
- B1.** All blasting operations shall be conducted in full compliance with all the laws of the state, with all local ordinances, and with all possible care so as to avoid injury to person and property.
2. The **CONTRACTOR** shall perform a **pre-blast survey** of the area where blasting is required. He shall record existing conditions in written form, sketches, photographs, video tapes, or any other form. All nearby buildings, foundations, driveways, roadways, and other existing structures shall be inspected for cracks, loose masonry, and other conditions which might be

attributable to blasting at a later date. A copy of said survey shall be provided to the **ENGINEER** before blasting commences.

3. The **CONTRACTOR** shall record the location, depth, and size of each hole. A copy of the said **blasting record** shall be provided to the **ENGINEER** at the conclusion of blasting rock.
4. No blasting will be permitted under or adjacent to any street, roads, or highway unless permission has been received in writing from the authority having jurisdiction.
5. Conform to all municipal, State, Federal, and other ordinances and codes relating to the storage and hauling of explosives. Particular attention is called to adherence to requirements of the electric, gas, and other utilities which may be located in the project area.
6. Damages and costs of whatever nature resulting from the work specified herein shall be borne solely by the **CONTRACTOR**.

**6.05 - Selected Materials For Pipe Embedment**

A. From the bottom of the trench to a minimum of 12 inches above the pipe crown, shall be referred to as the pipe embedment. Select material shall be 3/4" crush stone or as indicated on the drawings. The selected material shall be hand tamped around the pipe so that each section shall have a firm bearing throughout it's entire length.

**B1. Selected materials shall conform to the following standards:**

2. **Sand** - Shall be free from stone or any organic matter.

<u>Sieve Size</u>	<u>Percent Passing By Weight</u>
3"	100
#4	70 - 100
#200	0 - 12

3. **Bank Run Gravel** - shall be graded such that the maximum size of stone particles shall not exceed 3/4 of the completed depth of the layer being placed. In no case shall the stone size be larger than 6 inches.

<u>Sieve Size</u>	<u>Percent Passing By Weight</u>
6"	100
#4	25 - 70
#200	0 - 12

**4. Crushed Gravel** - At least 50 percent of the material retained on the 1 inch sieve shall have a fractured face.

<u>Sieve Size</u>	<u>Percent Passing By Weight</u>
3"	100
2"	95 - 100
1"	55 - 85
#4	27 - 25
#200	0 - 12

**5. Crushed Stone** - Crushed stone shall consist of clean durable ledge and rock. It shall be free from thin elongated pieces.

<u>Sieve Size</u>	<u>Percent Passing By Weight</u>
1"	100
3/4"	85 - 100
1/2"	15 - 45
No. 4	0 - 5
No. 3	0 - 5
No. 50	0 - 5
No. 200	0 - 5

**6.06 - Backfill**

- A.** The material above the pipe embedment zone shall be selected backfill or common fill as specified on the plans. All trenches within the limits of a roadway, shoulder, sidewalk, or other paved areas shall be thoroughly compacted by hand or mechanical means in layers not to exceed twelve (12) inches. Each backfill layer shall be at 95% of its optimum density.
- B.** All backfill material shall be free from all organic matter and debris. No stone or rock fragments larger than 6" shall be deposited in the backfill.
- C.** Any trench areas improperly backfilled or having excessive settlement, shall be reopened to the depth required, then refilled, compacted, restored to the required grade, mounded over and smoothed or repaved as necessary.

## SECTION 700

### TRENCH REPAIR

#### 7.01 - General

- A. Furnish all labor, materials, equipment, and incidentals required to replace all pavement removed over trenches or otherwise disturbed by the **CONTRACTOR** operations.
- B. Streets, driveways, parking areas or sidewalk pavement, damaged or disturbed by the **CONTRACTOR'S** operations shall be repaired, replaced, or restored by the **CONTRACTOR**, in accordance with the requirements specified herein and as directed by the Engineer, at no additional expense to the owner.
- C. Except as otherwise specified herein, the material and construction shall be in accordance with the “**Standard Specification for Road and Bridge Construction**”, **New Hampshire Department of Transportation (NHDPW)**, latest edition, including all addenda.

#### 7.02 - Materials

- A. **Bank Run Gravel:** Shall meet the requirements of section 600 herein.
- B. **Crushed Gravel:** Shall meet the requirements of section 600 herein.
- C1. **Base Course Pavement:** Shall be 3/4” Type B as specified in the NHDPW & H “Standard Specifications for Road and Bridge Construction.”
- 2. **Wearing Course:** Shall be 3/8” Type F as specified in the Standard Specifications referenced above.
- 3. **Temporary Pavement:** Shall be 1/2” Type C as specified in the Standard Specifications referenced above.

#### 7.03 - Temporary Pavement

- A. All trenches shall be paved immediately following construction unless otherwise noted on the plans or directed by the **ENGINEER**.
- B. The **CONTRACTOR** shall provide a mechanical sweeper and shall “**sweep**” clean all roads used or in the construction areas as requested by the **Engineer**. This shall be done as construction progresses to further control the dust nuisance caused by unpaved trenches in roadways and other areas. Upon completion of all road work, the **Contractor** shall sweep

clean the final work.

**C1.** Trenches shall be back-filled to within 22 inches of final grade as specified herein.

**2.** The **CONTRACTOR** shall place **12” of Bank run gravel, 8” crushed gravel, and 2” of Temporary pavement.** Gravel materials shall be thoroughly compacted by hand or mechanical means in layers not to exceed six (6) inches. Each backfill layers shall be 95% of its optimum density.

**3.** Temporary patches shall remain in place for a minimum of **60 days** but not more than 120 days. The **CONTRACTOR** shall have the responsibility to periodically inspect temporary pavement areas and repair as necessary, especially during the winter months when the temporary pavement remains in place for an extended period.

**4. USE OF COLD PATCH MATERIALS IS SPECIFICALLY PROHIBITED FOR TEMPORARY PATCH.**

**D.** All digging up, protecting, and replanting of hedges, shrubs, trees, and plants, along with stripping and stockpiling of all topsoil where it exists, and replacement of the original earth cover including regrading and clean-up shall be the sole responsibility of the **CONTRACTOR.**

**7.04 - Permanent Trench Pavement Repair**

**A.** At the end of the stabilization period the temporary patch will be cut out and the trench trimmed with neat straight cuts and square corners a minimum distance of (12) inches beyond the limits of the temporary patch or areas of observed settlement, whichever is greater. The **CONTRACTOR** will insure this requirement is adhered too.

**B.** The **CONTRACTOR** shall remove the temporary asphalt and crushed gravel as needed to obtain 4” of permanent pavement required. A tack coat shall be applied along all joints.

**C.** Supply and place (2 1/2) inches of 3/4” Type B Base course asphalt and (1 1/2) inches of 3/8” Type F Finish course asphalt. Paving shall be allowed if the air temperature is at least **45 degrees F** and rising, and the area is exposed to the sun.

**D.** Rolling shall be done with a self - propelled roller weighing not less than 8 tons and shall continue until a firm, even surface true to the lines and grades is obtained.

**E.** Newly paved trenches shall be either bonded to the existing pavement by an approved means of infra-red heat sealing, or overlaying by 1” of Type F pavement over the entire area.

**F.** All trenches shall be overlaid the entire width of roadway and 50 ft beyond the edges of the trenches along the length of the roadway. The new pavement shall be keyed into the existing pavements as directed by the **ENGINEER.** Finish course paving shall be placed by machine method in accordance with NHDPW & H “Standard Specifications for Road & Bridge Construction”.

## 7.05 - Sidewalks

**A.** All sidewalks, whether bituminous concrete or cement concrete, interfered with during the construction of sanitary sewer main and/or sewer service connections shall be rebuilt by the **CONTRACTOR** in accordance with the following specification:

- 1. Cement Concrete:** The foundation shall be at least (6)inches of well - compacted bank run gravel. The concrete shall be 3000 lb. strength, 4 inches in thickness, reinforced with No. 4, 4" x 6" mesh and wood flat finished. Expansion joints (3/4" open) shall be provided at least every 20 feet: dividing joints shall be of an approved type. It shall be compacted to 95% of its optimum density.
- 2. Bituminous Concrete:** The foundation shall be twelve (12) inches of bank run gravel as specified above, (material and compaction) the wearing surface be laid in two courses, a 1 1/2 inch bottom course and a 1 inch top course, thickness measured after compaction. The material and application shall conform to the Specifications outlined for roadway surfacing. All edges of the walks shall be formed with wood screeds, which are securely anchored and left in placed. The sidewalk shall meet existing side walk widths and have slope of 1/4 inch per foot from back edge of sidewalk towards roadway.

## SECTION 800

### AS-BUILTS

#### 8.01 - General

- A. The contractor must submit all asbuilts for Water/Sewer mains and Water/Sewer services. All costs for As-built drawings shall be absorbed under various items.

#### 8.02 - Requirements

- A. The below list is the minimum requirement which must be provided:

- 1) House location
  - 2) Installed sewer and/or water service location
  - 3) Driveway location
  - 4) Water main location
  - 5) Sewer main location
  - 6) Drain location (if any)
  - 7) Catch Basin location (if any)
  - 8) Sewer manhole location (if any)
  - 9) Retaining wall location (if any)
  - 10) Other Public Utilities (electric, telephone, etc.)
  - 11) Existing trees within 12' foot of proposed service (if any)
- (Figure 1 illustrates and example of a typical as-built site.)

- B. Original site plans may be used in drawing as-builts for sewer and water mains. The actual pipeline installed shall be drawn in red pencil or red ink, as will notes and swing ties.

- C. All newly installed water main gate boxes and hydrant gate boxes must be accurately located and **“tied off”** from permanent building structures only. Ties taken from poles, catch basins, manholes, other gate boxes, trees and property boundaries are not acceptable. The above requirement may be modified if any one **“tie”** distance is greater than one hundred feet (100')

- D1. Service **“as-builts”** must show the exact location and depths of new water/sewer services in relation to the building that it services. All depths between the Top of the service and existing ground must be noted.

2. Water service connection **“as-builts”** must include **“ties”** from the building corners to the corporation, the service box, unions, and any points at which the service changes directions. In addition, distances from corporations to curb stops and curb stops to unions and the point at which the service enters the foundation.

- 3.** Sewer Service connection “**as-builts**” must include “**ties**” from the building corners to the tap or wye, and to the clean-out. In addition, distances from the “**Tap of Wye**” to the clean-out and from the clean-out to point at which the service enters the foundation. The distance from the “**tap or wye**” to the upstream sewer manhole in the public sewer main shall also be noted.
- E.** Distances must be accurate to the nearest tenth of a foot (plus or minus 0.10”). Accurate “**as-built**” plans are dependent on good location and measurements **prior to backfill.**
- F.** Before the Town releases final monies from bid items or escrow accounts, complete “**as-built**” plans must be submitted to the Department of Public Works, 40 Fordway, Derry, New Hampshire 03038.

## Section 900

### Easement Construction

#### 9.01 General

A. Furnish all Labor, materials, equipment, and incidentals required to construct easements that will allow access to maintenance and construction equipment.

#### 9.02 Materials

A. 1) Woven Geotextile shall be a woven polypropylene product. It shall meet or exceed the following physical requirements.

<u>Geotextile Property</u>	<u>Test Method</u>	<u>Minimum Property Requirements</u>
Apparent Opening Size (US Standard Sieve Size)	ASTM D4751-87	No. 30 Sieve
Permittivity (1/second)	ASTM D4491-85	0.02
Grab Tensile Strength (Pounds)	ASTM D4632-86	270
Puncture Strength (Pounds)	ASTM D4833	100
Mullen Burst (psi)	ASTM D3786	550
Trapezoid Tear (pounds)	ASTM D4533-85	100

2) To prevent damaging the fabric, the Contractor shall exercise necessary care while transporting, storing and installing the fabric. Prior to installation, the fabric shall be protected from weather, direct sunlight or other ultra-violet exposure, and from dust, mud, dirt, debris and other elements which may affect its performance. Fabric which is torn, punctured or otherwise damaged shall not be placed. After placement, fabric shall be covered within 5 days. Traffic or construction equipment will not be permitted directly on the geotextile.

A. **Bank Run Gravel:** shall meet the requirements of Section 600 herein.

C. **Crushed Gravel:** shall meet the requirements of Section 600 herein.

### **9.03 Construction Easement**

- A.** A 50' wide construction easement shall be cleared and grubbed according to Plans or as specified by the Town's Engineer. Caution shall be exercised by the Contractor so as not to disturb areas outside the limits of work.
- B.** All loam shall be stripped within the limits of the 20' permanent utility easement and stock piled for future use in an authorized area.

### **9.04 Access Drive**

- A.** All utility lines and structures shall be installed and tested as outlined herein.
- B.**
  - 1)** A 12 foot wide access drive shall be constructed directly over the center of the utility main installed within the 20 foot permanent easement. Drainage culverts shall be installed according to plans or as directed by the Town's Engineer.
  - 2)** The access drive shall be cut to subgrade at a minimum of 18 inches from finished grade or as specified on the Plans. The geotextile shall be placed in accordance with the plans and manufacturer's requirements. Prior to placement of the fabric, the site shall be prepared to provide a smooth surface which is free from debris, obstruction, and depressions which could result in gaps, tears or punctures in the fabric during cover operations. The fabric shall be unrolled loosely and positioned as evenly as possible on the surface to eliminate wrinkles and folds. Pins or staples may be used to anchor the fabric as directed by the Engineer. The fabric should be pinned in a loose condition so that it easily conforms to the ground surface and will give to the inward movement of the overlying material. Fabric which is damaged after placement shall be replaced, repaired by stitching or patched. Patches shall be of the same material as the placed geotextile. The patch shall be joined to the existing fabric using overlapped seams as directed by the Engineer.
  - 3)** 12 inches of Bank run gravel shall be placed over the fabric in accordance with the plans. Fabric which is damaged as a result of careless or improper placement of gravel, grading techniques or equipment traffic above the fabric shall be repaired or replaced at the expense of the Contractor. 6 inches of crushed gravel shall be placed over the Bank run gravel and be graded to match the surrounding topography or as directed by the Town's Engineers.
  - 4)** Screened loam at an average depth of 2 inches shall be placed over the access drive and shall be seeded to discourage use by unauthorized vehicles.